



Forest Service
U.S. DEPARTMENT OF AGRICULTURE

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Draft Assessment

CIMARRON AND COMANCHE NATIONAL GRASSLANDS

Revised Land Management Plan

BACA, LAS ANIMAS, AND OTERO COUNTIES, COLORADO

MORTON AND STEVENS COUNTIES, KANSAS

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Introduction

Assessment Background

Purpose of the Assessment

The first step in revising a land management plan is to prepare an assessment. Assessments are intended to rapidly evaluate and present existing information about relevant ecological, economic, cultural, Tribal, and social conditions; trends and sustainability; and associate relationships to the land management plan. Assessments are not decision-making documents; instead, they provide current information on select topics relevant to the **plan area**. This assessment contributes to the planning process by:

- Providing information to help identify the need to change in the land management planning process
- Identifying and evaluating a solid base of existing information relevant to the land management plan
- Building a common understanding of that information with tribes, the public, and other interested parties before starting the land management planning process
- Developing relationships with interested parties, government entities, tribes, private landowners, and other partners
- Developing an understanding of the complex topics across landscapes that are relevant to planning for the Cimarron and Comanche National Grasslands

The Cimarron and Comanche National Grasslands

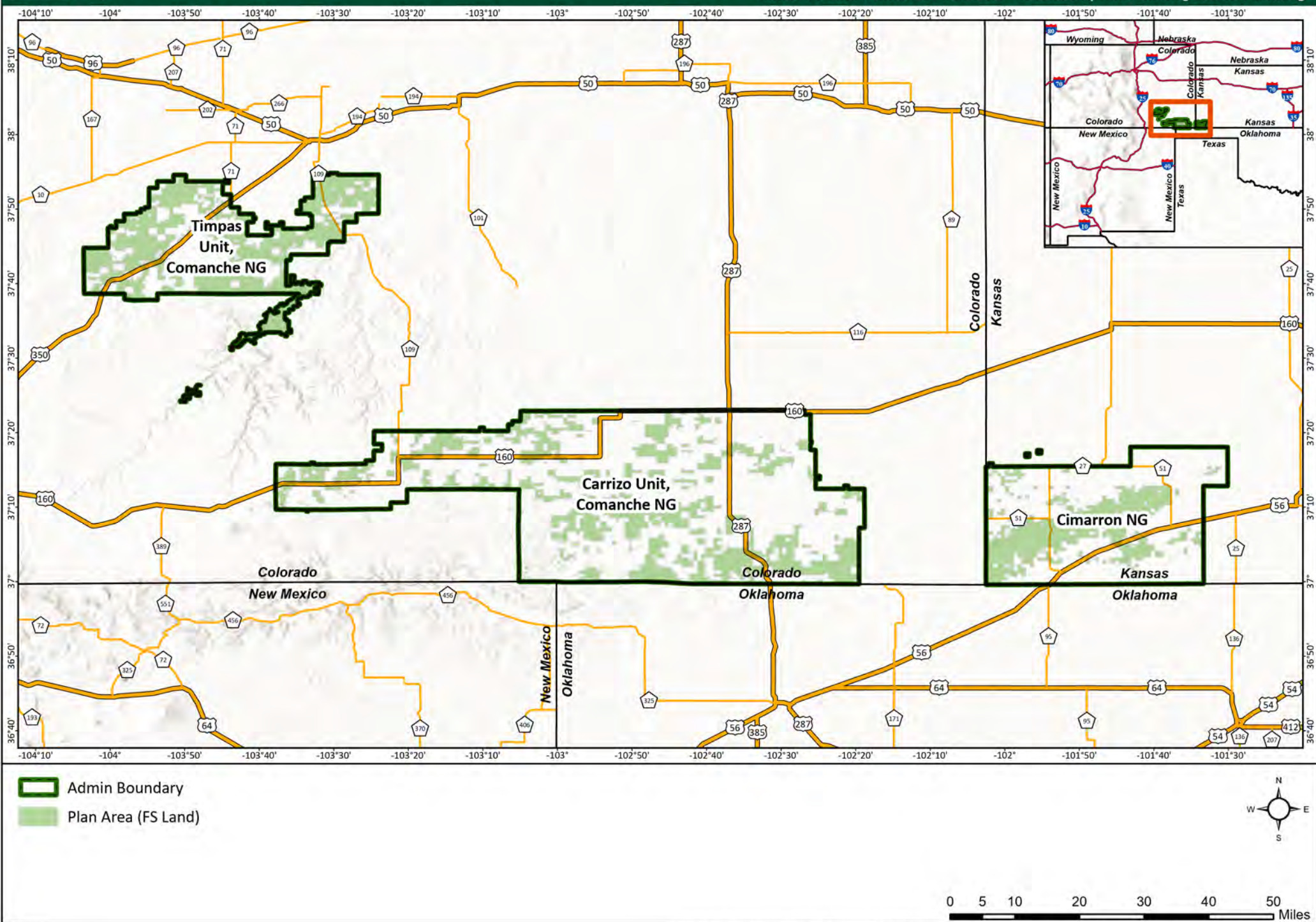
Grassland Setting

The Cimarron and Comanche National Grasslands consist of two districts, the Cimarron National Grassland in southwestern Kansas (108,621 acres) and the Comanche National Grassland in southeastern Colorado (443,642 acres). The Comanche National Grasslands has two distinct units: the Carrizo and Timpas Units. Together the Cimarron and Comanche National Grasslands span 552,263 acres of primarily isolated parcels with minimal consolidated and contiguous federal landownership (see figure 1). Major community hubs in the area include La Junta and Springfield, Colorado, and Elkhart, Kansas.



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Figure 1. Forest Setting
Cimarron and Comanche National Grasslands| Land Management Planning



The Cimarron National Grassland is the largest area of public land in Kansas, while the Comanche National Grassland is a significant public land area in southeast Colorado. Both are managed by the Forest Service for conservation and multiple-use purposes. Acquired from the Soil Conservation Service in the 1950's, the grasslands feature diverse landscapes, including rock cliffs, cottonwood groves, and prairie ecosystems. They provide habitat for a variety of wildlife, including the lesser prairie-chicken and golden eagle, and contain significant cultural and historic sites. The Santa Fe National Historic Trail crosses both grasslands, and the Comanche also includes one of North America's largest dinosaur trackways.

Landownership across the Cimarron and Comanche National Grasslands broader landscape is approximately 38 percent federal, 43 percent private, and a mix of state and other federal holdings. The plan area borders the Piñon Canyon Maneuver Site, a 235,000-acre military training site. Socioeconomic influences include farming as a primary economic driver, along with livestock grazing, recreation, and ties to the oil and gas industries.

Distinctive Roles and Contributions

The Cimarron and Comanche National Grasslands play a crucial role in the region's ecological, cultural, and socioeconomic landscape. Ecologically, they are home to native shortgrass prairie, which provides essential habitat for diverse flora and fauna. Distinctive geographic features include the Bent Canyon Bluffs, known for their limestone formations and unique ecological niches, and the Mesa de Maya, a series of eroded basalt-capped mesas stretching for 40 miles. The Picket Wire Canyonlands, with their paleontological resources and archaeological sites, further contribute to the grasslands' unique ecological and cultural character. Picture Canyon, a tributary of the Cimarron River, is the site of springs, seeps, and significant heritage resources, such as rock art, habitation shelters, lithic scatters, homesteads, and rare ferns that grow on cliff faces.

The Cimarron and Comanche National Grasslands are distinct in their cultural and historical significance, with over 12,000 years of habitation by uniquely diverse cultural and ethnic groups. Traditional Ecological Knowledge (TEK), including sustainable farming and fire management practices, remains an important part of the area's heritage. Key sites like the Rourke Ranch Historic District, listed on the National Register of Historic Places (NRHP), highlight the ranching and settlement history of southern Colorado.

The grasslands support essential habitats for at-risk species. The Bent Canyon Bluffs provide habitat for the lace hedgehog cactus and Texas horned lizard, while the lesser prairie-chicken, historically present in high densities in Colorado, relies on the sandsage prairie ecosystem of the grasslands for survival. The Picket Wire Canyonlands and OU Creek host several rare and endemic species, including the Colorado fraseria and other flora and fauna, such as the bighorn sheep, ferruginous hawk and loggerhead shrike. Watersheds within the grasslands, including the Upper Arkansas and Upper Cimarron basins, provide habitat connectivity, which is crucial for big game species like elk, pronghorn, and mule deer. These watersheds support not only biodiversity but also key ecosystem services like water filtration and carbon sequestration. The grasslands also serve as vital wildlife corridors, supporting biodiversity and migration pathways.

The ecosystems within the Cimarron and Comanche National Grasslands provide a variety of resource outputs, services, benefits, values, and opportunities, including contributions from multiple uses that support the local and regional economies, as well as supporting or providing ecosystem services. The grasslands support industries such as livestock production, which has a long history in the region; recreation, which draws visitors for activities like hiking, birdwatching, and exploring unique features; and oil and gas development, which provides a source of energy and jobs to the surrounding communities. The region also supports additional recreational opportunities tied to heritage tourism, particularly in areas like Picture Canyon, where visitors can explore cultural and natural features.

Ecosystem services provided or supported by the Cimarron and Comanche National Grasslands benefit human well-being through:

- Provisioning services, which are tangible products from the grasslands that provide nutrition, materials, and energy, including water supplies, forage and food, and fuel.
- Regulating services, which are services obtained through moderation or control of ecosystem processes, such as water filtration, soil stabilization, pollination, and disease regulation.
- Supporting services, which are services that maintain fundamental ecosystem processes, including habitat connectivity and maintenance of genetic and biological diversity; and
- Cultural services, which are non-material benefits that ecosystems provide to human societies and culture, including recreational, educational, and tourism opportunities; access to scenery; aesthetic values; and other nonuse values associated with the grasslands.

The grasslands also contribute to regional collaboration and sustainability. Their role in supporting wildfire mitigation plans and local tourism initiatives underscores their importance to the broader socioeconomic and ecological systems. These contributions foster a strong sense of place for local communities, connecting people to the landscapes and histories that define the region.

Looking forward, anticipated changes over the planning period include the impacts of warmer temperatures and altered precipitation patterns likely to affect species composition and ecosystem integrity. Socioeconomic shifts may include increased recreational use, driven by growing interest in outdoor activities, including cultural, historical, and ecological tourism. Changes in agricultural and other land management practices may occur due to changes in ecosystem integrity and resource demands. Water demand from expanding agriculture and adjacent population growth may further stress water systems, requiring innovative management strategies. Grazing, a historically significant land use in the grasslands, is likely to remain vital for the local economy, although management strategies may need to adapt to shifts in forage and water availability.

Major Drivers and Stressors

Stressors are factors that may degrade or impair ecosystem composition, structure, or ecological processes, potentially compromising ecological integrity.¹ Drivers are closely related to stressors but do not always impair integrity; some drivers are essential to maintaining ecosystem functions. However, drivers can become stressors when their frequency, severity, or extent exceeds the natural range of variation. The plan area and broader landscape has been shaped by a history of Indigenous land stewardship, native and domestic herbivory, European settlement, agriculture, and federal conservation. Today, modern stressors, including development, water use and invasive species, continue to strain resources. The major drivers and stressors in the Cimarron and Comanche National Grasslands include the following:

- **Current and Projected Climatic Conditions** Hot and dry weather coupled with variable precipitation affect survival of plant and animal species, increase the risk of wildfire, and impact infrastructure resilience and critical ecosystem services like water supply, forage, and habitat availability.
- **Water Use:** Agricultural needs, land use changes, energy development, and population growth drive water demand. Stressors include water quality issues (for example, nitrogen and phosphorus), overextraction, drought and groundwater depletion.
- **Wind:** Wind disturbance, specifically wind erosion, has been a significant driver of ecosystem change in the Cimarron and Comanche National Grasslands. The plan area, which lies in the semiarid Great Plains, is vulnerable to wind erosion due to the naturally dry conditions and exposed soils. The factors that contribute to wind erosion in these grasslands have deep historical roots, particularly due to the

¹ See 36 CFR 219.19.

long-term effects of plowing native prairie and continue to pose ecological and economic challenges in the region today.

- **Fire:** Fire can help maintain healthy grassland ecosystems by controlling woody encroachment and promoting native grasses. It also increases species diversity, helps cycle soil nutrients, and removes old vegetation. Fire suppression has decreased the historical fire frequency and led to shifts in species and ecosystem function as well as fuel accumulation. Fuel buildup coupled with prolonged drought cycles, warmer winters, and increased variability in the timing and amount of precipitation can lead to more severe and widespread wildland fire.
- **Invasive Species:** Non-native invasive plants, animals and diseases threaten native vegetation, biodiversity, and riparian ecosystems. While effective integrated management efforts may help mitigate the spread of some invasive species, species like Russian thistle continue to alter ecological processes, and there is currently no management strategy that can fully prevent this species from affecting the ecosystem. Wind disturbance can exacerbate invasive species spread.
- **Herbivory:** Herbivory encompasses both wild and domestic processes that can act as drivers or stressors by altering vegetation structure and ecosystem functions. Grassland ecosystems have evolved with herbivory, and factors such as timing, intensity, frequency, duration, and herbivore preference are key to its impacts. Herbivory interacts with disturbances like fire and variable precipitation, creating shifting landscape patterns. Domestic herbivory (e.g., cattle grazing) has deep historical and cultural roots in the Cimarron and Comanche National Grasslands. Prairie dogs, a keystone species that has experienced declines due to plague, alter soil structure and vegetation composition through their burrowing and foraging activities. Prairie dog grazing can create niches for native plant colonization, although in some instances it may favor invasive species.
- **Infrastructure:** Infrastructure in the Cimarron and Comanche National Grasslands includes a network of rural roads, trails, and access points that connect local communities, support Forest Service operations, and serve recreational visitors. This network promotes economic growth, public health, and emergency response while providing access to public lands. However, such infrastructure can fragment habitats, alter water flows, and disrupt cultural landscapes. Roads, fences, and structures near streams and rivers are especially vulnerable to extreme weather, flooding, and erosion, which can lead to structural failures, degraded water quality, and ecosystem disruption. Additionally, infrastructure linked to water developments and energy projects, including oil and gas, can further affect resource quality and ecological integrity.
- **Land Ownership:** Land ownership patterns in the Cimarron and Comanche National Grasslands are highly fragmented due to historical land acquisitions, homesteading policies, and shifts in land management priorities. This fragmentation poses challenges to ecosystem management, biodiversity conservation, and operational efficiency. Private inholdings, scattered parcels, and varied land uses complicate landscape-scale management efforts—including prescribed burning, grazing management, wildlife habitat improvement, and vegetation management. Limited public access to some federal lands due to surrounding private ownership can also hinder management efforts, recreation and habitat connectivity. Additionally, land tenure complexities increase administrative and economic costs for the Forest Service, requiring strategic land exchanges, easements, and partnerships to enhance management effectiveness.

Current Land Management Plan

The current Land and Resource Management Plan for the Pike and San Isabel National Forests and Cimarron and Comanche National Grasslands, signed in 1984, envisioned maintaining a balanced mix of resource outputs rather than maximizing specific outputs at the expense of others. The plan emphasized applying socially responsible management practices that address existing public issues while remaining adaptable to emerging concerns. Objectives included maintaining or enhancing local community and economic stability, improving environmental quality, and producing moderate increases in market resources, such as forest and range products.

The 1984 land and resource management plan has undergone several amendments to address management innovations, integrate updated Forest Service policies, accommodate project-specific needs, and assign management area prescriptions to newly acquired lands.

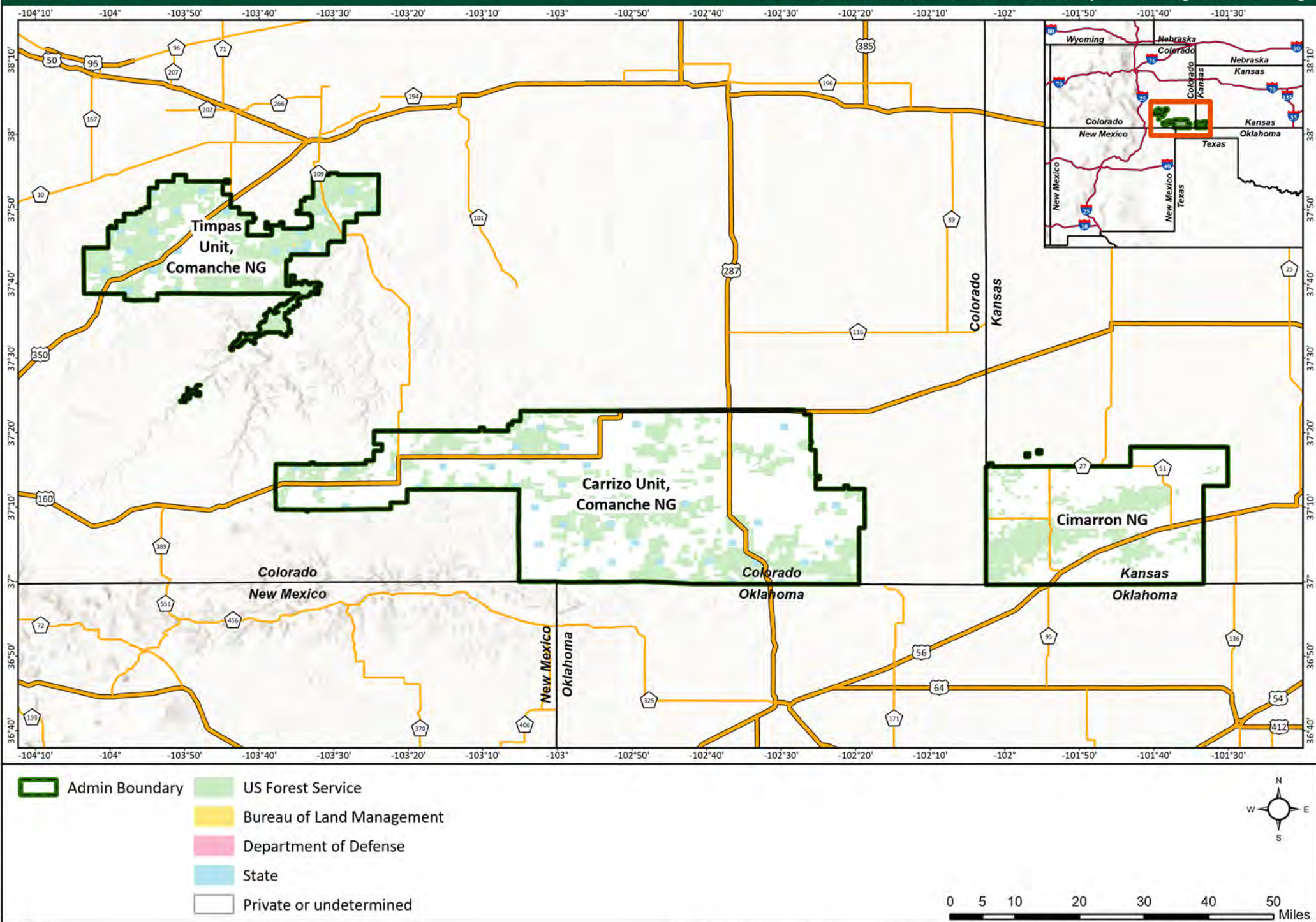
Since 1984, changes in the region such as intermittent regional drought, an increase in invasive species populations, altered fire regimes, an increase in water use, and an increase in recreation visitation have presented both challenges and opportunities (see the Major Drivers and Stressors section).

Moving forward, the cumulative effect of these challenges to the Cimarron and Comanche National Grasslands' ability to achieve its intended contributions to regional ecological, social, and economic sustainability require careful consideration to balance resource sustainability with the needs of local communities and the American people.



USDA Forest Service

Figure 2. Land Status
Cimarron and Comanche National Grasslands| Land Management Planning



The Assessment Process

Beginning in spring 2024, the Forest and Grassland Supervisor for the Pike-San Isabel National Forests & Cimarron and Comanche National Grasslands initiated engagement with Tribes, followed by outreach to county, state, and other federal agencies. On April 3, 2024, formal government-to-government invitations were extended to tribes for consultation on the plan. On September 4, 2024, Tribes were also invited to serve as cooperating agencies in the plan revision process. Counties and local governments were also invited to participate as cooperating agencies starting on September 30, 2024. On November 8, 2024, the Forest Supervisor issued the Notice of Intent to Prepare an Assessment and Initiate Plan Revision for the Cimarron and Comanche National Grasslands.

Public meetings began in January 2025 in southeastern Colorado. Virtual events aimed at public engagement and participation are scheduled for July and August 2025. The public is encouraged to stay informed about engagement opportunities and the status of plan revision by visiting the Cimarron and Comanche National Grasslands plan revision website.²

The Cimarron and Comanche National Grasslands' staff assisted in the preparation of the draft assessment with input and review from the Mountain Planning Services Group and Rocky Mountain Regional Office staff and leadership, as well as public feedback from initial engagement activities. Following the draft's release for public comment in summer/fall of 2025, the Forest Service will incorporate comments, Tribal consultation input, and additional data to produce the revised assessment.

It is important to note that the assessment report is not a decision document and will not be updated on a regular schedule. Instead, it serves as a foundation for identifying conditions, trends, and sustainability needs. This process will inform subsequent steps, including initiating National Environmental Policy Act (NEPA) procedures to prepare a revised land management plan in compliance with the 2012 Planning Rule (36 Code of Federal Regulations (CFR) 219.)

Best Available Scientific Information

During the draft assessment process, specialists on the planning team sought out and used a wide range of existing, available, and relevant data and science to evaluate conditions, trends, and risks to sustainability for the social, economic, and ecological systems found in the Cimarron and Comanche National Grasslands. Best available scientific information (BASI) is accurate, reliable, and relevant to the issues being considered, and can come from a variety of sources.

Although the best available scientific information is sometimes available in the form of peer-reviewed literature, other sources of information include scientific assessments, Traditional Ecological Knowledge, expert opinion, federal agency inventory and monitoring data, specialist observations, and data or information from the public (FSH 1909.12.07.13). To solicit this information, the planning team conducted literature reviews, consulted agency databases, and collaborated with subject-matter experts. Ideas and findings may be updated in the final assessment based on feedback from Tribes, cooperating agencies, and the public.

Scope, Scale, and Timing

The spatial extent of this assessment encompasses all national forest system lands within the administrative boundaries of the Cimarron and Comanche National Grasslands which will be covered under this planning process. This area, referred to as the plan area, serves as the primary focus for this assessment. Interspersed with National Forest System lands are tracts of privately owned or other federally managed lands that the Forest Service does not manage. These non-Forest Service-managed

² <https://www.fs.usda.gov/r02/psicc/planning/forest-plan/grasslands-plan-revision>

lands are important to understanding the conditions and broader management context. Therefore, the assessment considers all lands within this broader landscape as well as the ecological, social, and economic interactions between these lands and adjacent areas.

The geographic scope of this assessment is relevant at multiple scales, ranging from site-specific conditions within the Cimarron and Comanche National Grasslands to landscape-scale interactions across southeastern Colorado, southwestern Kansas, and adjacent areas. This multiscale approach ensures the assessment captures the full range of influences and outcomes of management decisions, both within the grasslands and across the surrounding landscapes.

The assessment addresses key resource topics that reflect the ecological, social, cultural, and economic dimensions of the Cimarron and Comanche National Grasslands include the following:

- Terrestrial ecosystems, aquatic ecosystems, and watersheds;
- Air, soil, and water resource quality;
- System drivers, including dominant ecological processes, disturbance regimes, and stressors, such as natural succession, wildland fire, invasive species, and climate change, and the ability of terrestrial and aquatic ecosystems in the plan area to adapt to change;
- Baseline assessment of carbon stocks;
- Threatened, endangered, proposed, and candidate species, and potential Species of Conservation Concern in the plan area;
- Social, cultural, and economic conditions;
- Benefits people obtain from the National Forest System plan area (ecosystem services);
- Multiple uses and their contributions to local, regional, and national economies;
- Recreational settings, opportunities, and access, and scenic character;
- Renewable and nonrenewable energy and mineral resources;
- Infrastructure, such as recreational facilities and transportation and utility corridors;
- Areas of Tribal importance;
- Cultural and historic resources and uses;
- Land status and ownership, use, and access patterns; and
- Existing designated areas in the plan area, including wilderness and wild and scenic rivers, and the potential need and opportunity for additional designated areas;

The temporal extent of this assessment spans past, present, and future conditions. Historical data inform trends and legacy impacts on the grasslands, while current conditions provide a baseline for understanding the status of resources and uses. Forward-looking projections, based on factors such as increasing temperatures, variable precipitation, population growth, and evolving land use practices, anticipate changes and challenges that may arise over the life of the revised management plan, typically 10 to 20 years.

This comprehensive approach ensures the assessment provides a robust foundation for informed, adaptive management of the Cimarron and Comanche National Grasslands, aligned with the Forest Service's mission to sustain the health, diversity, and productivity of the nation's forests and grasslands for current and future generations.

Engagement with Local, State, and Federal Agencies and Federally Recognized Tribes

Federally Recognized Tribes

Introduction

The Cimarron and Comanche National Grasslands plan area plays an important role in supporting the cultural, spiritual, and natural resource values of federally recognized tribes and intertribal organizations. Tribal Nations have expressed interest in helping to create a grassland management plan and shaping stewardship practices in the plan area, which contains several sacred sites, treaty-recognized areas, and other areas of importance. This unique government-to-government relationship guides consultation and collaboration, ensuring respect for Tribal sovereignty and adherence to federal trust responsibilities.

Several federally recognized tribes and intertribal organizations are associated with the Cimarron and Comanche National Grasslands plan area or broader region, including the Cheyenne and Arapaho Tribes, the Comanche Nation, the Northern Arapaho Tribe, the Northern Cheyenne Tribe, Jemez Pueblo, the Jicarilla Apache Nation, the Kiowa Tribe, the Osage Nation, the Pawnee Nation, Southern Ute Indian Tribe, the Ute Indian Tribe of the Uintah and Ouray Reservations, the Ute Mountain Ute Tribe and the Wichita and Affiliated Tribes. These tribes have historical and cultural ties to the area, which include a number of disclosed and undisclosed areas of cultural significance. Tribes have been engaged through formal consultation. Traditional Ecological Knowledge will be considered in the assessment process.

Confidentiality of culturally sensitive information remains a priority. The Forest Service will implement measures to protect sensitive Traditional Ecological Knowledge and other information shared during consultations. Existing challenges include the physical distance between the grasslands and Indigenous reservations and allotments, and funding for Forest Service personnel to physically confer with Tribal representatives. There are many opportunities to strengthen this collaboration further.

Status and Trends

In April 2024, the forest supervisor sent formal government-to-government invitations to federally recognized tribes to consult on the plan revision. In September 2024, the forest supervisor extended invitations to 13 tribes to serve as cooperating agencies in the plan revision process. Formal Tribal participation included a virtual meeting between PSICC staff and several Tribal nations in November 2024 with an additional information session in February 2025.

Tribal engagement and collaboration with the Cimarron and Comanche National Grasslands staff and leaders reflects ongoing efforts to honor Tribal sovereignty, address trust responsibilities, and reduce barriers to participation. Positive steps include hiring a Tribal Relations Specialist in 2023, the establishment of regular dialogue between PSICC and the respective Tribal nations, and multiple visits between the Tribal Relations Specialist and Tribal representatives.

Resource conditions, trends, and stressors are being evaluated in collaboration with tribes. System stressors, such as invasive species, nonnative ranching, wildland-urban interface challenges, have raised concerns about their effect on Tribal values. Other concerns expressed during engagement were species management, nonnative ranching, pollution, tourism, Tribal access, treaty rights, and sovereignty. Tribes also expressed interest in opportunities for shared stewardship and resource co-management.

Efforts to address barriers to Tribal participation have included continuous formal and informal dialogue. However, challenges persist, including physical distance of Tribes from the plan area, the ability of USFS to send personnel to Tribal reservations and allotments, and numerous logistical considerations. The Forest Service seeks to continue improving its engagement approach and aligning its management practices with Tribal objectives.

Sensitive information provided by tribes remains protected under Forest Service policy, ensuring that culturally sensitive knowledge is neither disclosed nor documented publicly in this assessment.

Local and State Governments and Other Federal Agencies

Introduction

The plan area supports adjacent communities by providing critical ecosystem services, such as watershed protection, wildlife habitat, recreational and ecotourism opportunities, energy opportunities, and forage for permitted grazing.

The Forest Service collaborates with a range of governmental entities that hold jurisdiction in or near the plan area. These include the Bureau of Land Management (BLM), Kansas State Forest Service, Kansas Department of Wildlife and Parks, Kansas Department of Health and Environment, Morton County (KS), City of Elkhart (KS), Colorado Parks and Wildlife, Colorado Department of Natural Resources, West Otero Timpas Soil Conservation District (CO) and Otero County (CO).

Coordination efforts aim to align land management planning and assessment processes, leveraging input and data from stakeholders. While ensuring alignment, the Forest Service also respects the unique mandates and policies of these jurisdictions, balancing its mission with shared goals for sustainable resource management.

Desired outcomes from state and local government engagement include meeting the requirements of the 2012 Planning Rule to guide plan revision, building relationships to support plan implementation and monitoring, and ensuring engagement fosters collaboration with Tribes and state and local agencies. The Forest Service will remain attentive to opportunities for plan conformity with these agencies throughout the engagement process.

Considerations of Existing Plans and other Sources of Relevant Information

For this draft assessment, the Forest Service is reviewing plans and policies from numerous agencies and jurisdictions, including but not limited to the 2020 Colorado Forest Action Plan, the 2023 Strategic Plan for Climate-Smart Natural and Working Lands (Colorado), the 2024 State Wildlife Action Plan (Colorado), the 2022 Kansas State Wildlife Action Plan, the 2021-2025 Statewide Comprehensive Outdoor Recreation Plan (Kansas), the 2019 Statewide Comprehensive Outdoor Recreation Plan (Colorado), and the 2017 La Junta Comprehensive Plan. These documents and others will be used to identify key management objectives, conflicts, and synergies relevant to the plan area.

Assessment Findings

Ecosystem Drivers and Stressors

Introduction

Ecosystem drivers are the dominant ecological or human-influenced processes that shape the ecosystem. Stressors are those factors that may directly or indirectly degrade or impair ecosystem composition, structure, or ecological process in a manner that may impair the ecosystem's ecological integrity (36 CFR 219.19). Some factors can be either a driver or a stressor, depending on the conditions and context under which the ecosystem is operating. This section provides an overview of the primary drivers and stressors that influence conditions in the Cimarron and Comanche National Grasslands. More detailed discussions disclosing the effects that these drivers and stressors have on specific ecosystem conditions are found throughout this chapter.

Current and Projected Climatic Conditions

Climate and weather are interrelated concepts, but there are some important differences. Weather is a description of the current state of the atmosphere, ranging from a few minutes to weeks. Climate, however, is the average weather condition recorded over a long period of time (e.g., 30 years). Measuring the weather includes assessing changes in air temperature, atmospheric (barometric) pressure, humidity, precipitation, solar radiation, and wind. Climate information includes statistical descriptions of normal weather and weather extremes, for example drought and floods. The Cimarron and Comanche National Grasslands are within the semiarid central portion of the Great Plains, characterized by low to moderate annual precipitation (12 to 20 inches),³ with most precipitation coming from occasional, sometimes severe, thunderstorms during otherwise hot, dry summers.⁴ Average annual temperatures range between 51 and 58 degrees Fahrenheit (°F), with average summer temperatures of 80 to 100°F and average winter temperatures between 32 and 38°F (NOAA 2024).

Over the last 100 years, mean annual temperatures have risen 1.5°F in Kansas and 2.5 °F in Colorado. The region has experienced the greatest warming in winter and spring or at nighttime (Kunkel et al. 2022). Precipitation is highly variable, with a trend of increasing variability in the timing and annual precipitation amount (Miller Hesed et al. 2023). The Rocky Mountain region frequently experiences drought cycles and multiyear periods of above-average precipitation, including significant flooding events (Rice et al. 2018). Historically, there were significant periods of drought in the 1930s and early 1940s (USDA Forest Service 2017a); (Koch et al. 2012). The Cimarron and Comanche National Grasslands experienced long-term drought since 2000 (USDA Forest Service 2017a); USFS 2024a; (Kunkel et al. 2022).

Under the highest baseline emissions scenario (Representative Concentration Pathway 8.5), in which emissions continue to rise at their current rate, the average annual temperature across the Cimarron and Comanche National Grasslands is projected to increase by 8.1 to 8.5°F for the period between 2071 and 2090, relative to historical temperatures from 1975 to 2005 (USFS 2024b). Summers are projected to experience greater warming than winters. Projected warming will increase the rate of soil moisture loss during dry spells, increasing the intensity of future naturally occurring droughts (Kunkel et al. 2022). Seasonal precipitation is projected to be slightly higher (0 to 0.8 inches) in winter compared with the historical period, while no clear pattern is projected for summer. The average length of time that snow will

³ Average annual precipitation is from the historical period of 1975 to 2005.

⁴ The average summer precipitation for the historical period 1975 to 2005 is 5 to 10 inches.

remain on the ground is expected to decrease from 10 to 25 days for the historical period to 0 days for the period between 2071 to 2090 (USFS 2024b).

Increased temperatures are expected to result in higher rates of water loss from soil and vegetation and a reduction in water available to vegetation. Changes in water availability affect vegetation composition and structure that would result from altered life cycle processes and responses of a plant to disturbance (Liu et al. 2021); (Liu et al. 2023); (USDA Forest Service 2017a). Different vegetation types respond differently to water stress, with grasslands being highly sensitive (Wei et al. 2022). Prolonged drought and higher temperatures can inhibit seedling establishment, limit growth rates, and affect reproductive success in favor of drought-tolerant species (Ahmad et al. 2009); Matias et al. 2017; (Liu et al. 2023). Water-stressed plants are more vulnerable to pests and disease, which would result in increased mortality and decline of certain plant species, while facilitating the spread of other vegetation, including invasive plants (Gely et al. 2019); (Luo et al. 2024).

Projected higher temperatures and drought could make the Cimarron and Comanche National Grasslands more vulnerable to wildfire. Although increased temperatures and drought may reduce overall vegetation cover, the remaining fine fuels—especially those associated with invasive species—can become more flammable under warmer and drier conditions. Consequently, large and severe wildfires may occur more frequently (Running 2006); (Abatzoglou and Williams 2016); (Higuera and Abatzoglou 2020). Warmer temperatures and prolonged drought are expected to increase fire frequency and intensity by promoting conditions that favor the accumulation of highly flammable, continuous fuel beds, despite potential reductions in total vegetation. This shift in fuel dynamics may ultimately decrease overall forage quantity, quality, and biodiversity (Kimball et al. 2024).

Seasonal shifts in precipitation and increased temperature will likely result in lower summer flows and earlier, potentially higher, and more frequent peak flows (Mantua et al. 2010); (Wu et al. 2012); (Stewart et al. 2005). Declining summer flows will alter the timing and availability of water supply, affecting agricultural, municipal, and public uses. Within the Cimarron and Comanche National Grasslands, most streams are intermittent. In the Comanche National Grassland, only three perennial streams—Timpas Creek, Carrizo Creek, and the Purgatoire River—currently exist. Projections do not indicate that these perennial streams will transition to intermittent flow within the planning period, although water diversions and withdrawals may further challenge the already intermittent reaches (Acuna et al. 2014); (Furniss and Howe 2016). An increased magnitude of peak streamflows may damage roads near streams or at road-stream crossings, ranging from minor erosion to extensive damage, thus affecting public safety, access for resource management, water quality, and aquatic habitat. Bridges, campgrounds, and national forest facilities near streams and floodplains will be especially vulnerable, reducing access by the public. Increasing water temperatures and declining flow will fragment aquatic habitat and reduce the ability of plants and animals to move along riparian corridors. Drought and extreme temperatures increase stress on fish and aquatic insects, as well as on riparian plants and animals (Furniss and Howe 2016).

Increased temperatures and altered precipitation patterns could impact economic and social sustainability through changes in ecosystem services and resource uses. Shifts in precipitation impact livestock grazing through reduced forage, which can reduce the economic contributions associated with livestock grazing operations that rely on the forage. Additionally, shifts in precipitation impact farming in the surrounding private lands. While farming does not occur within the Cimarron and Comanche National Grasslands, the decline of farming would have significant economic and social consequences for local communities, highlighting the interconnected nature of public and private lands. Reduced levels of precipitation increase the risk of wildland fire, the risk of property damages, and impacts on health from wildland fires, which can have large impacts on the local economies. Drought and the increased risk of wildfire can impact social sustainability by reducing access to clean air and reducing the quality of ecosystem services that benefit the communities through diverse and healthy ecosystems.

The identified impacts on economic and social sustainability affect the surrounding communities and economies, including communities that may be at higher risk due to other environmental stressors found in the area of influence, such as drinking water noncompliance and increased flood risk. The Risks and

Stressors to Social and Economic Sustainability section in Appendix A, Social and Economic Sustainability in the Cimarron and Comanche National Grasslands, provides more details on the impacts on economic and social sustainability from key drivers and stressors.

Water Availability

Water consumption can act as a system stressor when consumption of water resources exceeds a level where ecosystem needs can be met. Water use can disrupt natural flow patterns, impacting the timing and distribution of water in an ecosystem, which can affect species that rely on specific flow conditions for migration or spawning. When water from lakes, rivers, and freshwater resources is overconsumed, it disrupts the ecosystem and threatens native species by increasing salinity and pollution, and drying floodplain and wetland habitats (Sabater et al. 2018);(Navarro-Ortega et al. 2015).

Agricultural needs, land use changes, and population growth drive water demand within the region. Groundwater serves as the primary source of water for most uses within these grasslands. Groundwater removal and use directly affect an aquifer's hydrologic regime. When groundwater is pumped out at a rate that exceeds the natural recharge rate, the total amount of water stored in an aquifer is reduced. As the amount of stored water is reduced, the water table is lowered, or "drawn down". As water tables drop, pumping requires more energy and more expense. Eventually water yield may decrease or stop altogether. Intensive groundwater extraction acts as an ecological, social, and economic stressor that can result in declines in groundwater levels; an increase in the cost of groundwater extraction; diminished or even disappeared spring discharges and baseflows; degradation of wetlands; land subsidence; and intrusion of saline, brackish, or other low-quality water.

Water use can also act as an ecosystem stressor by reducing streamflow volumes. Surface water and groundwater withdrawals can alter flow by reducing water volumes in streams. Withdrawals may reenter the surface or groundwater system at a downstream location or be removed from the watershed through transpiration from crops, lawns, or pastures. Reduced streamflow volume can significantly impact aquatic ecosystems by shrinking available habitat, altering water quality, decreasing biodiversity, and impacting human activities like water access for drinking and irrigation, potentially leading to conflicts between human needs and environmental health (EPA 2025a, 2025c).

On the Cimarron and Comanche National Grasslands, there is a lack of legal protections for instream flows, which leaves aquatic ecosystems vulnerable (Colorado Water Conservation Board NoDate); Kansas Department of Agriculture 2025). Instream flows, which are used to preserve the natural environment, are not established within these grasslands. While water rights support community and agricultural needs, the absence of formal instream flow requirements highlights the need for adaptive strategies to mitigate impacts on aquatic ecosystems and to maintain the health of the grasslands' water-dependent habitats.

Increasing demand for agricultural water use on private lands continues to stress water resources, especially groundwater. Climate variability, drought, and groundwater depletion exacerbate these challenges, necessitating integrated management strategies. Efforts to balance water resource management with ecological sustainability remain ongoing (see the Water Resources section for more information).

Wind Disturbance

Wind disturbance, specifically wind erosion, has been a significant driver and stressor of ecosystem change in the Cimarron and Comanche National Grasslands. The plan area, which lies in the semiarid Great Plains, is vulnerable to wind erosion due to the naturally dry conditions, exposed soils, and the confluence of major weather systems that creates strong winds. The factors that contribute to wind erosion in these grasslands have deep historical roots, particularly with the lasting impacts of the Dust Bowl, and continue to pose ecological and economic challenges in the region today.

Wind erosion is a prominent issue in the Cimarron and Comanche National Grasslands, where windstorms can carry soil from plowed fields on neighboring private land onto National Forest System (NFS) lands. Soil can also become trapped in fence lines. This occurrence is exacerbated by a combination of factors including drier conditions, increasing frequency of droughts, and loss of vegetation that typically stabilizes the soil ((Blanco 2023)). The lack of sufficient biomass cover is mainly observed in plowed fields on private lands, not across the Cimarron and Comanche National Grasslands. The increasing frequency and intensity of windstorms, combined with land use practices on private lands, such as agricultural expansion and lack of adequate cover, contribute to soil degradation. Wind erosion leads to soil being deposited on the grasslands, which can reduce plant growth and soil fertility and alter the composition of plant communities. Areas subject to intensive land use on private lands, including agricultural expansion into marginal lands, are especially prone to wind erosion. On the National Grasslands, the loss of soil from adjacent lands and the deposition of this soil onto grasslands can exceed the rate at which soil naturally forms, potentially leading to long-term degradation of soil quality and altering ecosystem processes (Blanco 2023).

Wind erosion not only has immediate physical consequences, such as reduced soil fertility and increased desertification, but it also impacts air quality and human health, as airborne dust can reduce visibility and exacerbate respiratory issues.

The Dust Bowl of the 1930s was a catastrophic event, caused by a combination of severe, multi-year droughts and unsustainable agricultural practices, and has had a lasting legacy in this region. During this period, intense droughts and high winds, compounded by poor land management and the removal of native grasses, led to large-scale dust storms. The loss of plant cover left the soil exposed to the full force of the wind, leading to the erosion of millions of tons of topsoil and creating a widespread environmental and economic crisis (Finch et al. 2016).

The Dust Bowl resulted in not only the erosion of valuable topsoil but also the displacement of thousands of families and the collapse of the agricultural economy. The environmental degradation caused by wind erosion during this period underscored the need for better land management practices, including the importance of maintaining ground cover and preserving soil integrity. The impact of the Dust Bowl is still felt today in the Cimarron and Comanche National Grasslands, as soil development, which takes millennia, has been slow to recover from the erosion caused by this event (Finch et al. 2016).

Despite improvements in land management practices since the Dust Bowl, wind erosion remains a significant stressor on the Cimarron and Comanche National Grasslands' ecosystems. With changing climatic conditions, including increasing drought frequency and intensity, the region faces continued challenges in soil conservation. Drier conditions, coupled with the increasing frequency of extreme weather events, make the grasslands more susceptible to wind erosion (Livingstone and Warren 2019). The erosion process itself is influenced by the "boundary layer" effect, where wind energy is transferred from the upper atmosphere to the soil surface, creating turbulence that mobilizes soil particles (Livingstone and Warren 2019). This process is particularly impactful in areas with insufficient vegetation or protective cover.

To mitigate wind erosion, efforts to maintain vegetative cover and use adaptive grazing management are critical. Cover crops planted on adjacent private lands can help protect the soil by providing additional biomass, which reduces soil exposure and stabilizes the surface (Blanco 2023). However, these measures depend heavily on the actions of private landowners.

Fire

Frequent fire occurring every 35 years or less has shaped vegetation and ecological functioning in the Southern Great Plains for centuries (USFS GIS 2024, (Zouhar 2021). Recurrent fire can confine trees and shrubs to locations where fire is less frequent or absent, recycle carbon and nutrients, stimulate seeding and sprouting of vegetation, and encourage the growth of native grasses and forbs. However, shifts in fire frequency from historical patterns can cause stress to vegetation and disrupt ecological balance.

Deviations caused by fire exclusion, land use change, or warming temperatures for example, can change species composition and structure (invasive woody species, e.g.) and lead to an accumulation of vegetation and dead organic matter that increases the risk of uncharacteristically severe fires when wildfires do occur (Miller Hesed and Yocum 2023). Cycles and patterns of fire on a landscape are described as a “fire regime,” the typical frequency, intensity, duration, aerial extent, and seasonality of fire, though these processes are not static. In addition to changes in vegetation type and productivity (fuel loading), shifting climatic conditions and weather patterns can influence fire regime by changing fuel moisture content (fuel aridity or dryness of vegetation) making fuel more or less available to ignite and burn. In the grasslands, ecosystem fragmentation caused by modern human settlement patterns combined with fire suppression actions have lengthened fire return intervals in general, although some areas are managed with grazing to reduce fuel load and encourage desirable plant species. Predictions of prolonged drought and increasingly variable precipitation patterns may expand fire exposure, especially in systems with potential for extensive drought- or freeze-cured grass. For more information on how fire dynamics influence specific ecosystems, see the Terrestrial Ecosystems section.

While many fires on the Cimarron and Comanche National Grasslands were historically caused by lightning, Indigenous Peoples used fire to intentionally manage their landscape, including to maintain important ecosystems, improve hunting opportunities, and to transmit cultural practices. To describe the role fire would play in the absence of modern human intervention but include the impacts of Indigenous burning, historical fire regime groups classify the average number of years between fires (fire frequency or mean fire return interval) combined with fire severity (the amount of vegetation replacement) during the time these plant communities evolved characterized as the pre-European settlement period ((Agee 1993); (Lentile et al. 2006)). The five historical fire regime groups that occur within the plan area are described in more detail under the Fire Management section (table 14).

Invasive Species

A species is invasive if it meets the following two criteria: (1) it is a non-native organism to the ecosystem under consideration, and (2) its introduction causes, or is likely to cause, economic or environmental harm or harm to human, animal, or plant health. Invasive species include all taxa, including plants, such as state- and county-designated noxious weeds; vertebrates; invertebrates; and pathogens. Invasive species tend to spread aggressively because they lack natural controls, such as predatory insects and disease, which may have evolved within their native ranges. As a result, they can displace native species, change hydrology and microclimatic features, increase soil erosion, alter wildfire intensity and frequency, and cause disruptions to natural processes while reducing overall native community diversity. The 2012 Planning Rule identifies invasive species as a stressor to natural processes.

Terrestrial invasive species on the grasslands consist of non-native plants that can outcompete native species for resources, reduce biodiversity, reproduce prolifically, alter soil chemistry, reduce forage production, alter hydrologic cycles, change fire regimes, increase erosion, and have the potential to dominate entire ecosystems.

Relatively few nonnative plants can tolerate the arid summer conditions on the Grasslands; the most notable are cheatgrass (*Bromus tectorum*), Japanese brome (*Bromus japonicus*), Russian thistle (*Salsola tragus*), and kochia (*Kochia scoparia*). There is a greater diversity of invasive species in more mesic sites, such as riparian strips and roadsides. The most frequently encountered include tamarisk (*Tamarisk* spp.), musk thistle (*Carduus nutans*), and field bindweed (*Convolvulus arvensis*). Also, invasive but not listed as noxious are smooth brome (*Bromus inermis*), Old World bluestem (*Bothriochloa ischaemum*) and yellow sweet clover (*Melilotus officinalis*). Most of the species listed in table 1 have been documented on or have the potential to occur within both the Cimarron and Comanche National Grasslands.

Table 1. Noxious Weeds On or Near the Cimarron and Comanche National Grasslands

Species Name	Common Name	State Noxious Weed List	
		Colorado	Kansas
<i>Ambrosia grayii</i>	Bur ragweed		X
<i>Arctium minus</i>	Common burdock	X	
<i>Avena fatua</i>	Wild oats	X	
<i>Bromus tectorum</i>	Cheatgrass	X	
<i>Capsella bursa-pastoris</i>	Shepherd's purse	X	
<i>Carduus nutans</i> *	Musk thistle	X	X
<i>Centaurea repens</i> *	Russian knapweed	X	X
<i>Chorispora tenella</i>	Blue mustard	X	
<i>Cirsium arvense</i> *	Canada thistle	X	X
<i>Conium maculatum</i>	Poison hemlock	X	
<i>Convolvulus arvensis</i> *	Field bindweed	X	
<i>Cynoglossum officinale</i> *	Houndstongue	X	
<i>Descurania sophia</i>	Flixweed	X	
<i>Elaeagnus angustifolia</i>	Russian olive	X	
<i>Erodium cicutarium</i>	Redstem filaree	X	
<i>Hibiscus trionum</i>	Venice mallow	X	
<i>Hoffmannsegia densiflora</i>	Pignut		X
<i>Kochia scoparia</i>	Alkali weed	X	
<i>Lepidium latifolium</i>	Perennial pepperweed	X	
<i>Linaria dalmatica</i>	Dalmation toadflax	X	
<i>Setaria glauca</i>	Yellow foxtail	X	
<i>Setaria viridis</i>	Green foxtail	X	
<i>Sorghum halepense</i>	Johnson-grass	X	X
<i>Tamarix</i> spp.	Tamarisk	X	
<i>Tribulus terrestris</i>	Puncturevine	X	
<i>Verbascum thapsus</i>	Common mullein	X	

Sources: (Kansas Noxious Weed Law 2007); (Colorado Noxious Weed Act 2003)

Increases in non-native plant species, coupled with reductions in native species, often reduce the quality of wildlife habitats, along with primary production. The presence of invasive plant species may also influence fire return intervals. For example, tamarisk forms dense thickets of continuous fuel that is readily flammable even when it is healthy and green, increasing the incidence and intensity of wildfires in riparian areas where it has invaded. Trees and shrubs native to riparian areas recover more slowly than tamarisk post-fire, leaving these invaded areas even more vulnerable to fire – a positive feedback loop example where presence of an invasive species amplifies and reinforces more extreme fire behavior and effects. Warmer temperatures and more variable precipitation can create more favorable conditions for invasive species' establishment and spread as well. For example, Russian thistle, a rapidly germinating annual present throughout the plan area, can achieve relatively high coverage quickly with minimal precipitation. Further, it can create a fuel hazard, reduce native species' diversity, compete with agricultural crops, and negatively impact infrastructure, such as fences, buildings, and stock tanks.

The establishment and spread of aquatic invasive plants can also have deleterious effects on the landscape. For example, aquatic invasive plants can severely alter environmental conditions, ecosystem processes, plant and animal communities, and human uses of waterbodies. Freshwater aquatic habitats

appear to be disproportionately vulnerable to and negatively affected by invasive species, compared with terrestrial habitats ((Moorhouse and Macdonald 2014)). Many drainages on the Grasslands have populations of invasive plant species, such as tamarisk and Russian olive. Tamarisk stabilizes on banks, bars, and islands in systems where these features are mobile during flood events (USFS 2024g). Additionally, tamarisk can alter stream morphology, degrading aquatic habitat complexity for native species (USFS 2024g). As a result, infestations may lead to the drying up of springs, wetlands, and riparian areas by lowering water tables and concentrating salts in the soil (USFS 2024g). However, active treatment of invasive plant species, such as those being implemented in riparian areas, have yielded an upward trend in native plant composition in the plan area.

There are only three nonindigenous aquatic species' records in the plan area; all are confined to the Cimarron River. Two of the three records are for common carp (*Cyprinus carpio*); one was in 2003 and one was in 2004. The third record was for largemouth bass (*Micropterus salmoides*) in an isolated pool in 1964. Neither of these species are on the States' aquatic invasive species lists. However, there are reports of species included on the States' aquatic invasive species lists in HUC8 (subbasin) watersheds that intersect the plan area. As such, there is some potential for State-listed aquatic invasive species to occur in or move into the plan area.

Although feral hogs are not known to occur on the Grasslands at present, they are of concern. Feral hogs are identified by their behavior and habitat. Typically found in rural areas near water sources, these animals cause substantial damage to crops and natural habitats through aggressive foraging, leading to vegetation destruction and soil erosion. Feral hogs are presently considered eradicated from the State of Colorado, although monitoring is ongoing, as they are present in Kansas, Oklahoma, and New Mexico. The State of Kansas has an active feral hog control program in place.

Herbivory

Herbivory in this context consists of both wild (wildlife) and domestic (permitted livestock) disturbance processes that can act as either a driver or a stressor by altering the physical environment of vegetation and influencing ecological processes within grassland ecosystems. Grasslands have evolved with herbivory. Herbivory is dynamic, and several factors can influence outcomes over time and space. Timing, intensity, frequency, duration, and preference are important considerations that can influence herbivory's short- and long-term effects. Herbivory interacts with large-scale disturbances like fires, which influence herbivore distribution and create shifting mosaics across the landscape.

Herbivore activities can influence the abundance and distribution of plant species across a given landscape in multiple ways. The physical removal of plant material can create opportunities for native species to colonize, in turn creating suitable areas for native wildlife to utilize (USFS 2024g). For example, prairie dogs, which suffered declines associated with multiple plague outbreaks in the plan area, appear to readily colonize these newly suitable areas. In contrast, those opportunities may not always favor desirable species and instead can influence opportunistic or less desirable species. A reduction of herbivory can lead to a buildup of fuel loads, including fine fuels such as annual grasses, altering the fire return interval (Miller Hesed et al. 2023); (Carbutt et al. 2017). These alterations may increase or reduce the occurrence of certain species on the landscape.

Native herbivores, such as prairie dogs, are a naturally occurring keystone species in the shortgrass prairie ecosystem. This species impacts soil, plant species, and wildlife habitat. Through their burrowing activities they can improve soil structure by mixing subsoil and topsoil and thus increase aeration. During the soil disturbance process, nutrients are cycled and bare ground patches are formed, encouraging the establishment of many diverse forbs. This disturbance also increases native grass species such as blue grama and buffalograss over time. These islands of unique grassland habitat that contain burrows, increased bare ground, and a diversity of annual forbs and grasses are primary habitat for species such as mountain plovers, burrowing owls, and swift foxes. Many native mammals also depend on prairie dogs as a prey source. While prairie dogs provide quality wildlife habitat to many other species and have many

positive soil impacts, they also reduce primary production, reduce forage for livestock, and increase wind erosion and soil movement (Whicker and Detling 1988, (Davidson et al. 2012). Prairie dogs prefer to colonize where they can visually see so areas of existing bare soil and shorter vegetation increase colonization rates.

Native herbivory is both a historical and cultural practice within the plan area, which can impact the local communities within and, to varying extents, outside the plan area through cultural ecosystem services. For a more in-depth review, see the Multiple Uses and Ecosystem Services section of Appendix A.

Historical grazing practices during the late-19th and mid-20th centuries often involved excessive stocking rates, which led to widespread degradation of rangeland ecosystems. These practices significantly impacted riparian areas and stream channels, resulting in altered hydrology, reduced vegetation cover, and impaired habitat quality for aquatic and riparian-dependent species (Krausman 1996). Legacy effects of overgrazing in these sensitive areas include soil compaction, increased erosion, loss of streambank stability, and reduced water quality.

Modern grazing management practices, guided by an ecosystem-based approach, are designed to avoid such detrimental impacts. Current management does not authorize grazing at levels that would harm riparian ecosystems or compromise their long-term health.

The cumulative effects of herbivory, fire, and climate are noted here to recognize their combined influence on the ecosystem. Domestic herbivory is managed to balance forage use for livestock while also recognizing the habitat needs of non-domestic species. Furthermore, the goal of the fuels program is to reduce the frequency and extent of wildfire. It is critical to ensure that herbivory and fire management strategies are aligned to mitigate potential negative impacts on the ecosystem while reducing wildfire risk.

Infrastructure

Infrastructure within the Cimarron and Comanche National Grasslands comprises a network of rural roads, trails, water and wastewater systems, communications towers, bridges, dams, and recreational facilities that support both Forest Service operations and public use. This network not only facilitates economic growth, emergency response, and access to public lands but also supports cultural and social values within the region.

Infrastructure functions as both a driver and a stressor. Construction, maintenance, and expansion activities—including road building, fencing, water developments, and energy projects such as oil and gas facilities—can fragment habitats, alter water flow patterns, and disrupt natural ecological processes. Infrastructure located near streams and rivers are especially vulnerable to extreme weather, flooding, and erosion, which can lead to structural failures, degraded water quality, and broader ecosystem disruption ((Furniss and Howe 2016)).

Management strategies focus on enhancing infrastructure resistance and resilience through improved design, strategic placement away from sensitive ecological areas, and adaptive measures that address anticipated future climate variability. These continued efforts are critical to balancing the benefits of connectivity and public access with the need to preserve the ecological integrity of the grasslands.

Land Ownership

Land ownership within the Cimarron and Comanche National Grasslands is characterized by a mosaic of public and private lands—a legacy of historical policies such as the Homestead Act of 1862 and subsequent acquisitions under the Bankhead-Jones Farm Tenant Act (Hansen and Libecap 2004); (USFS 2008a). This fragmentation acts as both a driver and a stressor by complicating management efforts, increasing administrative and economic costs, and disrupting ecological connectivity. Fragmented ownership limits the effectiveness of large-scale management practices—such as prescribed burns,

habitat restoration, and rotational grazing—thereby impeding efforts to conserve biodiversity and maintain ecosystem integrity (USDA Forest Service 2005b).

To address these challenges, the Forest Service employs strategies such as **comprehensive grazing management plans**, land adjustments, exchanges, comprehensive surveys, and the posting of property boundaries to clarify ownership patterns. Divergent management objectives among private landowners and public agencies further complicate management efforts, necessitating strategic public-private partnerships and cross-boundary collaborations to align land use with regional ecological goals (Shafer et al. 2014). These measures are critical to mitigating the adverse effects of land fragmentation, ensuring sustainable land use, and streamlining management operations across the grasslands.

Terrestrial Ecosystems

In this section, the status and trends of ecological integrity are described for terrestrial ecosystems found on the Cimarron and Comanche Grasslands. The 2012 Planning Rule defines ecological integrity as the quality or condition of an ecosystem when its dominant ecological characteristics (for example composition, structure, function and connectivity) occur within the natural range of variation (NRV) and can withstand and recover from most perturbations imposed by natural environmental dynamics or human influence (36 CFR 219.19). The 2012 Planning Rule establishes ecological integrity as the criterion under which to evaluate ecological consequences of landscape change. It provides a measure to assess ecological sustainability in light of current conditions and trends. Identification of ecosystems that are threatened or compromised while identifying the features that have led to low integrity can inform planning priorities. Especially in fragmented landscapes like these grasslands, areas with higher ecological integrity can preserve biological variability and species richness and allow for species movement and recolonization to areas of lower integrity. They also sustain essential ecological functions and services and are a source of cultural identity for many people.

The ranking of ecological integrity can be thought of as the degree to which ecosystems are represented and functioning properly across the grasslands. Each ecosystem is assigned a level of integrity based on the following criteria (Source: (Hayward 2021):

- **High:** If the ecosystem remains on current trajectory it is expected to continue delivering major functions and services, including supporting biodiversity and productivity expected for this ecosystem without human interference. Drivers, stressors, and key ecosystem characteristics exhibit the NRV that was common in the past.
- **Moderate:** If the system remains on current trajectory it is expected to deliver major functions and services, including supporting biodiversity and productivity, at a reduced level relative to expectations for this ecosystem. One or more drivers, stressors, and key ecosystem characteristics are compromised in a way that disrupts disturbance regimes or characteristics of the system. However, compromised features are not those that determine the identity of this system, or significant characteristics are only modestly compromised. Drivers, stressors, and key ecosystem characteristics exhibit a range of variation that was not common in the past, but well within the range that results in resilience.
- **Low:** If the system remains on current trajectory it is expected to deliver some major functions and services, including supporting a portion of the biodiversity and productivity, at a reduced level relative to expectations for this ecosystem without human interference or active restoration. One or more drivers, stressors, and key ecosystem characteristics are significantly compromised. However, compromised features are not those that determine the identity of this system. Drivers, stressors, and key ecosystem characteristics exhibit a range of variation that was not common in the past, but they are within the range where resilience is possible.
- **Poor:** The ecosystem currently is or is trending toward experiencing a type-change or is incapable of delivering major functions and services including supporting biodiversity and productivity expected for

this ecosystem type without herculean human interference and maintenance. Drivers, stressors, and key ecosystem characteristics exhibit a range of variation rarely or never exhibited in the past.

As ecosystem conditions and trends do not follow administrative boundaries, it is important to view ecosystems in a broader landscape context to facilitate consistent analysis and monitoring. As such, the vegetation analysis and modeling processes were applied across all lands within the Cimarron and Comanche Grasslands administrative boundary, though reported acreages are only for lands within the plan area.

Introduction

NatureServe Ecological Systems (NatureServe 2018) mapped as LANDFIRE Biophysical Settings (BpS, landfire.gov) were used as the starting point to define and map terrestrial ecosystems. LANDFIRE BpS approximate natural vegetation communities and their estimated historical disturbance regimes before European settlement. Identification of benchmark conditions based on historic or natural ranges of variation (NRV) can provide a basis for the interpretation of ecological integrity and understanding of ecosystem dynamics including successional development, fire regime, and site productivity. The BpS product suite provides vegetation descriptions, state-and-transition models and map layers across all lands within the administrative boundary. NRV modeling results are still being summarized and will be included in future plan development.

This assessment also draws on the best available scientific information relevant to the ecosystems on the Cimarron and Comanche Grasslands including information from the Rangeland Analysis Platform (RAP, rangelands.app), Natural Resources Conservation Service Ecological Site Descriptions (ESD), peer-reviewed literature, resource experts and unit specialists. LANDFIRE BpS were lumped into three dominant terrestrial ecological systems that make up the majority of both grassland units: Shortgrass Prairie, Sandsage Prairie, and Canyonlands (table 2 and figure 3).

Key ecosystem characteristics outlined in the planning rule that drive ecological integrity and inform rankings were selected based on current available data for this assessment. This included a list of dominant species per each ecosystem from unanalyzed plot data, data from RAP on trends in shrub cover, annual and perennial herbaceous cover, tree cover, bare ground cover and production, plus observational unit input. Ecological integrity workshops conducted with unit staff provided observational information on the status and trends of these ecosystems. A summary of ecological integrity by ecosystem is found in table 3.

Table 2. Terrestrial ecosystems found on the Cimarron and Comanche National Grasslands

Ecosystem	Estimated Acres in the Plan Unit Area	Estimated Percentage of the Plan Unit Area
Cimarron	108,621	
Shortgrass prairie*	38,984	36%
Sandsage prairie	63,065	58%
Canyonlands	n/a	n/a
Other: Barren-Rock, Aquatics, Wetland, Riparian	6573	6%
Comanche	443,641	
Shortgrass prairie*	398,151	90%
Sandsage prairie	36,569	8%
Canyonlands	4570	1%
Other: Barren-Rock, Aquatics, Wetland, Riparian	4351	1%

Source: USFS GIS 2024

*Includes inclusions of Juniper Savanna found on rockier sites with limited grass growth.



USDA Forest Service

Figure 3. Ecosystem Classification
Cimarron and Comanche National Grasslands| Land Management Planning

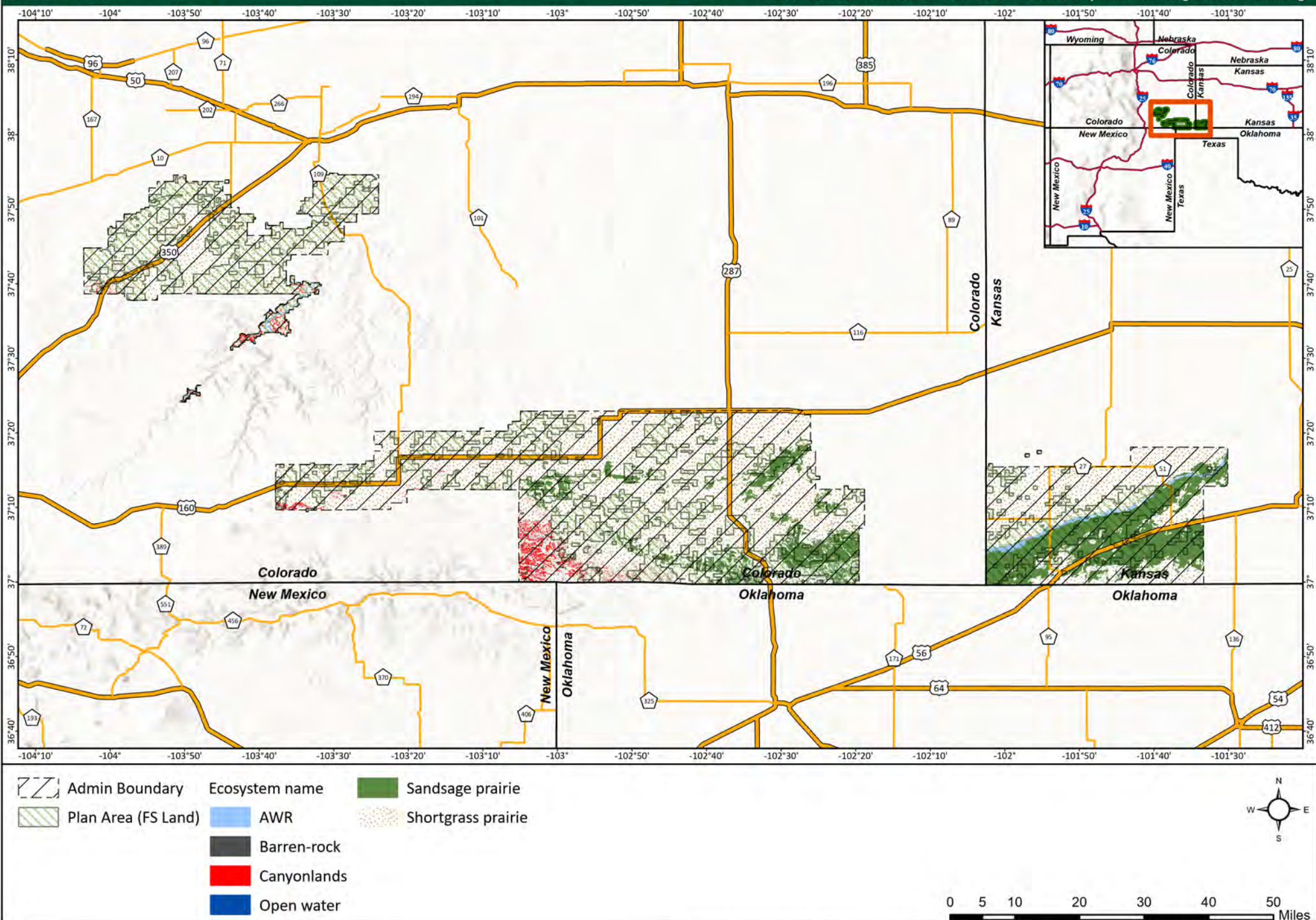


Table 3. Summary of terrestrial ecosystem integrity in the Cimarron and Comanche National Grasslands plan area

Ecosystem	Ecological Integrity	Integrity Rating	Restoration Potential
Shortgrass prairie	Low to Moderate	Moderate	Moderate to High
Sandsage prairie	Low to Moderate	Moderate	Moderate
Canyonlands	Moderate	Moderate to High	High

Source: (NatureServe 2024a)

The primary drivers and stressors impacting terrestrial ecosystems in the plan area include shifting climatic conditions, herbivory, invasive species, wildfire, wind, water use, infrastructure, and land fragmentation (see the Ecosystem Drivers and Stressors section above).

Climate models predict higher temperatures, shifts in precipitation patterns, and increased drought events in the plan area. Shifts in the timing of precipitation, along with increased temperatures, will alter species composition and compromise the integrity of terrestrial ecosystems (USFS 2024d); (USFS 2024c); (USFS 2024a); (Miller Hesed et al. 2023).

Managed herbivory (permitted grazing management) that appropriately adjusts timing, intensity, frequency and duration of grazing can increase ecological integrity by reducing biomass, which aids in the transfer of nutrients to the soil. Heavy, continuous, season-long herbivory, as is found in prairie dog towns, can result in increases in annual grasses and forbs, nonpalatable perennial grass species, bare ground, erosion, and nonnative species, which can compromise integrity.

Both the distribution and dominance of nonnative, invasive species can compromise the integrity of terrestrial ecosystems and ecosystem functioning. Increases in invasive species can reduce wildlife habitat quality, reduce primary production and diversity of native species, and alter fire return intervals.

The reduced extent and frequency of fire can result in the further encroachment of nonnative species. As native, fire-dependent species decline, overall native species diversity is reduced. Much of the area surrounding shortgrass and sandsage prairie has been converted to agricultural use or energy production. Both ecosystems are highly fragmented with a patchwork of privately owned lands scattered throughout the surrounding area and plan area (USFS 2024c); (USFS 2024d).

Shortgrass Prairie

Summary

The shortgrass prairie ecosystem occurs across eastern Colorado and New Mexico, the westernmost counties of Kansas, and the panhandles and rolling plains of Oklahoma and Texas. The extent of this ecosystem covers about 80 percent of the plan area (table 2). The shortgrass prairie is generally dominated by native perennial warm-season grasses⁵, intermixed with cool-season grasses⁶, and a diversity of perennial forbs. The warm season shortgrasses—grasses characterized by their low growth habit and adaptation to arid conditions—that dominate this system are extremely drought and grazing tolerant (USFS 2024d). Table 4 lists dominant species in the plan area.

⁵ Warm-season grasses are species that primarily grow during the warmer months (late spring to early fall) and are well adapted to high temperatures and seasonal drought.

⁶ Cool-season grasses grow mostly during the cooler parts of the year (spring and fall), thriving in milder temperatures and often greening up earlier in the season

Table 4. Dominant plant species in the shortgrass prairie ecosystem

Scientific Name	Common Name
<i>Bouteloua gracilis</i>	Blue grama
<i>Pascopyrum smithii</i>	Western wheatgrass
<i>Sporobolus cryptandrus</i>	Sand dropseed
<i>Hesperostipa comata</i>	Needle and thread
<i>Buchloe dactyloides</i>	Buffalograss
<i>Bouteloua curtipendula</i>	Sideoats grama
<i>Muhlenbergia torreyi</i>	Ring muhly
<i>Aristida purpurea</i>	Purple threeawn
<i>Hilaria jamesii</i>	Galleta
<i>Opuntia polyacantha</i>	Plains pricklypear
<i>Sphaeralcea coccinea</i>	Scarlet globemallow
<i>Thelesperma</i> spp.	Threadleaf
<i>Mentzelia nuda</i>	Bractless blazingstar
<i>Gutierrezia sarothrae</i>	Broom snakeweed
<i>Artemisia frigida</i>	Fringed sage
<i>Yucca glauca</i>	Soapweed yucca

Source: (USFS 2024d)

Species composition and cover by life form (as indicated by the percent cover of perennial grasses and forbs, annual grasses and forbs, and woody species) are the key ecosystem characteristics (KECs) that support the delivery of ecosystem services and ecological integrity in this ecosystem (USFS 2024d). When this ecosystem has high integrity, it:

- is dominated by native perennial warm season grasses, intermixed cool season grass species, and a high diversity of native perennial forbs (diversity of forbs also depend on annual precipitation).
- includes patchy inclusions of oneseed juniper trees (*Juniperus monosperma*) with a high diversity of structural and age classes (<1% of the ecosystem).
- has low occurrence of annual grasses and forbs (relative to perennials).
- has a minor shrub component and low if any tree cover.
- has low non-native and noxious species cover.
- has a fire return interval of 6-15 years; and
- and can recover from disturbances such as pulses in herbivory, drought, and fire with low long-term shifts in species compositions.

Shortgrass prairie in the plan area has a moderate to low ecological integrity rating. The main concerns influencing ecological integrity include shifts in the timing of precipitation and temperature increases, invasive species, herbivory, historical land uses and restoration efforts, current private land uses, and fire suppression (USFS 2024d).

Historical human activities, such as the local extirpation of bison and population reduction of prairie dogs, changed the vegetation ecology of the area (Provencher et al. 2025). Unsustainable agricultural practices and drought led to the Dust Bowl, which caused additional long-term changes in species composition and soil conditions. Following the Dust Bowl, replanting and restoration efforts by the Soil Conservation Service promoted shifts toward more drought-tolerant grass species, which are better adapted to dry conditions and can withstand high wind erosion. The Dust Bowl caused severe soil erosion and topsoil

loss, which reduced the prevalence of taller, deeper-rooted grasses. Overall, the extreme drought and dust storms have led to a less diverse plant community overall today ((McLeman et al. 2014)). More details on the impacts of the Dust Bowl are provided in the Land Use Legacy section under Ecosystems Drivers and Stressors.

The landscape of the plan area is currently fragmented because private lands are interspersed with National Forest System lands. This has made it challenging for the Forest Service to implement management activities such as prescribed fire to address the expansion of juniper trees. This ownership fragmentation also impacts the distribution of invasive species and can impact the success and feasibility of management activities such as the reintroduction of extirpated wildlife species.

Shortgrass prairie provides habitat for the mountain plover (*Anarhynchus montanus*), swift fox (*Vulpes velox*) and tarantulas (*Theraphosidae* spp.), among others. The colonies of black-tailed prairie dogs (*Cynomys ludovicianus*) present in this ecosystem provide a unique environment essential to many wildlife species including the prairie rattlesnake (*Crotalus viridis*) and burrowing owl (*Athene cunicularia*). Pronghorn (*Antilocapra americana*) and mourning doves (*Zenaida macroura*) inhabit the shortgrass prairie as well and provide hunting opportunities for the public. Raptors, such as the ferruginous hawk (*Buteo regalis*) and northern harrier (*Circus hudsonius*) are also present.

Status and Trends

Since the advent of satellite remote sensing (mid-1980s), the shortgrass prairie has seen a slight increase in tree cover, mainly in the southwest portion of the Carrizo Unit and the southern portion of the Timpas Unit (RAP 2024). The reasons for this expansion could be due to the historical fire suppression, past disturbance, livestock grazing, wildlife spreading seeds, positive soil acidification feedback loop,⁷ climatic variability, and carbon dioxide fertilization⁸ (Romme et al. 2009); (Milchunas et al. 2020); (Twidwell et al. 2021).

Current trends for the shortgrass prairie ecosystem show slight increases in perennial and annual grass and forb cover with stable or slightly decreasing bare ground (RAP 2024). Dominant cover species today include blue grama (*Bouteloua gracilis*), buffalograss (*Buchloe dactyloides*), purple threeawn (*Aristida purpurea*), sideoats grama (*Bouteloua curtipendula*), sand dropseed (*Sporobolus cryptandrus*), James' galleta (*Hilaria jamesii*), western wheatgrass (*Pascopyrum smithii*), and scarlet globemallow (*Sphaeralcea coccinea*). Cholla (*Cylindropuntia imbricata*) is increasing in density and frequency and could be attributed to climate change, plantings by Colorado Parks and Wildlife, and herbivory (Assal et al. 2015). Introduced species such as Old World bluestems (*Bothriochloa bladhii* and *B. ischaemum*) that were planted during the Dust Bowl are increasing and where they occur, significantly reduce plant diversity. Russian thistle (*Salsola tragus*) can have high cover across this ecosystem depending on annual precipitation. It can create areas of large litter accumulation, reduce native species diversity, and have negative impacts on infrastructure (fences, tanks, recreation sites, etc.). When this species occurs in high cover it has a significant negative impact on native species.

Precipitation shifts, coupled with increases in temperatures, may support the expansion of juniper tree cover along with increases in tree density, which could negatively affect the herbaceous layer. Conversely, increased drought could drive wildfires and insect outbreaks, which would reduce the extent of these woodland patches in the plan area. Historical fire regimes played a critical role in maintaining the balance of the juniper inclusion areas with the surrounding herbaceous species. Fires opened stands, increased diversity and productivity in understory species, and created a mosaic of stands of different sizes and ages across the landscape. On the Cimarron and Comanche National Grasslands, the

⁷ A self-reinforcing process where soil becomes more acidic over time. Increases of soil acidification could damage plant growth, which would reduce the natural mechanisms that help neutralize the soil's pH, leading to even more acidity and further decline in soil health.

⁸ The process by which increased levels of carbon dioxide in the atmosphere increase the rate of photosynthesis in plants.

shortgrass prairie includes areas of high vegetation cover with root systems that help reduce erosion, promote soil formation, and improve soil health (USFS 2024d). The shortgrass prairie also provides key provisioning, supporting, and cultural ecosystem services by maintaining genetic and biological diversity and providing food, forage for livestock, and genetic material (such as seeds). It also supports human health and well-being through recreational opportunities, such as ecotourism and hunting (more details on how ecosystems support economic and social sustainability through ecosystem services are provided in the Multiple Uses and Ecosystem Services section of Appendix A).

The overall trend across the planning unit is increased production of aboveground herbaceous vegetative biomass, which can result in increased support for provisioning services such as forage for livestock and food. However, the expansion of juniper areas could reduce primary production, which would reduce livestock forage and food services. Areas of shortgrass prairie that have seen reductions in native species diversity (sod bound blue grama and buffalo grass areas and planted old world bluestems areas [monocultures]) have reduced support for regulating ecosystem services (such as pollination, seed dispersal, and stabilized soil) and cultural ecosystem services (such as opportunities for seed collection, recreation, ecotourism, and hunting).

Bare soil is stable or slightly decreasing in the shortgrass prairie, so areas with high vegetative cover support regulating ecosystem services such as erosion control. Additionally, changes in plant diversity or plant species composition (invasive species, decreased diversity, more woody species) impact the overall stability of carbon storage by changing the allocation of above- and below-ground carbon pools. More above-ground allocation can reduce the stability of carbon that is sequestered.

Sandsage Prairie

Summary

The geographic range for the sandsage prairie includes eastern Colorado, part of southwestern Nebraska, and western Kansas. This ecosystem comprises approximately 18 percent (99,721 acres) of the plan area and is found at elevations ranging from 3,400 to 6,000 feet. Stabilized and active sand dunes occur over large expanses along the Cimarron River in Morton County (Kansas) and near Campo in southeastern Baca County (Colorado). Sandsage prairie occupies the dunes that lie in a band 1 to 5 miles wide, south of the Cimarron River (Kuhn et al. 2011). Herbaceous perennial cover is lower in the sandsage prairie, compared with the other terrestrial ecosystems in the plan area, due to the density and cover of sandsage and the sandier nature of the soils. See table 5 for a list of dominant species in this ecosystem.

Table 5. Dominant plant species in the sandsage prairie ecosystem

Scientific Name	Common Name
<i>Artemisia filifolia</i>	Sandsage
<i>Ericameria nauseosa</i>	Rubber rabbitbrush
<i>Yucca glauca</i>	Soapweed yucca
<i>Andropogon hallii</i>	Sand bluestem
<i>Schizachyrium scoparium</i>	Little bluestem
<i>Andropogon gerardii</i>	Big bluestem
<i>Calamovilfa longifolia</i>	Prairie sandreed
<i>Panicum virgatum</i>	Switchgrass
<i>Bouteloua gracilis</i>	Blue grama
<i>Sorghastrum nutans</i>	Indiangrass
<i>Sporobolus cryptandrus</i>	Sand dropseed

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Scientific Name	Common Name
<i>Abronia fragrans</i>	Fragrant sand-verbena
<i>Chenopodium pratericola</i>	Desert goosefoot
<i>Mentzelia nuda</i>	Bractless blazingstar
<i>Oenothera lavandulifolia</i>	Lavenderleaf sundrops
<i>Glandularia bipinnatifida</i>	Dakota mock vervain

Source: (USFS 2024c)

Species composition and cover by life form (as indicated by the percent cover of perennial grasses and forbs, annual grasses and forbs, and woody species) are the key ecosystem characteristics (KECs) that support the delivery of ecosystem services and ecological integrity in this ecosystem (USFS 2024c).

When this ecosystem has high integrity, it:

- is dominated by sandsage with a mix of warm-season and cool-season grasses with a high diversity of forbs.
- has low occurrence of annual grasses and forbs (relative to perennials) that are mainly tied to fluctuations in climate.
- has low nonnative and noxious species cover.
- has a fire return interval of 6–30 years that promotes species diversity, nutrient cycling, and the maintenance of woody species (see Fire Disturbance in the Ecosystem Drivers and Stressors section).
- can recover from disturbances such as pulses in herbivory, drought, and fire with low long-term shifts in species compositions.
- has a diversity of structural stages and variety of age classes of sandsage.

Sandsage prairie in the plan area has a moderate to low ecological integrity rating. The main drivers and stressors influencing the ecological integrity include shifts in the timing of precipitation and warmer temperatures, invasive species, herbivory, historical land uses and restoration efforts, current private land use, and fire suppression (USFS 2024c).

As described in the NRV report (Provencher et al 2025) and in the Land Ownership subsection under Ecosystem Drivers and Stressors, population reduction of native species (bison and prairie dogs) and unsustainable agricultural practices led to significant long-term changes in species composition in this ecosystem. Plowing followed by drought and wind disturbance associated with the Dust Bowl caused a shift in species composition that favored drought-tolerant shortgrass species, and a less diverse plant community overall (McLeman et al. 2014).

Although the Soil Conservation Service reclaimed the land by seeding, seed mixtures contained introduced species. The resulting changes in soil structure and species diversity shaped the current species composition associated with this ecosystem. On surrounding lands, this ecosystem has also been converted to center-pivot irrigation, plowed, and planted. Spraying of sandsage has also had an impact on this system, as spraying kills most forbs and shrubs (Elliot and Rideout-Hanzak 2020).

In addition to land use legacies, shifts in the timing of precipitation and warmer temperatures, invasive species, altered herbivory patterns resulting from loss of bison and lower prairie dog populations, and altered fire regimes resulting from suppression and land fragmentation are the primary stressors and drivers affecting this ecosystem and its contributions to social and economic sustainability.

Wildlife species associated with the sandsage prairie include mule deer (*Odocoileus hemionus*), lesser prairie-chicken (*Tympanuchus pallidicinctus*), grasshopper sparrow (*Caelifera* spp.), Cassin's sparrow (*Peucaea cassinii*) and lark sparrow (*Chondestes grammacus*), Northern bobwhite (*Colinus virginianus*)

and scaled quail (*Callipepla squamata*). Bumble bee (*Bombus* spp.) and the federally recognized Monarch butterfly (*Danux plexippus*; see At-Risk Species Section) are present when flowering plants are available.

Status and Trends

The current ecological integrity for this ecosystem is rated moderate to low. The factors contributing to this rating are similar to the factors described for all terrestrial ecosystems in the plan area and include land use legacies, warmer temperatures, altered patterns of precipitation, herbivory, wildfires; and the establishment and spread of invasive species. If the ecosystem remains on this current trajectory, it is expected to provide reduced functions and services, such as biodiversity and productivity, relative to expectations for this ecosystem without human interference or active restoration.

Trends in the sandsage prairie show perennial grasses and forbs are stable to slightly decreasing, and annual grasses and forbs and shrub cover are increasing (RAP 2024). The increasing cover of shrubs, primarily sandsage, leads to decreasing herbaceous cover and overall species diversity. The most dominant cover species today are sandsage (*Artemisia filifolia*), sand dropseed (*Sporobolus cryptandrus*), blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*), Russian thistle (*Salsola tragus*), camphorweed (*Heterotheca subaxillaris*), purple threeawn (*Aristida purpurea*), and western daisy (*Erigeron bellidiastrum*) ((USFS 2024c)). As discussed in the shortgrass prairie system introduced species such as old-world bluestems and invasive species such as Russian thistle can negatively impact this ecosystem's integrity.

Increased temperatures and shifts in the timing of precipitation (see Ecosystem Drivers and Stressors) contribute to this trend of shifting species composition. While this ecosystem supports many drought-tolerant species, extended periods of severe drought are likely to affect both species composition and the stability of the soil, particularly when compounded by the effects of wind, grazing, and fire.

This ecosystem also developed with fire as part of the ecological processes (Elliot and Rideout-Hanzak 2020); (Sprock et al. 2020), with a historic mean Fire Return Interval of 6-30 years (Provencher et al. 2025). However, fire exclusion has altered the effects of natural fire (see Fire Disturbance and Fire Management sections for more information). Continued fire suppression could lead to an increase in shrub density and a decrease of the herbaceous layer in this ecosystem. Burning can stimulate a rapid, response of vegetation in sandsage prairie, which in turn increases habitat heterogeneity (Assal et al. 2015). Burning may also result in an earlier seral stage of sandsage where the canopy cover and vertical structure are reduced, thereby reducing the suitability of lesser prairie-chicken habitat (refer to the At-Risk Species appendix for a more detailed discussion on how shrub density impacts the lesser prairie-chicken) (Sprock et al. 2020).

While prescribed fire could reduce impacts associated with fire suppression, implementation of prescribed fire in the plan area requires careful consideration since this ecosystem is highly fragmented due to the patchwork of land ownership throughout the plan area. Since fire cannot always be used, practices such as brush management may be necessary to help keep the community in balance (NRCS 2023).

Disturbances from wind, herbivory, recreation, agriculture, roads and fire can increase the introduction, establishment, and spread of nonnative, noxious, and invasive plant species, compromising the integrity of this ecosystem and overall ecosystem functioning. Increases in nonnative species and reductions in native species reduce wildlife habitat quality and primary production and can alter fire return intervals (see the Invasive Species section for more information). Depending on annual precipitation, Russian thistle cover could increase and create areas of large litter accumulation and reduce native species diversity (USFS 2024c).

Within the Cimarron and Comanche National Grasslands, the sandsage prairie provides similar ecosystem services as those in the shortgrass prairie ecosystem by supporting areas with high vegetation cover and native species diversity. However, the sandsage prairie ecosystem has areas of higher bare ground than the shortgrass prairie due the sandier nature of its soils, which provides unique habitat for

species such as the Andean prairie-clover (*Dalea cylindriceps*), a proposed Species of Conservation Concern (see table 14). Additionally, the sandsage prairie supports valuable habitat for at-risk species like the lesser prairie chicken, which may be negatively impacted by increasing shrub density (see the At-Risk Species and Other Highlighted Species section for more information).

Canyonlands

Summary

Canyonlands occur on semiarid mountains and foothills in southern Colorado east of the Continental Divide and in the foothills, mountains, and plateaus of New Mexico. They also extend east to limestone breaks in the southeastern Great Plains. This ecosystem is found at elevations ranging from 3,200 to 6,400 feet and comprises less than 1 percent (4,466 acres) of the plan area.

The vegetation of this ecosystem is a mix of herbaceous, shrub, and tree species. The slopes of the canyon walls are typically dominated by pinyon and juniper species. Dominant shrub, forb, and grass species include Gambel oak (*Quercus gambelii*), alderleaf mountain mahogany (*Cercocarpus montanus*), skunkbush (*Rhus trilobata*), golden currant (*Ribes aureum*), pricklypear (*Opuntia polycantha* spp.), paintbrush (*Castilleja* spp.), western wheatgrass (*Pascopyrum smithii*), and blue grama (*Bouteloua gracilis*). These are found commonly on the slopes of the canyonlands leading down to the riparian corridor (table 6). Ponderosa pine can be found intermixed in the southern part of the Comanche National Grassland but is not a widespread occurrence.

Table 6. Dominant plant species in the canyonlands

Scientific Name	Common Name
<i>Juniperus monosperma</i>	Oneseed juniper
<i>Juniperus scopulorum</i>	Rocky Mountain juniper
<i>Pinus edulis</i>	Twoneedle pinyon
<i>Bouteloua gracilis</i>	Blue grama
<i>Bouteloua eriopoda</i>	Black grama
<i>Pascopyrum smithii</i>	Western wheatgrass
<i>Hesperostipa comata</i>	Needle and thread
<i>Cercocarpus montanus</i>	Alderleaf mountain mahogany
<i>Rhus trilobata</i>	Skunkbush
<i>Ericameria nauseosa</i>	Rabbitbrush
<i>Ribes aureum</i>	Golden currant

Source: (USFS 2024a)

Species composition and cover by life form (as indicated by the percent cover of perennial grasses and forbs, annual grasses and forbs, and woody species) are the primary key ecosystem characteristics (KECs) that support the delivery of ecosystem services and ecological integrity in this ecosystem (USFS 2024a). When this ecosystem has high integrity it:

- is dominated by native woody vegetation, such as juniper and pinyon trees, mountain mahogany, skunkbush, and currant, with an understory of native perennial grasses, such as blue grama, black grama, and needle and thread. The bottomland that transitions to the riparian ecosystem is dominated by willows, plains cottonwood, and Gambel oak.
- has high structural diversity among woody species and herbaceous species.

- has a lower occurrence of annual grasses and forbs (relative to perennials) that are mainly tied to fluctuations in climate.
- has low nonnative and noxious species cover.
- has a fire return interval of 100 to 200 years that is infrequent and has low to moderate/mixed-severity fires that promote species diversity and nutrient cycling (see Fire Disturbance in Ecosystem Drivers and Stressors).
- both the ecosystem and individual plants can recover from disturbances such as pulses in herbivory, drought, flood, and fire with low long-term shifts in species composition.

The primary drivers and stressors affecting this ecosystem and its contributions to social and economic sustainability are climate, invasive species, herbivory (wild and domestic), and fire.

The canyonlands provide a variety of shrub and tree species which provide forage and cover for wildlife such as white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), pinyon jay (*Gymnorhinus cyanocephalus*) and canyon towhee (*Melospiza fusca*). They provide unique habitat for a diverse reptile and amphibian population including the red-spotted toad (*Anaxyrus punctatus*) and green toad (*Anaxyrus debilis*). Additionally, the herd of bighorn sheep in Picket Wire Canyon is the largest in the state of Colorado.

Status and Trends

The current ecological integrity for this ecosystem is rated moderate. Over the last 35 years, tree cover has increased, including a 4 percent increase in moderate-closed forests (< 40% tree cover), a 14 percent increase in open forests (10- 40% tree cover), and a 16 percent decrease in non-forested areas (< 10% tree cover) (RAP 2024). Most of this ecosystem is projected to be in the late seral stage due to the proportion and density of woody vegetation (NatureServe 2024b). This increase in woody species density and occurrence is due to both anthropogenic and non-anthropogenic factors, such as fire exclusion, land use change, and favorable climatic conditions for tree growth during most of the 20th century (Amme et al. 2020); (NatureServe 2024b). Juniper trees are expanding outside of the Canyonlands ecosystems and into the surrounding uplands and this expansion can reduce the herbaceous cover and diversity of the adjacent shortgrass prairie ecosystem. Like the rest of the plan area this ecosystem can have high areas of Russian thistle. Cholla (*Cylindropuntia imbricata*) occurs on the fringes of this ecosystem and upper and bottom edges of the canyon (transition areas). The uplands adjacent to Picket Wire Canyon have the densest cholla. This expansion could have negative impacts on native species due to shading effects and the use of resources (Allen et al. 1991).

This ecosystem developed with infrequent, mixed-severity fires where the dominant fire effect was to kill most or all trees and to top-kill most or all shrubs. Historical fires in persistent pinyon-juniper woodlands did not thin from below. Instead, they tended to kill all or most of the trees within the places that burned regardless of tree size (NatureServe 2024b). Therefore, decreases in fire frequency due to fire suppression will continue to lead to increased cover of woody species and less understory diversity. An increase in prescribed fire could benefit this ecosystem by improving the distribution of age and size classes of tree species and maintaining the mosaic of herbaceous and woody components of this ecosystem (see the Forest Management section for more detail). Increased prescribed fire management in this ecosystem, however, is difficult due to the amount of heritage sites and intermingled land ownership.

Increased temperatures and shifts in the timing of precipitation (see Ecosystem Drivers and Stressors) contribute to the trend of shifting species composition and further increases in woody species cover and density. While this ecosystem supports many drought-tolerant species, extended periods of severe drought are likely to affect both species composition and the stability of the soil. Drought could reduce vegetative cover on steep slopes thus decreasing soil stability and increasing erosion during severe storm and flooding events.

Recreation, such as hiking and hunting, and the associated use of roads increases the introduction and spread of nonnative, invasive species. This is particularly relevant to Picture, Picket Wire and Sand Canyons, which have the highest levels of recreation in this ecosystem. Invasive species, such as Russian thistle and tamarisk, are of particular concern in this ecosystem. Tamarisk invasion threatens the ecological integrity along the riparian bottoms of canyonlands and can increase fire return intervals. For a detailed discussion on the impacts of tamarisk in the bottomlands of this ecosystem, see Riparian and Non-Playa Wetlands Ecosystems. The higher recreational use in this ecosystem compared to the shortgrass prairie and sandsage prairie can have negative impacts on cultural resources, which are higher in abundance in this ecosystem.

Insects and disease from agents such as bark beetles, dwarf mistletoe, and other diseases may increase in this ecosystem due to denser tree cover. These would further alter community structure and cause a rapid decline in pinyon pine (NatureServe 2024b).

The native woody vegetation in the canyonlands throughout the Cimarron and Comanche National Grasslands support many ecosystem services that are similar to those in the shortgrass prairie (for example, erosion control, food and forage, and pollination). In addition, the canyonlands also provide key provisioning ecosystem services by maintaining genetic materials, such as seeds and pinyon nuts, and key cultural ecosystem services through the large number of cultural resources and heritage sites (more details on how ecosystems support economic and social sustainability through ecosystem services are provided in the Multiple Uses and Ecosystem Services section of Appendix A).

Aquatic, Wetland, and Riparian Ecosystems

Introduction

In this section, status and trends of ecological integrity are described and evaluated for four aquatic, wetland, and riparian (AWR) ecosystems. Ecological integrity (integrity) is defined as the degree to which ecosystems are represented across the grasslands and are functioning properly. As described for terrestrial ecosystems, in AWR ecosystems, an ecosystem with high ecological integrity is expected to continue delivering major functions and services that support biodiversity and productivity for this ecosystem without human interference. (USFS 2024f); (USFS 2024g); (USFS 2024e); (USFS 2024h).

Summary of Aquatic, Wetland, and Riparian Ecosystems

The AWR ecosystems in the plan area were classified into four groups: playa lakes; riparian areas and non-playa wetlands; lakes, ponds, and reservoirs; and prairie streams and rivers (figure 4, Wetlands and Riparian Areas). The plan area contains 552,326 acres of National Forest System lands. Less than 3% of the plan area consists of AWR ecosystems (see table 7).

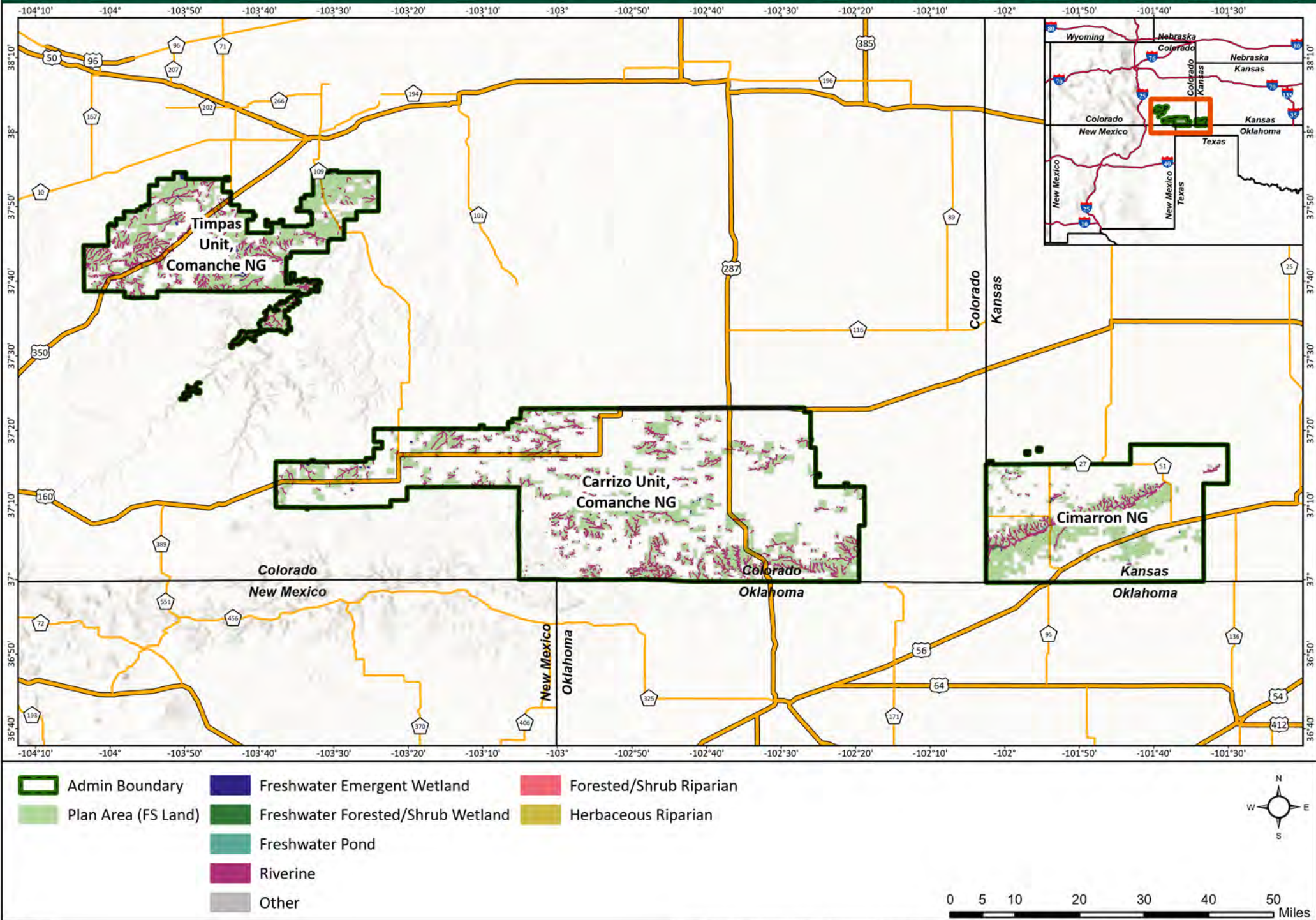


Table 7. Aquatic, wetland, and riparian ecosystems found in the Cimarron and Comanche National Grasslands plan area

Ecosystem	Estimated Extent in the Plan Area	Estimated Percentage of the Plan Area
Playa lakes	326 acres	0.05%
Riparian areas and non-playa wetlands	15,707 acres	2.8%
Lakes, ponds, and reservoirs	15 named lakes, ponds, or reservoirs	N/A
Prairie streams and rivers	16 miles perennial 1,501 miles intermittent 1,673 miles ephemeral 3,190 miles total	N/A

Sources: Playa Lakes Joint Venture 2025 (USGS 1999); (USFS 2024g)

Playas are shallow, ephemeral lakes formed by rainfall and associated runoff. These unique ecosystems provide crucial habitat for wildlife, particularly migratory birds. Additionally, playas serve important wetland functions, including mitigating floods, filtering surface runoff, and enhancing biodiversity (USFS 2024f); (Cariveau and Pavalacky 2009). Riparian areas are the portion of the stream channel occurring between the low and high water marks and adjacent terrestrial areas extending from the high water mark toward the uplands where vegetation may be influenced by elevated water tables or flooding. Wetlands are saturated or inundated by surface water or groundwater often enough and long enough during the growing season that they support wetland plants (Cooper and Merritt 2012). Riparian areas and non-playa wetlands ecosystems provide floodplain development, groundwater recharge, water filtration, essential wildlife habitat, and recreational opportunities (Driscoll and Smith 2021). Lakes, ponds, and reservoirs are natural or constructed waterbodies that support diverse aquatic wildlife. Prairie streams and rivers vary widely in geomorphology, stream flow patterns, and biota. The majority of streams in the plan area are ephemeral in nature, meaning they only flow after a precipitation event. Table 8, below, describes the integrity of these ecosystems.

Table 8. Summary of aquatic, wetland, and riparian ecosystem integrity in the Cimarron and Comanche National Grasslands plan area

Ecosystem	Ecological Integrity	Integrity Rating
Playa lakes	Moderate	High
Riparian areas and non-playa wetlands	Moderate	High to moderate
Lakes, ponds, and reservoirs	Moderate	Moderate
Prairie streams and rivers	Moderate	Moderate to low

Sources: (USFS 2024f); (USFS 2024g); (USFS 2024e); (USFS 2024h)

The primary drivers influencing all AWR ecosystems in the plan area include climate and geology. The primary disturbances and stressors on playa lakes and riparian and wetland ecosystems include shifts in the timing of precipitation and warmer temperatures, hydrologic alteration, and direct and indirect disturbances such as agricultural development, water use, transportation, unsustainable grazing practices, and invasive species (USFS 2024g). The primary disturbances for lakes, ponds, and reservoirs, and prairie streams and rivers, include warmer temperatures, altered precipitation patterns, livestock and herbivory, water use, transportation, recreation, and invasive species (USFS 2024g).

Playa Lakes

Summary

Playa lakes are shallow wetlands formed in natural depressions at the lowest points of closed watersheds. They rely on direct precipitation and surface runoff for water and are underlain by shrink-swell clay soils (smectite), which influence the lakes' hydrology. The water levels in playa lakes are highly variable, depending on rainfall patterns each year. There are no natural outflows; thus, stored water is lost through evaporation, evapotranspiration or infiltration into the playa floor ((Bowen et al. 2010)).

Playa lakes cover a small portion of the plan area (0.05 percent) and can occur singly or in clusters that may be hydrologically connected during heavy rain events or when water tables rise. There are seven playa lake clusters containing 18 individual playas. These account for slightly under half of the plan area's total playas. The majority of playas are found in the Cimarron Unit and eastern portion of the Carrizo Unit. One isolated playa occurs in the Timpas Unit (USFS 2024f).

Playa lakes provide ecosystem services such as groundwater recharge and water quality, surface water storage, and biodiversity. Playas contribute to groundwater recharge and water quality by filtering rainwater through grasses, which traps sediments and pollutants before the water enters the basin. The clay soils filter water during infiltration and percolation of playa clay floors. The surrounding upland areas absorb nitrates and dissolved contaminants (Gurdak and Roe 2009). Floodwaters and surface runoff are stored in the basin.

Wet-dry cycles in playas support diverse plant species, which adapt quickly to changing conditions. Plant communities provide food (seeds and associated invertebrates) and shelter for migratory and overwintering birds; they also support numerous amphibian species including frogs, toads, salamanders, shorebirds, waterfowl and other wildlife. The number of bird species increases with playa size and density and decreases in playas altered by human activities (Cariveau and Pavalacky 2009).

Playa lakes also provide ecosystem services that support economic and social sustainability by providing opportunities for recreation, ecotourism, and hunting (see the Multiple Uses and Ecosystem Services section of Appendix A for more information on how ecosystems support economic and social sustainability through ecosystem services).

Primary drivers that influence the current state of the playa lakes ecosystem include geology, topography, climate, and seasonal precipitation. These factors shape playa distribution and drainage patterns and drive wet-dry cycles that sustain ecological processes. The stressors affecting this ecosystem include altered precipitation patterns, hydrologic modification (for example, altered draining that can reduce playa function), and direct and indirect alteration of the landscape (for example, road construction and use, agricultural development, and spread of invasive species) (USFS 2024f).

The most influential key ecosystem characteristics (KECs) that impact ecological integrity are playa landscape distribution, drainage patterns, and playa health. Decreasing playa distribution, drainage pattern, and playa health could compromise the ecological integrity by limiting groundwater recharge, groundwater quality, and habitat at critical times for wildlife. Alterations to hydrologic processes through water development within contributing areas reduce groundwater recharge and surface water storage. Upland ground disturbance in playa areas contributes to filling playas with sediment and, potentially, contaminants, which may reduce groundwater quality (USFS 2024f).

Status and Trends

Playa Landscape Distribution

The main stressors that impact playa distribution include anthropogenic activities, altered precipitation patterns, and hydrologic modification. The number of playa lakes within the administrative boundary

(National Forest System lands and non-National Forest System lands) has decreased primarily due to past anthropogenic activities such as filling in for row crop farming and sedimentation from runoff, which is largely tied to agricultural practices. These disturbances have contributed to the loss of playa distribution and ecosystem function (Bowen and Johnson 2019). While these activities such as row cropping no longer occur on National Forest System lands in the plan area, they persist on the surrounding private lands, which could continue to impact playas in the plan area (Dahl 1990).

Warmer and drier climate trends have reduced precipitation causing more frequent droughts. This increase in drought events could impact playas by reducing the time they hold water and the amount of water they hold, which would indirectly impact animals that rely on playas during their migration periods. Moreover, open water on the Great Plains is subject to significant evaporation, and a warmer and drier climate could increase evaporation in these areas, further limiting the persistence of playa lakes (Assal et al. 2015).

Direct and indirect alterations of playa lakes, such as from energy development and its associated infrastructure, currently threaten and cause a reduction of playas in the area, by number, size, and density. Oil and gas development and constructed access roads surrounding playas have altered the flow paths that fill playas (Assal et al. 2015). Playas within the plan area on non-National Forest System lands have a higher density of hydrologic modifications. While some landowners have adapted their agricultural operations to protect playa function, these efforts are outside the Forest Service's control (USFS 2024f).

Agricultural uses such as crop production, irrigation, and grazing on non-National Forest System lands within the plan area may impact playa distribution. These practices alter a playa's structure, hydrology, and function, which may ultimately alter or eliminate the playa's biotic communities. The accumulation of sediments is a major concern. Sediments are mobilized by precipitation and irrigation runoff from surrounding croplands or overgrazed rangelands and carried to playa floors, thereby decreasing playa water volumes and altering their hydrological function. Native wetland plant populations could decrease due to decreased water holding capacity, and deposited sediments burying their seeds could hinder germination. Potential storage of runoff could decrease which would hinder flood attenuation. If less water is available in playas, drought stress may become more severe (Luo et al. 1997).

In the past, pits were sometimes dug into playas in an attempt to promote and extend water holding capacity. It was thought that extending water holding capacity would improve waterfowl habitat and overall ecological integrity of playas. In reality, excavating pits in playas removed underlying smectite clay layers and in some cases, caused playas to drain faster, which diminished water holding capacity. The Forest Service has worked to restore these altered playas, which has increased their distribution (defined in the USFS Playa lakes Worksheet as the spatial extent of the playa on the ground relative to its water holding capacity).

Distribution of playa lakes on NFS lands is expected to remain constant.

Drainage Patterns

Playa drainage patterns are important for clustered or larger intermittently connected groups of playas.

The playa drainage patterns on NFS lands in the plan area is in moderate condition. Warmer temperatures and shifts in the timing of precipitation patterns has resulted in more isolated playas. Direct and indirect alterations of the landscape, such as road and trail development and use, oil and gas development, and grazing practices, have contributed to increased erosion and sediment accumulation within playas (Assal et al. 2015).

The projected future condition for playas will likely remain stable. Where the Forest Service can restore playa lakes, the drainage patterns are expected to improve. However, activities outside the plan area and within the contributing areas of playas on National Forest System lands may continue to cause hydrologic disconnection (USFS 2024f).

Playa Health

Playas in the plan area have moderate ecological integrity. Past activities on both NFS and private lands that have contributed to increased sedimentation have degraded some playas and their contributing areas. However, the Forest Service has worked to restore playas in the Cimarron and Comanche National Grasslands. Nine were restored in 2016 on the Comanche National Grasslands. Restoration efforts are contributing to a slight upward trend in integrity (USFS 2024f).

The adjacent, non–National Forest System lands have playas in poorer condition due to higher rates of hydrologic modification and agricultural practices occurring in playas and their contributing areas. Cropland playas accumulate sediment at higher rates than grassland playas (Bowen and Johnson 2019). Partnership opportunities exist to restore playas on both public and privately owned lands.

Playa health is impacted by the same stressors mentioned above for landscape distribution and drainage patterns. While sedimentation will continue to occur due to activities on surrounding lands, current management objectives for the Cimarron and Comanche National Grasslands would protect playas and improve playa health through restoration within the Plan area (USFS 2024f).

Riparian Areas, Non-Playa Wetlands and Groundwater Dependent Ecosystems

Summary

Riparian areas and non-playa wetlands comprise approximately 3 percent of the plan area. The extent of riparian areas and wetlands in the plan area is estimated based on the extents of valley bottoms and isolated wetlands. Playa lakes are excluded from this ecosystem because they are considered a separate ecosystem, as described above.

Riparian areas are ecosystems along waterbodies like rivers and streams and adjacent to terrestrial areas. Flood events are a key driver characterizing riparian areas. Riparian areas typically have shallow water tables and support distinct vegetation types. Wetlands are ecosystems saturated by surface water or groundwater and support plants tolerant of inundation for long periods or requiring access to the water table (Cooper and Merritt 2012). Groundwater dependent ecosystems (GDEs) are included in this ecosystem classification. GDEs are ecosystems supported by groundwater and on the Cimarron and Comanche National Grasslands, include some types of wetlands, springs and seeps.

Changes in hydrologic and sediment regimes have impacted riparian areas in the plan area. Schumm and Lichty (Schumm and Lichty 1963) documents changes in channel dimensions on the Cimarron River between 1874 and 1960. In 1874, the average channel width was reported to be 50 feet. The maximum flood of record occurred in 1914 and destabilized the river channel and its banks. The flood triggered channel widening, which occurred between 1914 and 1942 when the average channel width reached 1,200 feet. From 1943 to 1954, riparian vegetation was reestablished, and the channel began to narrow. The average channel width reached 550 ft in 1954. Localized channel widening and narrowing occurred from 1954 to 1960 but no significant changes in channel dimensions were noted. Schumm and Lichty stated that the “influence of changing climatic conditions on vegetational growth is the key to Cimarron River behavior.” Following large floods and channel widening, riparian vegetation (including cottonwoods) expanded and became established on the wide, sandy floodplain. Plant cover on the widened floodplain decreased flow velocities during smaller, more frequent floods, which promoted sediment deposition and subsequent riparian vegetation expansion.

Riparian areas, non-playa wetlands, and GDEs provide ecosystem services including floodplain development, flood attenuation, groundwater recharge, improved water quality and wildlife habitat (USFS 2024g). These ecosystem services support economic and social sustainability for the surrounding

communities (see the Multiple Uses and Ecosystem Services section of Appendix A for more information on how ecosystems support economic and social sustainability through ecosystem services).

The primary drivers of riparian, non-playa wetland, and GDE ecosystems include geology, climate, and seasonal precipitation. Stressors affecting ecosystem integrity include warmer temperatures, shifts in the timing of precipitation, drought, hydrologic modification, direct and indirect floodplain surface disturbance (for example, agriculture, water use, transportation, and unsustainable grazing practices), and invasive species like tamarisk and Russian olive. The most influential KECs that impact the ecological integrity of riparian areas and non-playa wetlands consist of plant community composition, ground disturbance, hydrologic alteration, and invasion of invasive species (USFS 2024g).

Riparian areas, non-playa wetlands, and GDEs are essential and unique habitats within the grassland, supporting a wide range of amphibian species. Examples include Chihuahuan green toad, Couch's spadefoot and plain's leopard frog, which breed in these areas. Riparian corridors and wetlands are essential to a variety of highlighted species such as white-tailed deer, beaver and wild turkey.

Status and Trends

Plant Community Composition

Common native riparian and wetland vegetation in the plan area include cottonwood, willow, sedges, and rushes (see table 9) (USFS 2024g). Invasive species are also present within riparian and wetland areas in the plan area. See the Invasive Species section for a list of invasive species in the plan area.

Plant community composition in the plan area is impacted by channel incision, lowered water tables, encroachment of upland species including pinyon-juniper woodlands and invasive species. Channel incision, coupled with lowered water tables is leading to drier conditions and shifts in riparian vegetation communities toward plants more tolerant to drought conditions. Tamarisk and Russian olive, which are invasive species, affect riparian plant community composition by outcompeting native plants for available water resources. Treatment of invasive species on the Cimarron and Comanche National Grasslands has resulted in improved plant composition in some areas.

Table 9. Dominant plant species in aquatic, wetland, and riparian ecosystems

Common Name	Scientific Name
Sandbar willow	<i>Salix interior</i>
Peachleaf willow	<i>Salix amygdaloides</i>
Plains cottonwood	<i>Populus deltoides</i>
Saltbush	<i>Sarcobatus vermiculatus</i>
Pale desert-thorn	<i>Lycium pallidum</i>
Switchgrass	<i>Panicum virgatum</i>
Canada wildrye	<i>Elymus canadensis</i>

Source: (USFS 2024g)

Ground Disturbance and Hydrologic Alteration

Legacy effects of past floodplain disturbance, such as trailing and road development, contribute to a moderate ecological integrity rating for riparian areas, non-playa wetlands, and GDEs. Current conditions of riparian areas and non-playa wetlands in floodplains reflect past alterations since the mid-1800s. The processes contributing to floodplain development have largely been reduced through groundwater pumping to support agriculture, which reduced groundwater connection and altered the hydrologic and sediment regimes.

The expansion of agriculture and urbanization across the Great Plains and the areas surrounding and within the Cimarron and Comanche National Grasslands area have resulted in pollution, hydrologic disturbance, and physical modification of streams. The Cimarron and Comanche National Grasslands riparian areas and non-playas wetlands are affected by upstream and upslope activities that occur on and off National Forest System lands due to mixed ownership within the project boundary (Dodds et al. 2004).

Groundwater pumping from the High Plains aquifer has lowered groundwater tables and reduced stream flows on a regional scale ((Sophocleous 2005)). Reduced stream flows lead to smaller riparian corridors and potentially a shift in riparian vegetation composition from hydric tree and shrub species (e.g., cottonwood and willow) to mesic species (e.g., *Tamarix* sp.) (Stromberg et al. 2009). Trinidad Lake and Dam was constructed in the 1970's and alters the natural hydrograph of the Purgatoire River through the Comanche National Grasslands. The projected future condition will largely remain unchanged, except where restoration efforts occur, and where management efforts mimic natural disturbance regimes.

Invasive Species

The most common invasive species occurring in riparian areas in the Cimarron and Comanche National Grasslands include tamarisk (*Tamarix ramosissima*), Russian olive (*Elaeagnus angustifolia*), and reed canary grass (*Phalaris arundinacea*). Other invasive species occurring in wetland areas in the Cimarron and Comanche National Grasslands include barnyard grass (*Echinochloa crus-galli*) and cattails (*Typha latifolia*). These species typically leave a salt residue on the soil and take up water at high rates, which allows them to outcompete native plant species (cottonwoods and willows) and alter the vegetation structure (Nagler et al. 2021); (Pokorny et al. 2020). Tamarisk populations are stable within riparian ecosystems across the grasslands and current tamarisk distribution, abundance, and the associated impact represent a deviation from both the historical and desired condition of riparian woodland ecosystems in the plan area.

Tamarisk density is greater in the western portion of the Cimarron River and continues to spread downstream with dense stands in some places. However, active treatment and invasive control plans could reduce the spread and stabilize future spread (USFS 2024f).

Lakes, Ponds, and Reservoirs

Summary

The majority of features present in the plan area are small ponds measuring less than 0.1 acres in size. Many of these ponds are naturally formed, however some have been constructed for livestock watering. There are four reservoirs that are greater than 1 acre in size; these include Prairie Land Reservoir #1, Brown Reservoir, Reader Lake, and Government Pond (USFS 2024e). Wilburton Pond, Mallard Ponds, Point of Rocks Ponds, and the four ponds associated with the Cimarron Recreation Area are all within the Cimarron River corridor. These perennial, constructed waterbodies are stocked with catchable trout in the winter and catfish in the summer (USFS 2008a). There are also numerous perennial seep pits or giant divots that were dug in the Cimarron River bottom that are filled by alluvial water (USDA Forest Service 2005d). The existing seep pits were dug prior to 1987 and were originally dug by the USFS for the purpose of enhancing wildlife habitat.

Lakes, ponds, and reservoirs provide multiple ecosystem services, including providing aquatic habitat for fish, nutrient cycling, biodiversity, and cultural services. The primary stressors impacting ecosystem services include projected climatic conditions, invasive species, and groundwater depletion. These stressors are reducing the amount of water in these ecosystems, which can impact delivery of ecosystem services (USFS 2024e).

The KECs for this ecosystem consist of water quality, water quantity, and shoreline stability. When the ecosystem has high ecological integrity, high water quality supports diverse aquatic life while also providing clean drinking water sources for terrestrial wildlife and downstream users. High water quality

also supports balanced nutrient cycling through surface water, groundwater, soils, and plants. When water quality is degraded, contaminants can cycle through or accumulate in groundwater, riparian vegetation, and soils.

Water quantity is a key characteristic of ecological integrity because it maintains the extent of lakes, ponds, and reservoirs and provides water for plant life and wildlife. Adequate water quantity and natural flow regimes maintain many processes, such as maintenance of shoreline vegetation, shoreline morphology and stability, maintenance of dissolved oxygen and other water quality parameters, aquatic and riparian habitat availability, and temperature regulation, that drive healthy lake, pond, and reservoir ecosystems.

A stable shoreline has less shoreline erosion and filters sediment and other contaminant inputs from upland areas. As a result, water quality is improved, along with aquatic and riparian vegetation health. In addition to stable shorelines, infrastructure integrity is a key driver of ecological integrity for reservoirs. The absence of human alteration is often indicative of high ecological integrity. Human alteration often includes installation of riprap, shoreline compaction, impoundments meant to increase water-holding capacity, or pond excavation.

Stressors such as warmer temperatures, shifts in the timing of precipitation, livestock use, establishment and spread of invasive species, and recreational and water use can impact these KECs. Livestock grazing at an intensity and duration that exceeds the capability of a site to recover from grazing disturbance could reduce bank-stabilizing vegetation, causing bank destabilization, excessive soil erosion, and increased sedimentation, which can lead to higher water temperatures and spread of invasive plants.

Invasive species may impact native diversity by increasing fire frequency and decreasing native plants, soil moisture, and overall ecosystem biodiversity. Recreational use on and near shorelines contributes to soil compaction and erosion, impacts shoreline vegetation, and increases nutrient and other water quality contaminant inputs into waterbodies. Reservoir management and irrigation diversions reduce water-holding volumes that support a myriad of ecosystem processes.

Changes in ecosystem functions and the associated ecosystem services of lakes, ponds, and reservoirs are influenced by shifts in precipitation and temperature patterns, invasive species, and water use. These changes can, in turn, affect aspects of social and economic sustainability. The magnitude and direction of impacts on social and economic sustainability depend on the ecosystem service(s) affected. For example, a reduction in access or quality of recreational activities or forage for grazing may reduce associated provisioning and/or cultural ecosystem services (such as food and materials, economic contributions, access to scenery, and sense of place), or may improve regulating and/or cultural ecosystem services that were otherwise suppressed by impacts from grazing or recreation (such as shoreline vegetation maintenance, soil erosion reduction, air and water quality, and values associated with pristine, remote characteristics of open spaces). The Multiple Uses and Ecosystem Services section of Appendix A provides additional information on how ecosystems support economic and social sustainability through ecosystem services.

Status and Trends

Water Quality

Water quality in lakes, ponds, and reservoirs is currently influenced by a wide range of factors, including projected climatic conditions, invasive species, water use, and livestock grazing. These stressors impact the overall health of the ecosystem. Factors such as drought, shifts in the timing of precipitation, and increased temperatures, will likely continue to decrease water quantities, which could increase contaminant concentrations (Rice et al. 2018). Invasive species present within the plan area, such as tamarisk, could also decrease flow quantities, which would increase contaminant concentrations (Rice et al. 2018). Irrigation return flows would also increase the amount of contaminants in surface and

groundwater, which would affect water use. Livestock grazing occurring on the surrounding lands could increase runoff above lakes and ponds and decrease shoreline stability; both would increase the amount of sediment and naturally occurring metals reaching water bodies.

The Clean Water Act requires states to establish water quality standards and designated uses for their waters. If a water body does not meet its designated uses due to pollution, it is added to the state's "303(d) list" of impaired waters. Section 303(d) of the Clean Water Act authorizes the EPA to assist states, territories, and authorized Tribes in listing impaired waters and developing Total Maximum Daily Loads⁹ (TMDLs) for these waterbodies (EPA 2024a). There are two lakes included on the Section 303(d) list in the plan area: Cimarron Lake (i.e., Cimarron ponds at the Cimarron Recreation Area) and Point of Rocks Lake. In Cimarron Lake, aquatic life use is impaired, specifically due to eutrophication, where an excess of nutrients accumulates in a waterbody. This excess amount of nutrients has led to excessive algae and plant growth, which depletes dissolved oxygen and leads to the death of aquatic species (EPA 2025e). Point of Rocks Lake also has impairment in aquatic life use as well as domestic water supply and primary contact recreation.¹⁰ The issues identified include eutrophication and elevated sulfate concentrations. Elevated levels of sulfate are often due to excessive upland erosion and sedimentation in a waterbody (EPA 2025e).

The impaired waterbodies are not meeting their designated uses, as defined by the state under the Clean Water Act, Section 303(d). Examples of designated uses include supporting and protecting aquatic life, providing sufficient water quality for domestic water supply use, and recreation (e.g., swimming and fishing). While there are no domestic surface water intakes located on the impaired waterbodies, there are interactions between groundwater and surface water. Thus, degraded quality of surface water could impact the quality of groundwater. Both Cimarron Lake and Point of Rocks Lake are used for recreation, primarily fishing. The degraded water quality that led to the impaired ratings could impact fisheries' populations in the waterbodies and at Point of Rocks Lake.

Overall, water quality for lakes, ponds, and reservoirs will likely continue to trend downward as increased temperatures, drought, and shifts in precipitation patterns continue to exacerbate eutrophication (USFS 2024e).

Water Quantity

There is a lack of data for water quantity for lakes and reservoirs. See the Streams and Rivers Ecosystem and Water Resources sections for a discussion of water quantities for flowing surface water. There is evidence of decreasing water quantities in streams and rivers on the Cimarron and Comanche National Grasslands. There is likely a similar trend in lakes and reservoirs.

Shoreline Stability

Current conditions of reservoir shorelines are slightly degraded due to the lack of maintenance and the natural tendency of dams to erode and floodplains to reestablish. Because of these conditions, the ecological integrity of shoreline stability is trending moderate to low. Where livestock are allowed to congregate around water sources, shoreline trampling leads to increased sedimentation rates.

Vegetation that provides shoreline stability will likely decrease as water quantities decrease. Invasive species (for example, Russian olive and tamarisk) are outcompeting native vegetation for space and resources, which is contributing to shoreline degradation. Root masses of invasive species are typically less efficient at stabilizing banks and shorelines than native species, which leads to increased shoreline

⁹ A total maximum daily load establishes the maximum amount of a pollutant allowed in a waterbody and serves as the starting point or planning tool for restoring water quality.

¹⁰ Primary contact recreation is any activity that involves full-body contact with water and a risk of swallowing water. This includes activities like swimming, diving, and water skiing.

erosion. Unsustainable livestock use also contributes to the degradation of shoreline stability by causing shoreline compaction and alteration, which damages shoreline vegetation and increases shoreline erosion. Shoreline stability is likely to continue to degrade, which could also lead to impacts on economic and social sustainability through changes in ecosystem services (USFS 2024e).

Streams and Rivers

Summary

Most streams in the plan area are intermittent or ephemeral in nature. Timpas Creek, Carrizo Creek, and the Purgatoire River are perennial streams that occur in the Comanche National Grassland (USDA Forest Service 2005d). Many streams have downcut in the past and are now incised with little to no access to their historic floodplain. Regional groundwater depletion has decreased the period of flow of many intermittent streams.

The primary drivers for this ecosystem include geology, climate, and the hydrologic regime. Stressors imposed on streams and rivers consist of projected climatic conditions, herbivory, water use, transportation use, and the presence and spread of invasive species such as tamarisk and Russian olive.

Streams and rivers provide ecosystem services that support economic and social sustainability by providing fish and wildlife habitat and access to clean water (see the Multiple Uses and Ecosystem Services section of Appendix A for more information on how ecosystems support economic and social sustainability through ecosystem services).

The most influential KECs include water quantity, water quality, aquatic habitat complexity, connectivity (longitudinal connectivity and aquatic organism passage, and channel stability (in-channel stability and floodplain connectivity). Increased atmospheric and water temperatures as well as changes in precipitation and runoff regimes, wildfire regimes, riparian vegetation structure and health, and invasive plant proliferation could impact KECs in this ecosystem.

Grasslands streams such as the Purgatoire and Cimarron River are habitat for an assemblage of native fish and reptiles, including the smooth softshell turtle, fathead minnow, longnose dace, channel catfish, green sunfish and red shiner.

Status and Trends

Water Quality

Water quality in the plan area is considered compromised due to approximately eleven percent of stream miles being included on the 303(d) list. There are four lotic waterbodies included on the Section 303(d) list in the plan area: the main stem of the Cimarron River in Kansas and the Purgatoire River, Timpas Creek, and all tributaries of the Arkansas River in Colorado (Colorado Department of Public Health and Environment 2023; Kansas Department of Health and Environment 2024).

In the Cimarron River, aquatic life use and domestic water supply are impaired, specifically due to selenium and chloride. There is a total maximum daily load in place to address reducing the chloride impairment. However, there is no plan in place to address the selenium impairment (EPA 2025e). Selenium is a naturally occurring trace element. High concentrations of selenium in surface water may indicate runoff from land underlain by marine shale and/or inflow from groundwater that may be compounded by extensive application of irrigation water that can leach selenium from the soil and underlying rock (Miller et al. 2010).

In the Purgatoire River, the quality of water supply is not being met. The reasons for impairment include the presence of arsenic and manganese concentrations (EPA 2025e). In Timpas Creek, aquatic life and water supply are impaired by iron, selenium, and arsenic (EPA 2025e). For the tributaries of the Arkansas

River, aquatic life and water supply are impaired by selenium, manganese, and sulfate (EPA 2025e). There is currently no plan in place to address these impairments.

Water quality is vulnerable to stressors, including projected climatic conditions, invasive species, water use, and livestock grazing. Increased summer temperatures and shifts in the timing of precipitation will likely decrease water quantities, which could increase contaminant concentrations. Invasive species such as tamarisk also decrease flow quantities, which would increase contaminant concentrations. Irrigation return flows can also increase the amount of contaminants in surface and groundwater. Livestock grazing can increase runoff from uplands and decrease channel stability; both outcomes increase sediment and naturally occurring metals reaching stream channels.

The impairments in water quality could impact social and economic sustainability through impacts on access and quality of ecosystem services.

Water Quantity

The largest waterway is the Cimarron River, which is a perennial, underground stream flowing northeast through the grassland (for more information on rivers and streams in the plan area, see the Watersheds section). The Cimarron River basin has experienced reductions in surface flow and lowered groundwater table, which has resulted in reduced baseflow (USDA Forest Service 2005d).

Three perennial streams occur within the Comanche National Grasslands. These are Timpas Creek, East Carrizo Creek, and the Purgatoire River. USGS stream flow data and literature suggest that water quantities are being affected by groundwater depletions and water withdrawals (USFS 2024). Refer to the Water Resources section for more information.

Water quantity is most vulnerable to increased summer temperatures, shifts in the timing of precipitation, drought, water use, and invasive species. The future condition of water quantities for streams and rivers is likely to remain at similar levels or may decrease due to climate-induced changes and continued pumping of groundwater. This would result in less water availability for ecosystem services such as water supply, fire suppression, cultural services, biodiversity, and nutrient cycling, which would impact social and economic sustainability.

Aquatic Habitat Complexity

There are three perennial above-ground streams in the Comanche National Grassland: Timpas Creek, East Carrizo Creek, and the Purgatoire River. Habitat complexity on these streams has been impacted by historical changes to the flow regime due to upstream water storage and withdrawals, groundwater depletions, and the invasion of invasive tamarisk and Russian olive.

Native riparian species such as cottonwood and willow have been displaced by invasive tamarisk along much of the stream habitat. Dense tamarisk stands on streambanks accumulate sediment in their thick root systems, gradually narrowing stream channels and increasing the flooding potential. These changes in stream morphology can negatively impact habitat for aquatic species. The loss of native riparian vegetation has reduced the structural complexity of the riparian areas and decreased habitat complexity for aquatic species. Specifically, the loss of cottonwoods has led to the reduced availability of large woody debris, and increased streambank instability.

Upstream water use is not expected to decrease. Although substantial resources and energy have been dedicated to attempting to control tamarisk, it has proven to be extremely difficult, and it is unknown if a substantial reduction will be achieved in the future. Reduced complexity could lead to reduced aquatic species diversity.

Connectivity

The current condition of longitudinal channel connectivity in terms of sediment and debris movement is likely compromised due to the number of road-stream crossings (table 10). Road-stream crossings, regardless of if they are a barrier to aquatic organism movement, typically impede movement of sediment and other channel debris to some degree. The capacity to transport sediment and debris is critical for maintenance of channel stability.

Table 10. Stream-road intersect summary in the Cimarron and Comanche National Grasslands

Stream Name	Stream Miles	Number of Stream-Road Intersects	Intersects per Stream Mile
Upper Cimarron	4,625.03	2,503	0.54
Upper Arkansas	2,455.56	1,207	0.49

Source: USFS GIS 2024

Channel Stability and Floodplain Connectivity

The current conditions of channel stability and floodplain connectivity are static or continuing on a downward trend. Excessive channel aggradation or degradation at or near road-stream crossings is likely occurring, which could impact channel stability. Impacts from transportation networks, such as increased flow coming off roads, could impact bank stability.

Watersheds

Introduction

This section provides essential insights into the ecological health of the Cimarron and Comanche National Grasslands by examining conditions from ridgetop to stream bottom. This broadscale perspective highlights the interconnectedness of ecosystems and the significance of watershed dynamics.

Summary

Watersheds within the Cimarron and Comanche National Grasslands form the headwaters of the Upper Cimarron basin and the southern portion of Upper Arkansas basin. The Cimarron River is a tributary to the Arkansas River and the two merge near Tulsa, Oklahoma. The Arkansas river continues to flow east until it flows into the Mississippi river. In 2010, sixth-level sub-watersheds (typically 10,000 to 40,000 acres) across all National Forest Systems lands were classified using the national Watershed Condition Framework (WCF) (USFS 2011). A watershed condition was assigned following an assessment of existing data, knowledge of the land and professional judgment. A comprehensive update to these ratings has not been undertaken on the Cimarron and Comanche National Grasslands since the original ratings. However, individual watershed ratings have been updated following watershed restoration efforts.

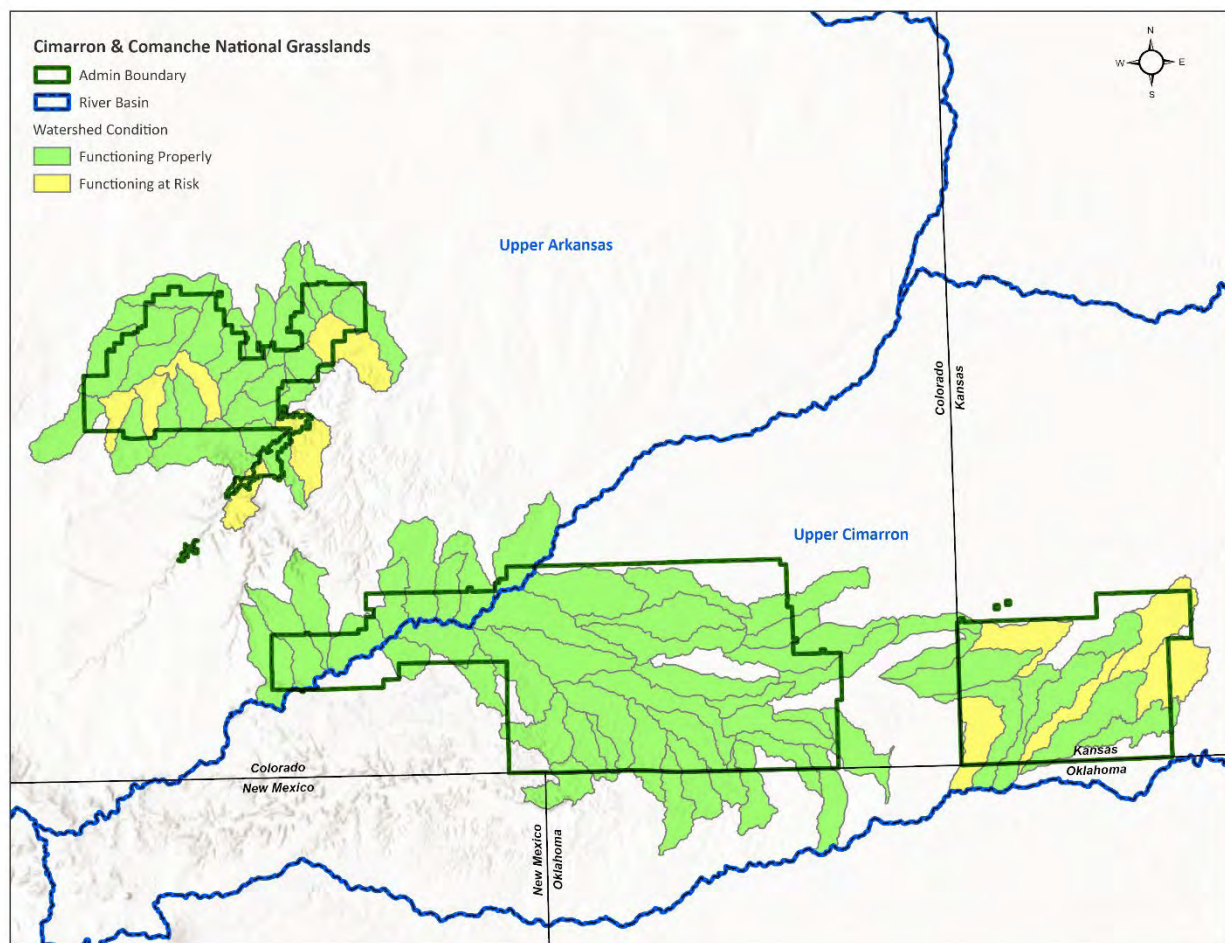
The WCF reports that water quality, water quantity, riparian wetland vegetation and soil conditions across the Cimarron and Comanche National Grasslands are generally in good or properly functioning condition. Aquatic habitat is in fair condition and aquatic biota is in poor condition. Indicators for roads and trail impacts and fire regime/wildfire were fair across most of the Cimarron and Comanche National Grasslands. It should be noted that these ratings were developed in 2010 and more recent data suggest that water quality and water quantity indicator ratings (See water resource section) may be rated lower at present date.

Status and Trends

Setting

River basins in the United States are delineated into a nested hierarchy represented by Hydrologic Unit Codes (HUCs) numbered with 2 to 12 digits, which are then categorized with names from largest in size to smallest that include: regions (2-digit HUC), sub-regions (4-digit), basins (6-digit), sub-basins (8-digit), watersheds (10-digit), and sub-watersheds (12-digit) (USGS and NRCS 2013). The Cimarron and Comanche National Grasslands lies within two river basins: 1) Upper Arkansas, and 2) Upper Cimarron. These basins are then divided into 10 sub-basins, 32 watersheds and 127 sub-watersheds. Of these 127 sub-watersheds, 83 were evaluated using the WCF. 44 of the 127 sub-watersheds that overlap the Cimarron and Comanche National Grasslands plan area contain less than 5% NFS lands and were not evaluated due to the relatively small influence that management has on these sub-watershed (see figure 5).

Figure 5. Watershed Condition in the Cimarron and Comanche National Grasslands



Watershed Condition Classification

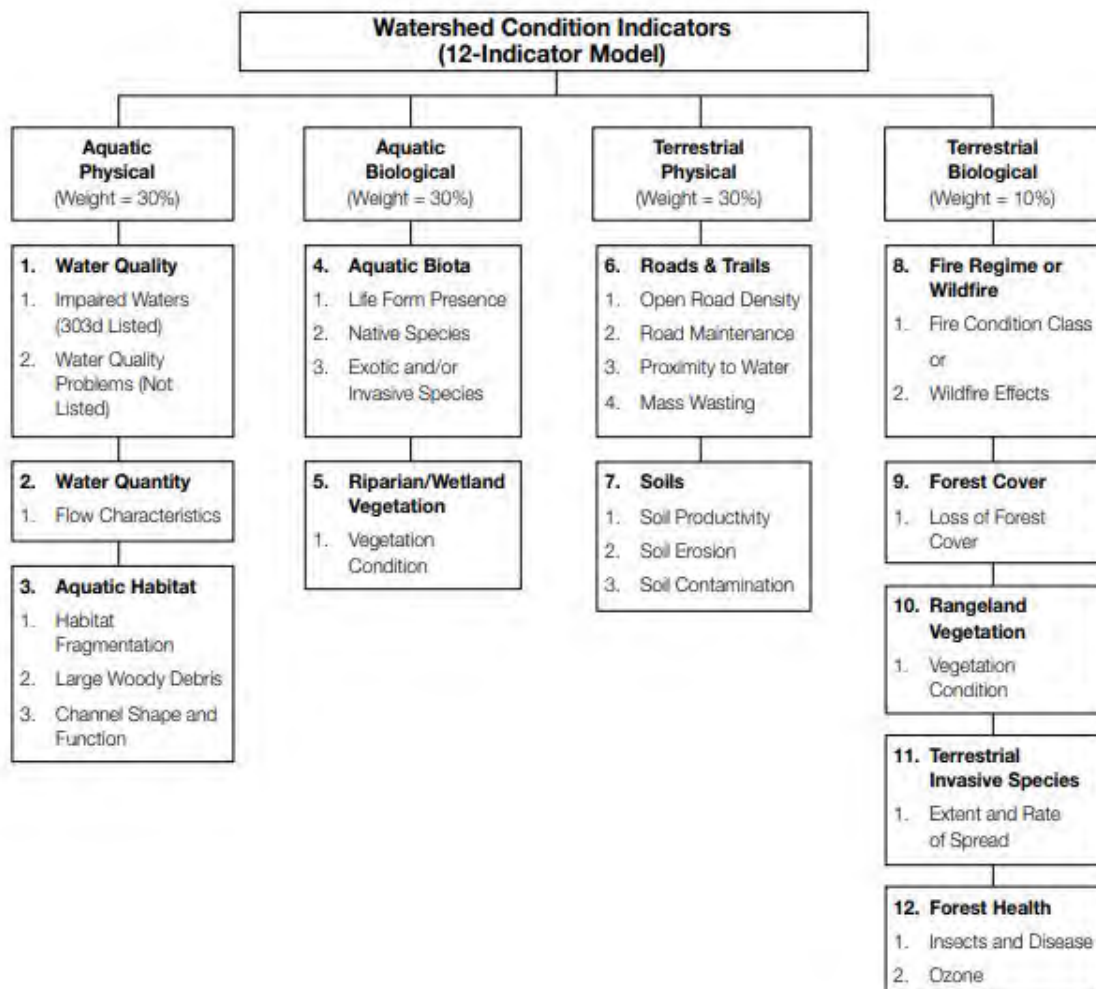
In 2010, sub-watersheds (6th level 12-digit HUC, typically 10,000 to 40,000 acres) were used to assess and prioritize areas for restoration across all national forests using the national WCF (USFS 2011). The

WCF was used to assign a watershed condition rating following an assessment of existing data, knowledge of the land, and professional judgment.

Watershed condition is the state of the physical and biological characteristics and processes within a watershed that affect the soil and hydrologic functions supporting aquatic and terrestrial ecosystems. Watershed condition reflects a range of variability from natural pristine (functioning properly) to degraded (impaired). The Forest Service Manual classification defines watershed condition in terms of “geomorphic, hydrologic and biotic integrity” relative to “potential natural condition.” In this context, integrity relates directly to functionality. Integrity is evaluated in the context of the natural disturbance regime, geo-climatic setting, and other important factors within the context of a watershed (USFS 2011).

The WCF considers 12 indicators to assign watershed condition class ratings. The indicators are grouped into four process categories: 1) Aquatic, Physical; 2) Aquatic, Biotic; 3) Terrestrial, Physical; and 4) Terrestrial, Biota. The first three categories each constitute 30 percent of the total framework rating. The fourth category constitutes the remaining 10 percent. Indicators are evaluated using a defined set of attributes as shown in figure 6. (For a more detailed explanation of the WCF, please refer to Watershed Condition Framework – A framework for assessing and tracking changes to watershed condition (USFS 2011).

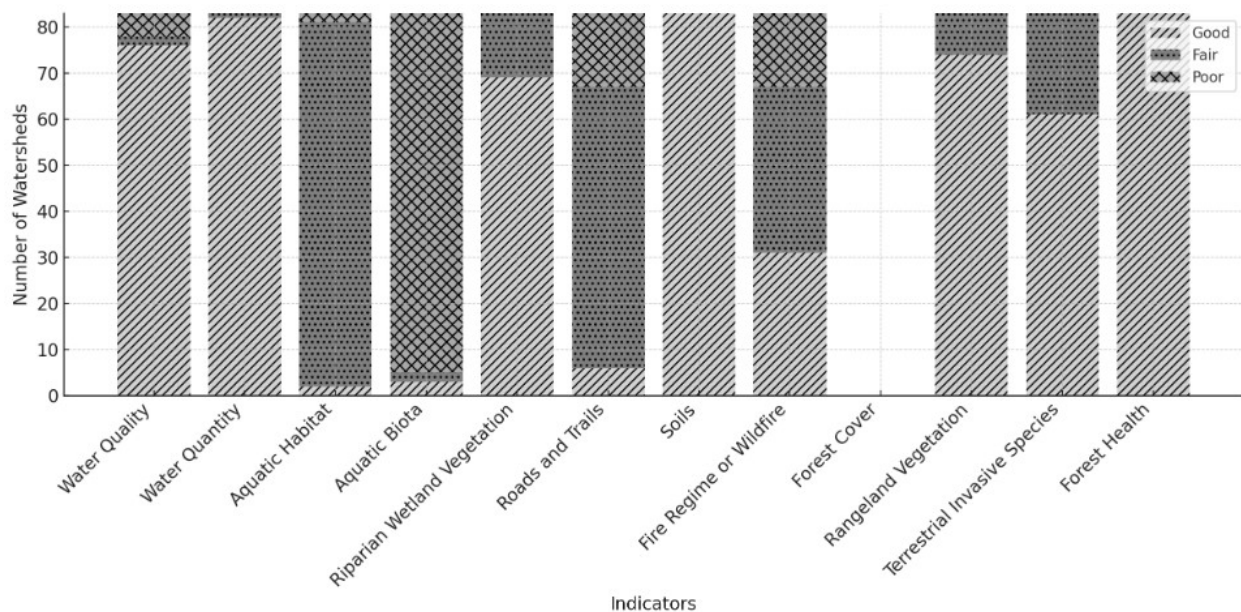
Figure 6. Process categories and indicators of the Watershed Condition Framework



For each watershed, attributes within each indicator are individually rated as “good” (Class 1), “fair” (Class 2), or “poor” (Class 3) according to existing data, knowledge of the land and professional judgement. The attribute scores are then averaged to calculate a score for each indicator. The indicator scores are then averaged to calculate a rating of Class 1 (functioning properly), Class 2 (functioning at risk) or Class 3 (impaired function) for each process category. The Process Category scores are then combined based on a weighting factor to determine a score for each watershed. A watershed is functioning properly (Class 1) if the physical attributes are appropriate to maintain or improve biological integrity, i.e., the watershed is functioning in a manner like natural wildland conditions (USFS 2011). Class 2 and Class 3 watersheds have impaired function because some physical, hydrological, or biological thresholds have been exceeded. Class 2 watersheds exhibit moderately impaired functions and Class 3 watersheds exhibit severe impairments. These impairments can occur due to natural processes, such as wildland fire or large slope failures, but they are more typically caused by human related disturbance, such as: roads close to streams, overgrazing by domesticated animals, invasive species, recreational activities or presence of aquatic non-native species.

The Cimarron and Comanche National Grasslands has 83 watersheds that have been rated using the WCF. Of these, 11 have been rated “functioning at risk” and the remaining 72 are rated as “functioning properly.” The existing Watershed Condition Classification ratings were developed in 2010 and only the completed Priority Watershed, Minnie Canyon-Purgatoire River, has been updated since. The Watershed Condition Classification ratings remain static unless there are updates that need to be recorded to reflect changed conditions on the ground. The 2010 ratings serve as a benchmark for assessing water quality and related ecological parameters, providing a foundation for ongoing evaluations and improvements in water resource management (Potyondy and Geier 2011). Forest Cover was not rated because that Indicator does not apply to the watersheds in the plan area. Indicators most commonly rated fair or poor include aquatic habitat, aquatic biota, roads and trails and fire regime/wildfire (figure 7). Water quality, water quantity, and riparian wetland vegetation were commonly rated good across the Cimarron and Comanche National Grasslands. However, more recent evidence related to water quality, groundwater depletion and invasive species suggests that watershed conditions have changed since 2010. See the Water Resources and Drivers and Stressors sections.

Figure 7. WCF Indicator rating for watersheds across the plan area.



Priority Watersheds for Restoration

A component of the WCF is identifying priority watersheds for restoration. Priority watersheds are selected using an interdisciplinary approach which is based on agency restoration priorities, the importance of watershed resources to local communities and economies and alignment with agency and partner priorities. Once a priority watershed has been identified, a Watershed Restoration Action Plan (WRAP) is developed and implemented. WRAP development and implementation corresponds to an achievable program of work and current budget levels available to individual National Forests and Grasslands.

To-date the Cimarron and Comanche National Grasslands has implemented and completed one WRAP for the priority watershed Minnie Canyon-Purgatory River. All planned restoration activities in this watershed were completed by 2015 and included invasive species management and improvements to existing roads and trails. The Clark Canyon-Purgatory River watershed is downstream of the Minnie Canyon-Purgatory River watershed and was identified as a priority watershed in 2017. Clark Canyon-Purgatory River has high value paleontological and cultural resources that would benefit from soil erosion and sedimentation protection measures. Water quality in the Purgatory River was also identified as a concern. Planned restoration activities include road and trail improvements, gully stabilization, invasive species management and fence installation.

Linkages between Ecosystems

The interconnectedness of terrestrial and aquatic, riparian and wetland ecosystems within the Cimarron and Comanche National Grasslands is crucial to understanding watershed health. Significant linkages exist between these systems, especially where riparian zones interface with aquatic habitats. These areas serve as critical transition zones, influencing nutrient cycling, water filtration, and habitat connectivity for both terrestrial and aquatic species. Healthy riparian ecosystems contribute to improved water quality by filtering pollutants and excess nutrients before they enter aquatic systems, which is vital for maintaining biodiversity, supporting at-risk species that rely on clean water habitats, and providing clean drinking water to downstream users. Additionally, riparian corridors facilitate wildlife movement between terrestrial and aquatic ecosystems, enhancing genetic diversity and species' resilience against environmental changes.

Ecological and Socioeconomic Values of Watersheds

The Cimarron and Comanche National Grasslands hosts areas of a high biodiversity levels, including rare and at-risk species that require focused conservation efforts. The rivers flowing through these national grasslands, particularly sections of the Cimarron River, play a critical role in supporting diverse wildlife. These habitats are vital for bird species, such as the lesser prairie-chicken, which depends on the expansive prairie grasslands and stream corridors for breeding and shelter. More information on these species can be found in the At-Risk Species and Other Highlighted Species section.

Watersheds in the Cimarron and Comanche National Grasslands support key ecosystem services such as providing clean, filtered water supplies to communities for drinking, irrigation, and livestock watering. The watersheds also support cultural ecosystem services by providing a sense of place and connections to the lands, and attracting visitors to the area for recreational opportunities, including hiking, fishing, and wildlife watching, which contribute to the local economy through jobs, income, and economic output.

Key Interactions Affecting Watershed Dynamics

Dispersed across a mixed-ownership landscape, the Cimarron and Comanche National Grasslands may experience impacts from management activities occurring on upstream, non-NFS lands. This mixed ownership pattern creates challenges in buffering the land managed by the Forest Service from external pressures, like road use and agriculture. These activities can lead to habitat fragmentation, reduced

connectivity, and increased sedimentation in waterways. Watersheds within the plan area are also particularly vulnerable to altered precipitation patterns and increased evaporation rates (High Plains Regional Climate Center 2024).

Invasive species also pose a significant threat to native biodiversity and ecosystem functions by disrupting the ecological balance and contributing to watershed degradation. For example, cheatgrass is highly flammable and increases the frequency and intensity of wildfires, which can negatively impact watershed functions such as water quality and soil conditions. Frequent fires, fueled by cheatgrass, lead to soil erosion and increased sedimentation in waterways, reducing water quality and impacting aquatic habitats. Similarly, tamarisk invades riparian areas, altering water availability by consuming large amounts of water and reducing streamflow. Tamarisk not only affects water quantity but also diminishes habitat for native plant and animal species that depend on healthy riparian ecosystems.

Opportunities for Restoration

The Cimarron and Comanche National Grasslands' current landscape presents various opportunities for the restoration and enhancement of watershed health. Implementing integrated restoration projects that target multiple resource concerns—such as soil health, water quality, and vegetation condition—can enhance overall watershed function. These projects, which address interconnected issues, help restore ecological balance and improve the landscape's resilience to future stressors. Additionally, increasing public awareness and engagement in watershed management initiatives can foster community stewardship and support for restoration efforts. Public participation can play a key role in sustaining long-term restoration outcomes by encouraging responsible land use practices and cultivating a sense of ownership in local conservation efforts.

Issues, Concerns, and Opportunities beyond the Plan Area

Many issues and concerns related to watershed management in the Cimarron and Comanche National Grasslands extend beyond the plan area, impacting regional water quality and ecosystem health. For example, watersheds in the Cimarron and Comanche National Grasslands intersect broader regional water management frameworks and dispersed landownership, necessitating collaboration with neighboring jurisdictions to address common challenges. Regional growth and increasing resource demands will continue to put pressure on watershed health, highlighting the need for proactive management strategies that encompass a broader landscape approach.

Air, Soil, and Water Resources

Air Quality

Summary

This section evaluates how the current management plan affects air quality within the Cimarron and Comanche National Grasslands by describing existing air quality conditions and trends, identifying grassland resources that are impacted by air pollution, and measuring the effect of air pollution on sensitive resources.

The Cimarron and Comanche National Grasslands contribute to maintaining and improving air quality. Healthy grasslands support diverse plant communities that contribute to the ecosystem's ability to filter air pollutants (Gopalakrishnan et al. 2018) and can help alleviate the impacts on air quality from wildland fire (Twidwell et al. 2016). Grasslands stabilize soil, reducing soil erosion and the release of dust and particulate matter into the air (Lambert et al. 2020).

Air quality concerns in the Cimarron and Comanche National Grasslands, which primarily are associated with particulate matter emissions from dust and smoke, can reduce visibility and have adverse health effects, such as respiratory and cardiovascular diseases. During the Dust Bowl, air quality in the grasslands was hazardous to health from blowing dust. After this period, vegetation restoration and land stabilization restored the grasslands' air quality conditions to conditions that meet state and federal standards with respect to all air pollutants. However, dry conditions and drought continue to affect the arid soils in the Comanche and Cimarron National Grasslands, where dust storms, primarily originating from agricultural fields on private lands, are common during high winds. Agricultural activities on private lands, including hog farms in Morton and Stevens counties, Kansas; grazing operations; and feedlots, emit ammonia, resulting in odors that can diminish recreational quality.

Wildland fire is a primary driver of air pollution from the grasslands. Historically, natural fires played a crucial role in maintaining the health and diversity of grassland ecosystems. However, altered fire regimes, interrupted by land uses from agriculture, biofuels production, and mineral resource extraction; a warming climate; and drier conditions have resulted in a proliferation of fine dry fuel, which have a higher likelihood of ignition and rapid fire spread, leading to larger and more frequent wildfires. These intense fires release substantial amounts of smoke and particulate matter into the atmosphere, adversely affecting air quality over extensive areas and posing health risks to communities in Wildland Urban Interfaces (WUIs) and downwind of these fires. Controlled, prescribed burns are used to reduce fuel loads and manage vegetation composition. While these burns also produce smoke, they are conducted to minimize air quality impacts compared to uncontrolled wildfires. Post-fire landscapes in the grasslands where vegetation cover is reduced can be susceptible to wind erosion. The loss of stabilizing plants leads to the removal of topsoil by wind, generating dust storms that further degrade air quality.

The Cimarron and Comanche National Grasslands' natural and cultural features attract visitors and provide local and regional economic support from recreation and visitation. Air quality affects the natural quality of the grasslands and can impact the quality of the visitor experience, which can, in turn, affect visitation levels and businesses that rely on tourism. Air quality can also affect ecological sustainability through impacts on vegetation and water resources. High ozone concentrations can injure sensitive vegetation, causing oxidation and burning of plant tissue, and disrupting growth and productivity (Grulke and Heath 2019). Burning of fossil fuels emits sulfur dioxide and nitrogen oxides into the atmosphere, which can lead to atmospheric deposition above critical loads, damaging aquatic and terrestrial ecosystems (Fenn et al. 2011); (Pardo et al. 2011). Critical loads are deposition levels above which components of grassland ecosystems experience harmful ecological effects (Porter et al. 2005).

The Environmental Protection Agency establishes national ambient air quality standards as directed by the Clean Air Act. The Colorado Department of Public Health and Environment and Kansas Department of Health and Environment monitor air quality and provide reports summarizing air quality data. The national ambient air quality standards focus on the following six criteria pollutants: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and particulate matter, including both particulate matter 10 (PM₁₀) and particulate matter 2.5 (PM_{2.5}), as defined by the aerodynamic diameter of the particulate in microns.

Status and Trends

Air quality in the grasslands is assessed in terms of trends in particulate matter concentration, visibility, nitrogen deposition, and ozone exposure. Air quality in the grasslands is in attainment with respect to all air pollutants, meaning it regularly meets state and federal standards (EPA 2024). Due to the semiarid nature of the region, dust from agricultural operations and smoke from prescribed fires and wildfires, which are primarily composed of PM_{2.5} and PM₁₀ that degrade visibility, dominate air pollution.

Currently, no air monitoring stations are maintained within the Cimarron and Comanche National Grasslands. The nearest monitoring stations include a PM₁₀ monitor and a PM_{2.5} monitor in Lamar, Colorado, located approximately 50 miles north of the Carrizo Unit and 50 miles east of the Timpas Unit of the Comanche National Grassland. Lamar, Colorado, is in Prowers County, which was designated as a

PM₁₀ nonattainment area in 1992. Lamar was redesignated as a PM₁₀ maintenance area in 2005, indicating an improvement in air quality based on PM₁₀ concentration (EPA 2025d). Due to the rural nature of the grassland environment, the air quality is expected to be better than air quality in locations closer to developed areas, such as Lamar.

The areas that experience good air quality conditions within the Cimarron and Comanche National Grasslands contribute to social sustainability through visual and viewer enjoyment, physical and mental health, and quality of life for the surrounding communities.

According to the terrestrial condition assessment done for the Cimarron and Comanche National Grasslands in 2024 regarding air quality conditions with respect to nitrogen deposition and ozone exposure, approximately 63 percent of the landscape is estimated to be experiencing good conditions,¹¹ characterized by a score of 0.6 to 0.2, while 17 percent is estimated to be experiencing moderate conditions, characterized by a score of 0.2 to -0.2. Fourteen percent is estimated to be experiencing poor conditions, characterized by a score of -0.2 to -0.6. Six percent is estimated to be experiencing very poor conditions, characterized by a score of -0.6 to -1.0. No areas have very good conditions (score of 0.6 to 1). In comparison, regional and national assessments show that 8 and 10 percent of the landscape, respectively, experience very poor conditions.

Fire is a natural part of the grasslands in Kansas and Colorado. It is essential for maintaining the health and diversity of rangelands. Air quality concerns from wildland fire have increased across the grasslands in the Rocky Mountain region, due to the trend of increasing size and severity of wildfires since 2000 (USFS 2023). Warming temperatures and longer, more severe drought conditions can increase fire occurrence in the grasslands.

Prescribed fires conducted under controlled conditions can mitigate the impacts from more severe, uncharacteristic wildfires in the grasslands. Prescribed burns are initiated when weather and fuel conditions are optimal to meet management goals while minimizing smoke impacts on nearby communities. Prescribed fire in Colorado must comply with the Colorado Prescribed Fire Planning Implementation Policy Guide (Colorado Division of Fire Prevention and Control 2023), which includes a permitting process that provides parameters and constraints to limit smoke impacts to communities.

Forest Service air quality policy directs coordination with state and federal air quality control efforts. This is done by managing and mitigating the sources of air pollution emitted by Forest Service activities, such as prescribed burning, the construction and use of roads, and the operation of facilities. Through compliance with federal and state regulations, the Forest Service largely addresses air quality issues, concerns, and opportunities in the plan area.

Soil Resources

Historical Context

The 1930s Dust Bowl significantly impacted soil conditions across the Cimarron and Comanche National Grasslands. Historical and cultural agricultural practices and severe drought led to widespread crop failures and grassland dieback, and the bare ground created an increase in erosion and soil degradation. Although substantial recovery efforts have been undertaken since then, this historical disturbance continues to influence soil quality and resilience in the region (Cook et al. 2009); (McLeman et al. 2014).

Summary

Soil resources within the Cimarron and Comanche National Grasslands are primarily shaped by the region's climate, geology, and hydrology (Pouyat 2020) (Also see Historical Context above). This

¹¹ The terrestrial condition assessment uses the Ecosystem Management Decision Support logic model to score each metric on a scale of -1 (very poor) to +1 (very good).

assessment focuses on the dominant land resource regions (LRRs) and major land resource areas (MLRAs) relevant to the Cimarron and Comanche National Grasslands, notably LRR G (Western Great Plains Range and Irrigated Region) and LRR H (Central Great Plains Winter Wheat and Range Region). The Cimarron and Comanche National Grasslands landscape is further delineated by its five MLRAs, presented in descending order of dominance:

- **Central High Plains, Southern Part (67B):** This MLRA features eolian sands, loess, and riverine sediments on dissected high plains. The semi-arid climate contributes to high erosion potential and salinity challenges.
- **Upper Arkansas Valley Rolling Plains (69):** Influenced by sediments from the Arkansas River, this MLRA contains diverse soils like Calciargids and Torrifluvents and faces wind erosion and soil quality degradation issues.
- **Southern High Plains, Northern Part (77A):** Located on eolian plains over the Ogallala Formation, this MLRA includes vulnerable soils in playas and loess, where intensive agriculture places significant pressure on soil resources.
- **High Plateaus of the Southwestern Great Plains (70A):** Defined by shale-derived soils on plateaus and escarpments, this MLRA requires strong conservation efforts to address historical grazing impacts.
- **Central High Tableland (72):** Shaped by wind deposition and loess, this MLRA supports grazing but struggles with soil organic matter loss and erosion from intense storms.

The Cimarron and Comanche National Grasslands' soil resources span these five MLRAs, each shaped by distinct geologic, physiographic, and climatic influences. These MLRAs define a landscape of varied textures, soil compositions, and ecosystem dynamics. The semi-arid to dry climate across these areas contributes to limited soil moisture retention, higher erosion potential, and challenges for maintaining soil productivity (NRCS 2014).

Soil taxonomy data identify the dominant soil orders in this area as approximately 48 percent Alfisols, 16 percent Mollisols, and 17 percent Entisols, with Aridisols covering 9 percent. The Timpas Unit of the Comanche National Grassland is predominantly characterized by Aridisols and Entisols, indicative of arid conditions and limited soil development, while Alfisols and Mollisols—typically associated with deeper, organic-rich topsoil and more soil development—dominate other units.

Soil productivity in the Cimarron and Comanche National Grasslands depends heavily on its primary parent materials. Deposits transported by wind and water dominate the grasslands and include eolian sands, loess, and alluvium. These materials influence both the soil's physical and chemical properties and its susceptibility to degradation from erosion and compaction, as seen in MLRAs 67B and 69, where fine-textured and sandy soils developed in eolian materials are highly prone to erosion, especially from wind, and in MLRA 70A, where finer parent materials deposited by wind and water or weathered from bedrock create heavier-textured soils with rutting, compaction, and salinization potential.

Soil data for Cimarron and Comanche National Grasslands are primarily sourced from Natural Resources Conservation Service (NRCS) soil surveys (NRCS 2025b), which classify soils by their physical and chemical properties.¹² The Cimarron and Comanche National Grasslands soils are broadly categorized into six major soil orders, with Alfisols and Mollisols covering approximately 64 percent of the grasslands ((NRCS 2020)). These orders represent some of the most fertile soils in the country, important for their organic-rich surface horizons, developed primarily through the growth and dieback of grass roots. Other orders, such as Entisols and Inceptisols, indicate soils with lesser horizon development (NRCS 2014) and are particularly noticeable in the Timpas Unit within MLRA 69. These orders highlight the importance of

¹² Personal communication with U.S. Department of Agriculture, Mountain Services Planning Group, January 7, 2025.

parent material and climate in influencing soil formation and stability (refer to figure 8, Soil Parent Material).

Key indicators used to assess soil productivity and quality include organic matter levels, texture, and erosion susceptibility. Organic matter plays a vital role in maintaining soil moisture and health, preventing erosion, and supporting vegetation growth. In erosion-prone areas, soil disturbance monitoring has become essential for understanding soil conditions in the Cimarron and Comanche National Grasslands and mitigating erosion effects when necessary (USFS 2008a). Map units in the soil survey indicate that approximately 5,670 acres have continued erosion issues. Prominent salinity problems exist in the Timpas unit; Manzanola silty clay loam, dry, saline, 0 to 2 percent slopes make up approximately 8,160 acres (NRCS 2025b). The NRCS also evaluates soil salinity levels, especially in irrigated areas where salinization impacts soil and water quality. There is no irrigation on the Cimarron and Comanche National Grasslands. It does occur on surrounding landscape where irrigation is used on some of the more fertile land.

Erosion, bulk density, and nutrient cycling are further indicators measured to assess soil condition. Changes to soil condition may be caused by ground disturbing activities. USFS Soil Scientists conduct environmental assessments to consider existing conditions and potential effects on soil resources associated with management activities. They evaluate the degree and extent of soil disturbance using Forest Soil Disturbance (Page-Dumroese et al. 2009) or similar monitoring protocols (e.g., (Pellant et al. 2020). Disturbance to the soil's surface and subsurface attributes are considered and detrimental impacts to soil resources are defined (see FSH 2509.25).

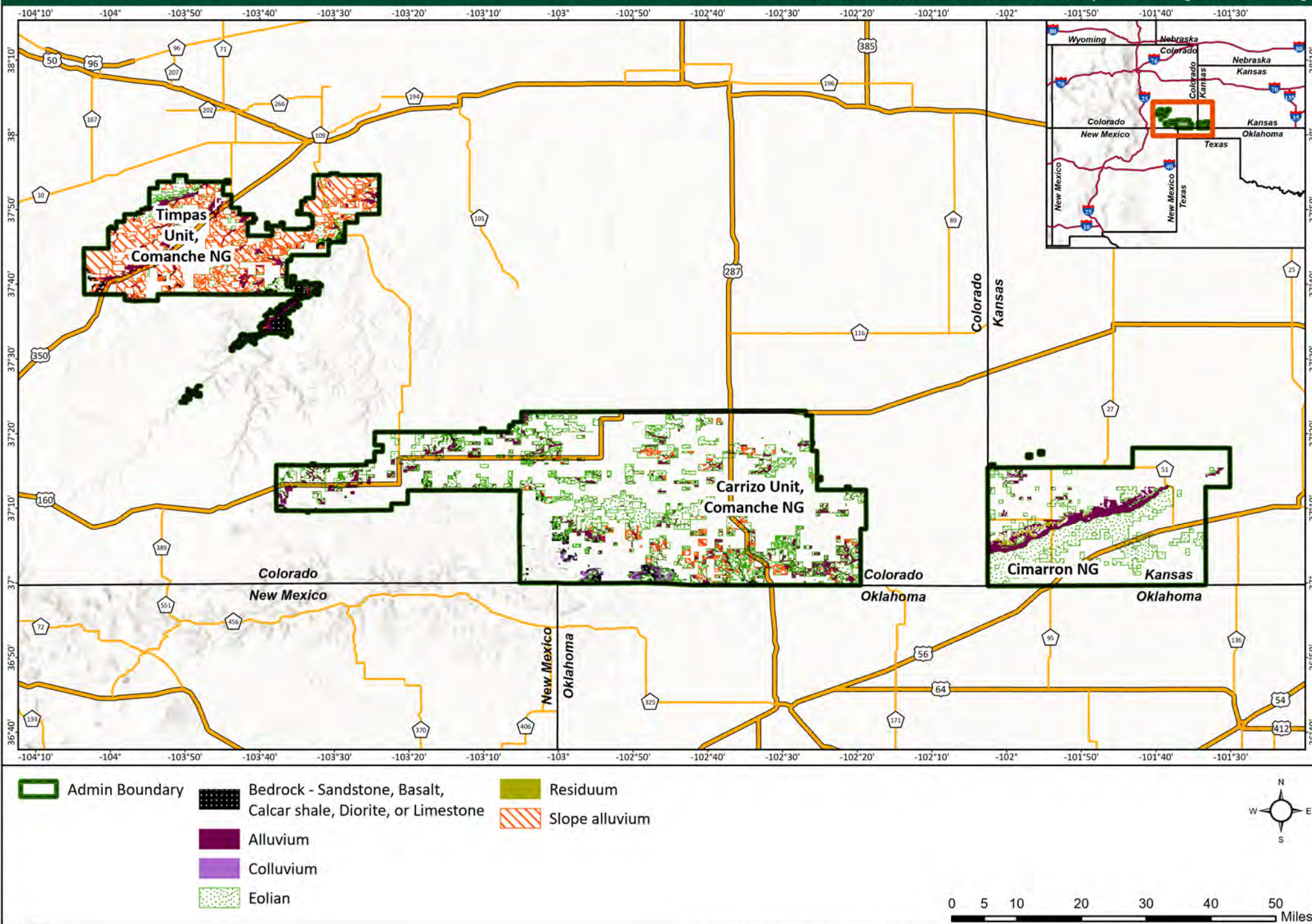
Geomorphic landforms, such as playas, loess plains, and dune fields, support sensitive wetland and riparian ecosystems. These ecosystems rely heavily on stable soil conditions but are highly susceptible to disturbances such as erosion, compaction, and invasive species encroachment. Soils with high clay content, common in MLRAs 70A and 77A, further complicate management due to shrink-swell behaviors that undermine structural stability and reduce water infiltration. Addressing these interconnected challenges requires adaptive management strategies that prioritize soil stability, erosion prevention, moisture retention, and invasive species control to sustain these fragile ecosystems.

The land management plan guidance for soil management in the Cimarron and Comanche National Grasslands prioritizes erosion control, moisture management, and prescribed grazing to sustain soil productivity. Current conservation practices, including vegetation management and adaptive grazing, aim to limit erosion, control invasive species, and promote ecosystem resilience. These efforts have helped maintain soil conditions under current management, but external pressures, such as land development and climate variability, continue to pose risks to soil health. Specific threats—such as erosion, salinity, and invasive species—could lead to more rapid soil degradation, particularly in sensitive ecosystems. Prescribed grazing and erosion control can maintain soil conditions and manage recovery rates in problem areas. Ongoing efforts to address these challenges are essential for preserving ecosystem services that support both environmental sustainability and the well-being of surrounding communities. Proactive, adaptive management and continuous monitoring are key to ensuring informed decision-making and maintaining soil health in the long term.



USDA Forest Service

Figure 8. Soil Parent Material
Cimarron and Comanche National Grasslands| Land Management Planning



6/26/2025
Datum: North American 1983. Scale: 1:1,200,000

This product is reproduced from geospatial information prepared by the U.S. Department of Agriculture, Forest Service. GIS data and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc. Using GIS products for purposes other than those for which they were created, may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify, or replace, GIS products based on new inventories, new or revised information, and if necessary in conjunction with other federal, state or local public agencies or the public in general as required by policy or regulation. Previous recipients of the products may not be notified unless required by policy or regulation.

Status and Trends

Current Conditions and Trends

The general climate of the Cimarron and Comanche National Grasslands is semi-arid, with annual precipitation primarily occurring in spring and early summer through frontal storms and late-summer thunderstorms. This climate limits moisture availability, which can deplete soil moisture and increase susceptibility to wind and water erosion, especially in areas with sparse vegetation or loose soil. These arid conditions also contribute to organic matter loss and soil compaction, particularly in the Timpas Unit, where Aridisols and Entisols dominate. Such soils have limited development, exacerbating the challenges to maintaining soil health (NRCS 2014).

The primary soil suborders within the Cimarron and Comanche National Grasslands include Ustalfs (48 percent), Ustolls (16 percent), and Orthents (14 percent). The mineral composition of the Timpas Unit includes a high proportion of carbonatic minerals, whereas other subunits contain various shrink-swell clays and calcareous soils. Landforms across the Cimarron and Comanche National Grasslands are dominantly plains (90 percent) but also include dunes (3 percent), canyonlands (3 percent), river valleys (2 percent), and playas (<1 percent). For example, the Timpas Unit is characterized by rocky and rolling rugged terrain with escarpments, while the southwestern portion of the Carrizo Unit is notable for its canyonland topography.

Parent materials such as eolian deposits (67 percent), alluvium (13 percent), and slope alluvium (12 percent) contribute to soil formation and characteristics, supporting distinct ecosystems, including ecosystem features like blowouts and playas (refer to the Aquatic, Wetland, Riparian Ecosystems section). These soils are integral to habitats for endemic species, and aquatic, wetland, and riparian ecosystems enhance local biodiversity. Key aquatic, wetland, riparian (AWR) characteristics—such as Closed Depression, Wet Meadow, Salt Meadow, Sandy Bottomland, and Loamy Lowland—are identified through the NRCS Potential Soil Wetland Landscape (PWLS) method and ecosite descriptions (ESDs) derived from Soil Survey Geographic Database (SSURGO) soil components.

Although current management strategies are stabilizing soil conditions, long-term trends point to the need for adaptive land management practices. These practices must include strategies focused on soil moisture retention, organic matter preservation, and erosion control. Adaptive management practices, which incorporate these strategies and rely on monitoring and continuous adjustments, will be critical in preserving soil health and supporting ecosystem resilience in the future.

In summary, soil conditions across the Cimarron and Comanche National Grasslands are generally stable under current management strategies. Soil changes typically occur gradually, and the area is maintaining a relatively stable status due to effective management practices. However, external pressures—such as land use changes and climate variability—pose ongoing risks, potentially leading to more rapid soil degradation on sensitive ecosystems. Erosion, salinity, and spread of invasive species could exacerbate these risks. Proactive, adaptive management measures and ongoing monitoring will be necessary to mitigate these threats and ensure informed, responsive decision-making to maintain soil health and ecosystem resilience over time.

Water Resources

Summary

Water resources in the Cimarron and Comanche National Grasslands are essential to local and regional ecosystems, supporting ecological, cultural, social, and economic functions. The Upper Arkansas Basin (Hydrologic Unit Code (HUC) 110200) spans Colorado and New Mexico, while the Upper Cimarron Basin (HUC 110400) covers Colorado, Kansas, and Oklahoma. Subbasins and watersheds within these areas contribute to sustaining the region's ecological integrity (refer to the Watersheds section for details).

The Cimarron and Comanche National Grasslands contain a 3,190-mile network of rivers and streams on National Forest System lands, categorized as perennial (flowing year-round), intermittent (flowing seasonally), and ephemeral (flowing only after rainfall). Approximately 16 miles are categorized as perennial streams, which include the Cimarron River, Timpas Creek, Purgatoire River, and Carrizo Creek. Approximately 1,501 miles are categorized as intermittent streams, and 1,673 miles are categorized as ephemeral streams. The entire administrative boundary encompasses 6,967 total miles of rivers and streams, which includes 61 miles of perennial streams, 3,289 miles of intermittent streams, and 3,617 miles of ephemeral streams (USGS 1999).

Groundwater is primarily sourced from the High Plains Aquifer, particularly the Ogallala Aquifer, which has experienced significant declines due to heavy agricultural use. Water resources within the Cimarron and Comanche National Grasslands support essential ecosystem services, including provisioning services such as clean, fresh water and cultural services such as recreational opportunities and cultural practices of Tribal communities. (Refer to the Multiple Uses and Ecosystem Services section of Appendix A for more information on the impacts of water resources on social and economic sustainability through ecosystem services.)

Water management on the Cimarron and Comanche National Grasslands has historically focused on agricultural demands, with most water use coming from wells. While infrastructure such as surface water diversions for irrigation may play a role, they do not significantly influence surface water flow regimes, as most streams are intermittent or ephemeral. The absence of instream flow protections is not unique to the Cimarron and Comanche National Grasslands, and instream flows are not a primary concern for water management in the Plan Area. Water use is regulated by state water law, with no evidence of over-extraction or degradation from surface water diversion systems. However, increasing agricultural demand, coupled with land use changes, continues to stress water resources, especially groundwater, and can lead to potential concerns about the allocation of water resources for land management purposes and for downstream communities. Elevated levels of selenium, arsenic, and chloride, often linked to agricultural runoff, threaten both aquatic life and human water supplies. Addressing these challenges through adaptive management strategies is essential for sustaining water resources and maintaining ecological health in the Cimarron and Comanche National Grasslands.

Status and Trends

Key waterways in the Cimarron and Comanche National Grasslands include the Cimarron River, Timpas Creek, and the Purgatoire River. The Cimarron River is ephemeral through the Cimarron National Grasslands, flowing only after large precipitation events. The Cimarron River has average annual flows ranging from 0.055 to 32.6 cubic feet per second (cfs) (USDA Forest Service 2005d). Concerns about declining flows are linked to groundwater depletion, with conservation measures focused on limiting withdrawals and enhancing recharge to ensure long-term availability (USGS 2018). Timpas Creek, a perennial stream with an average annual flow of 61 cfs, is known for its flash flood responses, particularly during thunderstorms (USDA Forest Service 2005d). The Purgatoire River, which historically experienced extreme flooding before the 1960s, is now regulated by Trinidad Lake upstream. Past flooding played a key role in exposing the dinosaur tracks on the south side of the river. While the river continues to shape the landscape, modern management efforts focus on mitigating its erosive effects to preserve these paleontological resources (USDA Forest Service 2005d). The northernmost downstream parcel contains the Picket Wire Canyonlands dinosaur track site, the largest assemblage of dinosaur trackways in North America and a resource of international significance (refer to the Cultural Resources section for more details). Historical data indicate a mean annual peak streamflow of 3,060 cfs, sufficient to submerge the tracks but to stay contained within the channel banks (USDA Forest Service 2005d).

Groundwater primarily comes from the High Plains Aquifer, supplying 99.9 percent of water used in the Cimarron River Basin (McGuire and Strauch 2024). The Ogallala Aquifer, the largest unit of the High Plains Aquifer, underlies the Cimarron National Grasslands. It has low recharge rates and is experiencing significant declines due to extensive agricultural irrigation, which accounts for 97 percent of water use.

Conservation efforts, such as those outlined in the Kansas Water Plan, aim to address these declines (USDA Forest Service 2005d).

The Cimarron and Comanche National Grasslands also feature 678 lakes, ponds, and reservoirs covering approximately 650 acres. Reservoirs greater than 1 acre include Prairie Land Reservoir #1, Brown Reservoir, Reader Lake, and Government Pond (USDA Forest Service 2005d). Constructed ponds such as Wilburton Pond, Mallard Ponds, Point of Rocks Ponds, and the ponds within the Cimarron Recreation Area are situated along the Cimarron River corridor. These perennial waterbodies are stocked with trout in the winter and catfish in the summer and provide vital recreation and wildlife habitat (USDA Forest Service 2005d). There are also playas, mostly less than 1 acre, that act as intermittent water sources influenced by surface flow changes (USDA Forest Service 2005d). The Grasslands contain about 105 springs, primarily associated with canyons, and wetlands that support diverse vegetation types, primarily found within the Comanche National Grassland (USDA Forest Service 2005d). For more detailed information on specific water bodies and their conditions, refer to the Aquatic, Wetland, Riparian Ecosystems section.

Downward trends to water resources stem from agricultural expansion, population growth, and climatic variability, with annual precipitation patterns influencing the grasslands' numerous ephemeral and intermittent streams. Groundwater quality concerns include contamination from agricultural runoff, such as elevated nitrate levels, and industrial activities introducing volatile organic compounds and heavy metals. Monitoring efforts by Cimarron National Grassland staff include annual well testing for nitrates and organics, with data retained at the district office. Cleanup and monitoring efforts address contamination risks from oil and gas operations in collaboration with the Kansas Department of Health and Environment (USDA Forest Service 2005d).

Interactions between water resources and other resource values in the Cimarron and Comanche National Grasslands are shaped by several complex stressors. Land use changes, particularly from agricultural practices, contribute to increased runoff and sedimentation, which negatively affect aquatic habitats and water quality. Additionally, altered precipitation patterns and more frequent extreme weather events are anticipated to worsen existing challenges in water management across these ecosystems. For example, higher intensity and shorter duration precipitation events could impact water resources through flooding and impacts to roads and other infrastructure, which could contribute to increased runoff and reduce water quality. Additionally, shifts in precipitation patterns and drought could reduce water quantity and water quality.

Water Rights and Uses

The water resources within the Cimarron and Comanche National Grasslands are used for diverse purposes such as commercial operations, domestic consumption, wildfire management, recreation, agricultural irrigation, and livestock watering. Groundwater serves as the primary source of water for most uses within these grasslands. Water rights in the grasslands are regulated by state law, with Kansas and Colorado both following the prior appropriation doctrine, which operates on a "first in time, first in right" principle. This framework allocates water to users based on when the water was first put to beneficial use, with those who used the water first getting priority.

The Forest Service can hold federal reserved water rights for administrative purposes or through state appropriation for all other beneficial uses. There are 204 records in the Forest Service's Water Rights and Uses (WRU) Database on the Cimarron National Grassland while the Comanche National Grassland has 876 records in the WRU database. The WRU database contains information for points of diversion as well as points of use; therefore, one water right may have multiple records associated with it. The exact number of water rights on the grasslands held by the Forest Service is unknown. There are also many water rights and well permits held by others within the plan area. These are not included in the WRU database but are important as they often have much greater volumes or pumping rates associated with them than those used by the USFS. The Forest Service manages water use through a structured permitting process. The Forest Service issues special use authorizations to permit water diversions,

storage, and other activities on National Forest System lands, ensuring compliance with state and federal regulations.

Public Water Systems and Protection Areas

The Cimarron and Comanche National Grasslands contain two public water systems (PWS).¹³ These systems serve communities and are regulated under the Safe Drinking Water Act. The plan area also overlaps eight groundwater wellhead protection areas. These wellhead protection areas contribute water to a PWS well or intake and have the potential to affect water quality at PWSs. Wellhead protection areas are typically located within a set radius around groundwater wells to prevent contaminants from entering the aquifer. These areas safeguard drinking water for municipalities such as Walsh, Kim, Campo, and Pritchett in Colorado, as well as Rolla and Hugoton in Kansas. These wellhead protection areas also protect drinking water sources available at the Cimarron Recreation Area.¹⁴

Municipal water use downstream of the Cimarron and Comanche National Grasslands has increased significantly since the current land management plan was put in place. Expanded efforts to protect areas that contribute to a PWS are necessary to ensure sustained municipal water supplies. Ongoing monitoring and adaptive management strategies are essential to respond to evolving challenges.

Assessment of Impaired Waters

The 2024 assessment of impaired waters identifies several impaired water bodies within the plan area, as required under Section 303(d) of the Clean Water Act. This section mandates that states develop water quality standards and identify water bodies where these standards are not met.¹⁵ These impaired water bodies are then placed on the 303(d) list, and total maximum daily loads (TMDLs) are created to address pollutants causing the impairments. States update this list every two years to ensure the necessary management measures are in place to bring these waters into compliance.

Within the assessment area, the following water bodies are listed on the 303(d) list:

- Cimarron River (Main Stem): This river is impaired for Aquatic Life Use and Domestic Water Supply due to selenium and chloride contamination. While a TMDL is in place to address chloride, no TMDL has been developed for selenium. The source of chloride is identified as a naturally occurring groundwater intrusion, while selenium impairment is often linked to runoff from land with marine shale or irrigation activities (EPA 2025e).

¹³ A Public Water System is defined as a system that provides piped water to at least 15 service connections or serves an average of 25 individuals for at least 60 days a year. See <https://www.epa.gov/dwreginfo/information-about-public-water-systems>.

¹⁴ Geospatial data was obtained from the Environmental Protection Agency (EPA) Office of Groundwater and Drinking Water (OGWDW), which manages access to and distribution of sensitive drinking water facility locational data. The EPA national layer contains all surface and ground water public drinking water systems across the United States. The public water system and source facility information were obtained from the Safe Drinking Water Information System/Federal Version (SDWIS/FED). The drinking water source locations used in deriving the Source Protection Areas are the active sources (intakes, wells, reservoirs, infiltration galleries, and springs) with valid locations (expressed as latitude/longitude). These inputs were analyzed against the National Hydrography Dataset Version 2.1 (EPA n.d.) using the TOTMA field (Time of Travel) – 24 hours upstream. Due to the identification of intakes and wellheads within the geospatial data, the information is protected and can only be acquired with proper authorization. Federal partners with a legitimate use case can be authorized to access and use this data in their analysis, after agreeing to comply with EPA OGWDW policy on sensitive drinking water data.

¹⁵ The entities identifying the relevant water bodies for the 2024 303(d) list were the Kansas Department of Health and Environment and Colorado Department of Public Health and Environment.

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- Purgatoire River (Main Stem): This river is impaired for Water Supply due to high concentrations of arsenic and manganese. Both of these contaminants are naturally occurring but have concentrations that exceed the acceptable limits for water supply use (EPA 2025e).
- Timpas Creek (Main Stem): This creek is impaired for Aquatic Life Warm Water–Class 1 and Water Supply due to iron, selenium, and arsenic contamination. The presence of these contaminants has led to degradation of both aquatic life and water supply (EPA 2025e).
- Arkansas River Tributaries: These tributaries, spanning 624.6 miles, are impaired for Aquatic Life Warm Water–Class 2 and Water Supply due to selenium, manganese, and sulfate (EPA 2024d). Selenium is often introduced through runoff from areas with marine shale and from irrigation activities, which exacerbate the leaching of contaminants from soil and rock (EPA 2025e).

In addition to these rivers and streams, two lakes within the assessment area are listed on the 303(d) list due to eutrophication and sulfate contamination:

- Cimarron Lake (Moss Lake Middle): This lake is impaired for Aquatic Life Use due to nutrient loading, which leads to eutrophication. This process depletes oxygen levels in the water, harming aquatic life, especially fish (EPA 2025e).
- Point of Rocks Lake (Moss Lake West): This lake is impaired for Aquatic Life Use, Domestic Water Supply, and Primary Contact Recreation due to eutrophication and elevated sulfate levels. The elevated sulfate levels not only harm aquatic life but also affect the quality of water for domestic use and recreation, such as swimming (EPA 2025e).

The condition of these lakes is unlikely to improve without intervention. Runoff from both private lands and National Forest System lands, combined with groundwater depletion from agricultural irrigation, is expected to maintain or worsen water quality. The resulting degradation could impact aquatic life, water supply, and recreational activities such as fishing and swimming.

The National Aquatic Resource Surveys (NARS) are collaborative programs between the US EPA, states, and tribes designed to assess the quality of the Nation's coastal waters, lakes and reservoirs, rivers and streams, and wetlands using a statistical survey design. The National Rivers and Streams Assessment (NRSA), National Wetlands Condition Assessment (NWCA) and the National Lakes Assessment (NLA) are components of NARS. Since 2007, there have been two randomly selected locations on the Cimarron and Comanche National Grasslands to collect physical, chemical, and biological data on surface water. (Additional information related to NARS is available at: <https://www.epa.gov/national-aquatic-resource-surveys>.)

- Purgatoire River (NRSA Sites): Sampling results for the Purgatoire River during the 2008–2009 period showed that total nitrogen levels were considered good at 384 micrograms per liter (µg/L), while total phosphorus was classified as fair at 78.7 µg/L. In the 2013–2014 period, nitrogen was recorded at 440 µg/L (good) and phosphorus at 33 µg/L (good). In 2018–2019, nitrogen was 449 µg/L (good) and phosphorus was 67.3 µg/L (fair). These findings indicate that water quality in the river is generally good but still shows some variation in nutrient levels across the years.
- Vogel Canyon (NWCA Sites): The Vogel Canyon wetland site, included in the National Wetland Condition Assessment (NWCA), was recorded with alarmingly high nutrient levels. Nitrogen levels were recorded at 3450 µg/L (poor) and phosphorus at 318 µg/L (poor) during 2016 sampling, highlighting significant water quality issues in the wetland.

Colorado and Kansas routinely test for harmful cyanobacterial blooms (HCBs) in the region. One NRSA site in the Purgatoire River tested positive for microcystin above the EPA's reporting limit during the 2013 sampling period. The 2019 sampling did not detect any microcystin at this site, indicating potential seasonal variations in HCBs.

Several stressors, both natural and anthropogenic, contribute to water quality impairments in the Cimarron and Comanche National Grasslands plan area. Naturally occurring pollutants, such as selenium, chloride, arsenic, and sulfate, are exacerbated by human activities such as agricultural runoff, livestock grazing, and irrigation practices. Nitrogen and phosphorus loading, particularly in the Southern Plains ecoregion, are significant contributors to eutrophication and algal blooms, leading to oxygen depletion in water bodies. Without intervention, the water quality in the affected rivers, streams, and wetlands is expected to continue as is or worsen due to ongoing agricultural activities, groundwater depletion, and insufficient mitigation measures. The presence of private lands within the plan area significantly reduces the agency's ability to implement broad-scale water quality improvements, further complicating management efforts.

Effective management strategies are crucial for addressing both the naturally occurring pollutants and the human-induced stressors that contribute to these impairments. Proactive measures, including the development of TMDLs for selenium and other unaddressed impairments, will be key in mitigating further degradation and setting clear pollution reduction goals. Additionally, improving monitoring efforts will be essential in tracking water quality trends and informing future management actions to protect aquatic life, water supply, and recreational activities within the region.

Current Land Management and Future Projections

The current land management plan provides a foundational framework for addressing water resource issues in the Cimarron and Comanche National Grasslands. However, it could benefit from additional specificity and a more comprehensive approach to address emerging challenges such as groundwater depletion, natural pollutants, and human-induced stressors like grazing, agriculture, and recreation. While many issues are addressed through project-specific design and mitigation measures, opportunities exist to strengthen the plan's standards and guidelines to more effectively manage water resources.

Projections suggest that ongoing groundwater depletion and the degradation of aquatic habitats and water supplies may continue, influenced by factors such as climate, geology, and consumptive water uses like irrigation and stock watering. Nonconsumptive uses, including recreational and ecological needs, are also at risk, which could impact species diversity and riparian ecosystem health.

At-Risk Species and Other Highlighted Species

At-Risk Species

Federally Recognized Species - Threatened, Endangered, Proposed, and Candidate Species

Introduction

Threatened, Endangered, Candidate, and Proposed (TEPC) species recognized under the Endangered Species Act of 1973, as amended (ESA; 16 US Code (U.S.C.) 1531 et seq.) that are, or may be, present in the Cimarron and Comanche National Grasslands include the black-footed ferret (*Mustela nigripes*; Endangered; experimental/nonessential), gray wolf (*Canis lupus*; Endangered), New Mexico meadow jumping mouse (*Zapus hudsonius luteus*; Endangered), tricolored bat (*Perimyotis subflavus*; proposed Endangered), eastern black rail (*Laterallus jamaicensis* ssp. *jamaicensis*; Threatened), lesser prairie-chicken (*Tympanuchus pallidicinctus*; Threatened), piping plover (*Charadrius melodus*; Threatened), rufa red knot (*Calidris canutus rufa*; Threatened), Arkansas River shiner (*Notropis girardi*; Threatened), monarch butterfly (*Danaus plexippus*; proposed Endangered), regal fritillary (*Speyeria idalia*; proposed Threatened), and Suckley's cuckoo bumble bee (*Bombus suckleyi*; proposed Endangered) (FWS 2024b).

- Of all TEPC species, two species, the lesser prairie-chicken and monarch butterfly, are known to occur in the plan area. One species, the Arkansas River shiner, was historically known to occur but

has been extirpated from the plan area. The remaining nine species are either not known to occur in the plan area, or they have ranges that fall outside the plan area. No critical habitat is proposed or designated in the plan area (see table 11).

- While the lesser prairie-chicken is one of the species known to occur in the plan area, population trends have seen a steady decline since 1990. Recent survey data indicates only one active lek detection on NFS lands in 2024. There are several active leks on private lands surrounding or adjacent to NFS lands.
- The Pike and San Isabel National Forests and Cimarron and Comanche National Grasslands Land and Resource Management Plan (USFS 1984) contains direction for the management of resources on both the two Forests and two Grasslands.

Opportunities to improve protection for some TEPC species in the plan area include:

- Lesser prairie chicken: provide residual nesting cover near the historic and active leks; reduce overhead structures near the lek such as power poles and isolated trees which allow for perching predators.
- Monarch butterfly: provide and protect milkweed, promote blooming plant species throughout the growing season
- Tricolored bat: survey for hibernacula, maternity roost and roosting trees. Protect such sites if found with appropriate buffers of disturbance and treatment.

Summary

Federally recognized species that are present or may be present in the Cimarron and Comanche National Grasslands are listed in table 11, which summarizes their habitat and observation information in the plan area. Figure 9 shows the listed species' ranges. However, no critical habitat is proposed or designated in the plan area. Additional information on the status and population trends for these species is below the table.

Table 11. Federally recognized species that are, or may be present on the Cimarron and Comanche National Grasslands

Taxa Group	Common Name/Scientific Name	Status	Habitat	Observation Information in the Plan Area	Status of Ecological Conditions in the Plan Area
Bird	Eastern Black Rail <i>Laterallus jamaicensis</i> ssp. <i>jamaicensis</i>	Threatened	Shallow wetlands with standing water that are dominated by dense emergent vegetation, such as cattails and bulrush, with willow in the overstory. In the plan area, riparian areas and non-playa wetlands; streams and rivers.	Potential to occur.	Aquatic, riparian, and wetland habitat have declined.

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Taxa Group	Common Name/Scientific Name	Status	Habitat	Observation Information in the Plan Area	Status of Ecological Conditions in the Plan Area
Bird	Lesser Prairie-chicken <i>Tympanuchus pallidicinctus</i>	Threatened	Large tracts of relatively intact native grasslands and prairies. In the plan area, shortgrass prairie; sandsage prairie.	Known to occur.	Shortgrass and sandsage prairies have declined in habitat quality. One active lek was reported in 2024.
Bird	Piping Plover <i>Charadrius melodus</i>	Threatened	Sparsely vegetated sandbars and reservoir shorelines on river systems as well as on the shorelines of alkaline lakes. In the plan area, lakes, ponds, and reservoirs; streams and rivers.	The plan area is outside the known range of occurrence.	Aquatic, riparian, and wetland habitat have declined.
Bird	Rufa Red Knot <i>Calidris canutus rufa</i>	Threatened	Muddy or sandy, open habitats with sparse vegetation used along waterways during migration. In the plan area, riparian areas and non-playa wetlands; lakes, ponds, and reservoirs; streams and rivers.	The plan area is outside the known range of occurrence.	Aquatic, riparian, and wetland habitat have declined.
Fish	Arkansas River Shiner <i>Notropis girardi</i>	Threatened	Dynamic southern Great Plains river systems. In the plan area, streams and rivers.	Historically present but likely extirpated.	Aquatic, riparian, and wetland habitat have declined.
Invertebrate	Monarch Butterfly <i>Danaus plexippus</i>	Proposed Endangered	Larvae are obligates on milkweed species, though adults need various nectar sources during migration. In the plan area, shortgrass prairie; sandsage prairie; riparian areas and non-playa wetlands.	Known to occur.	Shortgrass and sandsage prairies have declined in habitat quality. Aquatic, riparian, and wetland habitat have declined.

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Taxa Group	Common Name/Scientific Name	Status	Habitat	Observation Information in the Plan Area	Status of Ecological Conditions in the Plan Area
Invertebrate	Regal Fritillary <i>Speyeria idalia</i>	Proposed Threatened	Larvae are obligates on native violets, and adults need various nectar sources and bunchgrasses for cover. In the plan area, shortgrass prairie; sandsage prairie; riparian areas and non-playa wetlands.	Not known to occur.	Shortgrass and sandsage prairies have declined in habitat quality. Aquatic, riparian, and wetland habitat have declined.
Invertebrate	Suckley's Cuckoo Bumble Bee <i>Bombus suckleyi</i>	Proposed Endangered	Prairies, grasslands, and meadows. In the plan area, shortgrass prairie; sandsage prairie; riparian areas and non-playa wetlands.	The plan area is outside the known range of occurrence.	Shortgrass and sandsage prairies have declined in habitat quality. Aquatic, riparian, and wetland habitat have declined.
Mammal	Black-footed Ferret <i>Mustela nigripes</i>	Endangered; Experimental/ Non-essential	Prairie dog colonies. In the plan area, shortgrass prairie; sandsage prairie.	Not known to occur.	Shortgrass and sandsage prairies have declined in habitat quality. Areas of active prairie dog colonies fluctuate, but the colonies are stable or at pre-plague outbreak (2005-2006) level.
Mammal	Gray Wolf <i>Canis lupus</i>	Endangered	Lone, dispersing gray wolves may be present throughout the state of Colorado. In the plan area, various habitats.	Not known to occur.	Shortgrass and sandsage prairies have declined in habitat quality.

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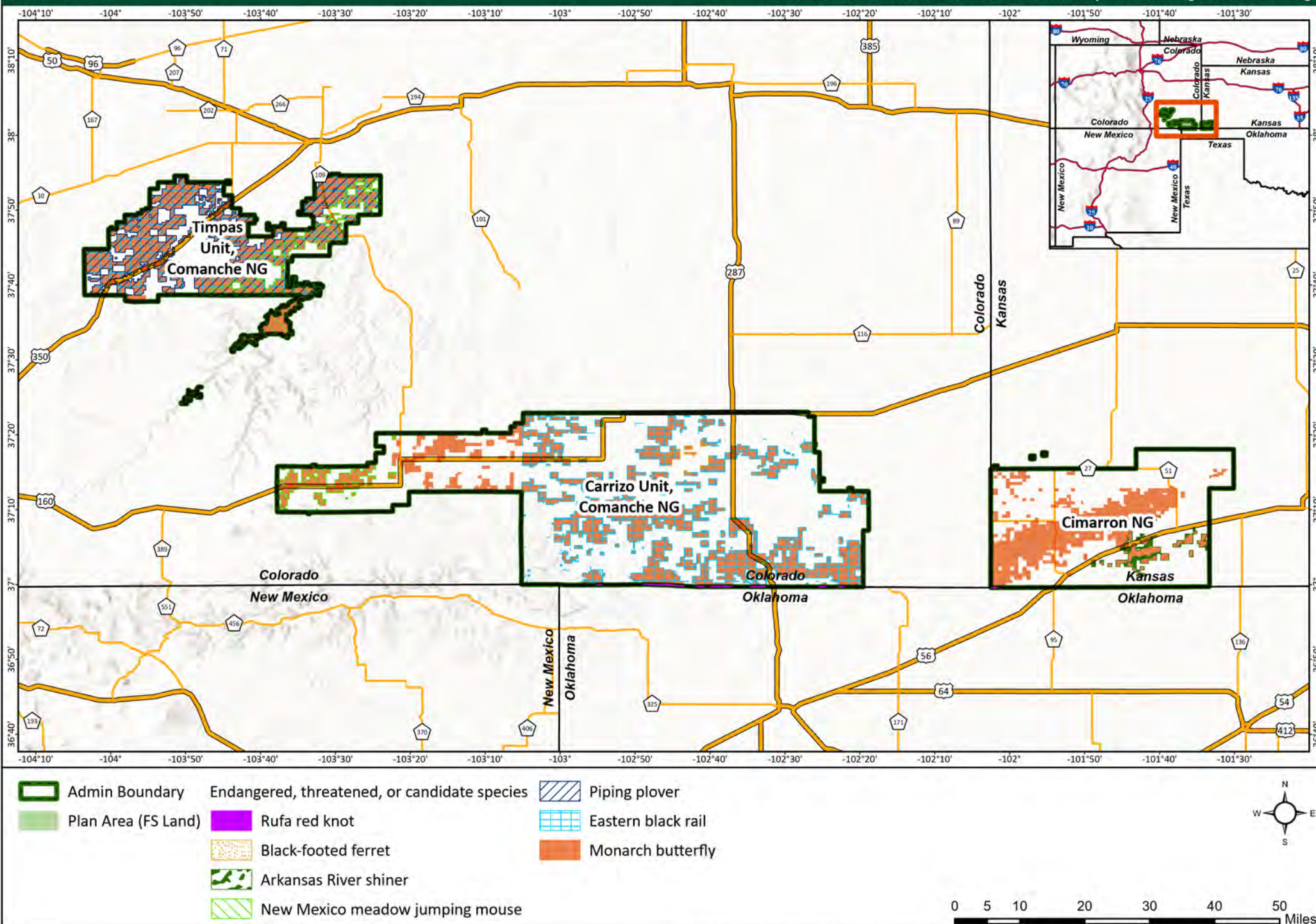
Taxa Group	Common Name/Scientific Name	Status	Habitat	Observation Information in the Plan Area	Status of Ecological Conditions in the Plan Area
Mammal	New Mexico Meadow Jumping Mouse <i>Zapus hudsonius luteus</i>	Endangered	Nests in dry soils, but uses moist, streamside, dense riparian and persistent emergent herbaceous or scrub-shrub wetland vegetation up to an elevation of about 8,000 feet. In the plan area, riparian areas and non-playa wetlands; streams and rivers.	The plan area is outside of the known range of occurrences.	Aquatic, riparian, and wetland habitat have declined.
Mammal	Tricolored Bat <i>Perimyotis subflavus</i>	Proposed Endangered	Uses caves and abandoned mines in winter. During the spring, summer, and fall, they are found in forested habitats where they roost in trees, primarily among leaves of live or recently dead deciduous hardwood trees, but may also be found in pine trees. In the plan area, riparian areas and non-playa wetlands; streams and rivers.	Not known to occur; however, the species has the potential to occur due to recent records just outside the plan area. Survey data in the plan area are limited.	Aquatic, riparian, and wetland habitat have declined.

Sources: NatureServe 2024, Unpublished USFWS Cimarron and Comanche National Grasslands plan revision letter, October 30, 2024, USFWS 2024c.



USDA Forest Service

Figure 9. Listed Species Current Range
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Trends

Black-footed Ferret. The USFWS listed the black-footed ferret as endangered in 1967 due to habitat loss and fragmentation associated with the conversion of prairie grasslands to agricultural areas; declines in prairie dogs, the major food source of the black-footed ferret; and invasive diseases, such as the sylvatic plague (FWS 1967). In the plan area, declines in black-tailed prairie dog colonies have dictated the lack of presence of black-footed ferrets. In 2014, black-footed ferrets were introduced on private lands adjacent to the Liberty Allotment on the Comanche National Grassland. The black-tailed prairie dog colony at the time was large enough to support the reintroduction, but the population began to decline due to the plague. While one ferret kit was discovered the following year, eventually reintroduced ferrets died off along with the prairie dogs. Areas of active prairie dog colonies fluctuate, but the colonies are currently stable or at pre-plague outbreak (2005-2006) level.

Gray Wolf. The USFWS listed the gray wolf as endangered in 1974 due to excessive hunting, trapping, and habitat loss (USFWS 1975). The USFWS established a nonessential experimental population (NEP) of the gray wolf in the State of Colorado in 2022. Colorado Parks and Wildlife (CPW) requested that the USFWS establish a NEP in conjunction with their State-led gray wolf reintroduction effort (USFWS 2023c). In the plan area, the species is not known to occur. However, given that lone, dispersing wolves may be present in Colorado, it is possible for an individual to move through the plan area.

The Forest Service, USFWS, and CPW convene to identify whether any wolf den or rendezvous sites are known to be active on the grasslands and, if so, whether there is a need for temporary restrictions to be implemented on project activities. Additionally, predator management for predatory grassland mammal species, such as the coyote (*Canis latrans*), would be coordinated with the USFWS as well as APHIS if wolves were found to be present on the grasslands.

New Mexico Meadow Jumping Mouse. The USFWS listed the New Mexico meadow jumping mouse as threatened in 1983 (USFWS 1983) due to habitat loss and degradation associated with excessive grazing. However, due to continued population declines, the species was uplisted to an endangered status in 2014 (FWS 2014). The plan area is considered outside the species' known range, with the nearest recorded occurrence approximately 40 miles away. However, in the plan area, the presence of aquatic ecosystems, such as riparian areas, non-playa wetlands, and prairie streams and rivers, which have permanent or seasonally permanent water sources, have the potential to support the tall, dense herbaceous vegetation that the mouse requires.

Tricolored Bat. The tricolored bat was proposed for listing as endangered by the USFWS in 2022 because the species, along with other cave-dwelling bats, faces extinction due to range-wide impacts associated with white-nose syndrome (FWS 2022). Though survey data are limited, there are no known occurrences for the tricolored bat in the plan area. However, there is a record in Stanton County, Kansas, just north of the plan area (Schmidt et al 2021). As such, the species could potentially occur. The plan area supports a multitude of aquatic habitats, such as prairie streams and rivers, which are favorable foraging habitats for many bat species, including the tricolored bat. Future surveys for the species will thus be conducted and coordinated with the USFWS.

Eastern Black Rail. The USFWS listed the Eastern black rail as threatened in 2020, resulting from primarily habitat loss and alteration (FWS 2020a). The Eastern black rail has the potential to occur in the plan area, as the plan area supports aquatic ecosystems (riparian areas, non-playa wetlands, and prairie rivers and streams) that can serve as important foraging habitat as well as habitat to support nesting habitat for the species.

The Eastern black rail has been located by CPW in wetlands along the Arkansas River in recent years (CPW 2018, (Hargett 2024). The grasslands plan to implement survey efforts for the black rail in areas of suitable habitat to determine species presence and will develop design features to protect those habitats.

Lesser Prairie-chicken. Two distinct population segments (DPS) of the lesser prairie-chicken received federal listing by the USFWS in 2022; the Southern DPS was listed as endangered, whereas the Northern

DPS, which overlaps the plan area, was listed as threatened ((FWS 2023a)). While the species is known to occur in the plan area, lek survey data indicate the population has been on a steady downward trend since 1990. The most recent surveys indicate only one active lek detection in 2024. See Zoological areas for more information.

Piping Plover. The USFWS listed the piping plover as endangered and threatened in 1985. Piping plovers inhabiting the watershed of the Great Lakes received an endangered status, while piping plovers throughout the remainder of the species' range received a threatened status (USFWS 1985). The main contributors to the federal listings included habitat disturbance and destruction, along with disturbances to nesting adults and chicks (USFWS 1985). The plan area is considered outside the species' known range of occurrence and as such the species is not known to occur; however, the presence of many aquatic ecosystem types (that is, riparian areas, non-playa wetlands, and prairie rivers and streams) could support important stopover foraging habitat.

Rufa Red Knot. The USFWS listed the rufa red knot as threatened in 2015 due to habitat loss resulting from development, disturbance, and challenges related to climate change (FWS 2015). Population declines have been estimated at over 85 percent in recent decades (Pelton et al. 2022). The plan area is considered outside the species' known range of occurrence and as such the species is not known to occur, however, the presence of many aquatic ecosystem types (that is, riparian areas, non-playa wetlands, and prairie rivers and streams) could support important stopover foraging habitat.

Arkansas River Shiner. The USFWS listed the Arkansas River shiner as threatened in 1998 due to habitat destruction and modification resulting from stream dewatering or depletion due to diversion of surface water and ground pumping, construction from impoundments, and water quality degradation (FWS 1998). Historically, the species was known to inhabit six major river systems (Lower and Upper Arkansas River, Cimarron River, North Canadian River, and Lower and Upper South Canadian River; (FWS 2020b). However, the species is currently restricted to two isolated populations in the South Canadian River in eastern New Mexico, the Texas panhandle, and Oklahoma (USFWS 2023a (FWS 2023c).

While federally designated critical habitat occurs in the Cimarron River, it is over 40 miles downstream of the plan area. The last known occurrence for the Arkansas River shiner in the plan area occurred in 1987; as such, the species is presumed to be extirpated from the Cimarron and Comanche National Grasslands (FWS 2023b).

Monarch Butterfly. The monarch butterfly was recently proposed for listing as threatened by the USFWS (FWS 2024c). The plan area includes a variety of ecosystems (that is, shortgrass prairie) that could potentially support foraging for the monarch butterfly. The monarch butterfly is known to be present on the grasslands, however observations are relatively low (e.g., <10).

Regal Fritillary. The regal fritillary was proposed for listing as threatened by the USFWS in 2024 due to threats associated with the continued loss and fragmentation of large, intact native grasslands through the conversion by agriculture and development (FWS 2024a). There are no records of the regal fritillary on the grasslands.

Suckley's Cuckoo Bumble Bee. Throughout its range, the species has been collected in various habitat types at elevations ranging from 6 to 10,500 feet. However, this species has not been documented within the contiguous United States since 2016. As an obligate social parasite, Suckley's cuckoo bumble bee relies on social bumble bees in the genus *Bombus* to reproduce. It is classified as a semi-specialist parasite and is confirmed to usurp the nests of Western bumble bees (*Bombus occidentalis*) and Nevada bumble bees (*Bombus nevadensis*). Other potential hosts within the subgenus *Bombus* may also support this species across its range (FWS 2024b).

Species of Conservation Concern

Introduction

Based on the potential Species of Conservation Concern (SCC) identification criteria, 327 species warranted an in-depth species evaluation. Of these, 69 (52 plant species and 17 wildlife species) were identified as potential SCC (table C-1 and table C-2 in Appendix C). Species considered but not identified as potential SCC are summarized in table C-3 in Appendix C. The list of potential SCC is subject to modification during and after the planning process, and final authority for identification of SCC rests with the Regional Forester.

Plan components developed for ecosystem integrity and diversity should provide the ecological conditions needed for all at-risk species including SCC. If there is a specific need for a species not addressed in the suggested plan components then a species-specific plan component is developed.

Summary

SCC are native species known to occupy the Cimarron and Comanche National Grasslands plan area that are not federally recognized under the ESA (including candidate species), but for which the Regional Forester has determined there is a substantial concern for the species' long-term persistence within the plan area.

The Regional Forester evaluated potential SCC species using an explicit four-indicator scheme that incorporates the current state of extinction risk in the context of NFMA viability determinations. As explained by the Regional Forester's SCC process rationale, there are two criteria that a species must meet to be identified as an SCC (Appendix C). The first is that the species is native to, and known to occur in, the plan area. The second criterion is that the best available scientific information indicates there is substantial concern for the continued persistence of the species in the plan area. The SCC list may be modified, based on best available scientific information, Tribal input, and public input during or after the planning process before approval of the final land management plan.

Status and Trends

The Forest Service identified 69 potential SCC species in the Cimarron and Comanche National Grasslands. They include amphibians, birds, fish, invertebrates, mammals, reptiles, and plants. Potential SCC occupy a variety of terrestrial and aquatic ecosystems in the plan area. Tables C-1, C-2, and C-4 in Appendix C summarize the habitats, status, and trends for potential SCC.

While many issues and concerns that drive management for SCC are often specific to each species, several key themes can apply to many species in the plan area. For example, loss of habitat continues to pose a significant threat. Further, increases in frequency of high-severity fire can also threaten SCC and their habitats. Additional impacts associated with warmer temperatures, shifts in precipitation patterns, and drought, coupled with the spread of diseases and invasive species' encroachment, can also pose threats to SCC persistence in the plan area.

Other Highlighted Species

Other highlighted species are those with special management interest or importance but that are not considered to be at risk in the plan area. These multiple use or focal species often provide benefits to humans, such as supporting recreational activities (for example, hunting, fishing, tourism, and a variety of wildlife viewing opportunities), as well as providing benefits to agricultural success, such as pollination. The identification of focal species or species assemblages is an additional management approach that may be considered to assess the ecological conditions provided by the plan area.

Summary

Other highlighted species are multiple use or focal species with special management interest or importance that are not considered to be at risk in the plan area, such as game species for hunting; migratory birds for viewing; keystone species, which provide a suite of ecosystem services; culturally important species; and pollinators for agriculture.

Wildlife and plant species contribute to the overall biodiversity of the Cimarron and Comanche National Grasslands and support many ecological, social, and economic services. For example, the brown tarantula attracts nature viewers during its autumn migration which bolsters the economic value of the grasslands, whereas pollinators such as the American bumblebee (*Bombus pensylvanicus*) are important for agricultural crop success. Similarly, bats provide pest control for crops by helping to combat losses while also reducing the need for pesticide use. The ecological impact of black-tailed prairie dogs (*Cynomys ludovicianus*) is evaluated in Appendix C species evaluations. Other species such as big game (for example, pronghorn [*Antilocapra americana*] and mule deer [*Odocoileus hemionus*]), game fish (such as trout and channel catfish), and watchable wildlife (for example, ferruginous hawk [*Buteo regalis*] and northern harrier [*Circus hudsonius*]) can attract visitors to the area and support recreational activities, such as fishing and hunting, along with nature viewing. These recreational activities supported by multiple use species can spur recreational spending and economic contributions to the surrounding communities through jobs, labor income, and economic output. Additionally, these species provide value to the surrounding communities through nonuse intrinsic values (see the Multiple Uses and Ecosystem Services section of Appendix A for more information on how species support economic and social sustainability through ecosystem services).

State fish and wildlife agencies may manage the populations of multiple use species through hunting and fishing regulations. Specialists and biologists identified roughly six categories of multiple use species in the plan area, these include: big game, game birds, keystone species, non-native game fish, watchable wildlife, pollinators, and species of cultural importance.

Status and Trends

The status and trends of other highlighted species in the Cimarron and Comanche National Grasslands are intimately tied with the quality and quantity of the ecosystems they occur in; therefore, their status and trends are likely to follow general status and trends associated with ecosystems in the plan area (see the Terrestrial Ecosystems and Aquatic, Wetland, and Riparian Ecosystems sections). Given the intimate ties of species to the ecosystems they inhabit, stressors that negatively affect ecosystems also affect the species. Examples of multiple use species and their various benefits to the grasslands are summarized below.

Game Species: Big Game and Game Birds. Game species (e.g., big game, game birds, and non-native game fish) species that are known to occur on the plan area include Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*), elk (*Cervus elaphus*), pronghorn (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), quail, pheasant, grouse and mourning dove (Order – Galliformes), wild turkey (*Meleagris gallopavo*), geese and ducks (Order – Anseriformes), and channel catfish (*Ictalurus punctatus*). These species support recreational activities, such as fishing and hunting, in the plan area which in turn can support the economy of the grasslands.

Keystone Species. Keystone species known to occur in the plan area, such as the black-tailed prairie dog (*Cynomys ludovicianus*) and the North American beaver (*Castor canadensis*), play a fundamental role in altering the landscape in the plan area to support native wildlife. For example, the prairie dog (evaluated in the *At-risk Species Appendix*) improves soil structure via burrowing activities, which encourages the establishment of diverse forbs in newly disturbed areas—serving as primary habitat for a multitude of species such as mountain plovers, burrowing owls, and swift foxes (Whicker and Detling 1988; (Davidson et al. 2012).

Watchable Wildlife and Tourism. Watchable wildlife species known to occur in the plan area include raptors such as the ferruginous hawk (*buteo regalis*) and northern harrier (*Circus hudsonius*) and arachnids such as the brown tarantula (*Aphonopelma hentzi*). These species attract visitors thus promoting tourism to the national grasslands. For example, the migration of brown tarantula, which peaks in mid-September, draws nature enthusiasts from near and far to witness mating displays—providing great economic value to the grasslands and local communities during this time. The plan area also attracts year-round birding opportunities.

Pollinators. Pollinators known to occur in the plan area provide value to agriculture and support the diverse native flora of the grasslands. For example, agricultural crop success is due in large part to the presence of pollinators. Additionally, the persistence of native flora relies on both the timing and presence of pollinators like bumblebees.

Species of Cultural Importance. Species of cultural importance known to occur in the plan area, such as the two-needle pinyon pine (*Pinus edulis*), provide food, medicine, sustenance, and value to Indigenous people in the grasslands. Pinyon pine was historically used by Tribes as a food source (i.e., the nuts and seeds were consumed raw, roasted, or were ground into flour) whereas the leaves were often steeped for tea. Further, the bark of the plant was consumed to stave off starvation in extreme cases.

Carbon Stocks and Carbon Pools

A carbon assessment of the Cimarron and Comanche National Grasslands can help land managers understand how much carbon is currently stored in grassland ecosystems and how the potential to reduce atmospheric carbon dioxide and methane concentrations may be influenced by management activities and disturbance regimes.

Summary

The following assessment is based on the assessment of carbon stocks presented in the grassland section of the Forest Carbon Assessment for the Pike-San Isabel National Forests in the Forest Service's Rocky Mountain Region (Wyndham et al. 2023), and estimates of aboveground and belowground carbon stocks from SSURGO/SSURGO and Rangeland Analysis Platform (RAP)/Rangeland Productivity Monitoring Service (RPMS) data for the footprint of the Cimarron Comanche National Grasslands. Carbon emissions from agency, contractor, or permittee business operations, Tribes, or public recreation uses are not included.

Ecosystem services are benefits people obtain from functioning ecosystems. Long term storage of carbon is a regulating ecosystem service that can have important beneficial consequences both within and beyond the plan area. Carbon uptake and storage helps reduce atmospheric methane and carbon dioxide concentrations. Through photosynthesis, growing plants remove CO₂ from the atmosphere and store it as carbon in biomass; some of this organic material is eventually stored in soils. Carbon stock describes the total amount of belowground and aboveground carbon that is stored in live and dead biomass as well as in the soil.

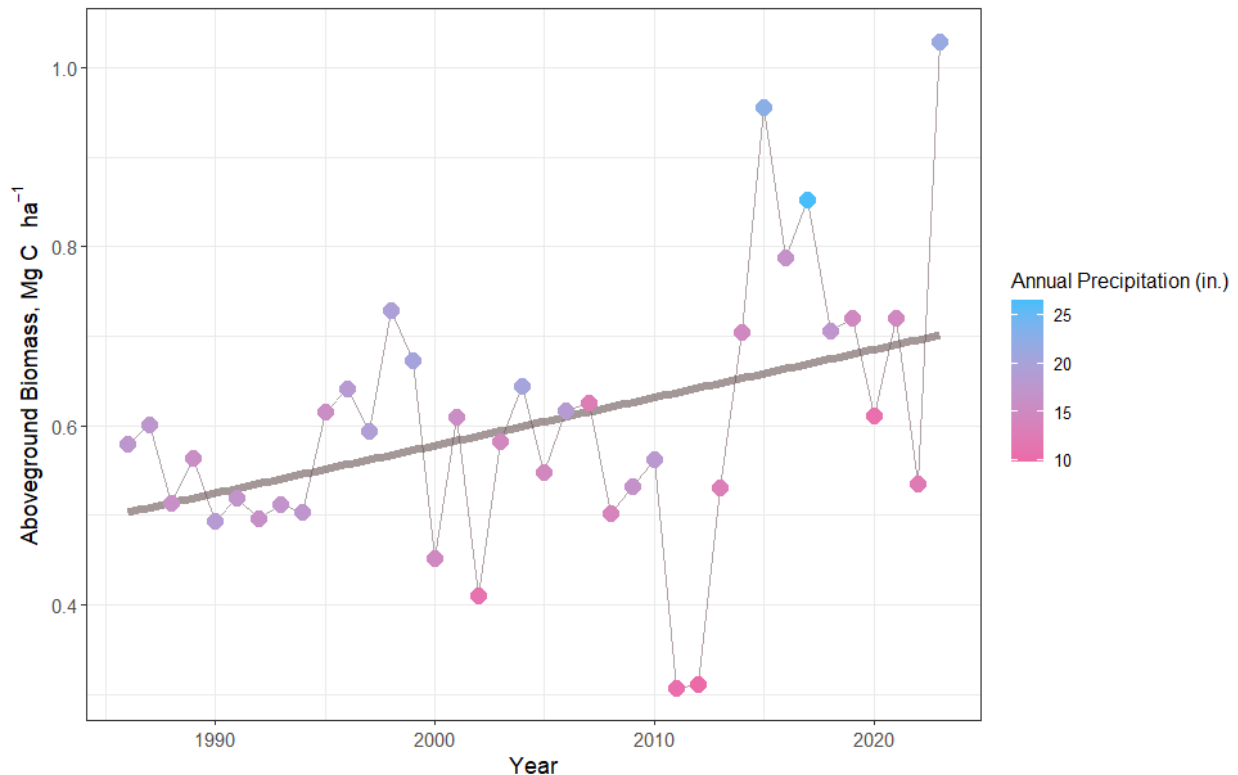
Ecosystem integrity and health is linked to carbon stability in plant and soil pools, which can be influenced through management approaches. The amount of carbon that can be stored depends greatly upon the condition and health of the land. Grassland health can be managed through proper grazing practices and implementation of vegetation treatments including prescribed fire, that maintain and improve ecological integrity.

Status and Trends

Most of the carbon stored on the Cimarron and Comanche National Grasslands is in soils, as is common for non-forest ecosystems (Derner and Schuman 2007); (McKinley and Blair 2008); (Janowiak et al. 2017). Soil is a stable carbon pool relative to other ecosystem carbon pools. Carbon density per unit area representing an estimate of soil carbon stocks can help compare belowground carbon distribution in each grassland unit. Based on gSSURGO data analysis for the plan boundary, the Carrizo unit with 69.7 megagrams¹⁶ (Mg) of carbon per hectare has the highest soil carbon density among the three grassland units, while the Cimarron unit has a soil carbon density of 51.9 Mg of carbon per hectare, and Timpas unit has a soil carbon density of 50.5 Mg of carbon per hectare. Each unit's total soil carbon stock is calculated by multiplying the soil carbon density for each unit area by total hectares within the plan boundary. The combined estimate of soil carbon stock from lands owned by the Forest Service within all three units of the Cimarron and Comanche National Grasslands is approximately 13.3 Tg. The soil carbon stock estimates only include organic soil carbon stocks and exclude estimates of solid inorganic carbon and root matter.

The aboveground carbon stock in herbaceous plant material is a dynamic pool that varies between years depending on biotic and abiotic conditions and drivers. Figure 10 shows the trends in the aboveground carbon stock per unit area, presented in Mg of carbon per hectare, and annual precipitation on the Cimarron and Comanche National Grasslands between 1986 to 2023. Years with greater carbon stock tend to correlate with years of greater precipitation. According to this data, the aboveground carbon stock per hectare is increasing over time, but has high interannual variability, particularly after 2010.

Figure 10. Cimarron and Comanche National Grasslands Aboveground Carbon Stock Trend



¹⁶ One megagram = 1,000,000 grams

According to the RAP data (Jones, Robinson, et al. 2021); (Allred et al. 2021), the average aboveground carbon stock per unit area within the Cimarron and Comanche National Grasslands administrative boundary (which includes non-federal inholdings) between 2013 to 2023 was 0.649 Mg of carbon per hectare. The RPMS (Reeves et al. 2021) is a similar dataset that uses remotely sensed imagery processed through a Rangeland Vegetation Simulator to quantify of pounds of biomass per acre without subdividing plant functional types. This dataset includes shrub biomass (Jones, Robinson, et al. 2021) and provided a slightly higher average estimate for 2013 to 2023 using the federally-owned plan boundary—0.74 Mg of carbon per hectare. For the plan boundary (223,395 ha), there is an estimated 113,766 Mg of total carbon based on the RPMS analysis. Both RAP and RPMS data products have been validated for accuracy and found to be consistent with field data; given that RPMS is able to account for shrub biomass, it may be more accurate.

Carbon dynamics on grasslands are influenced by fire and grazing (Barros et al. 2021). These activities temporarily decrease above ground vegetation, resulting in a reduction in aboveground carbon stocks in grasslands (Knapp et al. 1998); (van Auken 2009). The effects of grazing management on soil carbon are variable and depend on management practices (McSherry and Ritchie 2013). Grazing has long played an important role in plant composition and nutrient cycling in many rangeland ecosystems in the Great Plains (Knapp et al. 1998); (Childs et al. 2022). Carbon stock in rangelands is correlated with forage production. According to one study, the largest driver of forage is proper stocking rate. In native shortgrass steppe rangelands, grazing does not influence soil carbon over long time scales (up to seven decades; (Derner and Schuman 2007). While management-intensive grazing practices allow forages to store reserves during times of abundant precipitation, rotational and deferred grazing does not enhance carbon storage (Derner and Schuman 2007); (Barros et al. 2021).

Although heavy grazing can influence plant community dynamics, climate variability has a greater effect on plant community and productivity in arid and semiarid environments (Biondini et al. 1998). With warmer and longer growing seasons, greater climatic variability, and more extreme events (e.g., increased occurrence of large precipitation events), a longer growing season is projected. These climatic changes may affect livestock production both directly via physiological impacts on animals and indirectly via modifications to forage, invasion of undesirable plants, and increased exposure to parasites (Derner and Schuman 2007). Elevated CO₂ conditions may increase water use efficiency and plant production (Morgan et al. 2004) but alter species composition and reduce forage quality (Milchunas et al. 2005; (Morgan et al. 2004) in a system extensively used for livestock grazing. A shift in plant species, community composition, and ecological state can influence the soil carbon and nitrogen cycles in a semi-arid ecosystem, with variable results (Epstein et al. 1998; (Childs et al. 2022). Reduced stocking rates, change in livestock breeds and/or grazing practices are general recommendations that could be implemented to cope with increased climatic stress (Wyndham et al. 2018).

Drought can impact the carbon cycle in rangelands. Increased temperatures and reduced precipitation lower soil water availability resulting in decreased plant productivity and altering species composition (Wyndham et al. 2018). Approximately one-third of terrestrial carbon is stored in rangelands worldwide, but drought may diminish carbon sinks and increase carbon emissions as plant production is more sensitive to drought than microbial respiration (Canarini et al. 2016); Hoover and Rogers 2016). Severe drought can lead to local extirpation in areas where the recolonization potential of the site is low (Samson et al. 2004). Severe drought can lead to local extirpation in areas where the recolonization potential of the site is low (2004 (Samson et al. 2004). Both abiotic and biotic factors can define how a site will respond to drought.

The greatest lasting influence in grassland and rangeland ecosystem carbon stocks is land-use and land-cover change. Soil carbon in grasslands is generally stable; therefore, any major change to soil carbon would arise as a result of long-term and sustained changes in land use or vegetation cover. For example, there can be substantial losses of soil carbon where rangelands have been converted to agricultural use (Derner and Schuman 2007); (Yellajosula et al. 2020).

Under changing climate and environmental conditions, grasslands may be increasingly vulnerable to a variety of stressors. These potentially negative effects on vegetation productivity rate and carbon storage exist alongside the positive effects of longer growing seasons, increases in precipitation, and elevated atmospheric carbon dioxide concentrations. Across the region, land conversion for development on private ownerships is a concern (Wear et al. 2013) and this activity can cause substantial carbon losses (Tubiello et al. 2013); (USFS 2016). Carbon stewardship practices in grazing and native vegetation restoration can strengthen resilience and reduce ecosystem vulnerability to drought and wildfires.

Fire Management

Summary

This section provides a brief overview of fire management in the plan area, highlighting its role in landscape resilience, community safety, and ecological integrity. Fire management in the Cimarron and Comanche National Grasslands has historically included both suppression and controlled burning practices, driven by the dual goals of protecting human life and maintaining ecosystem health (Sanders and Durham 1985). In 2022, the Forest Service launched a 10-year plan, “Confronting the Wildfire Crisis,” aiming to expand fire resilience efforts in areas with high community risk by leveraging congressional funding and science-based planning to increase forest health treatments across vulnerable landscapes (USFS 2022).

Fire management affects social, cultural, and economic sustainability in the region, particularly in WUI areas where communities, recreation, tourism, and Tribal lands face wildfire threats to health and safety, as well as property damages. For instance, seasonal fuel moisture patterns elevate fire behavior and require strategic suppression approaches (He et al. 2019). In the absence of explicitly defined WUI-designated areas, as many of the communities are rural, local hazard mitigation plans identify the risks for communities where homes and structures integrate with natural vegetation, heightening wildfire hazards due to local conditions like wind and fuel loads (Blue Umbrella 2015); (Las Animas County 2022); (Otero County 2013).

Ecological sustainability benefits from prescribed burns and grazing can mimic the effects of natural disturbances, reduce excess vegetation, and improve the landscape’s resilience to fire, drought, and pests. However, stressors such as drought, woody encroachment, and herbaceous invasives necessitate careful planning, as these conditions can increase fire vulnerability (Miller Hesed and Yocum 2023).

Status and Trends

There is limited data for fire occurrences within the two grasslands prior to 1990. Four wildfires greater than 5,000 acres were documented between 1939 and 1990, although there may have been additional occurrences of fires that went unrecorded. Factors that may contribute to limited fire occurrence in modern times include fire suppression efforts, reduced fuel loading due to increased livestock grazing, the establishment of fuel breaks and increased access routes through road building, and varied management priorities reflected across fragmented land ownership.

While human-caused fires can occur in the grasslands throughout the year, a majority of lightning-caused fires occur before green-up (new annual growth with high moisture content) from early April until mid-May, and from mid-July until early September after fine fuels have cured. Table 12 shows fire occurrence by cause between 1990 and 2024. Between 2000 and 2022 wildfire burned an average 2,750 acres per year (see table 13 for total acreage of wildfire by year). Figure 11, Historical Fire Occurrence (1999–2024), displays recorded large fires within the plan area.

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Table 12. Total number of wildfires between 1990 and 2024 by ignition cause

Cause*	Number of Fires
Camping	15
Smoking	4
Railroad	1
Equipment	29
Other human causes	43
Incendiary	3
Firearms and weapons	1
Undetermined	2
Debris and open burning	8
Lightning	159

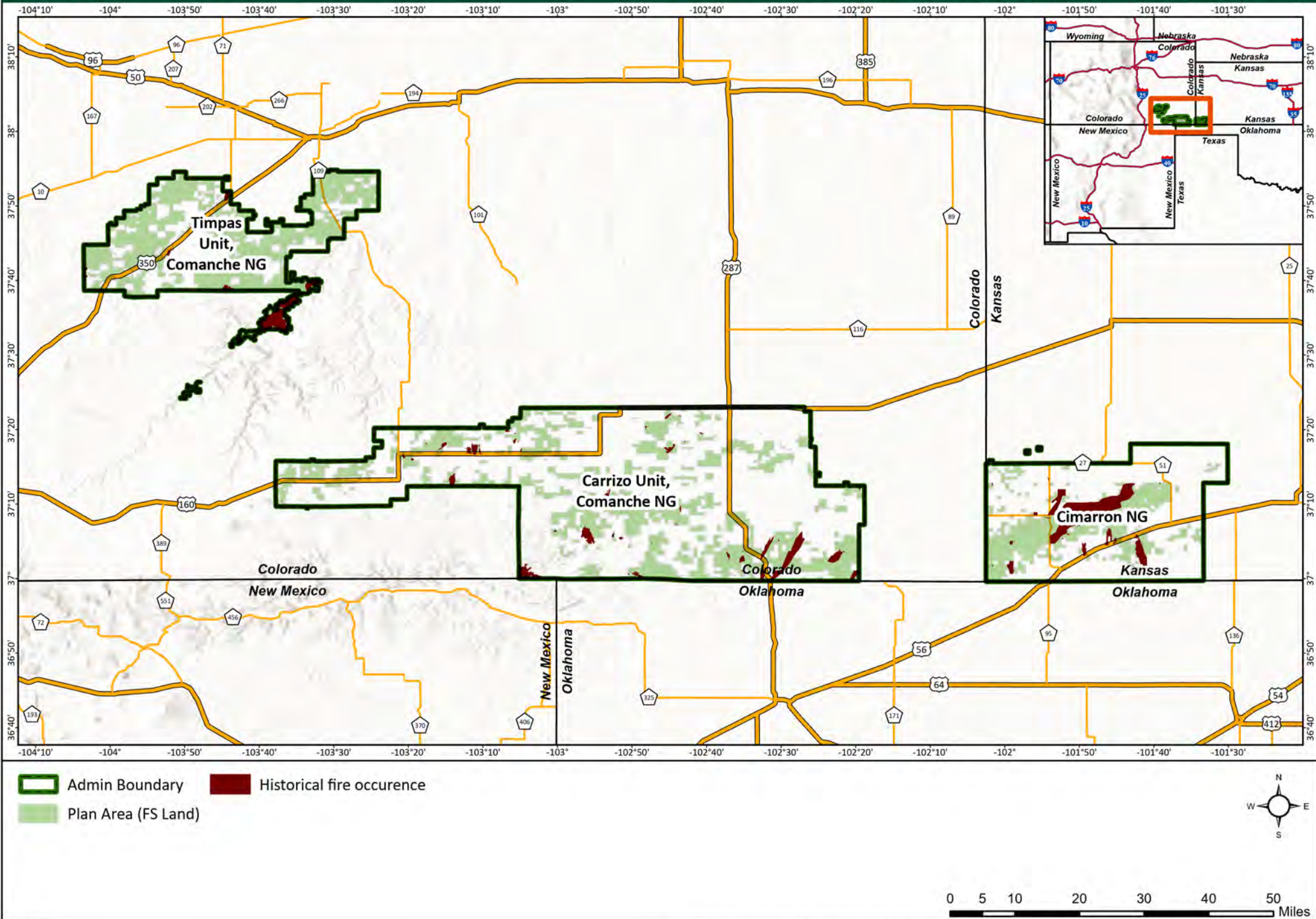
Source: USFS GIS 2024

*All causes except for lightning are considered human causes.

Table 13. Total acreage of wildfires within the Cimarron and Comanche National Grasslands between 2000 and 2022

Year	Number of Acres
2000	5,200
2002	1,200
2003	200
2004	800
2005	2,100
2006	2,900
2007	100
2008	1,100
2010	700
2011	24,100
2014	100
2015	100
2016	500
2018	100
2019	2,900
2020	1,000
2022	1,000

Source: USFS GIS 2024



Fire management objectives can be guided by historical fire regime groups and vegetation condition class, which indicates how current vegetation is different from likely historical vegetation communities. Changes in temperature, precipitation, drought frequency, fire frequency (fire exclusion), grazing intensity and species, introduced plant species, and land use change can lead to departure from historical natural vegetation condition (described by LANDFIRE Biophysical Settings). Table 14 describes the historical fire regime groups along with the associated biophysical settings. Table 15 describes the vegetation condition class, and table 16 provides a summary of fuel-reduction treatments performed in the plan area.

Table 14. Historical fire regime

Fire Regime Groups	Frequency (Fire Return Interval)	Severity	Acres in the Plan Area	LANDFIRE Biophysical Setting
I	0–35+ years, frequent	Low and mixed*	6,600	Western Great Plains Mesquite Woodland and Shrubland; Southern Rocky Mountain Ponderosa Pine Woodland-South
II	0–35+ years, frequent	Replacement**	534,300	Western Great Plains Shortgrass Prairie; Western Great Plains Sand Prairie
III	35–100+ years, less infrequent	Low and mixed*	4,400	Southern Rocky Mountain Pinyon-Juniper Woodland
IV	35–100+ years, less infrequent	Replacement	5,400	Western Great Plains Floodplain Systems
V	200+ years	Any severity	100	Inter-Mountain Basins Mixed Salt Desert Scrub

Source: USFS GIS 2024

*Indicates some understory and some stand replacement

**Replacement fire in grassland communities indicates consumption of most above-ground vegetation.

Table 15. Vegetation condition class

Vegetation Condition Class	Acres in the Plan Area	Percentage of the Plan Area*
I.A, Very Low 0-16 Departure	39,000	7
I.B Low, 17-33 Departure	266,600	48
II.A Moderate to Low, 34-50 Departure	184,500	33
II.B Moderate to High, 51-66 Departure	41,300	7
III.A High, 67-83 Departure	2,300	<1
III.B Very High 84-100 Departure	200	<1

Source: USFS GIS 2024

*Percentages do not add up to 100% due to portions of the Cimarron and Comanche National Grasslands that are mapped as agriculture, barren, or developed and thus do not fall into vegetation condition classes.

Table 16. Fuel-reduction treatments performed in the plan area between 2008 and 2023

Type of Fuel-Reduction Treatment	Number of Acres
Broadcast burning - prescribed fire	10,500
Chipping of fuels	0
Compacting/crushing of fuels	500
Fuel break	7,200
Jackpot burning – small, concentrated, and scattered controlled burn	100
Piling of fuels by hand or machine	300

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Type of Fuel-Reduction Treatment	Number of Acres
Range cover manipulation	4,500
Rearrangement of fuels	700
Thinning for hazardous fuels reduction	300

Source: USFS GIS 2024

Grasslands within the Cimarron and Comanche National Grasslands evolved under varying disturbances, including wildfire, Indigenous cultural burning, grazing from native herbivores such as bison, and ground disturbance from burrowing mammals, such as black-tailed prairie dogs (Miller Hesed and Yocum 2023). Prairie dog colonies grazed and clipped vegetation, contributing to a mosaic of vegetation growth, with areas of both disturbed and undisturbed lands (Miller Hesed and Yocum 2023). However, since the mid-1800s, the ecological processes under which grasslands have evolved have been interrupted by agriculture, oil and gas production, and mineral resource extraction (Carbutt et al. 2017). This interruption of natural processes has led to a buildup of fuels, leading toward more frequent and higher-intensity wildfires in prairie ecosystems (Miller Hesed and Yocum 2023).

The 1984 land and resource management plan provided direction to maintain fire-dependent ecosystems using prescribed fires and to reclaim disturbed areas to meet the visual quality objectives of retention. Specific goals include reducing the fuel load buildup and wildlife habitat improvements, but strategies to mimic natural disturbances are not mentioned (USFS 1984). Frequent, low-intensity prescribed fires can play a crucial role in sustaining forest health in pinyon-juniper woodlands and grasslands by reducing fuel loads, controlling competition from fire-sensitive species, and promoting resilience to stressors like drought, beetles, and disease (USDA Forest Service 2024c), (USFS 2024b). Following this guidance, between 2008 and 2023 the Cimarron and Comanche National Grasslands staff have carried out a series of fuel-reduction projects totaling 24,100 acres treated. Prescribed fire and controlled burns accounted for 10,600 acres. Additionally, 13,400 acres were mechanically treated through thinning, fuel rearrangement, fuel break creation, and hazardous fuels removal (USFS GIS 2024). WUI areas continue to be a focus of fuel treatments as the Forest Service emphasizes the need to protect life, property, and highly valued resources and assets.

Communities and Infrastructure

The counties within the Cimarron National Grassland include Morton County and Stevens County, Kansas. The Comanche National Grassland falls in Otero, Baca and Las Animas Counties, Colorado. Morton and Stevens Counties are part of a multi-hazard, multi-jurisdictional mitigation plan with seven other counties in southwest Kansas. This plan provides a broad overview of hazards that may impact the region, with suggested, broad mitigation measures (Blue Umbrella 2015). Conversely, Baca, Las Animas and Otero Counties have specific wildfire protection plans, which include risk assessments and suggested mitigation plans (Colorado State Forest Service 2011), (Las Animas County 2022); (Otero County 2013). Individual wildfire responses are directed by local emergency response management agencies and are site specific.

The current land and resource management plan does not provide specific fire management direction or direction for designing and implementing fuel breaks (USFS 1984). However, it does provide for a cost-effective level of fire protection to minimize the combined costs of protection and damages, and to prevent loss of human life, for fires originating on NFS and private land (USFS 1984).

Wildland fire management on the Comanche Grassland is a partnership among local, county, state, Tribal, and federal entities led by the Colorado Division of Fire Prevention and Control (CDFP). Wildfire preparedness plans prepared annually by CDFP describe the availability of resource for different levels of wildfire risk (Colorado Division of Fire Prevention and Control 2024). Grassland staff are working to have an annual wildfire operating plan established for the Cimarron.

Communities near the Cimarron and Comanche National Grasslands have not designated specific Wildland-Urban Interfaces (WUIs) in their hazard mitigation plans, but the hazard mitigation plans do define WUIs and address challenges associated with these environments. Although these communities are not urban, they apply a mixed interface definition, which includes isolated homes or rural communities within wildland areas (Colorado State Forest Service 2011), (Blue Umbrella 2015), (Las Animas County 2022); (Otero County 2013). Concerns within the hazard mitigation plans include instances where homes and structures are densely integrated into natural landscapes and are influenced by local conditions such as temperature, humidity, wind, slope, and available fuel load. The risk in the WUI is heightened by the proximity of structures to dense vegetation, leading to an increased hazard for interface fires, which can be classified as classic, mixed, or occluded interfaces, depending on how developed areas intersect with wildland regions (Blue Umbrella 2015), (Las Animas County 2022); (Otero County 2013).

The Cimarron and Comanche National Grasslands landownership follows a fragmented land ownership pattern, which can impact wildfire intensity and spread based on landowner type (Barros et al. 2021), Miller Hesed et al. 2023). Areas that are considered high-value resources by land managers and owners, such as private, industrial, and some federal lands, experience less overall area burned due to fire suppression efforts (Barros et al. 2021). However, variable fire policies across different land managers may make fire management difficult when coordinating varying agency responses (Barros et al. 2021); (Blue Umbrella 2015), (Las Animas County 2022); (Otero County 2013). This pattern implies that fragmented landscapes, including the Cimarron and Comanche National Grasslands, could see intensified cross-boundary fire exposure, especially where fire policies are inconsistent (Barros et al. 2021). Each hazard mitigation and wildfire protection plan includes discussion on addressing this challenge, describing mutual and automatic aid agreements between county, state, and federal agencies.

Restoration and Prescribed Fire

The 1984 land and resource management plan does not specify specific post-fire rehabilitation efforts (USFS 1984). Regional stressors like drought, wildfire and pests, such as bark beetles, may occur in units administered by the Cimarron and Comanche National Grasslands. Additional threats from invasive herbaceous and woody plants (like tamarisk), include changing fire regimes with increased wildfire frequency and intensity. Many invasive species, including annual grasses and woody plants, are able to outcompete native grasses in times of drought, exacerbating this risk (Delwiche 2009), (Molvar et al. 2024). In riparian cottonwood ecosystems, the pattern is reversed, where cottonwood sprouts more quickly than tamarisk species. These findings, which differ from most studies on riparian cottonwood regeneration in the Great Plains, suggest that local environmental conditions, fire timing, and intensity play key roles in how some riparian species respond to wildfire (Wonkka et al. 2018). These stressors can complicate the use of prescribed fire due to concerns that added stress might harm trees, especially during or after drought conditions. Overall, while warmer temperatures, altered precipitation patterns, drought, invasive species, and fire interact to influence grassland vulnerability, a balanced fire management approach that includes regular prescribed burns and other fuel reduction treatments can help to maintain grassland resilience, even in the face of these compounded stressors.

Forest Management

Summary

The Cimarron and Comanche National Grasslands feature diverse grass and shrublands as well as inclusions of juniper savanna (described as part of the shortgrass prairie), canyonlands, and riparian communities along the Cimarron and Purgatoire Rivers and their tributaries. Oneseed juniper (*Juniperus monosperma*), twoneedle pinyon (*Pinus edulis*), Gamble oak (*Quercus gambelii*) and scattered ponderosa pine (*Pinus ponderosa*) occur naturally in the juniper savanna and canyonland ecosystems, with typically low cover. Riparian corridors provide habitat for plains cottonwood (*Populus deltoides*).

These savannas and woodlands provide wildlife habitat, help stabilize soils and influence hydrological regimes and fire behavior.

Historically, low annual precipitation combined with frequent disturbance from fire, bison, and other wildlife limited the establishment of trees in most of the plan area. Nevertheless, the wooded ecosystems have provided important resources for local rural communities. During the homestead era in the late 1800s, settlers used cottonwoods as building materials. A small amount of cottonwood was also harvested to be used for pallet material in the 1970s. With its natural resistance to rotting, junipers were cut for fence posts. Most of these past uses have been incidental. Juniper, pinyon, Gamble oak and cottonwood cover types have not been considered viable for industrial use. Productivity of the ponderosa pine sites is too low for commercial timber production. From 2005 to the present, there have been no commercial timber sales on the Cimarron Comanche National Grasslands.

Status and Trends

Today, natural disturbance regimes have been altered by land fragmentation, fire suppression and changes in grazing. This resulted in an increase of tree cover in the juniper savanna and canyonland ecosystems. Juniper and pinyon pine have also encroached into the shortgrass prairie. Data from the Rangeland Analysis Platform (RAP 2024) show that in 1990 – 1993 less than 10,000 acres or 1.8% of the plan area could be classified as forested with more than 10% tree cover. By 2020-2023, about 17,000 acres or 3.1% of the plan area had more than 10% tree cover. The higher cover of woody species has reduced the diversity of bunchgrasses and shrub species.

The 1984 Forest Plan states that the Comanche and Cimarron National Grasslands contain no suitable land for timber production. This was based on the existing cover types and low productivity of forested sites. Prolonged droughts, altered precipitation patterns, and higher-than-average temperatures have stressed tree species, particularly pinyon pine and cottonwood. The effects of these climate-related changes are likely to intensify, with potential shifts in species' distributions and greater susceptibility to pests and diseases. Despite the increase of forest cover over the last 30 years, it is not likely that these newly forested sites are capable of sustained production of timber.

The replacement of grasslands and open savannas with denser woodlands provides opportunities for future forest management. Prescribed fires can be successful in altering vegetation structure, increasing grass cover and improving hydrologic function of encroached sites (Williams et al. 2019). Other management actions include grazing and mechanical tree removal. These management actions are costly because established woody plant populations are difficult to remove (Miller Hesed and Yocum 2023). Some sites may provide opportunities for post and pole harvests.

Non-Timber Forest Products

Summary

Non-timber forest products in the Cimarron and Comanche National Grasslands include firewood, pinyon pine nuts, juniper berries, and various medicinal, floral, and crafting materials. These non-timber forest products are vital to local communities and Tribes, both commercially and for personal use. Historically, these products have supported local economies and cultural practices. Species of cultural importance are further described in the Other Highlighted Species section.

From 2005 to present, the Cimarron and Comanche National Grasslands have sold approximately three firewood permits for cottonwood.

Status and Trends

Currently, the Cimarron and Comanche National Grasslands do not provide commercial timber harvest, though fuelwood permits are available from the unit. No permits are sold for other non-timber products and there is little ability to do so. The increasing risk of drought or invasive insects, along with prescribed fires, may affect the availability and sustainability of specific non-timber forest products. Current monitoring efforts for non-timber forest products are minimal and restricted to research collection permitting.

Rangeland Management

Summary

This section provides an overview of livestock and rangeland management within the Cimarron and Comanche National Grasslands. The Forest Service authorizes domestic livestock grazing under a permit system. Rangeland management supports ecological sustainability by maintaining biodiversity, stabilizing soils, and regulating hydrologic and fire regimes. The Forest Service administers this use to be compatible with other multiple-use objectives and to provide desired benefits to communities. Livestock grazing provides benefits to other uses of National Forest System lands, such as fuels reduction and clean water for wildlife from livestock water developments.

Management of grazing within the Grasslands is dependent on many different factors and conditions which include climate, ecological, and economic influences within the plan area. These factors influence the number of livestock that are authorized to graze each unit on an annual basis in order for plan goals and objectives to be achieved. Information on ecological conditions that affect rangeland management objectives can be found within the Ecosystem Drivers and Stressors and Terrestrial Ecosystems sections of the assessment. Grazing in the plan area provides surrounding communities with economic and social benefits, including employment, income, and support for tradition, heritage, and quality of life. Keeping ranching as a viable occupation maintains the open space of the area. Adjacent private lands can provide additional habitats for wildlife and connectivity.

Key issues include the impacts of warmer temperatures, altered precipitation patterns, drought, and lowering water tables, as well as complexity and challenges brought by increasing recreation/visitation to the National Grasslands.

The Comanche National Grasslands administers 226 allotments that are authorized for livestock grazing. There is one NEPA decision that authorizes livestock grazing management through Allotment Management Plans (AMPs) for the Comanche National Grassland. Four grazing associations (Campo Grazing Association, Pritchett Grazing Association, Kim Grazing Association, and the Timpas Grazing District) implement this decision under a Grazing Agreement between the associations and the Forest Service. The associations then issue permits to their individual members. On the Comanche, there are 147 member-producers utilizing the National Grassland. All livestock grazing permits for the Comanche National Grassland are for cattle only. Authorized livestock numbers fluctuate annually. Between 1994 and 2024, annual authorized livestock numbers on the Comanche National Grassland have varied from 6,888 head of livestock to 19,541 head of livestock.

The Cimarron National Grassland administers grazing on 30 allotments. The Morton County Grazing Association issues permits to 61 member-producers to implement the grazing decision for the Cimarron National Grassland. Cattle are the only kind of livestock authorized on the grassland. From 1994 to 2024, authorized livestock numbers fluctuated annually and have varied from 370 head of livestock to 6,401 head of livestock.

In compliance with the current LRMP, permit administration focuses on vegetative condition and trend, forage utilization, livestock numbers, and implementing the grazing strategy. This monitoring verifies if

grazing practices are achieving rangeland management goals. These observations are used in conjunction with precipitation data and vegetative management objectives in determining future grazing strategies and annual stocking rates.

The Cimarron and Comanche National Grasslands use various grazing management strategies individually or in combination to move towards and meet vegetative and resource management objectives while providing sustainable forage for domestic livestock, wildlife and habitat needs. The Forest Service uses set utilization (percent use of forage) guidelines based on the grazing system used within each range unit or allotment. The allowable utilization for each grazing management system is determined by seed and vegetation reproduction goals for each pasture or range unit, except the continuous-use grazing system, which is determined by the pasture's condition class. The grazing management systems utilized on the Grasslands are defined below:

- **Rest-Rotation System:** A rest rotation grazing system uses more than one pasture and rotates cattle from one pasture to the next at varying intervals, but it has one or more pastures that do not get grazed for an entire year. Season of use is changed from year to year so that each grazed pasture is deferred until after the forage plants have set seed.
- **Deferred-Rotation System:** Deferred rotation grazing systems use more than one pasture and rotate cattle from one pasture to the next at varying intervals. Season of use is changed from year to year so that each pasture is deferred until after forage plants have set seed.
- **Continuous System:** This is a one-pasture system that allows livestock to continually graze one section of land for the entire grazing season.

Permitted grazing in the national grasslands supports about 337 annual jobs, \$6.9 million in total labor income, and \$14.2 million in total GDP (also referred to as “value added”; see table 24 in the Economic Contributions section of Appendix A).¹⁷ Ecosystem services associated with grazing in the Cimarron and Comanche National Grasslands include provisioning services (such as providing forage and economic opportunities) and cultural services (such as sense of place and traditional ways of life). Other ecosystem services include wildlife habitat; recreation; watershed functions; carbon sequestration; and biodiversity conservation. These ecosystem services provide communities value beyond those that are captured in the economic contributions discussed. Information on impacts on economic and social sustainability through livestock grazing is explored more deeply in the Multiple Uses and Ecosystem Services section of Appendix A.

Status and Trends

Authorized livestock numbers fluctuate annually based on vegetative management objectives, annual precipitation, and local economic factors. Annual numbers are determined in coordination with local grazing associations to align with vegetative management objectives.

Historically, the High Plains region of the United States has periodic cycles of drought and dry conditions. The U.S. Drought Monitor Data show that cyclical drought conditions have become very common over the last 25 years, with dry conditions persisting in between periods of major drought (National Drought Mitigation Center 2025). Conditions over the last 25 years show a consistent drought in the region. Aridification of the area could lead to a reduction in rangeland production and available forage for domestic livestock. These would affect future authorized livestock numbers for the grazing associations that are permitted to graze within the plan area as trends of persistent drought conditions become more common in the future (see Ecosystem Drivers and Stressors section).

¹⁷ The total results represent an estimate of the number of jobs and labor income supported by the dollar amount of Forest Service activities in the area per average year. More specifically, each job is not represented by a single person in the context of economic contributions analysis. Please refer to the Economic Contributions subsection of Appendix A for further discussion of methods used.

Cultural Resources

Summary

Humans have inhabited the area for at least 12,000 years, and the Cimarron and Comanche National Grasslands contain an important record of early hunter-gather occupation (USDA Forest Service 2005a); (Zier et al. 1999). Around AD 1350–1725, some groups in the area adopted a more sedentary lifestyle based on foraging, horticultural subsistence, and pottery manufacture (Carrillo et al. 2011); (Stoffle et al. 1984); (Zier et al. 1999). The Cimarron and Comanche National Grasslands contain significant cultural resources from these eras, including rock shelters, camp sites, stone and slab enclosures, tipi rings, rock art, lithic scatters, bedrock metates, and micaceous wares (Carrillo et al. 2011); (Zier et al. 1999); (USDA Forest Service 2005a) (see figure 12).

European colonization of North America decimated Native American populations across the continent beginning in the late fifteenth century and extending until the nineteenth century (USDA Forest Service 2005a); (Carrillo et al. 2011). In 1850, Euro-American and Hispanic families started permanently settling in the region, which intensified in the later 19th century following the passage of the Homestead Act (USDA Forest Service 2005a); (Carter and Mehls 1984); (Buckles and Buckles 1984). Historic sites from the era include remnants of abandoned communities, homesteads, campsites, and trails variously notable for their surface scatters and building ruins (Carrillo et al. 2011); (Buckles and Buckles 1984).

The cultural landscape within the Cimarron and Comanche National Grasslands is robust and contains multiple significant sites and districts designated or proposed for protection and enhanced management. Areas of note include the Carrizo Creek Canyon, Crack Cave, the Picket Wire Canyonlands area, the Picture Canyon area, the Rourke Ranch Historic District and House, the Vogel Canyon Historic District, and the Santa Fe National Historic Trail. Cultural resources in the area are diverse resources, from petroglyphs to homesteads; preservation management varies across the plan area.

As of 2024, 27,379 acres (2 percent) of the plan area have been surveyed, and 3,044 cultural resources have been recorded. Of these cultural resources, 37 are listed on the National Register of Historic Places (NRHP) (figure 13) and 342 have been determined eligible for listing. More cultural resources date to the precontact period (736), while 535 date to the historic period. Forty-eight cultural resources have a date that spans both periods. The remaining 1,725 are of unknown date. There are 135 Forest Service priority heritage assets of distinct public value that require active management. Their significance and management priority may be indicated by their official designation status; any prior preservation, interpretation, use investment; an agency-approved management plan; and/or signs of critical deferred maintenance needs. The numbers of resources listed above are sourced from the Natural Resource Manager (NRM) and may not be accurate, as this database is incomplete.

Cultural resources provide valuable contributions to interpretive and educational experiences and heritage tourism. Cultural sites and resources, for instance, can document many levels of human adaptation with the landscape. All eras of human adaptation to North American prairie grasslands are demonstrated in the cultural record of the plan area. Resources also illustrate prominent historical trends and events in local, regional, and national history, thus supporting social values such as local identity, sense of place, and spiritual values and traditions. Through heritage tourism, cultural sites and resources within the Cimarron and Comanche National Grasslands support economic opportunities like jobs and income for multiple communities within and associated with the plan area. The Multiple Uses and Ecosystem Services section of Appendix A provides more details on how cultural resources support economic and social sustainability.

Figure 12. Cultural and Historical Features in the Cimarron and Comanche National Grasslands



Image Annotations:

Center (Overview of the Trail): The image shows the remnants of the Santa Fe Trail within the Cimarron and Comanche National Grasslands. Between 1821 and 1846, this trail served as the primary route for trade between Missouri and New Mexico. Established by William Becknell's party, the trail followed routes originally created by Indigenous peoples. The Santa Fe Trail was largely replaced by the railroad in 1880. Within the Cimarron and Comanche National Grasslands, 23 miles of the trail remain, and a parallel track allows tourists to explore this historic route (USDA Forest Service photo by Nancy Brewer; (Putz 2024).

Upper Left (Santa Fe Trail Marker): Marker for the Santa Fe Trail in the Cimarron and Comanche National Grasslands. Although primarily used for trade, the trail also facilitated migration to California.

Lower Left (Picture Canyon): Picture Canyon features numerous rock art panels created by Indigenous peoples over thousands of years. Human presence in the area dates back to at least 12,000 years, as evidenced by lithic scatters, rock shelters, tipi rings, and petroglyphs, such as the human carving shown in the image (USFS 1995).

Upper Right (Vogel Canyon): Vogel Canyon contains abstract rock art and remnants of Indigenous habitation from 300 to 800 years ago. It also features a spur of the Santa Fe Trail, and an associated stagecoach stop (USFS 1995).

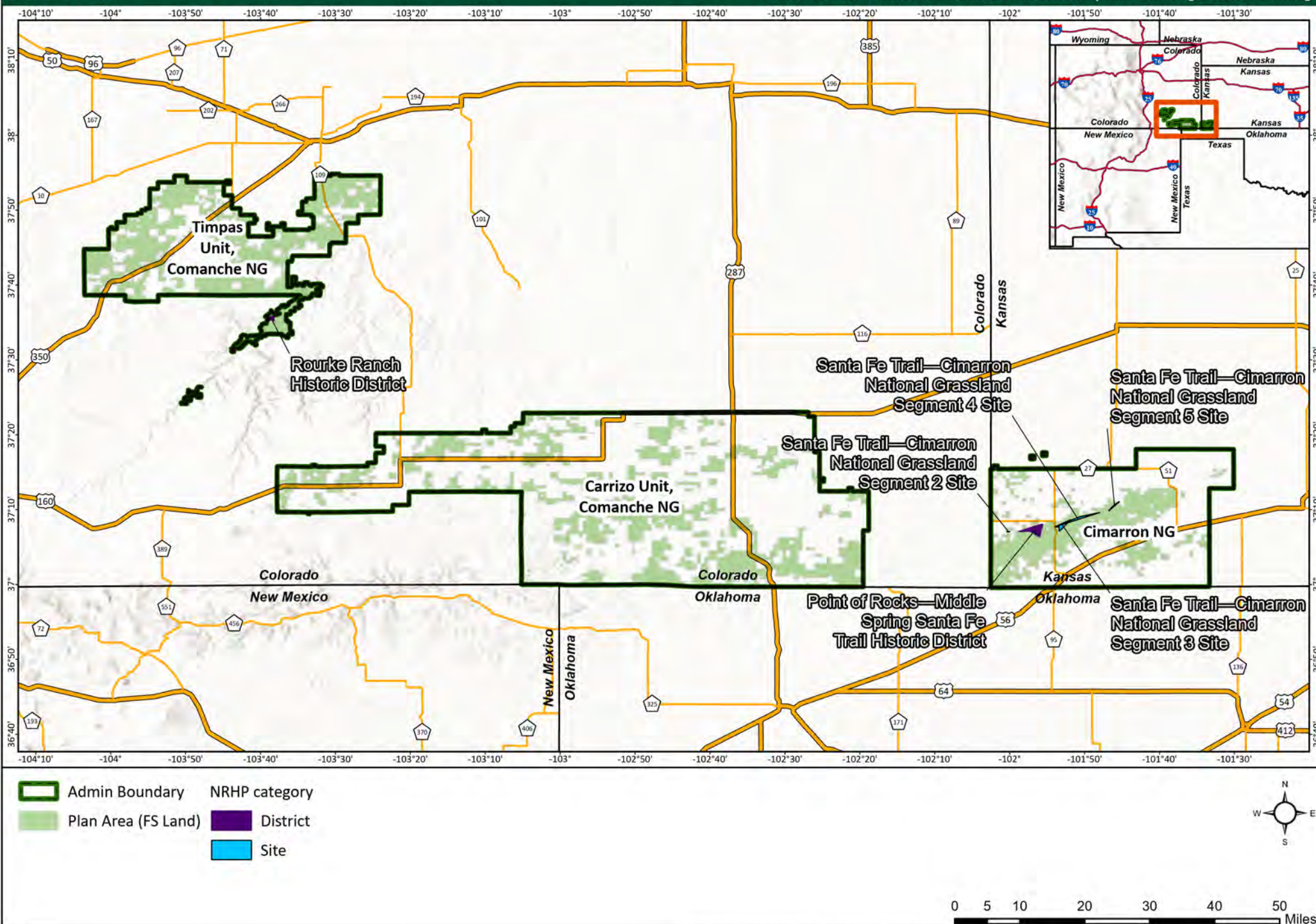
Lower Right (Homestead Ruins): This image shows the ruins of a homestead from the late 19th or early 20th century. Waves of settlers moved into the region due to policies like the Enlarged Homestead Act of 1909. Many homesteads were abandoned during the Dust Bowl of the 1930s (Carrillo et al. 2011); USFS n.d.).



USDA Forest Service

Figure 13. Cultural Sites

Cimarron and Comanche National Grasslands| Land Management Planning



Status and Trends

Forest Service Manual 2360 defines “cultural resources” as objects or locations of human activity from the precontact or historic period, or both ((USFS 2008b)). Resources include archaeological sites, architectural sites, structures, places, objects, and traditional cultural properties. Identification usually occurs through field survey, historical documentation, or oral evidence ((USFS 2008b)). The Forest Service’s Heritage Program covers the whole range of cultural resources, from artifacts to cultural landscapes, without regard to NRHP eligibility (USFS 2008b).

The use and protection of cultural resources on federal lands is governed by numerous laws, regulations, policies, executive orders, and secretarial orders. The Forest Service has also produced a collection of manuals, handbooks, and local management plans that reflect and build on national governance. The Forest Service’s official policy for cultural resource management is laid out in Manual-Chapter 2360, Heritage Program Management (USFS 2008b). Sites included on or eligible for inclusion on the NRHP are protected in accordance with appropriate laws. Due to their unknown significance, unevaluated sites are treated as eligible until their status is determined.

The cultural resources found across the Cimarron and Comanche National Grasslands can provide important scientific data and educational information that are of public benefit and support social and economic sustainability to communities. Opportunities for the study and public use of these sites include the following:

- Adaptive Reuse – developing historic properties for administrative or public use purposes in a manner that helps conserve and maintain the property while serving other administrative, recreational, education, economic, social, or other purposes central to the Forest Service’s mission.
- Interpretation – includes the creation and posting of a variety of media such as informational signage, websites, brochures, and guides for exploring the area and supporting heritage tourism. A relevant example includes the 2012 Native Grasslands Interpretation Plan.
- Public Dissemination – publishing and presenting findings from cultural resource studies at the local, regional, or national level.
- Scientific Investigation – professional research and investigation that serves an agency or public benefit, receives appropriate consultation, is legally authorized, and is completed and recorded in a professional manner.
- Windows on the Past – an umbrella program for providing heritage information and experiences to the public. These include the development of materials, projects, or programs with a public education or outreach focus. Examples of national programs include Passport in Time and partnerships with organizations such as HistoriCorps.

The primary indicators used to assess the condition and trend of cultural and historic resources are the following:

- Loss, damage, destruction, and displacement that affects the integrity of cultural resources and traditional cultural places, especially, but not exclusively, their eligibility to the NRHP
- Changes to the setting that affect the interpretation, appreciation, and significance of cultural resources and traditional cultural places
- The number of opportunities for heritage tourism

The grasslands have not been fully inventoried for cultural resources. Furthermore, the Forest Service’s database for heritage data, the NRM database, is incomplete and does not contain comprehensive information; thus, the condition for the majority of sites is currently unknown. Past condition assessments of some special areas identified in the Cimarron and Comanche National Grasslands indicate that the

condition of cultural resources likely varies (USDA Forest Service 2008). There are a number of condition drivers and associated trends for cultural resources within the plan area, as follows:

- Vandalism, as well as the removal of artifacts, by the public results in the partial or total loss of valuable scientific information and detrimentally impacts Tribal cultural values. The trend of this driver is ongoing.
- Natural weathering and degradation occur to archaeological resources over time, affecting the integrity of sites. The trend of this driver is ongoing.
- Recreational activities and certain land use practices, like grazing, can inadvertently impact cultural resources by causing actions such as erosion, which leads to the resources' exposure or damage. The trend of this driver is ongoing. These activities and land use practices can support social and economic sustainability, as discussed in the Recreation and Range Management sections; however, they can also lead to impacts on social and economic sustainability due to disturbance to cultural resources.
- Climate-driven changes in ground cover and ground-disturbing natural processes are emerging stressors on cultural resources. More frequent and more intense droughts, wildfires, and storms will increase the potential erosion of soils and changes in the vegetation cover. They also will result in direct damage to delicate materials. The trend of this driver is increasing.
- Wildfires can directly damage or destroy artifacts and structures through thermal stress. Fire can also cause indirect impacts, such as erosion, weathering, and displacement. The trend of this driver is increasing.

The current land management plan for the Cimarron and Comanche National Grasslands noted that there were only eight sites on the NRHP in 1984, although it acknowledges that this number is expected to increase as evaluations are completed. The goal of future management was to complete inventory of the forests and grasslands, continuing to identify and protect sites that are included on or eligible for inclusion on the NRHP. It was also recommended that sites be interpreted, where appropriate. Special interest areas were suggested for areas of rare plants and endangered wildlife habitat. There were none proposed for areas of historical or archaeological significance.

Since the creation of the land and resource management plan (USFS 1984), 29 more properties were added to the NRHP, and 342 sites were classed as eligible. The Santa Fe Historic Trail was also listed as a national historic trail. The plan does not acknowledge or highlight the significance of this trail, nor does it include any specifics about the number, date, and type of sites in the Cimarron and Comanche National Grasslands. Future management plans would benefit from updated quantitative and qualitative details about the cultural resources, as well as a summary of the cultural resource inventories that have taken place to date.

Designating areas with special historical and archaeological characteristics provides for better protections by managing public recreation in these areas. In 2008, four special areas were identified and evaluated in a draft land management plan (USDA Forest Service 2008). These include areas of important historical and archaeological interest, including the Picket Wire Canyonlands Paleontological Area and Recreation Area, the Picture Canyon Historical Area, the Santa Fe National Historical Trail, and the Vogel Canyon Historical Area. Further potential recommendations include Carrizo Canyon Recreation Area, Point of Rocks-Middle Spring Santa Fe Trail Historic District, and Rourke Ranch Historic District. Designating more districts, as defined under the National Historic Preservation Act (NHPA) (for example, San Juan Canyon, Holt Canyon, Ute and Aubrey Canyons, and Cimarron River), and priority heritage assets (for example, Point of Rocks Ranch, Dolores Mission, Madison Zoo Panel, and Wagon Wheel Shelter) would also protect and enhance the management of certain significant areas.

When the Picket Wire Canyonlands were transferred to the Comanche National Grassland in 1990, a management plan was formulated (USDA Forest Service 1994). One goal was to conserve and protect heritage resources within the area. Part of this included offering opportunities for public engagement and

scientific research. Surveys were proposed to sample the area and help evaluate resources for listing on the NRHP. This particular management plan responded to most condition drivers and outlined specific opportunities for public use and education, but it only covered this portion of the Cimarron and Comanche National Grasslands.

Thirteen segments of the Santa Fe National Historic Trail fall within the Cimarron and Comanche National Grasslands. The Santa Fe National Historic Trail Comprehensive Management and Use Plan was developed in 1990 (NPS 1990). Additionally, a Santa Fe Trail Scenic and Historic Byway Corridor Management Plan was developed in 2023 (Smith 2023). The management plans do not identify or respond to specific impacts, but they outline broad opportunities to support the Forest Service and other partners in preserving the trail's important qualities, including the archaeological qualities. This is mostly done through public engagement and the development of interpretation materials.

The 1984 land management plan only requires coordination with the State Historic Preservation Office (USFS 1984). The CCNG is signatory to a NHPA programmatic agreement that addresses reporting for negative find inventories. This PA was developed in consultation and executed in 2010 with the Colorado State Historic Preservation Officer (USDA Forest Service 2010). National policies and executive orders have since been released that require Tribal consultation and engagement. Consultation with federally recognized tribes is required for specific projects or activities, for example, as part of the Section 106 NHPA and NEPA processes. Additionally, land management plans are required to be created with Tribal input and acknowledge the importance of Traditional Ecological Knowledge. Likewise, cultural resources, as defined by the Forest Service (see Glossary), are to be evaluated and planned for using Traditional Ecological Knowledge principals and content (36 CFR 219.4(a)(3); Forest Service Handbook 1909.12; Forest Service Handbook 1909.12, Chapter 40). The current plan lacks Tribal involvement and direction regarding cultural resources.

Variable climatic conditions present an additional challenge to the Forest Service and its responsibility to preserve cultural resources. Changes in weather patterns and increased frequency of extreme weather events (see Ecosystem Drivers and Stressors section) can affect cultural resources both directly (for example, damage caused by heat and precipitation) and indirectly (for example, damage caused by changes to vegetation, flooding, erosion, and wildfires) (USDA Forest Service 2024b); (Rockman et al. 2016). The Forest Service has responded to this threat in the Cimarron and Comanche National Grasslands; the details are described in the final paragraph of the heritage program plan.

Adverse effects from federal undertakings are largely reduced and avoided through the Section 106 and NEPA processes. Several programmatic agreements have been signed between the Colorado State Historic Preservation Office and the Forest Service on certain programs to minimize forest fire risks and to implement travel management plans reiterating the Forest Service's commitment to national laws and setting forth specific protocols for their application (USDA Forest Service 2017c), (USDA Forest Service 2017b), (USDA Forest Service 2022).

The current management plan mentions finding an adaptive use for cultural resources (A02.01). Direction also states that the Forest Service will foster heritage tourism, which supports economic and social sustainability for communities; however, the only related action is the issuance of permits to qualifying academic institutions and other organizations for the study and research of sites (A02.03). Since the creation of the last plan, there are new technologies and methods for connecting people to cultural resources and enhancing heritage tourism. New digital tools are available, such as quick response (QR) codes, GIS story maps, and digital videos. Heritage tourism in the current land management plan lacks any coordination or connection with wider state-level preservation goals (Office of Archaeology and Historic Preservation 2017) and (Kansas State Historic Preservation Office 2017).

The current management plan prescribes annual monitoring efforts for listed and eligible sites, which could help monitor the condition of sites and track threats. Since the creation of the current plan, there are modern approaches and best management practices for records management (i.e. record digitization, full entry and update in cultural resource databases) that are important aspects for documenting, managing,

and tracking site conditions and threats. Also, site stewardship programs are now available to involve the public and tribes in site monitoring.

A new heritage program plan is currently being developed to improve heritage program standard scores through a balance of NHPA Section 106 and Section 110 compliance. For the past seven years, the USFS Heritage Program Managed to Standard has scored on average 15.7 points, which is well short of the 45 points needed to meet the standard. Forest Service Manual 2362.3 outlines the seven parts (a-g) of an ideal heritage program plan (USFS 2008b). Current management already includes some of these parts. Part e) covers inadvertent encounters of remains or funerary objects in the Cimarron and Comanche National Grasslands are protected by the Native American Graves Protection Act (NAGPRA). The specific protocol is laid out in the NAGPRA plan developed for the PSICC in 2025 in part as a component of the heritage program plan (USFS 2025a). Part f) is “protocols for responding to damage to or theft of cultural resources.” Responses to violations of the Archaeological Resources Protection Act of 1979 are facilitated by an action plan created for the PSICC in 2025 (USDA Forest Service 2024a). Part g), “direction for the protection of cultural resources that are vulnerable to catastrophic fires or other natural or human-caused damage,” is also covered by an emergency response protocol for the Pike-San Isabel National Forests and Cimarron and Comanche National Grasslands (USDA Forest Service 2024e). The existence of this plan acknowledges the possibility of natural disasters, such as wildfires and floods, and their potential effects on cultural resources. The plan also reiterates that the Forest Service’s protocol for addressing these impacts follows the CFR. The iteration of this law allows the Forest Service to respond with efficiency and flexibility.

The remaining parts of a heritage program plan for managing cultural resources on the Cimarron and Comanche National Grasslands are being developed to include a cultural resources overview (part a), predictive modeling (part b), goals and objectives (part c) and monitoring annual targets assess conditions and success of treatment or mitigation measures to sites (part d).

Tribal Rights and Interests

Summary

Colorado and Kansas have been the home of Indigenous people since time immemorial. The area of the Cimarron and Comanche National Grasslands is the ancestral homeland and travel way of Native groups. The Cimarron and Comanche National Grasslands were inhabited and used by a number of Tribal groups from the precontact to the historic period, including, but not exclusive to, the Jicarilla Apache, Arapaho, Cheyenne, Comanche, Kiowa, Lipan Apache, Osage, Pawnee, and Ute Tribes. During the 19th century, these groups were removed to reservations far from the Cimarron and Comanche National Grasslands in southwest Colorado, eastern Kansas, New Mexico, Oklahoma, and Wyoming (USDA Forest Service 2005a); USFS 2024).

Today these groups retain a connection to these lands due to their cultural, religious, and ancestral ties. Indigenous use of the grasslands over the centuries and millennia is reflected by the number of important cultural sites, sacred sites, and traditional cultural places that are known and predicted to be within the plan area. Potential locations of Tribal importance include the Carrizo Canyon Area, Crack Cave, Picket Wire Canyon, Picture Canyon, and Vogel Canyon. The government-to-government consultation process may confirm significance and Tribal-requested direction as well as identify other potential areas.

The Rocky Mountain Region (Region 2) of the Forest Service maintains a list of interested tribes connected to the Cimarron and Comanche National Grasslands. Tribes that may be interested in the consultation process include (in alphabetical order) the Apache Tribe of Oklahoma, Cheyenne and Arapaho Tribes, Cheyenne and Arapaho Tribes of Oklahoma, Comanche Nation of Oklahoma, Jicarilla Apache Nation, Kiowa Nation of Oklahoma, Osage Nation of Oklahoma, Pawnee Nation of Oklahoma, Southern Ute Indian Tribe, Ute Indian Tribe of the Uintah and Ouray Reservation, Ute Mountain Ute Tribe, and Wichita and Affiliated Tribes. PSICC formally invited tribes on September 4, 2024, inviting them

to be cooperating agencies. PSICC hosted a virtual engagement with tribes on November 6, 2024, and February 19, 2025.

There are four historic treaties generally associated with the plan area. These include the 1863 Conejos Treaty, the 1865 Little Arkansas Treaty, the Medicine Lodge Treaties of 1867, and the Ute Treaty of 1868. However, none of these treaties contain reserved rights that are applicable to management of the Cimarron and Comanche National Grasslands. Regardless of the absence of reserved treaty rights covering the plan area, the Forest Service will continue to engage in government-to-government consultation with tribes regarding their connection to the plan area, any contemporary use of them, and areas or resources of Tribal interest.

The Cimarron and Comanche National Grasslands can provide important benefits to tribes, through cultural, historic, and traditional resources such as supporting traditional and cultural harvesting and collecting; preserving sacred and culturally significant places and areas; supporting jobs and income for local Tribal communities; and providing value with the sense of place, cultural identity of communities, and associated spiritual values.

Status and Trends

Sacred sites, Tribal cultural landscapes, Tribal resources, and traditional cultural properties (TCPs) have religious, cultural, and traditional importance to tribes. Sacred sites and TCPs are managed under the authority of the American Indian Religious Freedom Act, NHPA, and Executive Order 13007). Sacred sites and TCPs are identified by a tribe or authoritative representative of an Indian religion. The Forest Service is committed to protecting and managing these sites in consultation with the tribes. This includes ensuring Tribal access to the sites for traditional, religious, and cultural practices.

The primary indicators used to assess the condition and trend of cultural resources and Tribal interests are the following:

- Loss, damage, destruction, and displacement that affects the integrity of cultural resources, sacred sites, and TCPs
- Changes to the setting that affect the understanding, appreciation, use, and significance of cultural resources, sacred sites, and TCPs

As of 2025, no cultural resources, sacred sites, or TCPs of interest to tribes in the plan area have been identified through consultation and engagement. It is likely, however, that many recorded artifacts and areas with significant cultural resources are also of importance to tribes. The condition for the majority of sites is currently unknown. Past condition assessments of some special areas identified in the Cimarron and Comanche National Grasslands indicate that the condition of cultural resources, sacred sites, and TCPs likely varies (USDA Forest Service 2008). There are a number of condition drivers and associated trends for cultural resources, sacred sites, and TCPs within the plan area, including the following:

- Vandalism, as well as the illegal removal of artifacts, by the public results in the partial or total loss of valuable cultural information and detrimentally impacts Tribal cultural values. The trend of this driver is ongoing.
- Natural weathering and degradation occur to Tribally significant cultural resources, sacred sites, and TCPs over time, affecting the integrity of sites. The trend of this driver is ongoing.
- Recreation and certain land use practices, like grazing, can inadvertently impact cultural resources, sacred sites, and TCPs by causing actions such as erosion, which leads to their exposure or damage. The trend of this driver is ongoing.
- Public visitation can also directly and inadvertently cause damage and deterioration. The trend of this driver is ongoing.

- Climate-driven changes in ground cover and ground-disturbing natural processes are an emerging stressor on cultural resources. More frequent and more intense droughts, wildfires, and storms will increase the potential erosion of soils and changes in the vegetation cover. They also will result in direct damage to delicate materials. The trend of this driver is increasing.
- Wildfires can directly damage or destroy artifacts and structures through thermal stress. Fire can also cause indirect impacts, such as erosion, weathering, and displacement to cultural resources, sacred sites, and TCPs. The trend of this driver is increasing.

These conditions that impact cultural resources, sacred sites, and other resources and areas important to tribes for cultural purposes would impact the social and economic sustainability through degradation of cultural, social, and spiritual values and services. These impacts would occur throughout the region.

The use and protection of cultural resources and Tribal interests on federal lands is governed by numerous laws, regulations, policies, executive orders, and secretarial orders. The Forest Service has also produced a collection of rules, manuals, handbooks, and local management plans that reflect and build on national governance.

The current management plan for the Cimarron and Comanche National Grasslands includes limited management direction for cultural resources, sacred sites, and TCPs to provide a degree of protection to objects, sites, and landscapes of Tribal importance (USFS 1984). Certain areas and features, like Picket Wire Canyon and the Santa Fe Trail, which includes former Native American routes, have more recent management plans that provide detailed and expansive protective measures (NPS 1990); (USDA Forest Service 1994); (Smith 2023). See the Cultural Resources section for details. Although cultural resources (and thus incidentally some Tribal interests) are largely protected through these management goals and directives, Tribal knowledge, interests, and consultation are not adequately addressed within these documents; therefore, the current management plan does not meet current federal standards.

Reference to the tribes is absent from the 1984 land and resource management plan, which predates much of the legislation that requires Tribal involvement and the consideration of tribes' interests in the planning process. Tribes are only mentioned briefly in terms of their historic connection to the Santa Fe Trail in the trail's 2023 management plans. The Picket Wire Canyon management plan similarly refers to tribes in terms of their past history with the site. It suggests widening educational programs, with one suggestion being the collection of plant specimens during an American Indian herbal-identification walk.

To help address the above issues, the Forest Service is in the process of developing a Tribal engagement strategy for the revised management plan. Opportunities for consultation and engagement will be provided in person or virtually, or both. Interested tribes have already been identified and invited to act as cooperating agencies. The Forest Service is committed to undertaking government-to-government consultation with federally recognized tribes. Efforts will also be made to identify any non-federally recognized Tribal groups and include them in the engagement strategy.

Landownership, Status, Use, and Access

Ownership and Status

Summary

Landownership and status are fundamental concepts in land management. Landownership refers to who holds legal title to the land and any associated rights or limitations, leases, and permits that affect administration of the land. Landownership considers land interests owned by the government in private lands (for example, minerals located below the surface) and the interests others hold in government lands (for example, easements). Land status refers to the legal classification of land, such as zoning or management designations. While federally managed lands are generally not subject to zoning regulations, these often reflect local priorities for land use compatibility and community development.

The landownership pattern in the Cimarron and Comanche National Grasslands is fragmented, meaning there are various owners and statuses for different parcels of land. This fragmentation is a result of the region's history of land acquisition and federal policies like the Homestead Act of 1862, which encouraged the establishment of small farms and homesteads by offering 160-acre parcels of federal land to qualified individuals (Hansen and Libecap 2004); (USFS 2008a). As land was claimed under this act, the landscape was transformed, leading to a patchwork of privately owned farms and ranches throughout the region.

Unsustainable farming methods and severe drought conditions of the Dust Bowl, coupled with the economic downturn of the Great Depression, devastated the Great Plains region in the 1930s. This led the government to initiate the Bankhead-Jones Farm Tenant Act (BJFTA) which authorized the purchase and acquisition of lands from bankrupt farmers and ranchers or landowners who wanted to leave the area for a better life, for conservation and restoration purposes under the Lands Utilization Program (LUP; (Hansen and Libecap 2004).

Today, the grasslands are a mosaic of public and private lands. The Forest Service employs various strategies to manage landownership and use within the plan area. These strategies include land adjustments such as acquisitions (purchase and donation), conveyances, and exchanges (USDA Forest Service 2005b). However, fragmented landownership in the region continues to create challenges for management and can escalate costs associated with conservation efforts (USDA Forest Service 2005b). These costs and conflicts can have impacts on social and economic sustainability, such as impacts on quality of life and sense of community, among others.

Status and Trends

The plan area of the Grasslands covers about 1,464,384 acres. National Forest System lands, as well as private, other federal, state, and non-governmental entities, all have surface ownership within that administrative boundary. National forest system lands encompass approximately 552,263 acres on the three units that make up the Grasslands. Other federal and state managed within the administrative boundary includes roughly 320 acres of Bureau of Land Management lands and 43,000 acres of Colorado State Land Board lands. The remainder of the lands within the administrative boundary are owned by private individuals, groups, non-governmental organizations, and other entities.

Ownerships adjacent to the Grasslands include additional Colorado State Land Board jurisdictions, the Oklahoma Commissioners of the Land Office, and non-governmental organizations (i.e. Nature Conservancy). The U.S. Army also has a training facility, Piñon Canyon Maneuver Site, located adjacent to the Grasslands. The plan area contains numerous private land inholdings and properties bordering its boundaries that mostly consist of ranches and homesteads. Land managers conduct surveys and post property boundary lines to help protect public lands from trespass and encroachment and to maintain conservation and restoration efforts (USDA Forest Service 2005b).

Forest Service land adjustments in the region can occur over time through exchanges, purchases, donations, access (easement) acquisitions, Small Tract Act conveyances¹⁸, or special legislation conveyances. Priorities for landownership adjustments within the Cimarron and Comanche National Grasslands include consolidating federal landownership to reduce the number of isolated parcels and tracts via land adjustments (USDA Forest Service 2005b). Per the BJFTA, Section 32(c), Title III, the Forest Service is authorized to "sell, exchange, lease, or otherwise dispose of, with or without a consideration, any property so acquired" under the act (7 United States Code [U.S.C] 1011(c) (Olson 1997). This provision allows the Forest Service to enter land exchanges involving national grasslands;

¹⁸ Small Tract Act refers to Public Law 97-465, which authorized the Secretary of Agriculture to sell, exchange, or interchange certain small parcels to resolve landownership conflicts, improve land management, or address public benefit needs.

however, specific restrictions vary depending on the circumstance, and certain limitations generally apply, as follows:

- Land exchanges with public agencies may only occur if the agency agrees to use the lands for a public purpose.
- Land exchanges with private entities may occur only if the exchange does not conflict with the purpose of the BJFTA and if the value of the property received is substantially equal to the value of the property conveyed. While land exchanges with private entities can be authorized under certain conditions, the provisions of the BJFTA do not authorize outright sales of national grasslands to private parties.
- Section 206 of the FLPMA of 1976 should be considered during the exchange of National Forest System lands (including national grasslands).

The Forest Service adopted regulations (36 CFR 213.1(b)) that state that BJFTA lands comprising the national grasslands will be held permanently ((Olson 1997); CRS 2016) though provisions of the BJFTA generally authorized the exchange of land acquired under its authority. Under limited circumstances, small parcels of grasslands deemed “surplus” may qualify for land adjustment purposes under the Small Tracts Act (16 USC 521c et seq.) (Olson 1997); USDA 2020), which seeks to address and resolve land management challenges such as trespass, boundary disputes, and encroachment, or to improve public access.¹⁹

Land adjustments have occurred over the last several decades to increase or decrease lands under national forest system management. Table 17 below shows the summary of acres acquired under the BJFTA Title III authority or through other means by each decade. The Grasslands were established in the 1950's as a result of title III of the Bankhead-Jones Farm Tenant Act and transfers associated with this Act cover about 509,143 acres (95 percent of total NFS lands). Acquisitions under the Bankhead-Jones authority occurred in the 1960s and 1980s, adding just over 3,800 acres to the Grasslands. Through other types of acquisitions, such as donation, exchanges, purchases or transfers, the Grasslands added 24,488 acres in the 1990s and early 2000s. This latter addition included a transfer of just over 16,000 acres from the U.S. Army for the Picket Wire Canyonlands area. Over the years, about 920 acres of national forest system lands have been disposed through exchanges, grants, interchange, or sales.

Table 17. Lands acquired to create the Cimarron and Comanche National Grasslands by decade.

Decade	Bankhead-Jones Farm Tenant Act Title III Acquisitions (acres)	Other Acquisitions (acres)
1940s	0	39
1950s	523,492	0
1960s	2,718	0
1970s	0	0
1980s	1,123	0
1990s	0	23,680
2000s	0	808
Total²⁰	527,333	24,528

¹⁹ <https://www.federalregister.gov/documents/2020/09/29/2020-21258/conveyance-of-small-tracts>

²⁰ Total acreages may differ from other NFS ownerships due to various analysis processes and data used.

Reserved public domain, pertaining to lands that have never left ownership of the United States preserving the public ownership of surface and subsurface ownership, applies to approximately 5,686 acres. Subsurface ownership outside of these reserved public domain lands can be very complex and largely depends on the deed language of each acquisition. In some cases, the United States acquires the subsurface rights during land purchases, exchanges, transfers, or other means of acquisition. In other cases, subsurface rights are held by a non-federal entity such as a private individual, corporation, or state agency. The Forest Service recognizes that lands under agency surface ownership may be subject to individuals, corporations, groups, states, and other non-federal entities exercising their mineral reservations or outstanding mineral rights. Throughout the land management plan revision process, understanding the extent of mineral estates and the potential for entities to exercise these rights will help ensure the revised plan will appropriately consider where subsurface rights may affect the Grasslands ability to achieve management goals.

Understanding the patterns of NFS surface ownership across the Grasslands illustrates the importance of cross-boundary coordination to meet the agency and other entities' land management goals. Parcel sizes of contiguous NFS lands on the Grasslands range from about 0.5 acre to just over 180,000 acres and average about 3,300 acres. Nearly two-thirds of the NFS parcels are less than 500 acres (table 18). Another almost third of the parcels range from 500 to 5,000 acres. The remaining 9 percent of the Grasslands consist of contiguous NFS lands parcels larger than 5,000 acres.

Table 18. Parcel sizes of National Forest System lands within the administrative boundary of the Grasslands.

Acreage Range (acres)	Number of Parcels	Percentage of All Parcels
<100	38	23%
100-499	68	40%
500-999	19	11%
1000-4999	29	17%
5000-9999	5	3%
10k-49999	6	4%
>50,000	3	2%
Total	168	100%

Impacts of system drivers and stressors, such as projected climatic conditions, invasive species, increased urban expansion, and land conversion, will exacerbate issues stemming from the disjointed landownership pattern within the plan area. Land fragmentation hinders biodiversity conservation and ecosystem restoration initiatives, reduces the efficacy of management efforts, and increases management costs in several ways, such as the following:

- Increased temperatures and warmer, drier conditions are leading to more frequent wildfires. Fragmented landownership will continue to create challenges with the effectiveness of hazardous fuels treatments and in fire suppression tactics. Addressing these challenges requires collaboration across landownerships to implement coordinated treatments to reduce potential fuel loads.
- Additionally, warmer temperatures and shifts in the timing of precipitation are contributing to the expansion of invasive species, which further threaten grassland health by outcompeting native vegetation. Effective management of invasive species in fragmented landscapes with diverse ownerships will depend on collaboration and establishing partnerships and agreements that foster cross-boundary treatments, such as targeted grazing, prescribed burns, and control of invasive species.

While current plan direction for land exchanges, land acquisitions, and access is still generally valid, recent research highlights the need for a broader, landscape-scale approach to managing fragmented lands like those of the Cimarron and Comanche National Grasslands (USFS 1984; (Augustine et al. 2021). By shifting focus from individual landholdings to the entire grassland ecosystem, land managers can implement practices like habitat restoration, prescribed fire, sustainable grazing to promote biodiversity, and adaptation strategies to support economic vitality in local communities. To achieve this, strategic public-private partnerships are essential. Differences in management objectives among landowners can hinder grassland management efforts. A landscape-scale approach that considers factors such as landownership, status, and fragmentation necessitates collaboration across property boundaries. Fostering shared values and a sense of collective stewardship can allow land managers to develop joint grassland management objectives and approaches that align with the goals and needs of local communities and residents (Shafer et al. 2014).

Use and Access

Summary

Land Use and Access

Land use refers to assessing past and present land activities and how lands could be used in the future. A land use assessment considers land use capability and suitability for different uses, potential conflicts between land uses, and the impact of these activities on the lands' ecological, social, and economic health.

Access refers to the pattern and means by which public and private lands within the plan area are accessed. Most often, access is provided via National Forest System roads or by easements given by non-federal landowners over private lands to public lands. Motorized and nonmotorized trails also provide means for individuals to access national grasslands.

Status and Trends

The history of the Cimarron and Comanche National Grasslands serves as a unique reminder of the importance of land stewardship and sustainable land use practices, and the contribution that past and present communities have made on the formation of the landscape.

The Pike and San Isabel National Forests and Cimarron and Comanche National Grasslands Land and Resource Management Plan designates around 80 percent of the Cimarron and Comanche National Grasslands' land base as 6B, managed for intensive livestock grazing (USFS 1984). Details related to the management of grazing are provided under the Rangeland Management section.

Oil and gas development is also a major land use in the Cimarron and Comanche National Grassland. Significant land uses adjacent to the Cimarron and Comanche National Grasslands also include wind energy. These uses support social and economic sustainability through jobs, income, and economic output. They also provide a sense of place and way of life for some (see the Contributions to Social and Economic Sustainability Section of Appendix A for more information on the economic contributions and social value of agriculture, livestock grazing, and mineral development in the plan area).

In addition to these primary land activities, the national grasslands provide for several other important ecosystem functions and uses, including forage production and grazing, biodiversity maintenance, recreation, and energy development. To facilitate these various uses, the Forest Service issues and administers special use authorizations.

Special Use Authorizations

The Cimarron and Comanche National Grasslands' staff processes and administers lands special use authorizations for a variety of activities. A lands special use authorization is a legal document, that grants the holder specific privileges to use and occupancy of national forest system lands. These authorizations are issued for a defined period and specific purpose, helping ensure that any lands special use activity in the Cimarron and Comanche National Grasslands, such as research, weather stations, water and power utilities, and telecommunications infrastructure, are properly authorized and managed. Lands special use authorizations include research, weather stations, water and power utilities, and telecommunications infrastructure.

Recreation special use authorizations permit recreational uses and events, such as guide outfitting services, target range shooting, and other temporary events to provide opportunities for commercial recreational ventures on national grasslands, which support associated economic contributions in the local communities. These uses also support social and economic sustainability through economic contributions and ecosystem services, such as sense of place and community, physical and mental health, and quality of life, throughout the region.

Overall, for the plan area, the Forest Service currently administers a total of 234 authorizations for various land uses; of these, 190 authorizations are issued for the Cimarron National Grassland, and 44 are issued for the Comanche National Grassland. Table 19, below, details the type and number of the specific land use authorizations.

Table 19. Special Uses Authorizations issued for the Cimarron and Comanche National Grasslands²¹

Land Use	Number of Authorizations Cimarron National Grassland	Number of Authorizations Comanche National Grassland
Outfitting and guiding service	0	1
Target range	1	0
Noncommercial group use	0	1
Fence	0	1
Research study	3	0
Weather station	1	4
Batch and mixing plant	1	0
Oil and gas pipeline	158	16
Oil and gas pipeline-related facility	10	3
Power line, Rural Electrification Administration financed	1	2
Power line	5	0
Department of Transportation (DOT) easement	3	3
Forest Road and Trail Act easement	2	0
FLPMA easement	0	1
Private mobile radio service	0	1
Commercial radio service	0	1
Facility manager	0	1
Telephone and telegraph line	2	2

²¹ Unpublished issued authorizations data, provided by USFS on September 10, 2024.

Land Use	Number of Authorizations Cimarron National Grassland	Number of Authorizations Comanche National Grassland
Fiber-optic cable	1	2
Irrigation water transfer pipeline, less than 12-inch diameter	1	0
Water transfer pipeline, 12-inch or more diameter	0	1
Water transfer pipeline, less than 12-inch diameter	1	3
Stream gauging station	1	1
Water quality monitoring station	1	0
Total number of authorizations	190	44

Energy, Minerals, and Geological Resources

This section of the assessment will describe and evaluate renewable and nonrenewable energy resources in the Cimarron and Comanche National Grasslands. Information used to conduct the assessment of mineral resources includes public documents and data produced by federal and state agencies, tribes, internal Forest Service documents and studies, peer-reviewed scientific literature, company profile websites, U.S. Geological Survey (USGS) maps, federal regulations, Forest Service manual direction, and personal communication with professionals considered to be knowledgeable in their respective fields.

Key Takeaways

- The Cimarron and Comanche National Grasslands have high solar and wind energy potential but low biomass and hydropower energy potential; however, due to the pattern of isolated public parcels scattered amongst private lands and other factors, renewable energy projects are unlikely to develop in the national grasslands. Renewable projects in the area would likely occur on adjacent private lands. Due to the limited projected new developments, there is not expected to be economic contributions associated with new renewable energy activity.
- The Cimarron and Comanche National Grasslands have two active mineral materials sites, including sand, gravel, and caliche, used for road maintenance by the Forest Service and local counties. Materials are available for free use by public authorities under the Bankhead-Jones Farm Tenant Act of 1937. These sites are important sources to meet infrastructure needs of local communities, and they support jobs, income, and economic output.
- There are no locatable mineral claims in the Cimarron and Comanche National Grasslands, and there are not expected to be economic contributions associated with locatable mineral activity.
- Oil and gas drilling in the Cimarron National Grassland began in 1930 with the discovery of the Hugoton Gas Field, followed by the discovery of around 35 new fields through the 1950s, 1970s, and 1980s. Currently, there are 436 active facilities in the Cimarron National Grassland, with 61 percent of its 108,500 acres leased for exploration. These facilities support economic sustainability by contributing to jobs, income, and economic output for the surrounding regions.
- Geological hazards that occur in the Cimarron and Comanche National Grasslands include landslides, flooding, other weather-related events, and abandoned mine lands. Risks associated with geological hazards can often be addressed by avoidance or mitigation. Datasets such as the Federal Emergency Management Agency's (FEMA) National Flood Hazard Layer, the USGS Riverine

Flooding Analysis, and the USGS Landslide Hazards Program offer valuable information to assist with local risk management, environmental planning, and hazard mitigation efforts.

- The Cimarron and Comanche National Grasslands have fossil localities where these ancient records are preserved in rock layers and exposed through erosion or other shifts in the earth's surface.
- Karst resources can support groundwater systems and unique biological communities and serve as habitats for bats and other wildlife. No prominent sites are known to exist in the Cimarron and Comanche National Grasslands.

Renewable Energy

This section discusses renewable energy sources, including biomass, hydroelectric, hydrokinetic, solar, and wind sources. Power site classification withdrawals and utility corridors are also included. Geothermal energy is included under leasable minerals in the Nonrenewable Energy and Mineral Resources section, in addition to coal, oil, and gas. Discussions of locatable minerals, leasable minerals, mineral materials, and mining activities are in the Nonrenewable Energy and Mineral Resources section.

Summary

Five active dams are in the Cimarron and Comanche National Grasslands; four are listed as full operational, and one is listed as operational with limitations. Two of the dams meet the criteria for jurisdictional dams, as defined in Forest Service Manual 7506. None of these dams are used to generate hydroelectric power.

Wind speed maps from the National Renewable Energy Laboratory (Roberts 2024) show that the Cimarron and Comanche National Grasslands have high to moderate average wind speed at 330 feet (a typical height for utility-scale wind power generation).

Solar maps from the National Renewable Energy Laboratory (Roberts 2018a) indicate most of the Cimarron and Comanche National Grasslands have high direct solar irradiance, indicating that the solar potential in the plan area is high.

Biomass energy generation typically uses waste materials from timber development, or it occurs in areas where climatic conditions allow for rapid biomass growth. As an arid grassland with limited timber resources, the Cimarron and Comanche National Grasslands are not a good candidate for biomass energy development.

If new renewable energy development were to occur in the Cimarron and Comanche National Grasslands, the development could support economic and social sustainability by supporting jobs, income, economic output, a way of life, and the intrinsic value that communities might have for renewable energy usage (see the Contributions to Social and Economic Sustainability section of Appendix A for more information on the benefits that renewable energy could provide the surrounding communities).

Status and Trends

Given the limited geographic relief and relatively small size of rivers in the Cimarron and Comanche National Grasslands, there is limited to no potential for future development of hydroelectric power generation. This would result in very small or no economic contributions associated with development of hydroelectric power generation.

There are existing solar and wind developments on private lands in the area around the Cimarron and Comanche National Grasslands, indicating these types of development are viable in the plan area (EIA 2024). However, lands managed by the Forest Service in the Cimarron and Comanche National Grasslands are interspersed with private lands in many areas. Due to the permitting process and required environmental analysis for developing renewable energy facilities on National Forest System lands, it is typically less expensive and faster to develop these facilities and associated infrastructure on private

lands, where private lands are available. As a result, very little development of wind and solar energy and very little economic contributions associated with wind and solar energy activity in the Cimarron and Comanche National Grasslands are likely.

Due to the limited biomass resources available in the decision area, no biomass energy development is likely to occur, and as a result, no economic contributions from biomass energy activity are expected.

The current land management plan allows for special uses, such as power line ROWs, but does not consider specific management or issues specific to renewable energy developments, such as the visual impacts associated with wind turbines or whether specific areas might not be appropriate for utility-scale solar development given the need for large, contiguous parcels of land.

Nonrenewable Energy and Mineral Resources

Nonrenewable energy resources include crude oil, natural gas, coal, tar sand, and oil shale. Although the Forest Service manages surface resources, the Bureau of Land Management (BLM) typically manages the actual federal energy resources including leasing. Forest Service management of surface use associated with energy and mineral resource development is guided by federal regulations at 36 CFR 228 (Locatable, Mineral Materials, and Oil and Gas Resources) and 36 CFR 251.15 (Mineral Reservations), guidance in Forest Service Manuals 2810 (Locatable), 2820 (Mineral Leases, Permits and Licenses), 2830 (Mineral Reservations and Outstanding Mineral Rights), and 2850 (Mineral Materials) the 1992 Energy Policy Act, and rules and regulations issued by the Secretary of Agriculture in 1938, 1939, 1950, and 1963, depending on the ownership of the mineral estate.

Mineral Materials

Summary

Sand and gravel pits are present in the Cimarron and Comanche National Grasslands, with the materials primarily used by the Forest Service and local counties for road maintenance. These mineral materials, which include common varieties of sand, gravel, rock, fill dirt, and other common borrow materials, may be made available for free use only to public authorities and agencies under the provisions of the Bankhead-Jones Farm Tenant Act of 1937, which governs lands acquired and managed under the act. Availability of free or low-cost mineral materials to local communities supports economic development, which, in turn, supports jobs and labor income (see the Economic Contributions section of Appendix A for more details on economic contributions from mineral activity). Alternative sources of these materials may be cost prohibitive for communities due to the high costs of transporting these materials.

Status and Trends

The Cimarron and Comanche National Grasslands currently have two active mineral materials sites, including one for sand and gravel, and one for caliche located on the Cimarron. These are primarily used by the Forest Service and local counties and towns for road maintenance. The Forest Service makes free use mineral materials available to state, county, and local governments at no cost to support the maintenance and development of roads and other infrastructure. This benefits local communities by reducing the costs of infrastructure maintenance.

Current conditions are likely to remain the same, though there is the potential for the development of new sites for similar uses in the future. This future development could lead to support for the economic sustainability in the region through jobs, income, and output; however, the magnitude of impact depends on the number of new sites that would be developed, which is currently unknown.

The current management allows for exploration and disposals of mineral materials under terms and conditions to prevent or control adverse impacts on surface resources and uses. It also directs that the objective of reclamation requirements be to return disturbed lands to the planned uses. This management

allows for the support of local communities and economic development by providing for community needs to support road maintenance and other infrastructure development and maintenance. Opportunities for management planning include examining whether current locations are sufficient to meet needs, considering locations where future development would be appropriate and least impactful on surface resources, and examining whether reclamation of closed mineral materials locations has been effective and whether additional guidance or requirements are needed.

Locatable Minerals

Summary

The administration of locatable minerals in the Cimarron and Comanche National Grasslands varies depending on whether the minerals are classified as public domain or acquired. For acquired lands, processing locatable minerals is limited due to the restrictions set forth by the Bankhead-Jones Farm Tenant Act of 1937, which does not grant authority for hard-rock leasing. While the act was amended in 1981 to include energy materials, it specifically excluded hard-rock minerals. This limitation was further reinforced by a 1998 Forest Service decision regarding Florida Rock Industries, which affirmed that hard-rock minerals cannot be leased on lands acquired under the authority of the Bankhead-Jones Farm Tenant Act. For public domain minerals, locatable minerals are processed in accordance with the General Mining Law of 1872, which governs mining activities on public lands.

Status and Trends

No active mining claims are present. Due to the Cimarron and Comanche National Grasslands' location in a sedimentary basin, which has limited locatable mineral resources, development is unlikely to increase in the future. Due to the limited development and activity, there is not expected to be economic contributions associated with locatable mineral activity.

Management of locatable mineral resources is largely dictated by the requirements of the General Mining Law of 1872 on public domain lands and by the Bankhead-Jones Farm Tenant Act of 1937 on acquired lands. Opportunities for management planning include examining whether management direction is consistent with the most recent guidance regarding the management of locatable minerals on acquired lands.

Fluid Minerals

Key Takeaways

- Oil and gas drilling in the Cimarron National Grassland began in 1930 with the discovery of the Hugoton Gas Field, followed by significant drilling activity in the 1950s, 1970s, and 1980s, including the discovery of around 35 new fields. Most oil and gas drilling in the Comanche National Grassland occurred in the 1990s with the development of the Campo Oil Field. Developments within both national grasslands are reaching the end of the developments' productive life.
- There are approximately 60,500 acres of federal fluid mineral leases in the Cimarron National Grassland and approximately 2,900 acres of federal fluid mineral leases in the Comanche National Grassland. The Cimarron and Comanche National Grasslands currently supports 286 Active Oil and Gas leases. Oil and gas activity supports economic and social sustainability through jobs, labor income, economic output, and a way of life.
- There is no existing geothermal development and limited geothermal potential in the Cimarron and Comanche National Grasslands, and there are not expected to be economic contributions associated with geothermal activity.

Summary

Active federal fluid mineral leases within the administrative boundaries of the Cimarron and Comanche National Grasslands plan area are shown below in figure 14, Fluid Mineral Leasing. Figure 15, figure 16, and figure 17 show the approximate locations of producing wells with symbology showing the decade in which each well was completed, and wells which have been plugged and abandoned with symbology showing the decade in which each well was plugged.

Oil and gas drilling in the Cimarron National Grassland began in 1930 with the discovery of the Hugoton Gas Field. By the 1950s, drilling expanded with significant discoveries like the Panoma and Greenwood Gas Areas and the Interstate Field. There are 60,500 acres under federal lease, down from 66,167 acres leased in May 2005. Some infill drilling has continued to occur within the fields in the Cimarron National Grassland over the last 20 years. Several key federal laws, including the Mineral Leasing Act of 1920 and the Bankhead-Jones Farm Tenant Act of 1937, along with other regulations, govern oil and gas development, balancing resource extraction with conservation. There are approximately 337 producing gas wells and 44 producing oil wells on Forest Service administered surface within the Cimarron National Grassland. Of those approximately 156 gas wells and 6 oil wells are producing from federal mineral leases, the remaining wells are producing from private mineral estate.

The Comanche National Grassland has varying oil and gas potential, with the eastern Carrizo Unit, including the Campo Oil Field, having high potential, while the Timpas Unit has low potential. There has been little activity since the 1990s, and the Campo Field is at the end of its productive life. Remaining wells are no longer producing and are scheduled for plugging and reclamation. Currently, there are 2,900 acres under federal lease in the Comanche National Grassland, down from 15,000 acres in 2005. Private mineral rights and leases also influence land management in the area.

Additionally, approximately 500 miles of oil, gas, and water pipelines cross the Comanche National Grassland. Pipelines off lease are authorized through special use permits, while those on lease are governed by federal lease terms. Pipeline corridors are periodically reviewed to assess the need for additional corridors, and ROW areas are restored within 2 to 3 years to minimize environmental disturbance.

Current oil and gas activity in the Cimarron and Comanche National Grasslands contributes to the regional and local economies by supporting a total of about 12 jobs, \$516,000 in labor income, and \$1.6 million in total GDP (also referred to as “value added”; see the Economic Contributions Section of Appendix A for more details on the economic contributions from mineral activity).²²

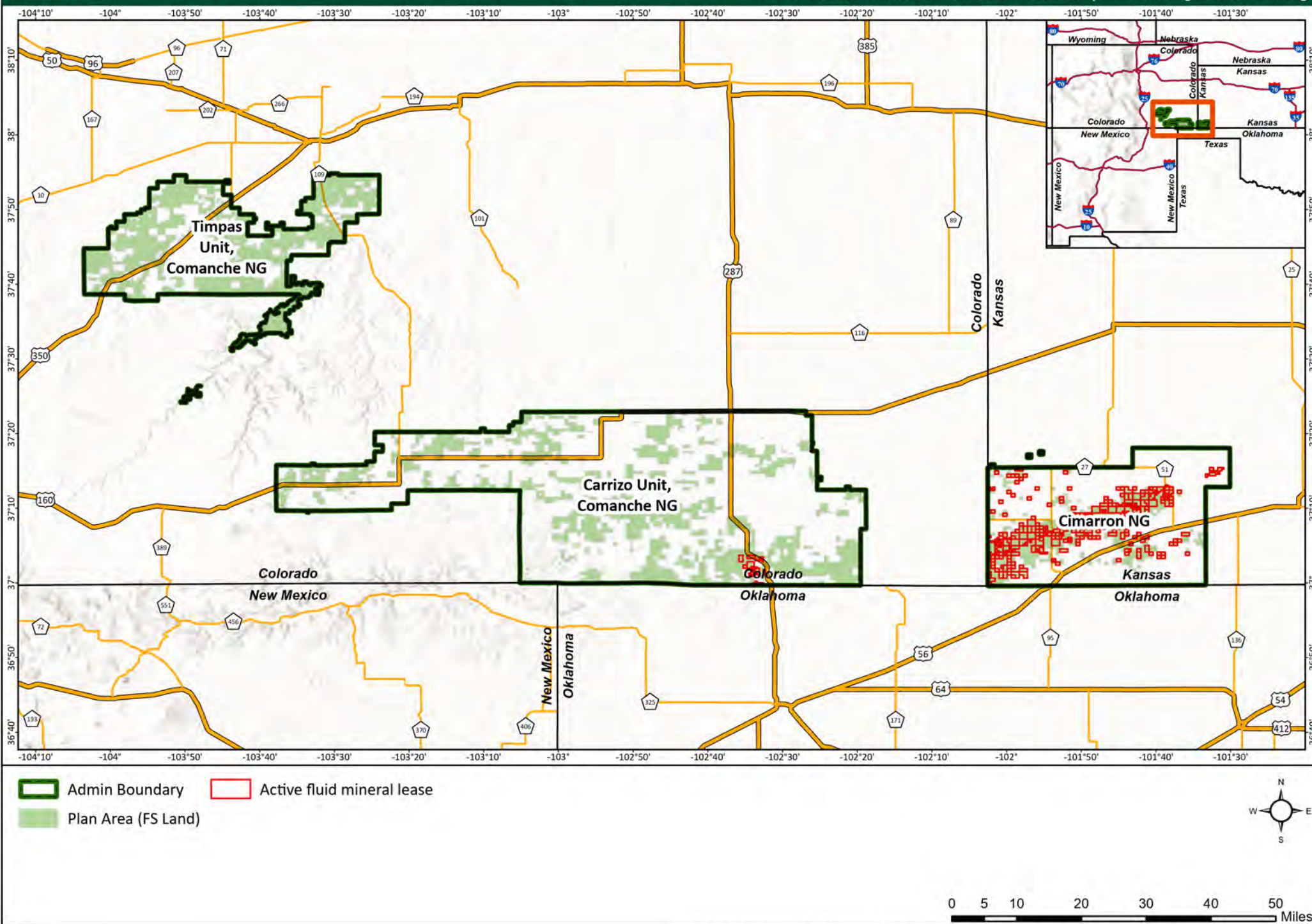
Data from the National Renewable Energy Laboratory show that the relative geothermal favorability of the Cimarron and Comanche National Grasslands ranges from moderate to least favorable, compared with the rest of the United States (Roberts 2018b). There are no geothermal leases in the area (BLM 2024).

²² The total results represent an estimate of the number of jobs and labor income supported by the dollar amount of Forest Service activities in the area per average year. **More specifically, each job is not represented by a single person in the context of economic contributions analysis.** Please refer to the Economic Contributions subsection of Appendix A for further discussion of methods used.



USDA Forest Service

Figure 14. Fluid Mineral Leasing
Cimarron and Comanche National Grasslands| Land Management Planning



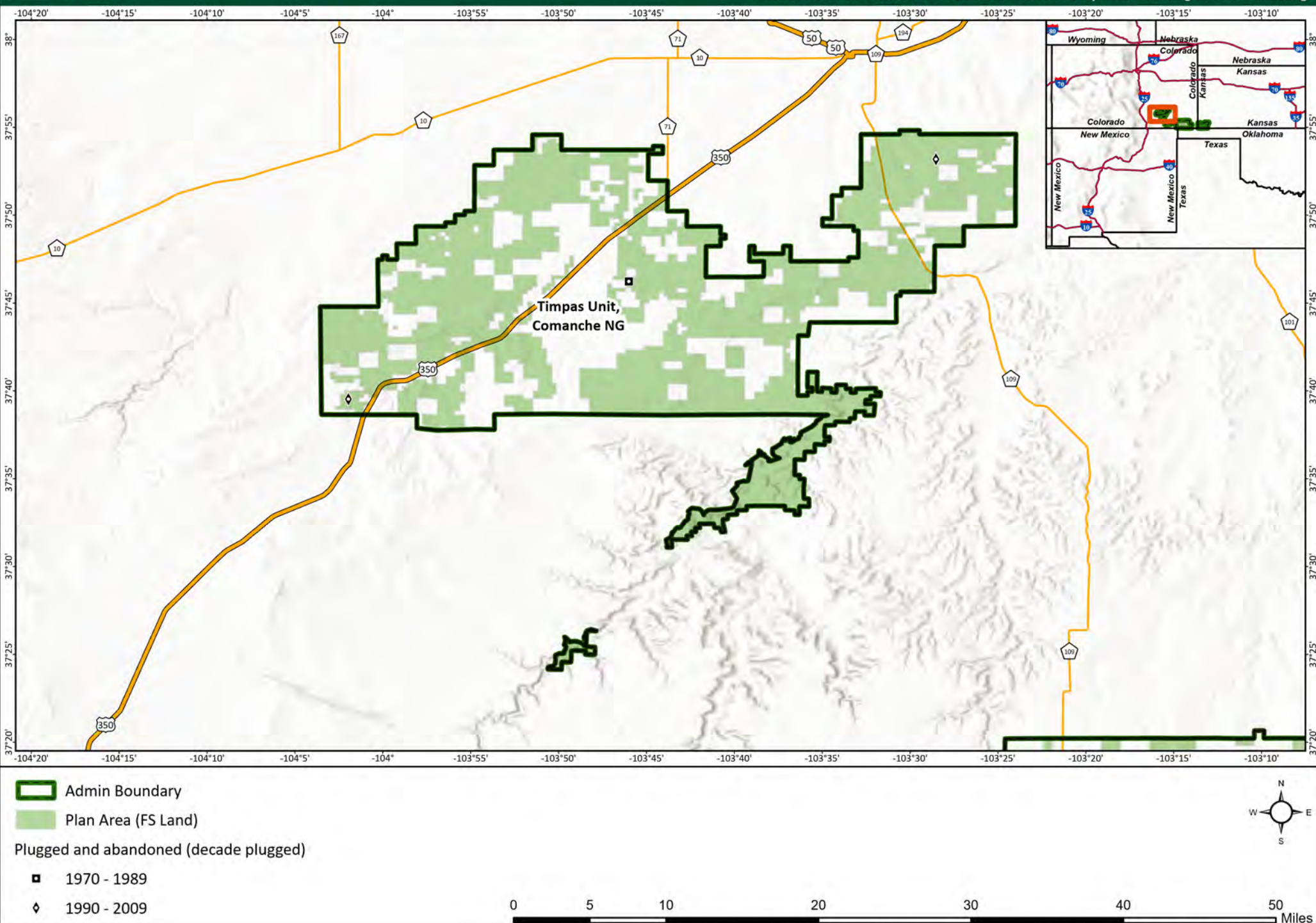
6/26/2025
Datum: North American 1983. Scale: 1:1,200,000

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USDA Forest Service

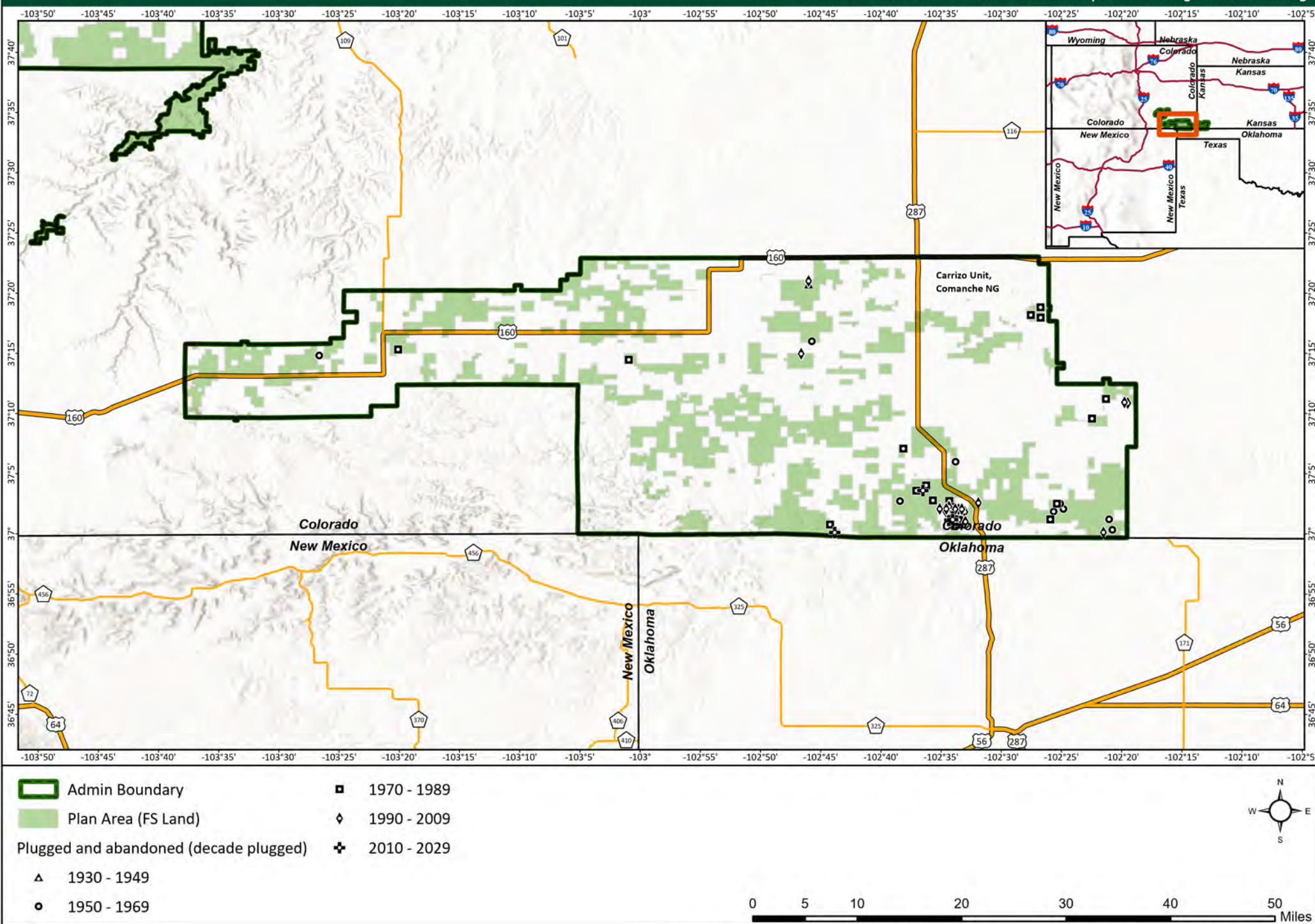
Figure 15. Oil and Gas Wells
Cimarron and Comanche National Grasslands| Land Management Planning





USDA Forest Service

Figure 16. Oil and Gas Wells
Cimarron and Comanche National Grasslands| Land Management Planning



6/26/2025
Datum: North American 1983. Scale: 1:744,000

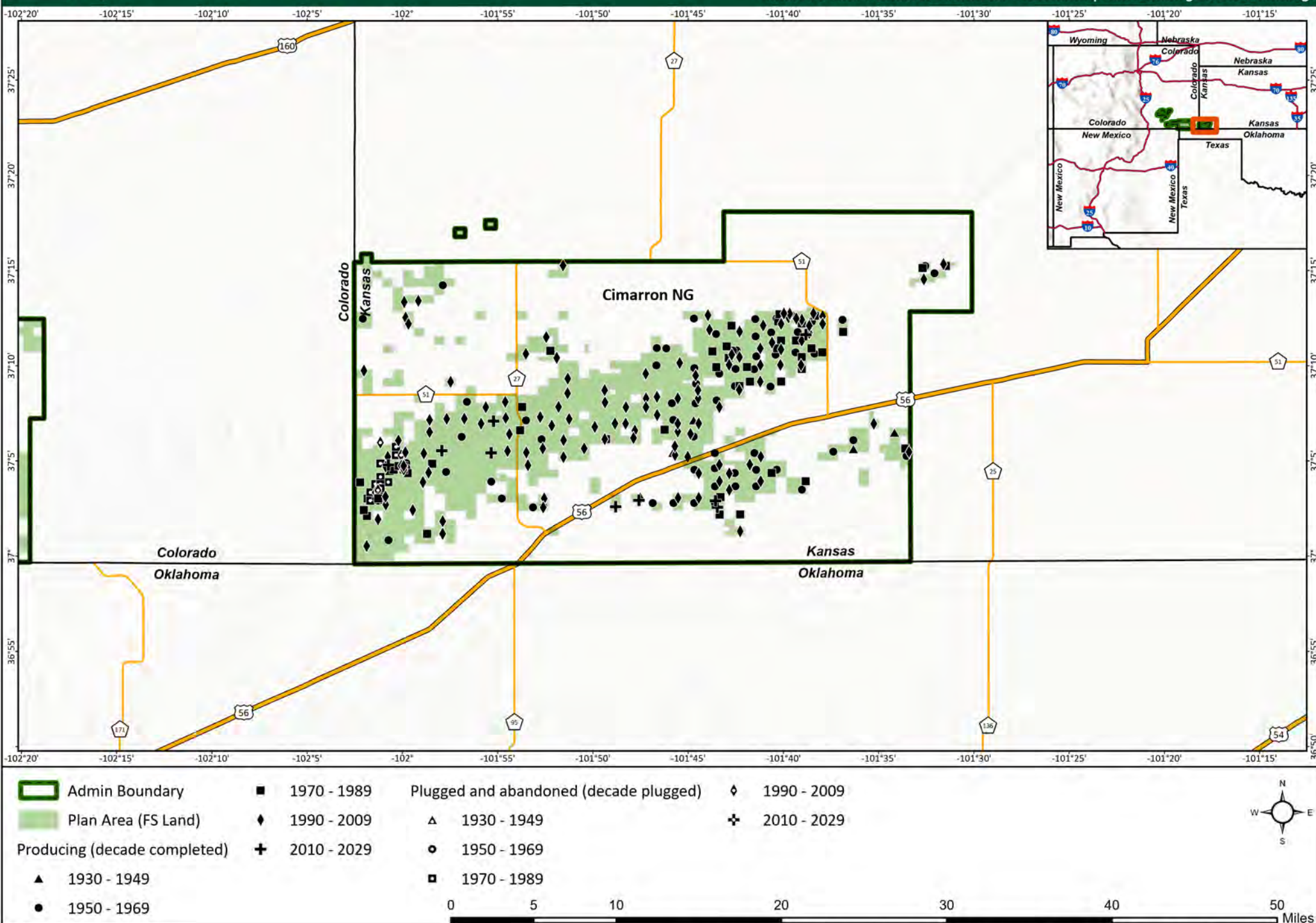
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USDA Forest Service

Figure 17. Oil and Gas Wells

Cimarron and Comanche National Grasslands| Land Management Planning



6/26/2025
Datum: North American 1983. Scale: 1:471,000

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Status and Trends

After development drilling in the Campo Field in 1991 and 1992, drilling activity within the Comanche National Grassland significantly slowed. From 1993 to 2003, only six wells were drilled in the area. The last 23 active wells in the Campo Field on the Comanche National Grassland are currently being plugged and abandoned as the field has reached the end of its productive life. Murfin Drilling Company, initially proposed a workover of a test well to evaluate the viability of producing from the Neva Formation. However, the cost and complexity made the project economically unfeasible, leading to the decision to plug the remaining wells. Unless new technologies extend viability, all Comanche O&G wells are expected to be plugged by 2026, barring further delays²³. Nearby wells on private land remain in operation. However, there is potential for new discoveries of additional reserves in the region through exploratory drilling.

By 2040, an additional 14,000 acres of reverted private mineral estates within the Cimarron National Grassland will revert to federal ownership. The remaining private mineral estate is privately held in perpetuity. Oil and gas production is expected to continue on the Cimarron, a 2003 BLM review projected little change in overall oil and gas production levels. However, production records for Morton County, Kansas, which contains almost all the federal mineral estate within the Cimarron National Grassland, show that production of oil and gas has been on a declining trend since 1995 (Kansas Geological Survey 2025).

Due to the low relative geothermal potential of the Cimarron and Comanche National Grasslands, no development of geothermal energy is likely to occur. As a result, there are not expected to be economic contributions associated with geothermal energy activity.

Due to the limited expected new drilling to occur, the economic contributions associated with new future oil and gas activity are expected to be limited. Reclamation of oil and gas sites can be used as an opportunity to improve ecology and diversity. For example, in New Mexico, the Playa Lakes Joint Venture restored oil infrastructure sites and created nearly 4,000 acres of LPC nesting habitat, demonstrating how reclamation efforts can benefit wildlife (Nature Conservancy, 2011).

Opportunities for management planning include assessing whether existing management is effective in protecting other resources in the Cimarron and Comanche National Grasslands or if there are opportunities to reduce or mitigate impacts. Another consideration is post-oil and gas land use. Many oil and gas sites have spur roads leading to flat pads, particularly around the Cimarron River, which could be maintained for recreation, campsites, OHV use, or other public access. Alternatively, these existing pads and roads could be used to support new development, such as a wind farm, transitioning the area from one energy industry to another.

Geological Resources

Geological Hazards

Key Takeaways

- The geological hazards that occur in the Cimarron and Comanche National Grasslands include landslides, flooding, other weather-related events, and abandoned mine lands features. Geological hazards could pose risks to the health and well-being of people and property in surrounding communities. Datasets like FEMA's National Flood Hazard Layer, the USGS Riverine Flooding Analysis, and the USGS Landslide Hazards Program can provide critical information to support local risk management, environmental planning, and hazard mitigation strategies.

²³ Cullen Lapointe, Forest Service Geologist. Comment on draft document, January 29, 2025.

Summary

Geological hazards are natural or human-altered processes that pose potential threats to public health, safety, infrastructure, and resources. Damage resulting from geological hazards can impact economic and social sustainability through costs of repair and medical bills, and reduced quality of life and way of life to the surrounding communities.

In the Cimarron and Comanche National Grasslands, geologic hazards include landslides, flooding, other weather-related events, and abandoned mine land features. Federal laws and agency regulations provide guidance on managing these hazards, emphasizing the identification of hazard zones, avoiding infrastructure development in these areas, and applying best practices to mitigate or prevent risks.

A USGS study of landslide susceptibility shows that portions of the Cimarron and Comanche National Grasslands have landslide susceptibility and that there are a few locations with a possible landslide occurring (Jones et al. 2019).

There are two documented abandoned land mine sites in the Cimarron and Comanche National Grasslands. One is listed as a sand pit and has an environmental hazard rating of “slight” and a physical hazard rating of “no significant hazard.” The second is listed as a flagstone quarry and has an environmental hazard rating of “none” and a physical hazard rating of “no significant hazard” (Sares et al. 2020).

Status and Trends

Datasets such as FEMA’s National Flood Hazard Layer, the USGS Riverine Flooding Analysis, and the USGS Landslide Hazards Program offer valuable information to assist with local risk management, environmental planning, and hazard mitigation efforts. These sources should be used to inform decisions involving the location of infrastructure. Landslides present a significant hazard, where they can cause loss of life, injury, and substantial socioeconomic disruption. Forecasting potential landslide locations is a critical tool for mitigating their impacts. Typically, landslide susceptibility models use historical data, mapping past landslides and correlating them with specific hillslope characteristics. These models assume that areas where landslides have occurred in the past will continue to be prone to failure in the future.

However, findings from a study by Jones et al (Jones, Boulton, et al. 2021) highlighted that landslide-prone areas are not static; they shift over time due to a variety of triggers, including extreme events like storms, floods, and earthquakes. These triggers lead to changes in the landscape, making the use of a single “snapshot” of landslide locations insufficient for accurately assessing future susceptibility. The study suggests that landslide hazard models need to be examined and updated regularly rather than relying solely on historical data, to improve predictions and better assess risks in rapidly changing areas.

Opportunities for management planning include examining locations of existing and planned infrastructure and recreation areas in relation to known or suspected geological hazards, and relocating facilities or trails where a human health or safety hazard may be present.

Paleontological Resources

Key Takeaways

- The Cimarron and Comanche National Grasslands have fossil localities where these ancient records are preserved in rock layers and exposed through erosion, thus requiring management efforts to prevent their loss to the elements.
- The paleontological resources in the Cimarron and Comanche National Grasslands attract visitors and researchers, supporting science, education and recreation that provides economic and social

benefits to surrounding communities. These fossil-rich areas offer opportunities for scientific discovery, education, and tourism, contributing to local economies while promoting public appreciation for the region's geologic history.

Summary

The potential for paleontological resources is assessed using a metric called the Potential Fossil Yield Classification (PFYC) system, which ranges from Class 1 (very low) to Class 5 (very high), as well as unknown. Table 20, below, shows the PFYC for the plan area within the Cimarron and Comanche National Grasslands.

Table 20. Comanche National Grassland PFYC

PFYC	Acres
Class 1 – very low	700
Class 2 – low	219,200
Class 3 – moderate	123,000
Class 4 – high	130,700
Class 5 - very high	75,500
Class U - unknown	3,200
Total	552,300

Source: USFS GIS 2024

There are two paleontological special interest areas in the plan area, the Fullerton Gravel Pit in the Cimarron National Grassland, and the Picket Wire Canyonlands in the Comanche National Grassland.

The paleontological resources in the Cimarron and Comanche National Grasslands offer recreational opportunities for visitors to participate in dinosaur track viewing. The recreational opportunities support economic and social sustainability through jobs, income, physical and mental health, and quality of life and enjoyment (see the Contributions to Social and Economic Sustainability section of Appendix A for more information).

Status and Trends

As additional study occurs, other areas could meet the criteria for and be designated as paleontological special interest areas. Focused management efforts would refine PFYC classifications and result in preservation of paleontological resources using scientific principles and expertise as required by federal law.

Management needs include additional inventory and monitoring, as well as implementing mitigation plans for ground-disturbing activities in areas with high to very high fossil potential. These efforts help preserve paleontological resources while imposing no restrictions on multiple use activities.

Caves and Karst Resources

Key Takeaways

- There are numerous cave features in the Cimarron and Comanche National Grasslands. While data indicate that parts of the Cimarron and Comanche National Grasslands are underlain by karst-type bedrock, there is only one suspected karst surface depression and no known karst caverns present.

Summary

Karst landscapes, formed by the dissolution of soluble rocks such as limestone, can lead to features like caves, sinkholes, and underground streams. These resources are important for supporting groundwater

systems, providing habitats for species like bats, offering insights into the area's geological and paleontological history, and providing recreational opportunities. Management of these features is crucial to ensure their protection. Mapping shows that some areas within the Cimarron and Comanche National Grasslands have carbonate (limestone) or evaporate (gypsum and salt) bedrock (USGS 2020), indicating that these areas may be susceptible to the formation of surface karst features such as sinkholes and caves. The formation of these types of features depends on the amount and rate of dissolution occurring in the karst bedrock, and the strength and thickness of overlying formations to resist subsidence or collapse.

There are a number of caves in the Cimarron and Comanche National Grasslands, mostly located within canyon country in the Comanche National Grassland. None of the caves have been determined to meet the criteria for significant cave designation under 36 CFR 290.3. A number of the caves have been assessed by the Heritage Program as they contain outstanding cultural features (rock art, hearths, lithics) and some are eligible for designation as heritage sites. None of the caves are known to be karst features; the only suspected karst feature is one surface depression with a depth of greater than 20 feet located partially within lands managed by the Cimarron and Comanche National Grasslands staff documented in a study conducted by the Colorado Geological Survey (White 2012).

Status and Trends

Karst areas may become better understood and documented with further scientific study of the area. Cave or karst features may be discovered and documented in the future, and new features may develop. Opportunities for management planning include examining existing management for known caves and pursuing further study to survey for caves and karst features.

National Forest System Roads, Trails, and Infrastructure

National Forest System Roads

Key Takeaways

- Roads are essential within the Cimarron and Comanche National Grasslands, supporting economic activities, connecting communities to recreational opportunities and cultural sites, and enabling critical services such as emergency response. However, roads can also negatively impact the environment through habitat fragmentation, erosion due to wind and water, and edge effects.
- County jurisdiction roads make up the largest segment (50 percent) of the road network within the boundaries of the Cimarron and Comanche National Grasslands. The majority of national forest system roads in the Cimarron and Comanche National Grasslands (94 percent) are maintained for passage by high-clearance vehicles and not all are suitable for use by standard passenger cars.
- Access is impacted by extreme weather and erosion events, which leads to braiding and widening of National Forest System roads as travelers deviate from the traveled way due to surface damages.

Summary

The arrival of European settlers and the subsequent construction of trails and roads, including the Santa Fe Trail, significantly altered the landscape and cultural dynamics of the region (see Designated Areas – National Scenic and Historic Trails). These roads facilitated westward expansion, trade, and settlement, influencing the region's land use pattern.

Beginning in the 1930s, a primitive and rudimentary road network serviced both the Cimarron and Comanche National Grasslands. Roads were primarily used to facilitate access to grazing allotments,

windmills, and other ranching infrastructure. They were constructed using native materials, and they received little maintenance until the late 1950s (USDA Forest Service 2005c).

In the Cimarron National Grasslands, the boom of the petroleum industry in the 1960s led to a dramatic increase in the number and length of roads, which in turn necessitated a higher level of maintenance. This trend continued until the year 2000 (USDA Forest Service 2005c).

As a result of the fragmented landownership pattern, the Comanche National Grassland have historically relied on state and county departments to help maintain the road network. These roads were also constructed of native materials and contained limited surfacing. The installation of allotment fences and the development of oil and gas resources in the Comanche National Grassland have continued to a gradual increase in the number of miles of road and level of maintenance (USDA Forest Service 2005c).

Status and Trends

The Cimarron and Comanche National Grasslands are currently serviced by a 3,943-mile existing road network. Approximately 1,325 miles of this network (34 percent of the total Cimarron and Comanche National Grasslands road system) consist of National Forest System roads. The remaining 2,618 miles consists of federal, state, and county roads that traverse the plan area. County roads constitute the largest portion of this latter category, totaling approximately 1,972 miles (50 percent) of the road network. Federal highways comprise 415 miles (10 percent), with the remaining 231 miles (6 percent) consisting of state roads. To date, over 800 miles of National Forest System roads have been decommissioned which does not include administrative roads for projects and access for special uses. Table 21, below, details the roads in the plan area by management and spatial extent.

Table 21. Roads in the plan area²⁴

Type	Spatial Extent (Miles)
National Forest System roads open to public motorized travel*	1,325
Federal Highways	415
State roads	231
County roads	1,972

*Roads open to public motorized use for at least some portion of the year, including those listed on the Motor Vehicle Use Map (MVUM).

The majority of the National Forest System roads within the Cimarron and Comanche National Grasslands (94 percent, or 1,246 miles of the total 1,325 miles of National Forest System roads) are classified as maintenance level 2, per the Forest Service Transportation Management Handbook. This means high-clearance vehicles are recommended for access (USDA Forest Service 2005c). The remaining 6 percent of the National Forest System roads are classified as maintenance level 3 (they are suitable for passenger cars, but user comfort is not a priority) and maintenance level 4 (there is a moderate degree of user comfort). There are no maintenance level 1 (closed more than 1 year) or maintenance level 5 (dust free; possibly paved) National Forest System roads in the plan area. See table 22, below, for details.

²⁴ Unpublished roads and trails data, provided by USFS on September 10, 2024.

Table 22. Miles of National Forest System roads in the plan area by maintenance²⁵ level

Maintenance Level	Miles of National Forest System Road (Miles)
Maintenance level 1	0
Maintenance level 2	1,245.6
Maintenance level 3	79.6
Maintenance level 4	0.47
Maintenance level 5	0

National Forest System roads that allow motor vehicles use two primary designations: Roads Open to Highway Legal Vehicles Only and Roads Open to All Vehicles (motorized mixed use). Examples of vehicle types that are highway legal include passenger cars, pickup trucks, SUVs, and motorcycles that are by state law licensed for general operation on all public roads. Vehicle types that are not highway legal include all-terrain vehicles, side-by-sides, and off-road motorcycles that are not licensed under state law for operation on public roads. A road that is designated as Open to All Vehicles allows any motor vehicle, both licensed and unlicensed, for general use on all public roads in the state, which includes off-highway vehicles.

In the Cimarron National Grassland, road maintenance is primarily accomplished by using a cooperative agreement with the Morton County Road Department of Kansas. Many roads within the Cimarron National Grassland were constructed for the purposes of accessing oil and gas operations; as such, maintenance of roads is also achieved in cooperation with individual oil and gas lease operators (USDA Forest Service 2005c).

NFS roads within the Comanche National Grassland were primarily constructed to access range allotments and improvements. Road maintenance is likely to continue to be maintained at or near current levels and will continue to be accomplished in collaboration with local county road departments (USDA Forest Service 2005c).

Roads play a crucial role in the Cimarron and Comanche National Grasslands and the surrounding communities. Roads support economic activities, such as oil and gas extraction, and facilitate access to agricultural land, rangelands, and livestock allotments. Roads also connect communities throughout the plan area, enabling visitors access to recreational areas and cultural sites. Accessible roads are crucial for emergency response; they facilitate crucial ingress and egress during natural disasters, such as wildfires; enable evacuation; and provide first responders the ability to transport essential supplies and equipment. Additional information on how roads and infrastructure support economic and social sustainability is provided in the Agency Operations and Infrastructure section of Appendix A.

While roads are vital for enabling sustainable resource management efforts and facilitating economic growth, they can also impact the ecological integrity of the Cimarron and Comanche National Grasslands, reducing landscape connectivity, contributing to habitat fragmentation and loss, and disrupting animal movement due to edge effects (the physical and biological changes that occur when a road creates a new boundary between two ecosystems) (Clevenger and Huijser 2011). While high-traffic and high-speed roads tend to be most disruptive, secondary highways, unpaved roads, and even open corridors have been shown to also change animal movement (Clevenger and Huijser 2011).

As population has increased and use type has shifted to accommodate traffic beyond the access needs creating these roads, recreational use has escalated in impact and importance. On the Comanche National Grassland specifically, roads initially created for range management are increasingly traveled by hunters, birders, and other recreational users. Over 900 miles of Maintenance Level 2 roads access the land and most are little more than “two-tracks” which were never located with increased traffic in mind and

²⁵ Unpublished roads and trails data, provided by USFS on September 10, 2024.

have never received maintenance with heavy equipment. As a result, many are in poor repair due to increased use while others often disappear due to lack of use. No differentiation in symbology exists on public maps and management strategies are the same due to their current designation. [A modern travel management analysis could better differentiate between routes needed for permitted use and those which are managed and recommended for public recreational use.]

Trends affecting the condition, use, or development of roads within the plan area and broader region include increasing weather variation and **increasing populations**. The impacts of these trends on roads, trails, and infrastructure are described below:

- The plan area resides within Forest Service Region 2, where increased frequency of extreme weather events, such as variable participation, is projected (DOT 2018). This heightens the risk of disturbances to roads, trails, and infrastructure from flooding, landslides, road washout, and culvert failures (DOT 2018); (Furniss and Howe 2016). Proximity to waterways significantly increases the vulnerability of these assets; roads, trails, and infrastructure are more vulnerable where they are located close to or cross streams and rivers.
- Within the Cimarron and Comanche National Grasslands, 94 percent of roads are maintenance level 2, meaning they are maintained for passage by high-clearance vehicles and not all are suitable for use by standard passenger cars, with minimal maintenance to focus on basic functionality; impacts from more extreme precipitation events may increase road susceptibility to washout or further erosion (DOT 2018).
- As populations increase, urban development can encroach on rural areas, resulting in the construction of new roads or the expansion of existing roads. Effective road network planning and development necessitate a thorough assessment of potential impacts on ecosystems, habitat connectivity, and wildlife population viability.
- The current management plan provides transportation system management direction (L01 and L20) related to road development and closures as the plan pertains to user safety, public access needs, or adverse impacts on natural resources, such as soil and water systems (USFS 1984). However, the plan lacks sufficient guidance to address impacts related to flooding or higher intensity precipitation events or incorporate emerging data and information into transportation network and road planning. As such, current management guidance overlooks broader ecosystem considerations.

National Forest System Trails

Key Takeaways

- Trails provide numerous benefits to local communities by promoting physical and mental health, supporting local businesses, and contributing to jobs and revenue in the area.
- Natural Resource Manager data from September 2024 indicates that approximately 28 miles of open National Forest System trails are not maintained to the national quality standards. Deteriorating infrastructure, such as eroded surfaces or compromised drainage systems, can amplify vulnerabilities to increased precipitation variability, extreme wind or storm events, and slope instability (Furniss and Howe 2016).
- While the current management plan addresses the need to regularly update and maintain trails for safety purposes, it does not provide adequate management direction to respond to modern trail management concerns related to flooding or higher intensity precipitation events, ecological integrity, or social and economic sustainability. Moving forward, aligning management strategies with EM-7720-103 (Standard Specifications for Construction and Maintenance) and FSM -2300 (Recreation Management) can help establish a sustainable maintenance schedule and recreation strategy that incorporates long-term ecological and economic considerations.

Summary

The plan area contains a rich history related to trail development within the plan area and broader region. The Santa Fe Trail served as a vital overland commercial trade route from Santa Fe, New Mexico, to Missouri between 1820 and 1870 (see Designated Areas – National Scenic and Historic Trails).

In addition to preserving and commemorating culturally and historically valuable areas, trails provide a number of additional benefits to local communities, such as providing access to public lands for recreation or education, improving public health by encouraging physical activity, and providing safer transportation routes for cyclists and pedestrians (Headwaters Economics 2016).

Well-established trail networks contribute to economic sustainability by attracting visitors and tourists who spend on local food, lodging, and services within the community. Additionally, trails support businesses that cater to outdoor enthusiasts, such as guide services, bike shops, and outdoor gear retailers. Properly designed and maintained trails also help mitigate damage to natural resources caused by heavy or concentrated visitor use.

Hiking, biking, horseback riding, and motorized activities are popular recreational activities within the Cimarron and Comanche National Grasslands. Ensuring the long-term sustainability of the trail network is essential to provide continued opportunities for these uses while protecting the natural environment and cultural resources of the area (see the Agency Operations and Infrastructure section of Appendix A for more details how trails support economic and social sustainability).

Status and Trends

There are a total of 163.9 miles of open National Forest System trails within the Cimarron and Comanche National Grasslands plan area; the vast majority of these (144.5 miles) are designated for nonmotorized use. The remaining 19.4 miles are for motorized activities and include 19.2 miles of trails for four-wheel-drive vehicles (the Cimarron River Trail) and two all-terrain vehicle trails (the Hill Climb and Sand Trap), consisting of less than a quarter mile total (0.19 miles). In addition to these motorized trails, there are also National Forest System trails that are also open to motorized use, including passenger vehicles, OHVs, motorcycles, and e-bikes. These shared-use trails provide additional motorized access beyond designated motorized roads and trails.

Of the 144.5 miles of nonmotorized trails, approximately 99.6 miles are managed for pedestrian (non-motorized, non-equine) uses, such as hiking and trail running. There are 8.5 miles of biking trails known as the Picket Wire Canyonlands. Approximately 36.3 miles are managed for pack and saddle (for example, equestrian) use, which includes the following trails: Arch Rock, Homestead, Outlaw, Companion, and Wilburton to Turkey.

A total of 7.4 miles of trails have been decommissioned, including 4.7 miles of the West Turkey singletrack motorized trail, 2.2 miles of the East Turkey River Loop and 0.2 miles of East Turkey Cutoff pack and saddle trails, and 0.25 miles of the Cottonwood Trail for pedestrian use.

Only a small portion (less than 2.5 percent) of trails within the plan area are not managed by the National Forest System. This includes 4 miles of trails maintained by local governments (counties, parishes, or boroughs) and 0.1 miles of privately owned trails.

The National Quality Standards for Trails establish desired outcomes for National Forest System trails managed at a full-service level. These standards also form the baseline for estimating the cost of managing National Forest System trails. The National Quality Standards for Trails consist of five key measures: health and cleanliness, safety and security, condition of facilities, responsiveness, and resource setting.

Of the total miles of open National Forest System trails within the plan area, approximately 73.9 miles are fully maintained, and approximately 28.7 miles lack full maintenance. Further evaluation is required to determine the current condition and maintenance level of the remaining 61.2 miles of trails. Trails lacking

regular maintenance are more susceptible to extreme weather events because deteriorating infrastructure, such as eroded surfaces or compromised drainage systems, can amplify vulnerabilities to increased precipitation variability, extreme storm events, and slope instability (Furniss and Howe 2016).

Per the 2005 Travel Management Rule, the Forest Service is required to identify and publish a MVUM for all national forests and grasslands. The MVUM shows motorized users where motorized use is allowed and clarifies the allowable vehicle class (for example, vehicles less than 50 inches wide, highway-legal vehicles, and motorcycles) and season of use. The 2019 MVUM is the most recent available map for the Cimarron and Comanche National Grasslands; it is available on the Pike-San Isabel National Forests and Cimarron and Comanche National Grasslands website at <https://www.fs.usda.gov/detail/psicc/maps-pubs/?cid=stelprdb5177824>.

Trends affecting the condition, use, or development of trails within the plan area and broader region include projected climatic conditions, increasing populations, unauthorized off-road use by motorized and mechanized equipment, and potential user conflicts, as described below:

- The plan area is within Forest Service Region 2; projected climatic variables for this region include an increased frequency of extreme precipitation and flooding, landslides, and more frequent and intense droughts and wildfires. These will place additional stress on the existing trail network, resulting in an increased likelihood of trail washout or erosion (DOT 2018).
- These impacts can render routes and trails impassable or inoperable for extended periods of time, disrupting public access and the recreational user experience. Adaptation strategies are crucial for the long-term resilience and sustainability of the trail network, which is vital for public access, recreational use, public safety, and supporting social and economic sustainability.
- Management direction related to trail system management in the current management plan (L23) emphasizes managing trails for non-motorized or equine travel (unless specifically closed to either user), maintaining transportation structures (for example, bridges and corduroys) to structurally sound and safe standards, and removing hazards such as loose rock, rotten infrastructure, or bog holes, which can impede safe travel (USFS 1984). The management plan also acknowledges the importance of coordinating trail opportunities with other federal, state, and municipal and private entities. While these are important considerations, the current management plan does not sufficiently address or respond to modern trail management concerns related to more extreme precipitation events, ecological integrity, increased visitation, or social and economic sustainability, as described above.

Infrastructure

Key Takeaways

- Infrastructure can stimulate economic growth, enhance recreational opportunities, improve public health, and provide access to public lands; at the same time, infrastructure can also fragment habitats, alter natural ecosystem processes, and disrupt cultural landscapes.
- Infrastructure located near streams and rivers is particularly vulnerable to more frequent extreme weather events and increased precipitation variability. These factors heighten risks to structural failures, water quality, and ecosystem disruption, as even small waterways can cause significant damage to infrastructure during storms or instances of slope instability.

Summary

Infrastructure within the plan area and broader region is a testament to the region's rich history and growing desirability as a recreational destination.

Infrastructure within the plan area consists of roads, trails, water and wastewater systems, communications towers and lines, bridges, dams, recreational facilities, gates, cattle guards, and fences. Administrative facilities include offices, warehouses, living quarters (barracks and individual residences), and fire stations. These facilities support Forest Service employees, equipment, and activities necessary for the management of the Cimarron and Comanche National Grasslands. Recreation infrastructure includes developed campgrounds, cabins, pavilions, shops, and toilets associated with recreational use (see Recreation). Travel management infrastructure includes roads, trails, and bridges (see National Forest System Roads and National Forest System Trails).

Infrastructure plays an important role in ecological, social, cultural, and Tribal sustainability. Infrastructure projects can have a significant impact on shaping, enhancing, or impeding various land uses and ecological processes; roads, buildings, and other infrastructure development can contribute to land and habitat fragmentation or cause changes in animal migration and water flow patterns. Some infrastructure, such as resource-extraction infrastructure or energy infrastructure, can also lead to pollution, poor air quality, and poor soil quality. Infrastructure projects can also alter the landscape and impact important cultural areas, such as archaeological or historic sites, in turn affecting the local community's sense of place.

On the other hand, infrastructure can provide important public benefits, stimulating economic growth through job creation during construction and maintenance, improving public access to public lands, and providing important public health services through clean water, sanitation systems, and emergency response (see the Agency Operations and Infrastructure section of Appendix A for more details how infrastructure impacts economic and social sustainability).

Status and Trends

Buildings

There are 63 buildings within the plan area that are further categorized into the following: industrial, service, storage, office, communications, housing, and other uses, as follows:

- **Industrial:** Five industrial buildings serve as pump houses or treatment centers.
- **Service:** Service infrastructure includes shelters, vault toilets (for example, outhouses), pavilions, shops, and an interpretive shelter. Within the plan area, there are currently 15 actively managed vault toilets and 2 shops (1 additional shop exists, for a total of 3 shops, but is not currently in active use). There are also 16 shelters and 3 pavilions interspersed throughout the area. There is currently only one interpretive shelter (Sierra Vista Interpretive Shelter) that also contains a parking area, trailhead for a 3-mile trail, and various exhibits and viewpoints.²⁶
- **Storage:** There are nine storage buildings for various uses, such as seed storage, steel sheds, vehicle storage, hazmat storage, and district storage.
- **Office:** The Cimarron National Grassland District Office is the only administrative office in the plan area.
- **Communication:** There is one telecommunications radio shed in the plan area.
- **Housing:** There are two housing units for the Carrizo Work Center dwelling and the Picket Wire Canyon manager's house.
- **Other:** This category consists of seven structures, including a calving shed, a ranch garage, a ranch stable, a stock shelter, a ranch storage, a ranch barn, and a ranch house.

²⁶ <https://www.nps.gov/places/sierra-vista-interpretive-site-comanche-national-grassland.htm>

Dams

- Five active dams are in the plan area; nearly all of them are fully operational, except for one (Timpas).

Communication Systems

- Ten radio towers are in the plan area; seven are owned and used by the Forest Service. The three remaining radio towers are privately owned (one), owned by the State (one), or leased by the Forest Service to another entity (one).

Water and Wastewater Systems

- **Wastewater:** There are three active and one disposed wastewater (septic) systems. In 2012, the Forest Service attempted to clean out the now disposed septic system, known as the Little Washington Wastewater System, but was unable to do so because the 1,000-gallon unit was filled with roots and fairly dry.
- **Water:** There are 35 water systems within the plan area that consists of wells, windmills and towers, water troughs, stock dams, overflow pits, water troughs, or general water systems that provide drinking water for people or animals. Of the 35 water systems, 16 are considered to be in good condition, 2 are considered satisfactory, and the remaining 17 water systems are pending condition ratings. Refer to Water Resources regarding public water systems.

Infrastructure within the plan area reflects the region's rural character, primary land uses, and community values, including barns, storage sheds for livestock and agricultural equipment, and water and wastewater systems for providing drinking water to people and animals. Several buildings and infrastructure also provide services and support for staff, visitors, and recreationists, including numerous administrative buildings, vault toilets, shops, and pavilions. Table 23 shows the NFS infrastructure in the plan area.

Table 23. National Forest System infrastructure in the plan area

Type	Number in Plan Area
Bridge (road)	1
Bridge (pedestrian)	3
Communication tower	10
Dam	5
Water system	35
Wastewater system	3
Administrative residence	2
Shelter	13
Toilet (vault)	15
Pavilion	3
Shop	3
Administrative facility	1
Visitor center	1
Storage	9

Note: Non-Forest Service infrastructure on National Forest System lands under a special use authorization or easement is captured/summarized under the Use and Access section.

The current management plan aims to thoroughly evaluate the facilities proposed for construction or development within the 100-year floodplain (A05 and A06).

The primary vulnerability of roads, trails, and infrastructure is extreme storms and related flooding (Furniss and Howe 2016). A vulnerability assessment completed for the Cimarron and Comanche National Grasslands in 2016 found that infrastructure is vulnerable to flooding, particularly when located within 100 feet of streams and rivers. More frequent and intense weather events, such as increased precipitation variability and shifting hydrological patterns can exacerbate risks to structural integrity due to flooding, erosion, and sedimentation, which can compromise infrastructure stability and functionality (Furniss and Howe 2016). Additionally, the proximity of infrastructure to waterways increases the likelihood of adverse effects on water quality or aquatic ecosystems.

Management efforts that consider ways to enhance infrastructure resistance (actions that defend against disturbance), resilience (actions that promote the ability to bounce back or return to prior conditions after a disturbance), and transitions (actions that accommodate or promote change to align with anticipated future climate conditions) can help assist land managers when considering the impacts from increased frequency of extreme weather events in infrastructure design and development (USDA Forest Service 2023b).

Recreation

Summary

The focus of the assessment for recreation is to identify and evaluate information about recreational settings and the uses, trends, and sustainability of recreational opportunities in the plan area; recreational access; and scenic character. The 2012 Planning Rule directs that forest plans must provide for sustainable recreation (Section 219.10(b)(1)(i)). The rule defines sustainable recreation as “the set of recreation settings and opportunities on the National Forest System that is ecologically, economically, and socially sustainable for present and future generations” (Section 219.19).

Recreational settings and opportunities are enhanced by the many visible and accessible remnants of the past. The Santa Fe National Historic Trail and the Santa Fe Trail National Historic and Scenic Byway offer visitors a chance to follow in the footsteps of early traders and travelers. The Picket Wire Canyonlands offer visitors the chance to walk in the footsteps of Jurassic-period dinosaurs in the largest and most well-preserved track site in North America.

According to 2021 USDA National Visitor Use Monitoring Program (NVUM) data for the Cimarron and Comanche National Grasslands, annual visitation to the grasslands is about 71,000 visitors (USDA Forest Service 2021). The grasslands attract visitors who are local, regional, and national; approximately 44 percent of visitors travel less than 50 miles, while almost 20 percent travel between 200 and 500 miles. Of the grasslands’ visitors, 86 percent are very satisfied with their recreational experience (USDA 2021). The top five reasons people recreate in the plan area are hiking/walking, viewing natural features, visiting historic sites, viewing wildlife, and nature study (USDA Forest Service 2021).

Spending by recreationists attributed to the Cimarron and Comanche National Grasslands supported an estimated 15 annual total jobs, \$505,000 in total labor income, and \$859,000 in total GDP (also referred to as “value added”; see table 24 in the Economic Contributions section of Appendix A).²⁷ Ecosystem services associated with recreation in the Cimarron and Comanche National Grasslands include cultural services, such as quality of life, physical, mental and spiritual health; experiencing and connecting with

²⁷ The total results represent an estimate of the number of jobs and labor income supported by the dollar amount of Forest Service activities in the area per average year. **More specifically, each job is not represented by a single person in the context of economic contributions analysis.** Please refer to the Economic Contributions subsection of Appendix A for further discussion of methods used.

nature; a sense of place and community; and educational opportunities on ecosystems, the environment, and cultures. These ecosystem services provide communities value beyond those that are captured in the economic contributions discussed.

Status and Trends

Both Colorado and Kansas have recently published an updated state comprehensive outdoor recreation plan (SCORP). These plans serve as the guiding documents to promote integrated outdoor recreation management and service provisions in a more holistic and effective manner. Both SCORPs provide discussions on recreational supply, demand, and usage patterns for each region of the states, as summarized from a variety of sources. Additionally, some counties have or are in the process of creating comprehensive plans that include recreation elements.

Current outdoor recreation trends identified in the 2019–2023 Colorado SCORP include rapidly increasing participation and economic output. In 2017, outdoor recreation in Colorado contributed \$62.5 billion in economic output; \$35 billion in gross domestic product; \$9.4 billion in local, state, and federal tax revenue; and 511,000 jobs in the state. Between 2014 and 2019, total economic output and tax revenue from outdoor recreation in Colorado nearly doubled, and jobs increased by almost 200,000. In southeast Colorado, recreation's economic output was \$1.65 million in 2017. The rapidly growing outdoor recreation sector is due to growing and sustaining public participation in outdoor recreation; 92 percent of Coloradans recreate in the outdoors at least once every few weeks and some, four or more times per week. Survey respondents included Participation levels in certain activities are growing faster than others. For example, the number of days Coloradans recreate on a trail grew 44 percent between 2012 and 2017. It is important to note that none of the data account for the impacts of the COVID-19 pandemic on outdoor recreation participation and revenue. That data will likely shape the next evolution of the SCORP.

In addition to this analysis, Colorado identified land, water, and wildlife conservation as a priority area to support a sustainable recreation industry. Other priority areas included recreation access, sustainable funding sources, and environmental stewardship.

The 2021–2025 Kansas SCORP was centered around improving access to outdoor experiences. The plan builds upon its previous versions and continues to work toward goals including improved outdoor recreational opportunities, encouraging regular stakeholder advocacy efforts, implementing sustainable funding sources, and continuing to protect cultural and natural resources in a way that allows outdoor recreation to occur in sensitive areas.

The Kansas SCORP was developed using the results from both a recreation user and a recreation manager survey. Most recreation users reported recreating two to four times per week. Approximately 40 percent of people stated they used county or city parks at least once a week. It was clear that most residents do not use outdoor recreational resources outside their community on a regular basis. The most common activities were hunting, fishing, walking, and recreational vehicle camping.

Kansas state recreation managers' top priorities are expanding community trail systems, connecting regional trail systems, and improving outdoor interpretive and educational facilities or programs. Priorities for implementation in the SCORP include improving connectivity, diversifying Kansas's recreation portfolio, increasing health and fitness opportunities, and enhancing, connecting, and promoting community-based recreation.

The primary indicators used to assess the status and trend of recreation in the Cimarron and Comanche National Grasslands include data collected from the National Visitor Use Monitoring Program (NVUM), the existing recreation opportunity spectrum (ROS) classifications, the accessibility of recreational opportunities, the quality of those recreational opportunities, and the amount of land open to recreation. These indicators are analyzed below.

Status and trends: ROS settings. The Forest Service uses the ROS to define recreational settings and categorize them into six distinct classes: primitive, semi-primitive nonmotorized, semi-primitive motorized,

roaded natural, rural, and urban (36 CFR 219.19). These classes serve as a zoning framework for planning and managing recreational settings and opportunities across National Forest System lands. Specific ROS classes convey the physical setting, mode(s) of transportation, anticipated concentration of people, and levels of management and infrastructure. By identifying the ROS, the Forest Service can ensure a sustainable set of recreational settings and opportunities for future generations, and visitors can select where they want to recreate based on what they want to do, what equipment they want to bring, and the type of experience they want.

As part of this assessment, the Forest Service used the National Recreation Opportunity Spectrum (ROS) Inventory Mapping Protocol (2019) to identify existing ROS classes within the Comanche and Cimarron National Grasslands. More than three-quarters of the grasslands were mapped as roaded natural, while only 400 acres were mapped as rural. Table 24, below, details the ROS classes that currently exist in the plan area.

Table 24. ROS classes in the plan area

Class	Acres	Percentage of the Plan Area
Urban	0	0
Rural	400	<1
Roaded natural	422,400	76
Semiprimitive motorized	116,000	21
Semiprimitive nonmotorized	3,900	0.7
Primitive	9,600	1.7

Source: USFS GIS 2024

User groups and populations value different aspects of recreation management or might have preferences and place higher value on different ROS classes than other user groups. These various preferences of visitors could inform decisions on adjustments for recreation management that would support social and economic sustainability. For example, many Hispanic and Latino communities in the region value fishing opportunities, day use sites, and more developed recreation sites with amenities. Recreation management decisions that impact these elements would likely impact social and economic sustainability associated with recreation among Hispanic and Latino populations. Additional information on recreation's contributions to social and economic sustainability is provided in the Outdoor Recreation and Forest Visitors section of Appendix A.

Status and trends: recreational opportunities. The Cimarron and Comanche National Grasslands' staff manages for a set of outdoor recreational opportunities that are consistent with the grasslands' ROS classifications. The Forest Service may provide opportunities directly or under a special use permit.

The most common developed site types in the plan area are picnic sites, interpretive sites, and fishing areas. Table 25 displays the existing developed recreation site types currently managed by the Cimarron and Comanche National Grasslands' staff. These recreational opportunities are arranged by grassland to show their distribution and location. All developed recreation sites are within the roaded natural ROS. Recreation sites are shown in figure 18, figure 19, and figure 20.

Table 25. Cimarron and Comanche National Grasslands’ existing developed recreation sites

Site Type	Cimarron	Comanche	Total
Campground	1	0	1
Fishing site	4	0	4
Group picnic site	1	0	1
Information site or fee station	0	1	1
Interpretive site	2	4	6
Lookout or cabin	0	1	1
Observation site	1	1	1
Picnic site	3	4	7
Target range	1	2	3
Trailhead	2	2	3
Wildlife viewing site	0	0	2
Total	15	15	30

Source: USFS 2024

Only two developed recreation sites require a use fee: the Cimarron campground and Cimarron group picnic site. In 2022, these sites generated approximately \$2,500 in fees. Other developed recreation sites include the grasslands’ main attractions, such as the Picket Wire Canyonlands dinosaur track site, and do not charge entrance or use fees. However, the Picket Wire guided auto tours range in price from \$0 to \$20 per person. This recreational opportunity is offered by the Forest Service and operates in high season on Saturdays. The tours are the easiest way to experience the Picket Wire Canyonlands which are home to the largest dinosaur trackside in North American and to see the area’s diverse history, natural features, and scenic views. Data on revenue from the automobile tours are not available at this time.

The Cimarron and Comanche National Grasslands do not allow for motorized cross-country travel; however, over 900 miles of ML2 “two-track” roads provide ample opportunities for motorized travel. The Cimarron offers a site where UTV and ATV use is allowed. Both grasslands provide unique opportunities for driving recreation on designated roads, primarily along the Santa Fe Trail National Historic and Scenic Byway and the Carrizo auto tour. The National Forest System Roads, Trails, and Infrastructure section provides a more robust analysis of the status and trends regarding motor vehicle use in the Cimarron and Comanche Nationals Grasslands.

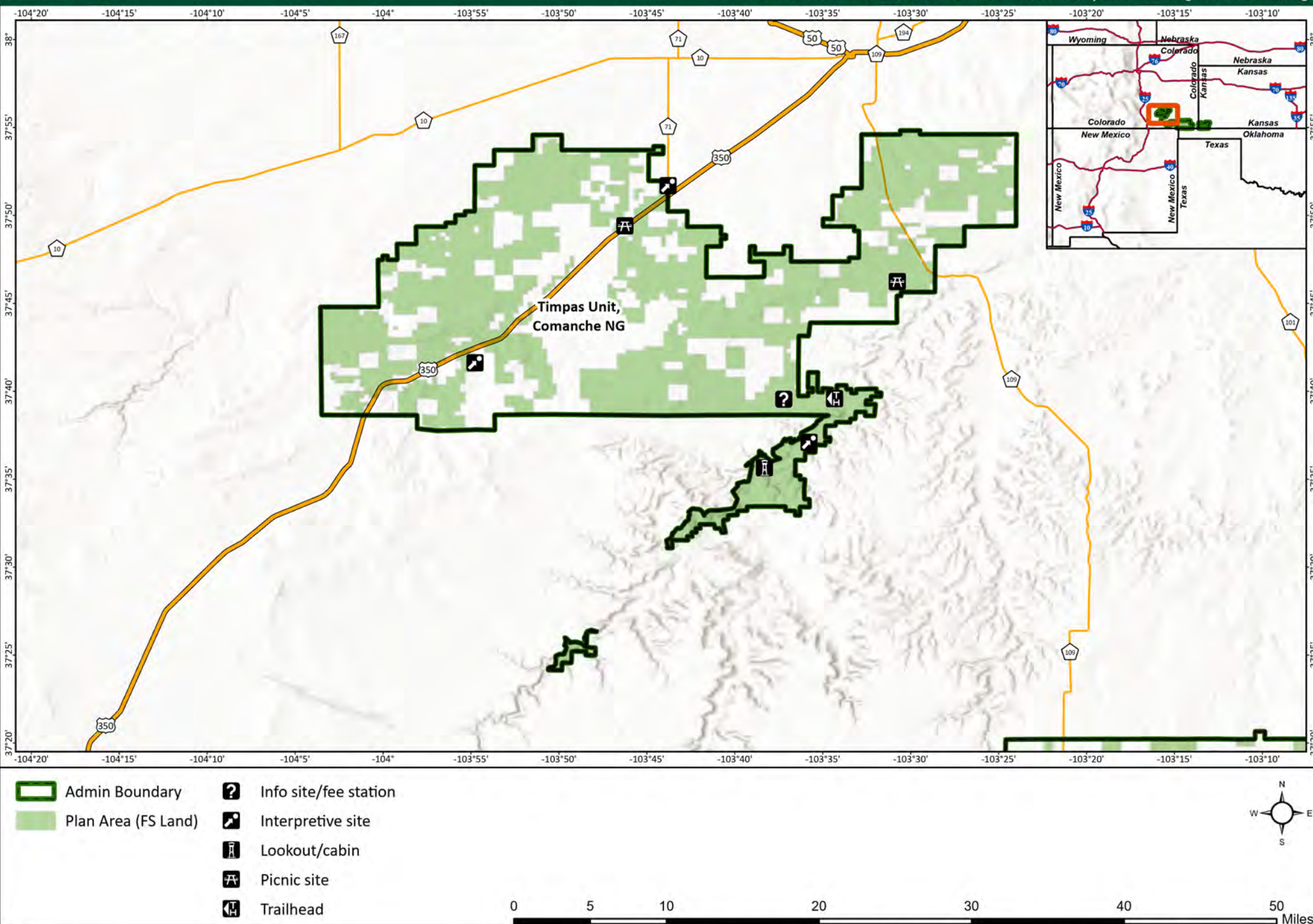
Hunting is a popular recreational activity that is permitted in the grasslands in accordance with state regulations. Hunting opportunities include big game species, small game, upland game, prairie dogs, upland birds, and waterfowl. See the Other Highlighted Species section for additional details.

Status and trends: recreation access. Access to and through the grasslands is facilitated year-round. Roads, motorized trails, and nonmotorized trails enable grassland visitors to walk, bike, ride, horseback, or drive to their destination. In the grasslands, the Forest Service currently manages approximately 19 miles of trails (USFS GIS 2024).



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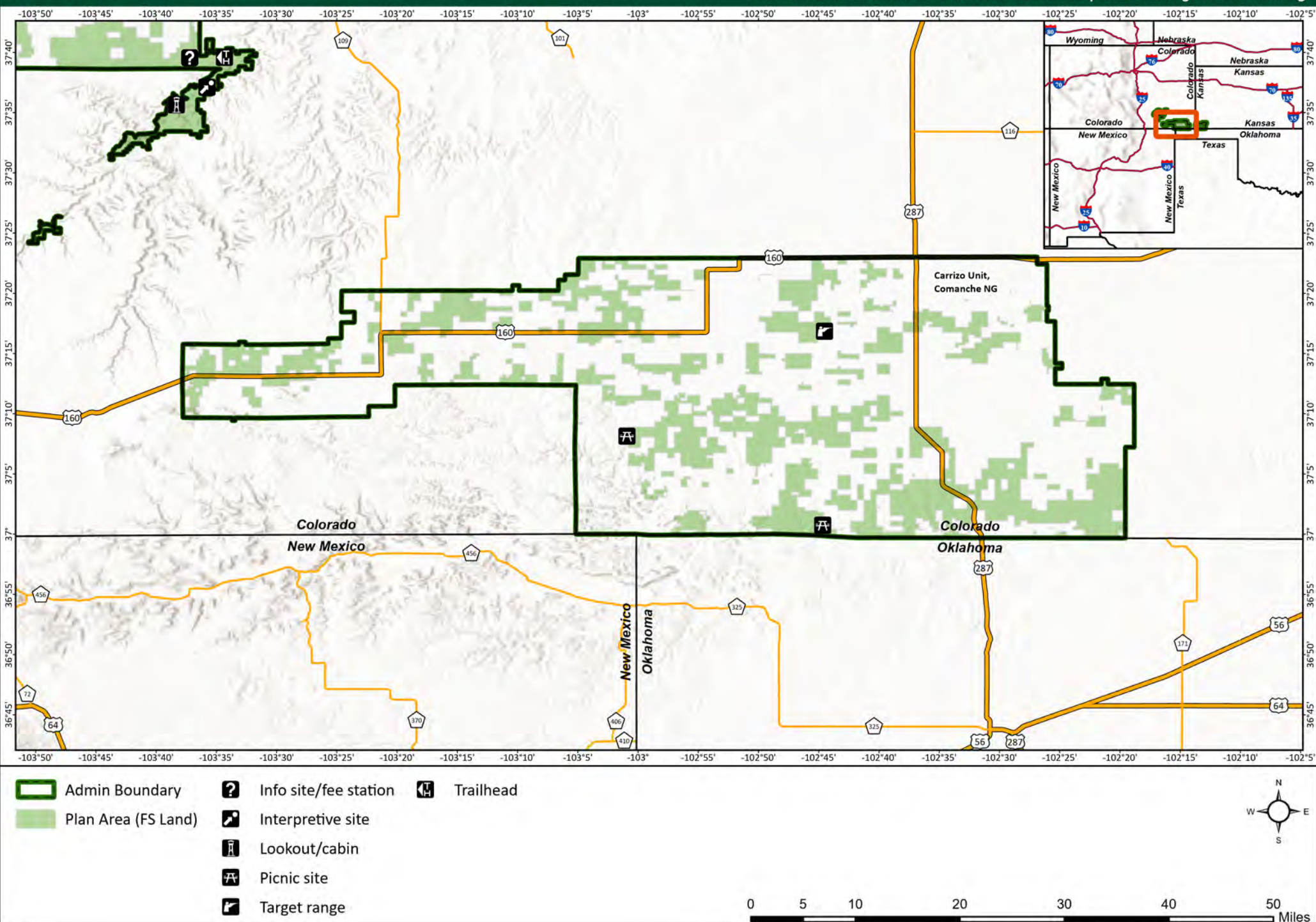
Figure 18. Recreation Sites
Cimarron and Comanche National Grasslands| Land Management Planning





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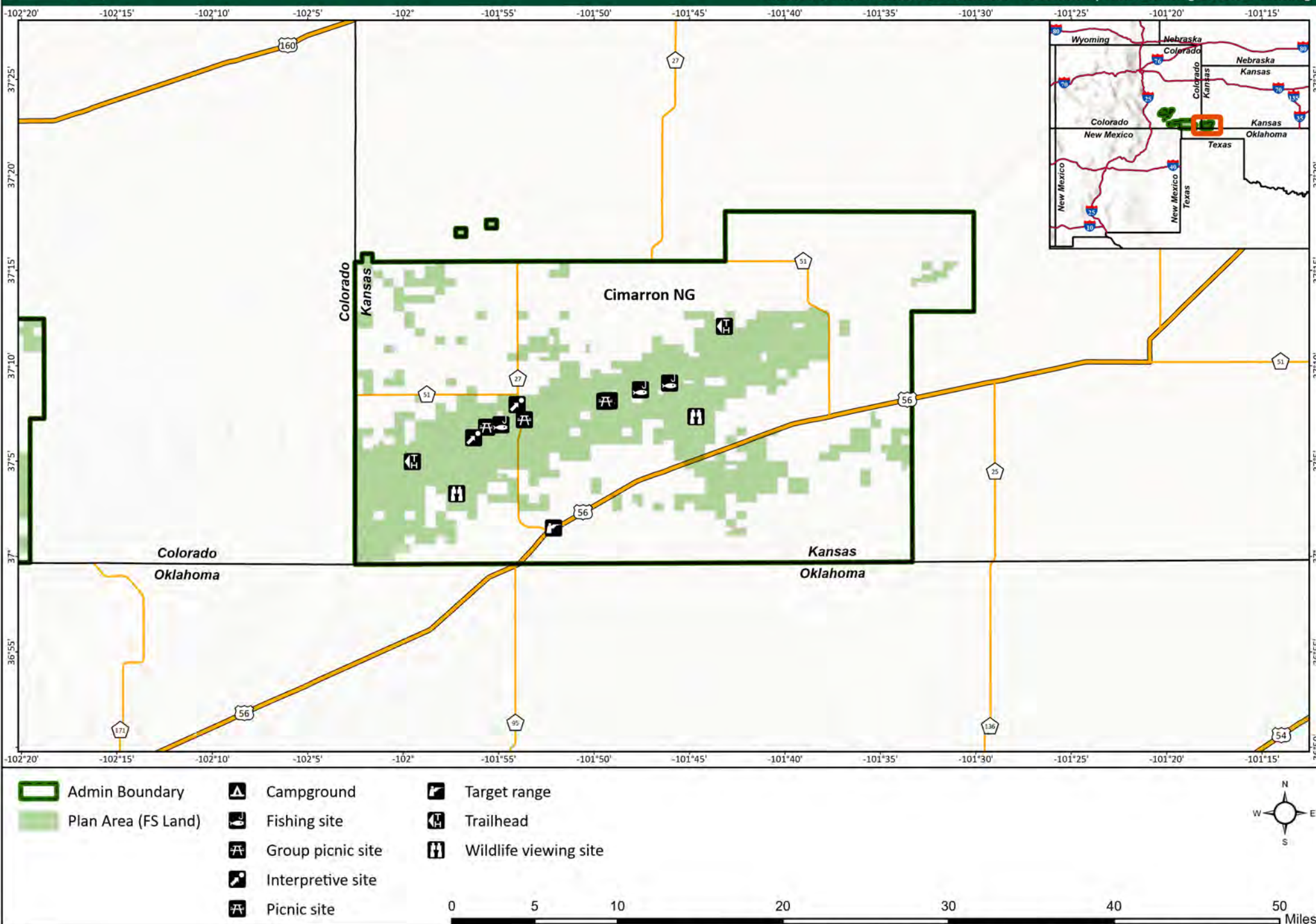
Figure 19. Recreation Sites
Cimarron and Comanche National Grasslands| Land Management Planning





USDA Forest Service

Figure 20. Recreation Sites
Cimarron and Comanche National Grasslands| Land Management Planning



6/26/2025
Datum: North American 1983. Scale: 1:471,000

This product is reproduced from geospatial information prepared by the U.S. Department of Agriculture, Forest Service. GIS data and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc. Using GIS products for purposes other than those for which they were created, may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify, or replace, GIS products based on new inventories, new or revised information, and if necessary in conjunction with other federal, state or local public agencies or the public in general as required by policy or regulation. Previous recipients of the products may not be notified unless required by policy or regulation.

Developed recreation sites have been designed for user accessibility. Walkways, bridges, handicap accessible fishing dock, picnic tables, grills, and some trails have been designed, built, or adapted to meet Architectural Barriers Act (ABA) and Forest Service Outdoor Recreation and Trails Accessibility (FSORAG and FSTAG) requirements. The Picket Wire Canyonlands auto tour also allows users who may not be able to complete the 11-mile hike to explore the dinosaur trackway and other paleontological resources in the canyonlands. Additionally, most of the grassland landscape is flat and allows for all vehicle types to travel on the majority of National Forest System roads to developed recreation areas without requiring high-clearance or four-wheel-drive vehicles.

There is an increased demand for recreational vehicle accommodations and developed camping areas with access to highways and county roads during the early fall hunting season on the grasslands. Increased visitation, without proper enforcement, education, and engineering, has resulted in many hunters camping in designated day use areas with proximity to amenities such as vault toilets and picnic tables.

The Cimarron and Comanche National Grasslands are accessible to local communities, and popular recreation sites include the Cimarron Recreation Area, Vogel Picnic Area and Timpas Picnic Area. Local visitors often visit the Picket Wire Canyonlands and corral for horseback riding.

To address future visitation increases, the Forest Service may need to expand and improve existing developed recreation sites. Road maintenance frequency may also need to be increased to sustain accessibility. New and expanded campgrounds may also provide improved access and accommodate larger numbers of visitors.

Trends in recreational use, user preference, and satisfaction. National Visitor Use Monitoring (NVUM) provides data on visitor use and visitor satisfaction to improve the Forest Service's understanding about the types of activities people are interested in and the quality of their experiences. This monitoring is the most relevant, reliable, and accurate data available on national forest visitation. Monitoring data are collected using a random sampling method that yields statistically valid results for each unit. NVUM results are unbiased. The sampling plan accounts for both spatial and seasonal spread of visitation patterns. However, results for any single year or season may under- or overrepresent some groups of visitors.

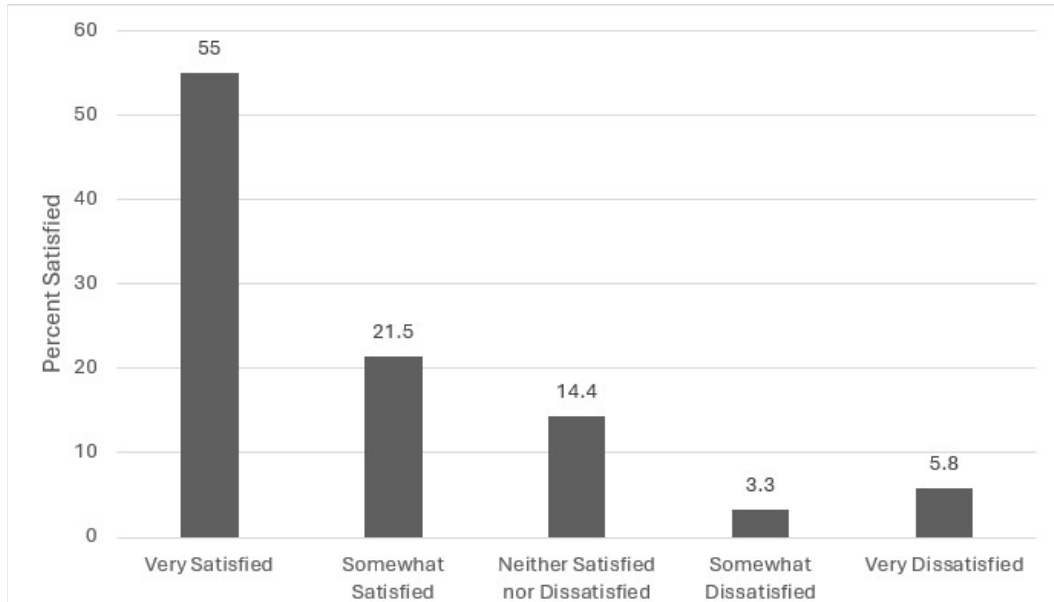
The most recent inventory for the Cimarron and Comanche National Grasslands was completed in 2016; there was an inventory done for the combined Pike-San Isabel National Forest and Cimarron and Comanche National Grasslands in 2021.

According to the 2021 NVUM data, approximately 71,000 people visit the Cimarron and Comanche National Grasslands annually. Visitation is almost evenly spread between local, regional, and national visitors; the largest response group was regional (24.4 percent of people said they traveled between 25 and 50 miles). The second-largest response group reported traveling between 200 and 500 miles to visit the grasslands (19.6 percent), while 19.2 percent of visitors reported traveling less than 25 miles (USDA Forest Service 2021). Visitation to the Cimarron and Comanche National Grasslands increased slightly, with reported visitation in 2016 being 66,000.

Visitor safety, minimizing conflict between uses, responding to the needs of existing and future visitors, creating connections between people and nature, promoting long-term mental and physical health, and instilling a culture of stewardship and appreciation are all important components of a satisfying recreational experience. Due to complex relationships between differing opinions about the levels and types of use that should be allowed on public lands, such as the level of access to trails where OHVs are allowed versus with the level of remote and undisturbed open spaces, management of recreational resources that balance economic and social sustainability among user groups can be challenging. Of visitors to the Cimarron and Comanche National Grasslands, 55 percent were very satisfied with their recreational experiences. Visitors reported particular satisfaction with the quality of developed facilities, condition of the environment, parking availability, recreation information availability, feeling of safety,

scenery, and signage adequacy. Survey respondents also reported a 100 percent feeling of safety at both developed and undeveloped recreation sites (USDA 2016).

Figure 21. Percent of Cimarron and Comanche National Grasslands Visits by Overall Satisfaction Rating



Source: USDA 2016

The top five reasons people recreate in the plan area are hiking/walking, viewing natural features, visiting historic sites, viewing wildlife, and nature study (USDA 2021). These reasons are nearly the same as those recorded in the 2016 NVUM report for the Cimarron and Comanche National Grasslands (USDA 2016).

National recreation trends. The Outdoor Industry Association published their 2023 outdoor participation trend report, summarizing some recent trends in outdoor recreation. Some important trends relevant to recreation on public lands include the following:

- There is overall growth in outdoor recreation participation. The outdoor recreation participation base grew 2.3 percent to a total of 168.1 million participants in 2022. Of Americans ages 6 and over, 55 percent participated in outdoor recreation at least once (OIA 2023).
- New outdoor participants are more diverse than the overall outdoor participant base and are driving increasing diversity not only by ethnicity but also across age groups (OIA 2023).

Projected climatic conditions and changing fire regimes may affect recreational demands and opportunities over time. Increased temperatures, particularly in summer months, may make the grasslands less appealing to visitors, as shade is not prevalent in the Cimarron and Comanche National Grasslands outside built shade structures in developed recreation areas. Warmer temperatures and shifts in the timing of precipitation may also affect species' populations and migrations and negatively impact hunting and wildlife viewing opportunities in the grasslands. Birding may be negatively impacted by habitat loss due to drought, fire, or intense cold spells. These impacts could reduce access and quality of economic and social values, such as physical, mental, and spiritual health, connecting with nature and culture, and education and economic opportunities.

The Cimarron and Comanche National Grasslands directly support the local economies which draw upon the Grasslands' cultural, historic, prehistoric, and paleontological sites. The town of La Junta celebrates an annual Tarantula Festival every year, which draws visitors from far distances to visit the grasslands in

search of male tarantulas. The Crack Cave Equinox Festival is a special event that takes place within Picture Canyon; one outfitter leads area tours with a special use permit around the equinoxes (Canyon Journeys 2024); (Bascom et al. 2024). The Forest Service will have opportunities to assess and adjust the availability of recreation special use, event, and oil and gas permits as use, demand, and conditions change.

Current management does not adequately address these overlapping resources.

Scenery

Key Takeaways

- Scenery is important to visitors' overall experience when visiting the grasslands. The National Visitor Use Monitoring surveys (USDA 2016) show that the highest activity visitors participate in is viewing natural features or scenery, with 55.5 percent of visitors participating in this activity. This high percentage emphasizes the importance of maintaining natural-appearing landscapes, so these visitors' expectations can be met and to support social sustainability through quality of life and visitor and viewer enjoyment.
- Scenery contributes to the ecological, social, cultural, Tribal, and economic sustainability by providing the backdrop for activities such as: tourism, outdoor recreation, cultural heritage, outfitter and guide operations, and many other activities that are valued by local and regional communities.
- The existing forest plan manages scenic resources using the Visual Management System (1974). The Forest Service now utilizes the Scenery Management System (1995) with additional developed Scenery Management System Mapping Protocols (2020).
- The existing scenic integrity of the Cimarron and Comanche National Grasslands classifies 83,648 acres as high or very high 479,424 acres as moderate, and 1,912 as low scenic integrity.
- The greatest opportunities in scenery management for this area are the vistas associated with the Sante Fe National Historic Trail and Scenic Byway, and the Picket Wire Canyon area. The greatest challenges to scenery in this area are resource extraction, vandalism, energy development, and population growth near and within the grasslands.

Summary

The Cimarron and Comanche National Grasslands' scenery provides visitors a view into the past. These Grasslands present a vast, open landscape dominated by shortgrass prairie, with rolling hills, occasional rocky canyons, and scattered juniper trees. The Picket Wire Canyonlands dinosaur tracksite offer visitors a chance to see the largest and most intact dinosaur tracksite in North America, while areas such as Picture and Vogel Canyons offer the chance to view cultural sites such as rock art and archaeological findings. The Santa Fe Trail, a national historic trail, traverses the Cimarron and Comanche National Grasslands. The Cimarron has 23 miles of the Santa Fe Trail, which is the longest portion of the trail available to the public. Visitors can step into the past while following the original transnational highway that traders used in the 1800s. The Sante Fe Trail National Scenic Byway allows visitors to experience these vistas from the same locations previous explorers and pioneers viewed these landscapes.

The Forest Service uses the Scenery Management System (SMS) to inventory, analyze, manage, and monitor scenic resources. The SMS is today's best science to achieve high-quality scenery through ecosystem management practices and integrates increased understanding of ecosystem processes and cultural landscapes in identifying the effects of various management practices on scenic resources. The primary components of the SMS inventory are scenic character descriptions, scenic attractiveness, concern levels, landscape visibility, existing scenic integrity, and scenic classes. Scenic character, the frame of reference for several inventories, is a combination of the physical, biological, and cultural images

that gives an area its scenic identity and contributes to its sense of place. The system takes into account that natural disturbance processes, such as fire, insects, and disease, are part of a dynamic natural landscape and serve a role in maintaining healthy, sustainable, resilient, and scenic landscapes.

The Cimarron and Comanche National Grasslands' scenery is vital to visitors' overall experience, and it contributes to economic and social sustainability. The primary activity of visitors to the Cimarron and Comanche National Grasslands is viewing natural features or scenery (USDA 2016). This means that impacts on scenery could lead to a reduction in recreation or a reduction in the quality of values associated with recreation settings and opportunities. This includes a potential reduction in economic contributions associated with recreation, in addition to potential reductions in quality of life and physical and mental health for the surrounding communities. It is important that the Cimarron and Comanche National Grasslands continue to maintain, and in some areas, enhance, scenic character to visitor and viewer enjoyment and support economic and social sustainability.

Status and Trends

The Forest Service uses a National Scenery Management System Inventory Mapping Protocol (USFS 2020) to meet the intent of the planning rule requirements and supporting Forest Service manual and handbook direction. The protocol ensures the same processes and considerations are folded into each plan development or revision effort. Products from the National Inventory Mapping Protocol include the following:

- Scenic character descriptions
- Scenic attractiveness
- Concern levels
- Landscape visibility
- Scenic classes
- Existing scenic integrity

The Forest Service prepared a scenery management appendix (Appendix D) that shows all six inventories which have been completed. These inventories will inform the mapping of Scenic Integrity Objectives which will be a part of the plan development process.

The Cimarron and Comanche National Grasslands are within the Great Plains Physiographic Province, being further classified into the Southern High Plains Section and Arkansas Tablelands Sections, as outlined in the "Ecological Subregions of the United States: Section Descriptions" ((McNab et al. 2007)). It is at this level that the SMS is based upon and classifies the land into scenic character units. The scenic character within these units is the frame of reference for classifying the three categories of scenic attractiveness: A (Distinctive), B (Typical), and C (Indistinctive) and up to five levels of existing scenic integrity (Very High to Very Low).

The Cimarron and Comanche National Grasslands have a primarily natural-appearing landscape with some areas of high and very high existing scenic integrity. Areas such as Point of Rocks, the Picket Wire Canyonlands dinosaur tracksite, Carrizo and Picture Canyons, and Vogel Canyon have high and very high scenic integrity.

The Cimarron and Comanche National Grasslands exist today with only minimal landform modifications. The 1984 land and resource management plan stated that "more than 99% of the Cimarron and Comanche meet or exceed visual quality objectives" (USFS 1984). Throughout both grasslands there is visible evidence of humans as a result of oil and gas exploration, railroads, road development, livestock grazing, recreational facilities, private development or inholdings, and limited surface mining for sand and gravel. The Santa Fe National Historic Trail and several of its branches or cutoffs traverse the area. The

oil and gas developments are probably the most visible features due to the lack of terrain or vegetation for screening, and their vertical appearance in an otherwise horizontal landscape.

Concern levels help the Forest Service capture public importance placed on landscapes viewed from travel ways and use areas. Travel ways are linear features with concentrations of public viewing, such as roads, trails, railroads, and streams. Use areas are spots that receive concentrated public viewing, such as campgrounds, scenic overlooks, visitor centers, and interpretive sites. Concern levels provide a foundation for other aspects of the SMS, such as landscape visibility and distance zones. They also influence the development of desired scenic integrity objectives, which guide the management of scenery resources.

Concern levels are divided into three categories. Level 1 represents travel ways and use areas of high concern for scenery management. Level 2 represents locations of moderate concern. Areas assigned to level 3 represent locations of low concern. Landscape Aesthetics, A Handbook for Scenery Management, Agriculture Handbook 701, provides more information (USFS 1995), pp. 4-8 through 4-10).

Concern Level 1. All primary and secondary travel routes, use areas, and waterbodies where the level of interest in scenery is high is a concern level 1 regardless of use level. Points and travel ways with an initial concern level 1 include the following:

- Santa Fe National Historic Trail and all its offshoots
- Santa Fe National Historic Trail and Scenic Byway and all its places to pull off or viewpoints
- Picket Wire Canyonlands recreation area and primary access roads and trails
- All roads associated with the self-guided Carrizo Auto Tour
- Research natural areas
- Administrative designated areas
- Primary roads
- All other recreation sites with development scale 4 and 5, as well as historic sites, lookouts, cabins, interpretive sites, and viewing areas
- Nearby non-Forest Service points of interest, including historic sites, interpretive sites, campgrounds, and lookouts

Concern Level 2. Concern level 2 includes all seen areas from primary travel routes, use areas, and waterbodies where visitors have a moderate interest in scenic qualities or low interest in scenic qualities, if the area receives moderate to high use. Points and travel ways with an initial concern level 2 include the following:

- All secondary access roads (includes all maintenance level 4 roads)
- Trail class levels 3 through 5
- All recreation sites at development scale 3
- Nearby non-Forest Service points of interest, including viewing areas and picnic areas

Concern Level 3. All remaining roads, trails, and recreation sites not included in concern levels 1 and 2 are concern level 3. These landscapes and secondary travel ways and use areas have local importance only and generally get low to moderate recreational use.

Scenery in the plan area can be experienced from roads, motorized trails, and the Santa Fe Trail Scenic Byway. Popular scenic areas include the Vogel Canyon Picnic Area and its Canyon Overlook Trail, which provides wheelchair accessible views of the canyon; the Sierra Vista Interpretive Site, which offers a unique elevated view of the grassland environment and historic Santa Fe Trail; and the Middle Spring

Picnic Area, Point of Rocks Interpretive Site, and the Cimarron Overlook also provide scenic views of the Santa Fe Trail. Scenery viewing is most accessible from developed or designated recreation areas.

The landscape visibility tool combines the concern level inventory with viewshed data to show the foreground, middle ground, and background that is visible from each point and travel way. Due to the flat nature of this landscape everything is visible within foreground concern level 1, middle ground concern level 1, foreground level 2, middle ground level 2, and background level 1. This analysis captures the potential impacts of any project on higher concern level points and travel ways viewsheds.

Scenic Attractiveness

Scenic attractiveness is the primary indicator of the intrinsic scenic beauty of a landscape and of the positive responses it evokes in people. It helps identify landscapes important for scenic beauty, based on commonly held perceptions of the beauty of landform, vegetation pattern, composition, surface water characteristics, land use patterns, and cultural features. The scenic attractiveness inventory breaks the landscape into three classifications (table 26). The most common scenic attractiveness class found in the Cimarron and Comanche National Grasslands is class B.

Table 26. Scenic attractiveness classification for the Cimarron and Comanche National Grasslands

Scenic Attractiveness Classification	Total Acres	Percentage of the Plan Area
Class A – distinctive	109,237	19.8%
Class B – typical	396,787	71.8%
Class C – indistinctive	46,158	8.4%
Total	552,182	100%

Existing Scenic Integrity

Scenic integrity is defined as “(“Existing visual condition”) Current state of the landscape, considering previous human alterations (USFS 1995), pp. Glossary-2).” Existing scenic integrity measures the current state of the landscape, considering previous human alterations. measures whether the landscape attributes described in the scenic character description are intact. The highest existing scenic integrity ratings are given to those landscapes that have little or no deviation from the character valued by constituents for its aesthetic appeal. Landscape-level drivers that affect existing scenic integrity include management activity caused visual disturbances, such as road construction, mining, drilling, utility corridors, and recreational facilities. Naturally caused visual disturbances include wildfires, insect and disease outbreaks, and wind and ice storms which are part the area's scenic character and play an important role in how landscapes and scenery changes naturally over time. Population growth is expected to increase demand for energy and communication infrastructure, which could impact recreational experiences and the sense of place.

There are areas across the Cimarron and Comanche National Grasslands with low to moderate existing scenic integrity (table 27). Some of these lands show management activities that contrast in shape, form, and texture with the surrounding natural-appearing environment. These include past vegetation treatments, built utility corridors, oil and gas extraction sites, and road corridors. Areas with low scenic integrity should be analyzed for potential improvement, particularly in areas that have growth in population and in recreational use or have high or moderate concern levels for viewing scenery.

Table 27. Existing Scenic Integrity by areas and acreage.

Existing Scenic Integrity	Count	Total Acres
High	57	83648
Moderate	1	479424
Low	431	1912

Long-term sustainability of scenery in the plan area is influenced by existing oil and gas development, ranching and livestock grazing, and wildland fire. Increased seasons of drought and higher-severity fires could negatively impact scenic integrity and landscape character. Additionally, isolated areas of vandalism are present, particularly at areas with rock art or paleontological resources. Scenery management for the national grasslands is directly related to other resources, such as recreation, cultural resources, utilities, and mineral exploration. Scenery is critical to recreation settings, important to visitors and communities, and foundational to outdoor recreation economies. Most recreational activities rely on the unique scenery of the grasslands. While some of these uses support social and economic sustainability through jobs and income, impacts on scenery from these uses could result in impacts on social and economic sustainability, such as through quality of life and visitor and viewer enjoyment, and if the impacts on scenery lead to less recreation, then there could be impacts on jobs and income (see the Contributions to Social and Economic Sustainability section of Appendix A for more information on economic and social sustainability). The plan area contains diverse cultural resources, ranging from petroglyphs to homesteads. These resources illustrate all eras of human adaptation to North America and provide visitors a glimpse into many prominent historical trends and events in local and regional history. The opportunities to see these places are a major draw for visitation and contribute to the area's scenic value.

Designated Areas

A designated area is defined as “an area or feature identified and managed to maintain its unique special character or purpose. Some categories may be designated only by statute and some categories may be established administratively in the land management planning process or other administrative process of the federal executive federal branch.”

This chapter assesses current conditions and trends for the existing statutorily and administratively designated areas within the Cimarron and Comanche National Grasslands, as well as any identified potential need and opportunity for additional designated areas. The only existing statutorily designated area is the Santa Fe National Historic Trail. Existing administratively designated areas include the Santa Fe Trail National Scenic Byway, Research Natural Area (RNA), paleontological areas, and zoological areas (figure 22) (Table 28).

Table 28. Existing designated areas in the plan area

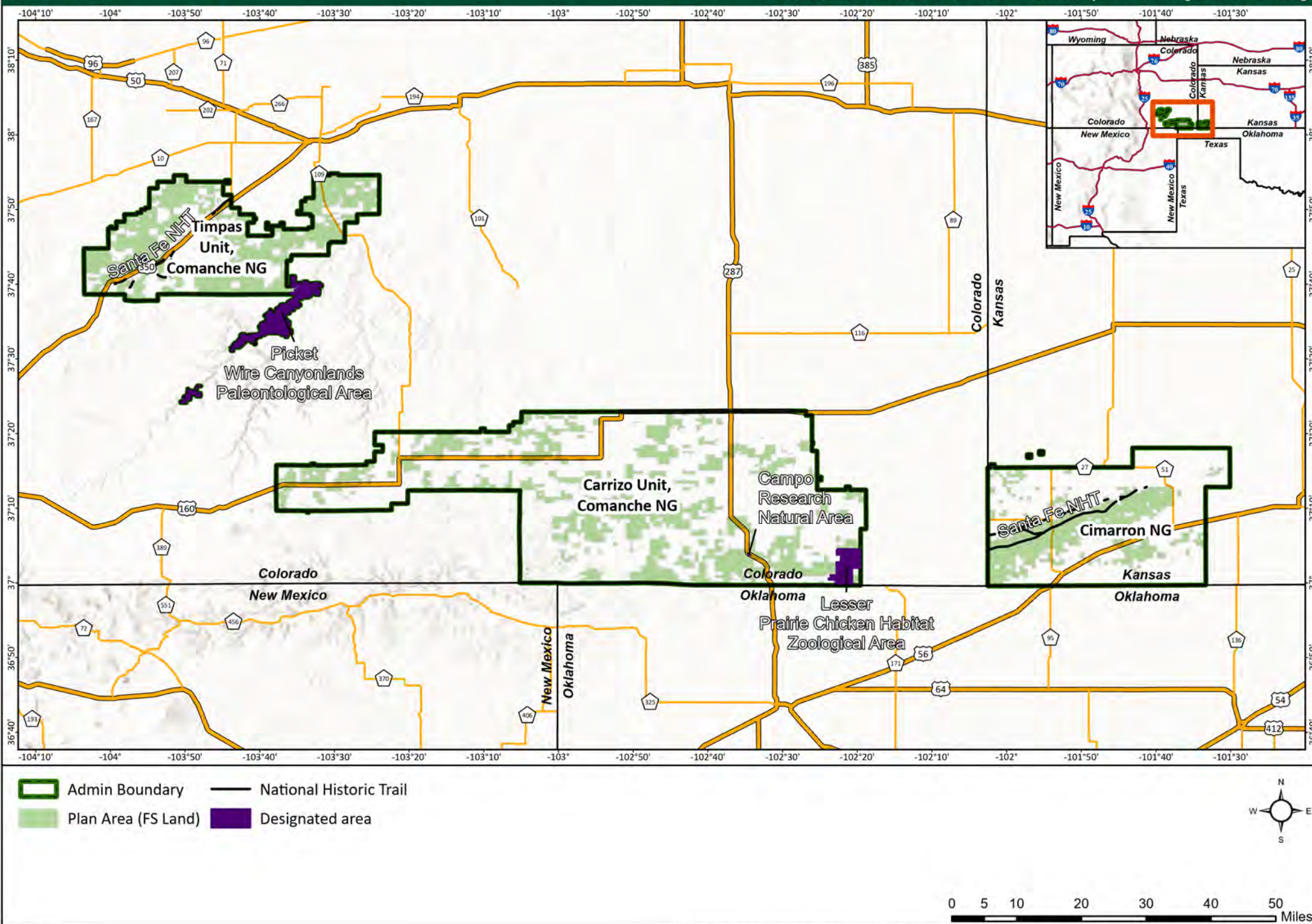
Designation Type	Total Size (Acres or Miles)	Percentage of the Plan Area
National scenic and historic trails	43 miles	Not applicable
Scenic byways	188 miles	Not applicable
RNAs	35 acres	0
Zoological areas	10,177 acres	1.8
Paleontological areas	16,728 acres	3.0

Source: USFS GIS 2024



USDA Forest Service

Figure 22. Designated Areas
Cimarron and Comanche National Grasslands| Land Management Planning



National Historic Trail and Scenic Byway

Summary

There is one congressionally designated trail in the plan area, the Santa Fe National Historic Trail. The Santa Fe National Historic Trail commemorates the United States' first trans-Mississippi route. The trail was primarily a commercial highway connecting Missouri and Santa Fe, New Mexico. The 1,203-mile corridor was the first major trans-Mississippi trade, travel, and communication link. It became the primary two-way commerce and trade route and created new economies. The trail played a critical role in the westward expansion of the United States and was an important two-way avenue for commerce and cultural exchanges between 1821 and 1880. The designated Mountain Route crosses southeast Colorado for approximately 188 miles. The Cimarron Route crosses the Cimarron National Grassland for 23 miles.

Recognizing its historical significance, impact, and legacy, Congress designated the Santa Fe Trail as a national historic trail in 1987 (NPS 2025). Within the plan area, segments of the Santa Fe National Historic Trail are still used today for recreational purposes. The Mountain and Cimarron Routes cross southeastern Colorado through the plan area.

Colorado's Santa Fe Trail Scenic and Historic Byway traverses 188 miles of southeast Colorado, extending from the Colorado-Kansas state line east of Holly, Colorado, to the Colorado-New Mexico state line on Raton Pass. The byway follows State Highways 50 and 350 and Interstate 25. The Santa Fe Trail National Scenic Byway was designated by the U.S. secretary of transportation as a National Scenic Byway in 1998.

Status and Trends

Santa Fe National Historic Trail. The Santa Fe National Historic Trail is a stand-alone resource managed in coordination with the National Park Service (NPS). The Comprehensive Management and Use Plan for the Santa Fe National Historic Trail was signed in May 1990 and covers the entire trail across Missouri, Kansas, Oklahoma, Colorado, and New Mexico. Management direction in the Comprehensive Management and Use Plan for the Santa Fe National Historic Trail includes specific direction to manage resource protection, regulatory processes, fees and ownership, research activities, visitor use, and interpretation. The NPS developed the Santa Fe Trail Foundation Document in 2021. This document serves as underlying guidance for administration and planning decisions for components of the National Trails System. This document includes an assessment of planning and data needs, and it identifies planning issues. The NPS specifically identified the need for visitor use data-collection efforts, a visual resource inventory, an impact mitigation strategy, a stewardship plan, an interpretive master plan, a resource protection plan, a communications plan, GIS data collection and mapping, stakeholder inventory, and an ethnographic study (NPS 2021).

The Santa Fe National Historic Trail provides opportunities for recreation and cultural and historic interpretation. Cultural and archaeological research occur along the national historic trail. The National Visitor Use Monitoring surveys from 2011 and 2016 note that one of the top reasons people visit the Cimarron and Comanche National Grasslands is to view natural features, which include views on and from the national historic trail (USFS 2011, 2016). Visitors can travel the national historic trail by horseback, foot, and bicycle. The 1990 Comprehensive Management and Use Plan for the Santa Fe National Historic Trail identified needs for trail development for all allowable uses, which has occurred in the grasslands over the last 30 or so years. These recreational opportunities support social and economic sustainability through economic contributions associated with recreational expenditures as well as values provided to the surrounding regions related to cultural and historic resources. These values benefit the surrounding communities (see the Agency Operations and Infrastructure section of Appendix A for more information on how cultural resources support economic and social sustainability).

Within the Cimarron and Comanche National Grasslands, visitors can traverse 23 miles of the Mountain Route in the Cimarron National Grassland and 18 miles of the Cimarron Route in the Cimarron and

Comanche National Grasslands. The Mountain Route followed the north bank of the Arkansas River to Bent's Old Fort in Colorado. This route was favored during the Civil War because there was less chance that Native American tribes would attack the trains. Once railroads were constructed, wagons went from the end of the tracks over the Mountain Route to Santa Fe, New Mexico, and beyond. The Cimarron Route headed southwest across a 60-mile stretch of waterless plains, known as La Jornada—the journey—to the Cimarron River. Wagons then followed the river and prairie springs across what is now the Oklahoma panhandle and entered New Mexico (NPS 1990). For travelers who used the Cimarron Route, the total distance traveled was approximately 865 miles from Missouri to New Mexico; the Mountain Route was more than 50 miles longer but provided more consistent access to water along the Arkansas River (NPS 1990).

Limestone posts mark the original trail route, and well-preserved ruts are visible. Visitors can traverse the Santa Fe Trail by foot or horseback (USDA Forest Service 2024f). Because the Santa Fe Trail is a national historic trail, the NPS must identify high-potential historic sites and route segments, identify all significant resources to be preserved, and identify and protect historic remnants and artifacts. In Colorado, there are 14 sites and 1 route identified. In Kansas, five segments of the national historic trail are in the National Register of Historic Places (NRHP).

The Santa Fe National Historic Trail is a major draw for visitors to the grasslands. No fees are required to visit this designated historic trail, and interpretive signs can be accessed by foot or by vehicles traveling along the designated Santa Fe National Historic and Scenic Byway. Some picnic areas exist along the trail; however, most recreation along the trail is undeveloped. Visitors can hike, bike, or horseback ride to explore the historic trade route. Other popular recreational opportunities in the Cimarron and Comanche National Grasslands include driving routes such as the Santa Fe National Historic and Scenic Byway or the Carrizo Auto Route. Visitation data for these routes specifically are not available. The Forest Service categorizes visitor use on the Santa Fe Trail within the Cimarron and Comanche National Grasslands as light. There are no fees to access this trail, and the trail is for nonmotorized use only. Commercial outfitters and guides require a special use permit to operate tours. The 1990 Comprehensive Management and Use Plan for the Santa Fe National Historic Trail acknowledged the need for the creation and management of a designated auto tour route.

Santa Fe Trail National Scenic Byway. Colorado's Santa Fe Trail Scenic and Historic Byway has received multiple designations in recognition of its historic significance, landscape integrity, and contributions to the heritage and culture of southeast Colorado and the American Southwest. These designations include national historic trail, Colorado scenic and historic byway, and national scenic byway. In Colorado, the byway traverses 188 miles of southeast Colorado along Highways 50 and 350 and Interstate 25. The Colorado portion of the byway is managed under the 2023 Corridor Management Plan. The Corridor Management Plan includes an analysis on the byway's current state and trends. Between 2014 and 2019, visitor spending on Colorado byways totaled \$4.92 billion ((Smith 2023)). A 2021 Colorado Tourism travel impact study found that travelers spent more than \$100 million in the four counties that contain the Santa Fe Trail National Historic and Scenic Byway and contributed nearly \$6 million in tax revenue (Smith 2023).

The byway's purpose is to preserve the trail's historic sites and resources for future generations ((Colorado Office of Economic Development International Trade 2021)). The byway's intrinsic values include archaeological, historical, cultural, natural, scenic, and recreational qualities. These qualities offer tourism opportunities for a variety of visitors. At this time, there are not visitation data for the byway. However, it can be inferred that due to southeast Colorado's perceived high temperatures and dry climate during the summers, visitation may spike during the shoulder seasons, or during late spring and early fall (Smith 2023).

The future development of wind farms, threat of projected climatic conditions, reduced use of personal vehicles, stagnant wages, and significant increases in visitation were all identified as threats to the Santa Fe Trail Scenic Byway (Smith 2023). Management decisions that allow for certain types of development could lead to a reduction in access and quality of social values associated with byways while increasing

economic contributions associated with the developments. On the other hand, other economic contributions associated with scenery (such as filming opportunities) may be decreased as well (see the Contributions to Social and Economic Sustainability section of Appendix A for more information on how cultural resources support economic and social sustainability).

The Canyons and Plains Regional Heritage Task Force oversees management of the byway (Colorado Office of Economic Development International Trade 2021). Currently, the task force provides information to visitors about the trail's history, as well as an alternate Colorado electric byway guide for visitors looking for vehicle charging stations along the way (Canyons & Plains 2024). Management of the byway is current and developing.

Research Natural Areas

Summary

RNAs are part of a national network of ecological areas designated for research, education, and/or to maintain biological diversity of National Forest System lands. RNAs are typically established to ensure long term maintenance and protection of ecosystems in their natural states. These protected natural areas may include unique habitats or ecological features, rare species of plants and animals and/or their habitats, or high-quality reference sites of widespread ecosystems. Site conditions at RNAs usually include only minor evidence of disturbance from roads, trails, infrastructure, logging, or livestock use.

The Campo Research Natural Area (RNA) was originally designated for its intact example of the shortgrass prairie ecosystem. Since its designation in 1987, the RNA has experienced ongoing disturbances that have degraded its ecosystem. In 2008, the designation of the Campo RNA was considered for removal.

Status and Trends

The Campo RNA is the only established RNA on the Comanche and Cimarron National Grasslands. It is located approximately 3 miles south of Campo, Colorado, in Baca County, and encompasses 35 acres on the Carrizo Unit of the Comanche National Grassland (USDA Forest Service 1987). The RNA is situated within a small, triangular area formed by the intersection of a highway and two rail lines (USDA Forest Service 2023a). The site was designated as a relatively intact example of the shortgrass prairie ecosystem, an ecosystem type widespread across the Cimarron and Comanche National Grasslands and discussed in detail in the Terrestrial Ecosystems section of this Assessment.

When the RNA was established in 1987, potential conflicts and impacts to ecosystem integrity were noted (USDA Forest Service 1987). There are existing oil, gas, and mineral rights that the Forest Service was unable to secure, though the Forest Service does have surface rights to the land. The RNA is not situated within any grazing allotment, but it is also, partially by design, not completely fenced in. Humans, wildlife, and livestock may access the site. The RNA, like the surrounding landscape, is also subject to major disturbances such as from long term weather variability and drought. The establishment report acknowledges a history of limited and ongoing disturbance but claims that the RNA is yet relatively more representative of undisturbed shortgrass prairie than other sites in the landscape. The report does not address issues of ecological restoration within the RNA, though it does provide direction for managing recreation, vegetation, livestock grazing, minerals, and transportation, emphasizing minor modifications as necessary to enhance the persistence of the blue grama grass-dominated shortgrass prairie ecosystem.

In 2007 and 2008, the Forest Service reviewed ecological conditions within the Campo RNA (USDA Forest Service 2008). The review concluded that ongoing disturbances appeared to be contributing to long term changes to ecological conditions. Existing conditions were observed to be less supportive of vegetation associated with shortgrass prairie and more conducive to that of a sand sage prairie ecosystem. The observed changes were driven by ongoing sand deposition from road maintenance and

other activities on adjacent lands. The increasingly sandy soil of the RNA appeared to show a gradual decline in blue grama and a simultaneous uptick in buffalograss and sandsage, two species that are characteristic of sandsage prairie.

These changes in plant composition called into question the continued viability of the RNA as a reference site for the shortgrass prairie ecosystem type. The 2008 review recommended vegetation monitoring to confirm these observations. If confirmed, the report recommended locating one or more additional areas of pristine shortgrass prairie to serve as RNAs in lieu of Campo. Two sites identified as possible alternatives were the proposed Bent Canyon Bluffs Area and the proposed OU Creek Area, which are described in the 2008 report and summarized in the Potential Designated Areas section of this Assessment. The Forest Service (USDA Forest Service 2009) concluded that, given widespread evidence of disturbance, neither of those sites met the criteria for RNA designation. As of now, no other reference site for shortgrass prairie ecosystem type have been identified within the Cimarron and Comanche National Grasslands, which presents challenges in assessing the natural range of variation of shortgrass prairie within the area.

Zoological Areas

Comanche Lesser Prairie-Chicken Habitat Zoological Area

Summary

The Forest Service designated the Comanche Lesser Prairie-Chicken Habitat Zoological Area (Area) in 1984 due to its prime habitat for lesser prairie-chicken (*Tympanuchus pallidicinctus*). The area was a good example of coordinated natural resource management by the Forest Service, regarding range and wildlife habitat management. The area served as an outdoor classroom and laboratory for the study of lesser prairie-chickens and their habitat.

The area is approximately 10,177 acres in the Comanche National Grassland in Baca County, Colorado. The Forest Service is responsible for habitat management in the area, and management direction is consistent with the existing land and resource management plan. The Forest Service may approve scientific research projects, initiate necessary improvements, allow livestock grazing in accordance with allotment management plans, allow hunting of wildlife, and protect leks and nesting habitat from surface disturbance from April 15 to June 30. The Forest Service may allow extraction leases and incorporate provisions to protect habitat, leks, and nesting habitat; monitor range conditions; and manage user access. Management is in collaboration with the Colorado Parks and Wildlife, as the zoological area is part of the Colorado Natural Areas System.

Status and Trends

In 1987, the State expanded this area, and its boundary was increased 892 acres. Historically, this area supported one of the highest densities of lesser prairie-chickens in the state. The geographic distribution of the lesser prairie-chicken is believed to have declined by over 90 percent since European settlement. Within this greatly reduced range, population numbers have also suffered dramatic declines. Recent years appear to have been especially hard on populations in southeastern Colorado. Habitat conditions recovered somewhat from past drought years; however, the area was hit by a series of blizzards in the winter of 2006–2007 that may have caused the population to severely decline (CNHP 2010). Suitable habitat is present in the Area and more than 400 birds were relocated from Scott City Kansas and the surrounding areas to the Cimarron and Comanche National Grasslands between 2016 and 2020 (Brown 2020). The majority of the birds relocated to the Area did not survive. There are no longer any active leks within the Zoological Area (2024).

The 1987 Articles of Designation designated the Comanche Lesser Prairie-chicken Zoological Area. As a result, the Forest Service became responsible for habitat management in the area in compliance with

management direction in the 1984 land and resource management plan. Current management in the 1984 land and resource management plan allows for adaptive management strategies, such as the reintroduction of species, as described above. Further, the Forest Service may approve scientific research by qualified persons through the issuance of a special use permit or cooperative agreement, if that research is deemed important and is compatible with current habitat management for lesser prairie-chicken.

The Forest Service may approve area improvements that are necessary for continued management and access. The Forest Service manages the area for multiple use, with lesser prairie-chicken habitat management being the priority activity. Hunting of wildlife is allowed in accordance with State regulations, and nesting habitat is protected from surface disturbances from April 15 through June 30. Mineral and gas development permits must include protective measures for lesser prairie-chickens. The Forest Service is required to monitor range conditions for impacts from livestock grazing. The Forest Service manages user access (USFS 1987).

Paleontological Areas

Picket Wire Canyonlands Paleontological Area

Summary

The Picket Wire Canyonlands Paleontological Area is a 16,728-acre designated area for its significant and unique paleontological, heritage, and natural resources, specifically its dinosaur tracksite. The area includes the Purgatoire River Valley, its tributaries, and side canyons. The area begins approximately 20 miles south of La Junta, Colorado, and extends for about 24 miles along the Purgatoire River.

The Picket Wire Canyonlands Paleontological Area is most well-known for its dinosaur tracksite, which is one of the largest and most intact in North America. It contains over a quarter mile of Jurassic dinosaur tracks that visitors can see on foot, on horseback, or by guided automobile tour. The Picket Wire Canyonlands Paleontological Area also contains over 500 documented archaeological and cultural sites.

The Picket Wire Canyonlands Paleontological Area is currently managed under direction in the 1994 Comanche National Grassland Picket Wire Canyonlands Management Plan. The area is managed to preserve paleontological, historic, cultural, and natural resources and promote ongoing research in the area. The Picket Wire Canyonlands Paleontological Area is also managed to promote public use and enjoyment while minimizing impacts from associated use. These management decisions help support social and economic sustainability by protecting paleontological and cultural resources and by allowing certain levels of economic activity, such as recreation, which can support jobs and labor income (see the Contributions to Social and Economic Sustainability section of Appendix A for more information).

Status and Trends

In 1990, Congress passed Public Law 101-510, Section 2825, directing the Secretary of the Army to transfer approximately 16,700 acres of the Pinon Canyon Maneuver Site to the Secretary of Agriculture, for inclusion in the Comanche National Grassland. In 1992, an amendment was made to the 1984 land and resource management plan to establish this paleontological area. These lands were to be known as the Picket Wire Canyonlands Paleontological Area. The Picket Wire Canyonlands Paleontological Area contains the largest Jurassic-period dinosaur tracksite in North America, with over 1,300 visible tracks, including many that are well-preserved, extending a quarter mile. The Picket Wire Canyonlands Paleontological Area is also considered outstanding for the amount and variety of archaeological sites and other heritage resources, which provide a spectacular record of human prehistory and history that visitors can explore.

The Picket Wire Canyonlands are situated within the Timpas Unit of the Comanche National Grassland, and its three parcels exist within two management areas: Management Area 1 OC, intended to protect locations of unusual natural resources, and Management Area 9A, which emphasizes riparian management. Although the Picket Wire Canyonlands Paleontological Area ecosystem has changed as the result of over 100 years of habitation and agriculture, visitors consider its environment to be pristine. The remote, rugged canyons and scarcity of obvious human facilities, such as power lines, paved roads, and structures, contribute to a feeling of unspoiled nature and solitude. Visitors to the Picket Wire Canyonlands Paleontological Area can engage in recreation, historical, and paleontological activities while exploring the area. The Forest Service is the managing agency, and management is currently directed under the 1994 Comanche National Grassland Picket Wire Canyonlands Management Plan (USDA Forest Service 1994).

Visitation to the Picket Wire Canyonlands is medium to heavy, particularly in May, June, September, and October. No overnight use is permitted in the Picket Wire Canyonlands Paleontological Area. Visitors can expect to hike approximately 11.2 miles to see the entire tracksite. The Forest Service also operates a guided automobile tour on Saturdays during peak season. Picket Wire Canyonlands guided auto tours are the only motorized access into the canyon (USDA Forest Service 2024d). Visitation to the Picket Wire Canyonlands Paleontological Area supports economic and social sustainability by providing economic contributions associated with recreation, as well as access to cultural resources that the surrounding communities value.

The Forest Service evaluated special areas of the Cimarron and Comanche National Grasslands in 2008. The evaluation identified the existing abundant and diverse paleontological resources in the Picket Wire Canyonlands Paleontological Area, including trace, plant, invertebrate, and vertebrate fossils, and the well-preserved prehistoric and historic archaeological sites. As of 2008, more than 80 percent of the canyonlands have been inventoried for heritage resources. Over 500 archaeological sites have been documented, and approximately 54 percent of those are considered significant and eligible to the NRHP. The Picket Wire Canyonlands Paleontological Area also contains many representative natural communities and includes special status plant and wildlife species.

Potential Designated Areas

This assessment discloses several areas that were identified a potential designated area based on previous evaluations and existing information. It should be noted that these potential designated areas are not required to be recommended or designated as part of the land management planning process.

During the land management planning process there will be concurrent processes for determining which lands may be recommended for inclusion in the National Wilderness Preservation System and which rivers may be eligible or suitable for inclusion in the National Wild and Scenic Rivers System as required by the Planning Rule.

Summary

In 2008, the Cimarron and Comanche National Grasslands staff underwent an evaluation of special areas (USDA Forest Service 2008). The report identified three areas – Bent Canyon Bluffs, Mesa de Maya, and OU Creek – for potential designation based on the area's ecological attributes. Separately, the Forest Service (USDA Forest Service 2009) found that none of the three areas met the criteria for designation as Research Natural Areas (RNA). Additionally, the 2008 document identified two areas- Picture Canyon and Vogel Canyon- for potential designation based on their historical attributes. Since these five areas are not designated, specific management has not been drafted.

Bent Canyon Bluff Area

This area is approximately 23 miles southwest of La Junta, Colorado, located in the arid portion of the shortgrass prairie ecosystem within the Timpas Unit of the Comanche National Grassland. This area has

unique geological profile of limestone outcrops, interspersed with unique septarian nodules, that support rare plants, uncommon vegetation communities, and patches of relatively undisturbed shortgrass prairie (USDA Forest Service 2008).

Mesa De Maya Area

This area is approximately 15 miles west of Kim, Colorado, located in the shortgrass prairie within the Carrizo unit of the Comanche National Grassland. This area has unique basalt formations that cap the mesa, consisting of substantial cliffs and large talus slopes that support rare plant species and vegetation communities. This area sees a dramatic change in landforms, which result in a variety of associated plants.

OU Creek Area

This area is approximately 7 miles northeast of Kim, Colorado, located on the Carrizo Unit of the Comanche National Grassland. This area has unique substrates that support a diverse vegetation type. There are streams and tributaries that have carved much of the plains exposing bedrock.

Picture Canyon Area

This area is located on the Carrizo Unit of the Comanche National grassland. This area has unique heritage resources and ample recreational opportunities. Picture Canyon is eligible to be nominated to the NRHP as a historic district. The area has remnants of Plains Indian cultures in rock art and early 20th century homestead remains (USDA Forest Service 2025). This area has scenic vistas, unique rock formations, gentle sandstone canyons, and rolling hills which attract visitation. The area has been heavily vandalized and some archeological deposits are eroding as a result of recreation, grazing, and natural weathering processes.

Vogel Canyon Area

This area is located on the Timpas Unit of the Comanche National Grassland. This area has unique heritage resources. The Vogel Canyon Area is within the Vogel Canyon Historic District, which was listed on Colorado's State Historic Register in 1995. The area contains heritage resources which span over 2,000 years. This area has observed negative impacts to the integrity of rock art panels because of vandalism and recreational use. The area is an arid shortgrass prairie and canyonland ecosystems. This area includes a tributary to the Purgatoire River. This area has many heritage resources and receives a high volume of recreational use.

References

- Abatzoglou, J.T. and Williams, A.P. 2016. Impact of anthropogenic climate change on wildfire across western US forests. *Proceedings of the National Academy of Sciences USA* 113(42): 11770-11775. <https://doi.org/10.1073/pnas.1607171113>
- Acuna, V., Datry, T., Marshall, J., Barcelo, D., Dahm, C.N., Ginebreda, A., McGregor, G., Sabater, S., Tockner, K., and Palmer, M.A. 2014. Why should we care about temporary waterways? *Science*, 343: 1080-1081 pp.
- Agee, J.K. 1993. *Fire ecology of pacific Northwest forests*. Washington, DC: Island Press. 493 p. <https://islandpress.org/books/fire-ecology-pacific-northwest-forests#desc>
- Ahmad, S., Ahmad, R., Ashraf, M.Y., Ashraf, M., and Waraich, E.A. 2009. Sunflower (*Helianthus annuus* L.) response to drought stress at germination and seedling growth stages. *Pakistan Journal of Botany* 41(2): 647–654. <https://www.cabidigitallibrary.org/doi/full/10.5555/20103003727>
- Allen, L.J.S., Allen, E.J., Kunst, C.R.G., and Sosebee, R.E. 1991. A diffusion model for dispersal of *Opuntia imbricata* (cholla) on rangeland. *Journal of Ecology* 79(4): 1123-1135. <https://doi.org/10.2307/2261103>
- Allred, B.W., Bestelmeyer, B.T., Boyd, C.S., Brown, C., Davies, K.W., Duniway, M.C., Ellsworth, L.M., Erickson, T.A., Fuhlendorf, S.D., Griffiths, T.V., Jansen, V., Jones, M.O., Karl, J., Knight, A., Maestas, J.D., Maynard, J.J., McCord, S.E., Naugle, D.E., Starns, H.D., Twidwell, D., and Uden, D.R. 2021. Improving landsat predictions of rangeland fractional cover with multitask learning and uncertainty. *Methods in Ecology and Evolution* 12(5): 841-849. <https://doi.org/10.1111/2041-210X.13564>
- Amme, N., Pague, C.A., and Redmond, M.D. 2020. Change in piñon-juniper woodland cover since Euro-American settlement: Expansion versus contraction associated with soil properties. *Rangeland Ecology & Management* 73(6): 847-855. <https://doi.org/10.1016/j.rama.2020.07.001>
- Assal, T.J., Melcher, C.P., and Carr, N.B. 2015. *Southern Great Plains Rapid Ecoregional Assessment: Pre-Assessment Report*. (Report). Open-File Report. 2015-1003. Reston, VA: U.S. Department of the Interior, Geological Survey (USGS). 284 p. <https://doi.org/10.3133/ofr20151003>
- Augustine, D., Davidson, A., Dickinson, K., and VanPelt, B. 2021. Thinking like a grassland: Challenges and opportunities for biodiversity conservation in the Great Plains of North America. *Rangeland Ecology & Management* 78: 281-295. <https://www.doi.org/10.1016/j.rama.2019.09.001>
- Barros, A.M.G., Day, M.A., Spies, T.A., and Ager, A.A. 2021. Effects of ownership patterns on cross-boundary wildfires. *Scientific Reports* 11(1) <https://doi.org/10.1038/s41598-021-98730-1>
- Bascom, G., Lamb, K., Kuhnel, K., and Larsen, S. 2024. Comanche recreation interview with Kurt Staton. Date: August 21, 2024 (1400-1500 MT). Salt Lake City, UT: U.S. Department of Interior, Bureau of Land Management (BLM). 4 p.
- Biondini, M.E., Patton, B.D., and Nyren, P.E. 1998. Grazing intensity and ecosystem processes in a northern mixed-grass prairie, USA. *Ecological Applications* 8(2): 469-479. [https://doi.org/10.1890/1051-0761\(1998\)008\[0469:GIAEPI\]2.0.CO;2](https://doi.org/10.1890/1051-0761(1998)008[0469:GIAEPI]2.0.CO;2)
- Blanco, H. 2023. Wind erosion. Chapter 5. *In* Cover crops and soil ecosystem services. Hoboken, NJ: John Wiley & Sons, Inc. 73-84 pp. <https://www.doi.org/10.1002/9780891186403.ch5>
- BLM (Bureau of Land Management). 2024. Mineral & Land Records System. Department of the Interior. Internet website: <https://mlrs.blm.gov/s/research-map>.
- Blue Umbrella. 2015. Southwest Kansas (Homeland Security Region C) multi-hazard, multi-jurisdictional hazard mitigation plan. Date: March, 2015. Wichita, KS: Blue Umbrella. 469 p. https://syracuseks.gov/documents/139/Redacted_Southwest_Kansas_Region_C_Hazard_Mitigation_Plan_04.15_compressed.pdf
- Bowen, M.W. and Johnson, W.C. 2019. Sediment accumulation and sedimentation rates in playas on the High Plains of western Kansas, USA. *Geomorphology* 342: 117-126. <https://doi.org/10.1016/j.geomorph.2019.06.014>
- Bowen, M.W., Johnson, W.C., Egbert, S.L., and Klopfenstein, S.T. 2010. A GIS-based approach to identify and map playa wetlands on the High Plains, Kansas, USA. *Wetlands* 30(4): 675-684. <https://www.doi.org/10.1007/s13157-010-0077-z>

- Brown, J. 2020. The squawking, stomping chicken of the grasslands is back in Colorado. The Colorado Sun, May 19, 2020, 9 p. <https://coloradosun.com/2020/05/19/lesser-prairie-chicken-colorado-kansas-relocation/>
- Buckles, W.G. and Buckles, N.B. 1984. Colorado historical archaeology context. Denver, CO: Colorado Historical Society. 159 p. <https://www.historycolorado.org/sites/default/files/media/documents/2018/605.pdf>
- Canarini, A., Carrillo, Y., Mariotte, P., Ingram, L., and Dijkstra, F.A. 2016. Soil microbial community resistance to drought and links to C stabilization in an Australian grassland. Soil Biology and Biochemistry 103: 171-180. <https://doi.org/10.1016/j.soilbio.2016.08.024>
- Canyon Journeys. 2024. Tour opportunities (website). Canyon Journeys, Last Modified 2024. <https://canyon-journeys.com/tours/>
- Canyons & Plains. 2024. Colorado electric byway (website). Canyons & Plains, Last Modified 2024. <https://canyonsandplains.org/santafetrailbyway/colorado-electric-byway/>
- Carbutt, C., Henwood, W.D., and Gilfedder, L.A. 2017. Global plight of native temperate grasslands: going, going, gone? Biodiversity and Conservation 26(12): 2911-2932. <https://doi.org/10.1007/s10531-017-1398-5>
- Cariveau, A.B. and Pavalacky, D. 2009. Biological inventory and evaluation of conservation strategies in southwest playa wetlands: Final report to the Nebraska Game and Parks Commission and the Playa Lakes Joint Venture. Date: June, 2009. Brighton, CO: Rocky Mountain Bird Observatory. 80 p. https://www.birdconservancy.org/wp-content/uploads/2014/06/RMBO_Nebraska_Playas_2009_Final_Report.pdf
- Carrillo, R., Christman, A., Corbett, E., Joyner, L., and Rusch, J. 2011. Historic context study of the Purgatoire River Region. Date: 2011. Denver, CO: Colorado Preservation, Inc. 117 p. <https://octa-trails.org/wp-content/uploads/2024/01/Purgatoire-River-Region-Historic-Context.pdf>
- Carter, C.J. and Mehls, S.F. 1984. Colorado southern frontier historic context. Date: 1984. Denver, CO: Colorado Historical Society. 157 p. <https://www.historycolorado.org/sites/default/files/media/documents/2018/607.pdf>
- CDPHE (Colorado Department of Public Health and Environment). 2023. Regulation #93 – Colorado's Section 303(D) List of Impaired Waters and Monitoring and Evaluation List. Internet website: <https://www.sos.state.co.us/CCR/GenerateRulePdf.do?ruleVersionId=11077&fileName=5%20CCR%201002-93>
- Childs, M.L., Li, J., Wen, J., Heft-Neal, S., Driscoll, A., Wang, S., Gould, C.F., Qiu, M., Burney, J., and Burke, M. 2022. Daily Local-Level Estimates of Ambient Wildfire Smoke PM for the Contiguous US. Environmental Science & Technology 56(19): 13607-13621.
- Clevenger, A.P. and Huijser, M.P. 2011. Wildlife crossing structure handbook: Design and evaluation in North America. Prepared under contract for the U.S. Department of Transportation, Federal highway Administration (FHWA), Central Federal Lands Highway Division. FHWA-CFL-TD-11-003. Bozeman, MT: Western Transportation Institute. 223 p. <https://rosap.nhtl.bts.gov/view/dot/41646>
- CNHP, Colorado Natural Heritage Program. 2010. Lesser prairie chicken habitat assessment: Comanche National Grassland (website). Colorado Natural Heritage Program, Last Modified September 28, 2010. <https://cnhp.colostate.edu/cnhpblog/2010/09/28/new-report-lesser-prairie-chicken-habitat-assessment-at-the-comanche-national-grasslands/>
- Colorado Division of Fire Prevention and Control. 2023. Colorado prescribed fire planning and implementation policy guide. Date: December, 2023. Lakewood, CO: Colorado Department of Public Safety. 97 p. https://drive.google.com/file/d/1gwJmRtruU3nTaob_-blHzOsG5xmhv4yo/view
- Colorado Division of Fire Prevention and Control. 2024. 2024 wildfire preparedness plan. Date: April, 2024. Lakewood, CO: Colorado Department of Public Safety. 32 p. <https://dfpc.colorado.gov/coloradowildfireprepplan>
- CPW (Colorado Parks and Wildlife). 2018. Black Rail Species Profile. https://cnhp.colostate.edu/download/documents/cwic_docs/CPWSpeciesProfiles/CPWProfiles_BlackRail.pdf
- Agriculture, 2003 35 Colorado Department of Agriculture. <https://ouraycountyco.gov/DocumentCenter/View/15502/Colorado-Noxious-Weed-act>

- Colorado Office of Economic Development International Trade. 2021. Restart industry associations success story: Santa Fe Trail Scenic & Historic Byway (website). Colorado Office of Economic Development and International Trade, Last Modified 2021. <https://oedit.colorado.gov/case-study/restart-industry-associations-success-story-santa-fe-trail-scenic-historic-byway>
- Colorado State Forest Service. 2011. Community wildfire protection plan Baca County fire. Date: February 11, 2011. Fort Collins, CO: Colorado State Forest Service. 59 p. <https://static.colostate.edu/client-files/csfs/pdfs/BacaCountyCWPP2011-AppxAdd2013.pdf>
- Colorado Water Conservation Board. NoDate. Instream flow program (website). Colorado Water Conservation Board, Last. <https://cwcb.colorado.gov/focus-areas/ecosystem-health/instream-flow-program>
- Cook, B.I., Miller, R.L., and Seager, R. 2009. Amplification of the North American “Dust Bowl” drought through human-induced land degradation. *Proceedings of the National Academy of Sciences USA* 106(13): 4997-5001. <https://doi.org/10.1073/pnas.0810200106>
- Cooper, D.J. and Merritt, D.M. 2012. Assessing the water needs of riparian and wetland vegetation in the western United States. Gen. Tech. Rep. RMRS-GTR-282. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 125 p. <http://dx.doi.org/10.2737/RMRS-GTR-282>
- Dahl, T.E. 1990. Wetland losses in the United States 1780's to 1980's. Washington, DC: U.S. Department of the Interior, U.S. Fish and Wildlife Service (FWS). 13 p. <http://www.fws.gov/wetlands/Documents/Wetlands-Losses-in-the-United-States-1780s-to-1980s.pdf>
- Davidson, A.D., Detling, J.K., and Brown, J.H. 2012. Ecological roles and conservation challenges of social, burrowing, herbivorous mammals in the world's grasslands. *Frontiers in Ecology and the Environment* 10(9): 477-486. <https://doi.org/10.1890/110054>
- Delwiche, J. 2009. Saltcedar: Is burning an option? *Fire Science Brief*(50): 6. <https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1006&context=jfspbriefs>
- Derner, J. and Schuman, G.E. 2007. Carbon sequestration and rangelands: A synthesis of land management and precipitation effects. *Journal of Soil and Water Conservation* 62(2): 77-85. https://www.researchgate.net/publication/43261980_Carbon_sequestration_and_rangelands_A_synthesis_of_land_management_and_precipitation_effects
- Dodds, W.K., Gido, K., Whiles, M.R., Fritz, K.M., and Matthews, W.J. 2004. Life on the edge: The ecology of Great Plains Prairie streams. *BioScience* 54(3): 205-216.
- DOT, U.S. Department of Transportation. 2018. U.S. Forest Service Transportation Resiliency Guidebook: Addressing climate change impacts on U.S. Forest Service transportation assets. DOT-VNTSC-USDA-19-01. Cambridge, MA: U.S. Department of Transportation (DOT), John A. Volpe National Transportation Systems Center. 93 p.
- Driscoll, K.P. and Smith, D.M. 2021. Development of riparian and groundwater-dependent ecosystem assessments for National Forests in the western U.S. *Sustainability* 13(8): 14. <https://doi.org/10.3390/su13084488>
- EIA (US Energy Information Administration). 2024. U.S. Energy Atlas Interactive GIS Data Viewer. Internet website: <https://eia.maps.arcgis.com/apps/webappviewer/index.html>.
- Elliot, L. and Rideout-Hanzak, S. 2020. 11480 Western Great Plains Sand Prairie: Landfire Biophysical Model. Washington, DC: USDA Forest Service. Original Release Date: August, 2020. <https://landfire.gov>
- EPA (U.S. Environmental Protection Agency). n.d. National Hydrography Dataset Version 2.1 (NHDPlus). Accessed January 7, 2025. <https://www.epa.gov/waterdata/nhdplus-national-data>
- EPA (United States Environmental Protection Agency). 2024a. Overview of Listing Impaired Waters under CWA Section 303(d). Available from: <https://www.epa.gov/tmdl/overview-listing-impaired-waters-under-cwa-section-303d>
- EPA (Environmental Protection Agency). 2025a. Climate Change Indicators: Streamflow. Accessed January 10, 2025. Internet website: <https://www.epa.gov/climate-indicators/climate-change-indicators-streamflow#tab-5>
- EPA. 2025c. Flow Alteration. Accessed January 10, 2025. Internet website: <https://www.epa.gov/caddis/flow-alteration>

- EPA, Environmental Protection Agency. 2025d. Nonattainment Areas for Criteria Pollutants (Green Book) (online data) Information about National Ambient Air Quality Standards (NAAQS) designations, classifications and nonattainment status (The project record contains date-stamped copies of relevant species, ecosystem, monitoring, mapping, and other data from this source). Washington, DC. Date Published: June 2, 2025 Available at: <https://www.epa.gov/green-book>. Please refer to project record.
- EPA, Environmental Protection Agency. 2025e. Overview of Listing Impaired Waters under CWA Section 303(d) (online data) The term "303(d) list" or "list" is short for a state's list of impaired and threatened waters (The project record contains date-stamped copies of relevant species, ecosystem, monitoring, mapping, and other data from this source). Washington DC. Date Published: July 22, 2024 Available at: <https://www.epa.gov/tmdl/overview-listing-impaired-waters-under-cwa-section-303d>. Please refer to project record.
- Epstein, H. E., I. C. Burke, A. R. Mosier. 1998. "Plant Effects on Spatial and Temporal Patterns of Nitrogen Cycling in Shortgrass Steppe." *Ecosystems* 1:374–385.
- Fenn, M.E., Lambert, K.F., Blett, T.F., Burns, D.A., Pardo, L.H., Lovett, G.M., Haeuber, R.A., Evers, D.C., Driscoll, C.T., and Jeffries, D.S. 2011. Setting limits: Using air pollution thresholds to protect and restore US ecosystems. *Issues in Ecology*. 14. Ecological Society of America. 21 p. <https://www.fs.usda.gov/research/treearch/41652>
- Finch, D.M., Pendleton, R.L., Reeves, M.C., Ott, J.E., Kilkeny, F.F., Butler, J.L., Ott, J.P., Pinto, J.R., Ford, P.L., Runyon, J.B., Rumble, M.A., and Kitchen, S.G. 2016. Rangeland drought: Effects, restoration, and adaptation. Chapter 8. *In* Effects of drought on forests and rangelands in the United States: A comprehensive science synthesis. Washington, DC: USDA Forest Service, Washington Office. 155-194 pp. https://www.fs.usda.gov/rm/pubs_journals/2016/rmrs_2016_finch_d001.pdf
- Furniss, M.J. and Howe, C. 2016. Regional-scale climate change vulnerability assessment for infrastructure in the National Forests and Grasslands of the Rocky Mountain Region: Including roads, trails, and recreational facilities. Date: September, 2016. Lakewood, CO: USDA Forest Service, Rocky Mountain Region (R2), Rocky Mountain Research Station. 117 p. https://www.fs.usda.gov/rm/pubs_journals/2016/rmrs_2016_furniss_m001.pdf
- FWS. 1983. Endangered and threatened wildlife and plants; Final rule to list the New Mexico meadow jumping mouse as threatened.
- FWS. 1985. Determination of endangered and threatened status for piping plover.
- FWS, Fish and Wildlife Service. 1998. Endangered and threatened wildlife and plants: Final rule to list the Arkansas river basin population of the Arkansas river shiner (*Notropis girardi*) as threatened. In 50 CFR Part 17. Vol. 63. Report Number. 64772-64799 pp. <https://www.govinfo.gov/content/pkg/FR-1998-11-23/pdf/98-31096.pdf>
- FWS, Fish and Wildlife Service. 2014. Endangered and threatened wildlife and plants; Determination of endangered status for the New Mexico meadow jumping mouse throughout its range. In 50 CFR Part 17. Vol. 79. Report Number. 33119-33137 pp. <https://www.govinfo.gov/content/pkg/FR-2014-06-10/pdf/2014-13094.pdf>
- FWS, Fish and Wildlife Service. 2020a. Endangered and threatened wildlife and plants; Threatened species status for eastern black rail with a section 4(d) rule. In 50 CFR Part 17. Vol. 85. Report Number. 63764-63803 pp. <https://www.govinfo.gov/content/pkg/FR-2020-10-08/pdf/2020-19661.pdf>
- FWS, Fish and Wildlife Service. 2022. Endangered and threatened wildlife and plants; Endangered species status for tricolored bat. In 50 CFR Part 17. Vol. 87. Report Number. 56381-56363 pp. <https://www.govinfo.gov/content/pkg/FR-2022-09-14/pdf/2022-18852.pdf>
- FWS, Fish and Wildlife Service. 2023a. Endangered and threatened wildlife and plants; Lesser prairie-chicken; Threatened status with section 4(d) rule for the northern distinct population segment and endangered status for the southern distinct population segment; Delay of effective date. In 50 CFR Part 17. Vol. 88. Report Number. 4087-4089 pp. <https://www.govinfo.gov/content/pkg/FR-2023-01-24/pdf/2023-01290.pdf>

- FWS, Fish and Wildlife Service. 2023b. Endangered and threatened wildlife and plants; Review of species that are candidates for listing as endangered or threatened; Annual notification of findings on resubmitted petitions; annual description of progress on listing actions. In 50 CFR Part 17. Vol. 88. Report Number. 41560-41585 pp. <https://www.govinfo.gov/content/pkg/FR-2023-06-27/pdf/2023-13577.pdf>
- FWS. 2023c. Endangered and threatened wildlife and plants; Establishment of a Nonessential Experimental Population of the Gray Wolf in Colorado.
- FWS. 2024c. IPaC list.
- FWS, Fish and Wildlife Service. 2024a. Endangered and threatened wildlife and plants; endangered status for the eastern regal fritillary, and threatened status with section 4(d) rule for the western regal fritillary. In 50 CFR Part 17. Vol. 89. Report Number. 63888-63909 pp.
- FWS, U.S. Fish and Wildlife Service. 1967. Endangered species; Native fish and wildlife. In Federal Register. Vol. 32. Report Number. 4001 p. <https://www.govinfo.gov/link/fr/32/4001?link-type=pdf>
- FWS, U.S. Fish and Wildlife Service. 2015. Status of the species - red knot (*Calidris canutus rufa*). Washington, DC: 29 p.
- FWS, U.S. Fish and Wildlife Service. 2020b. Arkansas River Shiner (*Notropis girardi*). 5 Year Review: Summary and Evaluation. Date: September 28, 2020. Tulsa, OK: U.S. Department of the Interior, U.S. Fish and Wildlife Service (FWS), Oklahoma Ecological Services Field Office. 20 p. <https://www.fws.gov/species/arkansas-river-shiner-notropis-girardi>
- FWS, U.S. Fish and Wildlife Service. 2024b. Proposed Rule: Endangered and Threatened Wildlife and Plants; Endangered Species Status for Suckley's Cuckoo Bumble Bee. In Federal Register. Vol. 89. Report Number. 102074-102091 pp.
- FWS, U.S. Fish and Wildlife Service. 2024c. Proposed Rule: Endangered and Threatened Wildlife and Plants; Threatened Species Status With Section 4(d) Rule for Monarch Butterfly and Designation of Critical Habitat. In Federal Register. Vol. 89. Report Number. 100662-100716 pp. <https://www.govinfo.gov/app/details/FR-2024-12-12/2024-28855>
- FWS, U.S. Fish and Wildlife Service 2023c. Draft recovery plan: Arkansas river shiner (*Notropis girardi*). Dated: August, 2023. Tulsa, OK: U.S. Department of the Interior, U.S. Fish and Wildlife Service (FWS), Southwest Region, Oklahoma Ecological Services Field Office. 37 p.
- Gely, C., Laurance, S.G.W., and Stork, N.E. 2019. How do herbivorous insects respond to drought stress in trees? *Biological Reviews* 95(2): 434-448. <https://doi.org/10.1111/brv.12571>
- Gopalakrishnana, Versha, S. Hirabayashi, G. Ziv, and B. R. Bakshi. 2018. "Air quality and human health impacts of grasslands and shrublands in the United States" *Atmospheric Environment* 182:193-199.
- Gulke, N.E. and Heath, R.L. 2019. Ozone effects on plants in natural ecosystems. *Plant Biology* 22(S1): 12-37. <https://doi.org/10.1111/plb.12971>
- Gurdak, J.J. and Roe, C.D. 2009. Recharge rates and chemistry beneath playas of the High Plains aquifer: A literature review and synthesis. (Report). U.S. Geological Survey Circular 1333. Reston, VA: U.S. Department of the Interior, Geological Survey (USGS). 39 p. <https://doi.org/10.3133/cir1333>
- Hansen, Z.K. and Libecap, G.D. 2004. The allocation of property rights to land: US land policy and farm failure in the Northern Great Plains. *Explorations in Economic History* 41(2): 103-129. <https://www.doi.org/10.1016/j.eeh.2003.10.002>
- Hargett, E.M. 2024. Habitat associations and abundance of eastern black rails (*Laterallus jamaicensis jamaicensis*) in southeastern Colorado. M.S. Thesis. Natural Resources and Environmental Sciences, University of Illinois Urbana-Champaign, Champaign, IL. 80 p. <https://www.ideals.illinois.edu/items/131483>
- Hayward, G. 2021. Evaluating ecological integrity for terrestrial ecosystems: Operational & technical approach. Using local knowledge (brainstorming). Dated: February 2021. 105-114 pp.
- He, T., Lamont, B.B., and Pausas, J.G. 2019. Fire as a key driver of Earth's biodiversity. *Biological Reviews* 94(6): 1983-2010. <https://doi.org/10.1111/brv.12544>
- Higuera, P.E. and Abatzoglou, J.T. 2020. Record-setting climate enabled the extraordinary 2020 fire season in the western United States. *Global Change Biology* 27(1): 1-2. <https://doi.org/10.1111/gcb.15388>
- High Plains Regional Climate Center. (2024). High Plains Regional Climate Center. University of Nebraska–Lincoln. Retrieved November 7, 2024, from <https://hprcc.unl.edu/>

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Revised Land Management Plan*

- Hoover, D. L. and B. M. Rogers. 2016. "Not all droughts are created equal: the impacts of interannual drought pattern and magnitude on grassland carbon cycling." *Global Change Biology* 22:1809–1820. Internet website: <https://doi.org/10.1111/gcb.13161>.
- Janowiak, M., Connelly, W.J., Dante-Wood, K., Domke, G.M., Giardina, C., Kayler, Z., Marcinkowski, K., Ontl, T., Rodriguez-Franco, C., Swanston, C., Woodall, C.W., and Buford, M. 2017. Considering forest and grassland carbon in land management. Gen. Tech. Rep. WO-95. Washington, DC: USDA Forest Service. 68 p. <https://doi.org/10.2737/WO-GTR-95>
- Jones, E.S., Mirus, B.B., Schmitt, R.G., Baum, R.L., Burns, W.J., Crawford, M., Godt, J.W., Kirschbaum, D.B., Lancaster, J.T., Lindsey, K.O., McCoy, K.E., Slaughter, S., and Stanley, T.A. 2019. Summary Metadata – Landslide Inventories across the United States: U.S. Geological Survey data release. Internet website: <https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=ae120962f459434b8c904b456c82669d>.
- Jones, J.N., Boulton, S.J., Bennett, G.L., Stokes, M., and Whitworth, M.R.Z. 2021. Temporal variations in landslide distributions following extreme events: Implications for landslide susceptibility modeling. *Journal of Geophysical Research: Earth Surface* 126(7): 26. <https://doi.org/10.1029/2021JF006067>
- Jones, M.O., Robinson, N.P., Naugle, D.E., Maestas, J.D., Reeves, M.C., Lankston, R.W., and Allred, B.W. 2021. Annual and 16-day rangeland production estimates for the western United States. *Rangeland Ecology & Management* 77: 112-117. <https://www.doi.org/10.1016/j.rama.2021.04.003>
- Agriculture, 2007 Article 13 Kansas Department of Agriculture.
- Kansas Department of Health and Environment. 2024. 2024 303(d) List of All Impaired & Potentially Impaired Waters. Internet website: <https://www.kdhe.ks.gov/DocumentCenter/View/34320/Proposed-2024-303d-List-PDF>
- Kansas Geological Survey. 2025. Morton County--Oil and Gas Production. Internet website: <https://www.kgs.ku.edu/PRS/County/klm/morton.html>.
- Kansas State Historic Preservation Office. 2017. 2017–2022 Kansas preservation plan. Date: 2017. Topeka, KS: Kansas State Historic Preservation Office, Kansas Historical Society. 38 p. https://www.kansashistory.gov/preserve/pdfs/kansas_preservation_plan_2017.pdf
- Kimball, Sarah, J. Rath, J. E. Coffey, M. R. Perea-Vega, M. Walsh, N. M. Fiore, P. M. Ta, K. T. Schmidt, et al. 2024. "Long-term drought promotes invasive species by reducing wildfire severity" *Ecology* 105(4). Internet website: <https://esajournals.onlinelibrary.wiley.com/doi/epdf/10.1002/ecy.4265>.
- Knapp, A., Briggs, J., Harnett, D., and Collins, S. 1998. *Grassland Dynamics: Long-Term Ecological Research in Tallgrass Prairie*. New York, NY: Oxford University Press. 364 p. <http://lter.konza.ksu.edu/content/grassland-dynamics-long-term-ecological-research-tallgrass-prairie>
- Koch, F.H., Coulston, J.W., and Smith, W.D. 2012. Mapping drought conditions using multi-year windows. Chapter 10. *In* Forest health monitoring: 2009 national technical report. Gen. Tech. Rep. SRS-167. Asheville, NC: USDA Forest Service, Southern Research Station. 163-179 pp. https://www.srs.fs.usda.gov/pubs/gtr/gtr_srs167/gtr_srs167_163.pdf
- Krausman, P.R. 1996. Rangeland wildlife. Denver, CO: Society of Range Management. 440 p. https://www.fs.usda.gov/pnw/pubs/pnw_1996_krausman001.pdf
- Kuhn, B., Nelson, B.E., and Hartman, R.L. 2011. A floristic inventory of the Cimarron National Grassland (Kansas) and the Comanche National Grassland (Colorado). *Journal of the Botanical Research Institute of Texas* 5(2): 753-772. <http://www.jstor.org/stable/41972334>
- Kunkel, K.E., Frankson, R., Runkle, J., Champion, S.M., Stevens, L.E., Easterling, D.R., Stewart, B.C., McCarrick, A., and Lemery, C.R. 2022. 2022: State climate summaries for the United States. NOAA Technical Report NESDIS 150. Silver Spring, MD: U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Services (NESDIS). 1 p. <https://statesummaries.ncics.org>
- Lambert, A., Hallar, A.G., Garcia, M., Strong, C., Andrews, E., and Hand, J.L. 2020. Dust impacts of rapid agricultural expansion on the Great Plains. *Geophysical Research Letters* 47(20): 11. <https://doi.org/10.1029/2020GL090347>
- Las Animas County. 2022. 2022 Hazard mitigation plan. Date: 2022. Trinidad, CO: Las Animas County. 197 p. <https://lasanimascounty.colorado.gov/sites/lasanimascounty/files/2022hazmitprocurment.pdf>

- Lentile, L.B., Smith, F.W., and Shepperd, W.D. 2006. Influence of topography and forest structure on patterns of mixed severity fire in ponderosa pine forests of the South Dakota, Black Hills, USA. *International Journal of Wildland Fire* 15(4): 557-566. <https://doi.org/10.1071/WF05096>
- Liu, C., Siri, M., Li, H., Ren, C., Huang, J., Feng, C., and Liu, K. 2023. Drought is threatening plant growth and soil nutrients of grassland ecosystems: A meta-analysis. *Ecology and Evolution* 13(5): 10. <https://doi.org/10.1002/ece3.10092>
- Liu, Y., Zhou, R., Wen, Z., Khalifa, M., Zheng, C., Ren, H., Zhang, Z., and Wang, Z. 2021. Assessing the impacts of drought on net primary productivity of global land biomes in different climate zones. *Ecological Indicators* 130: 14. <https://doi.org/10.1016/j.ecolind.2021.108146>
- Livingstone, I. and Warren, A. 2019. *Aeolian geomorphology: A new introduction*. Hoboken, NJ: John Wiley & Sons Ltd. 274 p. <https://www.doi.org/10.1002/9781118945650.fmatter>
- Luo, H. R., L. M. Smith, B. L. Allen, and D. A. Haukos. 1997. Effects of sedimentation on playa wetland volume. *Ecological Applications* 7:247–52.
- Luo, Y., Ke, Y., Wang, H., Xu, C., Gu, Q., Yu, Q., Smith, M.D., Madrimov, R., Samatov, N., Yang, W., and Wu, H. 2024. Interaction of extreme drought and insect herbivores on grassland community is affected by drought pattern. *Journal of Plant Ecology* 17(3): 13. <https://doi.org/10.1093/jpe/rtae041>
- Mantua, N., Tohver, I., and Hamlet, A. 2010. Climate change impacts on streamflow extremes and summertime stream temperature and their possible consequences for freshwater salmon habitat in Washington state. *Climatic Change* 102(1): 187-223. <https://www.doi.org/10.1007/s10584-010-9845-2>
- McGuire, V.L. and Strauch, K.R. 2024. Water-level and recoverable water in storage changes, High Plains aquifer, predevelopment to 2019 and 2017 to 2019. *Sci. Inv. Rep.* 2023-5143. Reston, VA: U.S. Department of the Interior, Geological Survey (USGS). 26 p. <https://pubs.usgs.gov/publication/sir20235143>
- McKinley, D.C. and Blair, J.M. 2008. Woody plant encroachment by *Juniperus virginiana* in a mesic native grassland promotes rapid carbon and nitrogen accrual. *Ecosystems* 11(3): 454-468. <https://doi.org/10.1007/s10021-008-9133-4>
- McLeman, R.A., Dupre, J., Berrang Ford, L., Ford, J., Gajewski, K., and Marchildon, G. 2014. What we learned from the dust bowl: Lessons in science, policy, and adaptation. *Population and Environment* 35(4): 417-440. <https://doi.org/10.1007/s11111-013-0190-z>
- McNab, W.H., Cleland, D.T., Freeouf, J.A., Keys, J.E., Nowacki, G.J., and Carpenter, C.A. 2007. Description of "Ecological subregions: Sections of the conterminous United States". First Approximation. Gen. Tech. Rep. WO-76B. Washington, DC: USDA Forest Service. 92 p.
- Milchunas, D. G., A. R. Mosier, J. A. Morgan, E. R. LeCain, J. Y. King, and J. A. Nelson. 2005. "Elevated CO₂ and defoliation effects on a shortgrass steppe: Forage quality versus quantity for ruminants." *Agriculture, Ecosystems and Environment* 111:166–184. Internet website: <https://doi.org/10.1016/j.agee.2005.06.014>.
- Milchunas, D., Augustine, D., and Sprock, H. 2020. 11490 Western Great Plains Shortgrass Prairie: Landfire Biophysical Model. Washington, DC: USDA Forest Service. Original Release Date: August, 2020. <https://landfire.gov/>
- Miller Hesed, C.D. and Yocum, H.M. 2023. Grassland management priorities for the North Central Region. (Report). Date: April, 2023. Open-File Rep. 2023-1037. Reston, VA: U.S. Department of the Interior, Geological Survey (USGS). 53 p. <https://doi.org/10.3133/ofr20231037>
- Miller Hesed, C.D., Yocum, H.M., Rangwala, I., Symstad, A., Martin, J.M., Ellison, K., Wood, D.J.A., Ahlering, M., Chase, K.J., Crausbay, S., Davidson, A.D., Elliott, J.L., Giocomo, J., Hoover, D., Klemm, T., Lightfoot, D.A., McKenna, O.P., Miller, B.W., Mosher, D., Nagy, R.C., Nippert, J.B., Pittman, J., Porensky, L.M., Stephens, J., and Zale, A.V. 2023. Synthesis of climate and ecological science to support grassland management priorities in the North Central Region. (Report). Open-File Report. Date: April 14, 2023. Open-File Report 2023-1036. Reston, VA: U.S. Department of the Interior, Geological Survey (USGS). 21 p. <https://doi.org/10.3133/ofr20231036>
- Miller, L.D., Watts, K.R., Ortiz, R.F., and Ivahnenko, T. 2010. Occurrence and distribution of dissolved solids, selenium, and uranium in groundwater and surface water in the Arkansas River Basin from the headwaters to Coolidge, Kansas, 1970–2009. Date: 2010. *Sci. Inv. Rep.* 2010–5069. Reston, VA: U.S. Department of Interior, Geological Survey (USGS). 59 p. <https://pubs.usgs.gov/sir/2010/5069/pdf/SIR10-5069.pdf>

- Molvar, E.M., Rosentreter, R., Mansfield, D., and Anderson, G.M. 2024. Cheatgrass invasions: History, causes, consequences, and solutions. Date: January, 2024. Hailey, ID: Western Watersheds Project. 128 p. <https://westernwatersheds.org/wp-content/uploads/2024/02/Cheatgrass-Literature-Review-final.pdf>
- Moorhouse, T.P. and Macdonald, D.W. 2014. Are invasives worse in freshwater than terrestrial ecosystems? *WIREs Water* 2(1): 1-8. <https://doi.org/10.1002/wat2.1059>
- Morgan, J.A., Mosier, A.R., Milchunas, D.G., LeCain, D.R., Nelson, J.A., and Parton, W.J. 2004. CO₂ enhances productivity, alters species composition, and reduces digestibility of shortgrass steppe vegetation. *Ecological Applications* 14(1): 208-219.
- Nagler, P.L., Hull, J.B., van Riper, C., III, Shafroth, P.B., and Yackulic, C.B. 2021. The transformation of dryland rivers: The future of introduced tamarisk in the U.S. (Report). Date: April, 2021. Fact Sheet 2020–3061. Reston, VA: U.S. Department of Interior, Geological Survey (USGS). 6 p. <https://doi.org/10.3133/fs20203061>
- National Drought Mitigation Center. 2025. U.S. drought monitor: Data (Time series) (online data). Lincoln, NE: University of Nebraska, National Drought Mitigation Center; United States Department of Agriculture; and U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). Available at: <https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx>
- Nature Conservancy. 2011. Restoring Lesser Prairie-Chicken Habitat. Internet website: <https://www.nature.org/content/dam/tnc/nature/en/documents/restoring-lesser-prairie-chicken-habitat.pdf>.
- NatureServe. 2018. International Ecological Classification Standard: Terrestrial Ecological Classification, Terrestrial Ecological Systems of CONUS and Puerto Rico on the LANDFIRE Legend. Date: August 28, 2018. Arlington, VA: NatureServe. https://landfire.gov/documents/LANDFIRE_Ecological_Systems_Descriptions_CONUS.pdf
- NatureServe. 2024. NatureServe Network Biodiversity Location Data accessed through NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available <https://explorer.natureserve.org/>. (Accessed: November 14, 2024).
- NatureServe. 2024a. International terrestrial ecological system western great plains shortgrass prairie. Arlington, VA: NatureServe. 16 p.
- NatureServe. 2024b. International terrestrial ecological system: southern rocky mountain pinyon-juniper woodland and savanna. Series Editor: NatureServe, ed. NatureServe Central Databases. 13 p.
- Navarro-Ortega, A., Acuña, V., Bellin, A., Burek, P., Cassiani, G., Choukr-Allah, R., Dolédec, S., Elosegi, A., Ferrari, F., Ginebreda, A., Grathwohl, P., Jones, C., Rault, P.K., Kok, K., Koundouri, P., Ludwig, R.P., Merz, R., Milacic, R., Muñoz, I., Nikulin, G., Paniconi, C., Paunović, M., Petrovic, M., Sabater, L., Sabater, S., Skoulikidis, N.T., Slob, A., Teutsch, G., Voulvoulis, N., and Barceló, D. 2015. Managing the effects of multiple stressors on aquatic ecosystems under water scarcity. The GLOBAQUA project. *Science of The Total Environment* 503-504: 3-9. <https://doi.org/10.1016/j.scitotenv.2014.06.081>
- NOAA (National Centers for Environmental Information). 2024. Climate at a Glance County Time Series. Internet website: <https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/county/mapping>.
- NPS, National Park Service. 1990. Santa Fe National Historic Trail: Comprehensive management and use plan. Date: May, 1990. Washington, DC: U.S. Department of Interior, National Park Service (NPS). 141 p. <https://www.nps.gov/safe/learn/management/upload/Comprehensive-Management-Plan-508.pdf>
- NPS, National Park Service. 2021. Foundation document: Santa Fe National Historic Trail - Missouri, Kansas, Colorado, Oklahoma, New Mexico. Date: October, 2021. Washington, DC: U.S. Department of Interior, National Park Service (NPS). 50 p. https://www.nps.gov/safe/getinvolved/upload/SAFE_FD_508_2021-1103.pdf
- NPS, National Park Service. 2025. Santa Fe National Historic Trail: History & culture (website). Last Modified: August 31, 2025 <https://www.nps.gov/safe/learn/historyculture/index.htm>
- NRCS, USDA Natural Resources Conservation Service. 2023. Ecological site R077AY011TX Sand Hills 16-22" PZ (website). U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS), Ecosystem Dynamics Interpretive Tool (EDIT), Last Modified September 11, 2023. <https://edit.jornada.nmsu.edu/catalogs/esd/077A/R077AY011TX>

*Draft Assessment
Cimarron and Comanche National Grasslands
Revised Land Management Plan*

- NRCS, USDA Natural Resources Conservation Service 2014. Keys to soil taxonomy. 12th ed. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/class/?cid=nrcs142p2_053580
- NRCS, USDA Natural Resources Conservation Service 2020. Web soil survey U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS), Soil Survey Staff. <https://websoilsurvey.nrcs.usda.gov>
- NRCS, USDA Natural Resources Conservation Service. 2025b. Soil Survey Geographic Database (SSURGO) (online data). Date Accessed: June 5, 2025. Available at: <https://www.nrcs.usda.gov/resources/data-and-reports/soil-survey-geographic-database-ssurgo>
- Office of Archaeology and Historic Preservation. 2017. The power of heritage and place: A 2020 action plan for Colorado preservation: 2020 Colorado statewide preservation plan. Date: 2017. Denver, CO: History Colorado. 72 p. <https://www.historycolorado.org/sites/default/files/media/document/2017/StatePlan.pdf>
- Olson, E. 1997. National Grasslands management: A primer. Date: November, 1997. Washington, DC: U.S. Department of Agriculture, Office of the General Counsel, Natural Resources Division. 40 p. https://www.fs.usda.gov/grasslands/documents/primer/NG_Primer.pdf
- Otero County. 2013. Otero County community wildfire protection plan. Date: June 11, 2013. La Junta, CO: Otero County. 52 p. <https://static.colostate.edu/client-files/csfs/pdfs/OteroCountyCWPP2013.pdf>
- Outdoor Industry Association (OIA). 2023. Outdoor Participation Trends Report. Available online: <https://outdoorindustry.org/resource/2023-outdoor-participation-trends-report/>.
- Page-Dumroese, D.S., Abbott, A.M., and Rice, T.M. 2009. Forest soil disturbance monitoring protocol. Vol. II: Supplementary methods, statistics, and data collection. Gen. Tech. Rep. WO-GTR-82b. Washington, DC: USDA Forest Service. 64 p. <https://doi.org/10.2737/WO-GTR-82B>
- Pardo, L.H., Fenn, M.E., Goodale, C.L., Geiser, L.H., Driscoll, C.T., Allen, E.B., Baron, J.S., Bobbink, R., Bowman, W.D., Clark, C.M., Emmett, B., Gilliam, F.S., Greaver, T.L., Hall, S.J., Lilleskov, E.A., Liu, L., Lynch, J.A., Nadelhoffer, K.J., Perakis, S.S., Robin-Abbott, M.J., Stoddard, J.L., Weathers, K.C., and Dennis, R.L. 2011. Effects of nitrogen deposition and empirical nitrogen critical loads for ecoregions of the United States. *Ecological Applications* 21(8): 3049-3082. <https://doi.org/10.1890/10-2341.1>
- Pellant, M., Shaver, P.L., Pyke, D.A., Herrick, J.E., Lepak, N., Riegel, G., Kachergis, E., Newingham, B.A., Toledo, D., and Busby, F.E. 2020. Interpreting indicators of rangeland health. Technical Reference 1734-6, Version 5. Denver, CO: U.S. Department of the Interior, Bureau of Land Management (BLM), National Operations Center. 202 p. <https://www.blm.gov/documents/national-office/blm-library/technical-reference/interpreting-indicators-rangeland-health-0>
- Pelton, M.M., Padula, S.R., Garcia-Walther, J., Andrews, M., Mercer, R., Porter, R., Sanders, F., Thibault, J., Senner, N.R., and Linscott, J.A. 2022. Kiawah and Seabrook islands are a critical site for the rufa red knot (*Calidris canutus rufa*). *bioRxiv*: 22. <https://doi.org/10.1101/2022.03.21.485188>
- Playa Lakes Joint Venture. 2025. Playa Lakes Joint Venture: Providing partner-based solutions to conservation challenges (website). <https://pljv.org>
- Pokorny, M., Mangold, J., and Noack, R. 2020. Plant guide for Russian olive (*Elaeagnus angustifolia* L.). Date: April, 2020. Bridger, MT: U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS), Bridger Plant Materials Center. 4 p. https://plants.usda.gov/DocumentLibrary/plantguide/pdf/pg_elan.pdf
- Porter, E., T. Blett, D. U. Potter, and C. Huber. 2005. "Protecting resources on Federal lands: implications of critical loads for atmospheric deposition of nitrogen and sulfur." *BioScience* 55(7):603–612.
- Potyondy, J.P. and Geier, T.W. 2011. Watershed condition classification technical guide. Date: July 2011. Report FS-978. Washington, DC: USDA Forest Service. 41 p. https://www.fs.usda.gov/biology/resources/pubs/watershed/maps/watershed_classification_guide_2011FS978.pdf
- Provencher L, Badik KJ, Byer S. 2025. Grassland natural range of variation. Final Report for the Cimarron-Comanche National Grasslands to the USFS Mountain Service Planning Group. The Nature Conservancy, Reno, Nevada.
- Putz, M. 2024. More than meets the eye: Tallgrass to the forest: The Comanche and Cimarron National Grasslands (website). U.S. Department of Agriculture, Forest Service (USDA Forest Service), Last Modified 2024. <https://www.fs.usda.gov/about-agency/features/more-meets-eye>

- RAP (Range Analysis Platform). 2024. CCNG Range Analysis Platform Trends data. [Rangeland Analysis Platform](#)
- Reeves, M. C., B. B. Hanberry, H. Wilmer, N. E. Kaplan, and W. K. Lauenroth. 2021. "An Assessment of production trends on the Great Plains from 1984 to 2017." *Rangeland Ecology and Management* 78:165-179.
- Rice, J.R., Joyce, L.A., Regan, C., Winters, D., and Truex, R. 2018. Climate change vulnerability assessment of aquatic and terrestrial ecosystems in the U.S. Forest Service Rocky Mountain Region. Gen. Tech. Rep. RMRS-GTR-376. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 216 p. <https://doi.org/10.2737/RMRS-GTR-376>
- Roberts, B.J. 2018a. U.S. Annual Solar Direct Normal Solar Irradiance, National Solar Radiation Database Physical Solar Model. National Renewable Energy Laboratory. Internet website: <https://www.nrel.gov/gis/solar-resource-maps.html>.
- Roberts, B.J. 2018b. Geothermal Resources of the United States, Identified Hydrothermal Sites and Favorability of Deep Enhanced Geothermal Systems. National Renewable Energy Laboratory. Internet website: <https://www.nrel.gov/gis/geothermal.html>.
- Roberts, B.J. 2024. U.S. Wind Speed at 100-Meter above Surface Level. National Renewable Energy Laboratory. Internet website: <https://www.nrel.gov/gis/wind-resource-maps.html>.
- Rockman, M., Morgan, M., Ziaja, S., Hambrecht, G., and Meadow, A. 2016. Cultural resources climate change strategy. Date: December, 2016. Washington, DC: Cultural Resources, Partnerships, and Science and Climate Change Response Program, U.S. Department of Interior, National Park Service (NPS). 51 p. https://www.nps.gov/subjects/climatechange/upload/NPS-2016_Cultural-Resoures-Climate-Change-Strategy.pdf
- Romme, W.H., Allen, C.D., Bailey, J.D., Baker, W.L., Bestelmeyer, B.T., Brown, P.M., Eisenhart, K.S., Floyd, M.L., Huffman, D.W., Jacobs, B.F., Miller, R.F., Muldavin, E.H., Swetnam, T.W., Tausch, R.J., and Weisberg, P.J. 2009. Historical and modern disturbance regimes, stand structures, and landscape dynamics in piñon–juniper vegetation of the western United States. *Rangeland Ecology & Management* 62(3): 203-222. <https://doi.org/10.2111/08-188R1.1>
- Running, S.W. 2006. Is global warming causing more, larger wildfires? *Science* 313(5789): 927-928. <https://doi.org/10.1126/science.1130370>
- Sabater, S., Bregoli, F., Acuña, V., Barceló, D., Elosegi, A., Ginebreda, A., Marcé, R., Muñoz, I., Sabater-Liesa, L., and Ferreira, V. 2018. Effects of human-driven water stress on river ecosystems: A meta-analysis. *Scientific Reports* 8(1): 11. <https://doi.org/10.1038/s41598-018-29807-7>
- Samson, F.B., Knopf, F.L., and Ostlie, W.R. 2004. Great Plains ecosystems: Past, present, and future. *Wildlife Society Bulletin* 32(1): 6-15. <https://pubs.usgs.gov/publication/1015222>
- Sanders, K. and Durham, J. 1985. Rangeland fire effects: A symposium. Boise, ID: U.S. Department of the Interior, Bureau of Land Management (BLM), Idaho State Office. 124 p.
- Sares, M.A., Phillips, R.C., Neubert, J.T., Wood, R.H., II, Lovekin, J.R., Kirkham, R.M., and Benson, R.G. (2020). On-008-04D U.S. Forest Service abandoned mine land inventory map (Map). Colorado Geological Survey. Accessed: 2020. <https://cologeosurvey.maps.arcgis.com/apps/webappviewer/index.html?id=28e1efe2d4fb4d8abee5fd24ff7adce8>
- Schmidt, C.J., Peek, M., Kaufman, G.A., Kaufman, D.W., Finck, E.J., Patrick, L., Hope, A., and Timm, R. 2021. Kansas Mammal Atlas: An on-line reference (Homepage). Hays, KS: Sternberg Museum of Natural History, Fort Hays State University. Originally Released: 2021. <https://webapps.fhsu.edu/ksmammal>
- Schumm, S.A. and Lichty, R.W. 1963. Channel widening and flood-plain construction along Cimarron River in southwestern Kansas. Date: 1963. Prof. Pap. 352-D. Washington, DC: U.S. Department of Interior, Geological Survey (USGS). 71-88 pp. <https://doi.org/10.3133/pp352D>
- Shafer, M., Ojima, D., Antle, J.M., Kluck, D., McPherson, R.A., Petersen, S., Scanlon, B., and Sherman, K. 2014. Great Plains. Chapter 19. In Melillo, J.M., Richmond, T.C. and Yohe, G.W., eds., *Climate Change Impacts in the United States: The Third National Climate Assessment*. U.S. Global Change Research Program (USGCRP). 441-461 pp.
- Smith, R. 2023. Santa Fe Trail scenic and historic byway Corridor management plan. Date: March, 2023. Boulder, CO: Canyons & Plains Southeast Colorado, Regional Heritage Taskforce. 145 p.
- Sophocleous, M. 2005. Groundwater recharge and sustainability in the high plains aquifer in Kansas, USA. *Hydrogeology Journal* 13(2): 351-365. <https://doi.org/10.1007/s10040-004-0385-6>

- Sprock, H., Kettler, S., and Schulz, K. 2020. 10940 Western Great Plains Sandhill Steppe: Landfire Biophysical Model. Washington, DC: USDA Forest Service. Original Release Date: August, 2020. <https://landfire.gov/>
- Stewart, I.T., Cayan, D.R., and Dettinger, M.D. 2005. Changes toward earlier streamflow timing across western North America. *Journal of Climate* 18(8): 1136-1155. <https://doi.org/10.1175/JCLI3321.1>
- Stoffle, R.W., Dobyns, H.F., Evans, M.J., and Stewart, O.C. 1984. Toyavita piavuhuru koroin "canyon of mother earth": Ethnohistory and native american religious concerns in the Fort Carson – Pinon Canyon maneuver area. Date: August 10, 1984. CX-1200-2-A006. Kenosha, WI: University of Wisconsin-Parkside. 293 p. <http://hdl.handle.net/10150/295804>
- Stromberg, J.C., Chew, M.K., Nagler, P.L., and Glenn, E.P. 2009. Changing perceptions of change: The role of scientists in tamarix and river management. *Restoration Ecology* 17(2): 177-186. <https://doi.org/10.1111/j.1526-100X.2008.00514.x>
- Tubiello, F.N., Salvatore, M., Rossi, S., Ferrara, A., Fitton, N., and Smith, P. 2013. The FAOSTAT database of greenhouse gas emissions from agriculture. *Environmental Research Letters* 8: 1-10. <https://doi.org/10.1088/1748-9326/8/1/015009>
- Twidwell, D., Fogarty, D., and Weir, J. 2021. Reducing woody encroachment in grasslands: A guide for understanding risk and vulnerability. Date: July, 2021. E-1054. Oklahoma City, OK: Oklahoma Cooperative Extension Service. 32 p. https://d31hzhk6di2h5.cloudfront.net/20211028/3d/59/fb/ad/97e1ae1aba9fb60993fe6b/E-1054WoodyEncroachment.pdf?utm_source=newsletter&utm_medium=email&utm_content=REA%20THE%20GUIDE&utm_campaign=October%20e-news
- Twidwell, D., Rogers, W.E., Wonkka, C.L., Taylor, C.A., and Kreuter, U.P. 2016. Extreme prescribed fire during drought reduces survival and density of woody resprouters. *Journal of Applied Ecology* 53(5): 1585-1596. <https://doi.org/10.1111/1365-2664.12674>
- USDA Forest Service. 1987. Establishment record: Campo research natural area. Baca County, CO: U.S. Department of Agriculture, Forest Service (USDA Forest Service), Rocky Mountain Region. 18 p.
- USDA Forest Service. 1994. Comanche National Grassland Picket Wire Canyonlands management plan 1994. Washington, DC: U.S. Department of Agriculture, Forest Service (USDA Forest Service). 72 p.
- USDA Forest Service. 2005a. Heritage resources. Chapter 8. *In* Specialist report- Existing condition descriptions Cimarron and Comanche National Grasslands. May 10, 2005 Washington, DC: U.S. Department of Agriculture, Forest Service (USDA Forest Service). 21 p.
- USDA Forest Service. 2005b. Landownership management. Chapter 10. *In* Specialist report- Existing condition descriptions Cimarron and Comanche National Grassland. May 10, 2005 Washington, DC: U.S. Department of Agriculture, Forest Service (USDA Forest Service). 3 p.
- USDA Forest Service. 2005c. Transportation. Chapter 19. *In* Cimarron and Comanche National Grassland, ed. Specialist report: Existing condition descriptions. Washington, DC: U.S. Department of Agriculture, Forest Service (USDA Forest Service). 4 p.
- USDA Forest Service. 2005d. Water resources. Chapter 21. *In* Specialist report- Existing condition descriptions Cimarron and Comanche National Grassland. May 5, 2005 Washington, DC: U.S. Department of Agriculture, Forest Service (USDA Forest Service). 22 p.
- USDA Forest Service. 2008. Evaluations of special areas: Cimarron and Comanche National Grasslands land management plan. Date: July, 2008. Washington, DC: U.S. Department of Agriculture, Forest Service (USDA Forest Service), Comache National Grassland. 31 p.
- USDA Forest Service. 2009. Cimarron and Comanche National Grasslands land management plan: Potential research natural areas assessment criteria, characteristics and summary conclusions. Date: May 20, 2009. Lakewood, CO: U.S. Department of Agriculture, Forest Service (USDA Forest Service), Rocky Mountain Region. 31 p.
- USDA Forest Service. 2010. Programmatic agreement among the Colorado State Historic Preservation Office and the U.S.D.A. Forest Service, Rocky Mountain Region Arapaho and Roosevelt National Forests Cimarron-Comanche National Grasslands Grand Mesa, Uncompahgre, and Gunnison National Forests Medicine Bow-Routt National Forests Pawnee National Grassland Pike and San Isabel National Forests Rio Grande National Forest San Juan National Forest White River National Forest regarding the reporting of negative results cultural resource inventories. USFS AR Agreement No. 10-MOA-11021000-014. Washington, DC: U.S. Department of Agriculture, Forest Service (USDA Forest Service). 35 p.

*Draft Assessment
Cimarron and Comanche National Grasslands
Revised Land Management Plan*

- USDA (United States Department of Agriculture). 2011. National Visitor Use Monitoring Survey and Report – Cimarron and Comanche National Grasslands.
- USDA. 2016. National Visitor Use Monitoring Survey and Report – Cimarron and Comanche National Grasslands.
- USDA Forest Service. 2017a. Drought impacts in the Rocky Mountain Region: A synopsis of presentations and work group sessions from the Region 2 drought workshop: Region 2 drought workshop. April 25-26, 2017; Washington, DC U.S. Department of Agriculture, Forest Service (USDA Forest Service). 9 p. <https://www.fs.usda.gov/sites/default/files/r2-droughtfactsheet.pdf>
- USDA Forest Service. 2017b. Programmatic agreement among the Colorado State Historic Preservation Officer, and the U.S.D.A. Forest Service Arapaho and Roosevelt National Forests and Pawnee National Grassland, Pike and San Isabel National Forests, Cimarron and Comanche National Grasslands, Grand Mesa Uncompahgre and Gunnison National Forests regarding the implementation of prescribed broadcast burning program. Washington, DC: U.S. Department of Agriculture, Forest Service (USDA Forest Service). 61 p.
- USDA Forest Service. 2017c. Programmatic agreement among the U.S. Department of Agriculture, U.S. Forest Service Pike-San Isabel National Forests & Cimarron and Comanche National Grasslands, Colorado State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding National Historic Preservation Act responsibilities for travel management on the Pike-San Isabel National Forests & Cimarron and Comanche National Grasslands. Washington, DC: U.S. Department of Agriculture, Forest Service (USDA Forest Service). 28 p.
- USDA. 2020. Conveyance of Small Tracts. *Federal Register*. Vol. 85, No. 30.
- USDA Forest Service. 2021. Visitor use report: Pike and San Isabel NF: National visitor use monitoring data collected FY 2021. Date: July 1, 2024. Lakewood, CO: U.S. Department of Agriculture, Forest Service (USDA Forest Service), Region 2. 51 p.
- USDA Forest Service. 2022. Programmatic agreement among the United States Forest Service, Rocky Mountain Regional Office, Pike-San Isabel National Forest and Cimarron and Comanche National Grasslands, Routt National Forest, San Juan National Forest and the Colorado State Historic Preservation Officer regarding vegetation management undertakings. Washington, DC: U.S. Department of Agriculture, Forest Service (USDA Forest Service). 35 p.
- USDA Forest Service. 2023a. Campo (website). U.S. Department of Agriculture, Forest Service (USDA Forest Service), Last Modified January 31, 2023. <https://research.fs.usda.gov/rmrs/rnas/locations/campo>
- USDA Forest Service. 2023b. Climate change and infrastructure: Quick reference guide. Date: November, 2023. Washington, DC: U.S. Department of Agriculture, Forest Service (USDA Forest Service), Office of Sustainability and Climate. 2 p.
- USDA Forest Service. 2024a. Archaeological resources protection act of 1979: Plan of action for the Pike-San Isabel National Forests & Cimarron and Comanche Grasslands. Date: August, 2024. Lakewood, CO: U.S. Department of Agriculture, Forest Service (USDA Forest Service), Region 2. 7 p.
- USDA Forest Service. 2024b. Climate change and cultural resources: Quick reference guide. Date: September, 2024. Washington, DC: U.S. Department of Agriculture, Forest Service (USDA Forest Service), Office of Sustainability and Climate. 2 p.
- USDA Forest Service. 2024c. Forest insect and disease conditions in the Rocky Mountain Region, 2023. Date: January, 2024. R2-RO-24-01. Lakewood, CO: U.S. Department of Agriculture, Forest Service (USDA Forest Service), Rocky Mountain Region Forest Health. 68 p.
- USDA Forest Service. 2024d. Picket Wire Canyonlands (website). U.S. Department of Agriculture, Forest Service (USDA Forest Service), Last Modified February 18, 2025. <https://www.fs.usda.gov/r02/psicc/recreation/picket-wire-canyonlands>
- USDA Forest Service. 2024e. Pike-San Isabel National Forests & Cimarron and Comanche National Grasslands: Emergency response protocol. Date: August, 2024. Pueblo, CO: U.S. Department of Agriculture, Forest Service (USDA Forest Service). 1 p.
- USDA Forest Service. 2024f. Santa Fe National Historic Trail (website). U.S. Department of Agriculture, Forest Service (USDA Forest Service), Last. <https://www.fs.usda.gov/r02/psicc/recreation/santa-fe-national-historic-trailhead>

*Draft Assessment
Cimarron and Comanche National Grasslands
Revised Land Management Plan*

- USDA Forest Service. 2025. Picture Canyon (website). U.S. Department of Agriculture, Forest Service (USDA Forest Service), Last Modified February 18, 2025.
<https://www.fs.usda.gov/r02/psicc/recreation/picture-canyon>
- USFS. n.d. Cimarron and Comanche National Grasslands Plan Revision. Internet site:
<https://www.fs.usda.gov/detail/psicc/landmanagement/planning/?cid=FSEPRD1169904>.
- USFS. 1984. Land and Resource Management Plan: Pike and San Isabel National Forests; Comanche and Cimarron National Grasslands. Pueblo, Colorado.
- USFS. 1987. Comanche Lesser Prairie Chicken Natural Area Articles of Designation.
- USFS. 1995. Rock Art of the Comanche National Grassland. Washington, DC. Internet site:
<https://archive.org/details/CAT10741556/page/n1/mode/2up>.
- USFS, USDA Forest Service. 1995. Landscape aesthetics: A handbook for scenery management. Agric. Handbook No.701. Washington, DC: USDA Forest Service. 104 p.
<https://www.nrc.gov/docs/ML1224/ML12241A377.pdf>
- USFS, USDA Forest Service. 2008a. Cimarron and Comanche National Grasslands: Land Management Plan. Date: October, 2008. Pueblo, CO: USDA Forest Service. 233 p.
- USFS, USDA Forest Service. 2008b. Forest Service Manual (FSM), Title 2300 (Recreation, Wilderness, and Related Resource Management), Chapter 2360 (Heritage Program Management). Report Number. Washington, DC. 83 p.
- USFS. 2009. Forest Soil Disturbance Monitoring Protocol: Volume 1: Rapid Assessment. General Technical Report WO-82a. Washington, D.C.
- USFS, USDA Forest Service. 2011. Watershed condition framework: A framework for assessing and tracking changes to watershed condition. Date: May, 2011. FS-977. Washington, DC. 24 p.
https://www.fs.usda.gov/sites/default/files/Watershed_Condition_Framework.pdf
- USFS, USDA Forest Service 2016. Future of America's forests and rangelands: Update to the Forest Service 2010 resources planning act assessment. Gen. Tech. Rep. WO-GTR-94. Washington, DC: Research and Development. 250 p. <https://doi.org/10.2737/WO-GTR-WO-GTR-94>
- USFS, USDA Forest Service. 2022. Confronting the Wildfire Crisis: Initial Landscape Investments to Protect Communities and Improve Resilience in America's Forests. Wildfire Crisis Landscape Investments. FS-1187d. Washington, DC: 17 p.
https://www.fs.usda.gov/sites/default/files/fs_media/fs_document/WCS-Initial-Landscapes.pdf
- USFS, USDA Forest Service 2023. Future of America's forest and rangelands: Forest Service 2020 Resources Planning Act Assessment. Gen. Tech. Rep. WO-GTR-102. Washington, DC. 348 p.
<https://www.doi.org/10.2737/WO-GTR-102>
- USFS. 2024. II DRS Core Inventory V. Excel.
- USFS. 2024. Tribal Connections. Internet website:
<https://usfs.maps.arcgis.com/apps/webappviewer/index.html?id=fe311f69cb1d43558227d73bc34f3a32> (Accessed Oct 12, 2024).
- USFS. 2024. Non-published Forest Service document (September 2024) Worksheet for Riparian and Non-Playa Lakes Ecosystems Technical Report.
- USFS. 2024b. Climate map exporter. Internet website:
<https://usfs.maps.arcgis.com/apps/Cascade/index.html?appid=84d0b8b9388343149f5365de517a6689>.
- USFS, USDA Forest Service. 2024a. Canyonlands. Terrestrial ecosystem integrity workshop. Date: 2024. Washington, DC. 6 p.
- USFS, USDA Forest Service. 2024b. Draft Ecological Impacts Analysis Report for the Draft EIS for Amendments to LMPs to Address Old-Growth Forests Across the NFS. (Supporting Document). National Old Growth Amendment (NOGA) Draft Environmental Impact Statement (DEIS) Portfolio. Date: June, 2024. Washington, DC. 140 p. <https://usfs-public.app.box.com/s/wn0w5nulj1576es7u206t4dru2h0etng/file/1566818095093>
- USFS, USDA Forest Service. 2024c. Sandsage prairie. Terrestrial ecosystem integrity workshop. Washington, DC. 7 p.
- USFS, USDA Forest Service. 2024d. Shortgrass prairie. Terrestrial ecosystem integrity workshop. Washington, DC. 9 p.
- USFS, USDA Forest Service. 2024e. Worksheet for lakes, ponds and reservoir ecosystems technical reports: Cimarron & Comanche National Grasslands. Washington, DC. 96-106 pp.

- USFS, USDA Forest Service. 2024f. Worksheet for playa lakes ecosystems technical reports: Cimarron and Comanche National Grassland. Washington, DC. 19 p.
- USFS, USDA Forest Service. 2024g. Worksheet for riparian and non-playa wetland ecosystems technical reports: Cimarron and Comanche National Grasslands. Washington, DC. 96-115 pp.
- USFS, USDA Forest Service. 2024h. Worksheet for Streams, Rivers and Riparian Ecosystems Technical Reports: Nebraska National Forests and Grasslands. (Draft). Helena National Forest, Mountain Planning Service Group and Nebraska National Forest. 25 p.
- USFS. 2025a. Plan for the Inadvertent Discovery and Identification of Native American Human Remains, Funerary Objects, Sacred Objects and Objects of Cultural Patrimony in Compliance with the Native American Graves Protection and Repatriation Act (NAGPRA), Pike-San Isabel National Forests & Cimarron and Comanche National Grasslands. February 2025.
- USFS GIS (USDA Forest Service, Geographic Information System). 2024. GIS data used in the Cimarron and Comanche National Grasslands assessments. USFS, Mountain Planning Service Group, Denver, Colorado.
- USGS, Geological Survey,. 1999. The National Hydrography Dataset. Fact Sheet 106-99. Reston, VA: U.S. Department of the Interior. 2 p. <https://doi.org/10.3133/fs10699>
- USGS, Geological Survey,. 2018. Groundwater decline and depletion (website). U.S. Department of Interior, Geological Survey (USGS), Last Modified June 6, 2018. <https://www.usgs.gov/special-topics/water-science-school/science/groundwater-decline-and-depletion>
- USGS, Geological Survey, and NRCS, USDA Natural Resource Conservation Service. 2013. Federal standards and procedures for the national Watershed Boundary Dataset (WBD). Chapter 3. *In* Book 11, Collection and Delineation of Spatial Data: Section A, Federal standards. 4th ed.
- USGS (U.S. Geological Survey). 2020. National Preparedness Month 2020: Landslides and Sinkholes. Office of Communications and Publishing. September 29, 2020. Internet website: <https://www.usgs.gov/news/featured-story/national-preparedness-month-2020-landslides-and-sinkholes>.
- Techniques and Methods 11–A3. Reston, VA: U.S. Department of the Interior, Geological Survey (USGS). 77 p. https://pubs.usgs.gov/tm/11/a3/pdf/tm11-a3_4ed.pdf
- van Auken, O.W. 2009. Causes and consequences of woody plant encroachment into western North American grasslands. *Journal of Environmental Management* 90(10): 2931-42. <https://doi.org/10.1016/j.jenvman.2009.04.023>
- Wear, D.N., Huggett, R., Li, R., Perryman, B., and Liu, S. 2013. Forecasts of forest conditions in U.S. regions under future scenarios: A technical document supporting the Forest Service 2010 RPA assessment. Asheville, NC: USDA Forest Service, Southern Research Station. 120 p.
- Wei, X., Huang, S., Huang, Q., Liu, D., Leng, G., Yang, H., Duan, W., Li, J., Bai, Q., and Peng, J. 2022. Analysis of vegetation vulnerability dynamics and driving forces to multiple drought stresses in a changing environment. *Remote Sensing* 14(17): 18. <https://doi.org/10.3390/rs14174231>
- White, J.L. 2012. Colorado map of potential evaporite dissolution and evaporite karst subsidence hazards: Map discussion. Denver, CO: Colorado Geological Survey, Department of Natural Resources. 28 p. <https://coloradogeologicalsurvey.org/publications/evaporite-dissolution-karst-subsidence-hazard-map-colorado/>
- Whicker, A., and Detling, J. 1988. Ecological consequences of prairie dog disturbances. *Bioscience*. Vol. 38, No. 11, How animals shape their ecosystems. Pp. 778-785.
- Williams, C.J., Pierson, F.B., Nouwakpo, S.K., Kormos, P.R., Al-Hamdan, O.Z., and Wertz, M.A. 2019. Long-term evidence for fire as an ecohydrologic threshold-reversal mechanism on woodland-encroached sagebrush shrublands. *Ecohydrology* 12(4): 28. <https://doi.org/10.1002/eco.2086>
- Wonkka, C.L., Twidwell, D., Bielski, C.H., Allen, C.R., and Stambaugh, M.C. 2018. Regeneration and invasion of cottonwood riparian forest following wildfire. *Restoration Ecology* 26(3): 10. <https://doi.org/10.1111/rec.12577>
- Wu, H., Kimball, J.S., Elsner, M.M., Mantua, N., Adler, R.F., and Stanford, J. 2012. Projected climate change impacts on the hydrology and temperature of Pacific Northwest rivers. *Water Resources Research* 48: 1-23. <https://doi.org/10.1029/2012WR012082>

*Draft Assessment
Cimarron and Comanche National Grasslands
Revised Land Management Plan*

- Wyndham, A., Elias, E., Brown, J.R., Wilson, M.A., and Rango, A. 2018. Drought vulnerability assessment to inform grazing practices on rangelands of southeastern Colorado's major land resource area 69. Date: January, 2018. Pueblo, CO: U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS). 37 p.
https://www.climatehubs.usda.gov/sites/default/files/SW_Climate_Hub_Drought_VA_MLRA69_Final.pdf
- Wyndham, A., A. Dugan, and D. McKinely. 2023. Forest Carbon Assessment for the Pike-San Isabel National Forests in the Forest Service's Rocky Mountain Region. US Forest Service.
- Yellajosula, G., Cihacek, L., Faller, T., and Schauer, C. 2020. Soil carbon change due to land conversion to grassland in a semi-arid environment. *Soil Systems* 4(3): 14.
<https://doi.org/10.3390/soilsystems4030043>
- Zier, C.J., Kalasz, S.M., Painter, M.W., Mitchell, M., and McFaul, M. 1999. Colorado prehistory: A context for the Arkansas River basin. Denver, CO: Colorado Council of Professional Archaeologists. 398 p.
<https://archaeologycolorado.org/sites/default/files/Arkansas%20Full.pdf>
- Zouhar, K. 2021. Fire regimes of plains grassland and prairie ecosystems. Fire Effects Information System. USDA Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory. 18 p.
https://www.fs.usda.gov/database/feis/fire_regimes/PlainsGrass_Prairie/all.html#:~:text=Summary%3A%20Historical%20fire%20regimes%20in,from%201%20to%2035%20years.

Glossary

Adaptive Grazing – A flexible grazing management strategy that adjusts based on changing conditions, aimed at maintaining soil health and preventing degradation.

Adaptive Management – A systematic approach to resource management that incorporates ongoing monitoring and feedback to adjust strategies in response to changing conditions and new information.

Adaptive Reuse – The process of developing historic properties for administrative or public use purposes in a way that helps conserve and maintain the property while serving other purposes central to the Forest Service's mission.

Air Quality – A measure of the cleanliness of the air and the presence of pollutants, such as particulate matter, ozone, and nitrogen deposition, that can affect human health, ecosystem services, and quality of life.

Alfisol – A soil order known for its fertility, typically found in forested areas, characterized by a clay-rich horizon that supports vegetation growth.

Animal Unit Month (AUM) – A standard unit of measurement for livestock grazing, representing the amount of forage needed by one animal unit (typically one cow) for one month.

Aquatic Biota – The collection of organisms living in water, including fish, invertebrates, and aquatic plants, which are used to assess the health of water bodies.

Aquatic Habitat – The natural environment where aquatic organisms live, which can be altered by changes in water temperature, flow, and quality.

Aquifer – An underground layer of water-bearing rock or sediment capable of storing and transmitting groundwater, such as the High Plains (Ogallala) Aquifer.

Archaeological Resources Protection Act of 1979 (ARPA) – A law that regulates the excavation and removal of archaeological resources from public and Indian lands to protect cultural heritage.

Archaeological Sites – Locations where evidence of past human activity is preserved, including tools, structures, and cultural artifacts.

Area of Analysis – The geographic area within which ecosystems, their components, or their processes are evaluated during analysis and development of one or more plans, plan amendments, or plan revisions. For a plan, an area of analysis may be larger than a plan area.

Arsenic – A toxic element that can contaminate water sources, posing a risk to both ecosystems and human populations.

Assessment – A process to evaluate and present existing ecological, economic, cultural, Tribal, and social conditions, trends, and sustainability in relation to the land management plan. It provides current information but is not a decision-making document.

Bankhead-Jones Farm Tenant Act of 1937 – A U.S. federal law that provides federal lands to be used for agricultural or other public purposes, including the free use of mineral materials by public authorities for infrastructure.

Bent Canyon Bluffs Botanical Area – A designated botanical area identified in a 2008 special areas report on the Cimarron and Comanche National Grasslands.

Best Available Scientific Information (BASI) – Information that is relevant, currently available, and useful for planning without further data collection or modification. It includes peer-reviewed literature, gray literature, expert opinions, and agency monitoring data.

Biodiversity – The variety of life in a particular habitat or ecosystem, including species diversity, genetic variation, and ecosystem diversity.

Blue Grama/Buffalograss Plant Community – A high-priority ecological focus for the research natural area, with restoration and protection recommended to prevent detrimental modification or disturbance.

Botanical Area – A designated area that preserves and protects unique plant communities, such as OU Creek, noted for its high-quality plant communities.

Broader Landscape – For land management planning pursuant to 36 CFR part 219, the plan area and the lands surrounding the plan area. The spatial scale of the broader landscape varies depending upon the social, economic, and ecological issues under consideration.

Canyonlands – A landscape characterized by deep, narrow valleys with steep sides, found in areas like Picket Wire Canyonlands, known for its ecological, paleontological, and recreational value.

Carbon Stock – The amount of carbon stored in ecosystems, including soil, plant roots, and aboveground vegetation. It plays a critical role in climate regulation and ecological health.

Cheatgrass (*Bromus tectorum*) – An invasive grass species that can alter fire regimes by increasing fire intensity and frequency, leading to decreased ecosystem resilience and carbon storage.

Chloride – A chemical compound that can accumulate in water sources, affecting both water quality and aquatic ecosystems.

Cimarron and Comanche National Grasslands – A total area of 552,265 acres in southeastern Colorado and southwestern Kansas, designated as National Grasslands and managed by the US Forest Service.

Climate Change – A long-term alteration in temperature and precipitation patterns, impacting ecosystem conditions, water availability, wildfire frequency, invasive species, and overall ecosystem services.

Climate Projections – Predicted scenarios of future climate conditions, based on the best available science but acknowledging a degree of uncertainty about future climate changes, particularly at more localized levels or over long periods.

Climate Variability – Changes in weather patterns over time, affecting precipitation, temperature, and ecosystem processes.

Comanche Lesser Prairie Chicken Habitat Zoological Area – Designated in 1987, this area once contained the largest concentration of active Lesser prairie chicken leks in Colorado.

Concern Levels – A measure, used in the scenery inventory process, of the degree of public importance placed on the aesthetics of landscapes. Concern levels are assigned to travelways and use areas to describe three levels of interest in scenery: High (1), Moderate (2), or Low (3).

Cooperating Agencies – Governmental or Tribal entities invited to collaborate on the land management plan revision, providing expertise and perspectives in the planning process.

Cultural Ecosystem Services – Non-market benefits provided by ecosystems that contribute to cultural values, such as opportunities for education, physical and mental health, and socialization.

Cultural Resources – Physical remains, landscapes, or practices significant to human history and cultural heritage, including petroglyphs, homesteads, and Traditional Cultural Properties.

Deferred Grazing System – A grazing system in which pastures are rested during certain years to allow vegetation to recover, with the timing and intensity of grazing adjusted to management objectives.

Designated Uses – Refers to the intended purposes of a water body as defined by a state under the Clean Water Act, Section 303(d), which is used to determine if a water body is considered “impaired” and needs further pollution control measures based on whether it can meet the water quality standards for those designated uses, like swimming, fishing, or drinking water supply.

Drivers – Environmental or human-induced factors that influence ecosystem processes and conditions. Drivers can become stressors if their impact exceeds natural variation.

Drought – A prolonged period of abnormally low precipitation that results in water shortages, affecting vegetation, wildlife, and human use of water.

Dust Bowl – A period during the 1930s characterized by severe dust storms and agricultural collapse in the Great Plains, leading to significant land conservation efforts.

Easements – A type of special use authorization (usually granted for linear rights-of-way) that is utilized in those situations where a conveyance of a limited and transferable interest in National Forest System land is necessary or desirable to serve or facilitate authorized long-term uses, and that may be compensable according to its terms.

Ecological Integrity – The ability of an ecosystem to support and maintain a balanced, adaptive community of organisms with minimal human interference.

Ecological Subregions – Geographic areas categorized based on their ecological characteristics, such as the Southern High Plains and Arkansas Tablelands Sections in the Great Plains Physiographic Province.

Economic Output – The total value of goods and services produced by recreation activities, including contributions to employment and income.

Ecosystem Services – Benefits provided by the environment, including forage for livestock, wildlife habitat, recreation opportunities, watershed functions, carbon sequestration, and biodiversity conservation.

Endangered Species Act (ESA) – A U.S. federal law aimed at protecting species at risk of extinction, such as the lesser prairie chicken, monarch butterfly, eastern black rail, and tricolored bat.

Entisols – A soil order containing young soils with minimal horizon development, found in areas such as the Timpas Unit of MLRA 69.

Eolian Sands – Soil materials primarily composed of sand, transported by wind, influencing the texture and erosion potential of the soil.

Erosion Control – Management practices aimed at reducing soil erosion, particularly in vulnerable areas such as the Cimarron and Comanche National Grasslands.

Executive Order 13007 – An executive order that mandates federal agencies to protect and preserve sacred sites and ensure Tribal access for religious and cultural practices.

Existing Scenic Integrity – Current state of the landscape, considering previous human alterations. See definition for scenic integrity objective.

FEMA National Flood Hazard Layer – A dataset from the Federal Emergency Management Agency that provides information on flood risks and hazards in specific areas.

Fire Disturbance – A natural process influencing vegetation structure, nutrient cycling, and species diversity, described by fire regime (frequency, severity, and extent).

Fire Occurrence – Data on the frequency and causes of fires within a specific area, including natural (e.g., lightning) and human-caused fires.

Fire Regime – The periodicity and pattern of naturally occurring fires in a particular area or vegetative type, described in terms of frequency, biological severity, and aerial extent.

Forest and Rangeland Renewable Resources Planning Act (RPA) – A 1974 U.S. law recognizing that national grasslands, including those managed by the Forest Service, are part of the National Forest System and should receive the same level of management and protection as national forests.

Forest System Roads – Roads within the national forest system, primarily for administrative purposes and public access, including to the national grasslands.

Fossil Localities – Areas where fossils are preserved in rock layers, often exposed due to erosion or shifts in the Earth's surface.

Fragmentation – The process by which large, contiguous habitats are broken into smaller, isolated patches, often due to human activities, leading to reduced habitat connectivity.

Fuels Reduction Treatments – Practices, such as thinning and rearrangement of vegetation, designed to reduce fire intensity by managing available fuel for fires.

Gamble Oak – A species of oak found in the southwestern United States, commonly in arid regions and woodlands.

Geologic Hazards – Natural hazards such as landslides, flooding, and earthquakes that result from geologic processes and pose risks to human safety and property.

Government-to-Government Consultation – A formal process of communication and cooperation between the U.S. government and federally recognized Tribes, aimed at addressing Tribal concerns and interests.

Grazing Management – Practices regulating livestock grazing to balance agricultural productivity with ecological sustainability and soil stability.

Great Plains Ecoregion – A vast area in the United States characterized by grasslands, including the Cimarron and Comanche National Grasslands, which has evolved with grazing by wild ungulates like the American bison.

Herbaceous Fuel Moisture – The moisture content in herbaceous (grass) vegetation, which affects fire behavior, such as flame length and spread.

Herbivory – The consumption of vegetation by wild or domestic herbivores, influencing plant distribution, fire regimes, and ecosystem processes.

Heritage Program Managed to Standard (HPMtS) – A program designed to ensure cultural resources are managed according to established standards.

Heritage Tourism – The practice of visiting sites of historical or cultural significance. It is a type of recreation whose purpose is to use, enjoy, and learn.

High Plains Aquifer – A major groundwater source in the region, including the Ogallala Aquifer, which is critically important for irrigation and drinking water.

Historical Fire Suppression – The practice of preventing wildfires, which has contributed to the encroachment of woody species into grasslands.

Homestead Act of 1862 – A U.S. federal law that provided 160-acre parcels of federal land to qualified individuals, encouraging the establishment of small farms and homesteads. This act led to a fragmented ownership pattern in many regions, including the Cimarron and Comanche National Grasslands.

Hugoton Gas Field – A significant natural gas field located in the Cimarron National Grasslands, first discovered in 1930.

Hydrologic Modification – Changes to the natural flow and distribution of water due to human activities, such as construction of dams or irrigation systems.

Hydrology – The science of water movement, distribution, and quality within the watershed, influencing local ecosystems and water resource management.

Inceptisols – Soils with more developed horizons than Entisols but still lacking significant maturity, found in areas like the Timpas Unit in MLRA 69.

Infrastructure Resilience – The ability of infrastructure such as campgrounds, roads, and bridges to withstand and recover from environmental stresses, including those caused by climate change.

Instream Flow Protections – Legal or regulatory mechanisms designed to ensure sufficient water flow in rivers and streams to maintain ecological integrity.

Intermittent Streams – Streams that do not flow year-round and may be more prone to drying out, particularly with changing climate conditions and water diversion or withdrawal.

Interpretation – The creation and posting of media (signage, websites, brochures, guides) to help the public explore and understand cultural resources, such as the 2012 Native Grasslands Interpretation Plan.

Interpretive Sites – Locations where visitors can engage with educational materials or presentations about the landscape's history, ecology, or cultural significance.

Invasive Species – Non-native species that, when introduced into a new environment, can disrupt the local ecosystem, decrease biodiversity, and alter habitat and food availability.

Juniper Areas – Areas dominated by juniper trees, which can expand and reduce the primary production of the ecosystem, negatively impacting livestock and food services, provides habitat for a variety of wildlife species such as the pinyon jay.

Juniper Expansion – The spread of juniper species, often in areas historically dominated by grasslands or sagebrush.

Karst Resources – Geologic features such as caves, sinkholes, and underground rivers formed in soluble rock like limestone, which can support groundwater systems and biological communities.

Land Ownership – Refers to who holds legal title to land and associated rights or limitations, such as rights-of-way (ROWs), leases, and permits. It includes ownership by the government in private lands (e.g., mineral rights) and the interests others hold in government lands (e.g., easements).

Land Status – The legal classification of land, which may include zoning or management designations. Federal lands are generally not subject to zoning, but such classifications can reflect local priorities for land use and community development.

Land Use Legacies – Historical land management practices and their long-term impacts on ecosystems, such as soil erosion from unsustainable agriculture during the Dust Bowl era.

Lands Utilization Program (LUP) – A program under the BJFTA that acquired submarginal lands for conservation and restoration, marking a shift from private ownership to public stewardship.

Landscape Visibility – Visual accessibility of the landscape to viewers, referring to one's ability to see and perceive landscapes and to the relative importance and sensitivity of what is seen and perceived in the landscape. Concern levels and distance zones are elements of landscape visibility.

Large Fires – Fires that cover 5,000 or more acres, which are significant in fire occurrence studies.

Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – A threatened species of grouse found in prairies. Tree encroachment negatively impacts its habitat.

Locatable Minerals – Minerals that can be claimed and extracted on public lands under the mining laws of the U.S.

Loess – A fertile, wind-blown silt soil often found in certain regions, contributing to soil productivity but also prone to erosion.

Mesa de Maya Botanical Area – Another botanical area identified in the 2008 special areas report on the Cimarron and Comanche National Grasslands.

Mineral Material Sites – Locations where materials such as sand, gravel, shale, and caliche are extracted, often used for infrastructure development and maintenance.

Mitigate – To avoid, minimize, rectify, reduce, or compensate the adverse environmental impacts associated with an action.

Mollisols – A soil order characterized by thick, dark, organic-rich horizons, known for high fertility, commonly found in grassland ecosystems.

Motorized and Non-Motorized Trails – Pathways within public lands designated for either motorized vehicles (such as ATVs) or non-motorized activities (like hiking or biking) to provide public access.

National Environmental Policy Act (NEPA) – Federal legislation requiring environmental assessments or impact statements for major federal actions affecting the environment, ensuring public input and transparency.

National Grasslands – Areas of public land designated for conservation and management as part of the National Forest System, particularly grassland ecosystems, first established by the Forest Service in 1960.

National Historic Preservation Act (NHPA) – A U.S. law that requires the consideration of impacts to cultural resources during federal activities.

National Register of Historic Places (NRHP) – A list of sites deemed significant for preservation. Eligibility for listing is a key indicator of a cultural resource's importance.

Native American Graves Protection and Repatriation Act (NAGPRA) – A law that governs the protection and repatriation of Native American human remains and cultural items.

Native Species Diversity – The variety of species native to a particular area. Loss of native species diversity can affect ecosystem functions like pollination and food production.

Nitrogen Deposition – The transfer of nitrogen from the atmosphere to the Earth's surface, which can impact soil and plant health, water quality, and biodiversity.

Non-native Insects – Insects that are not native to a region and can cause significant ecological disturbances.

Non-Playas Wetlands – Wetlands that are not formed by rainfall but instead depend on groundwater. These wetlands are crucial for supporting plant and animal life.

Non-Timber Forest Products (NTFPs) – Forest products other than wood, such as pine nuts and juniper berries, that provide value as edible, medicinal, floral, horticultural, or crafting materials and that contribute to biodiversity, ecological balance, and cultural uses.

Oil and Gas Drilling Facilities – Infrastructure supporting the extraction of oil and gas from underground reserves, contributing to local economies.

Palatable Plant Species – Plant species that are preferred and consumed by livestock. The percentage of palatable species varies across the different ecotypes of the grasslands.

Peak Stream Flows – The highest rate of flow in a stream, typically occurring after intense precipitation or snowmelt, which can lead to flooding and infrastructure damage.

Permanent Cross Fencing – Fencing used to subdivide grazing areas into smaller, manageable pastures, which is common in the Comanche and Cimarron National Grasslands.

Picture Canyon Historical Area – A site identified in the 2008 Special Areas Evaluation Report, notable for its heritage resources, including sites dating between AD 100 and 1920. Includes food processing areas, habitation shelters, historic inscriptions, homesteads, lithic scatters, and rock art.

Pinyon Ips Bark Beetle – A destructive insect pest that targets pinyon pine and other conifers, causing tree fatalities.

Pinyon Juniper Woodlands – A specific type of woodland ecosystem, often managed with prescribed fire to maintain ecosystem health and reduce fuel loads.

Plains Cottonwood – A tree species found in riparian areas, valued for its light, fibrous wood.

Plan Area – The National Forest System lands covered by a plan (36 CFR 219.16)

Playa Lakes – Shallow, temporary lakes formed by rainfall and runoff. These lakes support migratory bird habitats and play a role in flood mitigation and water filtration.

Ponderosa Pine – A species of pine tree found in North America, typically in mixed woodlands and forest areas.

Pollination Services – The process of fertilizing plants through the action of pollinators (e.g., insects, birds), which results in the production of fruits and seeds.

Prescribed Burning – The intentional use of fire under controlled conditions to manage vegetation, enhance ecosystem health, and reduce wildfire risk while mitigating smoke impacts.

Primary Contact Recreation – Refers to recreational activities where immersion and ingestion of water are likely to occur (i.e., swimming, rafting, kayaking).

Programmatic Agreement – An agreement that outlines the process for addressing specific issues, like cultural resource management, between agencies and the State Historic Preservation Officer.

Public Concern Points – Locations or areas identified as being of particular importance to the public for scenic value, typically found along travelways or in high-use recreation sites.

Public Domain Land – Land that is owned by the government and not claimed by private individuals. It was once considered “open range” for grazing but eventually became subject to management regulations, such as grazing allotments.

Recreation Access – Visitor access to and within National Forest system lands, through a variety of legally-authorized travel modes (FSH 2309.13, sec.10.5). Travel modes (foot, horse, bicycle, motorized vehicle, boat, or plane) and associated infrastructure (trails, roads, boat launches, airstrips, and parking areas) are for the purpose of engaging in recreation activities in specific recreation settings on NFS lands.

Recreation Experience – The perceptions, feelings, and reactions that a visitor has before, during, and after a visit to an area. (Interagency Visitor Use Management Framework, A guide to Providing Sustainable Outdoor Recreation, Edition One, July 2016).

Recreation Opportunity – An opportunity to participate in a specific recreation activity in a particular recreation setting to enjoy desired recreation experiences and other benefits that accrue. Recreation opportunities include non-motorized, motorized, developed, and dispersed recreation on land, water, and in the air (36 CFR 219.19).

Recreation Setting – The social, managerial, and physical attributes of a place that, when combined, provides a distinct set of recreation opportunities. The Forest Service uses the recreation opportunity spectrum to define recreation settings and categorize them into six distinct classes: primitive, semi-primitive non-motorized, semi-primitive motorized, roaded natural, rural, and urban (36 CFR 219.19).

Renewable Energy – Energy generated from natural resources that are replenished over time, such as solar, wind, biomass, and hydropower.

Research Natural Areas – Areas permanently established to preserve natural ecosystems and special ecological sites. The Cimarron and Comanche National Grasslands include a 35-acre research natural area.

Riparian Areas – Zones adjacent to rivers and streams that provide critical habitat, water filtration, and erosion control functions.

Riparian Corridor – Areas along water bodies (rivers, streams) that are influenced by water flow and provide unique habitats for various species.

Riparian Wetland Vegetation – Plant life associated with wetland ecosystems, particularly along rivers and streams, which plays a vital role in water filtration and habitat provision.

Russian Olive (*Elaeagnus angustifolia*) – Another invasive shrub species that negatively impacts riparian and wetland ecosystems by outcompeting native vegetation.

Sacred Sites – Any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site.

Sandsage Prairie – A type of prairie ecosystem characterized by sandsage shrubs. This ecosystem tends to have lower ecological integrity in some areas, with trends of reduced native species diversity.

Santa Fe National Historic Trail (NHT) – A national historic trail designated in 1987, primarily a commercial highway that connected Missouri and Santa Fe, New Mexico. It was a major trade and travel route across the U.S. The "Mountain Route" crosses southeast Colorado for approximately 188 miles, and the "Cimarron Route" crosses Kansas for 18 miles.

Scenic Attractiveness – An indicator of the intrinsic scenic beauty of a landscape, based on human perceptions of its landform, vegetation, water characteristics, and cultural features. Examples include "Distinctive," "Typical," and "Indistinctive."

Scenic Byway – A scenic route, like the Santa Fe Trail National Scenic Byway, designated at the forest, state or national level. To become an official national scenic byway, qualifying roads must have one of the following six "intrinsic qualities": scenic, historic, archeological, recreational, cultural, or natural and be at least regionally significant.

Scenic Character – A combination of the physical, biological, and cultural images that gives an area its scenic identity and contributes to its sense of place. Scenic character provides a frame of reference from which to determine scenic attractiveness and to measure scenic integrity (36 CFR 219.19). The term scenic character replaces the term landscape character, as defined and referenced in FSM 2380 and Agriculture Handbook 701.

Scenic Classes – A numerical measure of the relative value or importance of scenery in discrete landscape areas having similar characteristics of scenic attractiveness and landscape visibility. Scenic classes are a product of the inventory process that is used during Forest planning to compare the value of scenery with the values of other resources.

Scenic Integrity Objectives (SIOs) – The minimum degree to which desired scenic character attributes are to remain intact (Agriculture Handbook 701, page 20 and 5-9). There are four, nationally defined Scenic Integrity Objectives (SIOs) that can serve as desired conditions, and one (Very Low) used only in describing existing (not desired) conditions See FSM 2310 for levels and definitions for each level.

Selenium – A chemical element often found in groundwater, where elevated levels can be toxic to aquatic life and human health.

Shortgrass Prairie Ecosystem – A grassland ecosystem characterized by low-growing grasses, typically dominated by species like blue grama and buffalo grass. This ecosystem is important for livestock grazing and wildlife habitat.

Stakeholder Engagement – The process of involving Tribes, federal agencies, local governments, non-profits, landowners, and the public in the planning process to gather diverse perspectives and input.

Shrink-Swell Behavior – The expansion and contraction of soils, particularly clay-rich soils, in response to moisture changes, which can affect soil stability and water infiltration.

Snowpack – The accumulation of snow in an area, which gradually melts to provide water during warmer months. The duration of snowpack is projected to decrease due to rising temperatures.

Soil Productivity – The ability of soil to support vegetation growth, influenced by factors like texture, moisture retention, organic matter, and erosion potential.

Special Uses – All uses of National Forest System lands, improvements, and resources, except those authorized by the regulations governing sharing use of roads ([§ 212.9](#)); grazing and livestock use (part 222); the sale and disposal of timber and special forest products, such as greens, mushrooms, and medicinal plants (part 223); and minerals (part 228) are designated “special uses.”

Special Use Authorization – A written permit, term permit, lease, or easement that authorizes use or occupancy of NFS lands, and specifies the terms and conditions under which the use or occupancy may occur. See 36 CFR 251.51.

Stocking Rate – The number of livestock that can be supported on a given area of land, determined by factors like vegetation/soil type, livestock kind, precipitation, and land capability.

Stressors – Factors that degrade or impair ecosystem health, potentially reducing ecological integrity, such as invasive species, climate change, and water demand.

Sustainable recreation – The set of recreation settings and opportunities on the National Forest System that is ecologically, economically, and socially sustainable for present and future generations (36 CFR 219.19).

Sub-Watershed – A smaller unit of a watershed, essential for detailed hydrologic assessment and management.

Tamarisk (*Tamarix spp.*) – An invasive shrub species that often disrupts riparian areas by outcompeting native plants and altering water flow.

Taylor Grazing Act of 1934 – A U.S. law that withdrew remaining public domain lands from open range use to prevent land degradation, and allowed ranchers to obtain long-term grazing leases.

Terrestrial Condition Assessment (TCA) – An evaluation tool that assesses the health and sustainability of terrestrial ecosystems, including air quality, soil conditions, and vegetation cover.

Traditional Cultural Properties (TCPs) – Sites, areas, or features that are significant to specific racial, ethnic, or cultural groups based on cultural practices or beliefs. TCPs are subject to protection under the National Historic Preservation Act.

Traditional Ecological Knowledge (TEK) – Traditional knowledge held by Indigenous peoples about their natural environment, including sustainable farming, fire management, and ecosystem stewardship.

Tribal Consultation – The process of engaging federally recognized Tribes in the decision-making process, especially related to Section 106 of the National Historic Preservation Act (NHPA) and the National Environmental Policy Act (NEPA).

Tribal Cultural Landscapes – The geographic areas that are of cultural significance to Tribes, often linked to sacred sites and traditional practices, which may require protection and management to preserve their cultural value.

Tribal Engagement Strategy – A Forest Service initiative aimed at enhancing collaboration with Indigenous Tribes, integrating their knowledge, rights, and interests into land management plans.

Upper Arkansas Basin – A major watershed in the Cimarron and Comanche National Grasslands, covering approximately 15,952,058 acres across Colorado and New Mexico.

Upper Cimarron Basin – A major watershed in the Cimarron and Comanche National Grasslands, covering approximately 7,693,844 acres across Colorado, Kansas, and Oklahoma.

US Department of Agriculture Soil Conservation Service (SCS) – The federal agency responsible for the rehabilitation of the Cimarron and Comanche National Grasslands, which it acquired during the Dust Bowl in the 1930s. The lands were transferred to the Forest Service in 1954.

USGS Landslide Hazards Program – A program by the U.S. Geological Survey that monitors and assesses landslide risks across the United States.

USGS Riverine Flooding Analysis – A U.S. Geological Survey program that evaluates flood risks in river systems based on geological and hydrological data.

Visual Quality Objectives (VQOs) – Standards of measurement used to assess the aesthetic quality of landscapes, focusing on the degree of human impact on the visual character of an area used for assessing proposed and existing impact to scenic quality.

Water Quality – The condition of water bodies, influenced by factors such as pollutants, sediment, and biological health. Water quality is critical for aquatic species and human use.

Wetland Ecosystems – Areas saturated with water, including playas, riparian areas, and non-playa wetlands. These ecosystems support a wide range of biodiversity and provide essential ecological services.

Water Quantity – The amount of water available in an ecosystem, which can influence ecological functions, water availability for human use, and habitat quality.

Watershed Health – Refers to the condition of a watershed in terms of its ability to support biodiversity, water quality, and ecological resilience, which affects local economies and cultural practices.

Watershed Integrity – The degree to which a watershed maintains its natural ecological processes and functions, including water quality, habitat connectivity, and overall ecosystem health.

Watershed – An area of land where all precipitation drains into a common water body, such as a river, lake, or aquifer, essential for water resource management.

Wildfire – Uncontrolled fires that burn natural vegetation, posing risks to human health, property, and ecological integrity. Wildfires are a significant source of particulate emissions and carbon release.

Wildland-Urban Interface (WUI) – Areas where human development is near or intermixed with wildland areas, increasing the risk of wildfires impacting communities.

Woodland – An area dominated by trees and shrubs, with tree cover typically less than 50%.

Appendices

Detailed analytical content is provided in appendices, which support the findings presented in prior sections. Appendices may include specific findings, scientific methods, discussion of uncertainty, extended discussion of results, and rich reference to supporting literature. Appendices will be of most interest to Forest Service resource specialists, Tribes, and highly engaged members of the public that want to understand the complexity behind the overall assessment findings and supporting science. Appendices need not be included with printed copies of the report, rather they will be made publicly available on the Internet with weblinks included in the final version of the assessment report.

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Appendix A:
Social and Economic Conditions, Trends, and Sustainability
on the Cimarron and Comanche National Grasslands

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Appendix A: Social and Economic Conditions, Trends, and Sustainability on the Cimarron and Comanche National Grasslands

Introduction

The preamble of the 2012 planning rule for National Forest System (NFS) land management planning recognizes that ecological, social, and economic systems are interdependent, without one being a priority over the other. As such, the planning rule requires the consideration of social, economic, and ecological factors in all phases of the planning process. The rule also recognizes that, though national forest management can influence social and economic conditions relevant to a planning area, it cannot ensure social and economic sustainability because many factors are outside the control and authority of the responsible official. For that reason, the planning rule requires that plan components contribute to social and economic sustainability within Forest Service authority and the inherent capability of the plan area.

The planning rule defines sustainability in the following ways (§ 219.19):

- “Economic sustainability” refers to the capability of society to produce and consume or otherwise benefit from goods and services including contributions to jobs and market and nonmarket benefits; and
- “Social sustainability” refers to the capability of society to support the network of relationships, traditions, culture, and activities that connect people to the land and to one another and support vibrant communities.

To address the issue of social and economic sustainability, the Planning Rule requires that in the assessment for plan development or revision, the responsible official shall identify and evaluate existing information relevant to the plan area for 15 identified items. Three of the items tied most closely to social and economic sustainability are #6—social, cultural, and economic conditions and trends, #7—benefits that people obtain from the NFS planning area (ecosystem services), and #8—Multiple uses and their contributions to local, regional, and national economies. (§ 219.6(b))

This appendix presents the social, cultural, and economic context within which the Cimarron-Comanche National Grasslands (the Grasslands) operate. The information provided is intended as a descriptive and comparative baseline about the counties in the area of influence and includes information up through the year 2024 (in some cases 2023) for most variables. The Cimarron Grassland is entirely within Kansas, in Morton and Stevens Counties. The Comanche Grassland is entirely within Colorado, in Baca, Las Animas, and Otero Counties.

Methods

Measuring the human relationship with the ecological environment requires two types of indicators: those that help to understand social and economic conditions in communities near the Grasslands, and those that measure human uses of the forest’s lands and resources. Indicators may be either quantitative or qualitative in nature.

Relevant indicators to understand social and economic conditions of the Grasslands include, but are not limited to, population, age, racial and ethnic composition, employment, wealth, economic diversity, land

use and access patterns, and area-specific values, beliefs and attitudes. Relevant indicators to measure human uses and values of the CCNG's land and resources include, but are not limited to, recreation visits, mineral removal, authorized animal unit months (AUMs), payments to states and counties, Forest Service direct expenditures, and ecological integrities. Information collected during public comment periods is critical to understanding how the public values the Grasslands.

Baseline demographic and economic data are drawn from Federal sources and presented at the county and state levels, such as the U.S. Census Bureau and the Bureau of Economic Analysis. The Forest Service collects resource use data, such as recreation visits and grazing forage authorized. The economic contribution analysis combines baseline economic data with Forest Service resource data to estimate employment and labor income associated with Forest Service programs, resources, and uses. The data presented disclose the sources.

Much of the information contained in this report was taken from the Economic Profile System- Human Dimensions Toolkit (EPS-HDT). This toolkit was developed by Headwaters Economics in partnership with the Bureau of Land Management and the U.S. Forest Service. EPS-HDT is a free software application that produces detailed socioeconomic reports of communities, counties, state, and regions, including custom aggregations and comparisons. EPS-HDT uses published statistics from federal data sources, including, but not limited to, the Bureau of Economic Analysis, the Bureau of Labor Statistics, and the Census Bureau and American Community Survey. Other significant sources of information used for this report include the following:

- County comprehensive plans,
- Data on Forest Service programs,
- Salary and non-salary expenditures, and employment from Forest Service corporate databases,
- CDC's Social Vulnerability Index
- The results of an analysis of the contribution of the Grasslands' programs and expenditures on jobs and labor income using 2023 and 2024 Forest Service corporate data and the most recently available IMPLAN data, which is for the year 2022.

The appropriate scale for addressing the social and economic environment may differ from the scales used to address other resources and topics in the Assessment. Reliable economic data are available at the county-level; demographic data may be available at municipal and smaller areas. As stated previously, sub-county (for example, towns and cities) economic data are limited and often have large margins of error, particularly in rural areas. The economic modeling software, IMPLAN, which is used for the economic contribution analysis, uses county-level datasets.

Information Gaps

To gain an understanding of the social and economic environment, a combination of data collection methods is usually used -- both quantitative and qualitative methods. Much of the information presented in this appendix is derived from sources of Census information, which is quantitative data. Social environment descriptions are gathered in large part from perusal of Chambers of Commerce webpages, county planning documents, economic development groups and others. This information, however, does not provide "primary" types of data -- which would include information about how people define and explain their ties and connections to the land, how they explain the issues of importance -- in this case Forest Plan Revision -- from their own point of view. Primary types of data are informed through things like public engagement, public comments, stakeholder meetings, and other consulting activities.

Existing Forest Plan Direction

The management of the Cimarron-Comanche National Grasslands is detailed in the CCNG Land and Resource Management Plan - 1997 Revision, Phase II Amendment (2006). Under Goal 8: Promote rural development opportunities, section 801 explains the objective to “provide leadership in working with rural people and communities to develop natural resource-based opportunities and enterprises that contribute to the economic and social vitality of rural communities.”

Areas of Influence and Analysis

Management of CCNG lands affects residents and communities adjacent to administrative boundaries, as well as the broader landscape surrounding these areas. Individuals who share a connection with the CCNG can include those who actively use the lands and resources, as well as those interested in the non-use values and protection of the Grasslands – either locals or residents from across the Nation. To accurately portray the relationship of current Forest Service management and the associated populations, the area of socioeconomic influence must be defined. 2012 Planning Rule guidance directives describe several different geographic scales: the **plan area**, the **area of influence**, and the **broader landscape**. Each scale has its own considerations:

- The **plan area** is only the National Forest System land within the administrative boundary of the Cimarron-Comanche National Grasslands (not including inholdings or other ownership).
- The **area of influence** includes adjacent lands of any ownership that may be directly affected by the management of the national forest including private or state and local government inholdings within the administrative boundary. Major components of the area of influence are communities, land ownership and use, transportation and utility corridors, and natural features such as mountains and water.
- The **broader landscape** lies outside of the area of influence and is generally not affected as much by the management of the national forest but is still more or less consistent in nature with the area of influence. The broader landscape captures the ecosystem services that the plan area provides to a wider geographic area. This is a reflection of the importance of considering not only the more localized effects of plan area management but also the sustainability of the far-reaching benefits of the plan area. Users are likely to be located outside of the area of influence, but the contributions provided are still important to consider when evaluating management’s effect on social and economic sustainability.

Typically, neighboring counties have established strong social and economic ties to the land and the contributions of the plan area. However, geographic proximity (e.g. counties containing, or adjacent to, the Cimarron-Comanche National Grasslands) does not guarantee strong ties and therefore is not the only criterion. The directives define the area of influence as “where the management of the plan area substantially affects social, cultural, and economic conditions” (FSH 1909.12, section 13.21). Thus, the area of influence is determined by a variety of indicators, including grazing, recreation, payments to local governments, and key ecosystem services, as well as local knowledge from the public and CCNG staffs.

The Cimarron-Comanche National Grasslands socioeconomic area of influence includes Baca, Bent, Las Animas, Pueblo and Otero counties in Colorado; Morton and Stevens counties in Kansas; Union County in New Mexico; and Cimarron and Texas counties in Oklahoma (see figure 1, table 1). The majority of social, cultural, and economic contributions from the Grasslands are expected to accrue in these counties. This area represents where the forest would:

- spend project funds that support local businesses (e.g., spending on fuel and materials as well as payments to local contractors);
- support businesses that benefit from project activities (e.g., harvesting, oil and gas production, livestock sale barns, construction, etc.);

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- contribute to communities that act as important local entry points/gateways to the forest, and which therefore rely on forest visitors to sustain significant portions of the local economy (e.g., spending on food, lodging, equipment, guiding, packing and other types of businesses that support forest recreational activities);
- support ranching operations that utilize the forest for grazing.

A county included in the area of influence is depicted in figure 1 and table 1, below, if supported under one or more of the previously listed criteria. For instance, under the range criteria, counties are included based on the location (home or business) of permittees and the amount of animal unit months authorized, as well as known locations of sale barns and unit specialist knowledge. This socioeconomic area of influence is used to report and discuss trends throughout the social and economic sections in this appendix, however, characterizing the socioeconomic area of influence is iterative and dependent on information learned through the plan revision process. As such, the socioeconomic area of influence presented below is flexible and may shift as the plan revision process continues.

Figure 1. Cimarron-Comanche National Grasslands Socioeconomic Area of Influence

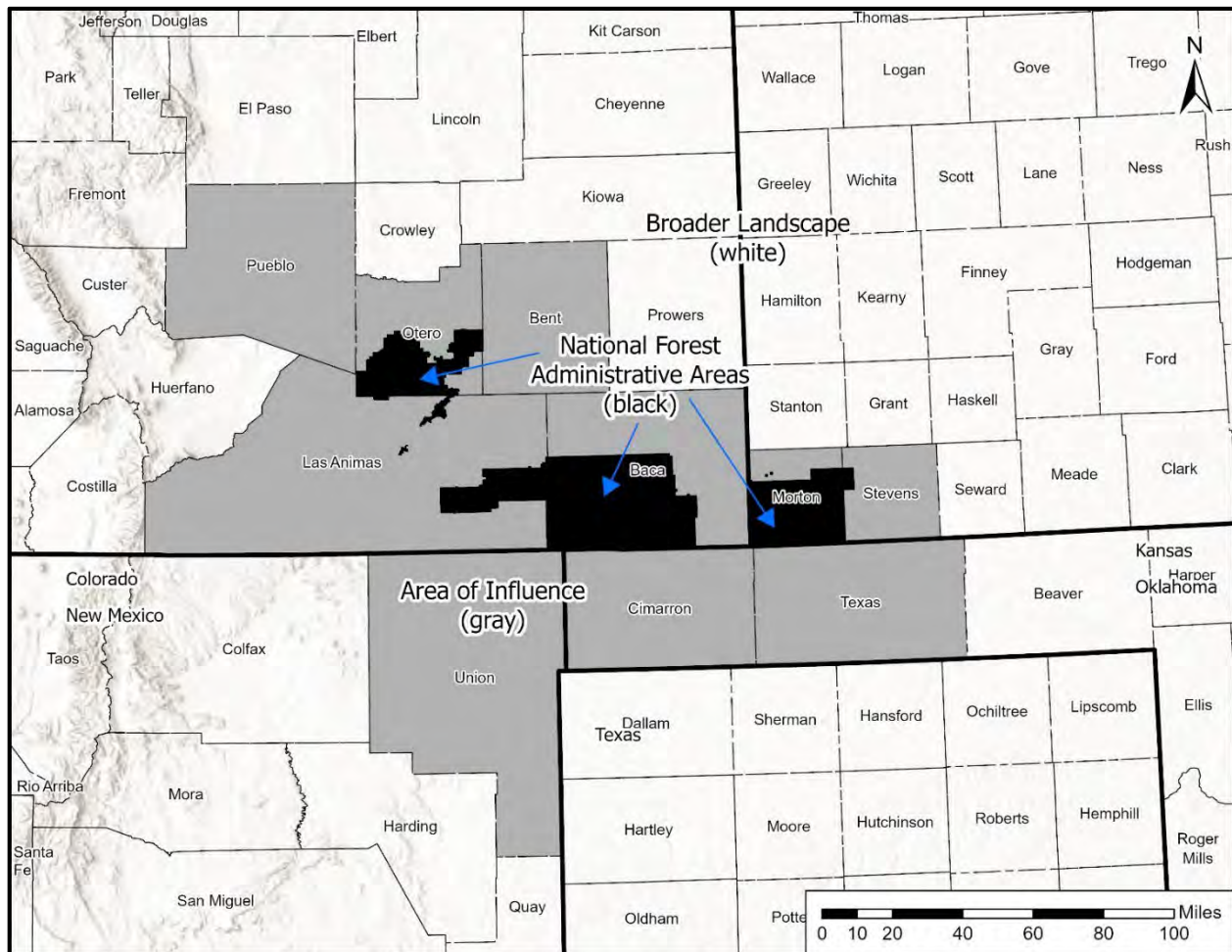


Table 1. CCNGs Socioeconomic Area of Influence Counties

County and State	Grassland Connection				
	BHJ/PILT/SRS ¹	Footprint ²	NVUM/Rec ³	Range ⁴	Timber ⁵
Baca County, CO		X	X	X	
Bent County, CO		X	X		
Las Animas County, CO	X	X		X	
Pueblo County, CO		X	X		
Otero County, CO		X	X	X	
Morton County, KS	X	X	X	X	
Stevens County, KS	X	X	X		
Union County, NM	X	X	X		
Cimarron County, OK		X	X		
Texas County, OK		X	X		

¹ BHJ/PILT/SRS - County designated to the CCNGs from FY 23 payments for Secure Rural Schools, Bankhead Jones, PILT, etc.

² Footprint - County touching the CCNGs, including touching its administrative borders.

³ NVUM/Rec - County designated to the CCNGs from falling within the NVUM 50-mile recreative expenditure buffer ({White, 2017, Spending patterns of outdoor recreation visitors to National Forests}) and/or based on recreational commuting patterns as indicated by the Administrative Unit.

⁴ Range - County containing significant activities of the grassland's range permittees, based on the most currently available NRM data and/or the Administrative Unit's ecological and social knowledge.

⁵ Timber - County containing over 5% of the Grasslands' contract bid winners (based on most current NRM data), if any, based on most currently available NRM data and/or the Administrative Unit's ecological and social knowledge.

For these counties, Amarillo, TX is the closest, largest metropolitan area with extensive shopping opportunities and additional professional services that may not be available locally. These counties also receive the majority of their news and television services from the Amarillo area. The eastern portion of Kansas Counties is most closely tied with larger service areas in Kansas, while to the west, Colorado counties are more strongly tied to Pueblo, Colorado Springs, and the Front Range Corridor. Transportation within the area includes the north-south U.S. Highway 287, historically designated as the Ports-to Plains Trade Corridor between New Mexico and northern Colorado. Highway 160 intersects Highway 287 just south of Springfield, Colorado and serves as a major route across southern Colorado. Highway 50 from Pueblo, Colorado, and east to the Kansas state line serves as a connector route for travelers and commuters. Burlington Northern Santa Fe railroad is a main north-south freight line with a short line, the Cimarron railroad, serving the Walsh and Vilas east into Kansas. Several communities also support bus services to the larger cities of Pueblo, Colorado Springs, and Amarillo, Texas.

Outside the local area of influence (also known as the broader landscape), people are interested in the resources of the Grasslands for birdwatching, conservation of habitat for a variety of wildlife species, cultural resource protection and interpretation and access, as well as protection and access for paleontological resources. Visitors from local communities, across the nation and abroad appreciate the solitude, beauty, and wildlife of the Grasslands. In general, most people want to maintain limited access to the Grasslands to prevent crowding and resource damage.

Existing Social, Cultural, and Economic Conditions

The Cimarron and Comanche National Grasslands (the Grasslands) were originally managed by the US Department of Agriculture Soil Conservation Service (SCS)¹. The SCS acquired these lands during the Dust Bowl days of the late 1930s and was charged with their rehabilitation. The lands were transferred to the Forest Service in 1954 and designated as National Grasslands in 1960.

¹ The SCS is now known as the NRCS (Natural Resources Conservation Service).

Social and Cultural Conditions and Trends

The diversity and importance of social aspects of the Grasslands help decisionmakers better understand how diverse peoples derive and steward social benefits, activities and relationships from the Grasslands. This section focuses on the human population structure and dynamics within the proposed area of influence for the Cimarron and Comanche National Grasslands. Human population is an important consideration in managing natural resources. Population structure (e.g., size, composition, density) and population dynamics (e.g., how the structure changes over time such as age distribution and in- and out-migration) are important components to understanding the relationship between forest management and the social environment. Different population groups use the areas in different ways, and it is beneficial to have some statistical understanding of those people and their uses.

Information regarding current population and how it has changed over time is included in the following section, along with some population projections. In addition to population numbers, this information includes components of population change, age and gender. These data can inform public involvement and promote sensitivity to cultural interests. Information on racial composition and poverty levels are also displayed and can help tailor outreach and meaningful involvement of different communities.

Population Change

Today, an estimated 245,647 people reside in the area of influence. With the exception of Pueblo County, Colorado, the population has seen an overall decrease between 2010 and 2022, with Morton County, Kansas experiencing the most significant decrease of 17.1%. The greater Kansas Non-Metro population also experienced a decrease between 2010 and 2022. Components of the population change include natural change (births and deaths) and Net Migration (international migration and domestic migration). The tables below (table 2 and table 3) outline the components for the counties in the area of influence. Pueblo County, Colorado, included in the Area of Influence as a footprint county and within the 50-mile visitor spending buffer, and Texas County, Oklahoma were the two counties that saw population increase, 7.6% and 6.6% respectively.

The city of Pueblo is located in Pueblo County, Colorado and likely accounts for the population increase in the county. Pueblo is south of Denver, Colorado and is a major metropolitan area, generally included when describing the Front Range area of Colorado. Texas County, Oklahoma is the second largest county in the state and is home to multiple colleges and large agricultural industries. Between 2020 and 2030, Colorado's population is project to increase at a slower pace compared to the previous decade. The majority of this growth across the state (88%) is expected for the Front Range, including the Denver Metro area. The deceleration is attributed to slower births, increased deaths, and a decrease in net migration.

Table 2. Population Characteristics in the CCNGs analysis area

County	Population (2010)	Population (2022)	Population Change (2010-2022)	Median Age (2010)	Median Age (2022)	Share of Population 65 Years and Over (2022)	Share of Population 18 Years and Under (2022)
Baca, CO	3,833	3,469	-8.8%	47.2	42.0	23.9%	22.2%
Bent, CO	6,125	5,561	-9.2%	40.2	40.7	18.4%	16.8%
Las Animas, CO	15,675	14,442	-8.0%	43.9	46.8	25.1%	18.3%
Otero, CO	18,830	18,580	-1.3%	40.8	40.5	21.1%	23.4%
Pueblo, CO	156,244	168,135	7.6%	38.4	39.8	18.9%	22.2%
Morton, KS	3,244	2,688	-17.1%	37.0	39.5	20.0%	25.6%
Stevens, KS	5,533	5,275	-4.7%	34.5	36.3	17.0%	29.2%

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County	Population (2010)	Population (2022)	Population Change (2010-2022)	Median Age (2010)	Median Age (2022)	Share of Population 65 Years and Over (2022)	Share of Population 18 Years and Under (2022)
Cimarron, OK	19,826	21,144	-9.2%	45.1	45.9	24.1%	24.3%
Texas, OK	19,826	21,144	6.6%	31.5	33.1	11.8%	28.4%
Union, NM	4,388	4,074	-7.2%	42.3	39.4	22.0%	21.4%
Colorado Non-Metro	677,110	712,570	5.2%	Na^	Na^	14.8%	21.5%
Kansas Non-Metro	950,587	919,793	-3.2%	Na^	Na^	16.3%	23.9%
Oklahoma Non-Metro	1,321,243	1,308,473	-1.0%	Na^	Na^	15.9%	23.9%
New Mexico Non-Metro	4,388	4,074	3.0%	Na^	Na^	18.1%	22.4%

^ Median age is not available for metro/non-metro or regional aggregations.

* ACS 5-year estimates used. 2022 represents average characteristics from 2018-2022; 2010 represents 2006-2010.

Data Sources: U.S. Department of Commerce. 2023. Census Bureau, American Community Survey Office, Washington, D.C.

Table 3. Components of Population Change

Components of Population Change 2010-2023				
	Colorado Counties Change	Kansas Counties Change	Oklahoma Counties Change	New Mexico County Change
Population Change, 2010-2023	6,944	-1,335	-710	-577
Average Annual Population Change (Natural Change & Net Migration)	496	-94	-133	-45
From Natural Change	-193	21	165	-9
Births	1,991	97	341	35
Deaths	2,185	76	176	44
From Net Migration	688	-116	-301	-36
International Migration	62	14	106	1
Domestic Migration	625	-130	-407	-36
From Residual	1	2	2	0
Factors Contributing to Population Change*, 2010-2023				
Natural Change	21.9%	15.1%	35.3%	20.2%
Net Migration	78.0%	83.8%	64.2%	79.6%
Residual	0.2%	1.1%	0.5%	0.3%

U.S. Dept of Commerce. 2023. Census Bureau, American Community Survey (ACS) Office, Washington, D.C.

* The absolute value of the individual component of population change divided by the sum of the absolute values of the three components (natural change, net migration, and the residual).

*ACS 5-year estimates used. 2022 represents average characteristics from 2018-2022; 2010 represents 2006-2010.

Age

Understanding the age distribution can help highlight whether policy changes and management actions might affect some age groups more than others. It also may highlight the need to understand the different needs, values, and attitudes of different age groups. If an area has a large, retired population or soon-to-be-retired population, for example, the needs and interests of the public may differ than an area with a large number of minors or young adults. For many locations, a significant development is the aging of the population, and in particular the retirement of the “Baby Boomer” generation (those born between 1946 and 1964). As this generation continues to enter retirement age, their mobility, spending patterns, and consumer demands (for health care and housing for example) can affect how communities develop economically ({Cromartie, 2009, Baby Boom Migration and Its Impact on Rural America}).

Median age throughout the Area of Influence in 2022 was between 33 years of age and 46 years of age. Since 2010, most counties have seen a slight increase in median age, or the median age has remained nearly the same. Baca County is the exception, with a median age decrease of 11% from 47 years in 2010 to 42 years in 2022.

Age distribution is important to understand and can help highlight whether policy changes and management actions might affect some age groups more than others. Across the area of influence, from 2010 to 2022, the age category with the largest estimate increase was 65 and over (10,365) and the age category with the largest estimated decrease was Under 18 (-3,054), indicating an aging population.

In 2022, the age category with the highest estimate for number of women was 45-65 (29,940) and similarly, the age category with the highest estimate for number of men was 45-65 (30,136).

The age category with the lowest percent of total is 35-44 (12.3%). This category, often called the working age population, showed no change across the area of influence between 2010 and 2022. In Colorado counties within the area of influence, the youth population (under 18) saw a decrease from 24.3% of the total population in the 2010 ACS to 21.9% in 2022. In Kansas, the youth population (under 18) saw a slight decrease from 28.8% to 27.9%. Oklahoma counties saw almost no change in youth populations (28%), while Union County, New Mexico saw a larger decrease from 27.1% to 21.4%.

Race and Ethnicity

Race is the self-identification data item in which respondents choose the race or races with which they most closely identify. Race categories include both racial and national-origin groups. The concept of race is separate from the concept of Hispanic origin. This is important to understand in planning because the racial composition of a place can indicate different needs, values, and attitudes that are sometimes held by different racial groups. Different groups of people may use public lands in different ways. They may also experience different barriers and opportunities to access public lands and natural resource management decision-making processes.

The current majority racial makeup of the socioeconomic area of influence for Cimarron and Comanche National Grasslands is 74.2% White Alone, which is less than the percent population White Alone for Colorado Non-Metro (81.8%) and Kansas Non-Metro (84.8%). Within the counties, 42.5% of the populations identifies as Hispanic or Latino of any race, which is significantly more than Colorado Non-Metro (22%), Kansas Non-Metro (14.1%), Oklahoma Non-Metro (9.3%) and the total U.S. population (19.4%) but slightly less than New Mexico Non-Metro (48.3%). Many counties have census blocks or larger areas that have a greater percentage of Hispanic or Latino representation than the broader area of influence. See table 4 for data comparisons.

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Table 4. Race and Ethnicity Demographic Characteristics

Race and Ethnicity	Area of Influence Counties	Area of Influence Counties %	Colorado non-metro	Colorado non-metro %	Kansas non-metro	Kansas non-metro %	Oklahoma non-metro	Oklahoma non-metro %	New Mexico non-metro	New Mexico non-metro %
Total Population	245,647	—	712,570	—	919,793	—	1,308,473	—	700,346	—
Race										
White (alone)	182,155	74.2	582900	81.8	780,189	84.8	915,189	69.9	407,692	58.2
Black or African American (alone)	5,454	2.2	7935	1.1	23,050	2.5	42,299	3.2	14,080	2.0
American Indian (alone)	5,915	2.4	13685	1.9	7,321	0.8	152,225	11.6	87,535	12.5
Asian (alone)	2,147	0.9	5769	0.8	9,918	1.1	13,191	1.0	7,134	1.0
Native Hawaii & Other Pacific Is. (Alone)	96	0.0	934	0.1	1,287	0.1	4,387	0.3	328	0.0
Some other race (alone)	21,300	8.7	28601	4.0	30,299	3.3	36,531	2.8	74,845	10.7
Two or more races	28,583	11.6	72746	10.2	67,729	7.4	144,651	11.1	108,732	15.5
Ethnicity										
Hispanic or Latino (of any race)	104,469	42.5	156,774	22.0	129,850	14.1	122,188	9.3	338,506	48.3
Not Hispanic or Latino	141,178	57.5	555,796	78.0	789,943	85.9	1,186,285	90.7	361,840	51.7

U.S. Department of Commerce. 2023. Census Bureau, American Community Survey (ACS) Office, Washington, D.C.

*ACS 5-year estimates used. 2022 represents average characteristics from 2018-2022; 2010 represents 2006-2010.

Tribal Rights and Interests

For a complete discussion on Tribes or cultural resources associated with the plan area, please see the ***Tribal Rights and Interests*** and ***Cultural Resources*** chapters of the Assessment.

The Cimarron and Comanche National Grasslands can provide important benefits to tribes, through cultural, historic, and traditional resources such as supporting traditional and cultural harvesting and collecting; preserving sacred and culturally significant places and areas; supporting jobs and income for local tribal communities; and providing value with the sense of place, cultural identity of communities, and associated spiritual values.

The Cimarron and Comanche National Grasslands were inhabited and used by a number of tribal groups from the precontact to the historic period, including, but not exclusive to, the Jicarilla Apache, Arapaho, Cheyenne, Comanche, Kiowa, Lipan Apache, Osage, Pawnee, and Ute Tribes. During the 19th century, these groups were removed to reservations far from the Cimarron and Comanche National Grasslands in southwest Colorado, eastern Kansas, New Mexico, Oklahoma, and Wyoming ({USDA Forest Service, 2005, Water resources}; USFS 2024). A number of historic treaties are associated with the plan area. These include the 1863 Conejos Treaty, the 1865 Little Arkansas Treaty, the Medicine Lodge Treaties of 1867, and the Ute Treaty of 1868.

Today these groups retain a connection to these lands due to their cultural, religious, and ancestral ties. Indigenous use of the grasslands over the centuries and millennia is reflected by the number of important cultural sites, sacred sites, and traditional cultural places that are known and predicted to be within the plan area. Potential locations of tribal importance include the Carrizo Canyon Area, Crack Cave, Picket Wire Canyon, Picture Canyon, and Vogel Canyon. The government-to-government consultation process may confirm significance and tribal-requested direction as well as identify other potential areas; locations of particularly sacred areas and sites are considered proprietary information and will not be disclosed here.

Values, Beliefs, and Attitudes

Values, beliefs and attitudes can shape the priorities and desired outcomes people have for forest management. These are relatively enduring concepts that people hold and often share within a given society or culture about important life principles, including what is good or bad and desirable or undesirable ({Allen, 2009, Values`, beliefs`, and attitudes technical guide for Forest Service land and resource management`, planning`, and decision-making}). Social analysis for Forest Service actions should consider the feelings, preferences, and expectations people have for forests and their management, or their values, attitudes, and beliefs (FSH 1909.17 (33.22)). Forest values are relatively enduring beliefs people hold about forests and the good, importance, or worth of specific aspects of them ({Tarrant, 2004, Forest values and attitudes in the south: Past and future research}; also see {Cervený, 2018, Understanding our changing public values`, resource uses`, and engagement processes and practices} for a review). Once these values are established, they orient relationships between people and forests, shaping both attitudes (tendencies to react favorably or unfavorably to situations, conditions, people, objects, or ideas) and actions ({Bengston, 2020, Shifting forest values as a driver of change}; {Cervený, 2018, Understanding our changing public values`, resource uses`, and engagement processes and practices}). Values and attitudes are thus at the core of conflicts over forest management ({Brown, 2000, Validation of a forest values typology for use in national forest planning}; {Cervený, 2018, Understanding our changing public values`, resource uses`, and engagement processes and practices}). Understanding the values held by different groups of people is essential for successful policy development, informed decision-making, and effective implementation of management actions (Bengston & Xu, 1995; {Bengston, 2020, Shifting forest values as a driver of change}).

The 2012 Planning Rule defines social sustainability as, “*the capability of society to support the network of relationships, traditions, culture, and activities that connect people to the land and to one another, and support vibrant communities.*” The factors of social sustainability can differ amongst individuals, however

generally many factors relate to interactions and relationships, culture, leisure, amenities, income, employment and job satisfaction, affordable housing, and health. One way of examining social sustainability is to understand the views and values held by individuals or groups and how they would like the Forests and Grasslands to contribute to social sustainability.

The diverse values that people hold can create complex situations for national grassland land management. In addition, many communities outside a unit's immediate area of influence have an interest in how it is managed, whether they directly use the forests (such as recreation or tourism) or not (such as water demand from urban and agricultural areas or concern for endangered species).

The Forest Service engages with the public through the plan revision process, and this is the best source of qualitative data on values, beliefs, and attitudes that can shape the priorities for forest plan revision. Until these engagements occur specific to the Grasslands, the information presented here is the best information available.

Communities surrounding the Grasslands are generally concerned about the direction and pace of change in their culture and economy. The Grasslands are viewed as contributing to sustainable levels of grazing for the local livestock industry, offering a wide variety of recreation opportunities, and managing wildlife habitat and access for both hunting and viewing opportunities. The Cimarron National Grassland is the largest block of public land in Kansas and is the only Forest Service location in the state, contributing a sense of place and quality of life to both the communities surrounding the land block as well as those visiting from across the state or farther. The importance of grasslands and continuous grassland ecosystems is reflected in the history of detrimental exploitation, and the rise of not-for-profit organizations dedicated to the conservation of grasslands across the country; and expanding scientific attention to the ecological and social values of short-grass prairies and grasslands. Grasslands are currently recognized as being the most threatened and least protected biome across the globe ({Scholtz, 2022, The last continuous grasslands on Earth: Identification and conservation importance}).

There are some conflicts between user groups. For example, livestock operations and grazing management can occasionally conflict with access to hunting opportunities across the highly fragmented landscape. The increase in popularity of the tarantula mating events in October coincide with one of the more popular pronghorn hunting seasons. So far, the unit has been able to appropriately manage these conflicting resource uses.

Social associations and organizations are an important part of community and cultural life in this rural area. The important formal and informal associations, which tie people of diverse backgrounds together, include occupations, local businesses, schools, churches, local government, media and entertainment centers. Agricultural and ranching-based organizations in the communities are not as dominant as they once were but are still important in fostering a sense-of-place across the area of influence today. Engaging with established community organizations can help involve populations that might not normally participate in forest service programming or planning processes. Though dominated by a rural lifestyle, many of the communities depend on the larger metropolitan centers of Pueblo, Colorado Springs, and Amarillo, Texas, for groceries, health care, and other services not provided in the smaller communities.

The area of influence is demographically diverse, with communities holding unique values and ways of utilizing and benefiting from public lands. Hispanic populations are prevalent in many communities and counties in the plan area. Research has shown that Hispanic/ Latino populations recreate in large groups, value fishing opportunities, and more developed recreation sites with amenities such as grills and potable water ({Thomas, 2021, A review of trends and knowledge gaps in latinx outdoor recreation on federal and state public lands}). Additionally, they often prefer day-use sites versus overnight camping. Across the nation, research shows that Hispanic/ Latinos share a strong sense of responsibility for the protection of public lands and natural environments, placing an importance on deriving meaning from participating in outdoor recreation and traditional cultural values, such as sharing their experiences with large groups of friends and family ({Flores, 2020, The Changing Dynamic of Latinx Outdoor Recreation on National and

State Public Lands)). Discussion with and meaningful involvement of all people in a community will help determine how best to facilitate their needs and desires in the outcomes of the plan revision process.

Across the area of influence, approximately 4.9% of the land is federally managed. As a land manager in the area, Forest Service management actions have the potential to affect the future of the counties and the communities and people that call the area home. Quality of life and economic opportunities have the potential to be affected by future management actions.

Economic Conditions and Trends

This section describes the structure of regional economies associated with the Grasslands. Diversified economies – those with employment in a variety of industries – are more resilient to changes in a single sector. While some individuals will still experience periods of unemployment, economic diversification helps to lessen the potential of economic collapse due to the decline of one industry. Determining the narrowness of an economy is important for decisionmakers, particularly when the dominant industry can be affected by changes in policy. For example, plan areas where the forest products industry or the tourism and recreation industries are dominant industries that are reliant on local national forests may be highly affected by changes in management direction.

On the other hand, efficiency is related to productivity and specialization. When economies specialize, total output increases, potentially allowing for greater levels of enjoyment and consumption, increasing standards of living. An economy that lacks efficiency and productivity risks being stagnant, and productivity growth is a crucial determinant of the living standard for future generations.

Table 5. CCNGs Area of Influence General Economic Indicators, 2022

Indicators		Combined Counties	Colorado Non-Metro	Kansas Non-Metro	New Mexico Non-Metro	Oklahoma Non-Metro
Prosperity	Avg. Earnings per Job	\$56,634	\$54,346	\$53,867	\$63,756	\$53,454
	Per Capita Income	\$49,516	\$69,416	\$52,295	\$50,502	\$50,169
	Services, Avg. Annual Wages	\$48,467	\$52,809	\$43,618	\$50,184	\$42,524
	Non-Services, Avg. Annual Wages	\$63,397	\$64,112	\$61,618	\$72,957	\$64,201
	Government, Avg. Annual Wages	\$52,192	\$57,064	\$41,859	\$57,322	\$51,304
Stress	Unemployment Rate Change, 2000-2022	0.3%	0.3%	-1.1%	-1.1%	0.0%
	Unemployment Rate	4.0%	3.1%	2.6%	4.2%	3.1%
Structure	Proprietors, % of Jobs	25.2%	34.6%	27.9%	23.1%	29.9%
	Non-Labor Income, % of Pers. Income	46.2%	50.6%	40.6%	47.6%	46.3%
	Services, % of Jobs	62.3%	63.4%	43.8%	50.7%	46.5%
	Non-Services, % of Jobs	20.2%	18.5%	25.9%	18.4%	23.9%
	Government, % of Jobs	16.2%	13.9%	19.0%	19.9%	20.0%

U.S. Department of Commerce. 2023. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.; U.S. Department of Labor. 2024. Bureau of Labor Statistics, Local Area Unemployment Statistics, Washington, D.C.; U.S. Department of Labor. 2024. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Washington, D.C.

Access, Land Use, and Ownership

Under the Forest Service’s “all lands” management philosophy and regulation, forest plan revisions must also consider the management of lands under various ownership outside of the national forest’s

jurisdictional boundaries. For example, the Forest Service must consult with the Bureau of Land Management on oil and gas leasing, with the Fish and Wildlife Service on critical habitat and endangered species, and with Native American tribes over matters of cultural areas and uses.

In the past decade, the conversion of open space and agricultural land to residential development has continued to occur at a rapid pace in many parts of the United States. The popularity of exurban² lot sizes in much of the country has exacerbated this trend (low density development results in a larger area of land converted to residential development). This pattern of development reflects a number of factors, including demographic trends, the increasingly unstable nature of economic activity, the availability and price of land, and preferences for homes on larger lots. These factors can place new demands on public land managers as development increasingly pushes up against public land boundaries. For example, human-wildlife conflicts and wildfire threats may become more serious issues for public land managers where development occurs adjacent to public lands. In addition, there may be new demands for recreation opportunities and concern about the commodity use of the landscape.

Table 6. Residential Development Trends in the Area of Influence

	% Change in Residential Acres (2000 – 2010)	% Second Homes in 2022
Baca County, CO	15.7%	1.3%
Bent County, CO	16.2%	1.5%
Las Animas County, CO	55.9%	9.5%
Otero County, CO	27.5%	0.5%
Pueblo County, CO	40.2%	1.6%
Colorado Non-Metro	54.9%	19.5%
Morton County, KS	3.1%	0%
Stevens County, KS	19.3%	0.8%
Kansas Non-Metro	24.8%	2.2%
Union County, NM	19.0%	9.8%
New Mexico Non-Metro	36.6%	8.8%
Cimarron County, OK	66.7%	2.3%
Texas County, OK	29.7%	1.6%
Oklahoma Non-Metro	23.1%	4.1%

Theobald, DM. 2013. Land use classes for ICLUS/SERGoM v2013. Unpublished report, Colorado State University; US Department of Commerce. 2023. Census Bureau, American Community Service (ACS) Office, Washington, D.C.

** The data in this table are calculated by ACS using annual surveys conducted during 2018-2022 and are representative of average characteristics during this period.*

With a mix of land ownership, often across landscapes that share basic similarities, there is the potential for a mix of management priorities and actions. Adjacency can offer challenges and opportunities—decisions made by public land managers may influence the local economy, particularly if public lands represent a large portion of the land base. Agency management actions that affect water quality, access to recreation, scenery (as well as other quality-of-life amenities), and the extent and type of resource extraction are particularly important in areas where much of the land is managed by public agencies.

² A region or settlement that lies outside a city and usually beyond its suburbs and that often is inhabited chiefly by well-to-do families (Merriam-Webster online dictionary 2014).

Federal and state land managers, private landowners, and others are constrained in different ways by laws and regulations that dictate how differing lands can be managed. In addition, where a large portion of land is owned and managed by federal agencies, local governments may rely heavily on federal PILT ("Payments in Lieu of Taxes") and revenue-sharing payments, such as those from the Secure Rural Schools and Community Self-Determination Act or BLM Taylor Grazing Act.

Table 7. Land Ownership as a Percentage of Total County Acres

County	Private Lands	USFS Lands	State Lands	Tribal Lands
Baca County, CO	85.2%	12.6%	2.2%	0.0%
Bent County, CO	86.4%	0.0%	13.4%	0.0%
Las Animas County, CO	81.1%	2.9%	7.9%	0.0%
Otero County, CO	62.6%	21.3%	15.7%	0.0%
Pueblo County, CO	75.6%	2.1%	15.7%	0.0%
Colorado Non-Metro	54.9%	22.7%	4.4%	2.1%
Morton County, KS	76.9%	23.1%	0.0%	0.0%
Stevens County, KS	99.8%	0.2%	0.0%	0.0%
Kansas Non-Metro				
Union County, NM	79.5%	2.3%	18.1%	0.0%
New Mexico Non-Metro				
Cimarron County, OK	63.2%	1.3%	35.4%	0.0%
Texas County, OK	88.3%	0.0%	11.7%	0.0%
Oklahoma Non-Metro				
Combined Counties	79.7%	4.9%	12.9%	0.0%

U.S. Geological Survey (USGS), Gap Analysis Program, 2022.

Degree of Urbanization

This section describes the level of urbanization in the area of influence. Urbanization is an important indicator for understanding population structure and associated dynamics. Population decline can signal a lack of, or decline in, economic opportunity ({McGranahan, 1999, Natural amenities drive rural population change}), aging populations, or a combination of the two, among other reasons. Alternatively, as populations grow and continue to establish themselves, conflicts between local residents and grassland visitors may increase. While living close to public lands may provide residents with amenities such as convenient access to recreation and wildlife viewing, increased congestion causes disadvantages such as crowds, litter, and noise ({Garber-Yonts, 2004, The economics of amenities and migration in the Pacific Northwest: Review of selected literature with implications for national forest management}, {Bolitzer, 2000, The impact of open space on property values in Portland, Oregon}). With the exception of Pueblo County, Colorado, the population within CCNG's socioeconomic area of influence has seen an overall decrease between 2010 and 2022 (see table 2, Population Characteristics in the CCNGs analysis area).

As residential areas and populations surrounding the Grasslands grow, the area's need for infrastructure increases, which may place greater pressure on the Grassland to provide, for example, utility rights-of-way. This type of pressure may threaten the grassland's role in contributing to sense of place and the quality of life in surrounding communities ({Stedman, 2003, Is it really just a social construction?: The contribution of the physical environment to sense of place}). Homes located near grasslands (i.e., the wildland urban interface, or WUI) are at risk of wildfire-related disturbances. When populations around the Grasslands expand, there are more homes in the WUI. There is greater risk to these growing

communities from increased frequency and extent of wildfire due to climate change ({Timberlake, 2021, Climate Change Vulnerability in the Black Hills National Forest}).

Distinguishing between metropolitan and nonmetropolitan status or urban and rural designations are two commonly used approaches for distinguishing counties on the basis of their demographic and geographic characteristics. The U.S. Department of Agriculture’s Economic Research Service classifies all counties along a rural-urban continuum, which describes the degree of urbanization in a county. The 2023 Rural-Urban Continuum Codes distinguish U.S. metropolitan (metro) counties by the population size of their metro area, and nonmetropolitan (nonmetro) counties by their degree of urbanization and adjacency to a metro area. The division of counties as either metro or nonmetro, based on the 2023 Office of Management and Budget (OMB) delineation of metro areas³, is further subdivided into three metro and six nonmetro categories. Each county and census-designated county-equivalent in the United States, including those in outlying territories, is assigned one of these nine codes. The codes span a scale from 1 through 9. Smaller numbers are more urban, larger numbers are more rural. Table 8 summarizes the rural urban continuum codes of the CCNGs’ socioeconomic area of influence.

Table 8. CCNG Socioeconomic Area of Influence Rural Urban Continuum Codes

State	County	Rural Urban Continuum Code	Code Description
Colorado	Baca	9	Nonmetro - Urban population of fewer than 5,000, not adjacent to a metro area
	Bent	9	Nonmetro - Urban population of fewer than 5,000, not adjacent to a metro area
	Las Animas	7	Nonmetro - Urban population of 5,000 to 20,000, not adjacent to a metro area
	Otero	6	Nonmetro - Urban population of 5,000 to 20,000, adjacent to a metro area
	Pueblo	3	Metro - Counties in metro areas of fewer than 250,000 population
Kansas	Morton	9	Nonmetro - Urban population of fewer than 5,000, not adjacent to a metro area
	Stevens	9	Nonmetro - Urban population of fewer than 5,000, not adjacent to a metro area
New Mexico	Union	9	Nonmetro - Urban population of fewer than 5,000, not adjacent to a metro area
Oklahoma	Cimarron	9	Nonmetro - Urban population of fewer than 5,000, not adjacent to a metro area
	Texas	7	Nonmetro - Urban population of 5,000 to 20,000, not adjacent to a metro area
Combined County Average		7.7	Nonmetro

U.S. Department of Agriculture, Economic Research Service (ERS), 2024.

Table 9 shows the broadband internet access percentiles across the area of influence as being generally high access, determined by a calculation of upload and download speeds and internet subscriptions. Even with this high access percentile data, it is difficult to pin-point the connections between broadband access and those populations in each county that might have connection concerns, as these are broad scale data sets. There may be may residents in the area of influence that do not have access to highspeed internet and outreach efforts should include some engagement options that do not require a highspeed internet connection.

³ Metropolitan areas are based on the Office of Management and Budget (OMB) delineation as of July 2023, see OMB Bulletin NO. 23-01.

Table 9. Broadband Access across the area of influence

County	State	Households with a broadband subscription
Baca	CO	78.5%
Bent	CO	78.0%
Las Animas	CO	80.5%
Otero	CO	76.1%
Pueblo	CO	82.5%
Stevens	KS	81.6%
Morton	KS	84.4%
Texas	OK	86.3%
Cimarron	OK	63.8%
Union	NM	74.2%

*The percentage of households reporting a broadband internet subscription of any type.
Source: 2017-2021 5-Year American Community Survey (ACS) Estimates, U.S. Census Bureau, Access Broadband Dashboard

Employment and Income

Employment and income statistics are important indicators of the economic health and associated trends of an area. Understanding which industries are responsible for most jobs and which sectors are growing or declining is key to grasping the type of economy that exists, how it has changed over time, and evolving competitive strengths.

Table 10. CCNGs Socioeconomic Area of Influence Employment by Industry and Trends

	2010	2022	% Change 2010-2022
Total Employment	-		9.9%
Non-services related employment	19.8%	20.2%	12.3%
Farm	5.9%	5.8%	8.6%
Forestry, fishing, & ag. services	0.6%	0.7%	16.2%
Mining (including fossil fuels)	1.4%	1.0%	-17.5%
Construction	5.5%	6.3%	25.3%
Manufacturing	6.4%	6.4%	10.4%
Services related employment	59.6%	62.3%	14.9%
Utilities	0.6%	0.5%	-11.2%
Wholesale trade	2.1%	2.3%	18.3%
Retail trade	10.7%	10.9%	12.1%
Transportation and warehousing	2.5%	4.4%	92.4%
Information	1.3%	0.9%	-18.6%
Finance and insurance	3.6%	3.8%	16.9%
Real estate and rental and leasing	3.3%	3.9%	29.5%
Professional and technical services	2.8%	4.1%	58.1%
Management of companies and enterprises	0.2%	0.3%	84.4%
Administrative and waste services	5.7%	4.1%	-20.3%
Educational services	0.9%	1.0%	19.7%
Health care and social assistance	12.2%	12.5%	12.6%
Arts, entertainment, and recreation	1.5%	1.4%	-1.0%

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	2010	2022	% Change 2010-2022
Accommodation and food services	6.9%	6.9%	10.8%
Other services, except public administration	5.3%	5.3%	8.9%
Government related employment	19.4%	16.2%	-8.2%

U.S. Dept. of Commerce. 2023. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.
 Note: All employment data are reported by place of work. Estimates for data that were not disclosed are indicated with gray text.

The level of, and changes in, per capita income and average earnings are also important for assessing the state of the economy and the well-being of individuals in associated communities. Changes in per capita income reflect economic growth in a community. In addition, comparisons between state and local area per capita income provide insight into the relative economic well-being of a community. Low per capita income may indicate that the local economy does not adequately support individuals and families. However, per capita income can sometimes be misleading. Since total personal income includes income from 401(k) plans as well as other non-labor income sources like transfer payments, dividends, and rent, it is possible for per capita income to rise, even if the average wage per job declines over time. In other words, non-labor sources of income can cause per capita income to rise, even if people are earning less per job. Also, because per capita income is calculated using total population and not the labor force as in average earnings per job, it is possible for per capita income to be relatively low when there are a disproportionate number of children and/or elderly people in the population. Average earnings, on the other hand, are an indicator of the quality of local employment, in terms of high-wage jobs. Table 10 and table 11 present a summary of general economic indicators and socioeconomic trends for the CCNGs' socioeconomic area of influence. For a thorough discussion of population conditions and trends associated with the Grasslands, see the ***Population Change*** subsection.

Table 11. CCNGs Area of Influence Socioeconomic Trends, 2000 – 2022

Trends	Combined Counties	Colorado Non-Metro	Kansas Non-Metro	New Mexico Non-Metro	Oklahoma Non-Metro
% Change in Population	9.5%	14.3%	-6.9%	3.6%	1.8%
% Change in Employment	10.2%	23.9%	-2.2%	12.0%	8.9%
% Change in Personal Income	27.1%	67.7%	18.7%	52.8%	41.9%
% Change in Avg. Earnings per Job	6.9%	7.8%	22.8%	25.2%	26.4%
% Change in Per Capita Income	16.1%	46.8%	27.5%	47.4%	39.4%

U.S. Department of Commerce. 2023. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.; U.S. Department of Labor. 2024. Bureau of Labor Statistics, Local Area Unemployment Statistics, Washington, D.C.; U.S. Department of Labor. 2024. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Washington, D.C

Non-labor income has grown rapidly over the last several decades in some locations while in others it has not. Also, some locations are more dependent on non-labor sources of income than others. For example, more than 20 percent of rural counties derive half or more of all personal income from non-labor sources compared with fewer than 5 percent of metro counties (Headwaters Economics 2017). Because non-labor income can be significant, it is important to understand its components. The economy of some locations may rely more on investment income, others on retirement benefits, and still others on welfare-related income streams (Lawson, 2014, The importance of non-labor income: an analysis of socioeconomic performance in western counties by type of non-labor income}). Table 12 summarizes components of non-labor income within the CCNGs socioeconomic area of influence, as a percentage of total personal income.

Table 12. CCNG Socioeconomic Area of Influence Components of Non-Labor Income, as a Percent of Total Personal Income, 2022

State	County	Total Non-Labor Income	Dividends, Interest, Rent	Age-Related Transfer Payments ¹	Hardship-Related Payments ²	Other Transfer Payments ³
Colorado	Baca	55.2%	17.5%	19.8%	14.5%	3.4%
	Bent	61.8%	20.2%	17.0%	18.9%	5.6%
	Las Animas	56.2%	15.6%	18.6%	15.9%	6.1%
	Otero	54.7%	13.6%	17.0%	17.8%	6.2%
	Pueblo	48.3%	15.4%	14.4%	13.8%	4.7%
	Non-Metro	50.6%	32.5%	9.7%	5.8%	2.6%
Kansas	Morton	45.5%	16.2%	19.1%	8.0%	2.2%
	Stevens	32.3%	14.9%	11.5%	4.0%	1.9%
	Non-Metro	40.6%	16.4%	14.5%	6.4%	3.3%
New Mexico	Union	51.9%	14.7%	18.5%	15.0%	3.7%
	Non-Metro	47.6%	15.1%	13.0%	16.0%	3.5%
Oklahoma	Cimarron	28.7%	11.9%	12.0%	2.8%	2.1%
	Texas	23.6%	10.4%	7.3%	3.6%	2.3%
	Non-Metro	46.3%	17.5%	15.7%	8.6%	4.4%
Combined Counties		46.2%	14.8%	14.2%	12.8%	4.5%

U.S. Dept. of Commerce. 2023. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.

¹ Includes Social Security and Medicare

² Includes Medicaid, income maintenance ("welfare"), unemployment insurance compensation.

³ Includes veterans' benefits, education and training assistance, workers' comp., and all other transfer payments.

Income and poverty are also important socioeconomic indicators to consider during assessment because low-income and/or impoverished populations may be more vulnerable to any adverse effects that result from changes to forest management. In general, low-income individuals tend to depend more directly on National Forests for subsistence food supplies, wood, and home heating. Communities or households with low incomes will also typically be more sensitive to management actions, which impacts costs to use or access Forest resources. For example, if people must travel farther to access recreation sites this increases the cost to use these recreation sites and this may have a disproportionate effect on low-income households. Since low-income individuals are more vulnerable to changes in the management of local resources, it is important for forest management to understand how these forest users may be affected by changes or restrictions to forest uses.

Table 13. Poverty and Low-Income Individuals- Colorado Counties

Poverty and Low-Income Individuals- Colorado Counties							
Poverty, 2022*	Las Animas County, CO	Pueblo County, CO	Otero County, CO	Baca County, CO	Bent County, CO	Combined Counties	Colorado
Individuals	13,791	163,989	18,130	3,391	4,234	203,535	5,653,289
Families	3,806	41,479	4,719	910	1,064	51,978	1,427,813
Individuals below poverty	2,627	27,274	4,350	781	1,146	36,178	540,105
Families below poverty	450	5,239	804	139	257	6,889	84,990
Low-income individuals	5,523	60,394	8,697	1,781	2,063	78,458	1,306,710

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Poverty and Low-Income Individuals- Colorado Counties							
Poverty, 2022*	Las Animas County, CO	Pueblo County, CO	Otero County, CO	Baca County, CO	Bent County, CO	Combined Counties	Colorado
Percent of Total							
Individuals below poverty	19.0%	16.6%	24.0%	23.0%	27.1%	17.8%	9.6%
Families below poverty	11.8%	12.6%	17.0%	15.3%	24.2%	13.3%	6.0%
Low-income individuals	40.0%	36.8%	48.0%	52.5%	48.7%	38.5%	23.1%

U.S. Department of Commerce. 2023. Census Bureau, American Community Survey (ACS) Office, Washington, D.C.
 *ACS 5-year estimates used. 2022 represents average characteristics from 2018-2022; 2010 represents 2006-2010.

Table 14. Poverty and Low-Income Individuals- Kansas Counties

Poverty and Low-Income Individuals- Kansas Counties				
Poverty, 2022*	Morton County, KS	Stevens County, KS	Combined Counties	Kansas
Individuals	2,615	5,158	7,773	2,848,334
Families	542	1,263	1,805	732,890
Individuals below poverty	345	816	1,161	329,870
Families below poverty	52	90	142	56,045
Low-income individuals	681	2,652	3,333	805,722
Percent of Total				
Individuals below poverty	13.2%	15.8%	14.9%	11.6%
Families below poverty	9.6%	7.1%	7.9%	7.6%
Low-income individuals	26.0%	51.4%	42.9%	28.3%

U.S. Department of Commerce. 2023. Census Bureau, American Community Survey (ACS) Office, Washington, D.C.
 *ACS 5-year estimates used. 2022 represents average characteristics from 2018-2022; 2010 represents 2006-2010.

Table 15. Poverty and Low-Income Individuals- Oklahoma Counties

Poverty and Low-Income Individuals- Oklahoma Counties				
Poverty, 2022*	Texas County, OK	Cimarron County, OK	Combined Counties	Oklahoma
Individuals	20,689	2,253	22,942	3,847,702
Families	4,467	506	4,973	987,338
Individuals below poverty	4,234	246	4,480	585,991
Families below poverty	609	30	639	108,707
Low-income individuals	9,176	817	9,993	1,365,004
Percent of Total				
Individuals below poverty	20.5%	10.9%	19.5%	15.2%
Families below poverty	13.6%	5.9%	12.8%	11.0%
Low-income individuals	44.4%	36.3%	43.6%	35.5%

U.S. Department of Commerce. 2023. Census Bureau, American Community Survey (ACS) Office, Washington, D.C.
 *ACS 5-year estimates used. 2022 represents average characteristics from 2018-2022; 2010 represents 2006-2010.

Table 16. Poverty and Low-Income Individuals- New Mexico Counties

Poverty and Low-Income Individuals- New Mexico Counties		
Poverty, 2022*	Union County, NM	New Mexico
Individuals	3,587	2,070,966
Families	822	503,154
Individuals below poverty	639	378,651
Families below poverty	143	68,850
Low-income individuals	1,883	803,933
Percent of Total		
Individuals below poverty	17.8%	18.3%
Families below poverty	17.4%	13.7%
Low-income individuals	52.5%	38.8%

U.S. Department of Commerce. 2023. Census Bureau, American Community Survey (ACS) Office, Washington, D.C.
 *ACS 5-year estimates used. 2022 represents average characteristics from 2018-2022; 2010 represents 2006-2010.

As described in table 13, combined counties in the area of influence in Colorado show that 17.8% of individuals and 13.3% of families live below poverty. This is greater than the percentages of individuals and families living in poverty across the Colorado population (9.6% and 6.0%, respectively). In Kansas, 14.9% of individuals and 7.9% of families live below poverty, compared to 11.6% of individuals and 7.6% of families statewide in Kansas. Oklahoma counties in the area of influence show that 19.5% of individuals and 12.8% of families live below poverty compared to 15.2% of individuals and 11.0% of families across the state. In Union County New Mexico, 17.8% of individuals and 17.4% of families live in poverty, which is less than the individuals in poverty across the state (18.3%) but more than families in poverty across the state (13.7%).

Contributions to Social and Economic Sustainability

The Cimarron and Comanche National Grasslands provide contributions that affect social, cultural, and economic conditions. These contributions include ecosystem services and multiple uses from the Grasslands that provide benefits to people either directly or indirectly. Management of the grasslands (in terms of its operations, employees, and connection to institutions and people outside the national grasslands' boundaries) contributes to the area socially and economically. This section describes the major contributions the grasslands provide that affect the social and economic sustainability associated with the area of influence.

Multiple Uses and Ecosystem Services

The following section and subsections characterize the current roles the Grasslands play, ecosystem services from those roles, and the associated contributions that are made to local and non-local people. Management of the Grasslands continues to provide resources and opportunities to people while maintaining and improving ecosystem conditions therein. Associated ecosystems ⁴ provide a variety of resource outputs, services, benefits, values, and opportunities. Some of these are directly tied to the economic system of local communities, while others are more social or cultural and can extend well beyond the local communities.

⁴ The Grasslands ecosystems identified in the Assessment include Canyonland, Riparian and Aquatic, Sandsage Prairie, and Shortgrass Prairie ecosystems.

The provision of multiple uses and ecosystem services are two of the major contributions to social and economic sustainability of the Grasslands in the broader landscape. Contributions from multiple uses and ecosystem services specific to the Cimarron-Comanche National Grasslands are closely intertwined and best considered in an integrated manner. These integrated concepts make explicit the various ways humans benefit from and depend on the natural world. This dependency extends from essential support for life (oxygen, water, and food) to security (natural regulation of insects, disease, and fire regime) and quality of life (scenic beauty and other cultural services such as outdoor recreation and existence, bequest, and spiritual values). All living resources in existence are important and contribute to human well-being directly or indirectly.

Ecosystem services ⁵ are components of nature that contribute to human well-being, such as the provision of water, which in turn promotes healthy rangeland or water supplies for mineral development or outdoor recreation. More specifically, ecosystem services (or benefits to people) provided by the land can include:

- **Provisioning services**, such as clean air and fresh water, energy, fuel, forage, fiber, and minerals; Provisioning services include all tangible products from ecosystems that humans make use of for nutrition, materials and energy. These products can be traded, consumed and/or used directly ({Haines-Young, 2010, The links between biodiversity, ecosystem services and human well-being}); they are divided into the main subcategories of food, materials and energy (Kandziora et al. 2013). Provisioning services are recognized as essential for meeting human needs for nutrition, shelter, and safety ({Daniel, 2012, Contributions of cultural services to the ecosystem services agenda}).
- **Regulating services**, such as long-term storage of carbon; climate regulation; water filtration, purification, and storage; soil stabilization and formation; flood control; and disease regulation.
- **Supporting services**, such as maintaining biodiversity (species and genetic), habitat connectivity and diversity, soil formation, photosynthesis, pollination, seed dispersal, and nutrient cycling; Supporting services indirectly impact people through the maintenance of ecosystem processes and functions over a long period; these services fundamentally support the other types of ecosystem services ({Millennium Ecosystem Assessment, 2005, Ecosystems and human wellbeing: synthesis}; {Daniel, 2012, Contributions of cultural services to the ecosystem services agenda}).
- **Cultural services**, such as educational, aesthetic, spiritual and cultural heritage values, cultural diversity, knowledge systems, inspiration, sense of place, recreational experiences, and tourism opportunities, are nonmaterial benefits people obtain from ecosystems (MEA 2005). Like the other ecosystem services, cultural ecosystem services must demonstrate significant relationships between ecosystem structures and functions in the biophysical domain and the satisfaction of human needs and wants in the medical, psychological, and social domain ({Daniel, 2012, Contributions of cultural services to the ecosystem services agenda}).

The planning rule does not explicitly require quantification of ecosystem services but rather expects some characterization of key services in forest assessments. When considering ecosystem services in forest plans, it is Forest Service policy to identify and consider a set of key ecosystem services provided by the plan area, rather than trying to identify and evaluate information about all ecosystem services that may be present in the plan area (FSH 1909.12, Ch. 10, sec. 13.12). The 2012 planning rule ({USFS, 2012,

⁵ Ecosystem services are defined as the “benefits people obtain from ecosystems” ({Millennium Ecosystem Assessment, 2005, Ecosystems and human wellbeing: synthesis}). More recently, the International Platform on Biodiversity and Ecosystem Services (IPBES) expounded upon the 2005 MEA to integrate the roles of culture and social values with known ecosystem services provided by the natural world (Díaz et al., 2015). This framework moves beyond traditional conceptualizations of ecosystem services and recognizes that contributions can be both positive and negative, and that perceptions of positive or negative may depend on cultural, economic, spatial, or temporal context (Díaz et al., 2018).

Planning Rule}) directs responsible officials to identify and evaluate existing information about the benefits (or ecosystem services) people obtain from the planning area as part of the plan assessment phase of plan revision. To meet these requirements, the Forest Service Handbook directs planning teams to focus on “key” ecosystem services.

Key ecosystem services are those that meet two criteria: (1) they are important to people in the broader landscape or beyond the plan area itself, and (2) they are likely to be affected by the management plan under revision (USFS 2015). In the effort to better focus and highlight contributions of National Forest management according to the aforementioned directives, key ecosystem services are those services that are important in the area of influence or the broader landscape and are likely to be influenced by the land management plan.

Key ecosystem services of the CCNGs are preliminarily identified are as follows:

- **Provisioning services:** Water supplies, forage/food (for all living things), fuel (for all combusting things), other grassland materials (fossils, rocks, minerals, etc.), plants, and wildlife for cultural or medicinal uses
- **Regulating services:** Water flow and groundwater recharge, sediment and flood control, water filtration and nutrient buffering, land and soil productivity, resistance and resilience from disturbances, pollination and seed dispersal
- **Supporting services:** Biodiversity (species and genetics), habitat connectivity and diversity, air quality, water quantity and quality, soil quality and character, carbon storage, groundwater/aquifer storage, nutrient and carbon cycling
- **Cultural services:** Recreational opportunities and access, scenery and aesthetic values, spiritual/sacred sites, wilderness character, educational opportunities, economic opportunities (jobs in tourism/industry/commodities), non-use values associated with the Grasslands (benefits people receive from knowing the Grasslands exist both presently and into the future; benefits people receive from connecting with lands from which their heritages and/or identities proliferate)

Here, ecosystem services are considered holistically, recognizing the connections among, and context-dependence of, significant multiple services provided by the Cimarron-Comanche National Grasslands. Some ecosystem service contributions can be both positive and negative at the same time (for example, carnivores may both control wild ungulate populations and threaten livestock populations). Moreover, while a service generates benefits in its own right, it can also affect other services positively or negatively, with implications for those associated benefits. Management decisions may affect the provision of services to varying degrees, thus, any changes in management can negatively or positively affect one or more associated services both directly or indirectly. These dynamics among ecosystem services, specifically regarding their management, are often referred to as tradeoffs (Bennett et al., 2009).

When considering ecosystem services provided by an area, that area’s cultures define links between people and nature; thus, Indigenous and Traditional Ecological Knowledges and local knowledges are crucial to understanding and characterizing contributions to people from the natural world (Diaz et al 2018). Per the 2005 MEA, social and cultural aspects of ecosystem services relate to the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences. Diaz et al. (2018) note that culture permeates all aspects of ecosystem services. For example, food is a consumptive contribution of nature to people, but it also has significant cultural, historical, and social meaning. Illuminating the value of CCNG social and cultural aspects helps characterize how people understand, value, interact with, and make meaning of the Grasslands to maintain quality of life, wellbeing, and cultural and economic vitality presently and for future generations. In line with these ideas, USFS recognizes the important role of culture in defining linkages between ecosystem services and human benefits across all topic areas, not just the key areas highlighted below.

The social and economic sustainability of an ecosystem depends on the ecological capabilities and limits of the resources that make up that ecosystem. Conversely, the ecological sustainability of an ecosystem depends on existing conditions, existing laws and regulations, and Forest Service management capabilities in terms of staff and budget resources. What is to be sustained on the Grasslands needs to be equally sustainable socially, economically, and ecologically. In most cases, past and current management have altered ecosystems from their pre-European conditions. In some cases, these changes have moved the ecosystem outside of the historic range of variability indicated. In these situations, active management may improve resource conditions and restore ecosystem components and functions but should remain balanced with associated social and economic tradeoffs.

Rangeland Management

This section describes ecosystem services from the National Grasslands through provision of livestock grazing and rangeland management, and how this contributes to social and economic sustainability in the area of influence. For example, livestock grazing on public lands provides a source of income for some individuals, social benefits, such as support for tradition and heritage, and can contribute to the preservation of open space on associated ranches. As part of the agency's mission, the Cimarron-Comanche authorizes grazing by domestic livestock under a permit system, administering this use to be compatible with other multiple-use objectives and to provide desired benefits to communities. Where other uses, such as recreation or wildlife habitat, can be provided at the same time, livestock may mingle with backpackers, and mule deer may drink from stock water tanks. Some uses cannot be provided in the same place or time, and a Land Management Plan can allocate certain acres with an emphasis on different types of use, such as mineral production or grazing. Please see the *Rangeland Management* chapter of the Assessment for a complete discussion on rangeland management existing conditions associated with the CCNGs.

The topic of ecosystem services from properly managed rangelands is broad and complex, driven by numerous influences. Policy, market fluctuation, incentives, to name a few, all contribute to the trajectory of a landscape. Historically, the focused beneficiary has been at the local level, primarily surrounding those that receive the initial and to some extent visual benefit as producers of rural community economic security. However, the benefits of properly managed rangelands are far reaching, affecting many with no knowledge of the benefits they are receiving:

- **Provisioning services:** forage (wild and domestic) and fiber; economic opportunities (jobs in tourism/industry/commodities) and stability for communities
- **Regulating services:** water infiltration and purification; vegetative composition manipulation; fuel reduction
- **Supporting services:** habitat connectivity, manipulation, and improvement; carbon sequestration/storage below ground; biodiversity maintenance through reduced/mitigated land-use conversion (from both agricultural and non-agricultural, e.g., row crop and/or development)
- **Cultural services:** Consumptive and non-consumptive recreational opportunities and access, specifically hunting and night sky tourism, among others; scenery and aesthetic values, specifically those associated with wide open spaces and bucolic landscapes, and maintaining associated viewsheds; wilderness character, specifically habitat connectivity and land-use conversion mitigation; educational opportunities; economic opportunities (jobs in tourism/industry/commodities) and stability for communities; ornamental materials, as well as materials for cultural and spiritual uses; non-use values associated with rangeland management on the Nebraska (benefits people receive from knowing rangeland management activities exist both presently and into the future; benefits people receive from connecting with lands from which their heritages and/or identities proliferate, etc.)

The Morton County Grazing Association (MCGA) is the only permittee authorized to graze livestock on the Cimarron National Grassland (NG). The MCGA was formed in 1943 and has members who are farmers and ranchers in Morton and Stevens counties in Kansas. The Comanche National Grassland

currently authorizes four permittees to graze livestock on the Carrizo Unit and one on the Timpas Unit: Campo Grazing Association (CGA), Pritchett Grazing Association (PGA), Kim Grazing Association (KGA) and Timpas Grazing District (TGD), respectively. These Comanche Grazing Associations and District were formed in the mid- to late 1970s and are made up of a membership that is governed by an elected Board. Unlike the MCGA, none of the Grazing Associations or District on this Grassland hire range riders to attend to the maintenance of the range improvements (fences, water facilities, stock tanks and ponds). Individual members of the Associations and Comanche District are responsible for the maintenance of their designated range improvements. Livestock sale barns commonly accessed by Cimarron-Comanche permittees are located in Beaver, Fowler, and La Junta, Colorado; Syracuse, Kansas; and Texhoma, Oklahoma.

The typical livestock grazing season lasts approximately six months (May 1 to November 15), with some allotments grazed on a year-round basis. Livestock grazing systems include season-long, deferment, deferred rotation, and rest rotation. Authorized numbers vary from year-to-year dependent on several factors including accumulated precipitation, vegetation conditions, environmental and economic considerations. Management objectives also are considered with authorized numbers.

Economic contributions presented in table 17, below, represent an estimate of employment and labor income supported by the dollar amount of grazing program activities on the CCNGs. For more details on economic contribution methodologies, see the *Economic Contributions* subsection. Economic contributions from grazing activities on the Cimarron and Comanche National Grasslands are the largest for any activity or multiple use presently occurring on the Grasslands.

Table 17. Estimated 2023 Economic Contributions from Grazing Activities on the Cimarron-Comanche National Grasslands

Employment	Labor Income	GDP ("Value Added") ¹
337	\$6,947,000	\$14,187,000

IMPLAN 2022; USFS 2023 program resource data; results, presented in 2024 dollars, are rounded to the nearest \$1000.

¹ Value added, or GDP, is not used here as a depiction of economic value or benefits from the National Grasslands as it only describes economic contributions and does not include the entire series of economic benefits and other nonmarket values (e.g., forest goods and services such as clean water and air, biodiversity, cultural resources, and wilderness).

Many of the National Grassland's permittees and their families have grazed the area since being displaced by the Dust Bowl in the 1930s. Grazing on what is now the CCNG occurred prior to European settlement primarily by wild ungulates. For many permittees, grazing the National Grasslands is important not only as a source of income, but as a part of their cultural identity. Social associations and organizations are an important part of community and cultural life in this rural area as well, however, historical agricultural organizations (such as the Grange, Farm Bureau, etc.), agricultural suppliers, cattlemen's associations, soil conservation services, 4-H, Future Farmers of America, among others, do not have the same dominance they once had 50 years ago. Today a multiplicity of organizations has arisen that matches the cultural diversity of the community residents. The sustainability of rangeland social aspects and associated cultural services are contingent upon ongoing social-ecological relationships, where rangeland ecosystem persistence and health are interdependent with social and cultural processes and stewardship ({Brunson, 2008, Ranching as a conservation strategy: Can old ranchers save the New West}).

While rangelands within the National Grasslands contribute to a variety of ecosystems and associated services such as wildlife habitat, recreation (including that associated with wildlife), watershed functions, carbon sequestration and biodiversity conservation, these lands have primarily been managed for forage. Under the Millennium Ecosystem Assessment (MEA) classification system, forage is a provisioning service. For a thorough discussion of the many ecosystem services provided by rangelands, see Maczko and Hidingier ({Maczko, 2008, Sustainable rangelands ecosystem goods and services (Sustainable Rangelands Roundtable Monograph No. 3)}) and the 2023 “Connecting Nature and People” Society for Range Management Task Force Report.

Rangelands produce a renewable dietary source of forage from diverse grasses, forbs, and woody plants. Cellulose from forage is converted by livestock into animal protein and fiber production (e.g., wool, mohair, etc.) for human consumption. By hosting specialized microbes in their digestive systems, ruminant livestock (cattle, bison, sheep, and goats) serve as conduits between cellulose in plant biomass and animal protein and fiber production (Derner et al., 2017). As a result, livestock and fiber production from rangelands is considered a key provisioning service provided by the National Grasslands that can have economic and subsistence values for individuals and local communities (Havstad et al., 2007; Sayre et al., 2013; Lindstater et al., 2016; Lind et al., 2020). Some level of grazing has been observed to help maintain or enhance plant diversity ({Milchunas, 1988, A generalized model of the effects of grazing by large herbivores on grassland community structure}). However, diversity tends to decline as grazing intensity and frequency increase above moderate, or sustainable, levels (Herrero-Jaguerei & Oesterheld, 2018). If grazing reduces the cover of dominant species, this can enhance diversity by allowing space and resources for other plants to co-exist (e.g., Marty, 2005; Porensky et al., 2013; Koerner et al., 2018). If grazing tends to increase the abundance of the most dominant species, it can have the opposite effect on diversity (Koerner et al., 2018; Porensky et al., 2017). Grazing can also help manage fine fuel loads to reduce the prevalence of severe wildfires (Davies et al., 2016; Davies et al., 2021). In addition to forage and livestock production, rangelands can also provide food and fiber from associated supported wildlife (Brown & MacLeod, 2011). Rangelands comprising the National Grasslands provide biotic resources, such as vegetation heterogeneity, for diverse wildlife habitats as well. Biodiversity maintenance is also considered a supporting ecosystem service. The status and condition of both consumptive and non-consumptive wildlife populations can serve as an indicator of the ecological condition of a rangeland; when wildlife populations thrive, the value of a rangeland, in terms of ecosystem services, typically thrives as well due to the synergistic interactions between the two ({Briske, 2017, Rangeland systems: Processes, management and challenges}). Year-round access to vital nutrients is key to maintaining wildlife populations (Stoellinger et al., 2020); as the acreage of a rangeland shrinks, habitat fragmentation increases, along with the value placed on protecting or creating migratory wildlife corridors. As such, conversion of rangelands to croplands or development is a persistent threat to native wildlife species ({Wilcove, 1998, Quantifying threats to imperiled species in the United States}; Green et al., 2005) and the ecosystem services they both provide (provisioning and cultural) and rely (provisioning and supporting, such as forage and biodiversity maintenance), upon. Avoiding such conversion has been shown to preserve species diversity and habitat connectivity (Olimb & Robinson, 2019). Further discussion on the ecosystem services associated with wildlife found on the Grasslands can be found in the ***Fish, Wildlife, and Plant Species subsection***.

Rangelands comprising the National Grasslands can also contribute to global carbon cycling (Conant, 2012). Soil carbon cycling is the process by which carbon is fixed from the atmosphere through plants and microbial processes and then stored in the soil. The amount of soil carbon cycling possible from an area is dependent on soil texture, the climate (including temperature and precipitation regimes), and vegetation composition. Existing land management and weather can also influence short-term fluxes (Sanderson et al., 2020). Because the aforementioned variables, among others, can affect soil carbon cycling potential unique to a given area, rangelands covering said area have considerable variability in carbon cycling potential.

Table 18. 2017 Estimated Forage Values of Beef Cattle Ranching-Based Ecosystem Services

State	USFS Range Acres	Federal Range Acres	Federal Forage Per Acre	Private Range Acres	Private Forage Per Acre
Colorado	7,300,000	12,982,150	\$1.43	12,446,044	\$5.60
Kansas	100,530	100,530	\$5.41	7,529,646	\$19.00
New Mexico	7,400,000	19,442,343	\$1.67	28,054,213	\$3.20
Oklahoma	43,837	43,837	\$4.03	15,581,489	\$13.00

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Alternatively, rangeland management that causes changes in vegetation structure and soil structure can affect runoff, erosion, groundwater recharge, and soil moisture for plant production. If livestock grazing management negatively affects the growth needs of plants (for example, by ignoring considerations of season, duration, and intensity of use), it may also threaten rangeland water dynamics. Similarly, livestock grazing management that negatively affects soil properties or biological soil crusts could represent a threat to ecosystem services otherwise provided. For example, in dry rangelands of the Colorado Plateau, loss of biological soil crusts from historic livestock trampling likely caused accelerated wind and water erosion (Duniway et al., 2018; Miller, 2011). Under some approaches to management, water quality can also be affected by livestock in riparian and wetland areas by increasing sediments, nutrients (i.e., nitrogen and phosphorus), and bacteria levels.

Although heavy grazing can influence plant community dynamics, climate variability has a greater effect on plant community and productivity in arid and semiarid environments ({Biondini, 1998, Grazing intensity and ecosystem processes in a northern mixed-grass prairie, USA}). With warmer and longer growing seasons, greater climatic variability, and more extreme events (e.g., increased occurrence of large precipitation events), a longer growing season is projected. These climatic changes may affect livestock production both directly via physiological impacts on animals and indirectly via modifications to forage, invasion of undesirable plants, and increased exposure to parasites (Derner et al. 2018). Elevated CO₂ conditions may increase water use efficiency and plant production ({Morgan, 2004, CO₂ enhances productivity, alters species composition, and reduces digestibility of shortgrass steppe vegetation}) but alter species composition and reduce forage quality (Milchunas et al. 2005; {Morgan, 2004, CO₂ enhances productivity, alters species composition, and reduces digestibility of shortgrass steppe vegetation}) in a system extensively used for livestock grazing.

Outdoor Recreation and Forest Visitors

Relationships between demographic and economic characteristics and recreation demand are complex. At the most basic level, as an area's population increases or decreases, use of the forest follows. Many factors affect recreation participation rates including income and ethnicity and race. Additionally, older populations will place different recreational demands on the grasslands. Among other resources, recreation on the Cimarron and Comanche National Grasslands is an important component of the contributions to social and economic sustainability in the area of influence. Non-fish or wildlife-related recreation is estimated to have contributed about 11 jobs and \$378,196 in labor income in 2023 (IMPLAN 2022). These metrics represent an estimate of the number of jobs and labor income supported by the dollar amount of the CCNGs' (non-wildlife) recreation activities in the area per average year. While hunting, fishing, and non-consumptive wildlife activities are some of the most prevalent forms of recreation on the Grasslands, wildlife-related recreation is discussed in the *Wildlife* subsection. Please see the *Recreation* chapter of the Assessment for a complete discussion on recreation existing conditions associated with the CCNGs.

The National Visitor Use Monitoring (NVUM) program surveys visitors on each national forest and grassland in 5-year intervals. It provides a snapshot of visitation, activity participation, demographics of visitors and visitor expenditures. Visitors to the National Grasslands come for a variety of recreation opportunities including viewing natural features, fishing, hiking and walking, hunting, driving for pleasure,

Off-Highway Vehicle (OHV) use, and relaxing. Statistics from the National Visitor Use Monitoring surveys (USDA 2016) show that the highest activity visitors participate in is viewing natural features, with 55.5 percent of visitors participating in this activity. This high percentage emphasizes the importance of maintaining natural-appearing landscapes, so these visitors' expectations can be met and to support social sustainability through quality of life and visitor and viewer enjoyment.

Visitors are most commonly coming from the counties in the area of influence (nearly 60% of visits, 2016 NVUM), indicating that local recreation and use of the Grasslands is important to communities in the surrounding area. Among racial and ethnic minorities, the most commonly encountered are Hispanic/Latino (26%). The age distribution shows that about 30% of visits are children under age 16. People over the age of 60 account for about 23% of visits. Many of the counties in the area of influence fall into high percentiles for persons with disabilities (50-99th percentile when compared to the respective geographic state (EPA EJScreen). Counties in the area of influence in Colorado are higher than the state average—19% compared to the state average of 11.6% for persons with disabilities. In the area of influence counties in Kansas, an average of 13.8% of people have disabilities, compared to the state average of 14.2%. Area of influence counties in Oklahoma have lower percentages of people with disabilities than the state average- 13.4% compared to the state average of 17.3% for persons with disabilities. Union County New Mexico averages higher as well- 23.3% of people have disabilities compared to the state average of 17.1%.

Visitors to the national grasslands are asked to report a general range of income when completing the NVUM survey. These results can help indicate the overall socio-economic status of visitors to the grasslands. In 2016, 49.5% of visitors self-reported their income category as falling between \$50,000 and \$74,999.

Community events and tourism opportunities depend on recreation opportunities found on the National Grasslands. The annual tarantula mating rituals on the Comanche National Grassland are an important community event for La Junta, Colorado which hosts a Tarantula Festival during this wildlife viewing recreation opportunity. Unit staff frequently participate in these types of community events, providing education and interpretation opportunities. Visitors to the grasslands also participate in dinosaur track viewing and other paleontological environmental education opportunities. The OHV user-group is very active and has helped create opportunities for motorized recreation on the grasslands, specifically at the "Racetrack". Night sky viewing opportunities play an important role in the local tourism industry and are advertised across the area of influence. Recreation is a key benefit that enhances wellbeing and community health and can encourage community resilience. The Grasslands provide an area for friends and family to gather, to pass on traditions, and to strengthen relationships. Outdoor recreation opportunities on these public lands also contribute to physical and mental health and well-being (Godbey 2009).

Recreation on the grasslands is characterized by large, dispersed, rural opportunities that support nature-based recreation activities, such as hunting, OHV riding, wildlife viewing, and fishing. There are limited developed campgrounds, trailheads, and fishing ponds. These opportunities and settings provide people with a variety of benefits: relaxation/ recreation, physical, mental and/or spiritual health, experiencing and connecting with nature, landscapes and/or their own or other people's cultures, environmental/ outdoor education, eco/adventure/nature-based tourism, opportunities to socialize, and challenge and competition. The benefits people obtain from recreating in a natural environment are subjective and highly personal, with different people obtaining different benefits from the same piece of land or grassland attribute. Recreation opportunities and settings provided by the Cimarron and Comanche are also important cultural services. The term "cultural services" refers to the intangible benefits people receive from ecosystems, including nonmaterial spiritual, religious, inspirational, and educational experiences ({Kandziora, 2013, Interactions of ecosystem properties`, ecosystem integrity and ecosystem service indicators: A theoretical matrix exercise}).

Heritage tourism is a significant component of the economy of the plan area with visitors coming to the Sante Fe National Historic Trail and events associated with the trail. Tourists are attracted by the

significance of historic properties and the character of traditional communities. In addition to the Sante Fe National Historic Trail and other historic and culturally significant sites such as Picture Canyon, Rourke Ranch, and Vogel Canyon, there are paleontological resources that draw numerous visitors each year and are celebrated by local communities. Picket Wire Canyonlands is a popular place to view one of the largest dinosaur tracksites in North America and to see rock art and other cultural resources. Access to this site is challenging and is currently provided by the grassland staff and Special Use Permits via scheduled, guided motor-vehicle tours of the area. The fee-based driving tour allows visitors who might not be able to make the 11-mile round trip hike an opportunity to view the tracksite features. There is currently a campground and trailhead associated with the site, with some accessibility features.

User groups differ about the suitability of some activities on the Grasslands. As with most public lands, there is conflict about the access given to off-highway vehicles (OHVs). Even within the OHV user group, people's opinions differ about the levels and types of use that should be allowed. Recreational users and hunters can be at odds with grazing permittees and their use of the Grasslands. Stock tanks and windmills are sometimes vandalized; pasture gates are sometimes left contrary to need, hampering livestock operations and management. Recreational users sometimes encounter livestock while accessing public lands, and may find the sight, smell, and sound unacceptable to their experiences, or believe that livestock grazing is taking priority over native species management on public lands. Conflicts and concerns about these resource uses are addressed by management under the multiple use standards to ensure that most users have access to resources without negatively affecting other types of resource users.

Wildlife

This section describes benefits people obtain from important fish, wildlife, and plant species that occur on the forest or grassland, and how this contributes to social and economic sustainability in the area of influence. Fish, wildlife, and plants of importance may include those with specific cultural value to indigenous populations, or those used by the public for hunting, fishing, trapping, gathering, or observing. These activities contribute to the local economy and to the culture of the surrounding communities. As such, consumption of and activities associated with wildlife and fish are an important multiple use of the Grasslands. As an ecosystem service, fish and wildlife provide a variety of benefits to the public:

1. Fish, wildlife, and plants are consumed as food, making them an important provisioning service provided by the Grasslands.
2. Fish, wildlife, and plants have numerous recreational and cultural uses. They are hunted for sport, viewed by recreationists, and are an important cultural resource for a wide array of people.
3. People hold a variety of non-use values for fish, wildlife, and plants. These may include existence values (people value the fact that wildlife and fish exist, even if they are never seen), bequest values (even people who do not use wildlife or fish recognize that future generations may value and use this resource), or option values (people recognize that certain fish or wildlife species that are not used now may have important uses in the future). For example, culturally important foods contribute not only to enhanced food security and nutritional health, but also toward strengthening cultural identity, a sense of belonging, connection to place, and stronger social and familiar relations (Lake 2018).
4. Biodiversity functions not only as an ecosystem service, but as a regulator of ecosystem processes and as a consumptive good, or product, of ecosystems. Biodiversity is a factor controlling ecosystem processes that underpin ecosystem services. At the same time, biological diversity at the genealogical and species level contributes directly to some ecosystem services and their values (for example, the number and evolutionary distinctiveness of species are ecosystem services directly contributing to ecosystem goods provided). Lastly, biodiversity itself is valued by humans as a good with distinctive value. Many components of biodiversity have cultural value, including appreciation of wildlife and scenic places and spiritual, educational,

religious and recreational values. Humans value places with a diversity of species, especially the more charismatic animals and plants, and retaining a full complement of wild species is important to many (Mace, 2012, Biodiversity and ecosystem services: A multilayered relationship).

The most recent National Visitor Use Monitoring (NVUM) survey done on the Cimarron-Comanche National grasslands indicates that fish and wildlife-related recreation accounted for approximately 11,219 primary visits (primary visits are visits where the primary reason for the trip was to visit the forest). Of these, an estimated 3,291 were by non-local visitors (those traveling more than 50 miles) (USFS NVUM 2016, 2021). This is important because non-local visitors bring additional money into the local economy. It is also important because non-local visitors often spend more money while in the area than local visitors. The economic contribution analysis conducted for this assessment indicates that approximately 4 jobs and \$127,200 dollars of labor income are associated with local and non-local fish and wildlife-related visits (and associated activities) to the Grasslands. These are estimates of the number of jobs and labor income supported by the dollar amount of CCNG wildlife-related activities in the area per average year. For more details on economic contribution estimates, please see the *Economic Contributions* subsection of this appendix.

Fish and Other Aquatic Species

Regarding significant fish populations and recreational anglers that characterize the Cimarron-Comanche, it is important to acknowledge the role that wetlands, vegetation, hydrologic function, and riparian conditions and processes play in influencing landscape-level organic material and nutrient cycling which produce and maintain the Cimarron-Comanche's game fish populations. Further extent of the game fish "ecosystem service" or "benefit to people" is determined by criteria such as stream access; stream-miles providing different qualities of habitat condition; fishing license processes provided by associated local government(s); parking and permitting processes provided by the Grasslands; local guide services; and hotel, restaurant, and other businesses that cater to the recreational anglers. Together, these ecosystem and agency contributions provide benefits to recreational anglers that frequent the Grasslands. In a broader sense, gamefish populations help to support jobs and local lifestyles. Cimarron-Comanche management decisions thus have potential to influence these benefits and their broader social and economic impacts by influencing the associated ecosystem conditions and processes, as well as the agency infrastructure, operations, and cooperative management activities, which make the game fish services possible.

At-Risk and Other Highlighted Species

Species of importance provide consumptive (hunting, fishing, and foraging) and non-consumptive (viewing, existence, and bequest) ecosystem services. The status and conditions of both consumptive and non-consumptive populations serve as indicators of the overall environmental quality, health and condition of a given area. Please see the *At-Risk Species and Other Highlighted Species* chapter of the Assessment for a complete discussion on species existing conditions associated with the CCNGs.

In addition to fire and grazing management, other factors that influence the abundance and distribution of wildlife species on the National Grasslands include habitat fragmentation, land use on adjacent private lands, fence and road densities, invasive plant species, conditions on the winter range of migratory species, and hunter harvest. When wildlife populations thrive, the value of an associated rangeland, in terms of ecosystem services, typically thrives too as there are synergistic interactions between the two (Briske, 2017, Rangeland systems: Processes, management and challenges).

A number of important game species occur on the two Grasslands. Although most are not listed as TES or MIS species, management efforts on the Grasslands still consider habitat needs for these species in order to maintain viable populations and provide for hunting opportunities. Primary big game species on the Grasslands are elk, mule deer, white-tailed deer, and pronghorn antelope. The natural history and status of these species on the Cimarron has been summarized in the environmental assessment (EA) for

the **Cimarron Allotment Management Plan (USFS 2001)**. On the Comanche, elk are present throughout the Picket Wire Canyonlands, particularly along the Purgatoire River corridor. Individual elk are also sighted annually on the Carrizo unit of the Comanche, but these are primarily dispersing animals from private ranches to the south and west. Mule deer and white-tailed deer are present at low density throughout the Grasslands in sandsage prairie, canyonlands, and riparian woodlands. State-wide harvest data indicate deer populations are stable in Kansas and Colorado. Management for deer and elk has focused on tamarisk control and cottonwood/willow restoration along riparian corridors, in order to improve summer and winter forage and provide calving areas.

Table 19. Estimated Total Big Game Harvest & Hunters, CCNGs Socioeconomic Area of Influence

	CCNGs Primary Big Game Species					
	Deer ³		Elk		Pronghorn	
	Est. Total Hunters ¹	Est. Total Harvest ²	Est. Total Hunters	Est. Total Harvest	Est. Total Hunters	Est. Total Harvest
Combined Area of Influence	5,445	2,770	5,305	1,297	3,116	1,607
Colorado	77,692	31,590	186,028	29,793	16,078	7,639
Kansas	172,035	83,126	216	60	419	159
New Mexico	30,762	9,399	38,578	14,713	6,754	4,956
Oklahoma ⁴	250,462	134,367	-	549	-	150

Colorado State Parks and Wildlife, 2023; Kansas Dept. of Wildlife and Parks, 2021, 2023, 2024; New Mexico Dept. of Game and Fish, 2023; Oklahoma Dept. of Wildlife Conservation 2023

¹ Hunters are as estimated by listed primary data source or, if not provided by primary data source, based on total licenses sold.

² For all manners of take, all seasons.

³ Includes mule and whitetail deer species.

⁴ Estimated total hunters or licenses were not disclosed.

Primary small game species on the Grasslands are wild turkey, mourning dove, scaled quail, bobwhite, desert cottontail, and black-tailed jackrabbit. A key limiting habitat feature for wild turkey on the Grasslands has been the availability of large, mature cottonwoods for roosting along riparian corridors. This has been addressed by efforts to control tamarisk and plant willows and cottonwoods along the Cimarron River on the Cimarron, and in Sand Canyon and Picket Wire Canyonlands on the Comanche. Management has also focused on scaled quail, with hundreds of gallinaceous guzzlers, small cattle enclosures and shrub plantings established on the Grasslands to improve overhead cover, water availability and quail nesting habitat.

User groups differ about the suitability of some activities on the National Grasslands. Recreational shooting of prairie dogs is currently allowed on the Cimarron; however, not everyone agrees that such shooting should be an opportunity provided by the Grasslands. By Colorado State regulation, recreational shooting on the Comanche is presently not allowed.

The spatial extent of prairie dog grazing has also changed. Both the spatial and temporal scale of large-herbivore grazing have been shortened by an order of magnitude, the temporal scale of fire has been shortened by an order of magnitude, and the spatial scale of fire has been reduced by an unquantified amount. These changes reduce the degree to which herbivory, fire and climate interact. In the present landscape, large herbivores rarely have the opportunity to respond to vegetative patterns created by fire or to landscape patterns created by patchy rainfall, primarily due to the small spatial scale at which livestock movements are managed. Herbivory by prairie dogs currently remains an important component of the disturbance regime on most of the Planning Area and continues to interact with livestock and the limited extent of fires that do occur. An exception is in the Arid Shortgrass Prairie Ecological Area, where the extent of prairie dog colonies remains low.

The highly fragmented land ownership pattern of the Planning Area is a major influence on wildlife management. Large blocks of National Forest System (NFS) lands do occur on the Cimarron National Grassland (Cimarron) and on the Timpas unit of the Comanche National Grassland (Comanche), but most NFS lands on the Grasslands are fragmented. Fragmented ownership limits the effectiveness of large-scale management practices—such as prescribed burns, habitat restoration, and rotational grazing—thereby impeding efforts to conserve biodiversity and maintain ecosystem integrity (USFS 2005a).

Terrestrial Ecosystems, Forest Management, and Non-timber Forest Products

Please see the *Terrestrial Ecosystems* chapter of the Assessment for a complete discussion on terrestrial ecosystem existing conditions associated with the CCNGs.

Plant species provide sources of food, shelter, and other resources for animals that humans benefit from, including pollinating insects, birds, large game species, and more. Insects often rely on specific host plants or plants that are active at a certain time of year. As a result, more diverse plant communities tend to support more diverse insect communities (e.g., Siemann et al., 1998; Knops et al., 1999; Wenninger et al., 2008; Zhang et al., 2016). Higher plant diversity supports higher primary productivity, as well as more stability in production across space and time (Isbell et al., 2009; Isbell et al., 2011; Cardinale et al., 2012; Hooper et al., 2012). Higher and more stable plant productivity can benefit humans directly, for example by providing a reliable source of hay or livestock forage. Higher and more stable plant production also has many indirect ecosystem service benefits, including erosion control, flood control, water purification, and carbon sequestration (Society for Range Management 2023). When it comes to establishing plant communities that will aid in the restoration of soil carbon in rangelands, however, it is critical to understand that not all plant species have equal potential to provide benefits. For example, native perennials grasses will continue to improve and sequester soil carbon over non-native annual grasses (Rau, 2011, Transition from sagebrush steppe to annual grass (*Bromus tectorum*): Influence on belowground carbon and nitrogen)).

In addition to supporting ecosystem processes and animal diversity, plant diversity can also provide direct benefits to humans in the form of raw materials that can be used or developed into medicines, new technologies, new food or fiber crops, new horticultural crops, and more. Because we do not yet know what benefits or technologies specific species will be able to contribute to in the future, the preservation of genetic diversity can improve chances of being able to use plant species for human needs in the future (Khoury et al., 2010). Current and future managed herbivory can also support integrity by helping to reduce biomass and the density of plant materials, which aids in the transfer of mass and nutrients to the soil. Heavy, continuous, season-long herbivory can result in increases in annual grasses and forbs, nonpalatable perennial grass species, bare ground, erosion, and nonnative species, which can compromise integrity. Grazing management that appropriately adjusts timing, density, and frequency of grazing can increase ecological integrity.

Most of the land that now makes up the Grasslands was cropland abandoned in the 1930s. Over time, reseeded efforts and grazing management have restored most of these NFS lands to prairie dominated by native grass and forb species. However, the composition of plant communities on the Grasslands today is still affected by the types of seed mixtures used during historic restoration efforts, and portions of the Grasslands have still not fully recovered from the severe disturbance that occurred during the Dust Bowl of the 1930s. Significant historical drought durations have also slowed the recovery. Some local citizens appreciate the USFS was able to reseed and stabilize the area that was to become the Cimarron and Comanche National Grasslands after the drought and subsequent dust storms of the 1930s. People are interested in seeing the area continue to improve, although there are differing opinions about the best methods to use and how far ecosystem restoration should be taken. Some people are interested in bringing back bison along with native grasses and vegetation – maintaining an ecosystem that would reflect what existed before the area was impacted by farming and domestic livestock. Others are interested in maintaining the current uses and benefits provided by the Grasslands resources while improving overall ecosystem health.

Shortgrass prairie specifically provides habitat for the mountain plover (*Charadrius montanus*), swift fox (*Vulpes velox*) and tarantulas (*Theraphosidae* spp.), among others. The colonies of black-tailed prairie dogs (*Cynomys ludovicianus*) present in this ecosystem provide a unique environment essential to many wildlife species including the prairie rattlesnake (*Crotalus viridis*) and burrowing owl (*Athene cunicularia*). Pronghorn (*Antilocapra americana*) and mourning doves (*Zenaida macroura*) inhabit the shortgrass prairie as well and provide hunting opportunities for the public. Raptors, such as the ferruginous hawk (*Buteo regalis*) and northern harrier (*Circus hudsonius*) are also present. The overall trend for shortgrass prairie across the planning unit is increased production, which can result in increased support for provisioning services such as forage for livestock and food. However, expansion of juniper areas could reduce primary production, which would reduce livestock forage and associated ecosystem services. Areas of shortgrass prairie that have seen reductions in native species diversity have reduced support for regulating and support ecosystem services (such as pollination, seed dispersal, and soil formation from stabilized soil) and cultural ecosystem services (such as opportunities for seed collection, recreation, including ecotourism and hunting). Bare soil is stable or slightly decreasing in shortgrass prairie, so areas with high vegetative cover support regulating ecosystem services such as erosion control. Additionally, changes in plant diversity or plant species composition (invasive species, decreased diversity, more woody species) affect the overall stability of carbon storage by changing the allocation to above- and below-ground carbon pools. More above-ground allocation can reduce the stability of carbon that is cycled.

Within the Cimarron and Comanche National Grasslands, the sandsage prairie provides similar ecosystem services to those in the shortgrass prairie ecosystem by supporting areas with high vegetation cover and native species diversity. However, the sandsage prairie ecosystem has areas of higher bare ground than the shortgrass prairie due to the sandier nature of its soils, which provides unique habitat for species such as the Andean prairie-clover (*Dalea cylindriceps*), a proposed Species of Conservation Concern (see Table 14). Additionally, the sandsage prairie supports valuable habitat for wildlife, including at-risk species like the lesser prairie chicken, which may be negatively impacted by increasing shrub density (see the At-Risk Species and Other Highlighted Species section for more information). While this ecosystem supports many drought-tolerant species, extended periods of severe drought are likely to affect both species composition and the stability of the soil, particularly when compounded by the effects of wind, grazing, and fire. Additionally, much of the area surrounding shortgrass and sandsage prairie associated with the Grasslands has been converted to agricultural use or energy production. Both ecosystems are highly fragmented with a patchwork of privately owned areas scattered throughout the surrounding area and plan area.⁶ In canyonland ecosystems present on the Grasslands, energy development, such as wind energy and mining, occur on surrounding lands (USFS 2024c).

The canyonlands found on the Grasslands provide a variety of shrub and tree species which provide forage and cover for wildlife such as white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), pinyon jay (*Gymnorhinus cyanocephalus*) and canyon towhee (*Melospiza fusca*). They provide unique habitat for a diverse reptile and amphibian population including the red-spotted (*Anaxyrus punctatus*) and green toad (*Anaxyrus debilis*). Additionally, the herd of bighorn sheep in Picketwire Canyon is the largest in the state of Colorado. The native woody vegetation in the canyonlands throughout the Cimarron and Comanche National Grasslands supports many ecosystem services that are similar to those in shortgrass prairie (for example, erosion control, food and forage, and pollination), however, juniper trees are expanding outside of the Canyonlands ecosystems and into the surrounding uplands; such expansion can reduce the herbaceous cover and diversity of the adjacent shortgrass prairie ecosystem. The canyonlands provide key provisioning ecosystem services by maintaining genetic materials, such as seeds and pinyon nuts, and key cultural ecosystem services through the prominence of cultural resources and heritage sites located in these areas. The higher recreational use in this ecosystem compared to the shortgrass prairie and sandsage prairie can have negative impacts on

⁶ Non-published Forest Service Ecosystem Integrity Workshop documents: Shortgrass Prairie, Sandsage Prairie provided September 2024

cultural resources, which are higher in abundance in this ecosystem. This high recreational use can also introduce non-native species.

Both the distribution and dominance of nonnative, invasive species can compromise the integrity of terrestrial ecosystems and ecosystem functioning. Increases in invasive species can reduce wildlife habitat quality, reduce primary production and diversity of native species, and alter fire return intervals. Tamarisk is a non-native invasive species that has infested many riparian drainages on the Grasslands. Tamarisk provides limited habitat for wildlife and bird species, which generally use it only when there are no other options (willow or cottonwood). Further, introduced species such as old world bluestems and invasive species such as Russian thistle can negatively impact the integrity of these ecosystems that comprise the Grasslands.

Grassland-Forest Management and Non-Timber Forest Products

Please see the *Forest Management* and *Non-Timber Forest Products* Chapters of the Assessment for a complete discussion on existing conditions associated with the CCNGs.

Historically, the limited forests and woodlands on the National Grasslands have provided useful products for the surrounding farming and ranching communities. Piñon pine and Gambel oak are excellent sources for fuel wood. Juniper has a natural resistance to rot; therefore, it was cut for fence posts. Because the wood from cottonwood trees is lightweight, fibrous, tough, and easy to nail without splitting, it is well suited for pallet material. A small amount of cottonwood was harvested from river bottoms on and adjacent to the Grasslands to be used for pallet material during the 1970s. Cottonwood was also used as building material during the homestead era in the late 1800s through 1930. From 2005 to the present, only three permits for cottonwood firewood collection have been issued. Gambel oak, pinyon pine, juniper, and cottonwood are all wood not considered as industrial wood products, as these species are not used as industrial wood types. Additionally, the ponderosa pine sites in the Cimarron and Comanche National Grasslands are not capable of producing at least 20 cubic feet per acre per year; they are not considered capable for industrial production. Therefore, none of the forested areas in the Cimarron and Comanche National Grasslands are suitable for timber production and are not calculated for the projected timber sale quantity. Due to the limited suitability of the forested areas for timber production, there are not significant economic contributions associated with timber harvest or production. However, the forested areas support social and economic sustainability through access to noncommercial wood products for fuel and heating sources (primarily firewood), which are also considered provisional ecosystem services. Forest ecosystems also support and provide regulatory, supporting, and cultural ecosystem services in many ways, such as: carbon uptake and storage, soil stabilization, temperature regulation, water filtration, as well as providing habitat, a sense of place, heritage and spiritual values and recreative opportunities.

Non-timber forest products in the Cimarron and Comanche National Grasslands include pinyon pine nuts, juniper berries, and various medicinal, floral, and crafting materials. Non-timber forest products contribute to social and economic sustainability by offering resources for local communities and supporting cultural traditions. Their collection can also aid associated ecological sustainability, although over-collection can threaten specific species. Management constraints, such as limited infrastructure and challenges from drought, temperature, and invasive species, may hinder non-timber forest product use. However, improving forest health through practices like prescribed fire could enhance non-timber forest product availability, so long as the fragmented nature of these ecosystems with privatized and other lands is not discounted. The existence and associated use of these resources presents yet another example of both provisional and cultural ecosystem services supported and provided by the Cimarron-Comanche National Grasslands.

Water

This section describes the provisioning, regulating, supporting, and cultural services people obtain from the Grasslands, as provided by water resources, watersheds and aquatic/riparian/wetlands (AWR) in the plan area, and how these services may contribute to social and economic sustainability in the

socioeconomic area of influence. For a complete discussion on water resource ecosystem existing conditions associated with the CCNGs, please see the *Water Resources* Chapter of the Assessment.

Water flow from the National Grasslands as well as water rights and entitlements of the units are important for providing water supplies to communities and sustaining urban and rural economies. Water also draws visitors to the area for cultural services provided by recreational opportunities such as fishing, hunting, boating, swimming, birding, and aesthetic enjoyment. The National Grasslands play an important filtration role for water quality, as well. A well-functioning ecosystem helps maintain the integrity of associated watersheds and AWR areas so that the Grasslands are able to filter out pollutants to help keep base loads within reasonable levels, which reduce municipal and well-water treatment costs and alleviates demand for costly infrastructure.

Even though water is scarce on many arid and semi-arid rangelands, the supply and storage of clean water is a fundamental provisioning ecosystem service provided by the Grasslands. Surface and ground water on the Grasslands provide crucial benefits in the form of habitat for aquatic organisms, drinking water for humans, wildlife, and livestock. The amount of water available to plants also supports a spectrum of ecosystem services on the Grasslands, as a variety of ecosystem services are closely linked to vegetation (e.g., forage for both wild and domestic herbivores, habitat for a wide range of species [biodiversity], carbon dynamics, etc.). For further detail on ecosystem services related to vegetation on the CCNGs, please see the *Terrestrial Ecosystems, Forest Management, and Non-Timber Forest Products* subsection of this appendix.

Groundwater primarily comes from the High Plains Aquifer, supplying 99.9 percent of water used in the Cimarron River Basin (McGuire and Strauch 2024). The Ogallala Aquifer, the largest unit of the High Plains Aquifer, underlies the Cimarron National Grasslands. It has low recharge rates and is experiencing significant declines due to extensive agricultural irrigation, which accounts for 97 percent of water use. Conservation efforts, such as those outlined in the Kansas Water Plan, aim to address these declines (USFS 2005b). Water rights in the grasslands are regulated by state law, with Kansas and Colorado both following the prior appropriation doctrine, which operates on a “first in time, first in right” principle. This framework ensures that water is allocated to users based on historical use while maintaining a focus on beneficial purposes. The Forest Service issues special use authorizations to permit water diversions, storage, and other activities on National Forest System lands, ensuring compliance with state and federal regulations. The Cimarron National Grassland holds 204 water rights, while the Comanche National Grassland has 876, as recorded in the Forest Service’s Water Rights and Uses Database.

The Cimarron and Comanche National Grasslands also contain two public water systems. These systems serve communities and are regulated under the Safe Drinking Water Act. Eight groundwater wellhead protection areas overlap the plan area, safeguarding drinking water for municipalities such as Walsh, Kim, Campo, and Pritchett in Colorado, as well as Rolla and Hugoton in Kansas.⁷ Municipal water use on the

⁷ Geospatial data was obtained from the Environmental Protection Agency (EPA) Office of Groundwater and Drinking Water (OGWDW), which manages access to and distribution of sensitive drinking water facility locational data. The EPA national layer contains all surface and ground water public drinking water systems across the United States. The public water system and source facility information were obtained from the Safe Drinking Water Information System/Federal Version (SDWIS/FED). The drinking water source locations used in deriving the Source Protection Areas are the active sources (intakes, wells, reservoirs, infiltration galleries, and springs) with valid locations (expressed as latitude/longitude). These inputs were analyzed against the National Hydrography Dataset Version 2.1 ({USGS, 1999, The National Hydrography Dataset}) using the TOTMA field (Time of Travel) – 24 hours upstream. Due to the identification of intakes and wellheads within the geospatial data, the information is protected and can only be acquired with proper authorization. Federal partners with a legitimate use case can be authorized to access and use this data in their analysis, after agreeing to comply with EPA OGWDW policy on sensitive drinking water data.

CCNG has increased significantly since the current land management plan was put in place. Expanded efforts to protect source water protection areas are necessary to ensure sustained municipal water supplies. If current trends in water use and groundwater levels continue, ongoing monitoring and adaptive management strategies are essential to respond to evolving challenges.

Water quality is vulnerable to stressors, including projected climatic conditions, invasive species, water use, and livestock grazing. Increased summer temperatures and shifts in the timing of precipitation will likely decrease water quantities, which could increase contaminant concentrations. Invasive species such as tamarisk also decrease flow quantities, which would increase contaminant concentrations. Irrigation return flows can also increase the amount of contaminants in surface and groundwater. Livestock grazing can increase runoff from uplands and decrease channel stability; both increase sediment and naturally occurring metals reaching stream channels. The impairments in water quality could impact social and economic sustainability through impacts on access and quality of ecosystem services.

Aquatic, Wetland, and Riparian (AWR) Ecosystems

The AWR ecosystems in the plan area were classified into four groups: playa lakes; riparian areas and non-playa wetlands; lakes, ponds, and reservoirs; and prairie streams and rivers. Only a small total percentage of the plan area consists of AWR ecosystems. Please see the *Aquatic, Wetland, and Riparian Ecosystems* and *Watersheds* Chapters of the Assessment for a complete discussion on AWR ecosystems and watersheds on the CCNGs.

Table 20. Aquatic, wetland, and riparian ecosystems found in the Cimarron and Comanche National Grasslands plan area

Ecosystem	Estimated Extent in the Plan Area	Estimated Percentage of the Plan Area
Playa lakes	National Forest System lands: 552,326 acres Playa lakes: 326 acres	Playa lakes: 0.05%
Riparian areas and non-playa wetlands	National Forest System lands: 552,326 acres Potential riparian areas and wetlands: 15,707 acres	Potential riparian areas and wetlands: 2.8%
Lakes, ponds, and reservoirs	15 named lakes, ponds, or reservoirs	N/A
Prairie streams and rivers	16 miles perennial 1,501 miles intermittent 1,673 miles ephemeral 3,190 miles total	N/A

Sources: Playa Lakes Joint Venture (2024.), National Hydrography Dataset (2024), {USFS, 2024, Worksheet for riparian and non-playa wetland ecosystems technical reports: Cimarron and Comanche National Grasslands}

AWR areas on the grasslands provide numerous benefits to people in each of the four categories of ecosystem services. These areas provide provisioning services such as aquatic habitat used by the public for recreational fishing and hunting big game and waterfowl for food. In low rainfall areas like the grasslands, AWR ecosystems provide critical water supplies for fresh water uses such as irrigation, stock water, domestic wells, and oil and gas uses. They can also provide plant fiber for clothing and other goods. Healthy AWR ecosystems provide regulating services such as filtration for water, surface water storage, groundwater storage, and erosion control. These ecosystems have been found to absorb and sequester carbon at high rates, helping maintain climate stability that supports life. Microclimates created by AWR ecosystems can help regulate water and air temperatures. Aquatic vegetation root systems

mitigate excessive erosion during high flow events by reducing flow velocities and power. Waterways and aquatic ecosystems can also serve as natural fuel breaks.

Aquatic resources are highly sought after for wildlife viewing and photography opportunities, especially in areas where they are scarcer, like the Grasslands. Other cultural services provided by AWR ecosystems include recreation and ecotourism. Fishing on the Cimarron National Grassland is one of the more popular recreational past times. Trails used for hiking, horseback trips, mountain biking, and motorized roads and trails often follow waterways. The importance of the natural landscape is a key health benefit for residents and visitors. This includes not just the physical aspects of outdoor activities but also the mental and emotional benefits that many people feel when they are near to or connected with water and waterways. For Tribal communities with connections to the area, the Grasslands may remain part of seasonal patterns of harvesting and collecting, and landscape elements such as waterways and springs may be part of traditional stories or sacred ceremonies.

The different aquatic ecosystems found on the grasslands provide various conditions necessary for plant and animal survival and reproduction. This supports biodiversity in the plan area, contributing to stronger ecosystem resiliency in the face of changing trends. Nutrient cycling and the exchange of organic and inorganic matter back into the production of living matter is yet another supporting service provided by the AWR ecosystems. Riparian vegetation is also an essential element in protecting water quality and stabilizing a given stream channel. Many drainages on the two Grasslands support riparian vegetation such as willow and cottonwood. Willow and cottonwood communities tend to have root systems that are effective in stabilizing stream channels, and the overstory can provide shade to keep water cooler, all of which is beneficial for aquatic biota and water quality. Unmanaged or ill-adapted livestock grazing can alter a cottonwood and/or willow community, oftentimes to one dominated by grass species or non-natives such as tamarisk. Tamarisk and Russian olive affect riparian plant community composition by outcompeting native plants.

The Clean Water Act requires states to establish water quality standards and designated uses for their waters. If a water body does not meet its designated uses due to pollution, it is added to the state's "303(d) list" of impaired waters. There are two lakes included on the Section 303(d) list in the plan area: the Cimarron Lake (i.e., Cimarron ponds at the Cimarron Recreation Area) and Point of Rocks Lake. In Cimarron Lake and Point of Rocks Lake, aquatic life use is impaired, specifically due to eutrophication, where an excess of nutrients accumulates in a waterbody. While there are no domestic surface water intakes located on the impaired waterbodies, there are interactions between groundwater and surface water. Thus, degraded quality of surface water could impact the quality of groundwater. Both Cimarron Lake and Point of Rocks Lake are used for recreation, primarily fishing. Impaired aquatic life use could impact fisheries' populations in the waterbodies, and impaired primary contact recreation could impact recreational swimming in the plan area.

There are also four lotic waterbodies included on the Section 303(d) list in the plan area: the Cimarron River, Purgatoire River, Timpas Creek, and all tributaries of the Arkansas River. In the Cimarron River, aquatic life use and domestic water supply are impaired, specifically due to selenium and chloride. The Cimarron River basin has also had significant reductions in flow. In the Purgatoire River, the quality of water supply is not being met. The reasons for impairment include the presence of arsenic and manganese concentrations (EPA 2024e). In Timpas Creek, aquatic life and water supply are impaired by iron, selenium, and arsenic (EPA 2024f). For the tributaries of the Arkansas River, aquatic life and water supply are impaired by selenium, manganese, and sulfate (EPA 2024g).

Factors such as drought, shifts in the timing of precipitation, and increased temperatures, will likely continue to decrease water quantities, which could increase contaminant concentrations. Present invasive species in the plan area, such as tamarisk, can also decrease flow quantities, which would increase contaminant concentrations ({Rice, 2018, Climate change vulnerability assessment of aquatic and terrestrial ecosystems in the U.S. Forest Service Rocky Mountain Region}). Irrigation return flows can also increase the amount of contaminants in surface and groundwater. Livestock grazing occurring

nearby can increase runoff upland of lakes and ponds and decrease channel stability, which increases the amount of sediment and naturally occurring metals reaching stream channels.

Energy, Minerals, and Geologic Resources

Mineral or geologic activity is principally dependent upon the occurrence of the resource which must typically be of sufficient quantity and quality to be economically explored and developed. Federally managed lands open to mineral entry and leasing or with valid existing rights within the planning area have potential for authorized mineral and energy resource activity. Lands with outstanding or reserved mineral rights also have the potential for mineral and energy resource activity. Please see the *Energy, Minerals, and Geological Resources* Chapters of the Assessment for a complete discussion on existing conditions associated with the CCNGs.

There are no locatable mineral claims in the Cimarron and Comanche National Grasslands, and there are not expected to be economic contributions associated with locatable mineral activity. The Cimarron and Comanche National Grasslands have fossil localities, where these ancient records are preserved in rock layers and exposed through erosion or other shifts in the earth's surface. These resources provide cultural ecosystem services that contribute to social sustainability of the area. There are no known prominent karst sites on the Grasslands, though karst resources can support regulating and supporting ecosystem services from groundwater systems and unique biological communities, as well as serve as habitat for bats and other wildlife.

The Cimarron and Comanche National Grasslands have seven active mineral materials sites, including sand, gravel, shale, and caliche, used for road maintenance by the Forest Service and local counties. Materials are available for free use by public authorities under the Bankhead-Jones Farm Tenant Act of 1937. These sites are important sources to meet infrastructure needs of local communities, and they support jobs, income, and economic output. More specifically, the Grasslands use mineral material from these mineral material sites to maintain and construct new roads, develop recreation sites, trail heads and other facilities. Access and parking for hunting, outfitting, camping, Grasslands management and other activities is a critical component of public use and enjoyment of these public lands. Without passable roads, the Grasslands would not be accessible to the public, Grasslands staff, and Grasslands contractors; consequently, the mineral material sourced from the Grasslands represents a contribution both socially and economically. Tourism and recreational use are made possible and enhanced by road systems, as maintained by mineral resources occurring on the Grasslands.

The Cimarron National Grassland has high potential for the occurrence of petroleum resources (oil, gas), low to moderate potential for common variety minerals (gravel, caliche), low potential for hardrock minerals (gold, silver, copper, iron, etc.), and no coal reserves. On the Comanche National Grassland, the eastern one-fourth of the Carrizo Unit has high potential for petroleum reserves (Campo Oil Field). The remaining area of the Carrizo Unit and all of the Timpas Unit have low potential for petroleum reserves.

The history of oil and gas drilling on what would become the Cimarron National Grassland began in 1930, with the discovery and development of the Hugoton Gas Field. The first large-scale drilling boom occurred in the 1950s by expanding the Hugoton Gas Field and by drilling several hundred feet deeper to discover the Panoma and Greenwood Gas Areas. Drilling in the 1970s and 1980s resulted in the discovery of many new formations (approximately 35 fields) on or adjacent to the Cimarron. The first exploratory drilling activity on the Comanche was in 1929 on land that would later become part of the Timpas Unit. In the Carrizo Unit of the Comanche, the first well was drilled in 1956. Currently, there are 436 active facilities in the Cimarron National Grassland, with 61 percent of its 108,500 acres leased for exploration. These facilities support economic sustainability by contributing to jobs, income, and economic output for the surrounding regions.

The Cimarron-Comanche National Grasslands currently supports 286 Active Oil and Gas leases totaling 63,332 acres of NFS lands. There are approximately 337 producing gas wells and 44 producing oil wells on Forest Service administered surface within the Cimarron National Grassland. Of those approximately 156 gas wells and 6 oil wells are producing from federal mineral leases, the remaining wells are

producing from private mineral estate. Currently, there are 2,900 acres under federal lease in the Comanche National Grassland, down from 15,000 acres in 2005. The Campo Field is at the end of its productive life; remaining wells are no longer producing and are scheduled for plugging and reclamation. Approximately 500 miles of oil, gas, and water pipelines cross the Comanche National Grassland. Pipelines are authorized under the provisions of a special use permit when located off lease, third party involvement or commercial. Pipelines located on lease are authorized under the provisions of a Federal lease when operated and owned by the lessee. Currently, the Grasslands have several pipeline and utility corridors identified within the Land and Resource Management Plan (USDA-FS 1984).

Economic contributions presented in table 21, below, represent an estimate of the number of jobs and labor income supported by the dollar amount of mineral activities on the CCNGs in the area per average year. For more details on economic contribution methodologies, see the *Economic Contributions* subsection of this appendix. The existence of these resources presents also another provisional ecosystem service supported and provided by the Cimarron-Comanche National Grasslands.

Table 21a. Cimarron National Grassland Lease Production Values

Product	Volumes Produced	Value of Products Sold
Oil Sales	34,049 bbl.	\$2,613,404
Gas Sales	808,143 mcf.	\$2,262,574
Gas Products	3,228,042 gal.	\$1,743,319

Office of Natural Resource Revenue (ONRR); USFS FY 2023 program resource data.

Table 21b. Estimated 2023 Economic Contributions from Minerals Activities on the Cimarron-Comanche National Grasslands

Employment	Labor Income	GDP (“Value Added”) ¹
12	\$516,000	\$1,576,000

IMPLAN 2022; USFS 2023 program resource data; results, presented in 2024 dollars, are rounded to the nearest \$1000.

¹ Value added, or GDP, is not used here as a depiction of economic value or benefits from the National Grasslands as it only describes economic contributions and does not include the entire series of economic benefits and other nonmarket values (e.g., forest goods and services such as clean water and air, biodiversity, cultural resources, and wilderness).

The Cimarron and Comanche National Grasslands have high solar and wind energy potential but low biomass and hydropower energy potential; however, due to the pattern of isolated public parcels scattered amongst private lands and other factors, renewable energy projects are unlikely to develop in the national grasslands. Renewable projects in the area would likely occur on adjacent private lands. Due to the limited projected new developments, there is not expected to be economic contributions associated with new renewable energy activity. Data from the National Renewable Energy Laboratory show that the relative geothermal favorability of the Cimarron and Comanche National Grasslands ranges from moderate to least favorable, compared with the rest of the United States (Roberts, 2018, Geothermal resources of the United States—Identified hydrothermal sites and favorability of deep enhanced geothermal systems). There are no geothermal leases in the area (BLM 2024).

Variables affecting energy and mineral activity include economics, national and local politics, environmental policies, public perspectives of environmental impacts, cultural shifts toward sustainable energy resources, such as water and wind energy; laws and legal decisions; and national and world supply and demand of natural resources. All of these factors have and continue to change through time.

Education and Research

Local communities and schools, students, youth crews, and non-local visitors all derive cultural, social, and historical benefits from opportunities to engage with natural, cultural, and historical resources through

educational and interpretive programs. The benefits of education and research include connecting people with nature and culture, increasing place-based-awareness, expanding opportunities for community members to interact in natural settings, spiritual opportunities and experience, and increasing and improving the body of scientific knowledge about ecosystem processes, fish and wildlife populations, and social and cultural resources.

The Cimarron and Comanche National Grasslands are used for inspiration for art, literature, and music, and local populations and communities are strengthened by cultural and historical awareness. Non-local visitors transfer and apply their experiences and awareness to their home communities in other areas of the country, thereby extending public benefits beyond the region. The grasslands unit staff provide outreach and education across their regions, to local schools, safety events, historical societies, and others. The Grasslands provide research opportunities for a variety of subjects, including historic and cultural interests, botanical interests and entomological interests.

The cultural resources found across the Cimarron and Comanche National Grasslands can provide important scientific data and educational information that are of public benefit and support social and economic sustainability to communities. Opportunities for the study and public use of these sites include the following:

- Adaptive Reuse – developing historic properties for administrative or public use purposes in a manner that helps conserve and maintain the property while serving other administrative, recreational, education, economic, social, or other purposes central to the Forest Service’s mission.
- Interpretation – includes the creation and posting of a variety of media such as informational signage, websites, brochures, and guides for exploring the area and supporting heritage tourism. A relevant example includes the 2012 Native Grasslands Interpretation Plan.
- Public Dissemination – publishing and presenting findings from cultural resource studies at the local, regional, or national level.
- Scientific Investigation – professional research and investigation that serves an agency or public benefit, receives appropriate consultation, is legally authorized, and is completed and recorded in a professional manner.

Windows on the Past – an umbrella program for providing heritage information and experiences to the public. These include the development of materials, projects, or programs with a public education or outreach focus. Examples of national programs include Passport in Time and HistoriCorps. Grasslands staff provide numerous opportunities for interpretation and education, including hosting events on the unit and participating in local community events such as annual Safety Days in the community, Sante Fe Trail Fishing Derbies, Historical Society education events, and more. In 2023, the grasslands staff reached approximately 4,300 people of all ages through education and outreach events.

Agency Contributions

The national forest maintains publicly accessible structures and improvements for both administrative and commercial uses. In addition, the national forest conducts operations and activities that contribute to use opportunities and social and economic sustainability.

National forest operations are the critical connection between the land management plan and the realization of desired future conditions. National forest operations are the physical actions that change the national forest itself, altering structure, composition, condition, or value to meet society’s needs for clean air and water, forest products, wildlife, recreation, and other benefits.

While engaged in operations, the Forest Service also directly employs a large workforce that contributes to the local economic and social fabric of the communities in which they reside. Forest Service salary expenditures contribute to economic activity in the communities that surround the forest. Forest Service employees live in these communities and spend their income on housing, food, and a variety of other

local goods and services. Non-salary operational expenditures generate economic activity in businesses that supply goods and services to support Forest Service programs.

Infrastructure on National Forests and Grasslands includes National Forest System roads, trails, bridges, public utilities, private infrastructure, recreation facilities, drinking water systems, dams, and administrative facilities. Recreational use of National Forests and Grasslands relies on accessible roads, trails, and developed sites. Households and industries rely on cellular towers, water developments, pipelines, and transmission lines to conduct their business.

Forest infrastructure is not a separate category in the economic contribution analysis because it is embedded in nearly all market transactions associated with forest uses. Timber generally cannot be removed from the forest for processing without National Forest System roads. Recreational visitors will not spend money in communities near National Forests and Grasslands if they cannot access preferred recreational sites. Mineral production cannot proceed without roads and pipeline right of ways. New families and businesses will not move to the communities surrounding the forest if they lack access to infrastructure essential to modern life.

Infrastructure and operations interact with a variety of national forest resources. For example, soils and riparian areas can be affected by roads. When roads are not properly maintained, riparian areas may be adversely impacted. New roads may compact soils and adversely affect the soil's ability to control floodwaters. Conversely, infrastructure can also protect soils. For example, the installation of new toilet facilities in heavily used dispersed recreation areas may protect area soils from contamination.

Payments to States and Counties

This section describes contributions from direct payments made by the Forest Service to States and counties, including revenue sharing payments from commercial activities on Federal lands, such as oil and gas leasing and livestock grazing.

Payments to States and local governments support public services in communities near the Grasslands and contribute to employment and labor income in the counties that surround the forest. These amounts can be compared to overall county revenues for perspective on their importance in supporting critical public services. Some of the least affluent areas may receive the largest payments from the Forest Service. Payments to local governments in sparsely populated and low-income areas are likely to be particularly meaningful, since these areas typically get less revenue from property, sales, and income taxes to fund local government operations.

The Grasslands make payments to state and local governments through three programs:

(1) **The Secure Rural Schools Act (SRS) or 25-Percent Payments:** Since 1908 the Secretary of the Treasury makes an annual payment to the States based on national forest receipts. The States distribute the payment among counties in which national forests are situated for the benefit of public schools and roads. The distribution is in proportion to the acreage of national forest in the county. Beginning in 1908 the payment was 25 percent of the moneys received annually. Since 2008 the payments are based on 25 percent of the 7-year rolling average annual receipts. These payments are commonly called 25-percent payments. However, in 2000, the Secure Rural Schools and Community Self-determination Act was passed which offered a guaranteed source of payments that was not tied to annual commercial revenue on National Forests. Under the Secure Rural Schools Act an eligible county elects to receive a share of the Secure Rural Schools Act State payment or a share of the 25-percent payment to the state.

(2) **The Bankhead-Jones Farm tenant Act:** The Forest Service also processes payments to counties from the sale of resources under the provisions of Title III of the Bankhead-Jones Farm Tenant Act. These receipts primarily consist of mineral receipts collected by the Office of Natural Resource Revenue (ONRR), and grazing receipts collected by the Forest Service. After each calendar year, the Forest Service is required to pay to the county in which land is held by the Forest Service, 25 percent of receipts received from the use of grasslands and land utilization projects during the previous calendar year.

Payments to counties from the Bankhead-Jones Farm Tenant Act are specific to historically acquired national grasslands, whereas payments to states and counties from mineral activities on national forest public domain lands are distributed via Federal Mineral Royalty (FMR) stipulations from ONRR. The Cimarron-Comanche National Grasslands are acquired lands that only distribute BHJ payments for mineral receipts collected by ONRR, rather than FMRs being returned to respective states and counties.

(3) **Federal Payments In-Lieu of Taxes (PILT):** The PILT program was created in 1976 and provides payments to counties and other local governments to offset losses in tax revenues due to the presence of substantial acreage of federal land in their jurisdictions. ***While local governments do receive these payments, they are largely outside the control of National Forest management.*** Generally, under PILT larger payments reflect larger acres under Federal management.

Secure Rural Schools Act (SRS) or 25-Percent Payments

In response to significant changes in natural resource use, Congress applied the concept of transition payments nationally in 2000 with the SRS act. SRS changed USFS revenue sharing in three fundamental ways: SRS (1) decoupled county payments from National Forest receipts traditionally dominated by timber, (2) introduced new purposes of restoration and stewardship through Title II funds that pay for projects on public lands, and (3) addressed payment equity concerns by adjusting county and school payments based on economic need (the Title I formula is adjusted using each county's per capita personal income).

U.S. Forest Service 25 Percent Fund: The 25% Fund, established in 1908, shares revenue generated from the sale of commodities produced on public land with the county where the activities take place. Twenty-five percent of the value of public land receipts are distributed directly to counties and must be used to fund roads and schools. States determine how to allocate receipts between these two local services.

The Secure Rural Schools and Community Self-Determination Act of 2000 (SRS), or Public Law 106-393: SRS was enacted in FY 2001 to provide 5 years of transitional assistance to rural counties affected by the decline in revenue from timber harvests on federal lands. The SRS Act has three titles that allocate payments for specific purposes:

- **Title I** - these payments to counties make up 80 to 85 percent of the total SRS payments and must be dedicated to funding roads and schools. States determine the split between these two services, and some states let the counties decide.
- **Title II** - these funds are retained by the federal treasury to be used on special projects on federal land. Resource advisory committees (RACs) at the community level help make spending determinations and monitor project progress.
- **Title III** - these payments may be used to carry out activities under the Firewise Communities program, to reimburse the county for search and rescue and other emergency services, and to develop community wildfire protection plans.

Counties elect to receive Secure Rural Schools Payments, or to continue with 25% Fund payments. Most counties have elected to receive Secure Rural Schools payments. Some counties, however, continue to prefer 25% Fund payments to Secure Rural Schools. SRS transition payments are only authorized through FY 2023, at which point Congress must decide to extend and/or reform SRS, or allow it to expire. If SRS expires, counties will again receive payments from the 25% Fund, recoupling payments directly to commercial activities on public domain land (Congressional Research Service 2023).

Because the Cimarron-Comanche National Grasslands (CCNGs) are acquired lands under the Bankhead Jones Farm Tenant (BHJ) Act, rather than public domain lands associated with the SRS Act and 1908 25% Fund, counties within the socioeconomic area of influence do not receive SRS or 25% Fund payments specifically from the CCNGs. However, some of these counties (e.g., Las Animas and Pueblo)

do receive SRS or 25% Fund payments from unrelated activities on other nearby USFS lands, such as the Pike-San Isabel National Forest.

The Bankhead-Jones (BHJ) Farm Tenant Act

Forest Service Grasslands, like the Cimarron-Comanche National Grasslands (CCNGs), are lands acquired by the Forest Service through the Bankhead-Jones Farm Tenant Act of 1937 (P.L. 75-210). The Act authorized acquisition of damaged lands to rehabilitate and use them for various purposes; while Bankhead-Jones acquired lands are still USFS lands, they are accounted for separately from public domain USFS lands that were not acquired under the Bankhead-Jones Farm Tenant Act. Receipts revenues from activities on the Grasslands, such as fluid minerals production and grazing, are shared directly with county governments in which production and/or grazing on CCNGs land occurred during the previous calendar year. Table 25, below, shows payments made from the CCNGs to counties in the socioeconomic area of influence for associated receipts revenues, if any.

Table 22. BHJ Payments to Counties from the CCNGs

State	County	FY 2023 Payment ¹
Colorado	Baca	\$7,190
	Bent	-
	Las Animas	\$2,282
	Otero	\$6,036
	Pueblo	-
Kansas	Morton	\$138,436
	Stevens	\$1,183
New Mexico	Union	\$1,767
Oklahoma	Cimarron	\$314
	Texas	-

USFS All Service Receipts (ASR 19-1), FY 2023 (payment year 2024).

¹ Net payment amounts (total amounts less sequestration amounts) are rounded to the nearest whole number.

Federal Payments In-Lieu of Taxes (PILT)

Congress authorized PILT in 1976 in recognition of the volatility and inadequacy of federal revenue sharing payment programs to compensate counties for non-taxable federal lands within their borders (Public Law 94-565). PILT increases and stabilizes county government revenue sharing payments by paying counties based on a per-acre average "base payment" that is reduced by the amount of revenue sharing payments and is subject to a population cap.

PILT is permanently authorized, but congress must appropriate funding on an annual basis. PILT was typically not fully funded until FY 2008 when counties received a guarantee of five years at full payment amounts (FY 2008 to FY 2012 payments). As county payments became more important to local governments after WWII (largely due to high timber extraction levels to fuel the post-war housing and economic growth), volatility became an issue. PILT increased and stabilized payments by funding counties from congressional appropriations rather than directly from commodity receipts. PILT payments are also important because they are not restricted to particular local government services but can be used at the discretion of county commissioners to fund any local government needs.

Table 23. PILT and Eligible Acres

State	County	Eligible CCNGs Acres	% of Total Eligible Acres (All Agencies)	Total PILT Payment	Avg. Per-Acre Payment
Colorado	Baca	205,695	99.8%%	\$ 676,706	\$ 3.29
	Las Animas	65,266	21.2%%	\$ 145,743	\$ 2.23
	Otero	172,680	100.0%	\$ 573,093	\$ 3.32
Kansas	Morton	107,701	100.0%	\$ 49,745	\$ 0.46
	Stevens	920	100.0%	\$ 442	\$ 0.48
Total		552,262	-	\$ 1,445,729	\$ 2.62

U.S. Department of Interior. 2023. Payments in Lieu of Taxes (PILT), Washington, D.C.; USFS FY 2024 Land Area Record (LAR) Report

Note: Payments in Lieu of Taxes (PILT) are Federal payments that help local governments offset losses in property taxes due to the existence of nontaxable Federal lands **within a county's boundaries**. Thus, only counties containing CCNGs acres are presented in the table above. Socioeconomic area of influence counties bordering, but not containing, CCNGs acres are omitted above.

Economic Contributions

Multiple uses on the Cimarron-Comanche National Grasslands contribute to social and economic sustainability. The Grasslands provide benefits to people, such as recreation and forage for grazing, among others. These benefits contribute to quality of life, culture, and livelihoods for people in the area of influence. While the social and non-monetary benefits of forest resources are not captured quantitatively, they are important to consider alongside the economic contributions discussed below.

The economic contributions made to the local communities by the Grasslands include direct, indirect, and induced jobs and income associated with livestock grazing, oil and gas extraction, and recreation (including tourism, and wildlife-related activities such as hunting, fishing, wildlife viewing) activities that occur, as well as direct expenditures made by the CCNGs for staffing and budgetary requirements. Though the Grasslands are located in close proximity to each other in adjoining counties and States, there is little economic trade between them. In general, both economic areas are small enough that most economic impact from CCNG resources is minimized due to money leaving rural Grasslands counties to larger areas, such as the cities of Pueblo and Denver, Colorado, or Amarillo, Texas.⁸ In terms of overall contributions, the Grasslands play a larger role in social contributions for local communities as well as for national interests. For a detailed discussion of the social fabric and local lifestyles that people living around the Grasslands appreciate and work to preserve, see the **Social and Cultural Conditions and Trends** section.

Methods

Cimarron-Comanche recreation, products (including oil and gas), and forage are uses that are quantified and analyzed for their economic contributions in the area of influence. Economic contributions detailed in

⁸ An additional factor in estimating economic impacts of various sectors is commonly referred to as "leakage". Part of the monies spent by businesses and individuals is spent within the county, while a portion of those monies is spent outside of the county's economy. The money expended outside of the county is referred to as leakage because funds "leak" out of the local economy and are spent elsewhere. By the same token, economic activity is introduced when those from outside the county purchase goods and services within the county, thereby introducing new money into the local economy. Despite this potential leakage, significant contributions from Forest Service management ripple through local economies, supporting jobs and income in many different sectors of the economy..

each section below were modeled using IMPLAN 2022 with the most recently available USFS data about the given program resource or activity.

IMPLAN is an input-output model, which estimates the economic impacts of projects, programs, policies, and economic changes on a region, including direct, indirect, and induced economic impacts. Direct economic impacts are generated by the activity itself, such as forest product harvesting. Indirect employment and labor income contributions occur when a sector purchases supplies and services from other industries in order to produce their product. Induced contributions are the jobs and labor income generated as a result of spending new household income generated by direct and indirect employment. The estimated jobs are defined as any part-time, seasonal, or full-time job generated as a result of spending new household income generated by direct and indirect employment. ***More specifically, each job is not represented by a single person in the context of economic contribution analysis.***

Each job is not represented by a person, say Charlie the Logger, who is working full time in the woods year-round. Instead, job and income contribution analysis adds up all the bits and pieces of Charlie's, Sarah's, Bill's, and Jane's economic activity in the area to then come up with estimated average annual *employment, labor income, and output* supported by FS expenditures on projects and activities. It makes it difficult to visualize the jobs since there is no Charlie to shake hands with, but it is a powerful measure of economic ties between FS projects and the local area. The total results represent an estimate of the number of jobs and labor income supported by the dollar amount of NFS activities in the area per average year.

Labor income is based on the same industry data and includes proprietor income and employee compensation (wages and benefits). **GDP**, also referred to as “value added”, is a commonly reported indicator of the total market value of all final goods and services produced in the Nation. To be precise, what we are measuring in the existing condition economic contribution analysis represents the agency's contribution to GDP in the CCNG socioeconomic area of influence. “Value added” is the difference between an industry or establishment's total output and the cost of its intermediate inputs, representing wealth created by industry activity. ***Value added, or GDP, is not used here as a depiction of economic value or benefits from the National Forests as it only describes economic contributions and does not include the entire series of economic benefits and other nonmarket values (e.g., forest goods and services such as clean water and air, biodiversity, cultural resources, and wilderness).***⁹

These are modeled results, representing the estimated economic contributions in the local economy stemming from Cimarron-Comanche visitors' spending, natural resources produced, and authorized forage use. These estimates differ from table 10 in the *Employment, Wealth, and Poverty* above because the economic contributions presented below are specific to Cimarron-Comanche activities, whereas the employment by industry in table 10 represent figures for the activities associated with the entire area of influence. Economic contributions from grassland activities fall within many industries in the area and are only a small portion of the total employment in the area table 10.

Estimates

The estimated economic contributions of Cimarron-Comanche National Grasslands resources, uses, and management activities are summarized in table 24 and referred to throughout this section. The estimates reported below are based on 2022 economic conditions for the area of influence (IMPLAN 2022) and the most recently available USFS data about the given program resource or activity.

⁹ USFS 2022. Forest Level Economic Contributions Dashboard. National Forest System, Ecosystem Management Coordination, Social Science and Economics group.
<https://usdagcc.sharepoint.com/sites/fs-emc-scer/SitePages/Job.aspx>

Table 24. Estimated Economic Contributions from Cimarron-Comanche National Grassland Program Area Expenditures

Program Area	Employment (Jobs) ^a	Labor Income ^a	Total GDP ("Value Added") ^b
Grazing	337	\$6,947,000	\$14,187,000
Recreation ^c	15	\$505,000	\$859,000
Timber	0	\$0	\$0
Minerals	12	\$516,000	\$1,576,000
Payments to States/Counties	14	\$865,000	\$1,179,000
Forest Service Expenditures	26	\$1,529,000	\$1,753,000
Total	404	\$10,363,000	\$19,553,000

IMPLAN 2022; USFS 2023 program resource data; results, presented in 2024 dollars, are rounded to the nearest \$1000 and may not sum to reflect totals.

^a Recall that each job is not represented by a single person in the context of economic contribution analysis. Total results represent an estimate of the number of jobs and labor income supported by the dollar amount of NFS activities in the area per average year.

^b Value added, or GDP, is not used here as a depiction of economic value or benefits from the National Forests as it only describes economic contributions and does not include the entire series of economic benefits and other nonmarket values (e.g., ecosystem services such as clean water and air, biodiversity, cultural resources, and wilderness).

^c Recreation estimates presented here include estimates for both wildlife and non-wildlife related recreation.

Table 24 shows the employment, labor income, and total output attributable to the activities of various Cimarron-Comanche National Grasslands program areas, totaling an estimated 404 jobs and \$10,363,000 in labor income on an average annual basis. Grazing, FS-related expenditures, and recreation contribute the most to employment in the regional economy, relative to other resource areas. The Forest Service expenditures category captures both salary and non-salary expenditures in fiscal year 2023.

As seen in table 25, below, it is estimated that the Cimarron-Comanche contributes about 0.32 percent of all jobs and labor income in the 10-county area. These jobs fall within many industries across the analysis area because they include direct, indirect, and induced jobs, as detailed in the Methods for Economic Contribution Analysis subsection above. The multiple uses of the Cimarron-Comanche (mainly grazing, recreation, and minerals) contribute the most jobs to the agriculture, manufacturing, government, and administration, accommodation and food services industries, real estate, and retail trade sectors in the area of influence.

The jobs estimates offer an incomplete picture of the Cimarron-Comanche's contributions to the regional economy because not all jobs are equivalent. Labor income estimates help to clarify the role of forest management in supporting livelihoods in communities near the Grasslands. Sectors that have the highest employment may not generate the highest labor income and vice versa. This is evidenced by the forest uses contributing more to total jobs in the area of influence than labor income. Forest contributions as a percent of total jobs in the area of influence (0.32%) is greater than the percent of labor income contributed by the forest (0.15%).

In the Cimarron-Comanche area of influence, the Grasslands will continue to contribute to social and economic sustainability by providing multiple uses, ecosystem services, infrastructure and having a presence in surrounding communities. While grazing, recreation, minerals and other resources will continue to play an important economic and social role in the area, individual counties may experience different levels of contributions, as well as varying degrees of progress toward the path of sustainable economic development. This is because some counties are currently more dependent upon specific industries than others. For example, counties with livestock sale barns likely have greater economic contributions from the grazing resources. Other counties may rely more heavily on tourism, regional services, or mineral activities. For this reason, different counties will experience different extents of contributions derived from the Cimarron-Comanche National Grasslands' resources and management.

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Table 25. Distribution of CCNGs industry contributions in the area of influence as compared to total area contributions in 2023

Industry	Forest Service (FS)-related Employment	% Employment for Total Area of Influence	FS-related Labor Income	% Labor Income for Total Area of Influence	FS-related Value Added	% Value Added for Total Area of Influence
Accommodations, food services	17	0.18%	\$430,000	0.17%	\$700,000	0.16%
Administrative, waste management	7	0.13%	\$228,000	0.10%	\$291,000	0.12%
Agriculture	259	2.58%	\$4,110,000	0.69%	\$7,914,000	1.28%
Arts, entertainment, recreation	5	0.27%	\$96,000	0.26%	\$173,000	0.22%
Construction	2	0.02%	\$97,000	0.02%	\$167,000	0.02%
Education services	1	0.11%	\$33,000	0.09%	\$37,000	0.10%
Finance & insurance	6	0.12%	\$187,000	0.10%	\$432,000	0.12%
Government & non-NAICs	32	0.18%	\$1,991,000	0.18%	\$2,150,000	0.16%
Health & social services	11	0.07%	\$684,000	0.06%	\$811,000	0.07%
Information	1	0.08%	\$46,000	0.06%	\$115,000	0.06%
Management	1	0.16%	\$41,000	0.15%	\$50,000	0.16%
Manufacturing	1	0.01%	\$82,000	0.01%	\$151,000	0.01%
Mining	6	0.18%	\$119,000	0.12%	\$965,000	0.19%
Other services	5	0.11%	\$232,000	0.09%	\$297,000	0.10%
Professional, scientific, technical services	4	0.07%	\$245,000	0.06%	\$327,000	0.07%
Real estate	15	0.33%	\$295,000	0.24%	\$1,834,000	0.13%
Retail trade	13	0.11%	\$437,000	0.09%	\$868,000	0.09%
Transportation	10	0.16%	\$445,000	0.12%	\$701,000	0.11%
Utilities	1	0.10%	\$73,000	0.08%	\$327,000	0.08%
Wholesale trade	9	0.32%	\$494,000	0.25%	\$1,245,000	0.27%
Total	404	0.32%	\$10,363,000	0.15%	\$19,553,000	0.17%

IMPLAN 2022; USFS 2023 program resource data; results, presented in 2024 dollars, are rounded to the nearest \$1000 or whole number and may not sum to reflect totals.

Risks and Stressors to Social and Economic Sustainability

The planning rule at 36 CFR 219.6 does not require assessments to provide explicit information on the risks or stressors affecting the social, cultural, or economic environments. Instead, it states that when developing plan components, responsible officials shall consider “reasonably foreseeable risks to ecological, social, and economic sustainability” (see 36 CFR 219.10 on multiple use). However, chapter 10 of the Planning Handbook (1909.12) suggests that available information on “risks, stressors, or drivers affecting the contributions or conditions” should be identified during assessment. Here, “conditions” refer to the social, cultural, and economic conditions affected by management of the plan area, while “contributions” refer to the contributions of the plan area to social and economic sustainability.

Social and economic sustainability on the Grasslands can be adversely affected by several factors, including population change and economic structure; changes in climatic conditions; and land fragmentation coupled with adjacent land uses. Many likely effects are short-term, rapid, and reversible; however, some threats are occurring slowly and irreversible within generational time spans. Economic impacts and destruction by natural disasters are often the most referenced in public dialogue but changes in the social identity (or sense of place) could be stressed as well and may affect the stability of local populations to some degree.

Climatic Conditions

The general climate of the Cimarron and Comanche National Grasslands is semi-arid, with annual precipitation primarily occurring in spring and early summer through frontal storms and late-summer thunderstorms. This climate limits moisture availability, which can deplete soil moisture and increase susceptibility to wind and water erosion, especially in areas with sparse vegetation or loose soil. The trend is toward warming temperature, suggesting that historical temperature averages to date may be an underestimate of what is likely, even in the near term. Hence, relying only on the historical climate may underestimate the potential for future risks ({Rice, 2018, Climate change vulnerability assessment of aquatic and terrestrial ecosystems in the U.S. Forest Service Rocky Mountain Region}).

The primary climatic characteristics affecting sustainability of the Grasslands are related to changing precipitation patterns, water use, and wind disturbance. Agricultural needs, land use changes, energy development, and population growth drive water demand for the semiarid plan area. Stressors include water quality issues, overextraction, and a lack of instream flow protections. Drought and groundwater depletion exacerbate these challenges. The plan area, which lies in the semiarid Great Plains, is vulnerable to wind erosion due to the naturally dry conditions and exposed soils. The factors that contribute to wind erosion in these grasslands have deep historical roots, particularly due to the long-term effects of plowing native prairie and continue to pose ecological and economic challenges in the region today.

Further, significant alterations in climatic conditions negatively affect rangelands and rangeland livelihoods tied to the Grasslands in multiple ways, including amplifying precipitation variability, increasing the likelihood of extreme events (e.g., floods and droughts), increasing wildfire frequency, severity and extent, increasing the abundance of undesirable species (including both woody encroachment and invasive species), increasing heat stress, and affecting livestock disease dynamics. Drought can impact the carbon cycle in rangelands. Increased temperatures and reduced precipitation lower soil water availability resulting in decreased plant productivity and altering species composition ({Wyndham, 2018, Drought vulnerability assessment to inform grazing practices on rangelands of southeastern Colorado's major land resource area 69}).

Clean air is also an important provisioning service provided by the Cimarron-Comanche National Grasslands (see the **Air Quality** chapter of the Assessment for a detailed discussion). Trees and plants absorb carbon dioxide through photosynthesis and in turn produce oxygen for people and animals to breathe. Smoke from agricultural, personal debris burning, prescribed burning and/or wildfires can settle

for days, producing unhealthy conditions. Usually, these conditions only occur for a few days at a time. However, the fine particles associated with smoke from forest fires can be especially problematic for those with ongoing health problems, such as lung disease or heart problems, and for the elderly, increasing their risk of hospital and emergency room visits or even the risk of death.

Air quality impacts from wildfires may intensify in the future if fires occur with greater frequency due to fuels buildup coupled with prolonged drought cycles, warmer winters, and increased variability in the timing and amount of precipitation. Because the Grasslands are now surrounded by and intermixed with private lands, fire can be a direct threat to private property. In the absence of explicitly defined WUI-designated areas, as many of the communities are rural, local hazard mitigation plans identify the risks for communities where homes and structures integrate with natural vegetation, heightening wildfire hazards due to local conditions like wind and fuel loads ({Blue Umbrella, 2015, Southwest Kansas (Homeland Security Region C) multi-hazard', multi-jurisdictional hazard mitigation plan}; {Las Animas County, 2022, 2022 Hazard mitigation plan}; {Otero County, 2013, Otero County community wildfire protection plan}). On the other hand, fire can help maintain grassland ecological sustainability by controlling woody encroachment and promoting native grasses. It also increases species diversity, helps cycle soil nutrients, and removes old vegetation.

Land Ownership Patterns and Adjacent Land Uses

The landownership pattern in the Cimarron and Comanche National Grasslands is fragmented, meaning there are various owners and statuses for different parcels of land. This fragmentation is a result of the region's history of land acquisition and federal policies like the Homestead Act of 1862, which encouraged the establishment of small farms and homesteads by offering 160-acre parcels of federal land to qualified individuals ({Hansen, 2004, The allocation of property rights to land: US land policy and farm failure in the Northern Great Plains}; {USFS, 2008, Cimarron and Comanche National Grasslands: Land Management Plan}). As land was claimed under this act, the landscape was transformed, leading to a patchwork of privately owned farms and ranches throughout the region. Please see the **Landownership, Status, Use and Access** chapter of the **Assessment** for a complete discussion.

In the Cimarron-Comanche National Grasslands, hunting, hiking, wildlife viewing, and OHV use are popular recreational activities (refer to *Recreation*). Fragmented landownership diminishes the recreational experience by disrupting legal access to public lands, hindering trail maintenance and trail network development efforts, and increasing the potential for land use conflict from inadvertent trespass. These issues could lead to impacts on economic and social sustainability through reduced quality of the recreational experience and reduced economic contributions from spending on recreational pursuits.

Land fragmentation also increases the susceptibility of isolated parcels to invasion by nonnative and invasive species ({Shafer, 2014, Great Plains}). Shifting climatic conditions are likely to further stress native plant and animal species, potentially creating an ecological advantage for the spread or proliferation of invasive species. Land conservation initiatives, such as prescribed burns or partnerships to establish wildlife connectivity corridors regardless of landownership have shown to improve habitat and the health and resilience of the ecosystem (USFS 2024a). Implementing large-scale management activities, such as prescribed burns, habitat restoration initiatives, or rangeland management practices like rotational livestock grazing is challenging with fragmented landownership; discontinuous land patterns require additional time traveling between sites and can make it challenging and costly to visit or access remote locations.

At broad scales, the ecological health and persistence of the Grasslands are currently threatened by land use conversion (for example, to residential developments or croplands) and adjacent land practices that do not align with management strategies. For example, significant land uses adjacent to the Cimarron and Comanche National Grasslands include wind energy. These uses support social and economic sustainability through jobs, income, and economic output. They also provide a sense of place and way of life for some; however, they may also conflict with native species or other land uses, perceptions and associated values. Additionally, converting rangelands to irrigated croplands or developed lands will

increase demands on surface and groundwater supplies, additionally straining water resources, particularly in drier regions. Groundwater resources, such as the Ogallala Aquifer, are being depleted at alarming rates to provide water for agriculture and urban areas, with recharge limited on any meaningful timeline for human use (Deines et al., 2020). Conversion of rangeland to cropland or development has also been identified as a significant and persistent threat to native wildlife species, associated corridors and the ecosystem services they both provide (provisioning and cultural) and rely (provisioning and supporting, such as forage and biodiversity maintenance), upon (Wilcove, 1998, Quantifying threats to imperiled species in the United States; Green et al., 2005). Year-round access to critical resources is vital to maintaining big game populations (Stoellinger et al., 2020); as the acreage of a rangeland shrinks, habitat fragmentation increases, along with the value placed on protecting or creating migratory wildlife corridors. Since the 2000s, conversion of rangeland to cropland has reaccelerated with an associated loss of habitat for wildlife (Lark, 2020).

Avoiding conversion has been shown to preserve species diversity and connectivity of habitat (Olimb & Robinson, 2019). Declines in wildlife species populations, particularly grassland birds, have been attributed to loss of spatial and temporal heterogeneity associated with intensive farming, advanced natural succession, fire exclusion, invasion and planting of nonnative plants and urbanization (Askins, 2007, Conservation of grassland birds in North America: Understanding ecological processes in different regions; Briske, 2017, Rangeland systems: Processes, management and challenges). Large amounts of sand sage prairie have been converted to agriculture on surrounding private lands, stressing the importance of maintaining this habitat on USFS lands. Chemical and mechanical treatments of sand sage occur on private lands to reduce sand sage cover and increase palatable perennial grass cover. This ecosystem is the most compromised ecosystem on surrounding lands compared to the other ecosystems in the plan area. This ecosystem also provides valuable habitat for wildlife, including at-risk species like the lesser prairie-chicken. Spencer et al. (2017) reported lesser prairie chicken range has declined by 84% since the beginning of the 20th century, and much of this decline is attributed to loss of habitat or fragmentation due to conversion.

The Cimarron and Comanche National Grasslands' fragmented land ownership patterns can also impact wildfire intensity and spread based on landowner type (Barros, 2021, Effects of ownership patterns on cross-boundary wildfires; Miller et al. 2023). Areas that are considered high-value resources by land managers and owners, such as private, industrial, and some federal lands, experience less overall area burned due to fire suppression efforts (Barros, 2021, Effects of ownership patterns on cross-boundary wildfires). However, variable fire policies across different land managers may make fire management difficult when coordinating varying agency responses (Barros, 2021, Effects of ownership patterns on cross-boundary wildfires; Blue Umbrella, 2015, Southwest Kansas (Homeland Security Region C) multi-hazard, multi-jurisdictional hazard mitigation plan; Las Animas County, 2022, 2022 Hazard mitigation plan; Otero County, 2013, Otero County community wildfire protection plan). This pattern implies that fragmented landscapes, including the Cimarron and Comanche National Grasslands, could see intensified cross-boundary fire exposure, especially where fire policies are inconsistent (Barros, 2021, Effects of ownership patterns on cross-boundary wildfires).

Impacts of system drivers and stressors, such as projected climatic conditions, invasive species, increased urban expansion, and land conversion, will exacerbate issues stemming from the disjointed landownership pattern within the plan area. Land fragmentation hinders biodiversity conservation and ecosystem restoration initiatives, reduces the efficacy of management efforts, and increases management costs in several ways. While current plan direction for land exchanges, land acquisitions, and access is still generally valid, recent research highlights the need for a broader, landscape-scale approach to managing fragmented lands like those of the Cimarron and Comanche National Grasslands (USFS 1984; Augustine, 2021, Thinking like a grassland: Challenges and opportunities for biodiversity conservation in the Great Plains of North America). By shifting focus from individual landholdings to the entire grassland ecosystem, land managers can implement practices like habitat restoration, prescribed fire, sustainable grazing to promote biodiversity, and adaptation strategies to support economic vitality in local communities. To achieve this, strategic public-private partnerships are essential. Differences in

management objectives among landowners can hinder grassland management efforts. A landscape-scale approach that considers factors such as landownership, status, and fragmentation requires collaboration across property boundaries. Fostering shared values and a sense of collective stewardship can allow land managers to develop joint grassland management objectives and approaches that align with the goals and needs of local communities and residents ({Shafer, 2014, Great Plains}).

Population, Economic Structure, and Values, Beliefs and Attitudes

If sustainability is understood to represent manageable or desired change, then changes in the composition of local populations may be seen as a threat to the conditions desired by long-term residents. Population growth due to in-migration from urban and retirement-aged residents may stress the CCNGs' resources to continue to provide the current supply of settings (such as for solitude, historical preservation, and scenery) and outputs (forage for grazing, recreation benefits, and fish and wildlife harvests). In addition, changing social values pitting resource use and development with resource preservation may lead to loss of community cohesion.

The counties surrounding the Grasslands are interested in growth and in diversifying their economies, but not at the expense of their rural and slower-paced lifestyles. Tourism or economic opportunities offered by the Grasslands could complement or conflict with the desires of these communities, both economically and socially. For example, oil and gas-related employment associated with leasable production on the Grasslands tends to be lucrative and difficult to substitute with other resource-based industries. Should oil and gas development on the Grasslands decline in the absence of increased regional economic diversification, dependent and less diversified communities will be stressed significantly. For more detailed discussion on economic diversity of the CCNGs socioeconomic area of influence, see the *Existing Social, Cultural, and Economic Conditions* section.

As presented in previous sections, the general population of the counties surrounding the Grasslands is increasing in age and few young people stay in the area to raise families, resulting in a decline in the overall population. At the same time, the Front Range urban population from Pueblo to Denver continues to grow, and more people are visiting the Grasslands in search of uncrowded recreational opportunities.

Because several of the communities within the area of influence are considered resource-dependent, the conditions described above represent risks and stressors to the desired conditions for the Grasslands. Adverse impacts would have a direct and negative impact on the local economies in terms of resource-related employment and earnings; federal payments to local governments; new investments in industries, businesses and residences; and loss of a tax base to fund schools, medical services, and municipal services. Further, as with so many rural places throughout the country, it is difficult for many young people to grow up in a rural community and then find a meaningful career path in their local area. Counties in the analysis area continue to work with economic development plans to bring more industry and opportunities to their areas; tourism is often considered, but it is difficult to develop high wage, full time positions in the tourism sector.

Lastly, the mainstream public beyond the CCNG regional area has limited understanding of the ecological and cultural values of rangeland systems attributable to the Grasslands, or of the consequences of rangeland conversion or degradation. Without opportunities to experience meaningful connections with rangeland systems, and to understand the ecological and social-ecological processes on rangelands that contribute to human wellbeing, the general population is unlikely to see rangelands as more than lands that have not yet been converted to another use (Sayre et al., 2017).

Forest Plan Consistency with External Plans on the Landscape

The Cimarron and Comanche National Grasslands plan revision effort does not conflict with county level master plans available for review regarding socioeconomic contributions. A review of available county economic development, land use, or strategic plans for the counties surrounding the Grasslands highlight

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a future role that the Grasslands may play while providing the multiple uses and ecosystem services discussed herein. Most counties are interested in:

- Retiree and youth retention within communities;
- Diversifying economic bases through both wildlife and non-wildlife-related recreational opportunities while maintaining and investing in other cultural and paleontological resources unique to the area, such as agricultural lifestyles and seasonal tourism associated with areas like Crack Cave.

The current land and resource management plan does not provide specific fire management direction or direction for designing and implementing fuel breaks (USFS 1984). However, the 1984 land and resource management plan does provide for a cost-effective level of fire protection to minimize the combined costs of protection and damages, and to prevent loss of human life, for fires originating on NFS and private land (USFS 1984).

References

- Allen, S. D., Wickwar, D. A., Clark, F. P., Dow, R. R., Potts, R., & Snyder, S. A. 2009. Values, beliefs, and attitudes technical guide for Forest Service land and resource management, planning, and decisionmaking. (PNW-GTR-788).
- Askins, R.A., Chávez-Ramírez, F., Dale, B.C., Haas, C.A., Herkert, J.R., Knopf, F.L., & Vickery, P.D. 2007. Conservation of Grassland Birds in North America: Understanding Ecological Processes in Different Regions: "Report of the AOU Committee on Conservation". Ornithological Monographs, iii-46.
- Bengston, D.N. 2020. Shifting Forest Values as a Driver of Change. In: Dockry, Michael J.; Bengston, David N.; Westphal, Lynne M., comps. Drivers of change in U.S. forests and forestry over the next 20 years. Gen. Tech. Rep. NRS-P-197.
- Bengston, D.N., and Xu, Z. 1995. Changing National Forest Values: a content analysis. Research Paper NC-323. St. Paul, MN: U.S. Dept. of Agriculture, Forest Service, North Central Forest Experiment Station.
- Bennett, E.M., Peterson, G.D., & Gordon, L.J. 2009. Understanding relationships among multiple ecosystem services. *Ecology Letters*, 12(12), 1394-1404.
- Bolitzer, B. and Netusil, N. 2000. The Impact of Open Spaces on Property Values in Portland, Oregon. *Journal of Environmental Management* 59(3): 185-193.
- Briske, D.D. (Ed.). 2017. Rangeland systems: processes, management and challenges. London, UK: Springer Nature.
- Brown, G., and Reed, P. 2000. Validation of a Forest Values Typology for Use in National Forest Planning. *Forest Science* 46(2), 240-247.
- Brown, J., & MacLeod, N. 2011. A site-based approach to delivering rangeland ecosystem services. *The Rangeland Journal*, 33(2), 99-108.
- Brunson, M.W., & Huntsinger, L. 2008. Ranching as a Conservation Strategy: Can Old Ranchers Save the New West?. *Rangeland Ecology & Management*, 61,137–147.
- Cardinale, B.J., Duffy, J.E., Gonzalez, A., Hooper, D.U., Perrings, C., Venail, P., ... & Naeem, S. 2012. Biodiversity loss and its impact on humanity. *Nature*, 486(7401), 59-67.
- Cervený, L.K., Davis, E.J., McLain, R., Ryan, C.M., Whittall, D.R., White, E.M. 2018. Chapter 9: Understanding our changing public values, resource uses, and engagement processes and practices. In: Spies, T.A.; Stine, P.A.; Gravenmier, R.; Long, J.W.; Reilly, M.J., tech. coords. 2018. Synthesis of science to inform land management within the Northwest Forest Plan area. Gen. Tech. Rep. PNW-GTR-966. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 717-807.
- Conant, R. 2012. Grassland soil organic carbon stocks: status, opportunities, vulnerability. In R. Lal, K. Lorenz, R.F. Hüttl, B.U. Schneider, & J. Braun (Eds.). *Recarbonization of the Biosphere* (pp. 275-302). Dordrecht: Springer.
- Cromartie, J. & Nelson, P. 2009. "[Baby Boom Migration and Its Impact on Rural America](#)," [Economic Research Report](#) 55947, United States Department of Agriculture, Economic Research Service.
- Davies, K.W., Bates, J.D., Boyd, C.S., & Svejcar, T. 2016. Prefire grazing by cattle increases postfire resistance to exotic annual grass (*Bromus tectorum*) invasion and dominance for decades. *Ecology and Evolution*, 10, 3356-3366.

- Davies, K.W., Bates, J.D., Boyd, C.S., O'Connor, R., & Copeland, S. 2021. Dormant-Season Moderate Grazing Prefire Maintains Diversity and Reduces Exotic Annual Grass Response Postfire in Imperiled Artemisia Steppe. *Rangeland Ecology and Management*, 79, 91-99.
- Deines, J.M., Schipanski, M.E., Golden, B., Zipper, S.C., Nozari, S., Rottler, C., ... & Sharda, V. 2020. Transitions from irrigated to dryland agriculture in the Ogallala Aquifer: Land use suitability and regional economic impacts. *Agricultural Water Management*, 233, 106061.
- Derner, J.D., Hunt, L., Filho, K.E., Ritten, J., Capper, J., & Han, G. 2017. Livestock production systems. In D.D. Briske, (Ed.). *Rangeland systems: processes, management and challenges* (pp. 347-372). London, UK: Springer Nature.
- Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., ... & Zlatanova, D. 2015. The IPBES Conceptual Framework—connecting nature and people. *Current Opinion in Environmental Sustainability*, 14, 1-16.
- Díaz, S., Pascual, U., Stenseke, M., Martín-López, B., Watson, R.T., Molnár, Z., ... & Shirayama, Y. 2018. Assessing nature's contributions to people. *Science*, 359(6373), 270-272.
- Duniway, M.C., Geiger, E.L., Minnick, T.J., Phillips, S.L., & Belnap, J. 2018. Insights from long-term ungrazed and grazed watersheds in a salt desert Colorado plateau ecosystem. *Rangeland Ecology & Management*, 71(4), 492-505.
- EPA (United States Environmental Protection Agency). 2024a. Overview of Listing Impaired Waters under CWA Section 303(d). Available from: <https://www.epa.gov/tmdl/overview-listing-impaired-waters-under-cwa-section-303d>
- _____. 2024b. Waterbody Report – Cimarron Lake (Moss Lake Middle). Available from: [How's My Waterway - Waterbody Report](#)
- _____. 2024c. Waterbody Report – Point of Rocks Lake. Available from: [How's My Waterway - Waterbody Report](#)
- _____. 2024d. Waterbody Report – Cimarron River. Available from: <https://mywaterway.epa.gov/waterbody-report/21KAN001/KS-110400021/2024>
- _____. 2024e. Waterbody Report – Purgatoire River, mainstem. Available from: https://mywaterway.epa.gov/waterbody-report/21COL001/COARLA07_A/2024
- _____. 2024f. Waterbody Report – Timpas Creek, mainstem. Available from: https://mywaterway.epa.gov/waterbody-report/21COL001/COARLA04a_A/2024
- _____. 2024g. Waterbody Report – Arkansas River, all tributaries. Available from: [How's My Waterway - Waterbody Report](#)
- FISRWG (The Federal Interagency Stream Restoration Working Group). 1998. *Stream Corridor Restoration: Principles, Processes, and Practices*. http://www.extranet.vdot.state.va.us/locdes/hydraulic_design/nchrp_rpt544/content/html/WorksCited/FISRWG_1998.pdf.
- Flores, D. and Sanchez, J.J. 2020. The Changing Dynamic of Latinx Outdoor Recreation on National and State Public Lands. *Journal of Park and Recreation Administration*. doi: 10.18666/JPra-2020-9807.
- Garber-Yonts, Brian. 2004. The economics of amenities and migration in the Pacific Northwest: review of selected literature with implications for national forest management. Gen. Tech. Rep. PNW-GTR-617. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 48 p.

- Godbey, G. 2009. Outdoor recreation, health, and wellness: Understanding and enhancing the relationship (Discussion Paper). Resources for the Future Discussion Paper 09-21. Washington, D.C.: Resources for the Future. Washington, D.C. 42 p.
- Haines-Young, R., & Potschin, M. 2010. The links between biodiversity, ecosystem services and human well-being. *Ecosystem Ecology: a new synthesis*, 1, 110-139.
- Hooper, D.U., Adair, E.C., Cardinale, B.J., Byrnes, J.E., Hungate, B.A., Matulich, K.L., ... & O'Connor, M.I. 2012. A global synthesis reveals biodiversity loss as a major driver of ecosystem change. *Nature*, 486(7401), 105-108.
- Headwaters Economics. 2017. Economy Surprisingly Dependent on Non-Labor Income. <https://headwaterseconomics.org/economic-development/trends-performance/economy-surprisingly-dependent-on-non-labor-income/>
- Herrero-Jáuregui, C., & Oesterheld, M. 2018. Effects of grazing intensity on plant richness and diversity: A meta-analysis. *Oikos*, 127(6), 757-766.
- IPCC. 2013. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.
- Isbell, F.I., Polley, H.W., & Wilsey, B.J. 2009. Biodiversity, productivity and the temporal stability of productivity: patterns and processes. *Ecology Letters*, 12, 443– 451.
- Isbell, F., Calcagno, V., Hector, A., Connolly, J., Harpole, W. S., Reich, P. B., ... & Loreau, M. 2011. High plant diversity is needed to maintain ecosystem services. *Nature*, 477(7363), 199-202.
- Knops, J.M., Tilman, D., Haddad, N.M., Naeem, S., Mitchell, C.E., Haarstad, J., ... & Groth, J. 1999. Effects of plant species richness on invasion dynamics, disease outbreaks, insect abundances and diversity. *Ecology Letters*, 2(5), 286-293.
- Khoury, C., Laliberté, B., & Guarino, L. 2010. Trends in ex situ conservation of plant genetic resources: a review of global crop and regional conservation strategies. *Genetic Resources and Crop Evolution*, 57(4), 625-639.
- Koerner, S.E., Smith, M.D., Burkepille, D.E., Hanan, N.P., Avolio, M.L., Collins, S.L., ... & Zelikova, T.J. 2018. Change in dominance determines herbivore effects on plant biodiversity. *Nature Ecology & Evolution*, 2(12), 1925-1932.
- Lal, P., Alavalapati, J.R.R., and Mercer, E.D. 2011. Socio-economic impacts of climate change on rural United States. *Mitigation and Adaptation Strategies for Global Change* 16(7): 819-844. <https://doi.org/10.1007/s11027-011-9295-9>
- Lark, T.J. 2020. Protecting our prairies: Research and policy actions for conserving America's grasslands. *Land Use Policy*, 97, 104727.
- Lawson, M.M., Rasker, R., Gude, P.H. 2014. The importance of non-labor income: an analysis of socioeconomic performance in western counties by type of non-labor income. *Journal of Regional Analysis and Policy*, 44(2), 175-190.
- Lind, J., Sabates-Wheeler, R., Caravani, M., Biong, L., Kuol, D., & Manzolilo Nightengale, D. 2020. Newly evolving pastoral and post-pastoral rangelands of Eastern Africa. *Pastoralism*, 10, 24.

- Lindstater, A., Kuhn, A., Naumann, C., Rasch, S., Sandhage-Hofmann, A., Amelung, W., ... & Bollig, M. 2016. Assessing the resilience of a real-world social-ecological system: lessons from a multidisciplinary evaluation of a South African pastoral system. *Ecology and Society*, 21, 35.
- Maczko, K., Hidinger, L. 2008. Sustainable Rangelands Ecosystem Goods and Services. SRR Monograph No. 3. Sustainable Rangelands Roundtable. Fort Collins, CO: Colorado State University, Warner College of Natural Resources. 111 p.
- Marty, J.T. 2005. Effects of cattle grazing on diversity in ephemeral wetlands. *Conservation Biology*, 19(5), 1626-1632.
- McGranahan, D. 1999. Natural Amenities Drive Rural Population Change. U.S. Department of Agriculture, Economic Research Service. Agricultural Economic Report No. 781. 27 p.
- Milchunas, D.G., Sala, O.E., & Lauenroth, W.K. 1988. A generalized model of the effects of grazing by large herbivores on grassland community structure. *The American Naturalist*, 132(1), 87-106.
- Millennium Ecosystem Assessment. 2005. Ecosystems and human well-being (Vol. 5). Washington, D.C.: Island Press.
- Miller, M.E., Belote, R.T., Bowker, M.A., & Garman, S.L. 2011. Alternative states of a semiarid grassland ecosystem: implications for ecosystem services. *Ecosphere*, 2(5), 1-18.
- Olimb, S.K., & Robinson, B. 2019. Grass to grain: Probabilistic modeling of agricultural conversion in the North American Great Plains. *Ecological Indicators*, 102, 237-245.
- Porensky, L.M., Wittman, S.E., Riginos, C., & Young, T.P. 2013. Herbivory and drought interact to enhance spatial patterning and diversity in a savanna understory. *Oecologia*, 173(2), 591-602.
- Porensky, L.M., Derner, J.D., Augustine, D.J., & Milchunas, D.G. 2017. Plant community composition after 75 yr of sustained grazing intensity treatments in shortgrass steppe. *Rangeland Ecology & Management*, 70(4), 456- 464.
- Rau, B.M., Johnson, D.W., Blank, R.R., Lucchesi, A., Caldwell, T.G., and Schupp, E.W. 2011. Transition from sagebrush steppe to annual grass (*Bromus tectorum*): Influence on belowground carbon and nitrogen. *Rangeland Ecology and Management*, 64, 139-147.
- Reidmiller, D.R., Avery, C.W., Easterling, D.R., Kunkel, K.E., Lewis, K.L.M., Maycock, T.K., & Stewart, B.C. (Eds.). 2018. Fourth National Climate Assessment, Volume II: Impacts, Risks, and Adaptation in the United States. Washington, D.C.: U.S. Global Change Research Program
- Rice J. R., L. A. Joyce, C. Regan, D. Winters, and R. Truex. 2018. Climate Change Vulnerability Assessment of Aquatic and Terrestrial Ecosystems in the U.S. Forest Service Rocky Mountain Region. Gen. Tech. Rep. RMRS-GTR-376. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 216 p.
- Sanderson, J.S., Beutler, C., Brown, J.R., Burke, I., Chapman, T., Conant, R.T., ... & Sullivan, T. 2020. Cattle, conservation, and carbon in the western Great Plains. *Soil and Water Conservation*, 75(1), 5A-12A.
- Sayre, N.F., McAllister, R.R.J., Bestelmeyer, B.T., Moritz, M., & Turner, M.D. 2013. Earth stewardship of rangelands: coping with ecological, economic, and political marginality. *Frontiers in Ecology and the Environment*, 11, 348-354.
- Sayre, N.F., Davis, D.K., Bestelmeyer, B., & Williamson, J.C. 2017. Rangelands: Where anthromes meet their limits. *Land*, 6(2), 31.

- Scholtz, R., and Twidwell, D. 2022. The last continuous grasslands on Earth: Identification and conservation importance. *Conservation Science and Practice* 4(3), e636.
- Siemann, E., Tilman, D., Haarstad, J., & Ritchie, M. 1998. Experimental tests of the dependence of arthropod diversity on plant diversity. *The American Naturalist*, 152(5), 738-750.
- Society for Range Management. 2023. Connecting Nature and People: A Society for Range Management Task Force Report. <https://rangelands.org/wp-content/uploads/2023/08/SRM-Ecosystem-Services-Report.pdf>.
- Spencer, D., Haukos, D., Hagen, C., Daniels, M., & Goodin, D. 2017. Conservation Reserve Program mitigates grassland loss in the lesser prairiechicken range of Kansas. *Global Ecology and Conservation*, 9, 21-38.
- Stedman, R.C. 2003. Is it really just a social construction?: The contribution of the physical environment to sense of place. *Society & Natural Resources*, 16(8), 671-685.
- Stoellinger, T., Albers, H.J., Middleton, A., Shogren, J.F., & Bonnie, R. 2020. Where the Deer and the Antelope Play: Conserving Big Game Migrations as an Endangered Phenomena. *Duke Env'tl. L. & Pol'y F.*, 31, 81.
- Tarrant, M.A. & Hull, R.B. 2004. Forest values and attitudes in the South: Past and future research. In H. M. Rauscher and K. Johnsen (Eds.), *Southern forest science: Past, present, and future* (pp. 231 – 241). USDA Forest Service, Asheville, NC.
- Thomas, A.S., Sanchez, J.J., and Flores, D. 2021. A Review of Trends and Knowledge Gaps in Latinx Outdoor Recreation on Federal and State Public Lands. *Journal of Park and Recreation Administration* 40(1): 24-43.
- Timberlake, T.J.; Halofsky, J.E.; Joyce, L.A.; Peterson, D.L. 2021. Climate change vulnerability in the Black Hills National Forest. U.S. Department of Agriculture, Forest Service, Western Wildland Environmental Threat Assessment Center. Unpublished report.
- USFS (USDA Forest Service). 2005. Chapter 21 – Water Resources. *Specialist Reports – Existing Condition Descriptions, Cimarron and Comanche National Grasslands*. Forest Service pdf.
- _____. 2012. 2012 Planning Rule. <https://www.fs.usda.gov/detail/planningrule/home/?cid=stelprdb5359471>.
- U.S. Dept of Commerce. 2023. Census Bureau, American Community Survey (ACS) Office, Washington, D.C.
- U.S. Department of Interior. 2020. Payments in Lieu of Taxes (PILT). <https://www.doi.gov/pilt>.
- Wenninger, E.J., and Inouye, R.S. 2008. Insect community response to plant diversity and productivity in a sagebrush–steppe ecosystem. *Journal of Arid Environments*, 72(1), 24-33.
- White, E.M. 2017. Spending patterns of outdoor recreation visitors to national forests. Gen. Tech. Rep. PNW-GTR-961. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 70 p.
- Wilcove, D.S., Rothstein, D., Dubow, J., Phillips, A., & Losos, E. 1998. Quantifying threats to imperiled species in the United States. *BioScience*, 48(8), 607-615.
- Zhang, K., Lin, S., Ji, Y., Yang, C., Wang, X., Yang, C., ... & Yu, D.W. 2016. Plant diversity accurately predicts insect diversity in two tropical landscapes. *Molecular Ecology*, 25(17), 4407-4419.

Appendix B:
Ecosystem Assessments

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Appendix C:
At-Risk Species and Other Highlighted Species

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Appendix C: At-Risk Species and Other Highlighted Species

Table C-1. Potential Species of Conservation Concern (SCC) on the Cimarron and Comanche National Grasslands

Taxa Group				
	Common Name / Scientific Name	Rationale for Identification as Potential SCC ¹	Global and State Conservation Ranks ²	Plan Area Occurrences by Source ³
Plant	Beaked spikerush <i>Eleocharis rostellata</i>	Threatened by and habitat declining from groundwater depletion in the plan area, specifically from groundwater depletion within the habitat at the single occurrence in the plan area along the Cimarron River. The population in the plan area is the western extent of the Great Plains range.	Global- G5 CO-NSR KS- S2	KSNHP: 1 GBIF: 1 iDigBio: 1 SEINet: 3
Plant	Bigelow's Bluegrass <i>Poa bigelovii</i>	Known from a single occurrence in the plan area and is associated with the shortgrass prairie ecosystem which has a declining trend in the quality of the habitat in the plan area. The population in the plan area is on the northeastern edge of the species' range.	Global- G5 CO- S2 KS-NA	GBIF: 1 iDigBio: 1 SEINet: 1
Plant	Black Grama <i>Bouteloua eriopoda</i>	Threatened by and declining habitat trend from woody plant encroachment; 15 known occurrences in plan area and on the northern edge of the species' range	Global- G5 CO- S3 KS- S1	KSNHP: 1 GBIF: 10 iDigBio: 6 SEINet: 15
Plant	Black Willow <i>Salix nigra</i>	Threats and declining trends consistent with wetland habitat in the plan area. The population in the plan area is on the western edge of the species' range with 4 total known occurrences in the plan area and restricted ecological conditions.	Global- G5 CO- S1 KS- S5	CNHP: 1 GBIF: 4 iDigBio: 3 SEINet: 4
Plant	Blue Three-awn Grass <i>Aristida purpurea</i> var. <i>nealleyi</i>	Threatened by and declining habitat trend from woody plant encroachment; single known occurrence in plan area and on the northeastern edge of the species' range.	Global- G5 CO- S2 KS-NSR	SEINet: 1
Plant	Buckley's Beardtongue <i>Penstemon buckleyi</i>	Single known occurrence in the plan area threatened by and declining from physical disturbance to habitat from user-created trails, dispersed camping sites and facility development from 1988 to present. The population in the plan area is at the western edge of the species' range.	Global- G4 CO- S2 KS- S3	SEINet: 1

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Taxa Group	Common Name / Scientific Name	Rationale for Identification as Potential SCC ¹	Global and State Conservation Ranks ²	Plan Area Occurrences by Source ³
Plant	California Amaranth <i>Amaranthus californicus</i>	Threatened by livestock grazing and drought. All key ecosystem characteristics (distribution, drainage pattern, and health) of playas in the plan area are considered compromised relative to the natural range of variation and the size and water holding capacity have decreased primarily from sedimentation. The population in the plan area is on the eastern edge of the species' range. Single known occurrence in the plan area and playas are limited in the plan area.	Global- G4 CO- NA KS- S1	KSNHP: 1 GBIF: 1 iDigBio: 1 SEINet: 1
Plant	Cardinal-flower <i>Lobelia cardinalis</i>	Threatened by climate stressors, groundwater depletion and drought with resultant declining trend in habitat from these threats. The population in the plan area is on the northern edge of the species' range with 7 known occurrences and a restricted wetland ecological condition.	Global- G5 CO- S2 KS- S5	CNHP: 1 GBIF: 6 iDigBio: 4 SEINet: 10
Plant	Cobea Beardtongue <i>Penstemon cobaea</i>	Threatened by livestock grazing and oil and gas development and exploration. The single occurrence in the plan area is from sandsage prairie, which is declining in quality in the plan area. The population in the plan area is on the western edge of the species' range.	Global- G4 CO- S1 KS- NSR	GBIF: 1 iDigBio: 1 SEINet: 1
Plant	Colorado Gentian <i>Frasera coloradensis</i>	Multitude of threats from physical disturbance, habitat loss, and herbicide. Shortgrass prairie has a declining trend in habitat quality in the plan area. Endemic to southeast Colorado and restricted to a total range of 25x75 miles. 15 known occurrences in the plan area and a restricted ecological condition.	Global- G2 CO- S2 KS- NA	CNHP: 10 GBIF: 15 iDigBio: 13 SEINet: 16
Plant	Comb-like Evening-primrose <i>Oenothera coronopifolia</i>	Single known occurrence in the plan area is threatened by physical disturbance and declines in habitat quality in the shortgrass prairie and sandage prairie. The population in the plan area is on the eastern edge of the species' range.	Global- G5 CO- NSR KS- S2	SEINet: 1
Plant	Cooley's Mimosa <i>Desmanthus cooleyi</i>	Threatened by grazing; declining trend in the population in the plan area where it once was previously known from the plan area in Morton County, Kansas. Species is now apparently extirpated from the state of Kansas, but still extant in the plan area in Colorado. The population in the plan area is on the northeastern edge of the species' range; total of 13 occurrences in the plan area.	Global- G5 CO- S2 KS- S1	KSNHP: 1 GBIF: 13 iDigBio: 8 SEINet: 15
Plant	Cutleaf Germander <i>Teucrium laciniatum</i>	Threatened by grazing and habitat conversion, this species has apparently been extirpated from the Kansas portion of the plan area while still extant in Colorado in the plan area. The population in the plan area is on the northern edge of the species' range with between 5-16 occurrences.	Global- G4 CO- NSR KS- S1	KSNHP: 3 GBIF: 16 iDigBio: 11 SEINet: 29

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Taxa Group	Common Name / Scientific Name	Rationale for Identification as Potential SCC¹	Global and State Conservation Ranks²	Plan Area Occurrences by Source³
Plant	Dwarf Milkweed <i>Asclepias involucrata</i>	A total of 8 above-ground stems are documented from the plan area at 2 locations. Threatened by and declining from the common factors in shortgrass prairie. The population in the plan area is on the northeastern edge of the species' range.	Global- G5 CO- S1 KS- SH	CNHP: 2 GBIF: 1 iDigBio: 1 SEINet: 1
Plant	Ear Muhly <i>Muhlenbergia arenacea</i>	Threats and declines in habitat quality common to shortgrass prairie in the plan area. Known from 2 occurrences in the plan area, the population in the plan area is disjunct from the rest of the species range to the south.	Global- G5 CO- S2 KS- NA	GBIF: 2 iDigBio: 2 SEINet: 6
Plant	Englemann's Goldenweed <i>Oonopsis engelmannii</i>	Threats and declines in habitat quality common to shortgrass prairie in the plan area. The 2 known occurrences in the plan area are on the southern edge of the species' range.	Global- G3 CO- S3 KS- S1	CNHP: 1 GBIF: 2 iDigBio: 2
Plant	Fendler's Three-awn grass <i>Aristida purpurea</i> var. <i>fendleriana</i>	Threats from physical disturbance and habitat alteration. Sandsage, shortgrass prairie, and juniper woodlands (the tree-free portion of that habitat which this species occupies) all have declining trends in the plan area. The 9 known occurrences in the plan area are on the eastern edge of the species' range.	Global- NSR CO- NSR KS- S2	GBIF: 3 iDigBio: 1 SEINet: 8
Plant	Flax-leaf Stenosiphon <i>Stenosiphon linifolius</i>	Threats and declines in habitat quality common to sandsage prairie in the plan area. The single known occurrences in the plan area are on the western edge of the species' range.	Global- G5 CO- S1 KS- S5	GBIF: 1 iDigBio: 1 SEINet: 1
Plant	Fragrant Indigobush <i>Amorpha nana</i>	Threatened by climate change, livestock grazing, and habitat alteration, which is resulting in a declining trend in habitat as trees encroach into this species' habitat. The 3 known occurrences in the plan area are on the northeastern edge of the species' range.	Global- G5 CO- S2 KS- S1	CNHP: 4 GBIF: 2 iDigBio: 2 SEINet: 3
Plant	Giant Dropseed <i>Sporobolus giganteus</i>	Threats and trends consistent with the decline in sandsage prairie in the plan area. The 7-25 occurrences in the plan area are on the northeastern edge of the species' range.	Global- G5 CO- S2 KS- S1	KSNHP: 4 GBIF: 4 iDigBio: 7 SEINet: 8
Plant	Great Plains Flatsedge <i>Cyperus lupulinus</i>	Threats and declining habitat trends consistent with the shortgrass prairie ecosystem in the plan area. The 3 known occurrences in the plan area are on the western edge of the species' range.	Global- G5 CO- S2 KS- NSR	GBIF: 3 iDigBio: 1 SEINet: 2

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Taxa Group	Common Name / Scientific Name	Rationale for Identification as Potential SCC ¹	Global and State Conservation Ranks ²	Plan Area Occurrences by Source ³
Plant	Greene Milkweed (Wheel Milkweed) <i>Asclepias uncialis</i>	Forest Service status is RFSS. Threatened by isolation, physical disturbance, and habitat alteration. The shortgrass prairie in the plan area has a declining trend in habitat quality, the sandsage ecosystem in the plan area has declined in habitat quality. There are 5 known occurrences in the plan area with a total of 9 individuals in the plan area. The population in the plan area is on the northeastern edge of the species' range.	Global- G2 CO- S2 KS- NA	CNHP: 4 GBIF: 1 SEINet: 1
Plant	Gummy Lovegrass <i>Eragrostis curtipedicellata</i>	Threats and declining habitat trends consistent with the shortgrass prairie and riparian ecosystems in the plan area. The single known occurrences in the plan area is on the northern edge of the species' range.	Global- G5 CO- S1 KS- S2	CNHP: 2 GBIF: 6 iDigBio: 1 SEINet: 8
Plant	Hartweg's Sundrops <i>Calylophus hartwegii</i> ssp. <i>pubescens</i>	Threats and declining habitat trends consistent with the shortgrass prairie ecosystem in the plan area. The single known occurrence in the plan area is on the northern edge of the species' range.	Global- G4 CO- S2 KS- NSR	CNHP: 1 GBIF: 2 iDigBio: 1 SEINet: 1
Plant	Harvard's Three-awn Grass <i>Aristida harvardii</i>	Threats and declining habitat trends consistent with the shortgrass prairie and sandsage prairie ecosystems in the plan area. Occurrences in the plan area are on the northern edge of the species' range.	Global- G5 CO- S1 KS- S1	KSNHP: 1 GBIF: 11 iDigBio: 11 SEINet: 8
Plant	Hoary Tansy-aster <i>Dieteria canescens</i> var. <i>glabra</i>	Threats and declining habitat trends consistent with sandsage prairie ecosystem in the plan area. The 3 known occurrences in the plan area are on the eastern edge of the species' range.	Global- G5/T4 CO- NSR KS- S1	GBIF: 3 iDigBio: 1 SEINet: 3
Plant	Honey Mesquite <i>Prosopis glandulosa</i> var. <i>glandulosa</i> ; <i>Prosopis glandulosa</i>	Threats and declining trend consistent with riparian ecosystems and sandsage prairie in the plan area. The 2 known occurrences in the plan area are on the northern edge of the species' range and riparian ecosystems are restricted in the plan area.	Global- G5 CO- NSR KS- S2	CNHP: 2
Plant	James' Beardtongue <i>Penstemon jamesii</i>	Threatened by habitat alteration and physical disturbance. Known from 7 total occurrences in the plan area. Species is extirpated from the Kansas portion of the plan area, which represents a declining population trend. The plan area is on the northern edge of the species' range.	Global- G4 CO- S1 KS- SH	CNHP: 2 GBIF: 3 SEINet: 3
Plant	Large-bract Scurfpea <i>Pediomelum cuspidatum</i>	Threats and declining trends consistent with the shortgrass prairie in the plan area. The 5 known occurrences in the plan area are on the northern edge of the species' range.	Global- G4 CO- S1 KS- S4	GBIF: 5 iDigBio: 3 SEINet: 4

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Taxa Group	Common Name / Scientific Name	Rationale for Identification as Potential SCC¹	Global and State Conservation Ranks²	Plan Area Occurrences by Source³
Plant	Least Duckweed <i>Lemna minuta</i>	Threats and declining trends consistent with aquatic ecosystems in the plan area. There are 4 known occurrences in the plan area which are on the eastern edge of the species' range.	Global- G5 CO- NSR KS- S1	GBIF: 3 iDigBio: 4 SEINet: 3
Plant	Longleaf Greeneyes <i>Berlandiera lyrata</i>	Threatened by grazing and oil and gas development, which has resulted in a marked decline in habitat in the largest occurrence in the plan area. There are between 10 and 16 known occurrences in the plan area and total population counts do not exceed 200 individuals. The population in the plan area is on the northern edge of the species' range.	Global- G5 CO- S2 KS- S1	KSNHP: 5 GBIF: 16 iDigBio: 11 SEINet: 21
Plant	Low Silverbrush <i>Argythamnia humilis</i>	Threatened by grazing and other physical disturbances and habitat alteration. 4 known occurrences in the plan area, one of which shows a marked proliferation of disturbance. One of the occurrences consists of a single individual plant. The occurrences in the plan area are the northern edge of the species' range	Global- G5 CO- S2 KS- NSR	CNHP: 2 GBIF: 2 iDigBio: 2 SEINet: 2
Plant	May Grass <i>Phalaris caroliniana</i>	Threats and declining trends consistent with wetland and riparian ecosystems in the plan area. 3 known occurrences in the plan area, which are on the northern edge of the species' range	Global- G5 CO- S1 KS- S2	GBIF: 3 iDigBio: 2 SEINet: 3
Plant	Narrowleaf Purple Coneflower <i>Echinacea angustifolia</i>	Threatened by physical damage to individual plants as well as habitat alteration and herbicide application. The habitat quality in the plan area has a declining trend from oil and gas development and fire suppression. There are between 1-3 known occurrences in the plan area which are on the western edge of the species' range.	Global- G5 CO- S2 KS- S5	GBIF: 1 iDigBio: 1 SEINet: 2
Plant	Neally's Dropseed <i>Sporobolus nealleyi</i>	Threats and declining trends consistent with sandsage prairie in the plan area, the single known occurrence in the plan area is on the northeastern edge of the species' range.	Global- G5 CO- S2 KS- NA	GBIF: 1 iDigBio: 1 SEINet: 1
Plant	New Mexico Blackberry <i>Rubus neomexicanus</i>	Threats and declining trends in the plan area consistent with wetland and riparian ecosystems. The 2 known occurrences in the plan area (one of which consists of 6-10 individuals) are the northern edge of the species' range. Ecological conditions (moist sites within other ecosystems) are restricted in the plan area.	Global- G5 CO- S1 KS- NA	CNHP: 3 GBIF: 3 iDigBio: 1 SEINet: 3
Plant	One-flower Flatsedge <i>Cyperus retroflexus</i>	Threats and declining trends in the plan area consistent with wetland and riparian ecosystems. The 1 known occurrence in the plan area is on the northern edge of the species' range.	Global- G5 CO- NA KS- S1	GBIF: 1 iDigBio: 1 SEINet: 2

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Taxa Group	Common Name / Scientific Name	Rationale for Identification as Potential SCC¹	Global and State Conservation Ranks²	Plan Area Occurrences by Source³
Plant	Painted Milkvetch <i>Astragalus ceramicus</i> var. <i>filifolius</i>	Threats and declining trends associated with riparian and sandsage ecosystems in the plan area. The 6 known occurrences in the plan area, which are noted to have small and local numbers of individuals, are at the southeastern edge of the species' range.	Global- G4/T4 CO- S3 KS- S1	KSNHP: 3 GBIF: 4 iDigBio: 2 SEINet: 5
Plant	Plains Ironweed <i>Vernonia marginata</i>	Threatened by and declining from groundwater depletion and invasive species in the plan area. The 6 known occurrences in the plan area (one of which consists of 5 individuals) are on the eastern edge of the species' range	Global- G5 CO- S1 KS- S1	KSNHP: 3 GBIF: 2 SEINet: 2
Plant	Poison Suckle <i>Suckleya suckleyana</i>	Threats and declining trends in the plan area consistent with wetland and playa ecosystems. There are 2 known occurrences in the plan area which are on the eastern edge of the species' range.	Global- G5 CO- NSR KS- S1	SEINet: 2
Plant	Queen's Delight <i>Stillingia sylvatica</i>	Threatened by and declining from habitat alteration from windmill and road development. The 3 occurrences in the plan area range from "abundant" to "scattered" and are on the northern edge of the species' range.	Global- G5 CO- S1 KS- NSR	CNHP: 2 GBIF: 6 iDigBio: 10 SEINet: 12
Plant	Reiuchenbach's Hedgehog Cactus <i>Echinocereus reichenbachii</i> var. <i>perbellus</i>	Threatened by and declining from oil and gas development in the plan area. There are 7 occurrences in the plan area restricted to a specific microhabitat. Population in the plan area is on the northern edge of the species' range	Global- G5/T4 CO- NSR KS- S1	KSNHP: 2 GBIF: 54 iDigBio: 8 SEINet: 20
Plant	Running Fleabane <i>Erigeron flagellaris</i>	Threatened by and declining from oil and gas development in the plan area. There is a single documented occurrence in the plan area on the eastern edge of the species' range.	Global- G5 CO- NSR KS- S1	KSNHP: 1
Plant	Sandsage Prairie-clover <i>Dalea cylindriceps</i>	Threatened by and declining from factors common to sandsage prairie in the plan area. There are 4 total known occurrences in the plan area, which are on the eastern edge of the species' range.	Global- G3 CO- S2 KS- S2	CNHP: 6 KSNHP: 6 GBIF: 13 iDigBio: 13 SEINet: 17
Plant	Shortbeak Arrowhead <i>Sagittaria brevirostra</i>	Threats and declining trends consistent with aquatic/riparian/wetland habitat in the plan area. There is a single known occurrence in the plan area that is on the western edge of the species' range.	Global- G5 CO- S1 KS- S4	GBIF: 1 iDigBio: 1 SEINet: 2
Plant	Southwestern Cloak Fern <i>Astrolepis integerrima</i>	Threatened by and declining from physical disturbance to habitat and climate stressors, such as drought. The single known occurrence in the plan area is on the northern edge of the species' range.	Global- G5 CO- S1 KS- NA	CNHP: 1 GBIF: 1 iDigBio: 1 SEINet: 1

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Plant	Springfield Bluestem <i>Bothriochloa springfieldii</i>	Threatened by and declining from alteration of habitat and physical disturbance to individuals. Between 3 and 8 total known occurrences in the plan area are on the northeastern edge of the species' range.	Global- G5 CO- S1 KS- NA	CNHP: 5 GBIF: 3 iDigBio: 2 SEINet: 6
Plant	Texas Bergia <i>Bergia texana</i>	Threatened by and declining from the factors consistent with wetland habitat in the plan area. The single known occurrence in the plan area is on the western edge of the species' range and the aquatic habitat is a restricted ecological condition in the plan area.	Global- G5 CO- S2 KS- S2	CNHP: 1 SEINet: 1
Plant	Toad Rush <i>Juncus bufonius</i>	Threatened by and declining from the factors consistent with riparian and wetland habitat in the plan area. Single known occurrence in the plan area is on the western edge of the species' range. Wetland/riparian habitat is a restricted ecological condition in the plan area.	Global- G5 CO- S4 KS- S2	GBIF: 1 iDigBio: 1 SEINet: 1
Plant	Trailing Ratany <i>Krameria lanceolata</i>	Threatened by and declining from physical disturbance and factors common to the shortgrass prairie in the plan area, particularly grazing. Half of the 20 or so occurrences in the plan area are in ecosystems that are declining in quality of habitat. While the spatial extent of the larger ecosystems this species is associated with is not restricted in the plan area, this species relies on freedom from overgrazing, areas of which there are few in the plan area, making for a restricted ecological condition in the plan area.	Global- G5 CO- S2 KS- S4	GBIF: 24 iDigBio: 16 SEINet: 24
Plant	Woolly Prairie-clover <i>Dalea lanata</i>	Threatened by overgrazing. The playa edge habitat of this species has declined in the plan area. Known from 4 occurrences in the plan area at the northern edge of the species' range.	Global- G5 CO- S2 KS- NSR	GBIF: 4 iDigBio: 2 SEINet: 5
Plant	Wright's Goldenrod <i>Solidago wrightii</i>	Threatened by loss or fragmentation of habitat and energy development. The shortgrass prairie has declined in quality in the plan area. There are between 2 and 5 known occurrences in the plan area, which is at the northern edge of the species' range.	Global- G4 CO- S2 KS- NA	GBIF: 3 iDigBio: 2 SEINet: 6
Amphibian	Chihuahuan Green Toad <i>Anaxyrus debilis</i>	Threatened by overpredation, drought, habitat conversion and fragmentation. Population and habitat have declined in the plan area resulting in extirpation from the Cimarron National Grassland. The plan area is at the northern edge of the species range. Wetland and riparian habitats are limited in the plan area.	Global- G5 CO- S2 KS- S2	CNHP: 60 GBIF: 34 iDigBio: 6
Amphibian	Couch's Spadefoot <i>Scaphiopus couchii</i>	State status is of special concern in Colorado. Species' habitat is threatened by invasive saltcedar, which has caused a reduction in habitat quality in the plan area. Population in the plan area is disjunct. Wetland and riparian habitats are limited in the plan area.	Global- G5 CO- S1 KS- NA	CNHP: 18 GBIF: 37 iDigBio: 1

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Amphibian	Plains Leopard Frog <i>Lithobates blairi</i>	State status is of special concern in Colorado and Forest Service status is RFSS. Threatened by non-native predators, infectious diseases, wetland conversion, altered hydrological regime, and grazing. Aquatic/riparian habitat in the plan area has declined. Plan area is at the western edge of the species' range. Wetland and riparian habitats are restricted in the plan area.	Global- G5 CO- S3 KS- S5	CNHP: 17 GBIF: 26 iDigBio: 13
Amphibian	Red-spotted Toad <i>Anaxyrus punctatus</i>	Threatened by Chytrid fungus, road mortality, introduced predators, climate stressors, habitat alteration, and other factors. Species thought to be extirpated from the Cimarron National Grassland and extant only in the Comanche National Grassland. The plan area is at the northern edge of the species' range. Species is considered very rare in the Grasslands with limited suitable habitat remaining.	Global- G5 CO- S4 KS- S2	GBIF: 3
Amphibian	Western Plains Narrow-mouthed Toad <i>Gastrophryne olivacea</i>	State status is of special concern in Colorado. Threatened by Ranavirus, hydrological and land use alteration. Aquatic/riparian habitat on the plan area has declined. Population in the plan area is on the northwestern edge of the species range or may represent a disjunct population. Wetland and riparian habitats are limited in the plan area; species' known distribution is restricted to the southwest corner of the Carrizo Unit of the Comanche.	Global- G5 CO- S1 KS- S5	CNHP: 11 GBIF: 6
Bird	Burrowing Owl <i>Athene cunicularia</i>	State status is threatened in Colorado and Forest Service status is RFSS. Threatened by loss of habitat, particularly suitable breeding habitat in prairie dog towns and prey base. Burrowing owls are restricted ecologically within the plan area, requiring prairie dog burrows for nesting. The prairie dog colonies in the plan area have experienced plague-induced declines in the past but currently appear to be relatively stable and at pre-plague outbreak levels. Species is endemic to shortgrass prairie and requires burrows to nest created by prairie dogs or other burrowing animals.	Global- G4 CO- S4B KS- S3B	KSNHP: 22 GBIF: 457 iDigBio: 1 IMBCR: 13
Bird	Grasshopper Sparrow <i>Ammodramus savannarum</i>	Forest Service status is RFSS. Threatened by habitat degradation from grazing and fire suppression. Robust decreasing population trends in the plan area. Population in the plan area is at the far western edge of its breeding range. Low density estimates on Cimarron Comanche NGs.	Global- G5 CO- S3B KS- S5B	GBIF: 294 iDigBio: 6 IMBCR: 207

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Taxa Group	Common Name / Scientific Name	Rationale for Identification as Potential SCC¹	Global and State Conservation Ranks²	Plan Area Occurrences by Source ³
Bird	Mountain Plover <i>Anarhynchus montanus</i>	State status is of special concern in Colorado and Forest Service status is RFSS. Threatened by habitat conversion and removal of grazing species such as prairie dogs, bison, and pronghorns. The prairie dog colonies in the plan area have experienced plague-induced declines in the past but currently appear to be relatively stable and at pre-plague outbreak levels. Population in the plan area is at the eastern edge of the breeding range. Species is a specialist that relies on prairie dog towns in short grass prairie of the Great Plains. Species is a rare summer resident in the plan area	Global- G3 CO- S2B KS- S1B	CNHP: 13 KSNHP: 1 GBIF: 44.
Bird	Pinyon Jay <i>Gymnorhinus cyanocephalus</i>	Forest Service status is RFSS. Threatened by loss of pinyon-juniper woodlands caused by long term drought and climate stressors, insects and disease. Population in the plan area is at the eastern edge of the species range. Pinyon/juniper habitat is restricted in the plan area. Although the quantity of pinyon-juniper habitat has increased in the plan area since the 1980s, quality of habitat for this species has been reduced due to a reduction in cone crops.	Global- G3 CO- S3 KS- NA	GBIF: 32 IMBCR: 1
Fish	Flathead Chub <i>Platygobio gracilis</i>	State status is of special concern in Colorado, threatened in Kansas, and Forest Service status is RFSS. Threatened by altered hydrological regime, habitat fragmentation, invasive species, overgrazing, water quality, and other factors. The species is extirpated from the historic position of its range within the Cimarron National Grassland and is now only present in the Comanche National Grassland. The plan area is at the edge of the species' range. Low relative abundance in the plan area and only a short fragment of suitable aquatic habitat in the plan area.	Global- G5 CO- S3 KS- S1	CNHP: 1 GBIF: 6 iDigBio: 1
Fish	Plains Minnow <i>Hybognathus placitus</i>	State status is endangered in Colorado, threatened in Kansas and Forest Service status is RFSS Threatened by altered hydrological regime, habitat fragmentation, non-native species, excessive drought and climate stressors. Population in the plan area was extirpated and recently re-introduced. The population in the plan area is disjunct. Only a short fragment of suitable aquatic habitat occurs in the Purgatoire River within the plan area.	Global- G4 CO- SH KS- S2	

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Taxa Group	Common Name / Scientific Name	Rationale for Identification as Potential SCC¹	Global and State Conservation Ranks²	Plan Area Occurrences by Source³
Fish	Suckermouth Minnow <i>Phenacobius mirabilis</i>	State status is endangered in Colorado. Threatened by impoundments, habitat fragmentation, non-native species, and climate stressors. Habitat quality for this species is likely decreasing in the plan area because land management activities upstream, tamarisk invasion, and hydrologic alteration of the Purgatoire River high flows. The plan area is at the edge of the species' range with low relative abundance of the species in the plan area.	Global- G5 CO- S2 KS- S5	CNHP: 1 GBIF: 5
Insect	Iowa Skipper <i>Atrytone arogos iowa</i>	Global Status as T2 that cannot be shown to be secure in the plan area.	Global- G2/T2 CO- NSR KS- S3	
Insect	Morrison's Bumble Bee <i>Bombus morrisoni</i>	Threatened by pesticides, pathogens, parasites, competition with honeybees, climate stressors, and other factors. Declining trend in habitat quality for this species due to altered fire regime, invasive cheatgrass, encroachment of woody species, and range condition in the plan area. The plan area is at the eastern edge of the species' range and species' range in the plan area is limited to the Comanche National Grassland. The highly fragmented landownership pattern of the plan area may not fully meet the species' needs for connectivity.	Global- G3 CO- S3 KS- NSR	GBIF: 5 iDigBio: 4
Reptile	Black-Necked Garter Snake <i>Thamnophis cyrtopsis</i>	Climate stressors and groundwater depletion may threaten the persistence of riparian areas that support many of the black-necked gartersnake's prey sources. Aquatic/riparian habitat has declined in the plan area. Population in the plan area is at the northern edge of its range. Species is considered rare in Colorado and aquatic/riparian habitats are restricted in the plan area.	Global- G5 CO- S2 KS- NA	CNHP: 4 GBIF: 2
Reptile	Smooth softshell turtle <i>Apalone mutica</i>	Threatened by road mortality, flooding of nests, predation on nests, off-road vehicle damage to nests, climate stressors, and stabilization of sand bars. Habitat quality is likely decreasing in the plan area because of land management activities upstream, impaired water quality, and tamarisk invasion. Plan area is at the extreme western edge of the species' range. Species has only been documented in the Purgatoire River of the Timpas Unit of the Comanche. Only a short fragment of suitable aquatic habitat occurs in the plan area.	Global- G5 CO- S1 KS- S4	CNHP: 1 GBIF: 1

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Taxa Group	Common Name / Scientific Name	Rationale for Identification as Potential SCC ¹	Global and State Conservation Ranks ²	Plan Area Occurrences by Source ³
Reptile	Western Massassauga <i>Sistrurus tergeminus</i>	Threatened by anthropogenic persecution, loss and fragmentation of habitat, grazing, encroachment by invasive vegetation, loss of burrows for over-wintering, prescribed fire, climate stressors, and other factors. The population and suitable habitat have likely declined in the plan area compared to historical abundance levels because of extended drought conditions, groundwater depletion, and shrub encroachment. Population in the plan area is disjunct. Species seems to have narrow ecological tolerances and has only been documented in the Timpas Unit of the Comanche	Global- G3 CO- S2 KS- S4	CNHP: 5 GBIF: 4

¹ **USDA Forest Service Species Status Definitions:** RFSS- regional forester sensitive species.

² **Global (G), infraspecific taxon (T), and subnational (S) conservation status rank definitions:** 1- Critically Imperiled, 2- Imperiled, 3- Vulnerable, 4- apparently secure, 5- Secure, SX- Presumed extirpated, SH- Possibly extirpated, NSR- No status rank, NA- Not applicable; State acronyms: CO- Colorado and KS- Kansas. Sources: USFS 2023, USFS 2024.

³ Observation records are reviewed in more detail in the species evaluations.

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Table C-2. Habitat Association, Key Ecosystem Characteristics, Trends, and Threats for Potential Species of Conservation Concern (SCC)

Common Name/ Scientific Name	Habitat Association in the Plan Area	Key Ecosystem Characteristics ¹	Declining Trends in Populations or Habitat in the Plan Area ¹	Significant Threats to Populations or Ecological Conditions the Species Depends On ¹
Beaked Spikerush <i>Eleocharis rostellata</i>	Riparian and wetland	Plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources. Habitat: The single occurrence in the plan area is along the Cimarron River which has declined in spatial extent and quality of habitat due to groundwater depletion moving the system from perennial to ephemeral flow. Trends common in the habitat type.	Population: Climate stressors, drought, and groundwater depletion. Habitat: Climate stressors, drought, and groundwater depletion. Threats common in the habitat type.
Bigelow's Bluegrass <i>Poa bigelovii</i>	Shortgrass prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: While the spatial extent of the shortgrass prairie is stable in the plan area the quality of that habitat has a declining trend.	Population: Grazing intensity. Habitat: Grazing intensity and threats associated with shortgrass prairie habitat including oil and gas development, invasive species, climate stressors, and the knock-on effects of fire suppression.
Black Grama <i>Bouteloua eriopoda</i>	Canyonlands, shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Trends consistent with shortgrass prairie (quality of habitat is declining) and canyonlands (woody encroachment from fire suppression resulting in decline in perennial grasses, e.g. this species) habitats. Trends common in the habitat type.	Population: Grazing intensity and extreme fire. Habitat: Physical disturbance, land conversion to agriculture, energy development, and woody encroachment. Threats common in the habitat type.
Black Willow <i>Salix nigra</i>	Riparian and wetland	Plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources. Habitat: Trends consistent with wetland habitat in the plan area (declining trend from ground-water depletion). Trends common in the habitat type.	Population: High-severity fire, drought, groundwater depletion, river management, insects and disease Habitat: High-severity fire, drought, groundwater depletion, river management, insects and disease. Threats common in the habitat type.

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Common Name/ Scientific Name	Habitat Association in the Plan Area	Key Ecosystem Characteristics ¹	Declining Trends in Populations or Habitat in the Plan Area ¹	Significant Threats to Populations or Ecological Conditions the Species Depends On ¹
Blue Three-awn Grass <i>Aristida purpurea</i> var. <i>nealleyi</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Trends common to the variety of habitat types used by this species, particularly as it relates to woody encroachment into this species' microhabitat.	Population: No known threats from the consulted sources. Habitat: General threats include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, recreation, invasive non-native/alien species, droughts, renewable energy infrastructure, and fire and fire suppression (CPW 2015, Rohweder 2022). Threats common in the habitat type.
Buckley's Beardtongue <i>Penstemon buckleyi</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: The habitat at the single known occurrence in the plan area has a declining trend from user created trails, dispersed camping sites and facility development from 1988 to present. Trends common in the habitat type.	Population: No known threats from the consulted sources. Habitat: Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non- native/alien species, droughts, renewable energy, and fire and fire suppression. Threats common in the habitat type.
California Amaranth <i>Amaranthus californicus</i>	Riparian and wetland	Plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources. Habitat: Trends common in the playa habitat type.	Population: Livestock grazing and drought. Habitat: Drought. Threats common in the habitat type.

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Cardinal-flower <i>Lobelia cardinalis</i>	Riparian and wetland	Plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources. Habitat: riparian/wetland habitat in the plan area has declined.	Population: Climate stressors, drought, and groundwater depletion. Habitat: Climate stressors, drought, and groundwater depletion.
Cobea Beardtongue <i>Penstemon cobaea</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: The record in the plan area occurs in sandsage prairie which is declining in quality in the plan area.	Population: No known threats from the consulted sources. Habitat: Livestock grazing and oil and gas exploration that can influence vegetation patterns and species composition across the grasslands (USDA Forest Service 2005a).
Colorado Gentian <i>Frasera coloradensis</i>	Shortgrass prairie, sandsage prairie, and canyonlands	Species composition and cover by life form	Population: Population is probably stable with some moderate historical declines related to agricultural practices. Habitat: Surface outcrop habitat trend is Likely relatively unchanged (USDA Forest Service 2018) but the shortgrass prairie in the plan area has a declining trend in quality of habitat in the plan area.	Population: Overgrazing, road maintenance, herbicide, and energy development. Habitat: Panjabi and Smith (2014) report that this species is primarily threatened by wind energy development (pers. Comm. (Hazlett 2004)). Moderately threatened by agricultural and road management practices such as herbicide application.

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Comb-like Evening- primrose <i>Oenothera coronopifolia</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Species uses habitat described in the plan area as shortgrass prairie, sandsage prairie, and juniper woodlands. Shortgrass prairie has a declining trend in quality in the plan area, sandsage prairie is declining in quality in the plan area, while juniper woodlands have increased in some parts of the plan area.	Population: No known threats from the consulted sources. Habitat: Housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non- native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022).
Cooley's Mimosa <i>Desmanthus cooleyi</i>	Shortgrass prairie, sandsage prairie, and canyonlands	Species composition and cover by life form	Population: The species is considered extirpated from Morton County, so the species has declined in at least a portion of the plan area. Habitat: species can use varied habitat types, including sandy, shortgrass prairie hillsides, ravines, washes, roadsides, and disturbed habitat; no discernable trend.	Population: Possibly grazing and roadside impacts since most extant occurrences are associated with roads. Habitat: Threats common in the habitat type.
Cutleaf Germander <i>Teucrium laciniatum</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Wetland/riparian habitat has declined in the plan area.	Population: No known threats from the consulted sources. Habitat: Climate stressors.
Dwarf Milkweed <i>Asclepias involucreata</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Shortgrass prairie is stable in Kansas but has deviated in eastern Colorado. Juniper woodlands have increased in distribution and abundance in the plan area in some ecosystems (canyonlands of the Comanche NG).	Population: Livestock grazing and invasive species. Habitat: Habitat is moderately vulnerable to climate stressors. Heavy continuous livestock grazing, military training, invasive non-native species, altered fire regime (fire suppression).

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Ear Muhly <i>Muhlenbergia arenacea</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Desert grasslands are declining. Sandsage habitat is declining in quality of habitat.	Population: No known threats from the consulted sources. Habitat: Desert grasslands are threatened by climate stressors and drought, livestock grazing, wildfire, and woody plant and invasive species encroachment (UA Wrangle 2024).
Englemann's Goldenweed <i>Oenopsis engelmannii</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Trends associated with the shortgrass prairie and canyonlands.	Population: No known threats from the consulted sources. Habitat: Threats common in the shortgrass prairie and canyonlands.
Fendler's Three-awn grass <i>Aristida purpurea</i> var. <i>fendleriana</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Trends common in the various habitat types particularly for shortgrass prairie, sandsage, and the tree-free portion of the canyonlands and juniper woodlands where woody encroachment is resulting in a declining trend in this species' particular ecological conditions.	Population: No known threats from the consulted sources. Habitat: General threats include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, recreation, invasive/non-native species, droughts, renewable energy infrastructure, and fire and fire suppression (Colorado State Wildlife Action Plan 2015, Kansas State Wildlife Action Plan 2022). Threats common in the habitat type.

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Flax-leaf Stenosiphon <i>Stenosiphon linifolius</i>	Shortgrass prairie, sandsage prairie, and canyonlands	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Sandsage prairie and shortgrass prairie have declining trends in habitat quality.	Population: No known threats from the consulted sources. Habitat: Housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, habitat shifting and alteration due to climate stressors, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (Colorado State Wildlife Action Plan 2015, Kansas State Wildlife Action Plan 2022) Threats common in the habitat types.
Fragrant Indigobush <i>Amorpha nana</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Pinyon-juniper habitat has expanded into neighboring communities, at both higher and lower elevations. Rocky slope habitat is limited to areas along rivers and their tributaries.	Population: Livestock grazing and climate stressors. Habitat: Land use including dispersed recreation and livestock grazing and the presence of invasive cheatgrass.
Giant Dropseed <i>Sporobolus giganteus</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Sandsage prairie has declined in habitat quality	Population: No known threats from the consulted sources. Habitat: Species is adapted to withstand dry conditions and disturbed areas. General threats include grazing, fire and energy development.
Great Plains Flatsedge <i>Cyperus lupulinus</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Shortgrass prairie is declining in the quality of habitat.	Population: Climate stressors and drought. Habitat: Threats associated with the shortgrass prairie including climate stressors and drought.

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Greene Milkweed (Wheel Milkweed) <i>Asclepias uncialis</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: Most of the known populations are small, discrete, and isolated with large areas of apparently suitable habitat being unoccupied. Habitat: Shortgrass prairie habitat in Kansas is declining and in Colorado there's a widespread deviation when it comes to composition due to grazing. Sandsage prairie has a declining trend in habitat quality.	Population: Gene flow between populations is limited due to isolation and could lead to a decline in the species viability over time, in addition to their extremely low rates of sexual reproduction. Specific threats to extant occurrences include recreational use, agricultural use, and military tank traffic. Other threats are population limitation by unknown biological requirements, altered disturbance regime, habitat loss, spread of exotic species, and climate stressors. Habitat: Species experienced historical declines due to the conversion of lands for agriculture and residential development. More recent declines in habitat quality and population sizes are due to incompatible land uses, like heavy grazing, invasive species, and off-road vehicle use
Gummy Lovegrass <i>Eragrostis</i> <i>curtipedicellata</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Shortgrass prairie and riparian (cottonwood gallery) are declining.	Population: Grazing with high stocking density can reduce standing biomass. Habitat: Threats common in the habitat types.
Hartweg's Sundrops <i>Calylophus hartwegii</i> ssp. <i>pubescens</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Species' known habitat within the plan area shows no evidence of disturbance and therefore is considered stable but shortgrass prairie in the plan area has a declining trend in habitat quality.	Population: Drought. Habitat: Drought.

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Harvard's Three-awn Grass <i>Aristida harvardii</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Trends common in the shortgrass and sandsage prairie.	Population: No known threats from the consulted sources. Habitat: Threats common in the habitat type.
Hoary Tansy-aster <i>Dieteria canescens</i> var. <i>glabra</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Sandsage habitat is declining in quality in the plan area.	Population: No known threats from the consulted sources. Habitat: Disturbance by oil and gas drilling, altered native vegetation, livestock farming and ranching, recreational activities, and fire suppression.
Honey Mesquite <i>Prosopis glandulosa</i> var. <i>glandulosa</i> ; <i>Prosopis glandulosa</i>	Shortgrass prairie, sandsage prairie, and riparian areas	Species composition, cover by life form, plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources. Habitat: Riparian areas are declining in the plan area, but sandy, dry soils are stable. Sandsage prairie is declining.	Population: Warming temperatures and drier conditions are impacting riparian habitat, but the species is also adapted to dry, sandy soils. Habitat: Climate stressors, drought, and conditions exacerbating encroachment of non-native invasives (e.g., tamarisk). Sandsage prairie is threatened by grazing, fire suppression resulting in woody encroachment, and energy development.
Jame's Beardtongue <i>Penstemon jamesii</i>	Shortgrass prairie, sandsage prairie, and riparian areas	Species composition, cover by life form, plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources. Habitat: Species appears to be a habitat generalist.	Population: No known threats from the consulted sources. Habitat: Prescribed fire and wildfire, road building and maintenance, livestock grazing, interspecific plant species competition, and climate stressors (Heil et al. 2006).
Large-bract Scurfpea <i>Pediomelum</i> <i>cuspidatum</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Trends consistent with shortgrass and sandsage prairie.	Population: Livestock grazing and habitat fragmentation. Habitat: Livestock grazing.

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Least Duckweed <i>Lemna minuta</i>	Lakes, streams, and riparian areas	Water quantity, water quality, shoreline stability, aquatic habitat complexity, connectivity, and channel stability and floodplain connectivity, plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources. Habitat: Aquatic habitat is declining in the plan area.	Population: Drought, wetland development, and livestock grazing. Habitat: Climate stressors, wetland development, and livestock grazing.
Longleaf Greeneyes <i>Berlandiera lyrata</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Pronounced habitat degradation has occurred in the heart of this species' largest occurrence in the Cimarron National Grassland.	Population: Overgrazing, oil and gas development. Habitat: Overgrazing, oil and gas development.
Low Silverbrush <i>Argythamnia humilis</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: At one of the two known locations (Withers Canyon Corral) there is a declining trend as evidenced by an increase in disturbed area associated with the Corral and what appears to be storage for road materials, a building, and associated parking areas. Habitat: Trends common in the shortgrass and sandsage prairie.	Population: Grazing Habitat: Grazing, military training, invasive non-native species, altered fire regime, conversion to agriculture, fragmentation from roads and development, gas and oil exploration and extraction. Moderate vulnerability from climate stressors.
May Grass <i>Phalaris caroliniana</i>	Riparian and wetland	Plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources. Habitat: Wetland and riparian habitat have declined in the plan area.	Population: No known threats from the consulted sources. Habitat: Habitat alteration from groundwater depletion and invasive species.

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Narrowleaf Purple Coneflower <i>Echinacea angustifolia</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources, but the species has declined across its range. Habitat: habitat quality and quantity in the plan area has declined because of oil and gas development in the species' occupied habitat and fire suppression.	Population: Excessive commercial harvest, inbreeding depression from habitat fragmentation, oil and gas development. Habitat: Fire suppression, mowing, herbicide use to control noxious weeds, conversion of prairie to pasture, intensive grazing, and oil and gas development.
Neally's Dropseed <i>Sporobolus nealleyi</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Trends common in the shortgrass and sandsage prairie.	Population: No known threats from the consulted sources. Habitat: Sandsage prairie is threatened by grazing, fire suppression resulting in woody encroachment, and energy development.
New Mexico Blackberry <i>Rubus neomexicanus</i>	Canyonlands, streams, and riparian areas	Species composition, cover by life form, water quantity, water quality, aquatic habitat complexity, connectivity, channel stability, plant community composition, hydrologic alteration, and upland and stream watershed condition	Population: No known trends from the consulted sources. Habitat: Riparian habitat in the plan area is declining, species is associated with moist sites.	Population: No known threats from the consulted sources. Habitat: Habitat alteration.
One-flower Flatsedge <i>Cyperus retroflexus</i>	Riparian and wetland areas	Plant community composition, ground disturbance and hydrologic alteration, and upland and stream watershed condition	Population: No known trends from the consulted sources, Habitat: Riparian ecosystems in the plan area are declining from groundwater depletion and invasive species.	Population: Possibly disturbance by large mammals and livestock. Habitat: Grazing pressure, ground water depletion, climate stressors, and invasive species.

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Painted Milkvetch <i>Astragalus ceramicus</i> <i>var. filifolius</i>	Sandsage prairie, shortgrass prairie, and riparian areas	Species composition, cover by life form, plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: populations on unstabilized sand dunes or riverbanks or bars may be subject to local extinction due to the ephemeral nature of the substrate. Habitat: Trend in the habitat is not known, although this species requires early successional habitat and the occurrences in the plan area are associated with riparian (cottonwood/juniper), dunes and alluvium, and sandsage. Riparian and sandsage ecosystems have declining trends in the plan area.	Population: In the Kansas herbarium records it indicates populations are usually small and local. These may be vulnerable to local extinction from overgrazing by livestock or conversion of habitat to cropland and oil and gas development. In addition, populations on unstabilized sand dunes or river banks or bars may be subject to local extinction due to the ephemeral nature of the substrate (Region 2 Sensitive Species Evaluation Forms). Habitat: Painted milkvetch is found exclusively on substrates derived from wind-blown sands and is frequently from loose sands in herbarium specimen labels. Preferred habitat is subject to frequent, natural change, vulnerable to conversion to croplands or change in community composition due to overgrazing by livestock and fire suppression.
Plains Ironweed <i>Veronia marginata</i>	Riparian areas	Plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources. Habitat: The collection remarks describe “weedy prairie” habitat where specimens were collected; predominance of weeds and groundwater depletion represent a decline in habitat quality.	Population: No known threats from the consulted sources. Habitat: Non-native invasive species and groundwater depletion. Threats associated with the habitat type.

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Poison Suckle <i>Suckleya suckleyana</i>	Riparian areas, wetlands, and playa lakes	Plant community composition, ground disturbance and hydrologic alteration, upland and upstream watershed condition, playa landscape distribution, drainage patterns, and playa health	Population: No known trends from the consulted sources.. Habitat: The number of playas in the plan area is stable, but size and water holding capacity have decreased, primarily from sedimentation (Ecological Integrity Worksheet 2024). Playa clusters in the plan area have decreased due to long-term drought, leaving more isolated playas (Ecological Integrity Worksheet 2024). Condition, or health, of playas is considered compromised because of past activities degrading playas and their contributing areas	Population: Changes to hydrologic conditions and invasive species. Habitat: Changes to hydrologic conditions.
Queen's Delight <i>Stillingia sylvatica</i>	Sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: May have declined due to windmill and road development; sandsage has a declining trend in habitat quality in the plan area.	Population: Overcollection for the medicinal plant industry. Habitat: Overgrazing, fire and trampling; high vulnerability to climate stressors.
Reiuchenbach's Hedgehog Cactus <i>Echinocereus reichenbachii</i> var. <i>perbellus</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: Available survey data shows a stable trend in the few places where occurrences have been re- visited. Habitat: quantity and quality have declined in the plan area because of oil and gas development.	Population: Oil and gas development, collection for the horticultural trade, competition with invasive prickly pear cactus. Habitat: Oil and gas development, sand/gravel quarries, land use change, landscape fragmentation, and climate stressors.

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Common Name/ Scientific Name	Habitat Association in the Plan Area	Key Ecosystem Characteristics ¹	Declining Trends in Populations or Habitat in the Plan Area ¹	Significant Threats to Populations or Ecological Conditions the Species Depends On ¹
Running Fleabane <i>Erigeron flagellaris</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: habitat in the plan area has declined because of natural gas pipelines that overlap species' occurrence polygon.	Population: Oil and gas development. Habitat: Oil and gas development.
Sandsage Prairie-clover <i>Dalea cylindriceps</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: sandsage habitat quality and habitat for this species has declined due to heavy off-road vehicle use in its floodplain habitat and grazing impacts on bank erosion.	Population: Overgrazing, invasive species including cheatgrass, mechanical damage from recreation, and potentially road maintenance. Habitat: Overgrazing, invasive species including cheatgrass, off-road vehicle use, and potentially road maintenance.
Shortbeak Arrowhead <i>Sagittaria brevirostra</i>	Riparian and wetland	Plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources. Habitat: riparian and wetland habitat in the plan area has declined.	Population: Climate stressors, drought, and groundwater depletion. Habitat: Climate stressors, drought, and groundwater depletion.
Southwestern Cloak Fern <i>Astrolepis integerrima</i>	Canyonlands	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Trends associated with the canyonlands habitat type.	Population: Drought and wildfire. Habitat: Helium mining, pipelines, road work, recreation, climate stressors, and livestock grazing.
Springfield Bluestem <i>Bothriochloa springfieldii</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Non-artificial waterways that could be used by this species are declining, as well as the plains and desert shrub communities.	Population: No known threats from the consulted sources. Habitat: Wildfire, grazing, climate stressors, and agricultural development in the plains and desert shrub communities.

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Common Name/ Scientific Name	Habitat Association in the Plan Area	Key Ecosystem Characteristics ¹	Declining Trends in Populations or Habitat in the Plan Area ¹	Significant Threats to Populations or Ecological Conditions the Species Depends On ¹
Texas Bergia <i>Bergia texana</i>	Riparian and wetland	Plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources. Habitat: Playa wetlands are declining due to sedimentation.	Population: Livestock grazing, invasive species, and drought. Habitat: Livestock grazing, roads, invasive species, drought, and wetland modification.
Toad Rush <i>Juncus bufonis</i>	Riparian and wetland	Plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources. Habitat: riparian and wetland habitat in the plan area has declined.	Population: No known threats from the consulted sources. Habitat: Climate stressors, drought, and groundwater depletion.

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Common Name/ Scientific Name	Habitat Association in the Plan Area	Key Ecosystem Characteristics ¹	Declining Trends in Populations or Habitat in the Plan Area ¹	Significant Threats to Populations or Ecological Conditions the Species Depends On ¹
Trailing Ratany <i>Krameria lanceolata</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Half of the documented occurrences are from ecosystems that have declining trends in either habitat quantity, quality, or both in the plan area.	Population: Out of 20 observations, seven of the known occurrences are found in the vicinity of abandoned and active oil and gas well activity sites. Human activity associated with oil and gas wells can impact individuals by driving over them or trampling and potentially uprooting the plant. Habitat: Most observations occurred within the western great plain's shortgrass prairie. Common stressors and threats include fragmentation, altered fire regime, overgrazing by livestock, and invasive species (in the less xeric regions). Fire suppression and certain grazing patterns such as continuous heavy grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. The short grasses that dominate this system are extremely drought- and grazing-tolerant although continuous heavy grazing and extended drought (3-4 years) can reduce cover of dominant species. (NatureServe 2024).
Wooly Prairie-clover <i>Dalea lanata</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: Species can use varied sandy habitats including sandsage prairie and playas which have a declining trend in quality.	Population: Overgrazing. Habitat: Threats common in the habitat types.

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Wright's Goldenrod <i>Solidago wrightii</i>	Canyonlands	Species composition and cover by life form	Population: No known trends from the consulted sources. Habitat: The shortgrass prairie habitat is stable in Kansas but has deviated from historical conditions regarding composition in eastern Colorado. The woodlands have shown an increase in distribution.	Population: Habitat loss and fragmentation. Habitat: Climate stressors, livestock grazing, and fire suppression as well as disturbances that can fragment the habitat such as energy development.

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Common Name/ Scientific Name	Habitat Association in the Plan Area	Key Ecosystem Characteristics ¹	Declining Trends in Populations or Habitat in the Plan Area ¹	Significant Threats to Populations or Ecological Conditions the Species Depends On ¹
Chihuahuan Green Toad <i>Anaxyrus debilis</i>	Shortgrass prairie, sandsage prairie, and riparian and wetland areas	Species composition, cover by life form, Plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: A repatriation effort was initiated by the Kansas Department of Wildlife and Parks (Taggart 1997) to introduce the species back into managed areas of their former range in Kansas. Releases were made in 1991, 1992, and 1993 at several sites in the Cimarron National Grassland. Despite annual surveys at the release sites since 2001, no Chihuahuan Green Toads have been re-discovered. Habitat: Taggart (1997) states: "Collins and Collins (1991) thoroughly studied the herpetofauna of the Cimarron National Grassland and indicated that the severe change in habitat conditions due to the drought of the 1930's, combined with the prevailing farming and ranching practices at that time, resulted in the extirpation of Bufo debilis from Morton County and adjacent areas. Morton County was one of the most devastated areas during the Dust Bowl. Today 43,777 ha of Morton County has been incorporated into the Cimarron National Grassland and reseeded to native grasses and forbs, thereby restoring suitable habitat and offering protection under the auspices of the United States Forest Service."	Population: Enigmatic declines have had a particularly major impact on toads in the Bufonidae family. In the plan area, Lambert and Gaughan, and Sivils et al. in (Colorado Natural Heritage Program 2020f) indicated that the area was actively grazed and could negatively affect this species. Sivils also commented that over-predation was a threat (Colorado Natural Heritage Program 2020f). Habitat: Locally threatened by conversion of desert or grassland habitat to human uses and probably also by pesticide use. Separation barriers include busy major highway such that toads rarely if ever cross successfully; roads with nonpermeable barriers to toad movement; urbanized areas dominated by buildings and pavement (NatureServe 2024d). Studies of herpetofauna of the Cimarron National Grassland indicated that the severe change in habitat conditions due to the drought of the 1930s, combined with the prevailing farming and ranching practices at that time, resulted in the extirpation of Bufo debilis from Morton County and adjacent areas. Morton County was one of the most devastated areas during the Dust Bowl (Taggart 1997).

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Couch's Spadefoot <i>Scaphiopus couchii</i>	Shortgrass prairie, sandsage prairie, playa wetlands, and riparian and wetland areas	Species composition, cover by life form, plant community composition, ground disturbance and hydrologic alteration, upland and upstream watershed condition, playa landscape distribution, drainage patterns, and playa health	Population: No known trends from the consulted sources. Habitat: Habitat has likely declined to some degree in the past due to exotic species (weeds). Aquatic/riparian habitat on the plan area has declined.	Population: Habitat loss, climate stressors, and road mortality. Habitat: Habitat loss, grazing and invasive species (<i>Tamarix</i> spp., weeds).
Plains Leopard Frog <i>Lithobates blairi</i>	Riparian and wetland areas	Plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: Population trend in the plan area is uncertain but declines on the Comanche National Grassland are suspected. Habitat: Aquatic and riparian in the plan area has declined.	Population: Habitat loss, invasive species, and infectious diseases. Habitat: Drought, habitat loss and alteration, groundwater depletion, livestock grazing, and agricultural development.
Red-spotted Toad <i>Anaxyrus punctatus</i>	Canyonlands, shortgrass prairie, sandsage prairie, and riparian areas and non-playa wetlands.	Species composition, cover by life form, plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources; species is thought to be extirpated from the Cimarron National Grassland and extant only in the Comanche National Grassland. Habitat: Aquatic and riparian habitat in the plan area has declined.	Population: Enigmatic declines have had a particularly major impact on toads in the Bufonidae family. Other threats include Chytrid fungus, flash flooding, road mortality, introduced predators, and climate stressors including changes to precipitation patterns. Habitat: Urbanization, loss of wetlands, riparian modification, dam building, agricultural runoff, gypsum mining, overgrazing, and Red Cedar encroachment.

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Western Plains Narrow- mouthed Toad <i>Gastrophryne olivacea</i>	Shortgrass prairie, sandsage prairie, and rivers, and streams, ponds, and riparian areas	Species composition, cover by life form, water quantity, water quality, aquatic habitat complexity, connectivity, and channel and shoreline stability and floodplain connectivity, plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources. Habitat: Aquatic and riparian habitat on the plan area has declined.	Population: Ranavirus. Habitat: Hydrological alteration, land use alteration such as conversion to cropland, pesticide runoff, and climate stressors.

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Common Name/ Scientific Name	Habitat Association in the Plan Area	Key Ecosystem Characteristics ¹	Declining Trends in Populations or Habitat in the Plan Area ¹	Significant Threats to Populations or Ecological Conditions the Species Depends On ¹
Burrowing Owl <i>Athene cunicularia</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: Population trends are declining in the bird conservation region containing the plan area. There is no specific robust data of population trend in the plan area. Within the Shortgrass Prairie Bird Conservation region (BCR 18), Integrated Monitoring in Bird Conservation Regions (IMBCR) population trends are declining. North American Breeding Bird Survey (BBS) trends indicate the population is uncertain in Colorado, declining in Kansas, and declining nation-wide. Habitat: Habitat has potentially decreased in quality. The species often makes use of prairie dog habitat, which also appears to be relatively stable or at pre-plague outbreak levels in the plan area (see black-tailed prairie dog Evaluation). Fire deficits due to fire suppression are also most pronounced on the Timpas Unit of the Comanche and parts of the Carrizo Unit of the Comanche.	Population: Loss of prairie dog towns and ongoing prairie dog management. Human disturbance near nesting areas, illegal shooting, predation from other raptors, fence/powerline collisions, drowning in stock tanks, rodenticides, and pesticides are known threats. Avian influenza is also becoming more prevalent in North America and is particularly harmful to raptors (Runstandler and Puryear 2024). Habitat: Loss of habitat, particularly suitable breeding habitat in prairie dog towns and prey base is the top threat.

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Common Name/ Scientific Name	Habitat Association in the Plan Area	Key Ecosystem Characteristics ¹	Declining Trends in Populations or Habitat in the Plan Area ¹	Significant Threats to Populations or Ecological Conditions the Species Depends On ¹
Grasshopper Sparrow <i>Ammodramus savannarum</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: Surveys conducted by the Bird Conservancy of the Rockies indicate robust decreasing trends in the Grasshopper sparrow population in the Cimarron and Comanche National Grasslands (-21.99%) and in the Shortgrass Prairie Bird Conservation Region (BCR18). The USGS has also estimated declining trends in both Colorado and Kansas. eBird reports decreasing trends in Kansas Habitat: Shortgrass prairie is stable in Kansas but has deviated in eastern Colorado. Sandsage prairie is declining in both Kansas and Colorado.	Population: Extensive loss of native grasslands through urban and agricultural development and habitat degradation from grazing and fire suppression have been the primary factors in this species' long-term population decline. Habitat: Agricultural conversion, overgrazing from livestock, and habitat conversion from human use as well as energy development, wildfires, and climate stressors, and drought.
Mountain Plover <i>Anarhynchus montanus</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: There is no specific population trend in the plan area. Surveys conducted by the Bird Conservancy of the Rockies indicate robust decreasing trends (-10.62 %) in the Mountain Plover population in the Shortgrass Prairie Bird Conservation Region in Colorado (CO-BCR18). BBS indicates population decrease in the Short Grass Prairie Region (BCR 18) (-2.67 %). Habitat: No clear loss of habitat in the plan area. The species often makes use of prairie dog habitat, which also appears to be relatively stable or at pre-plague outbreak levels in the plan area.	Population: The only modern direct threat to the species is occasional mortality from agricultural practices. Habitat: Within the plan area, removal of grazing species such as prairie dogs, bison, and pronghorns. Off plan area much habitat has been converted to agriculture, housing, or other non-naturalistic conditions.

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Pinyon Jay <i>Gymnorhinus cyanocephalus</i>	Canyonlands	Species composition and cover by life form	Population: No population trends specific to the plan area are available. BBS reports decreasing trends in Colorado and in the United States. eBird reports an increasing trend in Colorado. Habitat: Due to long-term drought conditions and increase in beetle kill, pinyon juniper forests in the Rocky Mountain Region are dying back and cone crops less abundant which makes food resources scarcer and more unpredictable for jays.	Population: Loss of pinyon-juniper woodlands caused by long term drought and climate stressors, insects and disease directly contribute to the pinyon jay decline. Wildfire is a secondary threat. Habitat: Removal of trees to accomplish other management priorities, long-term fire suppression, changes in woodland age and tree density, and changing climatic conditions that cause reduced piñon nut production and increased piñon pine mortality. Other threats include energy development in piñon-juniper woodlands, commercial piñon nut collection and the decline of insect populations.
Flathead Chub <i>Platygobio gracilis</i>	Freshwater river	Water quantity, water quality, aquatic habitat complexity, connectivity, and channel stability and floodplain connectivity	Population: The species is believed to be extirpated from the historic position of its range within the Cimarron National Grassland and is now only present in the Comanche National Grassland. Trends in time also indicate that relative abundance of flathead chub is getting lower in the Comanche National Grassland. Habitat: quantity and quality has decreased in the plan area, as evidenced by the extirpation of the species from the Cimarron River in the Cimarron National Grassland.	Population: Heavy metal contamination, severe storms, non-native piscivores, large impoundments and reservoirs, passage barriers and habitat fragmentation, competition for resources with other fish species, and groundwater depletion represent threats to populations. Habitat: Altered hydrological regime (surface or aquifer), wastewater from coalbed methane production, heavy metal contamination from mining and quarrying, large impoundments and reservoirs, passage barriers and habitat fragmentation, climate stressors, groundwater depletion, and overgrazing.

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Common Name/ Scientific Name	Habitat Association in the Plan Area	Key Ecosystem Characteristics ¹	Declining Trends in Populations or Habitat in the Plan Area ¹	Significant Threats to Populations or Ecological Conditions the Species Depends On ¹
Plains Minnow <i>Hybognathus placitus</i>	Freshwater river	Water quantity, water quality, aquatic habitat complexity, connectivity, and channel stability and floodplain connectivity	Population: Population in the plan area was extirpated and recently re-introduced in 2023; insufficient information to determine current population trend. Habitat: Quality is likely decreasing in the plan area because land management activities upstream, tamarisk invasion, and hydrologic alteration of the Purgatoire River high flows.	Population: Non-native fish species. Habitat: Water management and flow modification, fish passage barriers, excessive drought and climate stressors.
Suckermouth Minnow <i>Phenacobius mirabilis</i>	Freshwater river	Water quantity, water quality, aquatic habitat complexity, connectivity, and channel stability and floodplain connectivity	Population: Population trend in the plan area is not known, but no sources suggest a declining trend. Habitat: Quality is likely decreasing in the plan area because land management activities upstream, tamarisk invasion, and hydrologic alteration of the Purgatoire River high flows.	Population: De-watering of streams and potential spread of nonnative aquatic species. Habitat: Dams/impoundments, fish passage barriers, and climate stressors.
Iowa Skipper <i>Atrytone arogos iowa</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources. There is only one known occurrence record from the plan area. Habitat: Declining trend in habitat quality due to altered fire regime, invasive cheatgrass, encroachment of woody species, and range condition in the plan area.	Population: Wildfires and prescribed burning if not conducted carefully due to this subspecies being completely reliant on grasses for all of its life stages. Habitat: Fire (both wildland and prescribed), overgrazing, fragmentation and disturbance from anthropogenic uses, roads, non-native invasive species, and drought.

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Common Name/ Scientific Name	Habitat Association in the Plan Area	Key Ecosystem Characteristics ¹	Declining Trends in Populations or Habitat in the Plan Area ¹	Significant Threats to Populations or Ecological Conditions the Species Depends On ¹
Morrison's Bumble Bee <i>Bombus morrisoni</i>	Shortgrass prairie and sandsage prairie	Species composition and cover by life form	Population: No known trends from the consulted sources, but species has a decreasing population trend across its range. Habitat: Declining trend in habitat quality due to altered fire regime, invasive cheatgrass, encroachment of woody species, and range condition in the plan area.	Population: Pesticides, pathogens, parasites, competition with honeybees, climate stressors, and reduced genetic diversity. Habitat: Invasive species, altered fire regime, agricultural conversion, urbanization, habitat loss and habitat fragmentation, overgrazing, lithium mine and solar development, road development, encroachment of woody species, and climate stressors.
Black-necked Garter Snake <i>Thamnophis cyrtopsis</i>	Shortgrass prairie, sandsage prairie, canyonlands, riparian areas	Species composition, cover by life form, plant community composition, ground disturbance and hydrologic alteration, and upland and upstream watershed condition	Population: No known trends from the consulted sources. Habitat: Aquatic/riparian habitat has declined in the plan area.	Population: No known threats from the consulted sources. Habitat: Threats to habitat include loss or degradation from land conversion (urbanization or farmland) and deforestation, as well as climate stressors and groundwater depletion which are directly impacting the availability of perennial water sources.
Smooth softshell Turtle <i>Apalone mutica</i>	Riparian areas and non-playa wetlands, rivers	Plant community composition, ground disturbance and hydrologic alteration, upland and upstream watershed condition, water quantity, water quality, aquatic habitat complexity, connectivity, and channel stability and floodplain connectivity	Population: No known trends from the consulted sources.. Habitat: Habitat quality is likely decreasing in the plan area because of land management activities upstream, impaired water quality, and tamarisk invasion.	Population: Road mortality, flooding of nests, predation on nests, off-road vehicle damage to nests, climate stressors. Habitat: Roads, aquatic passage barriers, off-road vehicle use in nesting habitats; dams and dam operations, stabilization of sand bars by vegetation.

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Western Massassauga <i>Sistrurus tergeminus</i>	Rivers, streams, lakes, and ponds	Water quantity, water quality, aquatic habitat complexity, connectivity, and channel and shoreline stability and floodplain connectivity	Population: No known trends from the consulted sources., but likely that the species has declined on the National Grasslands compared to historical abundance levels. Habitat: quality likely declining because of extended drought conditions, groundwater depletion, and shrub encroachment.	Population: Predation by native predator, road mortality, and anthropogenic persecution. Habitat: Habitat loss and fragmentation, grazing, encroachment by invasive vegetation, loss of burrows for over- wintering, prescribed fire, energy production, high density road networks, and climate stressors.

¹See species evaluations and Ecology worksheets for additional information and definitions.

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Table C-3. Species Initially Considered for Species of Conservation Concern (SCC), but Removed from Further Consideration

Taxa Group	Common Name/Scientific Name	Determination¹	Rationale for Removal from Consideration²
Amphibian	Blanchard's Cricket Frog <i>Acris blanchardi</i>	Does not meet "Native and Known to Occur" criteria	Native, but species may be extirpated from plan area
Amphibian	Western Chihuahuan Green Toad <i>Anaxyrus debilis insidiosus</i>	Does not meet "Native and Known to Occur" criteria	Invalid taxonomy
Bird	American Avocet <i>Recurvirostra americana</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 3. Does not meet indicators 2 or 4.
Bird	American Bittern <i>Botaurus lentiginosus</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	American Redstart <i>Setophaga ruticilla</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	American White Pelican <i>Pelecanus erythrorhynchos</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Ash-throated Flycatcher <i>Myiarchus cinerascens</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 3. Does not meet Indicator 1, 2, or 4.
Bird	Baird's Sparrow <i>Centronyx bairdii</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Bald Eagle <i>Haliaeetus leucocephalus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Baltimore Oriole <i>Icterus galbula</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Bell's Vireo <i>Vireo bellii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 2. Does not meet indicators 3 or 4.
Bird	Black Phoebe <i>Sayornis nigricans</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Black Tern <i>Chlidonias niger</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Black-billed Cuckoo <i>Coccyzus erythrophthalmus</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient

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Taxa Group	Common Name/Scientific Name	Determination¹	Rationale for Removal from Consideration²
Bird	Black-crowned Night Heron <i>Nycticorax nycticorax</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Black-necked Stilt <i>Himantopus mexicanus</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Bobolink <i>Dolichonyx oryzivorus</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Brewer's Sparrow <i>Spizella breweri</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 2. Does not meet indicators 3 or 4.
Bird	Broad-winged Hawk <i>Buteo platypterus</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Bufflehead <i>Bucephala albeola</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Canvasback <i>Aythya valisineria</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Carolina Wren <i>Thryothorus ludovicianus</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Chestnut-collared Longspur <i>Calcarius ornatus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Chestnut-sided Warbler <i>Setophaga pensylvanica</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Chihuahuan Raven <i>Corvus cryptoleucus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 3. Does not meet Indicator 1, 2, or 4.
Bird	Cinnamon Teal <i>Spatula cyanoptera</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Curve-billed Thrasher <i>Toxostoma curvirostre</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 3. Does not meet Indicator 1, 2, or 4.
Bird	Double-crested Cormorant <i>Nannopterum auritum</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Eared Grebe <i>Podiceps nigricollis</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient

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Taxa Group	Common Name/Scientific Name	Determination¹	Rationale for Removal from Consideration²
Bird	Eastern Bluebird <i>Sialia sialis</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Eastern Towhee <i>Pipilo erythrophthalmus</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Ferruginous Hawk <i>Buteo regalis</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 1. Does not meet Indicator 2, 3, or 4.
Bird	Field Sparrow <i>Spizella pusilla</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Bird	Forster's Tern <i>Sterna forsteri</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Gadwall <i>Mareca strepera</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Golden Eagle <i>Aquila chrysaetos</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 1. Does not meet Indicator 2, 3, or 4.
Bird	Gray Vireo <i>Vireo vicinior</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Great Egret <i>Ardea alba</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Green-winged Teal <i>Anas crecca</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Hepatic Tanager <i>Piranga flava</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Bird	Hooded Merganser <i>Lophodytes cucullatus</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Hooded Warbler <i>Setophaga citrina</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient

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Taxa Group	Common Name/Scientific Name	Determination ¹	Rationale for Removal from Consideration ²
Bird	Ladder-backed Woodpecker <i>Dryobates scalaris</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Bird	Lark Bunting <i>Calamospiza melanocorys</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 2. Does not meet indicators 3 or 4.
Bird	Lazuli Bunting <i>Passerina amoena</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 3. Does not meet Indicator 1, 2, or 4.
Bird	Lesser Prairie-chicken <i>Tympanuchus pallidicinctus</i>	Does not meet SCC consideration criteria	ESA status precludes SCC
Bird	Lewis's Woodpecker <i>Melanerpes lewis</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Bird	Loggerhead Shrike <i>Lanius ludovicianus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Long-billed Curlew <i>Numenius americanus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Long-eared Owl <i>Asio otus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Marsh Wren <i>Cistothorus palustris</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 4. Does not meet indicators 2 or 3.
Bird	Mississippi Kite <i>Ictinia mississippiensis</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 3. Does not meet indicators 2 or 4.
Bird	Northern Harrier <i>Circus hudsonius</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Northern Pintail <i>Anas acuta</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Northern Shoveler <i>Spatula clypeata</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient

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Taxa Group	Common Name/Scientific Name	Determination¹	Rationale for Removal from Consideration²
Bird	Olive-sided Flycatcher <i>Contopus cooperi</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Ovenbird <i>Seiurus aurocapilla</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Peregrine Falcon <i>Falco peregrinus</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Pied-billed Grebe <i>Podilymbus podiceps</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Pine Siskin <i>Spinus pinus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Redhead <i>Aythya americana</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Ruddy Duck <i>Oxyura jamaicensis</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 1. Does not meet Indicator 2, 3, or 4.
Bird	Rufous-crowned Sparrow <i>Aimophila ruficeps</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Sandhill Crane <i>Antigone canadensis</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Scaled Quail <i>Callipepla squamata</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 2 and 3. Does not meet indicators 1 or 4.
Bird	Scissor-tailed Flycatcher <i>Tyrannus forficatus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 3. Does not meet indicators 2 or 4.
Bird	Scott's Oriole <i>Icterus parisorum</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Sharp-shinned Hawk <i>Accipiter striatus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Short-eared Owl <i>Asio flammeus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 1. Does not meet Indicator 2, 3, or 4.

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Taxa Group	Common Name/Scientific Name	Determination¹	Rationale for Removal from Consideration²
Bird	Snowy Egret <i>Egretta thula</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Snowy Plover <i>Anarhynchus nivosus</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Sora <i>Porzana carolina</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Spotted Towhee <i>Pipilo maculatus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Sprague's Pipit <i>Anthus spragueii</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Thick-billed Longspur <i>Rhynchophanes mccownii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Tree Swallow <i>Tachycineta bicolor</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Vesper Sparrow <i>Poocetes gramineus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Virginia Rail <i>Rallus limicola</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Virginia's Warbler <i>Leiothlypis virginiae</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Bird	Western Grebe <i>Aechmophorus occidentalis</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Western Screech-Owl <i>Megascops kennicottii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Bird	Western Wood-Pewee <i>Contopus sordidulus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Bird	Whimbrel <i>Numenius phaeopus</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient

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Taxa Group	Common Name/Scientific Name	Determination¹	Rationale for Removal from Consideration²
Bird	White-faced Ibis <i>Plegadis chihi</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	White-winged Dove <i>Zenaida asiatica</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Willet <i>Tringa semipalmata</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Willow Flycatcher <i>Empidonax traillii</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Wilson's Phalarope <i>Phalaropus tricolor</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Bird	Yellow-billed Cuckoo <i>Coccyzus americanus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Bird	Yellow-headed Blackbird <i>Xanthocephalus xanthocephalus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Fish	Arkansas Darter <i>Etheostoma cragini</i>	Does not meet "Native and Known to Occur" criteria	Native, but species may be extirpated from plan area
Invertebrate	a mayfly <i>Neochoroterpes oklahoma</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Invertebrate	American Bumble Bee <i>Bombus pensylvanicus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 4. Does not meet Indicator 3.
Invertebrate	Arogos Skipper <i>Atrytone arogos</i>	Does not meet "Native and Known to Occur" criteria	Invalid taxonomy
Invertebrate	Blue-ringed Dancer <i>Argia sedula</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Invertebrate	Brimstone Clubtail <i>Stylurus intricatus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 2 and 4. Does not meet indicators 1 or 3.
Invertebrate	Bronze Roadside-Skipper <i>Amblyscirtes aenus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.

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Taxa Group	Common Name/Scientific Name	Determination¹	Rationale for Removal from Consideration²
Invertebrate	Drooping Star-of-Bethlehem <i>Pygarctia neomexicana</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 2 and 3. Does not meet indicators 1 or 4.
Invertebrate	Eastern Ringtail <i>Erpetogomphus designatus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 2 and 4. Does not meet indicators 1 or 3.
Invertebrate	Elsa Sphinx Moth <i>Sagenosoma elsa</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 3. Does not meet Indicator 1, 2, or 4.
Invertebrate	Ghost Tiger Beetle <i>Ellipsiptera lepida</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 3. Does not meet indicators 2 or 4.
Invertebrate	Green Skipper <i>Hesperia viridis</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Invertebrate	Mexican Forktail <i>Ischnura demorsa</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Invertebrate	Monarch <i>Danaus plexippus</i>	Does not meet SCC consideration criteria	ESA status precludes SCC
Invertebrate	Plains Lemmon Beebalm <i>Monarda pectinata</i>	Does not meet "Native and Known to Occur" criteria	Native, but species may be extirpated from plan area
Invertebrate	Rainbow Bluet <i>Enallagma antennatum</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Invertebrate	Rhesus Skipper <i>Polites rhesus</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Invertebrate	Rita Dotted-Blue <i>Euphilotes rita coloradensis</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Invertebrate	Small Checkered-Skipper <i>Pyrgus scriptura</i> ssp. <i>scriptura</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 2 and 3. Does not meet indicators 1 or 4.

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Taxa Group	Common Name/Scientific Name	Determination¹	Rationale for Removal from Consideration²
Invertebrate	Sooty Dancer <i>Argia lugens</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 2 and 3. Does not meet indicators 1 or 4.
Invertebrate	Southern Plains Bumble Bee <i>Bombus fraternus</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Invertebrate	Splendid Tiger Beetle <i>Cicindela splendida</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Invertebrate	Yellow Bumble Bee <i>Bombus fervidus</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Invertebrate	Yucca Giant-Skipper <i>Megathymus yuccae</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Mammal	American Hog-nosed Skunk <i>Conepatus leuconotus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 3. Does not meet Indicator 1, 2, or 4.
Mammal	Big Free-tailed Bat <i>Nyctinomops macrotis</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 2 and 3. Does not meet indicators 1 or 4.
Mammal	Black-footed Ferret <i>Mustela nigripes</i>	Does not meet SCC consideration criteria	ESA status precludes SCC
Mammal	Black-tailed Prairie Dog <i>Cynomys ludovicianus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 4. Does not meet Indicator 3.
Mammal	Eastern Mole <i>Scalopus aquaticus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 3. Does not meet Indicator 1, 2, or 4.
Mammal	Eastern Red Bat <i>Lasiurus borealis</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 3. Does not meet Indicator 4.
Mammal	Elk <i>Cervus elaphus</i>	Does not meet "Native and Known to Occur" criteria	Not native to plan area
Mammal	Fringed Myotis <i>Myotis thysanodes</i>	Does not meet "Native and Known to Occur" criteria	No occurrence records could be found in the plan area

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Taxa Group	Common Name/Scientific Name	Determination¹	Rationale for Removal from Consideration²
Mammal	Little Brown Myotis <i>Myotis lucifugus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 1. Does not meet Indicator 2, 3, or 4.
Mammal	Northern Hoary Bat <i>Lasiurus cinereus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 2. Does not meet indicators 3 or 4.
Mammal	Pallid Bat <i>Antrozous pallidus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 3. Does not meet indicators 2 or 4.
Mammal	Rocky Mountain Bighorn Sheep <i>Ovis canadensis canadensis</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 3. Does not meet Indicator 4.
Mammal	Silver-haired Bat <i>Lasionycteris noctivagans</i>	Does not meet "Native and Known to Occur" criteria	Accidental/Transient
Mammal	Swift Fox <i>Vulpes velox</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 3. Does not meet indicators 2 or 4.
Mammal	Townsend's Big-eared Bat <i>Corynorhinus townsendii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 3. Does not meet indicators 2 or 4.
Mammal	Western Small-footed Myotis <i>Myotis ciliolabrum</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 3. Does not meet Indicator 1, 2, or 4.
Mammal	White-toothed Woodrat <i>Neotoma leucodon</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 1. Does not meet Indicator 2, 3, or 4.
Plant	a liverwort <i>Plagiochasma wrightii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	American Sea-blite <i>Suaeda calceoliformis</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Plant	Annual Skeleton-weed <i>Shinnersoseris rostrata</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.

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Taxa Group	Common Name/Scientific Name	Determination¹	Rationale for Removal from Consideration²
Plant	Arkansas Valley Evening-primrose <i>Oenothera harringtonii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Atlantic Goldenrod <i>Solidago arguta</i> var. <i>caroliniana</i>	Does not meet "Native and Known to Occur" criteria	Not native to plan area
Plant	Bailey's Rabbitbrush <i>Chrysothamnus baileyi</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Plant	Beach Wormwood <i>Artemisia campestris</i> ssp. <i>caudata</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 4. Does not meet indicators 2 or 3.
Plant	Black-stem Spleenwort <i>Asplenium resiliens</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Bush Morning-glory <i>Ipomoea leptophylla</i>	Does not meet SCC consideration criteria	No status rank to warrant overview
Plant	California Crabgrass <i>Digitaria californica</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Camphorweed Goldenaster <i>Heterotheca subaxillaris</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 3. Does not meet Indicator 4.
Plant	Capulin goldenrod <i>Solidago capulinensis</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Plant	Chickasaw Plum <i>Prunus angustifolia</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Claspingleaf Venus'-looking-glass <i>Triodanis perfoliata</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 4. Does not meet Indicator 3.
Plant	Clustered Broomrape <i>Orobanche fasciculata</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 4. Does not meet Indicator 3.
Plant	Coastal Sandbur <i>Cenchrus spinifex</i>	Does not meet "Native and Known to Occur" criteria	Not native to plan area

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Taxa Group	Common Name/Scientific Name	Determination¹	Rationale for Removal from Consideration²
Plant	Common Evening-primrose <i>Oenothera biennis</i>	Does not meet "Native and Known to Occur" criteria	No occurrence records could be found in the plan area
Plant	Cottonflower <i>Guilleminea densa</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Plant	Creek Plum <i>Prunus rivularis</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Plant	Cutleaf Cyclanthera <i>Cyclanthera dissecta</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 2, 3, and 4. Does not meet Indicator 1.
Plant	Desert Portulaca <i>Portulaca halimoides</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Plant	Douglas Ragwort <i>Senecio flaccidus</i> var. <i>flaccidus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Dwarf Dalea <i>Dalea nana</i> var. <i>nana</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 2 and 4. Does not meet indicators 1 or 3.
Plant	Ebony Spleenwort <i>Asplenium platyneuron</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Elenkin's Rock Pimple Lichen <i>Staurothele elenkinii</i>	Does not meet SCC consideration criteria	No status rank to warrant overview
Plant	Engelmann Evening-primrose <i>Oenothera engelmannii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 3. Does not meet Indicator 4.
Plant	Erect Knotweed <i>Polygonum erectum</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Plant	False Golden-weed <i>Grindelia ciliata</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.

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Taxa Group	Common Name/Scientific Name	Determination¹	Rationale for Removal from Consideration²
Plant	Fanleaf Vervain <i>Verbena plicata</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Feather-plume Dalea <i>Dalea formosa</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Plant	Fendler's False Cloak Fern <i>Argyrochosma fendleri</i>	Does not meet "Native and Known to Occur" criteria	Not native to plan area
Plant	Fire-wheel Blanket-flower <i>Gaillardia pulchella</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Does not meet any of the indicators.
Plant	Flat-globe Dodder <i>Cuscuta umbellata</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 4. Does not meet Indicator 1, 2, or 3.
Plant	Fremont's Goosefoot <i>Chenopodium fremontii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Plant	Green Needlegrass <i>Nassella viridula</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Green Spleenwort <i>Asplenium viride</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Hairy False Goldenaster <i>Heterotheca hirsutissima</i>	Does not meet "Native and Known to Occur" criteria	Invalid taxonomy
Plant	Hairy Four-o'clock <i>Mirabilis hirsuta</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 4. Does not meet indicators 2 or 3.
Plant	Hall's Milkweed <i>Asclepias hallii</i>	Does not meet "Native and Known to Occur" criteria	No occurrence records could be found in the plan area
Plant	Hall's Panicgrass <i>Panicum hallii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Hoary Broomspurge <i>Euphorbia lata</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 3. Does not meet Indicator 1, 2, or 4.

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Taxa Group	Common Name/Scientific Name	Determination ¹	Rationale for Removal from Consideration ²
Plant	Hoary Fleabane <i>Erigeron canus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Plant	Holzinger's Venus' Looking-glass <i>Triodanis holzingeri</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Plant	Howard's Evening-primrose <i>Oenothera howardii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Indian Mountain-ricegrass <i>Achnatherum hymenoides</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 3. Does not meet indicators 2 or 4.
Plant	Iron Standing-cypress <i>Ipomopsis laxiflora</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 3. Does not meet Indicator 4.
Plant	James' Dalea <i>Dalea jamesii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 3. Does not meet Indicator 4.
Plant	Long-hood Milkweed <i>Asclepias macrotis</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Loosescala Gayfeather <i>Liatris squarrosa</i> ; <i>Liatris squarrosa</i> var. <i>glabrata</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Plant	Mapleleaf Grape <i>Vitis acerifolia</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Marshweed <i>Flaveria campestris</i>	Does not meet "Native and Known to Occur" criteria	Not native to plan area
Plant	Meadow Flax <i>Linum pratense</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 4. Does not meet Indicator 1, 2, or 3.
Plant	Narrowleaf Willow <i>Salix exigua</i>	Does not meet SCC consideration criteria	S1 status is erroneous

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Plant	Oklahoma Plum <i>Prunus gracilis</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Oppositeleaf False Bahia <i>Picradeniopsis oppositifolia</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Plant	Oregon Woodsia (Tetraploid) <i>Physematum oreganum</i>	Does not meet "Native and Known to Occur" criteria	Invalid taxonomy
Plant	Pink Mimosa <i>Mimosa borealis</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 3. Does not meet Indicator 4.
Plant	Pondhorn <i>Uniomerus tetralasmus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 4. Does not meet Indicator 1, 2, or 3.
Plant	Prairie Cupgrass <i>Eriochloa contracta</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 4. Does not meet Indicator 1, 2, or 3.
Plant	Prairie Redroot <i>Ceanothus herbaceus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 1. Does not meet Indicator 2, 3, or 4.
Plant	Prairie Skeletonplant <i>Stephanomeria pauciflora</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Plant	Reichenbach's Hedgehog Cactus <i>Echinocereus reichenbachii</i>	Does not meet "Native and Known to Occur" criteria	No occurrence records could be found in the plan area
Plant	Reverchon's Stickleaf <i>Mentzelia reverchonii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Rocky Mountain Bladderpod <i>Physaria calcicola</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Rocky Mountain Nailwort <i>Paronychia depressa</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area

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Plant	Rocky Mountain Phacelia <i>Phacelia denticulata</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Plant	Rocky Mountain Rhombo-pod <i>Cleomella palmeriana</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Plant	Rosy Palafoxia <i>Palafoxia rosea</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 3. Does not meet Indicator 4.
Plant	Roundleaf Four-o'clock <i>Mirabilis rotundifolia</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Plant	Sagebrush Goldspeck Lichen <i>Candelariella rosulans</i>	Does not meet SCC consideration criteria	No status rank to warrant overview
Plant	Sand Muhly <i>Muhlenbergia arenicola</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 3. Does not meet Indicator 4.
Plant	Sandhill Goosefoot <i>Chenopodium cycloides</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Sessile Water-speedwell <i>Veronica catenata</i>	Does not meet "Native and Known to Occur" criteria	Not native to plan area
Plant	Shining Flatsedge <i>Cyperus bipartitus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 4. Does not meet Indicator 3.
Plant	Showy Peavine <i>Lathyrus polymorphus</i> var. <i>incanus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 4. Does not meet Indicator 3.
Plant	Simple Cliffbrake <i>Pellaea glabella</i> ssp. <i>simplex</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Plant	Skunkbush <i>Rhus aromatica trilobata</i>	Does not meet "Native and Known to Occur" criteria	Invalid taxonomy
Plant	Slim-leaf Prairie-clover <i>Dalea tenuifolia</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 3. Does not meet Indicator 1, 2, or 4.

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Plant	Small-flower Sand-verbena <i>Tripterocalyx micranthus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Small-flowered Marsh-elder <i>Iva axillaris</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Plant	Smooth Goosefoot <i>Chenopodium subglabrum</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 3. Does not meet indicators 2 or 4.
Plant	Smooth Shadow-crust Lichen <i>Hyperphyscia syncolla</i>	Does not meet SCC consideration criteria	No status rank to warrant overview
Plant	Soil Ruby Lichen <i>Heppia lutosa</i>	Does not meet SCC consideration criteria	No status rank to warrant overview
Plant	Spreading Three-awn Grass <i>Aristida divaricata</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 4. Does not meet indicators 2 or 3.
Plant	Star Cloakfern <i>Notholaena standleyi</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Plant	Tall Silverbush <i>Argythamnia mercurialina</i> var. <i>mercurialina</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 4. Does not meet indicators 2 or 3.
Plant	Texas Bindweed <i>Convolvulus equitans</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 3. Does not meet Indicator 1, 2, or 4.
Plant	Texas Dropseed <i>Sporobolus texanus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 4. Does not meet Indicator 3.
Plant	Trinidad Milkvetch <i>Astragalus puniceus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Upland Brittle Bladderfern <i>Cystopteris tenuis</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Plant	Variable Orange Lichen <i>Pyrenodesmia variabilis</i>	Does not meet SCC consideration criteria	No status rank to warrant overview

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Plant	Ward's Goldenweed <i>Oenopsis wardii</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Plant	Warty Caltrop <i>Kallstroemia parviflora</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 4. Does not meet Indicator 1, 2, or 3.
Plant	Wavy-leaf Twinevine <i>Sarcostemma crispum</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Plant	Waxy Rushpea <i>Hoffmannseggia glauca</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 3. Does not meet indicators 2 or 4.
Plant	Weak-leaf Bursage <i>Ambrosia confertiflora</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 4. Does not meet Indicator 1, 2, or 3.
Plant	Western Bitterweed <i>Hymenoxys odorata</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 4. Does not meet Indicator 1, 2, or 3.
Plant	Western Lettuce <i>Lactuca ludoviciana</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 4. Does not meet Indicator 1, 2, or 3.
Plant	Western Soapberry <i>Sapindus saponaria</i> var. <i>drummondii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	White Fluffgrass <i>Tridens albescens</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area
Plant	White Wild Onion <i>Allium textile</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Plant	Wingleaf Soapberry <i>Sapindus saponaria</i>	Does not meet "Native and Known to Occur" criteria	No occurrence records could be found in the plan area
Plant	Winter-fat <i>Krascheninnikovia lanata</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.

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Taxa Group	Common Name/Scientific Name	Determination¹	Rationale for Removal from Consideration²
Plant	Woodhouse's False Bahia <i>Picradeniopsis woodhousei</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Plant	Woolly Butterfly-weed <i>Gaura villosa</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 2, and 3. Does not meet Indicator 4.
Plant	Wooton's Lacefern <i>Cheilanthes wootonii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Plant	Wright Thelypody <i>Thelypodium wrightii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Plant	Wright's Cliffbrake <i>Pellaea wrightiana</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Plant	Wright's False Willow <i>Baccharis wrightii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets Indicator 4. Does not meet Indicator 1, 2, or 3.
Plant	Wright's Three-awn Grass <i>Aristida purpurea</i> var. <i>wrightii</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1, 3, and 4. Does not meet Indicator 2.
Reptile	Checkered Gartersnake <i>Thamnophis marcianus</i>	Does not meet "Native and Known to Occur" criteria	Native, but species may be extirpated from plan area
Reptile	Chihuahuan Nightsnake <i>Hypsiglena jani</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Reptile	Colorado Checkered Whiptail <i>Aspidoscelis neotesselatus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Reptile	Common Checkered Whiptail <i>Aspidoscelis tessellatus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 2 and 3. Does not meet indicators 1 or 4.
Reptile	Eastern Hog-nosed Snake <i>Heterodon platirhinos</i>	Does not meet "Native and Known to Occur" criteria	Native, but observations do not have sufficient precision to demonstrate species occurs in the plan area

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Taxa Group	Common Name/Scientific Name	Determination¹	Rationale for Removal from Consideration²
Reptile	Glossy Snake <i>Arizona elegans</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 2. Does not meet indicators 3 or 4.
Reptile	Long-nosed Snake <i>Rhinocheilus lecontei</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 3. Does not meet indicators 2 or 4.
Reptile	New Mexico Threadsnake <i>Rena dissecta</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 3 and 4. Does not meet indicators 1 or 2.
Reptile	Plains Hog-nosed Snake <i>Heterodon nasicus</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 4. Does not meet indicators 2 or 3.
Reptile	Prairie Ring-necked Snake <i>Diadophis punctatus arnyi</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 3. Does not meet indicators 2 or 4.
Reptile	Texas Horned Lizard <i>Phrynosoma cornutum</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 3. Does not meet indicators 2 or 4.
Reptile	Yellow Mud Turtle <i>Kinosternon flavescens</i>	Does not meet "Substantial Concern" criteria	Conservation concern does not rise to the level of substantial. Meets indicators 1 and 3. Does not meet indicators 2 or 4.

¹See Regional Forester's SCC Process (2024) for explanation of "Native and Known to Occur" criteria, "Substantial Concern" criteria, and indicators of conservation concern. SCC consideration criteria come from section 12.52d of the Forest Service Handbook 1909.12, Chapter 10.

²See Regional Forester's SCC Process (2024) and SCC Evaluation Summary R2 (2024). The SCC Evaluation Summary R2 (2024) provides more detailed rationales for each species; note that species removed due to invalid taxonomy do not have associated species evaluations.

Table C-4. Habitat Threats and Trends on the Cimarron and Comanche National Grasslands – Broad level, when available, is information that applied to a larger landscape than the Cimarron and Comanche National Grasslands plan area and unit level is information that applies to National Forest Systems (NFS) lands with the plan area.

Ecosystem or Habitat Type	Habitat Trends	Habitat Threats
Sandsage Prairie <u>Description:</u> Sandsage prairie is a shrub-steppe ecological system of the Great Plains of North America dominated by sand sagebrush (<i>Artemisia filifolia</i>) with a moderate to dense herbaceous layer dominated by perennial grasses. Sand sagebrush is a constant in this community type, the co-dominant graminoids vary depending on topographic factors but are mostly tall (3 to 6 feet) or mid-height (1.5 to 3 feet) grasses (Locklear 2017) This community type is found in association with dune fields and other areas of sandy habitat throughout a large area of the western Great Plains (Kuchler 1985). The geographic range is eastern Colorado, part of southwestern Nebraska, and western Kansas. Range is essentially limited to the Central Shortgrass, Southern Shortgrass, and Central Mixedgrass Prairie ecoregions, although it may be peripheral in a few other ecoregions. The greater part of the ecosystem occurs in the Central Shortgrass Prairie ecoregion in eastern Colorado, western Kansas, and southwestern Nebraska. The elevation range is 3,400 to 6,000 ft. (USFS 2024 Draft Ecological Integrity Worksheet Sandsage Prairie). Five sub-communities occur within sandsage prairie, which form a shifting mosaic of species that depend on various degrees of disturbance and stabilization (Locklear 2019). The most disturbed sub-community is open sand and blowouts (Locklear 2019). Although not species-rich, blowout communities are of conservation concern due to their infrequency and capacity to	Broad Level Across the Great Plains, sandsage prairie has experienced range-wide declines in both extent and ecological integrity (Locklear 2022). Moreover, “where tracts of sandsage prairie are intact, the ecological integrity of this shrub-steppe ecological system has likely been altered or degraded by range management practices aimed at increasing the cover of forage-producing grasses by reducing the shrub component” (Locklear 2022). Dune field habitats in sandsage prairie ecosystem are highly dynamic and subject to natural disasters (Locklear 2021). There is a history of land management practices aimed at dune minimization and eradication of blowouts via revegetation and sand control (Kelso et al. 2007). Dynamic dune systems have generally been reduced because of these active eradication programs (Kelso et al. 2007). Historically, in southern Canadian prairies, the number of active dunes has decreased significantly due to vegetation stabilization (Hugenholtz et al 2010). In Kansas, the sandsage shrubland habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of historic sandsage habitat has been lost, and habitat conversion to row crop production continues (Colorado State Wildlife Action Plan 2015). The remaining sandsage tracts generally have good landscape connectivity, but species composition is highly altered; understory grasses have been converted to short grass or annual species, and mixed and tall grass components are lacking (Colorado State Wildlife Action Plan 2015). Land conversion does not presently appear to be happening at the same scale	Broad Level The primary threats to sandsage prairie are habitat loss and fragmentation, and degradation of ecological integrity (e.g., conversion to agriculture, expanding exurban development, construction of roads, energy development, encroachment of woody plants, and targeted eradication of sandsage with herbicide) (Locklear 2022, Colorado State Wildlife Action Plan 2015, Rohweder 2022). Weather, climate changes, fire, and grazing constitute the most important processes impacting this system, and these processes are also interactive (Locklear 2019). While sandsage prairie is fairly resilient to the effects of drought in the Great Plains, there are biological limits to the ability of this vegetation to tolerate prolonged episodes of severe drought and may be at the limits of its drought tolerance in southeastern Colorado (Rondeau et al. 2018, Locklear 2019). Sandsage shrublands are ranked moderately vulnerable to the effects of climate change under a moderate emissions scenario (Colorado State Wildlife Action Plan 2015). These shrublands are well adapted to sandy soils and may be able to expand into adjacent areas under warmer and drier conditions, depending on disturbance interactions (Colorado State Wildlife Action Plan 2015). Unit Level Primary disturbances and stressors to this system include the following, which can also be interactive (USFS 2024 Draft Ecological Integrity Worksheet Sandsage Prairie): • Climate - Projected climate change models predict higher temperatures and more precipitation occurring in the winter and spring months with less occurring in the summer

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support endemic species (Kelso et al. 2007). The dune fields that support sandsage prairie occur as regionally restricted physiographic islands or anomalies (Locklear 2021). In the plan area herbaceous cover is lower in the sandsage prairie compared to other prairie types due to the density and cover of sandsage and the sandier nature of the soils. <u>Abundance:</u> Sandsage prairie comprises an estimated 99,721 acres, or 18% of the plan area at an elevation of 3,400 – 6,000 ft. Open, unstable sand dunes occur within the sandsage prairie ecological system. Unstable dunes and blowouts are very patchily distributed and generally small within this ecosystem (Locklear 2021). <u>Distribution:</u> Sandsage prairie ecosystem is spatially mapped predominantly on the Cimarron NG and Carrizo Unit of the Comanche NG with a small area located in the northern section of the Timpas Unit.	but roads, pipelines, and encroachment of woody plants continue to fragment habitat. While habitat loss is recognized, the significance of conversion is not greatly understood (Locklear 2021). Unit Level Statements are based on information derived from USFS 2024 Draft Ecological Integrity Worksheet Sandsage Prairie. There are two key ecological characteristic indicators (KEC) to determine ecological integrity for this system. They include Species Composition and Cover by Life Form. The overall integrity of this system currently has a ranking of moderate-low with moderate confidence. (Hayward 2021 Ecology Group). The degree which management activities can affect integrity is moderate with moderate confidence. The status of this system and the current and projected trend of the ecological integrity rating is influenced by rangeland analysis and unit input suggesting: • The cover trend for perennial grasses and forbs is stable to slightly decreasing. • Annual grasses and forbs cover trend is increasing. • Shrub cover trend is increasing. • Russian thistle, an invasive species, can have high cover across this ecosystem depending on the annual precipitation. It can create areas of large litter accumulation, reduce native species diversity, and have negative impacts on infrastructure. When this species occurs in high cover it has a significant negative impact on native species.	months. This shift in timing of precipitation coupled with increased temperature will shift species composition. This could result in an expansion of this ecosystem. Timely precipitation in the summer months support native species diversity and health. While this ecosystem supports many drought-tolerant species, increases in drought severity and frequency compromise species diversity and composition. • Invasive Species - Non-native, noxious, and introduced species distribution and frequency compromise the integrity of the ecosystem and ecosystem functioning. Increases in non-native species abundance and reductions in native species reduce wildlife habitat quality and primary productivity, and can alter fire return intervals. • Herbivory (by both wild and domestic species) - Current and future herbivory will both support or compromise ecosystem integrity. Heavy continuous season long grazing could result in increases in annual grasses and forbs, non-palatable perennial grass species, bare ground, erosion, and non- native species. Moderate and properly timed herbivory can support high native species diversity and reductions in bare ground, annual species, and non- native species. Herbivory can alter the structure and vigor of the sandsage ecosystem. • Fire – Sandsage resprouts well after fire, but fire can reduce the canopy cover and vertical structure which has wildlife habitat implications (e.g. for lesser prairie chicken). Frequent and severe fires can result in mortality of sandsage resulting in an increase in exposed sand/soil and increased wind erosion. Fire suppression can lead to a densification of the shrub component

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Ecosystem or Habitat Type	Habitat Trends	Habitat Threats
<i>(see above)</i>	• Cover of sand sagebrush is increasing which has negative impacts on herbaceous cover and diversity. • Distribution of open less vegetated sand dunes is naturally constantly shifting. • Proportion of seral states currently in this ecosystem have been impacted by historical previous management that included chemical and mechanical treatments of sand sagebrush to reduce the woody component of this ecosystem and enhance the herbaceous component for forage. • Key differences between the current versus historic plant communities identified for this ecosystem are reduced abundance and diversity of bunchgrasses and reduced vertical structure of vegetation, particularly on the Comanche NG. • Future climate and fire suppression could favor the increased woody state of this ecosystem. • NFS likelihood to affect change in this ecosystem could include prescribed fire, but due to fragmentation may be quite difficult to implement.	and a decrease of the herbaceous layer, thus altering the balance of shrubs to grasses and forbs in this ecosystem. • Wind erosion is an important disturbance that can have large impacts on species composition and succession due to the high susceptibility of sandy soils in this ecosystem. For more information, refer to USFS 2024 Draft Ecological Integrity Worksheet Sandsage Prairie.
Shortgrass Prairie *Note: the pinyon-juniper woodland and savanna as well as central mixedgrass prairie ecosystems have been included in the Shortgrass Prairie ecosystem (USFS 2024 Draft Ecological Integrity Worksheet Shortgrass Prairie). <u>Description:</u> Of the 1.1 million square miles of grasslands in North America, about 22% of grasslands is shortgrass prairie (Wrangle 2024). The shortgrass prairie occurs across eastern Colorado and New Mexico, the westernmost counties of Kansas, and the panhandles and rolling plains of Oklahoma and Texas at an	Broad Level Samson et al. (2004) estimated that the shortgrass prairies of the Great Plains have been reduced to 52% of their historic extent, and this reduction continues as grassland is converted to cropland. Natural disturbance processes in the grasslands are also reduced relative to historic conditions, which affects habitat quality for species in different ways. Fire suppression, landscape fragmentation, and extensive grazing in the region has generally decreased the fire frequency and enhanced shrub expansion into grasslands (Van Auken 2000, NatureServe 2024). Black-tailed prairie dogs, a keystone species in short- and mixed-grass prairies,	Broad Level Important processes impacting these grassland systems are drought and grazing, which also greatly influence fire frequency and extent (NatureServe 2024, LandFire BpS 11490 2020). Short grasses are generally extremely drought- and grazing-tolerant, although continuous heavy grazing and extended drought will reduce cover of dominant species (CNHP 2010, NatureServe 2024, LandFire BpS 11490 2020) Prolonged drought and overgrazing can cause mortality belowground and lead to long-term or permanent change in species composition. (Crockett 2020). As the driest of Great Plains grasslands, shortgrass prairie is susceptible to climate change

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Ecosystem or Habitat Type	Habitat Trends	Habitat Threats
elevation of 3,200 – 6,400 feet (LandFire BpS 11490 2020, Wrangle 2024). Delineating a precise boundary is not possible due to dynamic and shifting plant communities. Shortgrass occurs mostly west of the Kansas border (LandFire BpS 11490 2020). The Dust Bowl led to significant long-term changes in species composition, primarily causing a shift towards drought-tolerant shortgrass species like blue grama that are better adapted to dry conditions and can withstand high wind erosion due to their root structure. The Dust Bowl reduced the prevalence of taller, deeper-rooted grasses due to the severe soil erosion and loss of topsoil that took place during that time. The extreme drought and dust storms wiped out many plant species, leading to a less diverse plant community overall. In 2024, the natural vegetation is predominantly perennial grasses and is typically well adapted to grazing by large herbivores but less so to fire, in contrast to more mesic grasslands (LandFire BpS 11490 2020, Wrangler 2024). The dominant species in the shortgrass prairie are perennial warm season grasses (C4 grasses), primarily blue grama and buffalograss (Ecological Integrity Worksheet Shortgrass Prairie draft final). <u>Abundance:</u> Shortgrass prairie comprises an estimated 437,209 acres, or 80% of the plan area. It is the most abundant vegetation type in the plan area. <u>Distribution:</u> Shortgrass prairie is the predominant ecosystem spatially mapped within the plan area. It makes up most of the Timpas	now inhabit less than 1% of their historic range (Aasal et al. 2015). Loss of prairie dog communities reduces the representation of large areas of grazed vegetation and bare ground; many species associate with these highly modified patches for forage and reproduction. This also reduces habitat for species that rely on prairie dog burrows for shelter (Aasal et al. 2015). Recognizing these departures from historic conditions, the condition of the shortgrass prairie habitat in Kansas is considered good with a stable trend (Rohweder 2022). The majority (around 87%) of Colorado's shortgrass prairie is privately owned with most being utilized for agricultural production. While almost half of native prairie has been converted, vast expanses of native prairie in good condition still exist in Colorado (CNHP 2010). In Colorado, shortgrass prairie habitat is the largest loss of any of habitat type (Colorado State Wildlife Action Plan 2015). Remaining tracts have often been managed for domination of blue grama and exclusion of other grasses, resulting in a loss of native forb diversity (Colorado State Wildlife Action Plan 2015). In eastern Colorado and other parts of the state, a widespread deviation for shortgrass plains grasslands is associated with changes in species composition due to grazing by livestock. These changes include lower native species diversity, especially of native forbs; lower abundance of highly palatable grasses; greater abundance of relatively unpalatable species; increase in weedy species, especially the invasive non-native species; and bare soil. Typically, the species that are increasing in abundance are weedy annuals grasses, or weedy annual and biennial forbs (Crockett 2020). The status of this system on surrounding lands and the current and projected trend of the ecological	and increasing drought (NatureServe 2024). In Colorado shortgrass prairie is one of the most vulnerable sites (Smith 2024, Colorado State Wildlife Action Plan 2015). Warmer summer nighttime low temperatures and/or extended periods of drought are likely to change the balance of warm- and cool-season grasses, and, if fire frequency remains low, allow the establishment of woody species, with the potential for conversion to a more arid grassland type or savanna (Colorado State Wildlife Action Plan 2015). Smith (2024) states "What remains of the shortgrass prairie of eastern Colorado is at even more risk of die-off than previously thought, threatened by extreme drought. With a warming and drying on average they saw a 60% greater loss in plant growth in these extreme droughts than had previously been identified". Smith says "Shortgrass prairie was one of the most vulnerable sites. In her study, the blue grama grasses that dominate the Front Range go below their wilting point when soil moisture levels drop. It can cause mortality and push them to a point of catastrophic loss". Other general threats to this system include heavy continuous livestock grazing. Livestock grazing can create change in plant composition. This can include lower species diversity, lower abundance of highly palatable grasses and greater abundance of unpalatable species; increase in weedy species, especially invasive non-native, and bare soil (Crockett 2020). Invasive non-native species can threaten native plant species and alter community composition. Altered fire regime (fire suppression) is thought to be responsible for ecologically adverse shifts in the structure, composition, and diversity of these grasslands, leading specifically to the rise of ruderal species and invasion by less fire-tolerant species (Brockway et al 2007). Conversion to

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and Carrizo Units of the Comanche NG, as well as the Cimmaron NG.	integrity rating is influenced by rangeland analysis and Unit input suggesting: • Surrounding lands have a high degree of conversion from native shortgrass prairie to agriculture or energy production. • Ecosystem is highly fragmented with the patchwork ownership throughout the surrounding area and plan area. • Some juniper inclusion areas have been mechanically treated to increase primary production for livestock. CPW has also done some of this management to improve habitat for big horn sheep. • Fire suppression on surrounding lands has also led to the expansion of juniper inclusion areas. • Due to the high fragmentation of this landscape the uses and condition of surrounding private land has a large impact on NFS land (e.g. agriculture, prairie dogs, invasive species). Unit Level Statements are based on information derived from USFS 2024 Draft Ecological Integrity Worksheet Shortgrass Prairie. There are two key ecological characteristic indicators (KEC) to determine ecological integrity for this system. They include Species Composition and Cover by Life Form. The overall integrity of this system currently has a ranking of moderate-low with moderate confidence. (Hayward 2021 Ecology Group). The degree which management activities can affect integrity is moderate - high with moderate - high confidence (USFS 2024 Draft Ecological Integrity Worksheet Shortgrass Prairie). The status of this system and the current and projected trend of the ecological integrity rating is	agriculture, fragmentation from roads and development, gas and oil exploration and extraction also can have adverse impacts to this system (Colorado State Wildlife Action Plan 2015, Rohweder 2022, NatureServe 2024). Unit Level Primary disturbances and stressors to this system include the following, which can also be interactive (USFS 2024 Draft Ecological Integrity Worksheet Shortgrass Prairie): • Climate - Projected climate change models predict higher temperatures and more precipitation occurring in the winter and spring months with less occurring in the summer months. This shift in timing of precipitation coupled with increased temperature could shift species composition and compromise integrity. However, there are some climate scenarios that can improve productivity and favor warm season grass species which are dominant in this ecosystem. Blue grama and buffalograss are resilient to warmer temperatures even with changing precipitation regime. • Timely precipitation in the summer months supports native species diversity and health. While this ecosystem supports many drought-tolerant species, increases in drought severity and frequency compromise species diversity and composition. This shift in timing of precipitation coupled with increased temperature may support the expansion of juniper trees cover and increase tree density. This increase in these woody areas could have negative impacts on the herbaceous layer and impact the balance of these woody inclusion areas to the greater shortgrass prairie ecosystem. Increased drought could also drive fires and insect outbreaks, from

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<i>(see above)</i>	influenced by rangeland analysis and unit input suggesting: • Perennial grasses and forb cover trend stable to slightly increasing. • Annual grasses and forbs cover trend stable to slightly increasing. • Bare ground cover stable to slightly decreasing. • Limited tree expansion into shortgrass prairie; less than 1% of land area is forested (>10% tree cover). In areas with pinyon juniper inclusions, the density is increasing relative to the past, with a greater proportion of land area being open forest or moderately closed forests now than in the 1980's. • Across entire proclaimed boundary (NFS land and surrounding land) production is increasing and an increasing proportion of that production is attributed to annuals (which may be attributed to increased frequency and severity of drought) • Currently most non-native and noxious species are stable in the plan area. • Russian thistle can have high cover across this ecosystem depending on the annual precipitation. It can create areas of large litter accumulation, reduce native species diversity, and have negative impacts on infrastructure (fences, tanks, etc.). When this species occurs in high cover it has a significant negative impact on native species. The spatial and financial scale to treat Russian thistle which has high cover in this ecosystem is unfeasible. • Old world bluestems that were planted during the dust bowl are increasing and where they occur, they significantly reduce plant diversity. • High cover and occurrence of purple three awn may be of concern. This species is documented in the NRCS ecological site descriptions as	which these woodland patches would be slow to recover. • Invasive species - Non-native, noxious, and introduced species distribution and frequency compromise the integrity of the ecosystem and ecosystem functioning. Increases in non-native species and reductions in native perennial warm season grass species reduce wildlife habitat quality and primary production and increase fire return intervals. • Herbivory (wild and domestic) - Current and future herbivory will both support and/ or compromise integrity. Heavy continuous season long herbivory could result in increases in annual grasses and forbs, non-palatable perennial grass species, bare ground, erosion, and non-native species. Heavy herbivory can also have negative impacts on juniper inclusion areas. Moderate and properly timed herbivory can support high native species diversity and reductions in bare ground, annual species, and non- native species. • Fire - Reduced extent and frequency of fire leads to more species that are less tolerant to fire and can reduce species diversity. Historical fire regimes played a critical role in maintaining the balance of the juniper inclusion areas with the surrounding herbaceous species. Fire opened stands, increased diversity and productivity in understory species and created a mosaic of stands of different sizes and ages across the landscape. Altered fire regimes can increase the cover and density of the juniper inclusions in this ecosystem. • Areas of this ecosystem that have reduced native species diversity (e.g. blue grama and buffalo grass areas and planted old world bluestems areas as monocultures have reduced pollination services.

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<i>(see above)</i>	occurring in the lower diversity/ high disturbance states. • Cholla is increasing in density and frequency. Cause of this expansion could be due to changes in climate, plantings by CP, and or heavy herbivory. This expansion could have negative impact on native species (shading/ use of resources). • Juniper tree density and canopy coverage has increased into the shortgrass prairie. • Historical extent (pre-European settlement or pre-Dust Bowl) across the planning unit of the central mixedgrass prairie - local staff do not feel this ecosystem historically occurred on the planning unit. Today some mixed grass species (e.g. western wheatgrass, little bluestem, big bluestem, needle and thread, indiangrass, and switchgrass) are more prevalent in the areas north of the Cimarron River due to the proximity to the transitional zone of the shortgrass prairie to central mixedgrass prairie ecosystem. While the historical extent of the central mixedgrass prairie on the planning unit is uncertain the literature does support that current climate and soil structure (Post-Dust Bowl) do not support the potential for the central mixedgrass prairie within the planning unit. • Prescribed fire and mechanical treatment of juniper inclusion areas could have a large impact on maintaining the balance between the herbaceous and woody components of this ecosystem. The use of fire across this landscape is culturally difficult. NFS may have some ability to affect change in this ecosystem however the intermingled land ownership impacts on the ecosystem as a whole make change	• The highly intermixed ownership and fragmentation in the landscape can heavily influence the integrity of this system. For example, if adjacent land is farmed that can increase soil movement onto federal lands and could increase the chances of prairie dogs expanding or colonizing. Prairie dogs prefer to colonize where they can “see far” so shorter vegetation/bare soil attracts and helps them expand vs taller native prairie. For more information, refer to USFS 2024 Draft Ecological Integrity Worksheet Shortgrass Prairie.

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(see above)	more difficult. Climate change and fluctuating budgets also reduce the ability for NFS to affect change.	(see above)
Piñon-juniper Woodlands and Savanna (this habitat type is included within the shortgrass prairie ecosystem). <u>Description:</u> This system occurs on semiarid mountains and foothills in southern Colorado east of the Continental Divide; in foothills, mountains, and plateaus of New Mexico; and extends east to limestone breaks in the southeastern Great Plains (LandFire BpS Southern Rocky Mountain Pinyon-Juniper Woodland 2020). These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. Soils supporting this system vary in texture, ranging from stony, cobbly, and gravelly sandy loams to clay loam or clay (NatureServe 2024, Landfire BPS Southern Rocky Mountain Pinyon-Juniper woodlands 2020). These light to moderately dense woodlands occur at more mesic and often steeper and rockier sites and ridges compared to pinyon-juniper savannas. More heavily dense areas would occur in pockets on northerly aspects (Landfire BPS Southern Rocky Mountain Pinyon-Juniper Woodlands 2020). This habitat type can also be represented just below the lower elevational range of ponderosa pine and often intermingles with grasslands and shrublands (NatureServe 2024 Southern Rocky Mountain Juniper Woodland and Savanna). Canopy and understory characteristics vary considerably from place to place, from sparse stands of scattered small trees growing on poor substrates to relatively dense stands of large	Broad Level Piñon-juniper woodlands have expanded into shrublands and grasslands in some parts of the western United States (e.g., West 1999, Miller et al. 2019). In southeast Colorado, juniper woodlands have expanded (Colorado State Wildlife Action Plan 2015), particularly in areas of rocky, shallow soil types that have little herbaceous cover, but contraction has also occurred in deeper and more finely textured soils (Amme et al. 2020). Due to long-term drought conditions and increase in beetle kill, pinyon-juniper woodlands in the Rocky Mountain Region are dying back and conifer cone crops have become less abundant (USFS 2022). Historical data for pinyon-juniper woodlands shows a long-term decline in establishment rates, which are now at their lowest in centuries (Bureau of Land Management 2024, Shriver et al. 2022). Two-needle piñon pine is currently experiencing the most widespread declines. Other species, such as singleleaf piñon pine and various junipers, also show declines, but to a lesser extent (Bureau of Land Management 2024). Piñon-juniper populations are currently experiencing increased vulnerability associated with warm dry conditions (Shriver et al. 2022). Shriver et al. (2022) reports that “potential vulnerability of pinyon-juniper woodlands to climate change began to emerge 100 years ago with the initiation of declining establishment rates. However, despite declines in available establishment rates, population growth has continued throughout this period. Antecedent conditions that enabled long-term population growth may have masked the emerging trend of declining tree establishment rate. Given that establishment	Broad Level General threats to piñon-juniper habitat include oil and gas drilling, altered native vegetation, problematic native species (e.g. ips outbreak, black stain root disease), habitat shifting and alteration due to climate change, housing and urban areas, livestock farming and ranching, recreational activities, military exercises, fire and fire suppression (Colorado State Wildlife Action Plan 2015, Rohweder 2022). Piñon-juniper woodland is highly vulnerable to climate change due to the vulnerability of these woodlands to the interaction of drought, fire, and insect-caused mortality (Colorado State Wildlife Action Plan 2015). Hot and dry conditions are likely to increase the impact of fire and insect outbreaks, and favor juniper over piñon pine (Colorado State Wildlife Action Plan 2015). Both piñon and juniper species have thin bark and low canopies, making this habitat type relatively intolerant of fire (Huffman et al. 2008; Romme et al. 2009). Changing climate patterns are creating growing challenges for the management of piñon-juniper woodlands. Higher temperatures and lower precipitation associated with climate change has led to reduced growth, reproductive problems, little or no seedling germination after disturbance, and tree death (Kyllo 2016). Currently, mature, seed producing piñons are most affected and are dying far faster than immature understory trees can replace them (Kyllo 2016). Few studies have examined the relationship between grazing patterns and the expansion of piñon-juniper woodlands over the last century; however, Barger et al. found that piñon pine recruitment and growth appears to be tied more closely to climate conditions than to historical grazing practices, and that there was no significant difference in the density or basal

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trees on productive sites. From LandFire BpS Southern Rocky Mountain Pinyon-Juniper Woodlands (2020), vegetation is dominated by an open tree canopy of 2 to 10 meter tall one-seed juniper (<i>Juniperus monosperma</i>). Rocky Mountain Juniper (<i>Juniperus scopulorum</i>) may be present or dominant at higher elevations. Occasional two-needle pinyon pine (<i>Pinus edulis</i>) trees may be present but have low cover and are typically restricted to mesic microsites. The open to dense herbaceous layer is dominated by perennial grasses that vary with environments. Grass species are similar to those found in adjacent shortgrass prairie (NatureServe 2024 Southern Rocky Mountain Juniper Woodland and Savanna). <i>Pinus edulis</i> or <i>Juniperus monosperma</i> dominate the tree canopy. <i>Juniperus scopulorum</i> may codominate or replace <i>Juniperus monosperma</i> at higher elevations. Understory layers are variable and may be dominated by shrubs, graminoids, or be absent (LandFire BpS Southern Rocky Mountain Pinyon-Juniper Woodland 2020) <u>Abundance</u>: Piñon-juniper woodlands and savanna covers approximately 1,341 acres of the shortgrass prairie 437,209 acres representing 0.3% of the shortgrass prairie ecosystem in the plan area. Piñon-juniper woodland and savanna areas could be under quantified due to the expansion areas of the canyonlands where junipers are expanding further into uplands from the canyonlands. <u>Distribution</u>: Juniper woodlands are restricted to the southwestern portion of the Comanche NG (Kuhn et al. 2011) where there are extensive piñon pine forests in Picketwire Canyon and the Kim area in Las Animas County. These	rates are nearing their lowest level in 400 years, we may be entering a period when population growth can no longer be maintained, and range contraction may be more likely”. Unit Level Statements are based on information derived from USFS 2024 Draft Ecological Integrity Worksheet Shortgrass Prairie. The status of this system and the current and projected trend of the ecological integrity rating is influenced by rangeland analysis and unit input suggesting the following: • Juniper has increased in distribution and abundance in some ecosystems within the plan area, particularly the canyonlands of the Comanche National Grassland (CCNG 2005). • The overall trend across the planning unit is increased production which can result in increased forage for livestock and food delivered. However, expansion of juniper areas could reduce primary reduction and have a negative impact on livestock/ food services. • Juniper tree density and canopy coverage has increased in the juniper inclusion areas during the 20th century. The reason for this expansion may be due to the normal dynamics of this ecosystem and enhanced by favorable climatic conditions for tree growth during the 20th century. Other contributing possible mechanisms for expansions may be recovery from past disturbance, livestock grazing, fire exclusion, wildlife spreading seed, positive soil acidification feedback loop, climatic variability, and CO2 fertilization (Romme et al. 2009, Landfire 2020 SSRockyMtn PJWoodlands, Landfire 2020 SSRocky Mtn Juniper Woodland Savanna, Twidwell et al. 2021).	area of piñon pine trees between grazed and ungrazed sites. Unit Level Primary disturbances and stressors to this system include the following, which can also be interactive (USFS 2024 Draft Ecological Integrity Worksheet Shortgrass Prairie): • Fire suppression has contributed to mature, dense stands of one-seed juniper in the plan area, putting them at greater risk from disease and catastrophic fire (CCNG 2008). • Treatments, including mechanical mastication, are occurring on the Comanche NG to reduce juniper encroachment. • Shift in timing of precipitation coupled with increased temperature may support the expansion of juniper canopy cover and increase tree density. This increase in woody areas could have negative impacts on the herbaceous layer and impact the balance of the woody inclusion areas to the greater shortgrass prairie ecosystem. Increased drought could also drive fires and insect outbreaks, from which these woodland patches would be slow to recover. • Non-native, noxious, and introduced species distribution and frequency compromise the integrity of the ecosystem and ecosystem functioning. Increases in non-native species and reductions in native perennial warm season grass species reduce wildlife habitat quality and primary production and increase fire return intervals. • Current and future herbivory may support or compromise integrity. Heavy continuous season long grazing could result in increases in annual grasses and forbs, non-palatable perennial grass species, bare ground, erosion, and non-

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woodlands were found in Baca, Otero, and Las Animas counties at elevations of 4,420 to 6,440 feet (Kuhn et al. 2011). In Baca County, it is restricted to three sites: southwest of Pritchett along East Carrizo Creek, Carrizo Canyon, and Big Hole Spring. In Otero County it is limited to Christian Canyon near Delhi, Colorado (Kuhn et al. 2011). Las Animas County contained the majority of sites with seven occurrences of piñon-juniper woodlands (Kuhn et al. 2011). This habitat type is not spatially mapped within the plan area but is included in the shortgrass prairie spatial extent.	Impacts of the expansion of juniper inclusions into formerly non-wooded areas in this ecosystem is that formerly heterogeneous mosaics of small patches of junipers are becoming more homogeneous as trees become established in the shortgrass prairie ecosystem.	native species invasions. On the other hand, moderate and properly timed herbivory can support high native species diversity and reductions in bare ground, annual species, and non-native species. Reduced extent and frequency of fire can decrease species diversity and alter species composition. Historical fire regimes played a critical role in maintaining the balance of the juniper inclusion areas with the surrounding herbaceous species. Fire created openings in tree stands, increased diversity and productivity in understory species, and created a mosaic of stands of different sizes and ages across the landscape. For more information, refer to USFS 2024 Draft Ecological Integrity Worksheet Shortgrass Prairie.
Canyonlands (including cliff, canyon and rock outcrop habitat) <u>Description:</u> The vegetation of the Canyonlands Ecosystem is a mix of herbaceous, shrub, and tree species that occurs on semiarid mountains and foothills in southern Colorado east of the Continental Divide; in foothills, mountains, and plateaus of New Mexico; and extends east to limestone breaks in the southeastern Great Plains. Elevation for Canyonlands is 3200 to 6400 ft (USFS 2024 Draft Ecological Integrity Worksheet Canyonlands). Canyonlands occur on warm, dry sites on slopes and ridges that are contained by steep rocky canyon walls. Soils supporting this system vary in texture, ranging from stony, cobbly, and gravelly sandy loams to clay loam or clay. These light to moderately dense woodlands occur at more mesic and often steeper and rockier sites and ridges compared to the piñon-juniper woodland and savanna. Heavily dense	Unit Level Statements are based on information derived from USFS 2024 Draft Ecological Integrity Worksheet Canyonlands. Increased distribution and abundance of juniper, and reduced diversity of bunchgrasses and shrubs along some canyon floors. Tamarisk has replaced native woody species along the Purgatoire River, the Cimarron River, and several smaller streams. Its presence has changed ecological characteristics making these riparian areas less suitable for native plants and animals. There are two key ecological characteristic (KEC) indicators to determine ecological integrity for this system: 1) species composition and 2) cover by life form. The overall integrity of this system currently has a ranking of moderate - low with moderate - high confidence (Hayward 2021 Ecology Group). The degree which management activities can affect integrity is high with moderate confidence.	Unit Level Primary disturbances and stressors to this system include the following, which can also be interactive (USFS 2024 Draft Ecological Integrity Worksheet Canyonlands): Climate - Projected climate change models predict higher temperatures, more precipitation occurring in the winter and spring months with less occurring in the summer months, and more frequent severe storm events. This shift in timing of precipitation coupled with increased temperature will shift species composition and compromise integrity. This could result in an expansion of this ecosystem or increased woody cover and density. Drought could reduce the cover of soil stabilizing understory species on steep slopes and thus increase erosion during severe storm events and flooding events. Timely precipitation in the summer months supports native species diversity and health. While this ecosystem supports many

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areas tend to occur in pockets on northerly aspects. Precipitation ranges from 15 – 18 inches annually with most of the precipitation occurring in the summer months. Tree canopy and understory characteristics vary considerably from sparse stands of scattered small trees growing on poor substrates to relatively dense stands of large trees on productive sites. (Landfire BpS Southern Rocky Mountain Pinyon-Juniper Woodlands 2020). The slopes and edges of the canyons are typically covered with one-seed juniper, skunkbush sumac, and mountain mahogany. Dominant shrub, forb, and grass species include: Gambel oak, alderleaf mountain mahogany, skunkbush sumac, golden currant, pricklypear, paintbrush, western wheatgrass, sideoats grama, and blue grama and are found commonly on the slopes of the Canyonlands leading down to the riparian corridor. The understory, foot slopes, and mesa tops are similar to the vegetation of the Shortgrass Prairie Ecosystem. Additionally, riparian corridors exist in some of these canyons, which are marked by the presence of cottonwood and willow. Plant species typically found in the bottoms and on the slopes of canyons include sideoats grama, western wheatgrass, little bluestem, sand dropseed, blue grama, hairy grama, black grama, spike muhly, sand bluestem, pricklypear, and yucca (CCNG 2005 Ecological Sustainability). Ponderosa pine can be found intermixed in the southwestern part of the Comanche NG but is not a widespread occurrence. <u>Abundance:</u> Canyonlands comprise an estimated 4,466 acres, or 0.8% of the plan area occurring at 3,200 to 6,400 feet in elevation.	The status of this system and the current and projected trend of the ecological integrity rating is influenced by rangeland analysis and unit input suggesting the following: 1. Over the last 35 years tree cover has increased. 2. Greater than 40% tree cover (moderate/closed forest) has increased 4%. 3. 10-40% tree cover (open forest) has increased 14%; 4. Non-forested area (<10% tree cover) has decreased 16%. 5. Cholla occurs on the fringes of this ecosystem and upper edges of canyon and bottom edges (transition areas). The uplands adjacent to Picketwire Canyon have the densest cholla. 6. Increased distribution and abundance of juniper, and reduced diversity of bunchgrasses and shrubs along some canyon floors. 7. Detailed discussion on the impacts of invasive tamarisk in the bottomlands of the Canyonlands can be found in the Riparian and Non-Wetlands Playas Ecosystem. 8. The majority of this ecosystem may be in a late seral state due to the proportion and density of woody vegetation. 9. Russian thistle can have high cover across this ecosystem depending on the annual precipitation. When this species occurs in high cover it has a significant negative impact on native species. It can create areas of large litter accumulation, reduce native species diversity, and have negative impacts on infrastructure (such as fences and tanks). 10. Woody species are expanding outside of the Canyonlands Ecosystem and into the surrounding uplands which can reduce the herbaceous cover and diversity of the adjacent Shortgrass Prairie Ecosystem.	drought-tolerant species, increases in drought severity and frequency compromise species diversity and composition. Reduced native species diversity influences pollinator and wildlife habitat. 2. Invasive species - Non-native and noxious species distribution and frequency compromise the integrity of the ecosystem and ecosystem functioning. Increases in non-native species reduce wildlife habitat quality and primary production, reduce riparian integrity found within this ecosystem, and increase fire return intervals (tamarisk). 3. Herbivory (wild and domestic) - Current and future herbivory will both support and/ or compromise integrity. Heavy continuous season long herbivory could result in increases in annual grasses and forbs, non-palatable perennial grass species, bare ground, erosion, and non- native species. Moderate and properly timed herbivory can support high native species diversity and reductions in bare ground, annual species, and non- native species. Reduced native species diversity influences pollinator and wildlife habitat. 4. Insect and Disease - Insect and disease impacts may increase as tree cover becomes denser and with projected increases in drought frequencies. 5. Fire - Historically dominant fire effect was to kill most or all trees and to top-kill most or all shrubs. Decreases in fire frequency will result in higher cover of woody species and less understory diversity. 6. Recreation - Recreation in this ecosystem can increase erosion and introduce and spread noxious and non-native species. Picture and Sand canyon have the most recreation (hiking/hunting). Recreation can impact the

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<u>Distribution:</u> The canyonlands ecosystem is limited to the Comanche NG. The canyonlands are a distinct striking feature of the Comanche NG due to their contrasting relief to the surrounding shortgrass prairie and the abundance of juniper that flourishes in this system (CCNG 2015). Canyonlands are spatially mapped predominantly in the southern portion of the Timpas Unit and in the southwest corner of the Carrizo Unit.	11. Picture and Sand canyons experience the most recreational use (e.g. hiking and hunting) which can impact the cultural resources found in this ecosystem and associated roads can introduce and spread non-native species. 12. Changes in prescribed fire management could help restore this ecosystem and would be the primary tool to make the biggest impact, however the amount of heritage sites and intermingled land ownership can make the use of fire in this ecosystem difficult. 13. Key differences between the current versus historic conditions in the Canyonlands are increased distribution and abundance of juniper, and reduced diversity of bunchgrasses and shrubs along some canyon floors.	cultural resources found in this ecosystem and the associated roads can introduce and spread non-native species. 7. Reduced native species diversity influences pollination and wildlife habitat. For more information, refer to USFS 2024 Draft Ecological Integrity Worksheet Canyonlands.
Playas <u>Description:</u> Playa lakes are depressional wetlands hydrologically principally supported by precipitation and surface runoff. They are shallow basins located at the lowest elevations in closed watersheds with soils dominated by shrink-swell (smectitic) clays. They have no outflow to permanent water sources, although clustered playa lakes are intermittently connected when perched water tables are high enough during spring runoff and rain events. Playa water levels are particularly variable in timing, duration, and frequency due to dependence on temporal precipitation patterns. Playa vegetation occurs in concentric zones, each a different association which can completely change multiple times in a single season in response to wetting and drying periods. This system occurs at low elevation, non-glaciated landscapes within the Great Plains region. They are in depressional; topographic	Broad Level Johnson et al. (2012) found that only 0.2% of playas in the southern Great Plains had no wetland or watershed modification, although this study did not include any sampling points from Colorado or Kansas. In eastern Colorado, hydrologic manipulation of playas appears to be lower than other parts of the region; many playas in Colorado are not directly threatened by sedimentation from farming practices and remain in their native context of shortgrass prairie (Cariveau and Johnson 2007). Unit Level Statements are based on information derived from USFS 2024 Draft Ecological Integrity Worksheet Playas. There are three key ecological characteristic (KEC) indicators to determine ecological integrity for this system. They include playa landscape distribution, drainage pattern (clustered), and playa health (unmodified, unfarmed). The overall integrity of this system currently has a ranking of moderate with high confidence. The long-term integrity trend (50	Broad Level Large-scale landscape changes in the southern Great Plains, particularly agricultural impacts, threaten playas with functional loss and physical extinction (Johnson et al. 2012). The biggest threat to playas in the Great Plains is sedimentation from surrounding land use (Gurdak and Roe 2009). Sediment transport into playas is considerably higher from cropland settings than rangeland-dominated areas (Gurdak and Roe 2009). Other threats to playa health include hydrologic modification, ground disturbance by transportation, development, agricultural use, and unsustainable grazing practices. Unit Level Primary disturbances and stressors to this system include the following, which can also be interactive (USFS 2024 Draft Ecological Integrity Worksheet Playas): 1. Climate change may negatively affect playa lake drainage patterns in the plan area through changes to precipitation patterns and drying

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positions with a claypan or hardpan bottom. Playas are located in closed basins, many of which were “dug out” during the 1970s but restoration efforts have been made in recent years to fill back up with water. <u>Abundance</u>: Playa lakes are the predominant wetlands of the southern Great Plains region (Johnson et al. 2012). Within the plan area, there are an estimated 40 playas covering approximately 326 acres, or 0.06% of the plan area (Playa Lakes Joint Venture 2024, USFS 2024 Draft Ecological Integrity Worksheet Playas). <u>Distribution</u>: The playa cluster buffers overlap parts of the Cimarron NG and the Carrizo Unit of the Comanche NG. There is one mapped playa in the Timpas Unit of the Comanche NG (Playa Lakes Joint Venture 2024, USFS 2024 Draft Ecological Integrity Worksheet Playas).	years) is upward (high) with within NFS management with high confidence. The current ecological integrity rating of “moderate” reflects the following findings. Playa lakes, as well as all wetland types, have been in decline across greater southern Great Plains including the plan area (Dahl 1990). All KEC indicators of playas in the plan area are considered compromised relative to the natural range of variation. The number of playas in the plan area is stable, but size and water holding capacity have decreased, primarily from sedimentation. Playa clusters in the plan area have decreased due to long-term drought, leaving more isolated playas. Condition, or health, of playas is considered compromised because of past activities degrading the ecosystem and their contributing areas. However, the drainage pattern of playas in the plan area has stabilized under NFS management. The current condition of playas within the plan area is largely healthy and providing ecosystem services. The CCNGs has restored a few playas, which may contribute to a slight upward trend and the future trend is expected to be stable to increasing due to management continuing its current trajectory with continued management objectives to improve playas. Climate change that is outside NFS management control could impact the integrity and trend. Also, impacts from adjacent lands could impact playas in the plan area over the long term. Ability to improve playas through management on NFS lands in the short term (10 to 15 years) is high but considering private land disturbance and alteration of hydrologic connectivity in the larger	conditions, which could disconnect cluster playas into isolated playas. While models predict warmer and drier trends, the type and timing of precipitation may benefit or impact playas due to their dependence on precipitation. Less precipitation during animal migration periods may impact wildlife (USFS 2024 Draft Ecological Integrity Worksheet Playas). 2. Hydrologic alteration of playa lakes and their contributing areas may have major effects on their distribution. 3. Direct and indirect alterations (e.g. agriculture, water use, transportation, and non-native species invasions) threaten to reduce the number, size, and density of playa lakes. Roads and trails, energy development (oil, gas, wind, solar), and unsustainable grazing practices reduce sediment trapping during and following precipitation events. Sediment can flow into the playa and fill them with soil limiting their capacity to hold water. Roads have bisected playas and drainage networks on and off NFS lands altering flow paths that fill playas with sediment. 4. Invasive species can expand into the area and potentially deplete playas of water. 5. Livestock grazing at an intensity and duration that exceeds the capability for the system to recover from disturbance can impact playa sedimentation, hydrologic regime, and plant composition. For more information, refer to USFS 2024 Draft Ecological Integrity Worksheet Playas.

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Ecosystem or Habitat Type	Habitat Trends	Habitat Threats
(see above)	contributing area, the confidence is low. There is a high amount of agricultural use adjacent to playas on the Cimarron NG.	(see above)
Riparian and Wetlands <u>Description:</u> Riparian areas are terrestrial ecosystems in valley bottoms between streambanks and upland ecosystems. They are influenced by flowing water, water table dynamics, and sediment and debris from upstream and upslope sources. Riparian areas occur along streams, and at the edges of reservoirs, lakes, and ponds. Redistribution of water can decrease, create, or expand riparian and wetland vegetation. Wetlands are ecosystems dependent on groundwater at or near the surface. They support plants tolerant of inundation for long periods or requiring access to the water table. Riparian areas and wetlands have hydric soils by nature. They support wildlife that are dependent on this environment. <u>Abundance:</u> Riparian and wetland ecosystems comprise an estimated 6,333 acres, or 1% of the plan area. The riparian areas along perennial streams reflect current and historic hydrologic and sediment regimes. <u>Distribution:</u> The Cimarron and Comanche National Grasslands' riparian areas and wetlands occur along perennial and intermittent streams, at springs as groundwater dependent ecosystems, along reservoirs, stockponds, pits, and in windmill overflow areas. This system is spatially represented on the Cimarron NG and in the Timpas and Carrizo Units of Comanche NG.	Broad Level Globally, wetlands are vanishing three times faster than forests (Gardner and Finlayson 2018). The rate of net wetland loss has increased substantially across the United States, and the dominant driver is conversion to upland (Lang et al. 2024). Mechanisms of upland conversion include drainage and other less direct mechanisms, including increased temperature and evaporation and changes in precipitation patterns under climate change (Lang et al. 2024). Within the Interior Plains ecoregion, the National Wetland Condition Assessment (NWCA) found that 24% of wetland areas rated good for the vegetation index and 11% rated good for the non-native plant indicator. In Kansas, the current quality of herbaceous wetland habitat is unknown, but the trend in quantity is declining (Rohweder 2022). In Colorado, annual rates of tamarisk encroachment are estimated at 1% to 2.5% increase per year (USFS 2024 Draft Ecological Integrity Worksheet Riparian and Wetland). Unit Level Statements are based on information derived from USFS 2024 Draft Ecological Integrity Worksheet Riparian and Wetland. Inventories of native cottonwood species on the Cimarron NG indicate a diverse age and size structure is still present with greater populations occurring at the western portion of the plan area. Non-native invasive species including tamarisk and Russian olive have doubled in acres from 1981 to 1991, and as of 2003, the species occupied 7,200	Broad Level Nationwide, the rate of net wetland loss has increased substantially across the United States, and the dominant driver is conversion to upland habitat (Lang et al. 2024). Mechanisms of upland conversion include drainage and less direct mechanisms, including increased temperature and evaporation, and changes in precipitation patterns due to climate change (Lang et al. 2024). Unit Level Primary disturbances and stressors to this system include the following, which can also be interactive (USFS 2024 Draft Ecological Integrity Worksheet Riparian and Wetland): • Climate change - Long-term drought and high intensity storm events have eroded channels, decreased late season flows, and lowered water tables to greater degrees than previously observed. Sediment erosion and deposition, pollutant transport from uplands, and long-term incision have compromised ecosystem integrity. Riparian and wetland ecosystems have been compromised through dropping water tables and shifts in temporal patterns. • Hydrologic alteration. • Livestock grazing – Grazing disturbance can reduce bank and floodplain vegetation cover and diversity where livestock grazing occurs (or occurred in the past) at an intensity and duration that exceeds the capacity of a site to recover from grazing disturbance. It can also cause excessive deposition due to channel destabilization and bank alteration, cause

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<i>(see above)</i>	acres along the Cimarron River Basin in Kansas. Tamarisk distribution and abundance represent a major deviation from both the historic and desired condition of riparian woodland ecosystems in the plan area. Tamarisk density is greater in the western portion of the Cimarron River and is likely to continue to spread downstream and up tributaries through seed dispersal. Tamarisk is present in the Purgatoire River and throughout Picket Wire Canyon. There are three key ecological characteristic (KEC) indicators to determine ecological integrity for this ecosystem. They include plant community composition (condition), ground disturbance and hydrologic alteration, and upland and upstream watershed condition. The overall integrity of this system currently has a ranking of moderate with high confidence. The long-term integrity trend (50 years) is moderate with moderate confidence. The current ecological integrity rating of “moderate” reflects the following findings: Plant community composition has been altered by dropping water tables and incision which leads to riparian communities above the water table allowing for encroachment of non-riparian species such as piñon and juniper. On the Cimarron NG, there has been a noticeable water table change in the last 30 years due to upstream influences. The Comanche has an upward trend in native plant composition due to weed treatments of invasive species. Invasives, such as tamarisk and Russian olive, have spread into this ecosystem although active treatment has resulted in an upward trend in native plant composition. There has been some alteration due to legacy effects of past floodplain disturbance such as roads contributing to disturbance on non-NFS lands. On the Comanche NG, roads and livestock trailing	excessive soil erosion, lower water tables leading to a decrease in wetland and riparian vegetation and increase invasive plants. Uncontrolled livestock can congregate in wetlands and riparian areas where they find water, more desirable forage, and favorable microclimates. CCNGs is implementing grazing regimes to mimic pre-European settlement grazing patterns by wild ungulates including Bison and Elk. • Transportation networks - Where transportation networks intersect streams and wetlands or interrupt flow patterns in contributing areas it can lead to upland erosion and decreased infiltration and groundwater recharge, causing the hydrologic regime to be compromised. • Invasives species - Both terrestrial and aquatic invasive species degrade riparian and wetland ecosystem integrity. Invasive species decrease forage, increase fire frequency, decrease soil moisture, and decrease ecosystem biodiversity. Invasives of concern for degrading riparian areas on the CCNGs include tamarisk, Russian olive, and reed canary grass. Tamarisk and Russian olive are deep-rooted species that leave a salt residue on the soil and take up water at a high rate which allows them to outcompete native vegetation including cottonwoods and willows in riparian areas. For more information, refer to USFS 2024 Draft Ecological Integrity Worksheet Riparian and Wetlands.

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<i>(see above)</i>	has influenced conditions on other land ownership. Some stretches of the Purgatoire River show legacy effects that have caused downcutting, but it seems to be stabilizing or improving.	<i>(see above)</i>
Prairie Streams and Rivers <u>Description:</u> The majority of streams in the plan area are intermittent or ephemeral in nature. According to Colorado Natural Heritage Database data (2015), Timpas Creek is the only perennial stream on the Comanche NG. CCNG Water Resources (2005) reports that Carrizo Creek and the Purgatoire River on the Comanche NG are also perennial. <u>Abundance:</u> NFS lands in the plan area are estimated to have 16 miles of perennial streams, 1501 miles of intermittent streams, 1673 miles of ephemeral streams 3190 miles total. <u>Distribution:</u> Streams and rivers are spatially mapped within the Cimarron NG and on the Timpas and Carrizo Units of the Comanche NG.	Unit Level Statements are based on information derived from USFS 2024 Draft Ecological Integrity Worksheet Prairie Streams and Rivers. Streams and rivers on the Cimarron and Comanche National Grasslands flow through a mixed ownership pattern of private and public land which impacts the degree to which NFS management can influence the ecological integrity of streams and rivers. Streams have been altered due to past management activities and are now incised with little to no access to the floodplain. Regional groundwater depletion has altered the period of flow of many intermittent streams. There are five key ecological characteristic (KEC) indicators to determine ecological integrity for this system. They include water quality, water quantity, aquatic habitat complexity, connectivity, and channel stability and floodplain connectivity. The overall integrity of this system has a ranking of moderate with high confidence. The long-term integrity trend (50 years) is moderate with moderate confidence. The current ecological integrity rating of “moderate” reflects the following findings. There are 363 stream miles that are impaired (11% of river/stream systems) on NFS lands. There are four lotic waterbodies on the 303 (d) list including the Cimarron River, Purgatoire River, Timpas Creek, and the Arkansas River. The Arkansas River listing is for a network of headwater tributaries and includes 624.6 miles in the administrative boundary and 292.3 miles in the plan area boundary. Stream	Unit Level Primary disturbances and stressors to this system include the following, which can also be interactive (USFS 2024 Draft Ecological Integrity Worksheet Prairie Streams and Rivers): 1. Climate change - will likely decrease water quantities, which possibly increases contaminant concentrations impacting water quality. Consequence of reduced quantity is less available for water use and ecosystem services. 2. Water Use – Agricultural water use decreases the quantity of water impacting water quality. Irrigation return flows can also increase the amount of contaminants Groundwater depletion reduces stream flow and alters flow regimes. Habitat complexity is impacted by changes in flow regime due to upstream water storage and withdrawals, groundwater depletions in surface and groundwater. 3. Transportation network and use - There are several road-stream crossings in the plan area. Road and stream crossings typically impede movement of sediment and other channel debris. Capacity to transport sediment and debris is critical for maintenance of channel stability. Most likely the connectivity of stream channels is impaired throughout the plan area. 4. Invasive species - Invasive species, such as tamarisk, also decrease flow quantities, which could increase contaminant concentrations impacting water quality. Invasion of non-native Tamarisk and Russian olive has impacted habitat complexity. Native riparian species such

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Ecosystem or Habitat Type	Habitat Trends	Habitat Threats
<i>(see above)</i>	flows are reduced due to groundwater depletions and altered flow regime. The Cimarron River Basin has experienced serious reductions in flow where the dropping water table has resulted in reduced baseflow. Habitat complexity has been impacted by changes to the flow regime due to upstream water storage and withdrawals, groundwater depletion and the invasion of non-native invasive species. Native riparian species including cottonwood and willow have been displaced by invasive tamarisk along much of the stream habitat. The loss of native riparian vegetation has reduced the structural complexity of riparian areas for aquatic species. Ongoing efforts to control the spread of tamarisk have been difficult and it is unknown if substantial reduction will be achieved in the future.	as cottonwood and willow have been displaced by invasive tamarisk along much of the stream habitat. Dense tamarisk stands on stream banks accumulate sediment in their thick root systems, gradually narrowing stream channels and increasing flooding potential. These changes in stream morphology can negatively impact habitat for aquatic species. Loss of native species has reduced the structural complexity of the riparian area; loss of cottonwood has reduced availability of large debris and increases streambank instability. 5. Livestock grazing - Livestock grazing can increase runoff from uplands and decrease channel stability, both increases sediment and naturally occurring metals reaching stream channels impacting water quality. For more information, refer to USFS 2024 Draft Ecological Integrity Worksheet Prairie Streams and Rivers.
Lakes, Ponds, and Reservoirs <u>Description:</u> There are 15 named lakes, ponds, and reservoirs on NFS lands, and a total of 678 total lakes, ponds, and reservoirs in the plan area. Most features on the landscape are small ponds, less than 0.1 acre in size. There are four reservoirs that are greater than one acre in size: Prairie Land Reservoir #1, Brown Reservoir, Reader Lake, and Government Pond. Wilburton Pond, Mallard Ponds, Point of Rocks Ponds and the four ponds associated with the Cimarron Recreation Area are all within the Cimarron River corridor. There are numerous perennial “seep pits” or giant divots which were dug in the river bottom that are supplied by alluvial water. Teal Pond is a constructed perennial pond not associated with the Cimarron River Corridor; it is supplied by runoff.	Unit Level Statements are based on information derived from USFS 2024 Draft Ecological Integrity Worksheet Lakes, Ponds and Reservoirs. There are three key ecological characteristic (KEC) indicators to determine ecological integrity for this ecosystem. They include water quantity, water quality, and shoreline stability. The overall integrity of this system currently has a ranking of moderate with moderate confidence. The long-term integrity trend (50 years) is moderate with low confidence. The ecological integrity rating of “moderate” reflects the following findings. Two lakes are listed on the 303 (d) list in the plan area, Cimarron Lake (Moss Lake Middle) and Point of Rocks Lake (Moss Lake West). Most other lakes have not been assessed for water quality. Reservoir shorelines are somewhat	Unit Level Primary disturbances and stressors to this system include the following, which can also be interactive (USFS 2024 Draft Ecological Integrity Worksheet Lakes, Ponds and Reservoirs): • Climate Change- likely decreases water quantity which could increase contaminant concentration. Shoreline stability is vulnerable to climate change as stabilizing vegetation will likely decrease as water quantities decrease. • Livestock use – grazing can increase run off from uplands and decrease channel stability. Both of these processes increase sediment and naturally occurring metals reaching stream channels. Livestock use degrades shoreline stability by causing shoreline compaction and

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Ecosystem or Habitat Type	Habitat Trends	Habitat Threats
<u>Abundance</u>: See above. <u>Distribution</u>: Most of the open water is spatially mapped in the Timpas Unit of the Comanche NG with a few occurrences in the Carrizo Unit and Cimmaron NG.	degraded due to the lack of maintenance, invasive species outcompeting native species, and the natural tendency of dams to erode. Where livestock are allowed to congregate around water sources, shoreline trampling leads to increase sedimentation rates. Wind also generates wave action that leads to eroding shorelines and dam faces. Water quantity is probably reduced. There are no data sources for water quantity in lakes and reservoirs but there is documented reduced water quantity in streams and rivers.	alteration which damages shoreline vegetation and increases shoreline erosion. • Invasives species (e.g. tamarisk and Russian olive) – can decrease flow quantities which could also increase contaminant concentration. Invasive species can outcompete native vegetation and will degrade shoreline stability. • Recreational use. • Water use – agricultural use decreases water quantity and availability. Irrigation return flow can also increase the number of contaminants in surface and ground water. USGS stream flow data and literature suggest that water quantities in streams and rivers are being affected by groundwater depletions and water withdrawals. For more information, refer to USFS 2024 Draft Ecological Integrity Worksheet Lakes, Ponds and Reservoirs.

Species Evaluations

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Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Cimarron and Comanche National Grasslands | Bird Species Evaluations for Assessment | June 2025

Species Evaluation Report for Birds on the Cimarron and Comanche National Grasslands

**Prepared by USDA Forest Service, Mountain Planning Service
Group, Lakewood, Colorado**

Prepared for the Cimarron and Comanche National Grasslands



Cover Photo: Lazuli bunting (*Passerina amoena*)

This is a working document and the information contained herein may be changed or updated by the USDA Forest Service at any time in the future.

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American Avocet

(Recurvirostra americana)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Uncommon migrant and summer visitor. Dates range from 6 April to 21 September. Two adults and an immature were reported from the Elkhart sewer ponds on 13 May 1992. It is unknown if these birds nested locally. 17 individuals were counted on 08/01/1978. A total of 25 observation records were reported between 05/13/1994 and 05/30/2022 with a high count of 20 on 7/3/2009, 7 on 8/13/2016 and 8 on 5/7/2017 (Cable et al. 1996) Months of observations are April through October (Van Scoyoc 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Selenium contamination from agricultural irrigation and other human activities and methylmercury biomagnifies mainly through aquatic food webs are highly toxic to the species. Disturbance at nest and roost sites, collisions with power lines and wind turbines, and human and research activities are threats to this species.
 - b. Habitat: Wetland losses and conversion for agriculture and urban flood control.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population data are available in the plan area.
 - b. Habitat: Wetland habitat on the plan area has declined, but ponds created by USFS support the species' habitat on the Cimarron NG.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the eastern edge of the species' breeding range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: A total of 27 observation records. Two adults and an immature individual were reported in mid-May.
 - b. Ecological conditions: Wetland and open water habitats are limited in the plan area.

Species Status

G5; S4B,S4N in Colorado; S2B,S3N in Kansas.

Taxonomy

Recurvirostra americana is accepted as valid (Integrated Taxonomic Information System (ITIS) 2024a)

Overall species range

BREEDING: Northwest Territories, southeastern British Columbia, central Alberta, southern Saskatchewan, southwestern Manitoba, southwestern Ontario, and Minnesota south locally to southern California, central Nevada, northern Utah, south-central Colorado, southern New Mexico, and San Luis Potosi, east to central Kansas and coastal Texas. Nonbreeders often in usual winter range in summer.

NON-BREEDING: from California and southern Texas south through Mexico, casually to Guatemala, Belize, Honduras, and Costa Rica, locally in southern Florida (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

The population in the plan area is at the eastern edge of the species' breeding range. Partners in Flight estimates the global breeding population at 460,000. The species rates an 11 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF, 2024, Avian Conservation Assessment Database; PIF, 2024, Avian Conservation Assessment Database Scores (Green Heron)). In the western United States, American Avocets may migrate south for the winter, or they may migrate west from inland breeding sites to coastal wintering sites. The plan area is at the eastern edge of the species' breeding range.

Distribution, abundance, and trend in the plan area

Population

Uncommon transients and summer visitor. Dates range from 6 April to 21 September. Two adults and an immature were reported from the Elkhart sewer ponds on 13 May 1992. It is unknown if these birds nested locally. 17 individuals were counted on 1978/08/01 (Cable et al. 1996). A total of 25 observation records were reported between 05/13/1994 and 05/30/2022 with a high count of 20 on 7/3/2009, 7 on 8/13/2016 and 8 on 5/7/2017. Months of observations are April through October (Van Scoyoc 2024).

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the American avocet population in the plan area or the BCR stratum are available (Reese et al. 2024).

Habitat

(Cable et al. 1996) states, "Marshes once existed in low spots along the river and throughout the region. Today, these sites are completely dry, leaving no trace of their former wetlands. The Forest Service has constructed nine ponds that provide limited habitat for waterfowl, shorebirds, gulls, and herons. Because the Cimarron River seldom has water in it, these ponds support species that otherwise would not occur on Cimarron NG".

Threats (arising from on or off the plan area)

Population

Selenium contamination from agricultural irrigation and other human activities and methylmercury biomagnifies mainly through aquatic food webs are highly toxic to the species. Disturbance at nest and roost sites, collisions with power lines and wind turbines, and human and research activities are threats to this species (Ackerman et al. 2020).

Habitat

Wetland losses and conversation by diverting in-stream flows for agriculture and urban flood control are threats to the habitat for this species (Ackerman et al. 2020).

Ecological conditions

Ecological condition requirements

During the breeding season, avocets inhabit salt ponds, potholes, and shallow alkaline wetlands, as well as mudflats of inland lakes, impoundments, and evaporation ponds. Wetlands used are characterized by common cattail (*Typha latifolia*), bulrushes (*Schoenoplectus spp.*), or sedges (*Carex spp.*), but individuals spend most of their time in more open areas that have no vegetation, or that are characterized by glasswort (*Salicornia spp.*), salt grass (*Distichlis spp.*), and even greasewood (*Sarcobatus spp.*) in more upland areas.

During the migration, in the s. Great Plains, avocets predominantly use saline lakes and playas, especially those of shallow-to-moderate water depths, as well as mudflats of low to mid salinity (Ackerman et al. 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Riparian, wetland and open water habitat is limited in the plan area. Constructed artificial pond habitat in the plan area helps support this species (Cable et al. 1996).

Critical biological characteristics

Nesting most often occurs in loose colonies, although solitary nests also occur (Sordahl 1996).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Avocets may nest in association with other species. In Oklahoma, avocets nested near Snowy Plovers (*Charadrius alexandrinus*) and Least Terns (*Sterna antillarum*) (Dechant et al. 2002).

Intraspecific brood parasitism commonly occurs within American Avocet colonies (Giroux 1985).

Avocets feed on water boatmen (Hemiptera, Corixidae); adult and larval beetles (Coleoptera); fly larvae (Diptera), especially midges (Chironomidae); brine flies in more saline wetlands; and seeds of marsh or aquatic plants, especially sago pondweed (*Potamogeton pectinatus*), salt grass (*Distichlis spicata*), and bulrushes in freshwater wetlands (Ackerman et al. 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Increased salinization from agricultural drain water, surface flow, and subsurface flow is a problem in at least some inland wetlands in every western state in the US (Ackerman et al. 2020).

Maps of Species Range and Known Occurrences in Plan Area



Distribution of the American Avocet

Figure 1. Distribution of the American Avocet (Ackerman et al. 2020).

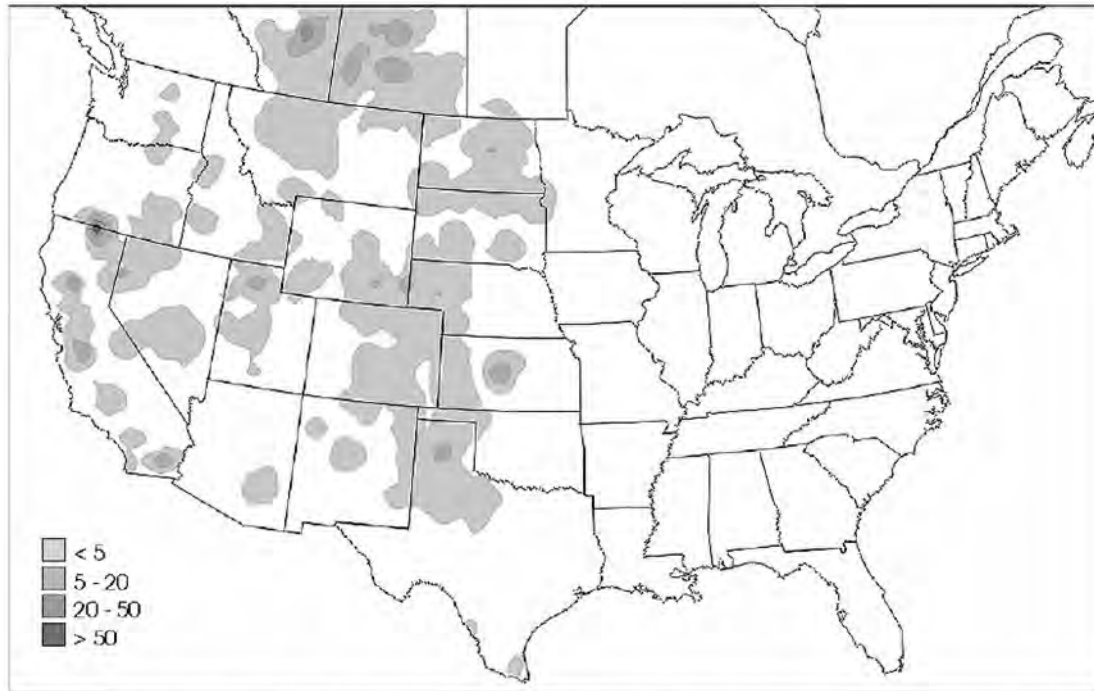


Figure. Breeding distribution of the American Avocet in the United States and southern Canada, based on Breeding Bird Survey data, 1985-1991. Scale represents average number of individuals detected per route per year. Map from Price, J., S. Droege, and A. Price. 1995. *The summer atlas of North American birds*. Academic Press, London, England. 364 pages.

Figure 2. Breeding distribution of the American Avocet in the United States and southern Canada, based on Breeding Bird Survey data, 1985-1991(Dechant et al. 2002).

Ash-throated Flycatcher (*Myiarchus cinerascens*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: (Cable et al. 1996) states: "A pair was seen by Ports at North Fork on 22 June 1978. Bluebird boxes placed by Schwilling along the Cimarron River attracted at least two pairs in 1991 with four eggs found in one box and five in another on 10 June 1991. A possible juvenile was present near one of these boxes on 6 July 1991. Two more nest boxes were occupied in 1993 with eggs in both on 4 June 1993 and four eggs in one and five chicks in the other on 22 June 1993. An adult was near a nest box with four eggs at the western river crossing on 21 May 1995". There is a total of non-duplicate 367 records within the plan area between 1973-05-06 and 2002-07-12. There are 10 element occurrence (EO) records reported by KSNHP between 1993-06-14 and 2010-05-27 (Van Scoyoc 2024). One of the EOs contains a nest box and 4 young in 1998 and 5 eggs in 1994 were observed. IMBCR (2024) reports 20 observations between 2011-05-09 and 2023-06-02 in the Comanche NG. A total of four specimens have been collected along Cimarron River in the Cimarron NG between 1950-05-07 and 2021-04-24. A total of 9 individuals have been collected from the Comanche NG between 1995-06-18 and 1997-06-18 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Declines in quantity of aerial insects, decline in quality of aerial food items, contaminants, habitat loss, and climate stressors.
 - b. Habitat: Commercial harvesting of yuccas, historical changes in wildfire regimes and frequencies, livestock grazing, and invasive introduced plants.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Increasing density trend in the Comanche NG. Within the Shortgrass Prairie Bird Conservation region (BCR 18), BBS shows increasing trends in Colorado, BCR 18 and in the United States. eBird reports increasing trends in Colorado.
 - b. Habitat: Bluebird boxes have afforded nesting habitat for this species in the plan area. Riparian habitat on the plan area has declined; however, tamarisk control and cottonwood and willow restoration efforts along the Cimarron and Purgatoire Rivers are ongoing. Juniper has increased in distribution and abundance in some ecosystems within the plan area, particularly the canyonlands of the Comanche National Grassland.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the north-western edge of the breeding range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population The Ash-throated Flycatcher is a common breeder just west of Morton County in both Cimarron County, Oklahoma, and Baca County, Colorado. Approximately 400 records including at least 8 nesting records with eggs and young are available in the plan area (Cable et al. 1996).

- b. Ecological conditions: Both riparian and pinyon-juniper habitats are both relatively limited in the plan area. Bluebird boxes have been used for nesting by this species in the plan area.

Species Status

G5; S5B in Colorado; S1B in Kansas.

Taxonomy

Myiarchus cinerascens is accepted as valid. Other common names include, Papamoscas cenizo [Spanish] and tyran à gorge cendrée [French]. (Integrated Taxonomic Information System (ITIS) 2024a)

Overall species range

The breeding range extends from central Mexico north into the United States to southwestern Nebraska and west to southern Washington. The breeding range includes New Mexico, Arizona, California, Utah, western and eastern Colorado, southern Idaho, southern Wyoming, western Kansas, western Texas, and eastern and coastal Oregon.

The non-breeding range extends from central Arizona and southeastern California south along the Pacific Coast of Central America to Nicaragua, including the Baja California Peninsula, and the Gulf Coast from southern Texas to Veracruz, Mexico.

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the north-western edge of the breeding range. Partners in Flight estimates the global breeding population at 10,000,000. The species rates an 8 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022). This species appears to be declining in the southwestern U.S. and throughout its range in Mexico but is increasing in the northern parts of its range (Fink et al. 2023).

Distribution, abundance, and trend in the plan area

Population

(Cable et al. 1996) states: "A pair was seen by Ports at North Fork on 22 June 1978. Bluebird boxes placed by Schwilling along the Cimarron River attracted at least two pairs in 1991 with four eggs found in one box and five in another on 10 June 1991. A possible juvenile was present near one of these boxes on 6 July 1991. Two more nest boxes were occupied in 1993 with eggs in both on 4 June 1993 and four eggs in one and five chicks in the other on 22 June 1993. An adult was near a nest box with four eggs at the western river crossing on 21 May 1995". There is a total of 367 records within the plan area between 1973-05-06 and 2002-07-12. There are 10 element occurrence (EO) records reported by KSNHP between 1993-06-14 and 2010-05-27. One of the EOs contains a nest box and 4 young in 1998 and 5 eggs in 1999 were observed {IMBCR, 2024 #37146; Van Scoyoc, 2024, Species Occurrence Data for the Cimarron-Comanche National Grasslands} reports 20 observations between 2011-05-09 and 2023-06-02 in the Comanche NG. A total of four specimens have been collected along Cimarron River in the Cimarron NG between 1950-05-07 and 2021-04-24. A total of 9 individuals have been collected from the Comanche NG between 1995-06-18 and 1997-06-18 (Van Scoyoc 2024).

Surveys conducted by the Bird Conservancy of the Rockies indicate robust increasing trends (12.9%) in the Ash-throated flycatcher population in the Shortgrass Prairie Bird Conservation Region in Colorado (Reese et al. 2024).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population increases in the Shortgrass Prairie Bird Conservation Region (S18) (1.37%), in Colorado (1.41%) and in the United States (0.52%) (Hostetler et al. 2023).

eBird reports increasing trends in Colorado (Fink et al. 2023).

Habitat

Desert scrub, pinyon-juniper and oak woodland, chaparral, thorn scrub and riparian woodland; in winter also in open deciduous woodland. Usually nests in a tree cavity, a hole in a cactus, in an abandoned woodpecker hole or Cactus Wren nest (NatureServe 2024).

Bluebird boxes have been used for nesting by this species in the plan area. Riparian habitat on the plan area has declined; however, tamarisk control and cottonwood and willow restoration efforts along the Cimarron and Purgatoire Rivers are ongoing. Juniper has increased in distribution and abundance in some ecosystems within the plan area, particularly the canyonlands of the Comanche National Grassland.

In southeast Colorado juniper woodlands have expanded (CPW 2015), particularly in areas of in rocky, shallow soil types that have little herbaceous cover, but contraction has also occurred in deeper and more finely textured soils (Amme et al. 2020) (see Appendix for more information).

Threats (arising from on or off the plan area)

Population

Birds that are aerial insectivores are generally affected by multiple threats including declines in aerial insects, decline in quality of aerial food items, contaminants, habitat loss, and climate stressors (Spiller and Dettmers 2019).

Habitat

Commercial harvesting of yuccas, historical changes in wildfire regimes and frequencies, livestock grazing, and invasive introduced plants are threats to the habitat of this species (Cardiff and Dittman 2020).

Ecological conditions

Ecological condition requirements

Desert scrub, pinyon-juniper and oak woodland, chaparral, thorn scrub and riparian woodland; in winter also in open deciduous woodland. Usually nests in a tree cavity, a hole in a cactus, in an abandoned woodpecker hole or Cactus Wren nest (NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Shortgrass prairie is the most common macrohabitat in the plan area (see Appendix). Bluebird boxes have been used for nesting by this species in the plan area.

Critical biological characteristics

This species occupies a wide variety of arid woodland habitats. However, as a cavity-breeder, this species is reliant on standing snags (dead trees) and other bird species, such as woodpeckers, to create the initial cavity (NatureServe 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Primarily insectivorous; feeds on bees, wasps, ants, caterpillars, moths, grasshoppers, etc. Also known to eat spiders and some berries. Often forages by flying out from perch and catching insects in the air (NatureServe 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Experiments using nest boxes to increase availability of nest cavities have generally resulted in increased densities of Ash-throateds and other cavity nesters (Brush 1983). Availability of suitable nesting sites is important in regulating breeding densities, but other factors, such as overall habitat quality or some lower threshold limit of territory size, may also be influential (Cardiff and Dittman 2020).

Maps of Species Range and Known Occurrences in Plan Area

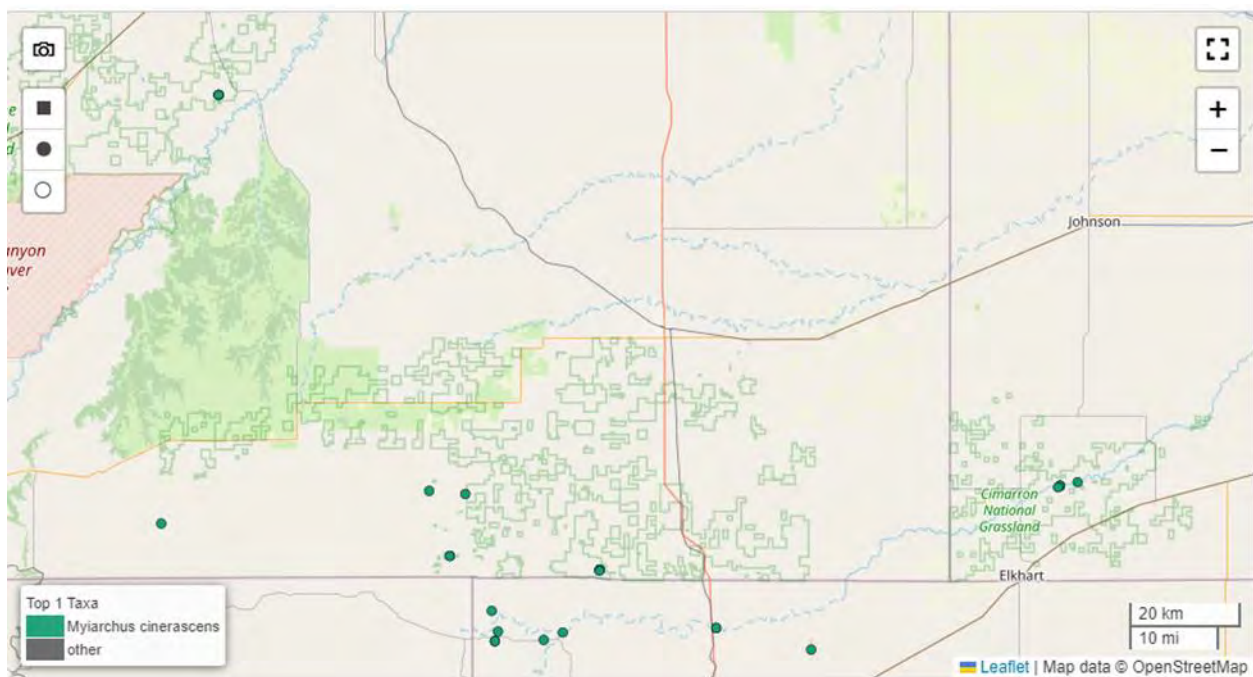


Figure 3. Ash-throated flycatcher occurrence records within the plan area (Van Scoyoc 2024).



Distribution of the Ash-throated Flycatcher

Figure 4. Distribution of the ash-throated flycatcher (Cardiff and Dittman 2020).

Bald Eagle

(Haliaeetus leucocephalus)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has 14 observations between 2011 to 2022 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Illegal shooting, lead poisoning, rodenticides, nest disturbance, wind energy projects, and pesticides. Avian influenza is also becoming more prevalent in North America and is particularly harmful to raptors (Runstadler and Puryear 2024).
 - b. Habitat: Nesting habitat is limited in the project area, requiring large diameter trees or cliffs near water. The plan area is largely utilized as winter habitat which is outside the nesting season.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: There is no information about population trend in the plan area. BBS and eBird indicate increasing trends in BCR 18, in Colorado, in Kansas and in the United States.
 - b. Habitat: Bald eagles utilize a wide variety of habitats and are mostly uncommon winter residents.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is not endemic, disjunct, or at the edge of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Species is readily observed in the plan area particularly in the winter and does not represent a low population.
 - b. All of the plan area is potential foraging and wintering habitat.

Species Status

G5; S3B, S3N in Colorado; S2B, S4N in Kansas; listed as Candidate in Colorado; listed as DL under the Endangered Species Act.

Taxonomy

Haliaeetus leucocephalus is valid. Retrieved November 21, 2024, from the Integrated Taxonomic Information System (ITIS) on-line database, www.itis.gov.

The two subspecies, *Haliaeetus leucocephalus leucocephalus* (southern U.S. and Baja California) and *H. l. alascanus* (northern U.S. and Canada) intergrade broadly in the central and northern U.S. Constitutes a superspecies with *H. albicilla* (NatureServe 2024)

Species range

Overall species range

The range of breeding bald eagles extends south and east from Alaska across southern Canada, south through California to Arizona, and east to Florida. Wintering distribution is spotty, but occurs throughout most of the contiguous U.S., north along the coast of British Columbia into coastal Alaska (FWS 2007).

In Colorado, bald eagles are found throughout much of the state during both the summer and winter. They can often be seen near large reservoirs and along major rivers. Bald eagles are frequently observed overwintering in Kansas.

Description of how the population in the plan area fits within the overall range

Primarily wintering habitat and limited nesting habitat within the central portion of the species' range. Partners in Flight estimates the global breeding population at 200,000. The species rates a 9 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

No population trend or abundance estimates are available specific to the planning area. While the species is readily observed in the plan area, particularly during the winter, it has not been well-documented.

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the bald eagle population in the plan area or the BCR stratum are available (Reese et al. 2024).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population increases in the Shortgrass Prairie Bird Conservation Region (S18) (8.84%), in Colorado (7.02%), in Kansas (5.23%) and in the United States (5.36%) (Hostetler et al. 2023).

eBird, which could produce better trend estimates for bald eagle, reports increasing trends in Kansas and in Colorado (Fink et al. 2023).

Habitat

No known nesting habitat in the plan area. The plan area is used for primarily winter habitat.

Threats (arising from on or off the plan area)

Population

Most non-natural mortalities are human caused (Colorado Bird Atlas Partnership 2016). Threats include illegal shootings, electrocutions, lead poisoning, collisions, and habitat loss or degradation due to human encroachment at breeding sites that may limit further population expansion. The effects of disturbance at nest and roost sites increase with duration and frequency of events and can increase energetic demands and reduce survival, especially in the winter if food and quality foraging sites are limited. Nest abandonment and reproductive failure is also possible during the nesting season. However, disturbance

impacts are generally not significant at a population level and there is a wide range of sensitivity to disturbance across individuals and populations (Buehler 2020).

Habitat

Specific threats to bald eagle habitat include development of renewable energy projects (e.g., solar, wind, geothermal, hydropower), recreation and/or other development projects that may disturb or alter habitat at nesting and winter roost sites.

Ecological conditions

Ecological condition requirements

Nests usually are in tall trees or on pinnacles or cliffs near water. Tree species used for nesting vary regionally and may include pine, spruce, fir, cottonwood, poplar, willow, sycamore, oak, beech, or others. Wintering eagles tend to avoid areas with high levels of nearby human activity (boat traffic, pedestrians) and development (buildings). Bald eagles preferentially roost in conifers or other sheltered sites in winter in some areas; typically, they select the larger, more accessible trees. Perching in deciduous and coniferous trees is equally common in other areas. Communal roost sites used by two or more eagles are common, and some may be used by 100 or more eagles during periods of high use. Winter roost sites vary in their proximity to food resources (up to 33 km) and may be determined to some extent by a preference for a warmer microclimate at these sites. Available data indicates that energy conservation may or may not be an important factor in roost-site. Communal night roosts often are in trees that are used in successive years (Buehler 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

All of the plan area is potential foraging and wintering habitat.

Critical biological characteristics

Bald eagles generally nest near coastlines, rivers, and large lakes where there is an adequate food supply. They nest in mature or old-growth trees, snags (dead trees), cliffs, and rock promontories. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that can weigh more than 1,000 pounds. Nest sites typically include at least one perch with a clear view of the water, where they forage.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Bald eagles are opportunistic feeders. Fish comprise much of their diet, but they also eat waterfowl, shorebirds/colonial waterbirds, small mammals, turtles, and carrion. Wintering bald eagles often congregate in large numbers along streams to feed on spawning salmon or other fish species and often gather in large numbers in areas below reservoirs, especially hydropower dams, where fish are abundant. Wintering eagles also take birds from rafts of ducks at reservoirs and rivers and congregate on melting ice shelves to scavenge dead fish from the current or the soft melting ice. Bald eagles will also feed on carcasses along roads, in landfills, and at feedlots (FWS 2007).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Wind energy projects have the potential of affecting both breeding and wintering habitats. Human activity related to land use, use of environmental contaminants, collisions with vehicles, structures and electrocutions, and disease have been reported to have variable effects on reproduction and survival across the range (see Conservation and Management: Effects of Human Activity) and thus may be important in population regulation. Human development may limit nest-site availability and access to food resources in aquatic areas, thus limiting the size of the breeding population and the productivity of individual territories. Human use of environmental contaminants, such as DDT, has historically been shown to limit reproduction and survival, and thus regulate populations (Buehler 2020).

Maps of Species Range

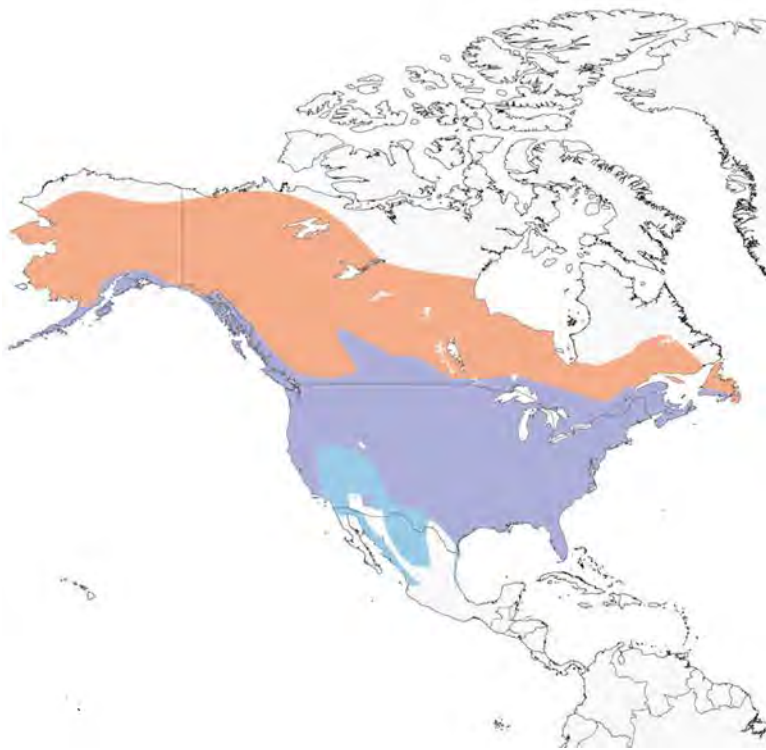


Figure 5. Distribution of bald eagle in North America.

Bell's Vireo (*Vireo bellii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: A total of 11 records between 1997-07-17 and 2021-05-12 on the Cimarron NG, and one record on 2014-05-17 on the Comanche NG are available {Cable, 1996 #24553; Van Scoyoc, 2024, Species Occurrence Data for the Cimarron-Comanche National Grasslands} reports that one individual along the Cimarron River on 10 May 1950 and another below Point of Rocks on 12 September 1982 were observed. One nest on 19 May 1992 and another on 4 September 1995 were found in the Cimarron NG.

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Brood parasitism and predation
 - b. Habitat: Loss of riparian habitat due to urban development, water diversion, flood control projects, fire, grazing, firewood cutting and the spread of agriculture.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends area available within the plan area. BBS and eBird show increasing trends in Kansas.
 - b. Habitat: Riparian habitat on the plan area has declined; however, tamarisk control and cottonwood and willow restoration efforts along the Cimarron and Purgatoire Rivers are ongoing.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the western edge of the population range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: A total of 15 observation records and two nesting records in the plan area.
 - b. Ecological conditions: Riparian and riparian woodlands are limited in the plan area.

Species Status

G5; S1B in Colorado; S4B in Kansas.

Taxonomy

Vireo bellii is accepted as valid. Common names include Vireo de Bell [Spanish]. Retrieved November 21, 2024, from the Integrated Taxonomic Information System (ITIS) on-line database, www.itis.gov.

Species range

Overall species range

BREEDING: southern California, southern Nevada, southwestern Utah, Arizona, southern New Mexico, northeastern Colorado, Nebraska, South Dakota, western North Dakota, southeastern Minnesota, southern Wisconsin, northeastern Illinois, northwestern Indiana, and southwestern Michigan south to northern Baja California, southern Sonora, southern Durango, Zacatecas, southern Tamaulipas, southern Texas, north-central Louisiana, Arkansas, and southwestern Tennessee, southwestern Kentucky, southern Indiana, and western Ohio.

NON-BREEDING: southern Baja California and southern Sonora south to Honduras, primarily on Pacific slope; casually north to California, Arizona, Texas, Louisiana, and southern Florida, and south to Nicaragua (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the western edge of the species' range. Partners in Flight estimates the global breeding population at 5,700,000. The species rates a 10 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

A total of 11 records between 1997-07-17 and 2021-05-12 on the Cimarron NG, and one record on 2014-05-17 on the Comanche NG are available {Cable, 1996 #24553@@author-year;Van Scoyoc, 2024, Species Occurrence Data for the Cimarron-Comanche National Grasslands} reports that one individual along the Cimarron River on 10 May 1950 and another below Point of Rocks on 12 September 1982 were observed. One nest on 19 May 1992 and another on 4 September 1995 were found in the Cimarron NG.

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the bell's vireo population in the plan area or the BCR stratum are available (Reese et al. 2024).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population increase (1.26%) in Kansas (Hostetler et al. 2023).

eBird reports increasing trends in Kansas (Fink et al. 2023).

Habitat

This species can occur in varied habitats, but in arid regions often occurs near water (NatureServe 2024). Dense tamarisk thickets and cattle grazing have almost eliminated cottonwood and willow along Timpas Creek. Tamarisk density, live cottonwood stem density, and the density of cottonwood regeneration are all greater in the western portion of the Cimarron River, while dead cottonwood stem density is greater along the eastern portion of the river channel. No inventories have been conducted for the Purgatoire River. Ongoing management efforts in the riparian woodlands are focused on tamarisk control and cottonwood and willow restoration along the Cimarron and Purgatoire Rivers.

Threats (arising from on or off the plan area)

Population

Brown-headed Cowbirds (*Molothrus ater*) parasitism rates vary geographically, but higher percent have been reported in Great Plains. In Kansas, nest abandonment was significantly higher with parasitized nests than unparasitized nests (Parker 1999).

Ground nesting adults and young are predated often by various mammals and reptiles (NatureServe 2024).

Habitat

Loss of riparian habitat due to urban development, water diversion, flood control projects, fire, grazing, firewood cutting and the spread of agriculture are threats to the habitat of this species (Kus et al. 2022).

Ecological conditions

Ecological condition requirements

Habitat types used during breeding include dense brush, willow thickets, mesquite, streamside thickets, and scrub oak, in arid regions often near water, also adjoining uplands. Nests are in shrub or low tree, usually averaging about one meter above ground, usually in horizontal or downsloping twig fork, typically near edge of thicket. Migration and winter habitats are primarily in dense scrub (NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Riparian and riparian woodlands are limited in the plan area (see Appendix).

Critical biological characteristics

Usually returns to same nesting territory in successive years (Franzreb 1989). More than 60 percent of male and 30 percent of female returning birds utilize the previous year's territories (Greaves 1989). Most fledglings that survive to breed, return to their natal area (Gray and Greaves 1991). Nest site occasionally found in same shrub as in previous years (Greaves 1987).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Eats primarily insects and small spiders (99.3 percent), rarely fruits (0.7 percent) (NatureServe 2024)

Predators include domestic cat (*felis domesticus*), raccoon (*procyon lotor*), opossum (*didelphis virginiana*), coyote (*canis latrans*), long-tailed weasel (*mustela frenata*), dusky-footed woodrat (*neotoma fuscipes*), deer mouse (*peromyscus maniculatus*), house mouse (*mus musculus*), rat (*rattus rattus*), and various snakes. Suspected or confirmed avian predators include greater roadrunner (*geococcyx californianus*), American crow (*corvus brachyrhynchos*), and scrub jay (*aphelocoma californica*) (NatureServe 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Riparian habitats are critical in arid and semi-arid regions. Riparian functions must support establishment and maintenance of mid-successional shoreline vegetation. Minimizing habitat patchiness may reduce rates of cowbird parasitism and preserves should be located in areas free of brown-headed cowbirds (*Molothrus ater*). Even isolated habitat islands occupied by apparently unpaired males should be protected and enhanced because the observed tendency of females to wander between mates may make these males important to tying together isolated sub-populations of the species (Greaves 1989).

Maps of Species Range and Known Occurrences in Plan Area



Figure 6. Distribution of the Bell's vireo (Kus et al. 2022).

Brewer's sparrow (*Spizella breweri*)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Many sightings on both units. 5 KSNHP (1978-2021), 179 GBIF records (1950-2022), 8 iDigBio (1950-2020), 86 IMBCR (2008-2021). A few nesting records exist in the plan area (Cable et al. 1996).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Brewer's sparrow population viability is likely linked to extensive alteration of sagebrush (sandsage) shrubsteppe habitat.
 - b. Habitat: Clearing of sagebrush (sandsage), some range management techniques. Wildfire. Habitat fragmentation from roads and development can also be an issue. Invasive species such as toadflax and also cause habitat to trend towards being less suitable for the species. Conifer encroachment also makes habitat less suitable for Brewer's sparrow.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Breeding bird surveys indicate declining population across the species' range; Within the Shortgrass Prairie Bird Conservation region (BCR 18), BCR population trends on the Cimarron increased from 2009-2015. Overall trends on shortgrass prairie are down (Hostettler et al. 2023).
 - b. Habitat: Sandsage prairie in the plan area exhibits some departures from historic conditions, but the current condition in the plan area is believed to be relatively stable and capable of providing abundant habitat for this species.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Brewer's sparrow is a strongly sagebrush dependent species. The range of the species is tied to the range of sagebrush-dominated ecosystems. In the plan area, this species is known to use the sandsage (*Artemisia filifolia*) habitat. The plan area is at the Eastern edge of the breeding and migration ranges.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Many sightings on both units. 5 KSNHP (1978-2021), 179 GBIF records (1950-2022), 8 iDigBio (1950-2020), 86 IMBCR (2008-2021).
 - b. Ecological conditions: Sandsage (sagebrush) prairie is abundant in the CCNGs.

Species Status

G5; S4B in Colorado; S1B in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Spizella breweri is valid. Retrieved November 21, 2024, from the Integrated Taxonomic Information System (ITIS) on-line database, www.itis.gov

Species range

Overall species range

Brewer's sparrow is located throughout western North America from central Mexico through to southwestern Canada, with scattered sightings and populations up into Alaska and Yukon. Some sightings in the Eastern U.S. and Canada as well (eBird 2024).

Description of how the population in the plan area fits within the overall range

The Comanche Cimarron Nations Grasslands within the eastern edge of the solid habitat block covering the western U.S. Partners in Flight estimates the global breeding population at 17,000,000. The species rates a 12 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List but is a species of common bird in steep decline (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

There are records of Brewer's sparrow from both grassland units and in every habitat type within the grasslands (eBird 2024).

Surveys conducted by the Bird Conservancy of the Rockies indicate robust, statistically significant increasing trends in the Brewer's sparrow population in the Cimarron National Grassland (KS-BCR18-CI) and robust increase in the occupancy in the Shortgrass Prairie Bird Conservation Region (BCR18) (Reese et al. 2024).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases in the Shortgrass Prairie Bird Conservation Region (S18) (-4.5%) and in the United States (-1.5%) (Hostetler et al. 2023).

eBird reports a decreasing trend in the United States (Fink et al. 2023).

Habitat

There are records of Brewer's sparrow from both grassland units and in every habitat type within the grasslands (eBird 2024).

Primary habitat includes areas dominated by big sagebrush (*Artemisia tridentata* spp). This species is known to use sandsage (*Artemisia filifolia*) grassland habitat in the plan area (Cable et al. 1996). Brewer's sparrows are most abundant in ecologically healthy shrub communities consisting of tall shrubs in a clumped distribution.

Threats (arising from on or off the plan area)

Population

Brewer's sparrow population viability is likely linked to extensive alteration of sagebrush shrubsteppe habitat (Holmes and Johnson 2005a).

Habitat

Primary influences include management activities that have a transformative effect on sagebrush habitat such as livestock grazing, followed by alteration of natural fire regimes and invasion by exotic plants (Holmes and Johnson 2005b). Habitat loss and fragmentation due to development also threaten the species.

Ecological conditions

Ecological condition requirements

The Brewer's sparrow is considered an obligate of sagebrush, {Holmes, 2005, Brewer's sparrow (*Spizella breweri*): A technical conservation assessment; Paige, 1999, Birds in a sagebrush sea. Managing sagebrush habitats for bird communities}. Throughout most of its breeding range, the Brewer's sparrow is most closely associated with landscapes dominated by big sagebrush (Wiens and Rotenberry 1981). Factors that influence Brewer's sparrow occupancy and abundance include the amount of sagebrush cover, sagebrush patch size, spatial distribution of patches, and the extent of disturbance and fragmentation. {Holmes, 2005 #9061; Paige, 1999, Birds in a sagebrush sea: Managing sagebrush habitats for bird communities} provide a detailed description of Brewer's sparrow habitat use in Region 2.

Throughout its breeding range, the Brewer's sparrow is most closely associated with landscapes dominated by big sagebrush (*Artemisia tridentata* spp.) {Wiens, 1981, Habitat associations and community structure of birds in shrubsteppe environments; Rotenberry, 1999, Brewer's sparrow: *Spizella breweri*}, and is considered an obligate of sagebrush communities (Braun et al. 1976, Paige and Ritter 1999). This bird has a maximum shrub canopy height threshold, typically utilizing shrubs with an average height of less than 5 ft {Petersen, 1985 #20833; Rotenberry, 1999, Brewer's sparrow: *Spizella breweri*} reported that Brewer's sparrows rarely used shrubs less than 20 inches tall. Brewer's sparrows occur less frequently in shrubby openings in pinyon-juniper and mountain mahogany woodlands (Sedgwick 1987) and large shrubby parklands within coniferous forests (All About Birds 2024a). They have also been found at high elevations above timberline and in shrubby montane valleys dominated by low-growing willow and shrubs consistent with reports documented in the literature.

At a broad, regional scale, Brewer's sparrow abundances have been correlated with shrub cover (Wiens and Rotenberry 1981), with the highest density of singing males found to be greatest in unfragmented shrubland habitats {Knick, 1995, Landscape Characteristics of Fragmented Shrubsteppe Habitats and Breeding Passerine Birds; Knick, 2000, Ghosts of habitats past: contribution of landscape change to current habitats used by shrubland birds; Knick, 2002, Effects of habitat fragmentation on passerine birds breeding in intermountain shrubsteppe}. Local densities are negatively influenced by landscape-level habitat changes that increase fragmentation in shrubland habitats {Rotenberry, 2020, Brewer's Sparrow (*Spizella breweri*); Knick, 2000, Ghosts of habitats past: contribution of landscape change to current habitats used by shrubland birds} hypothesized that Brewer's sparrows may be more sensitive to variation in landscape-level attributes than in local-scale habitat attributes.

Landscape-level attributes that are positively associated with Brewer's sparrow density include high shrub cover, large patch size, little fragmentation, low disturbance, and habitat heterogeneity {Knick, 1995, Landscape Characteristics of Fragmented Shrubsteppe Habitats and Breeding Passerine Birds; Knick,

2002, Effects of habitat fragmentation on passerine birds breeding in intermountain shrubsteppe} concluded that the occurrence of Brewer's sparrows increased with increasing area of sagebrush patches and decreasing fragmentation. The minimum patch size and the degree of patch isolation required for breeding have not been determined, but {Knick, 1995, Landscape Characteristics of Fragmented Shrubsteppe Habitats and Breeding Passerine Birds} suggest that isolated stands of sagebrush smaller than 2 ha are not likely to be nesting habitat.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Most of the habitat in the plan area is suitable for the species, if sagebrush cover is maintained. This habitat is reasonably well connected to other sagebrush habitats, at least relative to the flight range of these sparrows (see Appendix for more information on sandsage prairie).

Critical biological characteristics

Brewer's sparrows are a neoarctic-neotropical migrant with a circannual activity pattern in which they are an early spring migrant (Holmes and Johnson 2005b). Males arrive on the breeding grounds several days before females and begin to establish territories (Holmes and Johnson 2005b). Average temperatures in late April may influence the timing of territory establishment and pair formation, with colder temperatures delaying these activities (Petersen and Best 1985). Following territory establishment and pair formation, the nesting season extends from mid-April to early August, with most nesting activity concentrated between mid-May and late July (Rotenberry et al. 1999). Fall migration takes place from mid-August through October (Holmes and Johnson 2005b).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Protection and management of sagebrush habitat for Brewer's sparrow tends to result in conditions that favor other sagebrush -dependent species, such as sage grouse.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Intact sagebrush (sandsage prairie) ecosystems are critical for Brewer's sparrow. The sagebrush (sandsage prairie) ecosystem in the plan area is vulnerable to wildfire, conifer encroachment and habitat degradation from noxious and invasive weeds.

Maps of Species Range and Known Occurrences in Plan Area

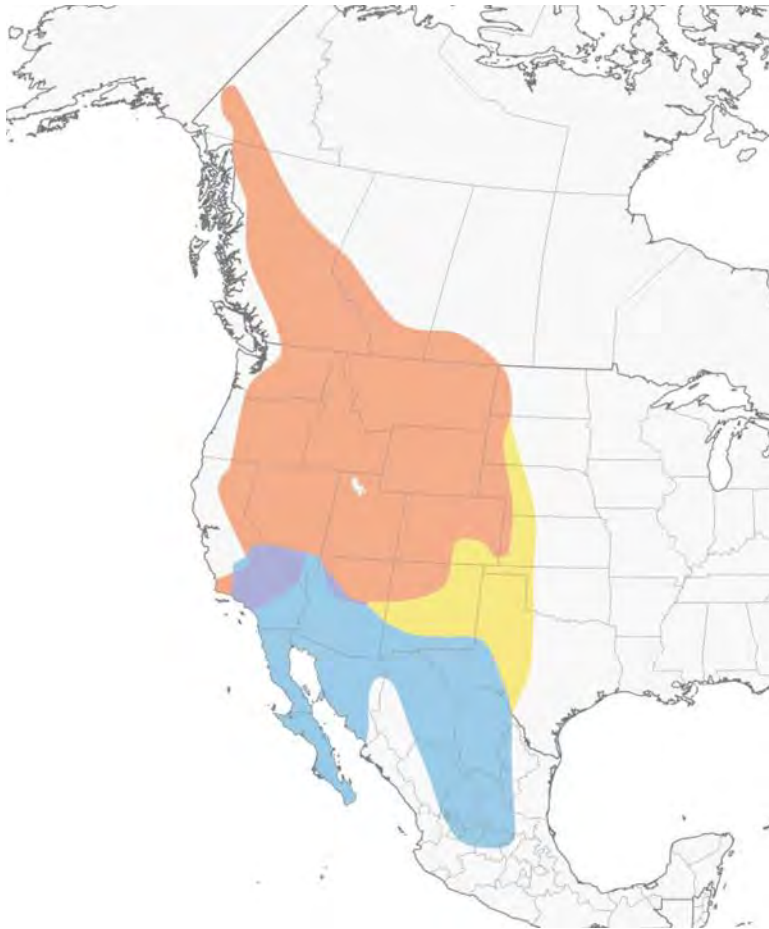


Figure 7. Distribution of Brewer's sparrow in North and Central America.

Burrowing Owl

(*Athene cunicularia*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Colorado Natural Heritage- 56 observations, Kansas Natural Heritage 47 observations between 1995 and 2007. GBIF- 457 observations between 1950-2023. IMBCR-13 observations between 2009 to 2016.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern:

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Loss of prairie dog towns and ongoing prairie dog management. Human disturbance near nesting areas, illegal shooting, predation from other raptors, fence/powerline collisions, drowning in stock tanks, rodenticides, and pesticides are known threats. Avian influenza is also becoming more prevalent in North America and is particularly harmful to raptors {Runstadler, 2024, The virus is out of the barn: the emergence of HPAI as a pathogen of avian and mammalian wildlife around the globe}.
 - b. Habitat: Loss of habitat, particularly suitable breeding habitat in prairie dog towns and prey base is the top threat.
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: Population trends are declining in the bird conservation region containing the plan area. There is no specific robust data of population trend in the plan area. Within the Shortgrass Prairie Bird Conservation region (BCR 18), IMBCR population trends are declining. BBS trends indicate the population is uncertain in Colorado, declining in Kansas, and declining nation-wide.
 - b. Habitat has potentially decreased in quality. The species often makes use of prairie dog habitat, which also appears to be relatively stable or at pre-plague outbreak levels in the plan area (see black-tailed prairie dog Evaluation). Fire deficits due to fire suppression are also most pronounced on the Timpas Unit of the Comanche and parts of the Carrizo Unit of the Comanche.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Endemic to short-grass prairie and requires burrows to nest created by prairie dogs or other burrowing animals.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Species is found within the plan area where prairie dog towns are located. Plague outbreaks influence prairie dog colonies.
 - b. They are restricted ecologically within the plan area requiring prairie dog burrows for nesting. Although shortgrass prairie is abundant throughout the plan area, they are dependent upon prairie dog colonies.

Species Status

G4; S4B in Colorado; S3B in Kansas; listed as Tier 1, Threatened in Colorado; USFS Region 2 Sensitive Species.

Taxonomy

Athene cunicularia is valid (ITIS 2024).

Species range

Overall species range

Burrowing owls are distributed throughout western North America, south from central Alberta to Tierra del Fuego in South America. Range contractions have occurred at the edges of the western distribution. Burrowing owls have been extirpated from British Columbia and Manitoba, Canada, with concurrent southerly range contraction in Alberta and Saskatchewan. There is strong evidence for a widespread, persistent decline in western burrowing owl in recent years, westerly range contractions have occurred in all U.S. states at the eastern edge of the species' distribution, including extirpation of the Minnesota populations (NatureServe 2024).

Historically in Colorado, burrowing owls were reported as locally common with a large amount on private lands. Each burrowing owl location represented one to many burrowing owls; thus, the number of locations is much lower than the actual burrowing owl population size in eastern Colorado (Brodhead et al. 2023).

Description of how the population in the plan area fits within the overall range

Common resident from spring through fall, rare in winter. Adults have been recorded near presumed nest burrows on numerous dates. Ports reported 24 birds 3.5 miles south of Wilburton on 13 June 1979. He estimated 56 owls distributed among 12 prairie dog towns during the summer of 1978. Burrowing Owls are very scarce in cold-weather months but have been known to overwinter. They have been seen on several Christmas bird counts (Cable et al. 1996). Partners in Flight estimates the global breeding population at 18,000,000. The species rates a 11 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

Surveys conducted by the Bird Conservancy of the Rockies indicate robust decreasing trends in the burrowing owl population in the Shortgrass Prairie Bird Conservation Region (BCR18) (Reese et al. 2024).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases in Kansas (-0.49%) and in the United States (-0.63%) (Hostetler et al. 2023).

eBird reports a decreasing trend in Colorado (Fink et al. 2023).

Habitat

Burrowing owl habitat typically consists of open, dry, treeless areas on plains, prairies, and deserts. These areas are also occupied by burrowing mammals and other animals that provide nest burrows. Main components at the macrohabitat scale within USFS Region 2 are as follows (McDonald et al. 2004):

- Open, dry, treeless areas, typically occupied by burrowing mammals that provide nest burrows
- Rangelands grazed by burrowing mammals and domestic livestock, which maintain short vegetation

The following list and subsequent discussion provide a thorough enumeration of the habitat components that consistently emerge with significance in burrowing owl habitat studies throughout USFS Region 2 (McDonald et al. 2004):

- High densities of available burrows for nesting.
- Active, or very-recently abandoned, prairie dog colonies.
- Close proximity to other nesting burrowing owls.
- Close proximity to occupied prairie dog burrows.
- Short vegetation around nest burrow, low shrub density, and high forb density.
- Presence of dried manure for lining of nest burrow.

Threats (arising from on or off the plan area)

Population

Burrowing Owls are still numerous, but populations have declined in some states by over 4% per year between 1966 and 2019, according to the North American Breeding Bird Survey. Partners In Flight (Widespread), IUCN (Least Concern, but Population Trend is Decreasing), and on the USFWS Birds of Conservation Concern list

Human disturbance: Vehicular traffic, pesticides, domestic animals, and recreational shooting of prairie dogs can negatively impact burrowing owl populations directly through mortality or indirectly through their effect on reproductive success or food supply of owls.

Energy development fence/powerline collisions, and stock tanks: Collisions with powerlines and fences, cause some mortality, particularly during the fast, low foraging flights. Adults have been known to drown in stock watering tanks.

Pesticides: Susceptible to eggshell thinning from DDT.

Habitat

Because of their close association with prairie dogs, loss of burrowing owl habitat can generally be equated with loss of active prairie dog colonies through eradication programs, agricultural and urban conversion, and sylvatic plague (*Yersinia pestis*). The prairie dog colonies of the plan area have experienced plague-induced declines in the past{Augustine, 2008, Spatiotemporal dynamics of black-tailed prairie dog colonies affected by plague;Cully, 2000, New records of sylvatic plague in Kansas}. Areas of active prairie dog colonies have been fluctuating, but the colonies appear to be relatively stable or at pre-plague outbreak levels in the plan area (see black-tailed prairie dog Evaluation).

Habitat fragmentation caused by urbanization and agricultural conversion may increase road densities and thus may increase burrowing owl mortality from vehicular collisions. Fragmentation may also increase negative edge-effects on burrowing owls, such as susceptibility to predation and interspecific competition.

Changing climatic conditions are increasing the fire return interval across the species' habitats.

Losses on the Wintering Grounds: Little is known of the wintering range of burrowing owls that breed in USFS Region 2, but many may overwinter largely in Mexico. Because matrix-based demographic analyses suggest that the population dynamics of burrowing owls are particularly sensitive to changes in "adult" and first-year survival, these threats may have even greater impact on the wintering grounds. Return rates of yearling and experienced breeders from the wintering grounds are critical to the persistence of healthy populations and represent an inherent biological vulnerability stemming from the life history.

Ecological conditions

Ecological condition requirements

It is critical to protect concentrated prey sources such as prairie dog towns. Density and productivity are closely associated with cycles of prey abundance (Sidle et al. 2001).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Nearly all of the plan area is potential breeding habitat.

Critical biological characteristics

In the West, eradication of prairie dogs has reduced owl populations as has conversion of rangeland to irrigated agricultural land and, in some areas, loss of habitat to suburbanization. Other threats include excessive mortality due to predation (e.g., dogs cats, and food-subsidized populations of native predators), contaminants, and unknown factors (Brodhead et al. 2023)

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Requires large open areas with ample populations of burrowing mammals such as prairie dogs or ground squirrels.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Intensive agricultural practices, such as annual plowing and biennial fallowing, exclude many prey species (NatureServe 2024).

Maps of Species Range



Figure 8. Distribution of the burrowing owl in the Americas

Chestnut-collared longspur

(*Calcarius ornatus*)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: 97 records from GBIF

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Nest predation, pesticide use and nest parasitism are all threats to the species – but not in this plan area because there is no nesting of this species in the CCNGs.
 - b. Habitat: Bird species migrates through CCNG and common resident from fall through spring (Cable et al. 1996). Conversion of habitat from grassland to cropland or urban development is a threat to the species habitat; juniper encroachment into prairie.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population decline is documented in the Northern Great Plains (NatureServe 2024), but it is less clear how population decline is reflected at the local level of the CCNGs because bird species is migratory through the plan area. Within the Shortgrass Prairie Bird Conservation region (BCR 18), IMBCR population trends are increasing.
 - b. Habitat: Conversion of prairie to cropland is not a threat on the USFS managed areas of the CCNGs (NatureServe 2024). Juniper encroachment into grasslands may reduce habitat quality for this species.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is migratory habitat within the species range, and at the edge of the wintering habitat. Chestnut-collared longspurs in the plan area are likely to be migrating through and common resident from fall through spring (Cable et al. 1996), but not likely nesting. Breeding and nesting occur in the Northern Great Plains.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Chestnut-collared longspur is a prairie generalist, and the plan area is mostly migratory and wintering habitat. This species is common resident from fall through spring. 97 records are found in GBIF.
 - b. Ecological conditions: Shortgrass prairie is the most common ecosystem in the plan area. Ecological conditions in the plan area do not currently appear to be limiting to this species.

Species Status

G5; S1B in Colorado; S3N in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Calcarius ornatus (J.K. Townsend, 1837) is accepted and valid (ITIS 2024).

Species range

Overall species range

The Great Plains of North America. Non-breeding winter habitat extends down into central Mexico. Breeding range is in the northern Great Plains including the Dakotas, Montana, and the Canadian prairie provinces.

Description of how the population in the plan area fits within the overall range

The plan area is within the species migratory habitat, just north of the winter non-breeding habitat. Partners in Flight estimates the global breeding population at 3,100,000. The species rates a 16 out of 20 on the Continental Concern Score, which means it is on the Partners in Flight Red Watch List and is a species at tipping point (PIF 2022). This species is a Bird of Conservation Concern Species (FWS 2021).

Distribution, abundance, and trend in the plan area

Population

Surveys conducted by the Bird Conservancy of the Rockies indicate robust increasing trends in the chestnut-collared longspur population in the Shortgrass Prairie Bird Conservation Region (BCR18) from 2016 to 2021 (Reese et al. 2024).

Habitat

Chestnut-collared longspur is a prairie generalist, and the plan area is mostly migratory and wintering habitat. This species is common resident in the plan area from fall through spring (Cable et al. 1996). Breeding range is from southern Alberta to southern Manitoba, southeast of the Rocky Mountains to northeastern Colorado, western Kansas, northcentral Nebraska, and western Minnesota. Non-breeding range include California (rare), northern Arizona, eastern New Mexico, eastern Colorado, and central Kansas south to northern Sonora, Chihuahua, Zacatecas, San Luis Potosi, and southern Texas (Anacker et al. 2013).

Threats (arising from on or off the plan area)

Population

There are population threats to the Chestnut-collared longspur in the northern great plains where the species nests. This can include nest predation and parasitism and impacts of pesticide use (Bleho et al. 2020). Those do not appear to be a threat to the species while it is in the plan area.

Habitat

Within the plan area, conversion of prairie due to juniper encroachment could be a threat to the species. Habitat fragmentation could also eventually occur if non-USFS lands in the area are converted to cropland, housing, or other non-natural development.

Ecological conditions

Ecological condition requirements

This is a species of the shortgrass prairies, rangelands and deserts. Also frequents recent burn scars, unpaved airstrips and other open but sparsely frequented places (Bleho et al. 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Shortgrass prairie is the most common ecosystem in the plan area (see Appendix), which is the preferred habitat for the Chestnut-collared longspur. This habitat is highly fragmented, but that may be of little consequence to a passerine bird that only passes through the area during migration, as is the case with this species.

Critical biological characteristics

The species' primary food sources are seeds, insects, larval insects and spiders (Bleho et al. 2020).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Predators include raptors, small carnivores, rodents and snakes. Cattle have been observed removing eggs and young from nests of sympatric ground-nesting grassland passerines. There are reported attacks on nestlings by Brown-head (Bleho et al. 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

The species prefers short grass prairies. Management actions that maintain short stature vegetation generally benefit this species. This can include grazing, mowing, and burning (NatureServe 2024).

Maps of Species Range and Known Occurrences in Plan Area

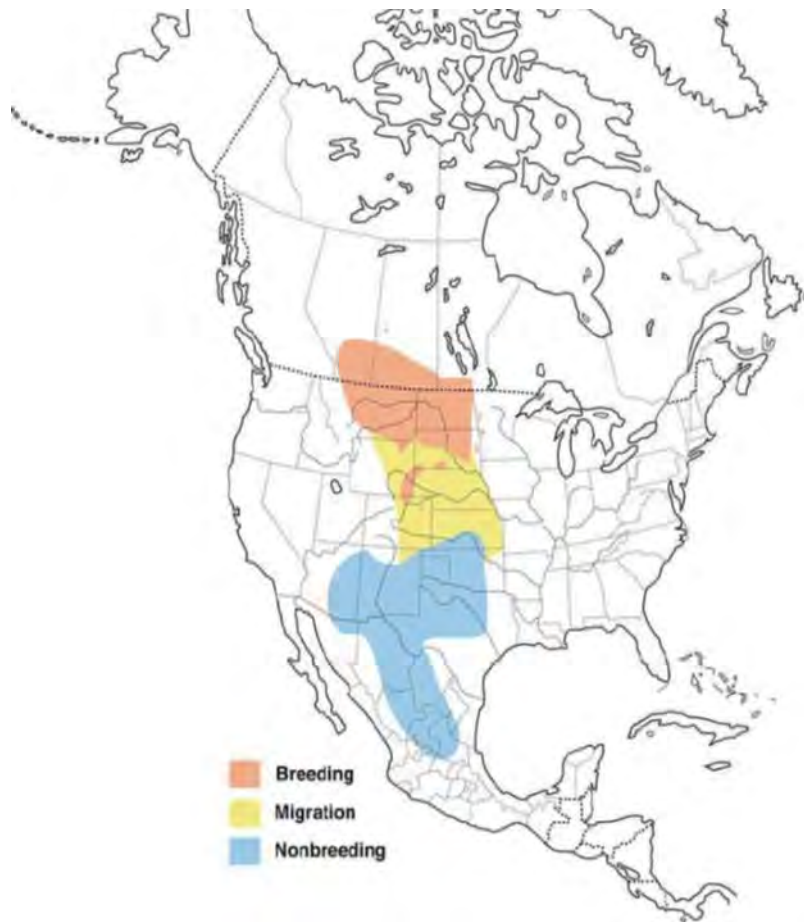


Figure 9. Distribution of chestnut-collared longspur in North and Central America.

Chihuahuan Raven

(*Corvus cryptoleucus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF- 670 observations between 1969-2022. IMBCR- 157 observations between 2009 and 2023.

Year of Last Known Occurrence: 2023.

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Human disturbance, illegal shooting, pesticide exposure.
 - b. Habitat: Increased fire return interval may impact habitat and insect populations.
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: Population trends are uncertain within the plan area; within the Shortgrass Prairie Bird Conservation region (BCR 18), IMBCR and BBS population trends are uncertain.
 - b. Habitat is expected to be stable.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is not endemic, disjunct. It is at the northern edge of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. This species is common in the plan area.
 - b. Shortgrass prairie is abundant in the plan area and the grasslands provide suitable year-round habitat for this species.

Species Status

G5; S3 in Colorado; S1 in Kansas; listed as Candidate in Kansas.

Taxonomy

Corvus cryptoleucus is valid (ITIS 2024).

Species range

Overall species range

Northern Sonora, southern Arizona, central New Mexico, eastern Colorado and southern Nebraska south to central Mexico, east to western Kansas and Oklahoma. Populations in northeast are migratory southward in winter (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

Primarily located on the Comanche portion of the plan area in Colorado. Uncommon resident on the Cimmaron (Cable et al. 1996) In Colorado, this species occurs in the southeast corner of the state with confirmed breeding in Archuleta, Baca, Bent, El Paso, Huerfano, Kiowa, Las Animas, Lincoln, Otero, Prowers, and Pueblo counties. Isolated pairs also have nested relatively recently in Stevens and Seward counties of sw. Kansas (Species is a year-round resident of the plan area {Dwyer, 2020, Chihuahuan Raven (*Corvus cryptoleucus*)}. Partners in Flight estimates the global breeding population at 840,000. The species rates a 10 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Chihuahuan Raven population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird, which could produce better trend estimates for Chihuahuan Raven, reports increasing trends in Kansas and in Colorado (Fink et al. 2023).

Habitat

In the northern part of range (Colorado, Kansas, and Oklahoma), habitat consists mainly of short-grass plains, with few trees. In those areas, possibly more frequently than elsewhere, windmills, telephone poles and power poles substitute for trees as support for nests (NatureServe 2024).

Threats (arising from on or off the plan area)

Population

In the past, organized efforts of shooting, poisoning, and trapping have killed thousands of Chihuahuan Ravens. Shooting of adults and nestlings, and disturbance of nests by humans, remained commonly reported through the early. Electrocution is likely a significant cause of mortality due to the species' propensity to nest on telephone poles and use wires to build nests. Pesticides have been shown to reduce reproductive success by reducing insect prey base, particularly grasshoppers {Dwyer, 2020, Chihuahuan Raven (*Corvus cryptoleucus*)}.

Habitat

An increase in the frequency and severity of fires can reduce nesting and foraging habitat. Pesticide use impacts foraging habitat {Dwyer, 2020, Chihuahuan Raven (*Corvus cryptoleucus*)}. Anthropogenic sites may provide a more solid nesting substrate than natural sites, primarily mesquite trees, which are vulnerable to destruction in storms {Dwyer, 2020, Chihuahuan Raven (*Corvus cryptoleucus*)}.

Ecological conditions

Ecological condition requirements

Requires adequate forage, particularly insects. In the plan area the species prefers open grassland.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The grasslands provide suitable year-round habitat for this species.

Critical biological characteristics

Dependent upon insects, particularly during nesting {Dwyer, 2020, Chihuahuan Raven (Corvus cryptoleucus)}.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species utilizes a wide variety of food resources but are particularly dependent upon insects {Dwyer, 2020, Chihuahuan Raven (Corvus cryptoleucus)}.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

This species would be sensitive to significant decreases in insect populations, particularly grasshoppers {Dwyer, 2020, Chihuahuan Raven (Corvus cryptoleucus)}.

Maps of Species Range



Figure 10. Distribution of the Chihuahuan raven in North and Central America

Curve-billed Thrasher

(*Toxostoma curvirostre*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: A total of 25 detections between 2011-05-15 and 2022-05-25 in the Comanche NG(IMBCR 2024). (GBIF 2024) reports a total of non-duplicate 133 records in the plan area between 1969-05-18 and 2022-12-31. (Van Scoyoc 2024)reports 3 records and (Van Scoyoc 2024) reports two records (in 1985 and on 1994-05-24). (Cable et al. 1996)reports; "Schwilling found a used nest in a cholla cactus on 27 April 1977. Ports found the first known active nest near the Cimarron River northeast of Rolla on 24 June 1978. Christmas bird counts data between 1963-1995 shows that this species was observed 12 years of the 24 years of the survey period. High counts include 4 in 1986 and 3 in 1984, and a total of 19 individuals were observed during the survey period (Cable et al. 1996).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No significant threats have been identified. Brood parasitism by cowbirds (*Molothrus* spp.) is rare. Collisions and human research impacts are not significant issues.
 - b. Habitat: Habitat loss to development and conversion to grassland monocultures.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: IMBCR data shows decreasing trends within the Shortgrass Prairie Bird Conservation Region (BCR 18).
 - b. Habitat: Shortgrass prairie exhibits many departures from historic conditions, but the current condition in the plan area is believed to be relatively stable.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the northern edge of the species range (Figure 11).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: unknown; about 150 records within the plan area.
 - b. Ecological conditions: shortgrass prairie is the most common ecosystem in the plan area.

Species Status

G5; S3 in Colorado; S1B in Kansas; listed as Candidate in Kansas.

Taxonomy

Toxostoma curvirostre is accepted as valid. Another common name is Cuitlacoche pico curvo (Integrated Taxonomic Information System (ITIS) 2024c).

Species range

Overall species range

RESIDENT: northwestern Arizona, northeastern New Mexico, southeastern Colorado, western Oklahoma, southwestern Kansas, and central Texas south to northwestern Nayarit, through Mexican Plateau to central Oaxaca and Veracruz, and central Tamaulipas (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the Northern edge of the species range (Figure 11). Partners in Flight estimates the global breeding population at 3,100,000. The species rates a 9 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

There are 133 observation records reported in GBIF between 1982-09-05 to 2022-09-13 (GBIF 2024). BCR reports 4 observations between 2011-05-31 and 2017-05-25 (IMBCR 2024). Cable et al. (1996) reports; "Schwilling found a used nest in a cholla cactus on 27 April 1977. Ports found the first known active nest near the Cimarron River northeast of Rolla on 24 June 1978. Christmas bird counts data between 1963-1995 shows that this species was observed 12 years of the 24 years of the survey period. High counts include 4 in 1986 and 3 in 1984, and a total of 19 individuals were observed during the survey period (Cable et al. 1996).

Surveys conducted by the Bird Conservancy of the Rockies indicate robust decreasing trends (-28.18%) in the curve-billed thrasher population in the Shortgrass Prairie Bird Conservation Region (BCR18)(Reese et al. 2024).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases (-1.5%) in the United States (Hostetler et al. 2023).

Habitat

Locations of observation points were mainly on shortgrass prairie. This species inhabits arid thornscrub, chaparral, cholla (*Opuntia*) grasslands, and other brushy areas. In Colorado and adjacent states, this species is found in cholla grasslands. Nests in a wide variety of cacti, shrubs and small trees throughout its range (NatureServe 2024).

Shortgrass prairie exhibits many departures from historic conditions, but the current condition in the plan area is believed to be relatively stable (see Appendix).

Threats (arising from on or off the plan area)

Population

Brood parasitism by cowbirds (*Molothrus* spp.) is rare. Collisions with stationary/moving structure or objects are not as great a problem as with migratory species or those that are more aerial. Extensive nest

checks cause scolding by parents, an occasional premature fledging, but no obvious nest desertion or increased mortality (Tweit 2020).

Habitat

The brushland are being lost to development and conversion to grassland monocultures (especially buffel grass, *Pennisetum cituare*) (Tweit 2020).

Ecological conditions

Ecological condition requirements

This species inhabits arid thornscrub, chaparral, cholla (*Opuntia*) grasslands, and other brushy areas. In Colorado and adjacent states, this species is found in cholla grasslands. Nests in a wide variety of cacti, shrubs and small trees throughout its range (NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Shortgrass prairie is the most abundant ecosystem in the plan area (see Appendix). Ecological conditions are not considered restricted for this species in the plan area.

Critical biological characteristics

Forages on ground in open areas with grasses and forbs, but no overstory; digs and probes through leaf litter. Climbs shrubs and trees for berries (Fischer 1980).

Populations in Colorado is reported to be permanent residents (Tweit 2020).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Suspected predators of eggs, nestlings, and fledglings include striped whipsnakes (*Masticophis taeniatus*), Texas patchnosed snakes (*Salvadora grahamiae*), western diamondback rattlesnakes (*Crotalus atrox*), and ants (*Formicidae*). Confirmed nest predators include coachwhips (*Masticophis flagellum*), bullsnakes (*Pituophis melanoleucus*), kingsnakes (*Lampropeltis getula*), desert spiny lizards (*Sceloporus magister*), roadrunners (*Geococcyx californianus*), round-tailed ground squirrels (*Citellus tereticaudus*), Harris' antelope ground squirrels (*Ammospermophilus harris*), and Harris' hawk (*Parabuteo unicinctus*) (NatureServe 2024).

Main foods for this species are *Arthropoda* and *Gastropoda*, *Coleoptera* and berries in fall, and *Coleoptera*, *Gastropoda*, and *Crustacea* in spring (Tweit 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

The brushlands are being lost to development and conversion to grassland monocultures (especially buffel grass, *Pennisetum cituare*) (Tweit 2020).

Maps of Species Range and Known Occurrences in Plan Area



Distribution of the Curve-billed Thrasher

Figure 11. Distribution map of the curve-billed thrasher (Tweit 2020).

Eastern bluebird

(*Sialia sialis*)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are approximately 196 observation records between GBIF, iDigBio, and IMBCR that range from 1934 to 2022.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Nest-site competition can be a threat but has been well mitigated by the nest box program over the last few decades. Climate stressors could have an impact on breeding success by improving the conditions in warmer climates but negatively impacting the colder climates. The significance of the climate change threat is unknown, but the nest-site competition does not appear to be significant at this time.
 - b. Habitat: Climate stressors and other disturbances (wildfire, insect disease, land development) that reduce or eliminate the critical habitat components. The significance is unclear given the plan area is at the far western edge of the breeding range.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Eastern bluebird population in the plan area or the BCR stratum are available. eBird reports decreasing trends in Kansas and in Colorado.
 - b. Habitat: Trends for the various habitats this species utilizes is not clearly documented.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. This species is at the edge of its range in the plan area.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: The population size is unknown.
 - b. Ecological conditions: Ecological conditions appear restricted and limited within the plan area due to limited availability of trees and sources for nesting cavities. Nesting appears largely bolstered by the use of nest boxes.

Species Status

G5; S2B in Colorado; S5 in Kansas.

Taxonomy

Sialis sialis is valid and recognized (Linnaeus 1758) (ITIS 2024). There are no other known synonyms for this species, but there are eight known subspecies.

Species range

Overall species range

The overall species range is extensive, covering every state in the U.S. from the Rocky Mountains across to the east coast, and in Canada from Regina all the way east to Quebec (NatureServe 2024). Most of the species range is considered secure or apparently secure according to (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

The plan area is at the far western edge of the species' range. According to (All About Birds 2024c), the breeding range for this species barely extends into the northeast corner of Colorado and includes the southern and eastern portions of Kansas. Partners in Flight estimates the global breeding population at 23,000,000. The species rates a 7 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

There are 196 observation records for the plan area. Cable et al. (1996) reported that the species is an uncommon resident for the Cimarron NG with numbers being somewhat higher during the seasonal migrations. At the time, it was reported that 1 juvenile from a nest of 3 was collected in June 1968, with more juveniles being observed in 1978 and 1979 (Cable et al. 1996). Thirty-two nest boxes were put up in the early 1990s to help nesting pairs during the breeding season (Cable et al. 1996), and according to NatureServe (2024) the nest box program range-wide has been successful in substantially increasing the range-wide population in the last few decades. The eastern bluebird is not considered a bird of conservation concern (BCC) by the USFWS.

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Eastern bluebird population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird reports decreasing trends in Kansas and in Colorado (Fink et al. 2023).

Habitat

Generally, their habitat includes forest edge, open woodland, and partly open situations with scattered trees, from coniferous or deciduous forest to riparian woodland, also pine woodland or savanna in the tropics (NatureServe 2024).

The preferred nesting habitat is open or semi-open grassland habitat with an open canopy and little or no understory, with sparse ground cover/low grass; orchards, mowed meadows, large lawns, cemeteries, orchards, roadsides, and areas with scattered trees and short ground cover; and clear-cut forests, burned tracts of pine woods, swampy habitats near urban areas (Sialis 2024). Perching spots (fence, telephone lines, medium size trees) preferred for hunting and nest-guarding are also critical.

Threats (arising from on or off the plan area)

Population

Threats from nest-site competition with starlings and house sparrows are well-known but have been alleviated by the nest box program that provides provisional suitable nest boxes (NatureServe 2024). Breeding success correlated with climatic conditions such that breeding success may improve in colder climates but decrease in warmer climates irrespective of any other climate-related habitat changes (Rush et al. 2024).

Habitat

The Cimarron and Comanche National Grasslands are on the western edge of this species' habitat (All About Birds 2024c). The species prefers more moist climates such as eastern deciduous forests. As such, changes in temperature and precipitation could make the CCNG's less suitable as habitat for the species. The eastern bluebird will forage in grassy areas but is a cavity nester and requires reasonably large trees for nesting success.

Other disturbances or events that would reduce or eliminate suitable grasslands and woodland areas are also a threat to this species' habitat. This includes wildfires, insect disease, and land development.

Ecological conditions

Ecological condition requirements

Eats mainly insects, also other invertebrates and small fruits; often flies from low perch to ground to feed on Orthoptera and beetles; also gleans from foliage (NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The shortgrass prairie habitat type is the dominant habitat type across the plan area (80%). It is considered good with a stable condition in Kansas but has deviated from historical conditions regarding composition in eastern Colorado (Rohweder 2022).

The sandsage prairie habitat type is the second-most widespread vegetation type in the plan area, and the most abundant type for the Cimarron National Grassland, specifically (USDA Forest Service 2005a). In Kansas, the sandsage prairie habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of the historic sandsage habitat has been lost or converted for agricultural uses (CPW 2015). The remaining tracts have good landscape connectivity, but the species composition is highly altered (CPW 2015).

Juniper woodlands are restricted to the southwestern portion of the Comanche National Grassland (DUPLICATE et al. 2011), where there are extensive pinyon pine forests in Picketwire Canyon and the Kim area in Las Animas County. Juniper has increased in distribution and abundance in some ecosystems within the plan area, particularly the canyonlands of the Comanche National Grassland (USDA Forest Service 2005a). The current ecosystem condition is likely well outside the historic range (USDA Forest Service 2005a), but the overall trend is unknown.

Critical biological characteristics

The nesting period varies with location and may begin as early as late February in some areas and extends into late summer (NatureServe 2024). Clutch size is usually 4-5. Individual females in most areas produce 2 broods/year, sometimes 3, very rarely 4. Incubation, mainly by the female, lasts 12-16 days. Males and females of nesting pairs of eastern bluebirds commonly engage in copulations with other eastern bluebirds. As a result, some nests contain nestlings with different fathers (NatureServe 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

It's unknown if this species has any important ecological or biological interactions with other species or ecosystem diversity and integrity.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

The availability of nest cavity sources or supplemental nest boxes can have a direct impact on this species' ability to reproduce successfully year-to-year. The presence of suitable, moist grassland climates is also critical for foraging for its preferred prey sources of insects and other invertebrates.

Maps of Species Range and Known Occurrences in Plan Area

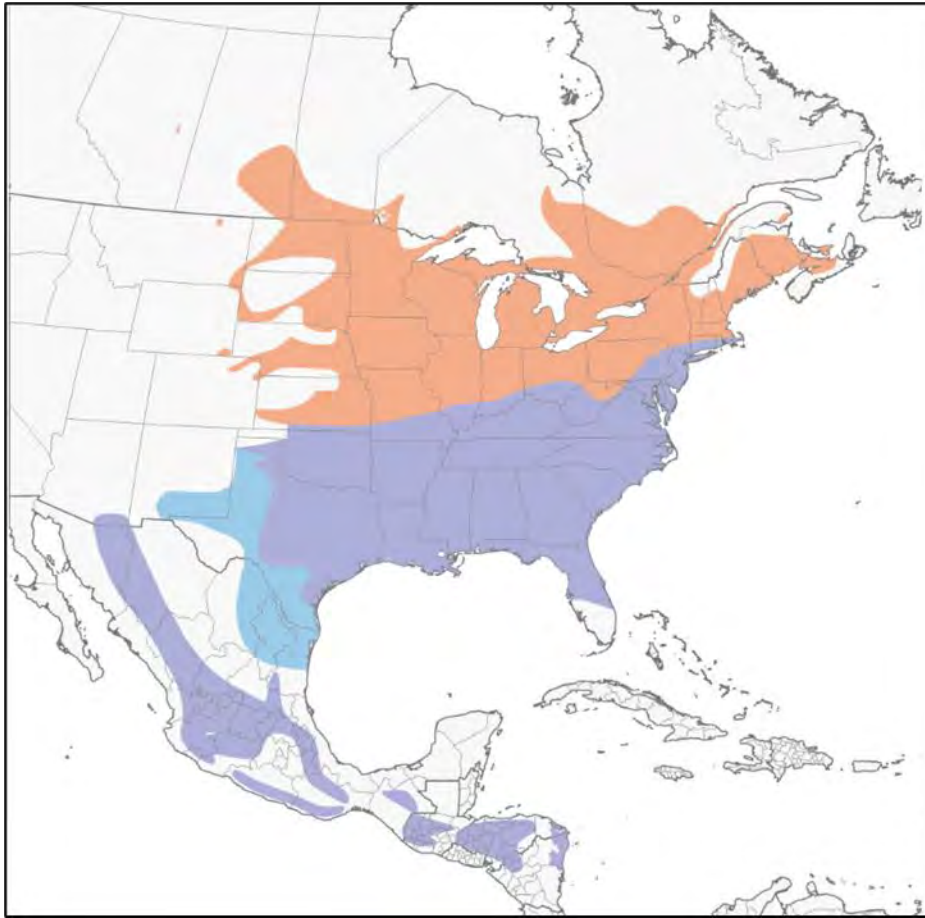


Figure 12. Distribution of the eastern bluebird for non-breeding (blue), year-round (purple) and breeding (orange) seasonal use (All About Birds 2024c).

Ferruginous Hawk

(*Buteo regalis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Colorado Natural Heritage- 75 observations between 1974 and 2019. Kansas Natural Heritage 2 observations between 1995 and 2007. GBIF- 448 observations between 1934-2022. IMBCR-2 observations between 2011 and 2018.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern:

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Human disturbance near nesting areas, illegal shooting, predation from other raptors, fence/powerline collisions, drowning in stock tanks, rodenticides, and pesticides are known threats. Avian influenza is also becoming more prevalent in North America and is particularly harmful to raptors {Runstadler, 2024, The virus is out of the barn: the emergence of HPAI as a pathogen of avian and mammalian wildlife around the globe}.
 - b. Habitat: Loss of habitat, particularly suitable breeding habitat, is the foremost threat to the security of ferruginous hawk populations throughout its current range. Conversion of native habitat to agriculture, as well as urbanization, results in a direct loss of all or a significant portion of ferruginous hawk habitat where such conversions occur.
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: No population trends are available in the plan area. BBS indicates increasing trends in the United States.
 - b. Habitat is expected to be stable. This species utilizes a wide array of open vegetation types as long as they have suitable nest sites, primarily cliffs; and an adequate prey base, primarily ground squirrels.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is not endemic, disjunct, or at the edge of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Species is common in the plan area.
 - b. All of the plan area is potential breeding, foraging and wintering habitat.

Species Status

G4; S3B,S4N in Colorado; S2B,S4N in Kansas; listed as Candidate in Colorado; listed as Candidate in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Buteo regalis is valid (ITIS 2024).

Species range

Overall species range

Ferruginous Hawks breed from eastern Washington east to southern Saskatchewan, south to northern Texas, south and west through central New Mexico and central Arizona, and as far west as southeastern Nevada. In Colorado, they are found primarily on the eastern plains, in the grassland and lowland riparian habitat types. Small numbers nest in northwestern Colorado and the San Luis Valley (NatureServe 2024)

Description of how the population in the plan area fits within the overall range

Common resident from fall through early spring, rare summer resident. Nesting Records: One pair of Ferruginous Hawks has probably nested more or less continuously since 1978 in southwestern Morton County. Ports found two nestlings west of Elkhart on 4 May 1979. Smith photographed two large nestlings on 18 June 1985. A nest four miles west of Elkhart discovered by Mike and Ellen Rader in 1993 was destroyed by a severe thunderstorm about 4 July. Cable and Seltman found carcasses of two fledglings beneath the nest on 14 July. Three pairs nested in Morton County in 1995. High Counts: 63 were counted on the Cimarron CBC of 30 December 1989, and 45 were reported on the CBC of 30 December 1991. This CBC often has the national high count for Ferruginous Hawks, meaning that the wintering population may be as concentrated in Morton County as anywhere else in the U.S. It usually associates closely with prairie dogs and often nests near their towns. However, this does not necessarily seem to be the case on Cimarron NG (Cable et al. 1996). Partners in Flight estimates the global breeding population at 110,000. The species rates a 10 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Ferruginous hawk population in the plan area or the BCR stratum are available (Reese et al. 2024).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate a population increase in the United States (1.04%) (Hostetler et al. 2023).

Habitat

Range-wide, ferruginous hawks occupy a variety of habitat types including open grasslands, shrub-steppe, croplands, desert, and the periphery of western pinyon (*Pinus eulis*) – juniper (*Juniperus* spp.) woodlands (Collins and Reynolds 2005). Ferruginous hawks are known to avoid the type of habitat provided on the GMUG National Forests. They avoid dense forests, extensive aspen parklands, high elevations, narrow canyons, and habitats recently altered by human development or cultivation (Collins and Reynolds 2005).

Structures used for nesting are variable. Ranked in order of use, these structures include trees and shrubs, cliffs, utility structures, and ground outcrops. Juniper is the most used tree for nesting, especially in the juniper forest/shrub-steppe interface in states west of the Continental Divide.

Ferruginous hawks winter in open terrain from grassland to desert. East of the Continental Divide, winter habitat selected by ferruginous hawks is primarily grassland, often in proximity to prairie dogs. In

Colorado, wintering ferruginous hawks were reported to concentrate in habitats with the highest densities of prairie West of the Divide, ferruginous hawks winter in grasslands and arid regions containing an abundance of prairie dogs, lagomorphs, and pocket gophers (Collins and Reynolds 2005).

Threats (arising from on or off the plan area)

Population

Human disturbance: The effect of direct human disturbance depends on several factors, including the type of activity, proximity to the nest or roost site, time of year and duration of the activity. Raptors are most sensitive just prior to egg laying. In certain cases, disturbance has negative effects. Shooting is the most reported source of adult mortality. Shooting near nests also may cause adults to leave the nests temporarily, exposing eggs or nestlings to additional mortality.

Energy development fence/powerline collisions, and stock tanks: Collisions with powerlines and fences cause some mortality, particularly during the fast, low foraging flights. Adults have been known to drown in stock watering tanks (NatureServe 2024).

Pesticides: Susceptible to eggshell thinning from DDT.

Habitat

Grazing, fire return interval, and invasive plant species: The removal of vegetation may impact prey populations, especially in drought years. Grazing also increases the invasion of sites by exotic invasive plants, such as cheatgrass (*Bromus tectorum*), which increase fire return intervals and accelerate the loss of native vegetation.

Frequency, intensity, and severity of wildfire is increasing across the species' habitats.

Ecological conditions

Ecological condition requirements

It is critical to protect concentrated prey sources such as prairie dog towns. Density and productivity are closely associated with cycles of prey abundance (Brodhead et al. 2023).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

All of the plan area is potential breeding, foraging and wintering habitat. In eastern Colorado, nested more frequently in grassland areas than in cultivated areas (Brodhead et al. 2023).

Critical biological characteristics

Heavily reliant upon small mammal prey. Keys to management are providing suitable nest sites, protecting active nest areas from disturbance, and improving habitat for prey. Isolated trees and stringers should be protected from livestock in nesting habitat. Prescribed burning may increase habitat suitability in shrub-dominated areas. Practices that increase exotic plant species number or dominance should be discouraged. Artificial nests have been used to increase the number of nesting pairs in areas where suitable sites are scarce (NatureServe 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Exhibits a strong preference for small mammals.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

(NatureServe 2024) states: Vulnerability of prey also is an important factor in habitat suitability, such that Ferruginous Hawks avoid dense vegetation that reduces their ability to see prey. Prey vulnerability decreases where taller small-grain crops replace shorter grasses. Intensive agricultural practices, such as annual plowing and biennial fallowing, exclude many prey species. In Alberta, prey abundance increases as the area of cultivation increases up to 30 percent, but abundance is reduced where agriculture is extensive, e.g., more than 30 percent.

Maps of Species Range

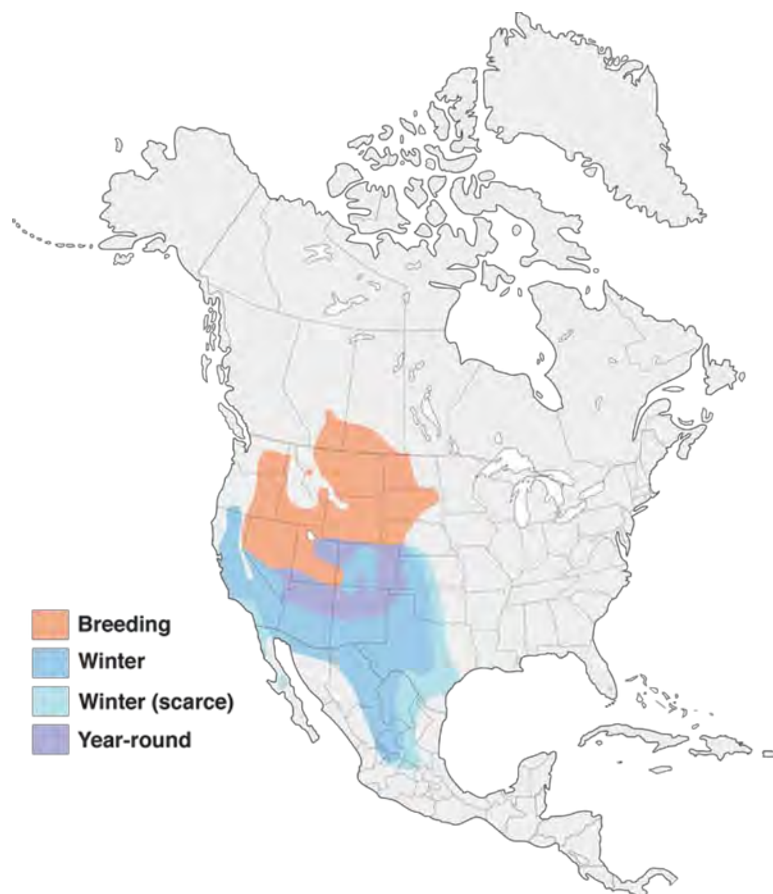


Figure 13. Distribution of the ferruginous hawk in North and Central America.

Field sparrow

(*Spizella pusilla*)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Between GBIF and iDigBio there are 112 observation records from 1950 to 2022 in the plan area. The IMBCR database has 4 observation records from 2019. There are nesting records of two juveniles with two adults in 1979, and singing males have been recorded in May 1967, June 1978, and July 1978 (Cable et al. 1996).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Predation and nest parasitism are the primary threats to the population.
 - b. Habitat: Climate stressors and loss of habitat through human- and naturally-caused disturbances.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Surveys conducted by the Bird Conservancy of the Rockies indicate a robust increasing trend in the Field sparrow population in the Comanche National Grassland. increasing trend for the Comanche (14.34%). BBS indicates population decreases in Kansas (-0.8%) and in the United States (-2.34 %). (Cable et al. 1996) considered the field sparrow was stable on the Cimarron NG.
 - b. Habitat: The trend of the habitat for the plan area is unknown.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the furthest western edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size is unknown.
 - b. Ecological conditions: Only the Cimarron NG part of the plan area that occurs within the species' range. Since the plan area is considered uncommon breeding and winter range habitat, it is likely that the amount and distribution of the required ecological conditions are limited.

G5; S1B in Colorado; S5B in Kansas.

Taxonomy

Spizella pusilla is the currently accepted valid name for the field sparrow (Integrated Taxonomic Information System (ITIS) 2024b). Other known synonyms include *Spizella pusilla pusilla*, *Spizella pusilla arenacea*, and *Fringilla pusilla* (ITIS 2024).

Species range

Overall species range

The breeding range includes eastern Montana east across the northern U.S. and southern Canada to New England and southern New Brunswick, south to northeastern Colorado, Oklahoma, Texas, Gulf Coast, and southern Georgia, as well as southern Manitoba (NatureServe 2024). The non-breeding range covers Kansas east to Massachusetts, south to southeastern New Mexico, northern Coahuila, central Nuevo Leon, northern Tamaulipas, Gulf Coast, and southern Florida (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

The plan area is at the very western edge of the species range, where breeding and winter habitat come together (Audubon Field Guide 2024). Only the Cimarron NG part of the plan area that occurs within the species' range, and it falls in the uncommon breeding and uncommon winter habitat ranges (Figure 14). Partners in Flight estimates the global breeding population at 9,300,000. The species rates 13 out of 20 on the Continental Concern Score, which means it is on the Partners in Flight Yellow Watch List and is a species at tipping point (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

The field sparrow is considered an uncommon resident on the Cimarron NG. The local population is small and reinforced by migrants in spring and fall. The trend of this species for the Cimarron NG is not well known, but according to (Cable et al. 1996), in Morton County field sparrows are apparently present in low numbers year-round, and the population appears to have remained stable for at least several decades. The conventional wisdom on this species is that it should not reside on the arid High Plains (Cable et al. 1996).

Surveys conducted by the Bird Conservancy of the Rockies indicate a robust increasing trend (14.34%) in the Field sparrow population in the Comanche National Grassland (KS-BCR18-CO) (Reese et al. 2024).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases in Kansas (-0.8%) and in the United States (-2.34 %) (Hostetler et al. 2023).

Habitat

The species prefers old fields, brushy hillsides, overgrown pastures, thorn scrub, deciduous forest edge, sparse second growth, and fencerows (NatureServe 2024). Nests on or near the ground in weed clumps, grass tufts, or litter usually at or near the base of woody vegetation early in the breeding season (May-June), but nest in small shrubs and saplings later in the breeding season as vegetative cover increases in height (NatureServe 2024). Woody vegetation and dense grass appear to be critical components for habitat suitability (NatureServe 2024). Other important habitat features are vegetation patchiness, species richness of herbaceous and woody vegetation, and slope (NatureServe 2024).

There are several different grassland vegetation types within the plan area (Sandsage prairie, shortgrass prairie, and mixed grass prairie). All the grassland types have shown a declining trend, but more discussion on these specific grasslands can be found in the Habitat Threats and Trends Appendix.

The present woody vegetation would consist of pinyon-juniper (P-J) woodlands. Species in the plan area include one-seed juniper (*Juniperus monosperma*), Rocky Mountain juniper (*Juniperus scopulorum*), and Piñon pine (*Pinus edulis*). One-seed juniper dominates in the uplands, and piñon pine is co-dominant near the canyons and other areas of rocky, shallow soil (Amme et al. 2020). Juniper woodlands are restricted to the southwestern portion of the Comanche National Grassland (Kuhn et al. 2011), where there are extensive pinyon pine forests in Picketwire Canyon and the Kim area in Las Animas County.

Threats (arising from on or off the plan area)

Population

Predation is the primary threat to the species, and nest predators are generally a variety of snakes (blue racers, milk snake, black rat snake, garter snake, and prairie snake), small mammals (gray fox, weasels, skinks, mink, raccoon, and opossum), birds (crows and house wrens) (NatureServe 2024). Parasitism by brown-headed cowbirds is common but the rates vary geographically. Parasitized nests are commonly deserted in the end. Little information exists regarding the effects of pesticides (NatureServe 2024).

Habitat

Threats to this species habitat does not appear to be well-documented; however, wildfires can pose a major threat to the loss of habitat and how well the burned area recovers or not over time (Audubon Field Guide 2024). Urbanization can also result in the loss of habitat and is often located in areas that overlap with areas the field sparrow relies on (Audubon Field Guide 2024). The species is relatively adaptable to disturbances as long as some woody vegetation remains, and it's thought that the population probably increased with the clearing of forested areas following the European settlement of North America and continues to be widespread and abundant (Audubon Field Guide 2024).

Based on the Climate Vulnerability (Audubon Field Guide 2024), the majority of the winter range is expected to remain stable or slightly improve, and the majority of the summer range is expected to be lost when you use the most extreme warming scenario of +3.0°C.

Primary threats to the grasslands at the unit level include grazing, drought, wildfire, and encroachment or expansion of non-native invasives. Energy development such as oil and gas can also be a threat to grasslands and is a currently authorized activity on the Cimarron National Grassland.

Ecological conditions

Ecological condition requirements

Prey sources include insects, spiders and seeds, and forages mainly on the ground (NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Since the plan area is at the very western edge of the species range and is considered uncommon breeding and winter range habitat, it is likely that the amount and distribution of the required ecological conditions are limited. The conditions are present but may not be of high enough quality or provide good connectivity to the rest of the species' range. The variety of grassland vegetation types are trending downwards, and the presence of woodlands are restricted to the southwestern portion of the Comanche National Grassland, which is outside of this species' range.

Critical biological characteristics

The field sparrow typically lays 3-5 eggs with incubation by the female lasting 10-12 days, or potentially up to 17 days in cold spring months (Audubon Field Guide 2024). If nests are parasitized by brown-headed cowbirds they are often deserted.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No known influences at this time.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Keys to management include providing shrub-dominated edge habitat adjacent to grassland or providing grassland with a shrub component (both of must which include dense grass and moderately high litter cover) and avoiding disturbances that eliminate woody vegetation (NatureServe 2024). Avoid management practices that completely remove woody vegetation (NatureServe 2024). Manipulations of forested riparian habitats include reducing woody vegetation to narrow strips, partially removing woody canopy, and thinning shrubs and saplings (NatureServe 2024). Disturbance, such as burning, should be avoided before territories have been established, approximately March to early April (NatureServe 2024). Burning after territories already have been established does not appear to cause territory abandonment (NatureServe 2024).

Maps of Species Range and Known Occurrences in Plan Area

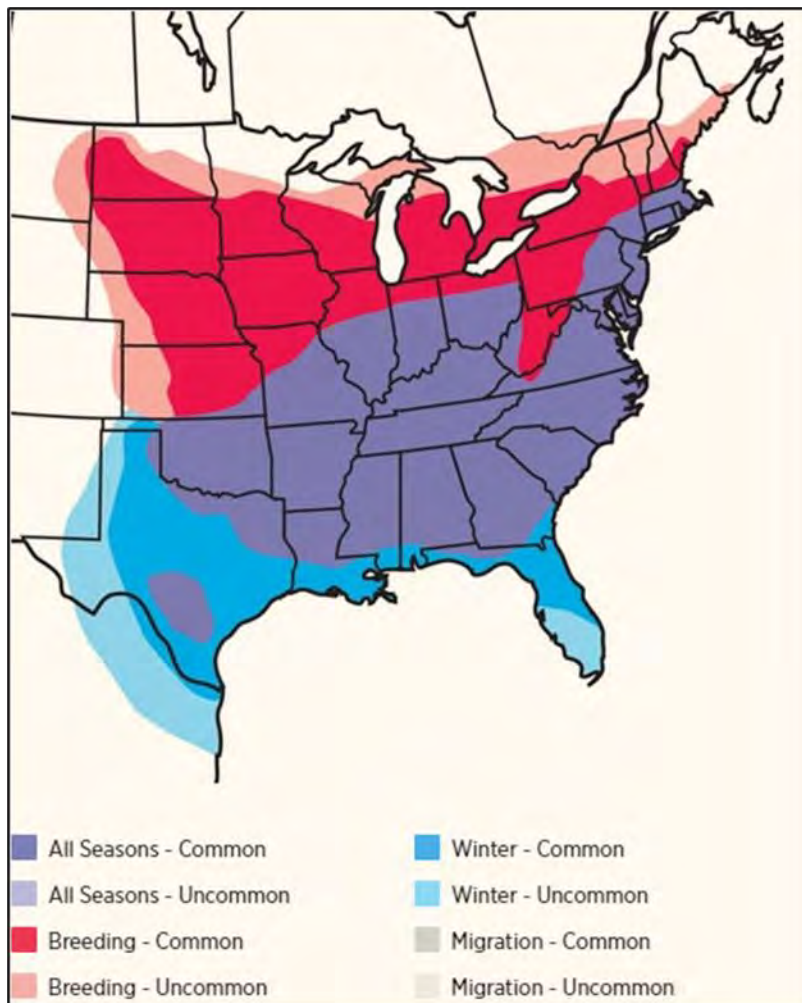


Figure 14. Seasonal migration and range for the field sparrow (Audubon Field Guide 2024).

Golden Eagle

(*Aquila chrysaetos*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF- 136 observations between 1969-2023. IDB- 1 observation in 1991.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Human disturbance near nesting areas, illegal shooting, predation from other raptors, fence/powerline collisions, drowning in stock tanks, rodenticides, and pesticides are known threats. Avian influenza is also becoming more prevalent in North America and is particularly harmful to raptors {Runstadler, 2024, The virus is out of the barn: the emergence of HPAI as a pathogen of avian and mammalian wildlife around the globe}.
 - b. Habitat: Nesting habitat is primarily cliffs which can be a limiting factor, especially if prolonged human disturbance is located adjacent to nesting areas. Overgrazing may affect prey abundance in the long-term by increasing fire return intervals and invasive grasses.
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: IMBCR show an uncertain trend in the Comanche stratum. Within the Shortgrass Prairie Bird Conservation region (BCR 18), both IMBCR and BBS population trends are uncertain. eBird reports decreasing trend in the United States.
 - b. Habitat is expected to be stable. Golden eagles utilize a wide array of open vegetation types as long as they have suitable nest sites, primarily cliffs; and an adequate prey base.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is not endemic, disjunct, or at the edge of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Golden eagles are commonly seen in the plan area.
 - b. All of the plan area is potential foraging and wintering habitat.

Species Status

G5; S3B,S4N in Colorado; S1B,S2N in Kansas; listed as Tier 1 in Colorado; listed as Candidate in Kansas.

Taxonomy

Aquila chrysaetos is valid (ITIS 2024).

Species range

Overall species range

In North America, golden eagle breeding occurs from western and northern Alaska eastward through Northwest Territories to Labrador, and south to northern Mexico, Texas, western Oklahoma, and western Kansas, and in eastern North America southward to New York and northern New England. The winter range in North America extends from south-central Alaska and southern Canada southward through the breeding range, and casually farther southward. In the United States, the species is most numerous in winter in the Rocky Mountain States, Great Basin, and western edge of the Great Plains (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

The presence of non-breeding immatures during the breeding season is unusual but not completely unexpected. Morton County would appear to contain good Golden Eagle habitat; and although no cliff nest sites are available, isolated cottonwood trees such as those used by other nesting eagles elsewhere in Kansas are readily available. Golden Eagles nest in fair numbers in the higher elevations just 50 miles west of Morton County (Cable et al. 1996). Partners in Flight estimates the global breeding population at 130,000. The species rates a 10 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Golden Eagle population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird reports decreasing trends in the United States (Fink et al. 2023).

Habitat

In the western U.S., golden eagles occur primarily in mountainous canyon land, rimrock terrain of open deserts and in grassland areas (Kochert et al. 2002). In northeastern Colorado, nesting occurs primarily in grasslands near cliffs. Foraging habitat is typically open areas such as grasslands or shrub-steppe. Agricultural areas are avoided for both nesting and foraging (NatureServe 2024).

Although cliffs are the most common nesting substrate, trees or man-made structures are also sometimes used. Many nests have a wide view of surrounding area or are on prominent escarpments. Proximity to hunting grounds is an important factor in nest-site selection. In northeastern Colorado, eggs are laid from early to mid-March through the beginning of April. Hatching occurs in late April through mid-May. Fledging occurs at 8-10 weeks old. Mammals comprise 80-90% of golden eagle diets. Principle prey items include hares and rabbits, ground squirrels, prairie dogs, and marmots. Golden eagles also frequently feed on carrion, especially during winter (Kochert et al. 2002).

Threats (arising from on or off the plan area)

Population

Golden Eagles have been shot and poisoned, sometimes in large numbers, and some illegal killing continues to occur. Elevated levels of lead in blood, probably from ingestion of ammunition in hunter-killed birds or mammals, have been recorded. Chronic subclinical lead exposure may weaken eagles and predispose them to injury, predation, starvation, disease, or reproductive failure (NatureServe 2024) .

Golden Eagles are vulnerable to electrocution when landing on power poles. Most mortalities occur during winter in western states where natural perches are lacking; poles with cross arms diagonal or parallel to prevailing winds are most lethal. Mortality also occurs from collisions with cars, fences and wind turbines. In some areas, golden eagles have been collected for Native American ceremonial purposes (NatureServe 2024).

Habitat

Agricultural and urban development have reduced suitable habitat. Nesting success is lower in areas where fire has burned shrublands and reduced the prey base (NatureServe 2024)

Grazing, fire return interval, and invasive plant species: The removal of vegetation may impact prey populations, especially in drought years. Grazing also increases the invasion of sites by exotic invasive plants, such as cheatgrass (*Bromus tectorum*), which increase fire return intervals and accelerate the loss of native vegetation.

Frequency, intensity, and severity of wildfires are increasing across the species' habitats.

Ecological conditions

Ecological condition requirements

Management of healthy eagle populations requires maintaining prey habitat in foraging areas. In shrub - steppe habitats, this involves sustaining native shrub communities, which are prime habitat for black-tailed jackrabbits {Kochert, 1999, Effects of fire on golden eagle territory occupancy and reproductive success;Marzluff, 1997, Spatial use and habitat selection of golden eagles in southwestern Idaho}. Shrub communities should be protected within 3 km of nests, and shrub communities can be maintained primarily through active fire suppression and secondarily by restoration of shrub communities in burned areas.

Reducing the potential for raptor electrocutions has been addressed by modifications in power pole and line structural design since the 1970s (Suggested practices for modifying or building raptor-safe power systems are described by the Avian Power Line Interaction Committee (Avian Power Line Interaction Committee 2006).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

All of the plan area is potential foraging and wintering habitat.

Critical biological characteristics

Requires rocky cliffs for nesting with protection from the sun and elements. Dependent upon mammals for prey, which comprise 80-90 of their diet.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Highly dependent upon mammals for prey such as hares, rabbits, and ground squirrels.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Urbanization and human population growth also alter eagle habitat. These processes have rendered many historical eagle use areas unsuitable, particularly in the Colorado Front Range. Widespread agricultural development and urban sprawl in the western United States is known to reduce jackrabbit populations and makes areas less suitable for nesting and wintering eagles.

Maps of Species Range

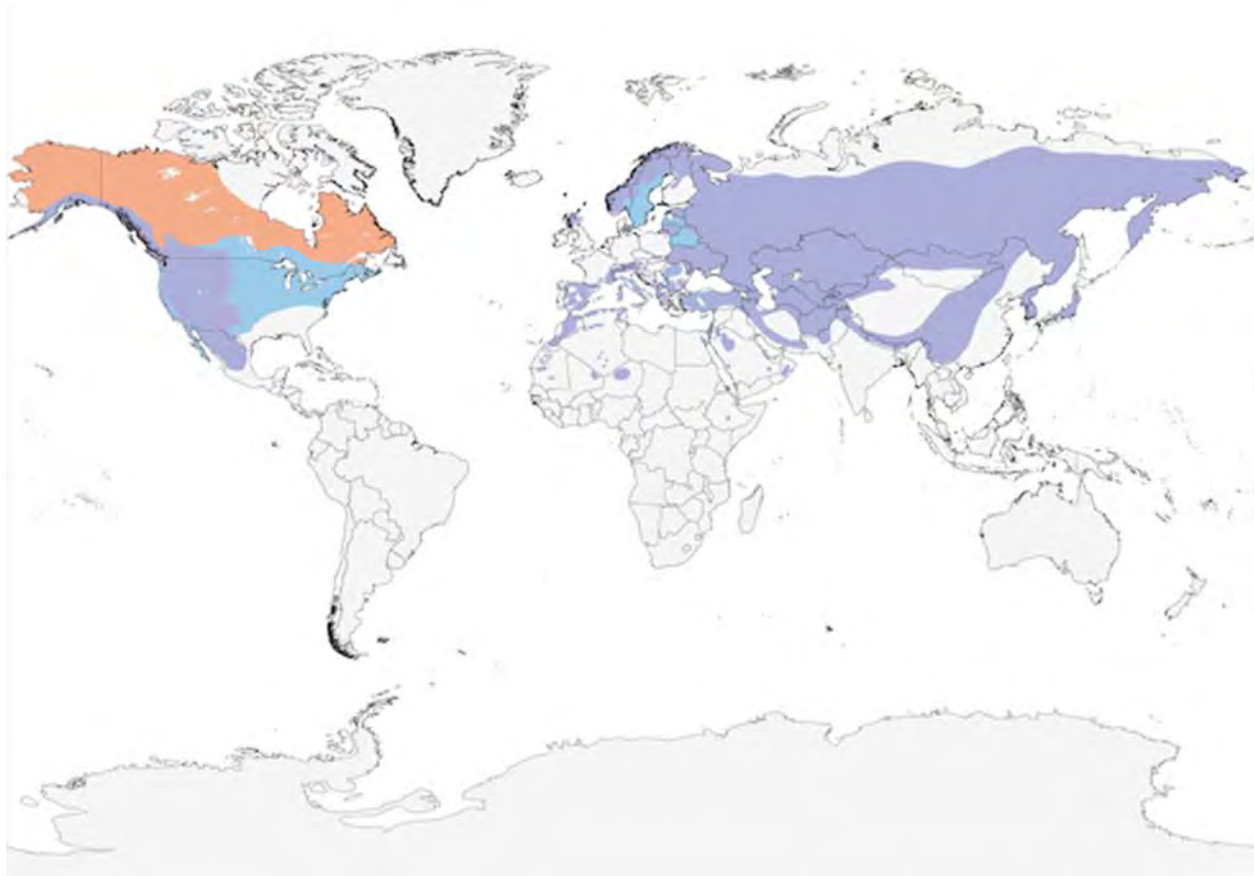


Figure 15. Global distribution of the golden eagle.

Grasshopper sparrow

(*Ammodramus savannarum*)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are approximately 507 observation records between GBIF, iDigBio and the IMBCR within the plan area. The oldest records date back to 1950.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Extensive loss of native grasslands through urban and agricultural development and habitat degradation from grazing and fire suppression have been the primary factors in this species' long-term population decline.
 - b. Habitat: There are significant threats to the habitat due to agricultural conversion, overgrazing from livestock, and habitat conversion from human use as well as energy development, wildfires, and drought.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Surveys conducted by the Bird Conservancy of the Rockies indicate robust decreasing trends in the Grasshopper sparrow population in the Cimarron and Comanche National Grasslands (-21.99%) and in the Shortgrass Prairie Bird Conservation Region (BCR18). The USGS has also estimated declining trends in both Colorado and Kansas. eBird reports decreasing trends in Kansas
 - b. Habitat: Shortgrass prairie is stable in Kansas but has deviated in eastern Colorado. Sandsage prairie is declining in both Kansas and Colorado.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The species is at the far western edge of its breeding range in the plan area.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Density estimates are low on the Cimarron and Comanche with 3.73% in 2023 with lower densities in 2021 and 2022 (approximately 2.5%). Down from 20.1% in 2016.
 - b. Ecological conditions: Grassland habitat for this species occurs widely across the plan area.

Species Status

G5; S3B in Colorado; S5B in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Ammodramus savannarum is the currently accepted valid name for the grasshopper sparrow (TSN 179333) (ITIS 2024). There are no other synonyms or English common names for the species. There are four known subspecies of the grasshopper sparrow.

Species range

Overall species range

This species has a very large range that includes all of Canada, the lower 48 states, and northern South America (NatureServe 2024). The breeding range is essentially the whole area east of the Rocky Mountains to the east coast and includes the southern end of central Canada but stops just north of the southern belt (All About Birds 2024d). There are some smaller pockets of the breeding range on the west side of the Rocky Mountains, but they are disconnected from the larger range. The year-round and non-breeding ranges fall primarily within the northern area of South America as well as the south half of Texas and across the southern belt and the Caribbean islands. Figure 16 below provides a visual diagram of the locations of the different seasonal ranges.

Description of how the population in the plan area fits within the overall range

The plan area is at the far western edge of the breeding range for this species. Partners in Flight estimates the global breeding population at 34,000,000. The species rates a 12 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List but is a species of common bird in steep decline (PIF 2022). The USFWS has identified the grasshopper sparrow on the Birds of Conservation Concern list (FWS 2021).

Distribution, abundance, and trend in the plan area

Population

According to (Cable et al. 1996), the grasshopper sparrow is a common summer resident for the Cimarron NG with records of the bird being between April and August, but no records after mid-August. At the time of Cable et al (Cable et al. 1996) report, there had not been any confirmed nesting records, but it was estimated that there were 33 territorial males per 100 acres in June 1979.

Surveys conducted by the Bird Conservancy of the Rockies indicate robust decreasing trends in the Grasshopper sparrow population in the Cimarron and Comanche National Grasslands (KS-BCR18-CI) (-21.99%) and in the Shortgrass Prairie Bird Conservation Region (BCR18) (-10.89%) (Reese et al. 2024).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases in the Shortgrass Prairie Bird Conservation Region (S18) (-2.07%), in Kansas (-1.99%), in Colorado (-3.89%) and in the United States (-2.38%) (Hostetler et al. 2023).

eBird reports decreasing trends in Kansas (Fink et al. 2023).

Habitat

The grasshopper sparrow is found in a broad array of open grassland types, which are readily available across the whole plan area, but it is notably area-sensitive, preferring large grassland patches greater than 8 ha in size (Slater 2004). Grasshopper sparrows may select larger patches so that they can nest in interior sites and avoid edge habitats, where they suffer higher predation and parasitism rates (Slater 2004). Within open grasslands of suitable patch size, grasshopper sparrows prefer grasslands habitats of intermediate height (~30 cm) with clumped vegetation interspersed with patchy bare ground, and sparse shrub cover (Slater 2004).

Grasslands across the grasshopper sparrow's breeding range vary in physiognomy and plant composition; this is mostly due to differences in soil, climatic conditions, and local disturbance regimes (Slater 2004). Because of this variation, grasshopper sparrows often favor different vegetation components, depending on the specific grassland ecosystem in which they occur (Slater 2004). In arid grasslands of the West and Southwest, they occupy lush areas with small amounts (<35 percent) of shrub or tall forbs, whereas in the East and Midwest, they occupy grasslands on drier sites with sparser vegetation (Slater 2004). Besides native prairie, grasshopper sparrows breeding habitat also includes pasture, hayland, CRP fields, airports, and reclaimed surface mines (Slater 2004).

The shortgrass prairie habitat type is the dominant habitat type across the plan area (80%). It is considered good with a stable condition in Kansas (Rohweder 2022) but has deviated from historical conditions regarding composition in eastern Colorado.

The sandsage prairie habitat type is the second-most widespread vegetation type in the plan area, and the most abundant type for the Cimarron National Grassland, specifically (USDA Forest Service 2005a). In Kansas, the sandsage prairie habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of the historic sandsage habitat has been lost or converted for agricultural uses (CPW 2015). The remaining tracts have good landscape connectivity, but the species composition is highly altered (CPW 2015).

Threats (arising from on or off the plan area)

Population

Grasshopper Sparrow populations declined by about 2.5% per year between 1966 and 2015, resulting in a cumulative decline of 72% over that period, according to the North American Breeding Bird Survey. Decline in several areas in the eastern U.S. and southeastern Canada evidently is due to loss of habitat from human-caused disturbances and is compounded by the losses caused by increased predation due to the mowing of habitat (NatureServe 2024). In Arizona, grazing decreased populations by removing bunchgrass, whereas in West Virginia, Florida, North Dakota, and Missouri moderate grazing did not cause a decline and (usually) increased grasshopper sparrow density by creating areas of favorable short vegetation (NatureServe 2024). Levels of brown-headed cowbird parasitism are considered generally low (NatureServe 2024).

Within Region 2, the greatest threats to grasshopper sparrows are habitat loss, habitat fragmentation, and habitat degradation from grazing and current fire regimes (Slater 2004). Grasshopper sparrows are sensitive to habitat fragmentation because they prefer large grassland patches and avoid smaller patches with low area to edge ratios (Slater 2004).

Habitat

Habitat loss occurs mostly through urban development and conversion of grasslands to croplands (Slater 2004). Although fire and grazing are obligatory disturbance processes necessary for the maintenance of grassland ecosystems and their avifauna, current regimes fail to replicate the natural dynamics under which grassland bird species and their habitats evolved (Slater 2004). Their mismanagement often has a negative impact on the quality and availability of grasshopper sparrow habitats. The impacts of grazing on habitat for this species appear to be conflicting depending on the area in question and the intensity of the grazing that occurs (NatureServe 2024).

At a broad scale, the primary threats to sandsage prairie are loss and fragmentation of habitat and degradation of ecological integrity (e.g., conversion to agriculture, expanding exurban development, construction of roads, energy development, encroachment of woody plants, and targeted eradication of sandsage with herbicide (CPW 2015). Weather, climate, fire, and grazing constitute the most important processes impacting this system, and these processes are also interactive (Locklear 2019). While

sandsage prairie is fairly resilient to the effects of drought in the Great Plains, there are biological limits to the ability of this vegetation to tolerate prolonged episodes of severe drought and may be at the limits of its drought tolerance in southeastern Colorado {Rondeau, 2018, Potential consequences of repeated severe drought for shortgrass steppe species; Locklear, 2019, Sandsage prairie: floristics, structure, and dynamics of a Great Plains plant community}.

At the unit level, grazing occurs over most of the plan area across both states. Long-term continuous grazing of domestic livestock has considerably altered these shrubland habitats from their pre-settlement condition {Colorado Natural Heritage Program, 2015, Climate Change Vulnerability Assessment for Colorado Bureau of Land Management; Rohweder, 2022, Kansas Wildlife Action Plan}. Generally, domestic livestock grazing tends to favor the increase of sandsage over associated native grasses therefore decreasing herbaceous cover {CNHP, 2015, Climate Change Vulnerability Assessment for Colorado Bureau of Land Management}. Fire is an important disturbance process for sandsage prairie, and fire suppression has caused encroachment of woody species such as eastern redcedar (Locklear 2019) and less mosaiced successional conditions (USDA Forest Service 2008). Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimmaron National Grassland.

While habitat loss and deleterious management practices are recognized as threats to sandsage prairie vegetation, the significance of these losses to the larger Great Plains ecoregion has not been examined (Locklear 2021).

For shortgrass prairie at a broad scale, important processes impacting these grassland systems are drought and grazing, which also greatly influenced fire frequency and extent (NatureServe 2024). Short grasses are generally extremely drought- and grazing-tolerant, although continuous heavy grazing and extended drought will reduce cover of dominant species {CNHP, 2010, Ecological systems: Shortgrass prairie}. As the driest of Great Plains grasslands, shortgrass prairie is susceptible to climate stressors and increasing drought (NatureServe 2024). Other general threats to grassland habitat include heavy continuous livestock grazing, military training, invasive non-native species, altered fire regime (fire suppression), conversion to agriculture, fragmentation from roads and development such as exurban and urban development, gas and oil exploration and extraction, invasive species (in the less xeric regions), renewable energy development, increased irrigation conversion of grassland into cropland, and ongoing depletion of the Ogallala Aquifer {Johnson, 2012 #34398; Colorado Parks and Wildlife (CPW), 2015, Species of greatest conservation need; Rohweder, 2022, Kansas Wildlife Action Plan}.

At the unit level, cattle grazing occurs over most of the plan area. Livestock grazing can create change in plant composition. This can include lower species diversity, lower abundance of highly palatable grasses and greater abundance of unpalatable species; increase in weedy species, especially invasive non-native, and bare soil (Crockett 2020). Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimmaron National Grassland. Roads traverse the plan area and can cause fragmentation; road density is particularly high in the Cimarron National Grassland {Cleland, 2017, Terrestrial condition assessment for national forests of the USDA Forest Service in the continental US}. Invasive non-native/alien species can threaten native plant species and alter community composition. Cheatgrass (*Bromus tectorum*) has increased in the plan area and represents a major change in the grassland ecosystem relative to historic conditions (USDA Forest Service 2005b). Relatively few non-native plants can tolerate the arid summer conditions on the Grassland. Shortgrass prairie is considered highly vulnerable to climate stressors in Colorado {Smith, 2024, Colorado's shortgrass prairies at risk of dying off as extreme droughts become more common; Colorado Parks and Wildlife (CPW), 2015, Species of greatest conservation need}. Lastly, aggressive fire suppression has occurred in the plan area and represents a departure from the natural frequency of fire (USDA Forest Service 2005b).

Reduced role of recurrent fire in these ecosystems it is thought to be responsible for ecologically adverse shifts in the structure, composition, and diversity of these grasslands, leading specifically to the rise of ruderal species and invasion by less fire-tolerant species (Brockway et al 2007).

Ecological conditions

Ecological condition requirements

While found in most grassland types, grasshopper sparrows require large patches of grasslands of intermediate height and cover. The creation and maintenance of this habitat condition is best accomplished by managing multiple large patches of grassland habitat in a variety of successional stages through different or rotating management schemes (e.g., fire, grazing, mowing). This ensures that some habitat patches will always be in an intermediate seral stage, favored by grasshopper sparrows.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The ecological conditions for this species are primarily grasslands, which are widely available and distributed across the plan area.

The shortgrass prairie habitat type is the dominant habitat type across the plan area (80%). It is considered good with a stable condition in Kansas (Rohweder 2022) but has deviated from historical conditions regarding composition in eastern Colorado (Crockett 2020).

The sandsage prairie habitat type is the second-most widespread vegetation type in the plan area, and the most abundant type for the Cimarron National Grassland, specifically (USDA Forest Service 2005b). In Kansas, the sandsage prairie habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of the historic sandsage habitat has been lost or converted for agricultural uses (CPW 2015). The remaining tracts have good landscape connectivity, but the species composition is highly altered (CPW 2015).

Critical biological characteristics

The grasshopper sparrow forages almost exclusively on bare ground. During the breeding season, insects, mostly grasshoppers (Orthoptera), comprise the majority (>60 percent) of their diet, with seeds taken secondarily (Slater 2004).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The primary avian predator of the grasshopper sparrow is the loggerhead shrike, with raptors likely being infrequent predators (Slater 2004). Some mammals and snakes are likely predators, taking adults and juveniles on the ground (Slater 2004).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Extensive loss of native grasslands through urban and agricultural development and habitat degradation from grazing and fire suppression have been the primary factors in this species' long-term population decline (Slater 2004). During the breeding season, food availability and interspecific competition do not appear to affect grasshopper sparrow populations (Slater 2004).

Maps of Species Range and Known Occurrences in Plan Area

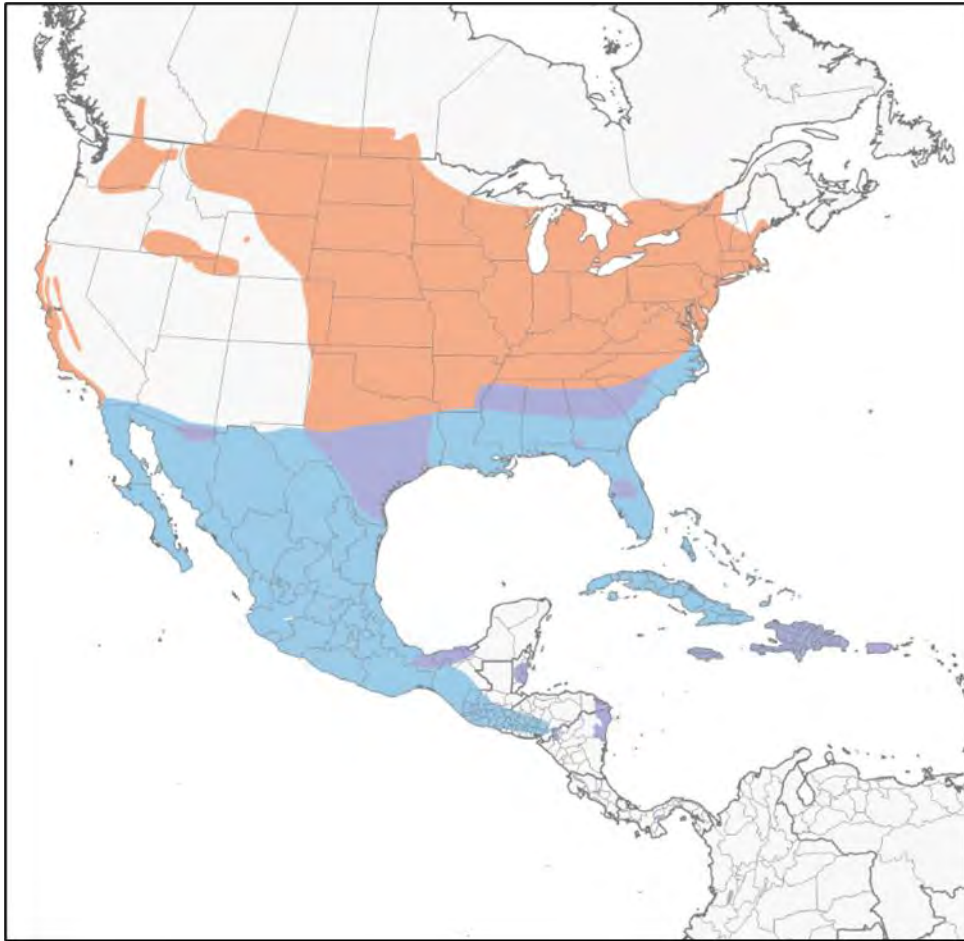


Figure 16. Seasonal distribution of the grasshopper sparrow showing the breeding range (orange), non-breeding range (blue), and the year-round range (purple)(All About Birds 2024d).

Gray Vireo

(*Vireo vicinior*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One individual was observed on 1996-05-05 in Cimarron NG(Cable et al. 1996). There are 7 element occurrence records along Purgatoire River and its tributaries between 1991-06-23 and 2010-05-06(Van Scoyoc 2024). Eight individuals have been observed between 2013-05-30 and 2022-07-02 along Purgatoire River(GBIF 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Nest parasitism by brown-headed cowbirds can affect the nest success.
 - b. Habitat: Threats to habitat include loss of pinyon/juniper woodlands due to fuels reduction and vegetation treatments or forage production for grazing, and large-scale wildfires.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: BBS shows increasing trends in Colorado and in the United States.
 - b. Habitat: Shortgrass prairie exhibits many departures from historic conditions, but the current condition in the plan area is believed to be relatively stable. Pinyon-juniper habitat has both expanded and contracted. The gray vireo's breeding range is projected to increase from 58 –71 percent between 2010 and 2099.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is a disjunct breeding population.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population information within the plan area is lacking, however documentation of 9 individuals within 7 element occurrences has been recorded.
 - b. Ecological conditions: Shortgrass prairie is the most common ecosystem in the plan area, while pinyon/juniper woodlands are much more limited.

Species Status

G5; S2B in Colorado.

Taxonomy

Vireo vicinior is accepted as valid. Other common names include Vireo gris [Spanish] (ITIS 2024).

Species range

Overall species range

This species breeds from southern California, southern Nevada, central Utah, southwestern and southeastern Colorado, and north-central New Mexico south to northwestern Baja California, southeastern Arizona, southeastern New Mexico, western Texas, and northwestern Coahuila. Center of abundance during the breeding season, based on North American Breeding Bird Survey (BBS), is in northern Arizona and southern Utah. Nonbreeding range includes central and southern Baja California, southwestern Arizona (rarely), Sonora (including Tiburón and San Esteban islands), and (rarely) western Texas (Big Bend region). Winter range extent is smaller than breeding range extent (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

Population in the plan area is a disjunct breeding population. Partners in Flight estimates the global breeding population at 560,000. The species rates a 12 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

One individual was observed on 1996-05-05 in Cimarron NG (Cable et al. 1996). There are 7 element occurrence records along Purgatoire River and its tributaries between 1991-06-23 and 2010-05-06 (Van Scoyoc 2024). Eight individuals have been observed between 2013-05-30 and 2022-07-02 along Purgatoire River (GBIF 2024).

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Gray Vireo population in the plan area or the BCR stratum are available (Reese et al. 2024).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population increases in Colorado (3.3%) and in the United States (3.3%) (Hostetler et al. 2023).

Habitat

Breeding habitats include warm/hot, semi-arid, shrubby habitats, especially mesquite and brushy pinyon-juniper woodlands; also chaparral and desert scrub. Thorn scrub, oak-juniper woodland, pinyon-juniper, juniper-cholla, mesquite, dry chaparral (NatureServe 2024).

Shortgrass prairie exhibits many departures from historic conditions, but the current condition in the plan area is believed to be relatively stable (see Appendix). Warming conditions during the past two centuries, together with changing fire regime, livestock grazing, and atmospheric pollution, increased the ability of this ecosystem to expand into neighboring communities, at both higher and lower elevations {Tausch, 1999, Fifty years of ecotone change between shrub and tree dominance in the Jack Springs pinyon Research Natural Area}.

The gray vireo's breeding range is projected to increase from 58 –71 percent between 2010 and 2099 (Van Riper et al. 2014).

Threats (arising from on or off the plan area)

Population

Population has decreased in CA and AZ maybe due to nest parasitism by brown-headed cowbirds(DeSante and George 1994).

Habitat

Threats to habitat include loss of pinyon/juniper woodlands due to fuels reduction and vegetation treatments or forage production for grazing, and large-scale wildfires (NatureServe 2024)(Barlow et al. 2020a).

Ecological conditions

Ecological condition requirements

Breeding habitats include warm/hot, semi-arid, shrubby habitats, especially mesquite and brushy pinyon-juniper woodlands; also chaparral and desert scrub. Thorn scrub, oak-juniper woodland, pinyon-juniper, juniper-cholla, mesquite, dry chaparral (NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Western Great Plains Shortgrass Prairie is the most abundant habitat type in the plan area (>80%). Pinyon/juniper woodland are limited and less than 1% of the plan area.

Critical biological characteristics

Take prey mainly by gleaning foliage and branches; by stalking (moving slowly through shrub or tree); hawk-capture (stationary prey, by large hop or short flight); hovering (adjacent to substrate bearing prey); flycatcher (taking prey in flight) and pouncing (dropping to ground to take prey, but returns to perch to consume prey). About 70% of prey taken by use of first 3 techniques, 25% by flycatching and 5% by pouncing(Barlow et al. 2020b). Builds cup nest suspended from forked twig in a shrub or tree 0.5 to 2 meters tall (Ehrlich et al. 1988); nest usually 0.5-3.5 meters above ground (NatureServe 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species eats a variety of arthropods, including large grasshoppers (6 cm; *Orthoptera*), cicadas (6 cm; *Homoptera*) and caterpillars (*Lepidoptera*)(Barlow et al. 2020b).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Habitat in open, mature piñon-juniper woodland with a shrubby understory, especially on moderate rocky slopes, needs to be maintained. Conservation recommendations include protecting existing habitat by

avoiding fire suppression (to prevent stands from becoming too dense) and limiting Brown-headed Cowbird parasitism by discouraging highly intensive, short-term grazing or the development of additional livestock water sources. A need was seen to educate both government agencies and the public about the importance of piñon-juniper habitat to birds (Barlow et al. 2020b).

Maps of Species Range and Known Occurrences in Plan Area



Distribution of the Gray Vireo

Figure 17. Distribution of the gray vireo (Barlow et al. 2020b).

Green-winged Teal

(*Anas crecca*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF- 47 observations between 1989-2022.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Shooting and trapping, both legal and illegal.
 - b. Habitat: The plan area does not contain adequate habitat and range-wide habitat is not declining.
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: There is no specific population trend in the plan area. Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Green-winged Teal population in the plan area or the BCR stratum are available. eBird reports increasing trends in Kansas and in Colorado.
 - b. Wetland habitat on the plan area has declined, but ponds created by FS support the species habitat on the Cimarron NG.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. It is an uncommon migrant and rare winter resident.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. This species has adequate numbers range-wide; it is an uncommon migrant and rare winter resident.
 - b. There is little suitable wetland habitat in the plan area.

Species Status

G5; S5B,S4N in Colorado; S1B,S5N in Kansas.

Taxonomy

Anas crecca is valid (ITIS 2024). Worldwide there are two recognized subspecies of Green-winged Teal: *Anas crecca carolinensis* in North America, *A. c. crecca* in Eurasia and the Aleutian Islands (Johnson et al. 2020).

Species range

Overall species range

Holarctic. BREEDS: north-central Alaska, northwestern and central Canada south to California, northern New Mexico, northern Nebraska, Minnesota, northern Ohio, western New York, Maine, Nova Scotia; Iceland, northern Eurasia, Aleutians south to southern Spain, northern Italy, southern Russia and northwestern China. WINTERS: in North America, mostly in the U.S., regularly to central Mexico and Antilles; also Hawaii; widely in Old World. In the U.S., the highest winter densities occur in western Texas, northern Utah, Kansas, Mississippi-Arkansas, and southeastern North Carolina; except for the latter, these are associated with national wildlife refuges (Root 1988).

Description of how the population in the plan area fits within the overall range

Uncommon migrant, rare winter resident. The species has been found on only a few Christmas Bird Counts. Partners in Flight estimates the global breeding population at 6,700,000. The species rates a 9 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern(PIF 2022).

Distribution, abundance, and trend in the plan area

Population

There is no specific population trend in the plan area. It is a rare winter resident and uncommon migrant. Population is increasing in North America (Johnson et al. 2020).

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Green-winged Teal population in the plan area or the BCR stratum are available(Reese et al. 2024). eBird, which could produce better trend estimates for Green-winged Teal, reports increasing trends in Kansas and in Colorado(Fink et al. 2023).

Habitat

Highest densities in wooded ponds of deciduous parklands with additional breeding in boreal forests, arctic deltas, and mixed prairie regions (Bellrose 1976a). Often inhabits grasslands or sedge meadows with brush thickets or woodlands next to a marsh or pond (Munro 1949b, Moison et al. 1967). In Alberta prairie habitat, found nesting in sedge cover rather than cattail (*Typha*), mixed prairie, weedy, or burned areas, when these types were available (Keith 1961). Often inhabits beaver (*Castor canadensis*) ponds in wooded areas (Baldassarre and Bolen 1994). In S. Dakota, 57.6% of 35 pairs used potholes and lakes (35.0% in semipermanent potholes), 7.3% nested near streams, and 35.1% used human-made wetlands (Baldassarre and Bolen 1994).

For migration and wintering habitat utilizes shallow wetlands (Johnson et al. 2020).

Threats (arising from on or off the plan area)

Population

Shooting and trapping, it is the most common duck next to mallards for hunters.

Habitat

There has been little degradation of habitat overall for this species (Johnson et al. 2020).

Ecological conditions

Ecological condition requirements

Shallow wetlands are critical for breeding, foraging, and wintering.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There is little suitable habitat in the plan area.

Critical biological characteristics

Requires shallow wetlands for breeding and wintering.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Prey item for many species. Important for wetland ecosystem integrity.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

There are few wetlands in the plan area that offer suitable habitat.

Maps of Known Occurrences in Plan Area

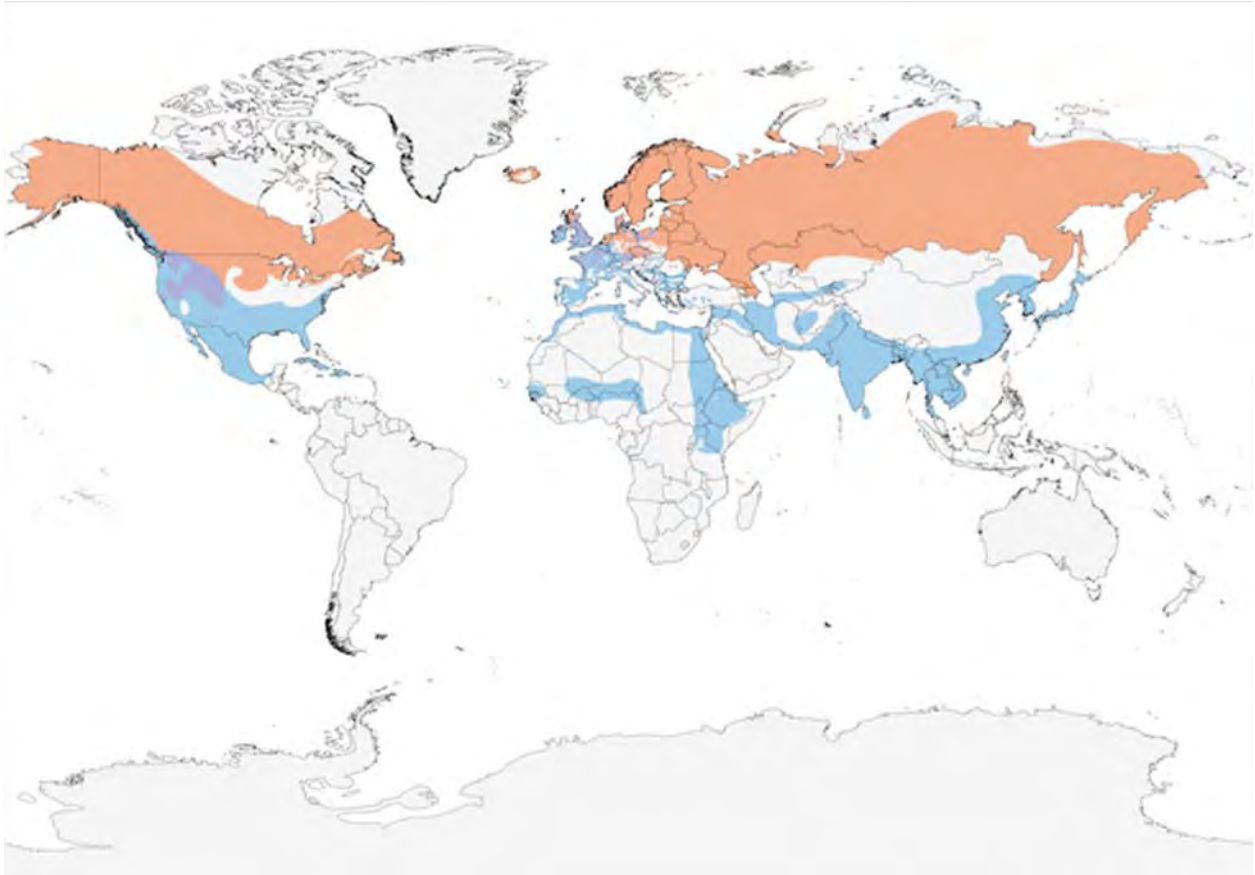


Figure 18. Global distribution of green-winged teal.

Hepatic Tanager

(*Piranga flava*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One individual was observed in Purgatoire Canyon on 2019-07-27. This species has been detected three times during the IMBCR survey on the Comanche NG, but the locations are not known.

Year of Last Known Occurrence: 2019

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No threats to population have been identified.
 - b. Habitat: Threats to habitat include drought, insects, overgrazing and recreation.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends are available in the plan area. eBird reports increasing trends in the United States.
 - b. Habitat: Riparian and riparian woodlands have declined within the plan area; however, tamarisk control and cottonwood and willow restoration efforts along the Cimarron and Purgatoire Rivers are ongoing. Pinyon-juniper habitat has been expanded in some parts of the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the northern edge of the breeding range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Information is lacking on population numbers for the plan area, but there are four observations in the plan area.
 - b. Ecological conditions: Shortgrass Prairie is the most abundant habitat type in the plan area. Pinyon/juniper woodland and riparian woodlands are more limited.

Species Status

G5; S1B in Colorado.

Taxonomy

Piranga flava is valid and accepted. Other common names include: Tángara encinera [Spanish] and Red Tanager [English](ITIS 2024f).

Species range

Overall species range

BREEDING: southern California, northwestern and central Arizona, western Colorado (probably), northern New Mexico, western Texas south to western Peru, Uruguay, Paraguay, Brazil, and Argentina. NON-BREEDING: mostly from northern Mexico (casually from southern California and southern Arizona) south through breeding range. FLAVA group: isolated savannas of southern Guyana and Suriname and northeastern Brazil north of Amazon; interior and southern Brazil, eastern Bolivia, Paraguay, Uruguay, and northern Argentina. LUTEA group: northern coastal mountains of Venezuela, Colombia (locally), western Ecuador, western Peru, and nw. Bolivia; Santa Marta Mountains of Colombia-Venezuela border; slopes of tepuis and other isolated mountains in southern Venezuela, adjacent northern Brazil, Guyana, and Suriname; Trinidad (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the northern edge of the breeding range. Partners in Flight estimates the global breeding population at 7,600,000. The species rates a 7 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern(PIF 2022).

Distribution, abundance, and trend in the plan area

Population

One individual was observed in Purgatoire Canyon on 2019-07-27. This species has been detected three times during the IMBCR survey on the Comanche NG, but the locations are not known.

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Hepatic Tanager population in the plan area or the BCR stratum are available(Reese et al. 2024). eBird reports increasing trends in the United States(Fink et al. 2023).

Habitat

Habitat for this species in the plan area could include riparian woodland and pinyon-juniper woodland borders or in clearings.

Warming conditions during the past two centuries, together with changing fire regime, livestock grazing, and atmospheric pollution, increased the ability of this ecosystem to expand into neighboring communities, at both higher and lower elevations {Tausch, 1999, Fifty years of ecotone change between shrub and tree dominance in the Jack Springs pinyon Research Natural Area}.

Dense tamarisk thickets and cattle grazing have almost eliminated cottonwood and willow along Timpas Creek. Tamarisk density, live cottonwood stem density, and the density of cottonwood regeneration are all greater in the western portion of the Cimarron River, while dead cottonwood stem density is greater along the eastern portion of the river channel. No inventories have been conducted for the Purgatoire River. Ongoing management efforts in the riparian woodlands are focused on tamarisk control and cottonwood and willow restoration along the Cimarron and Purgatoire Rivers.

Threats (arising from on or off the plan area)

Population

No threats to population have been identified (Eddleman 2020b).

Habitat

Degradation of habitat occurred due to drought, insects and overgrazing in Texas. Forest fire and human recreation potentially pose threats to the habitat in California (Eddleman 2020b).

Ecological conditions

Ecological condition requirements

Open coniferous forest, pine-oak forest, riparian woodland, lowland pine savanna. In Colorado, tall, mature ponderosa pine (*Pinus ponderosa*) in deeper and moister draws, or mesas covered on tops and sides by piñon pine (*Pinus edulis*) (Eddleman 2020a).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Western Great Plains Shortgrass Prairie is the most abundant habitat type in the plan area. Pinyon/juniper woodland or Riparian and riparian woodlands are more limited (see Appendix).

Critical biological characteristics

Follows river valleys during migration (Hubbard 1978). Pair formation may begin in late Mar in Chiapas, Mexico. Presumably occurs shortly after arrival on breeding grounds in northern populations (Edwards and Lea 1955).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Forages for insects high in trees; also flies out from branch and catches flying insects. Feeds on wild grapes and cherries in late summer. Costa Rica: eats many berries and arillate seeds in addition to insects (NatureServe 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information suggests that this species influences ecosystem structure or function.

Maps of Species Range and Known Occurrences in Plan Area



Distribution of the Hepatic Tanager

Figure 19. Distribution of hepatic tanager in the Americas

Ladder-backed woodpecker

(*Dryobates scalaris*)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Multiple sightings over many years, including 504 records from GBIF dating from 1952 through 2022. This is not a migratory species, indicating that the species is established in the area as these records are not flyover individuals.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Undetermined.
 - b. Habitat: Brush clearing, chaining and fire. Especially of mesquite (NatureServe 2024)
2. Declining trends in populations or habitat in the plan area:
 - a. Population: IMBCR surveys show an increasing population trend on the Comanche. eBird reports increasing trends in Kansas and in Colorado. Christmas bird counts document range-wide decline.
 - b. Habitat: Range wide habitat decline due to wildland fire and development. This species is adapted to desert woodlands, much of which is dominated by slow growing species that are slow to recover from fire. Invasive annual grasses may contribute to more frequent fires that occur early in the season before native plants set seed, this converts desert woodlands into annual grasslands and can severely impact species not adapted for annual grasslands – ladder-backed woodpecker included.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The CCNGs are at the edge of the range of Ladder-backed woodpecker. The species is more commonly associated with more arid desert woodlands in the deserts of the southwestern U.S. and northern Mexico(UDWR 2024).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Multiple sightings over many years, including 504 records from GBIF dating from 1952 through 2022.
 - b. Ecological conditions: This species makes use of riparian wetlands in the plan area, but most of the plan area is marginal habitat to non-habitat for a desert woodland species such as this.

Species Status

G5; S3 in Colorado; S1 in Kansas; listed as Candidate in Kansas.

Taxonomy

Dryobates scalaris (Wagler, 1829) is accepted and valid(ITIS 2024b).

Species range

Overall species range

Mexico and Central America north through the southwestern deserts of the US (All About Birds 2024b).

Description of how the population in the plan area fits within the overall range

The populations in Kansas and Colorado are at the extreme northern edge of the species range. It is year-round habitat as this is not a migratory species (All About Birds 2024e). Partners in Flight estimates the global breeding population at 5,500,000. The species rates a 9 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

Multiple sightings over many years, including 504 records from GBIF dating from 1952 through 2022. This is not a migratory species, indicating that the species is established in the area as these records are not flyover individuals.

Surveys conducted by the Bird Conservancy of the Rockies indicate robust increasing trends in the Ladder-backed woodpecker population in the Comanche National Grasslands (CO-BCR18-CO) (Reese et al. 2024).

eBird reports increasing trends in Kansas and in Colorado (Fink et al. 2023).

Habitat

Habitat use in the plan area is most riparian woodlands in the Cimarron NG, with scattered use of adjacent areas.

Threats (arising from on or off the plan area)

Population

Ladder-backed woodpecker appears to face no direct threat to the species, nothing causing direct mortality (Lowther et al. 2020).

Habitat

Primary threats to this species are habitat related. Loss of riparian woodlands due to climate stressors which may result in more arid ecosystems. Chaining or other removal of larger trees could impact the species as well. Grazing practices may have adverse effect on quality and quantity of habitat available for this species (Lowther et al. 2020).

Ecological conditions

Ecological condition requirements

Deserts, arid scrub, riparian woodland, mesquite, scrub oak, pinyon-juniper woodland, pine-oak association, pine savanna, thickets, shade trees in towns and rural areas. Digs nest hole in rotted stub or in dead or dying branch of various trees, also in saguaro, agave, yucca, fence post, utility pole; nest 3-8 m above ground {Tausch, 1981, Tree age and dominance patterns in Great Basin pinyon-juniper woodlands}(NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The primary habitat of the species is mostly limited to wetlands and riparian corridors on the Cimmaron NG.

Critical biological characteristics

Cavity nesting species, requires trees that are large enough to support that (Lowther et al. 2020).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

As with other woodpecker species, this ladder-backed woodpeckers can create or enlarge cavities which are then use by other wildlife species.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Ladder-backed woodpeckers are cavity nesters, as such they require large trees.

Maps of Species Range and Known Occurrences in Plan Area



Figure 20. Distribution of the ladder-backed woodpecker in North and Central America.

Lark Bunting

(Calamospiza melanocorys)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are 775 GBIF records between 1950-2023. There are 22 iDigBio records between 1950-1995. There are 537 IMBCR records between 2008-2019. Cable et al. (1996) states "Status: Abundant migrant and summer resident and common to abundant winter resident. Nesting Records: Ports found a nest with five eggs on 7 June 1978. High Counts: Seltman estimated more than 10,000 migrants on 3 August 1991 with more than 1,000 seen in a single flock. He further reported many flocks exceeded 100 birds. "Hundreds" were seen on 8 May 1977. Ports counted a total of 415 on 24 June 1978. Out of Season: Prior to 1976, no records documented Lark Bunting in Morton County during winter; but since the 209 recorded on 31 December 1976, this species has appeared on almost every Cimarron CBC. Wintering flocks numbering in the hundreds can also be seen in adjacent Colorado and Oklahoma. Severe weather seems to have little effect on Lark Buntings. Large wintering flocks have remained through blizzards and sub-zero cold. This behavior appears to be new and is somewhat puzzling. The historic winter range of Lark Buntings begins several hundred miles south of Morton County".

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Pesticide use for grasshopper control, collision with cars during breeding season, susceptible to drowning in stock tank, heavy summer grazing of short-grass prairie in Colorado is extremely detrimental to Lark bunting populations. Nests in agricultural areas susceptible to plowing and tilling.
 - b. Habitat: Overgrazing
2. Declining trends in populations or habitat in the plan area:
 - a. Population: IMBCR surveys show a declining trend in the Comanche stratum. Within the Shortgrass Prairie Bird Conservation region (BCR 18), IMBCR population trends are declining, and BBS surveys also show declining trends. eBird reports declining trends in Kansas and in Colorado. Wintering populations have established in Colorado and Kansas in the mid-1970.
 - b. Habitat: Shortgrass prairie exhibits many departures from historic conditions, but the current condition in the plan area is believed to be relatively stable (see Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the western edge of the species' breeding range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Many records of this species throughout the plan area.
 - b. Ecological conditions: plan area provides abundant grassland habitat for this species.

Species Status

G5; S4 in Colorado; S5B in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Calamospiza melanocorys is accepted as valid (ITIS 2024a).

Species range

Overall species range

BREEDING: southern Alberta, southern Saskatchewan, and southeastern North Dakota south, east of Rockies, to eastern New Mexico, northern Texas, western Oklahoma, eastern Kansas, and northwestern Missouri. NON-BREEDING: central California, southern Nevada, central Arizona, southern New Mexico, central Texas, southwestern Kansas, and western Oklahoma south to southern Baja California, Jalisco, Guanajuato, Hidalgo, Tamaulipas, and southern Texas (NatureServe, 2024, *Calamospiza melanocorys*, lark bunting).

Wintering populations have established in Colorado and Kansas in the mid-1970 (Shane and Seltman 1995).

Description of how the population in the plan area fits within the overall range

The plan area is at the western edge of the species' breeding range. Partners in Flight estimates the global breeding population at 12,000,000. The species rates a 12 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List but is a species of common bird in steep decline (PIF 2022). This species is listed as birds of conservation concern (FWS 2021) in BCR 17 and 19, but not listed in the BCR 18 which the plan area belongs to.

Distribution, abundance, and trend in the plan area

Population

Surveys conducted by the Bird Conservancy of the Rockies indicate robust decreasing trends in the Lark bunting population on the Comanche National Grasslands (CO-BCR18-CO) (-29.56%) and in the Shortgrass Prairie Region (BCR18) (19.87%) (Reese et al. 2024).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases in Kansas (-6.41%), in Colorado (-6.45%), in the Shortgrass Prairie Region (BCR18) (-4.95%) and in the United States (-4.01%) (Hostetler et al. 2023).

eBird reports decreasing trends in Kansas and in Colorado (Fink et al. 2023).

(Shane 2020b) notes that "Certain organizations such as Partners in Flight and National Audubon Society have listed Lark Bunting as species of concern, or high priority (Thompson 1993, Mckown 1999). Breeding Bird Survey (BBS) data used to establish this status (<35 yr) probably not adequate for this species (Shane 1996, Peterjohn and Sauer 1999). In Central Shortgrass Prairie, The Nature Conservancy (Nature Conservancy 1998) has concluded that Lark Buntings remain common and are considered globally secure".

Habitat

Breeding habitat are grasslands and shrub-steppe of high plains, including agricultural areas. In sw. Kansas, forages in sorghum stubble, loaf in tumbleweeds in ditches; also frequents cattle feed lots in winter (Shane 2020b). Shortgrass prairie exhibits many departures from historic conditions, but the current condition in the plan area is believed to be relatively stable (see Appendix).

Threats (arising from on or off the plan area)

Population

Pesticide use for grasshopper control, collision with cars during breeding season, susceptible to drowning in stock tank (Shane 2020b). Heavy summer grazing of short-grass prairie in Colorado is extremely detrimental to Lark bunting populations (Giezentanner and Ryder 1969). Nests in agricultural areas susceptible to plowing and tilling (Wilson 1976).

Habitat

Desert grasslands in wintering range has been destroyed or badly overgrazed (Shane 2020b).

Ecological conditions

Ecological condition requirements

Breeding habitat are grasslands and shrub-steppe of high plains, including agricultural areas (Shane 2020b). Heavy summer grazing of short-grass prairie in Colorado is extremely detrimental to Lark bunting populations; all other grazing regimens provide suitable habitat (Giezentanner and Ryder 1969). In sw. Kansas and se. Colorado, 1996-1997, breeding Lark Buntings usually avoid black-tailed prairie dog colonies; found most often in noncolonized shortgrass sites of region where vegetation height was 2.7 times higher and 2.2 times as dense (Winter 1999a). In sw. Kansas, forages in sorghum stubble, loaf in tumbleweeds in ditches; also frequents cattle feed lots in winter (Shane 2020b).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Shortgrass prairie is the most abundant ecosystem in the plan area (see Appendix). Ecological conditions are not considered restricted for this species in the plan area.

Critical biological characteristics

Time of season may influence selection of nesting habitat. In Kansas, used stubble fields for nesting during the early part of the breeding season, and later nested in native grassland on hillsides with sparser vegetation (Wilson 1976).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species feeds on small seeds, grain, insects, and occasionally cactus fruits in winter, weed seeds, wheat, few insects, and arachnids; occasionally leaves of forbs during migration and grasshoppers, weevils, ants, scarab beetles, true bugs, seeds of wild plants, grains, and some leafy matter in summer(Shane 2020b).

In Kansas, brown-headed cowbirds did not fledge from parasitized lark bunting nests(Wilson 1976).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Breeding Lark Buntings usually avoid black-tailed prairie dog colonies; found most often in noncolonized shortgrass sites of region where vegetation height was 2.7 times higher and 2.2 times as dense(Winter 1999b).

Maps of Species Range and Known Occurrences in Plan Area

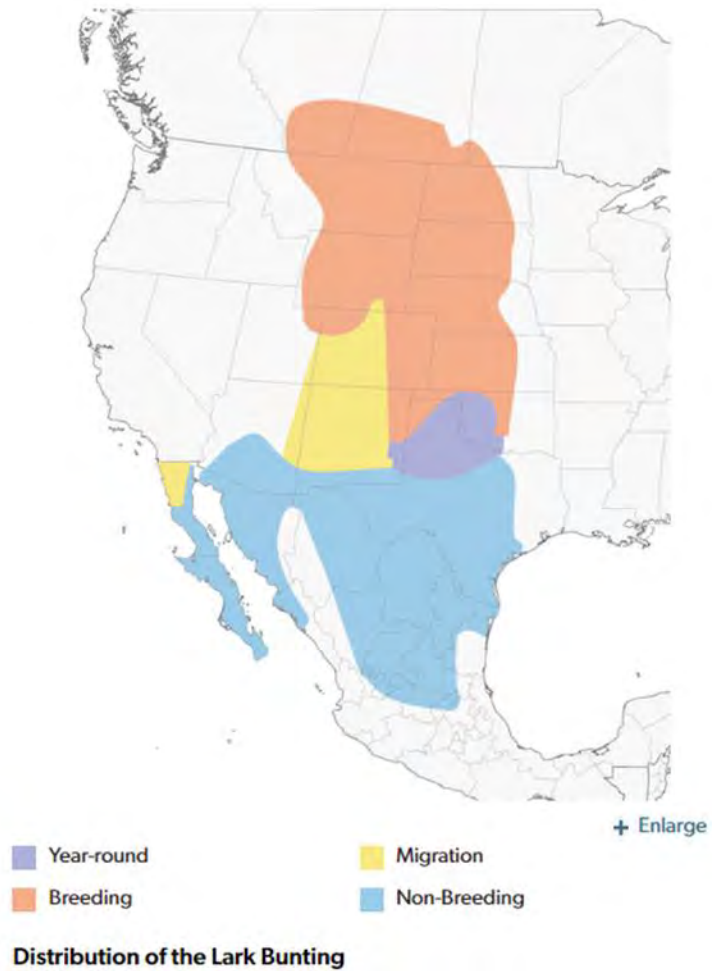


Figure 21. Distribution of the lark bunting (Shane 2020a).

Lazuli Bunting

(*Passerina amoena*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF- 170 observations between 1950-2022.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Nest parasitism by brown-headed cowbird.
 - b. Habitat: Utilizes a wide variety of brushy habitats and forested areas. Climate stressors can increase fire return intervals causing some potential habitat loss.
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: IMBCR surveys show an increasing trend in the Cimarron. eBird reports increasing trends in Kansas.
 - b. This species utilizes a wide variety of habitats; habitat has a stable trend in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is at the edge of the breeding range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. There are numerous observations within the plan area.
 - b. This species utilizes a wide variety of habitats and is not restricted ecologically.

Species Status

G5; S5B in Colorado; S1B in Kansas.

Taxonomy

Passerina amoena is valid (ITIS 2024).

Species range

Overall species range

Widespread in North America west of the Great Plains and south of the boreal forest in Canada (Greene et al. 2020).

Description of how the population in the plan area fits within the overall range

Primarily located on the Comanche portion of the plan area in Colorado for nesting and winter habitat.

For the Cimarron portion of the plan area, it is an uncommon migrant and rare summer resident (USDA 1996). Partners in Flight estimates the global breeding population at 6,500,000. The species rates an 8 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

Surveys conducted by the Bird Conservancy of the Rockies indicate robust increasing trends in the Lazuli bunting population on the Cimarron National Grasslands (KS-BCR18-CI) (Reese et al. 2024).

eBird reports increasing trends in Kansas (Fink et al. 2023).

Habitat

Utilizes a wide variety of brushy habitats especially arid bushy hillsides, riparian habitats, wooded valleys, aspen (*Populus*), willow (*Salix*), alder (*Alnus*), or cottonwood (*Populus*) thickets, sagebrush (*Artemisia*), chaparral, open scrub, recent postfire habitats, thickets and hedges along agricultural fields, and residential gardens (Greene et al. 2020.)

Threats (arising from on or off the plan area)

Population

Particularly sensitive to nest parasitism by Brown-headed Cowbird (Greene et al. 2020).

Habitat

Grazing, changes in fire return interval, and invasion by non-native plant species may cause decreases in habitat.

Ecological conditions

Ecological condition requirements

This species utilizes a wide variety of habitats. It is most sensitive to brood parasitism by brown-headed cowbird (Greene et al. 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

While the plan area offers some brushy habitat, the majority is grassland. The species is a rare summer resident and migrant (USDA 1996).

Critical biological characteristics

The species is sensitive to brood parasitism by brown-headed cowbird (Greene et al. 2020).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Brown-headed cowbird often target Lazuli Bunting (Greene et al. 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

This species is a rare summer resident and migrant.

Maps of Species Range

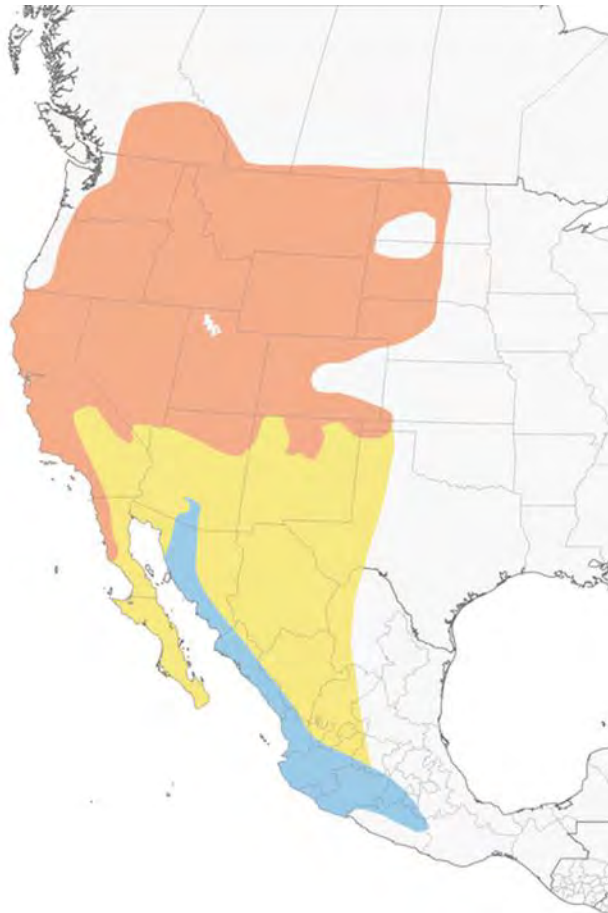


Figure 22. Distribution of lazuli bunting in North and Central America.

Lewis's Woodpecker

(*Melanerpes lewis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are 26 non-duplicate observation records reported in GBIF between 1973-05-06 to 2022-02-07(GBIF 2024). (CNHP 2023) reports 7 element occurrences between 1990-05-26 and 2007-05-26. Cable et al. (1996)reports: "One University of Kansas specimen was collected on 4 July 1927. Ely observed one flying along the Cimarron River on 5 May 1963. Fall birds were seen on 13 October 1985 and 16 September 1989. One was found on the Cimarron CBC of 30 December 1995, and another in the Elkhart cemetery on 3 May 1996".

Year of Last Known Occurrence: 2020

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Loss of breeding and wintering habitats.
 - b. Habitat: Timber harvest, fire suppression, cattle grazing, water regulation, and human development. Alterations to water regimes and improper livestock grazing have been shown to negatively impact cottonwood recruitment.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Lewis's Woodpecker population in the plan area or the BCR stratum are available. eBird reports an increasing trend in the United States.
 - b. Habitat: Riparian woodland habitat on the plan area has declined; however, tamarisk control and cottonwood and willow restoration efforts along the Cimarron and Purgatoire Rivers are ongoing.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population information is lacking for the plan area. ~30 observation records, one specimen and 7 element occurrences.
 - b. Ecological conditions: riparian woodland habitats are limited in the plan area.

Species Status

G4; S4 in Colorado; SNA in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Melanerpes lewis is accepted as valid. Other common names include Lewis' Woodpecker, Carpintero de Lewis.

Species range

Overall species range

BREEDING: southern British Columbia, southwestern Alberta, Montana, southwestern South Dakota and northwestern Nebraska south to south-central California, central Arizona, southern New Mexico, and eastern Colorado; locally distributed and sporadic within range.

NON-BREEDING: mainly from northern Oregon, southern Idaho, central Colorado, south-central Nebraska south irregularly to northern Mexico, southern New Mexico, and western Texas (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the eastern edge of the species range (Figure 23). Partners in Flight estimates the global breeding population at 82,000. The species rates a 13 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List but is a species of common bird in steep decline (PIF 2022). This species is a birds of conservation concerns (FWS 2021).

Distribution, abundance, and trend in the plan area

Population

There are 26 observation records reported in GBIF between 1973-05-06 to 2022-02-07. One or multiple individuals were reported from each record. High counts include 10 individuals on 1973-05-06, 5 individuals on 2010-06-03 and 3 individuals on 1992-07-05 (GBIF 2024). (CNHP 2023) reports 7 element occurrences between 1990-05-26 and 2007-05-26.

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Lewis's Woodpecker population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird reports an increasing trend in the United States (Fink et al. 2023).

Habitat

Actual bird locations were likely on cottonwood trees and riparian area along Cimarron River, Purgatoire River, or their tributaries. Dense tamarisk thickets and cattle grazing have almost eliminated cottonwood and willow along Timpas Creek. Tamarisk density, live cottonwood stem density, and the density of cottonwood regeneration are all greater in the western portion of the Cimarron River, while dead cottonwood stem density is greater along the eastern portion of the river channel. No inventories have been conducted for the Purgatoire River. Ongoing management efforts in the riparian woodlands are focused on tamarisk control and cottonwood and willow restoration along the Cimarron and Purgatoire Rivers.

Threats (arising from on or off the plan area)

Population

The loss of breeding and wintering habitats in the form of burned pine forests, park-like ponderosa pine forests, riparian cottonwood stands, and oak woodlands is thought to be the primary threat to the long-term persistence of Lewis's woodpecker populations (Abele et al. 2004).

Habitat

Primary causes of habitat degradation are likely timber harvest, fire suppression, cattle grazing, water regulation, and human development. These activities may result in the loss of nest and storage substrates, a reduction in the understory shrub community, a decrease in prey availability, or an increase in forest stand density (making them unsuitable for breeding).

Cottonwood galleries are key habitat for Lewis's woodpecker within the planning area. Alterations to water regimes and improper livestock grazing have been shown to negatively impact cottonwood recruitment along many western streams and rivers. The effects of livestock trampling and browsing have restricted cottonwood recruitment, creating even-aged riparian forest stands that lack structural complexity. A decline in cottonwood seedling establishment may be creating future conditions unsuitable as Lewis's woodpecker breeding and wintering habitat. Finally, although mast limitation is poorly understood, loss of oak woodlands may be influencing survival and distribution (Abele et al. 2004).

Ecological conditions

Ecological condition requirements

BREEDING: Open forest and woodland, often logged or burned, including oak, coniferous forest, riparian woodland and orchards, less commonly in pinyon-juniper. Distribution closely associated with open ponderosa pine forest in western North America and is strongly associated with fire-maintained old-growth ponderosa pine.

NESTING: Tends to nest in a natural cavity, abandoned northern flicker (*Colaptes auratus*) hole, or previously used cavity, 1-52 meters above ground. Sometimes will excavate a new cavity in a soft snag (standing dead tree), dead branch of a living tree, or rotting utility pole. Mated pair may return to the same nest site in successive years.

NON-BREEDING: In winter, uses oak woodlands, nut and fruit orchards. An important habitat feature in many wintering areas is the availability of storage sites for grains or mast, such as tree bark (e.g. bark of mature cottonwood trees) or power poles with desiccation cracks (NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Riparian woodland is relatively limited in the plan area (see Appendix). Tamarisk has become well-established in both the Cimarron River Corridor and the Purgatoire River {USFS, 2005, Cimarron and Comanche National Grassland: Vegetation/Ecology}, which can compete with native riparian woodland species such as cottonwoods.

Critical biological characteristics

Lewis's woodpeckers are primary cavity excavators, but they most often nest in existing cavities and will reuse the same nest cavity for successive years.

The complete nesting cycle of Lewis's woodpecker spans approximately 51 days, with only one brood per year (Dudley and Saab 2003 cited in (Abele et al. 2004). Re-nesting may occur if a nest fails early in the nesting cycle. In the southern portion of their range (California, Nevada, Utah, Colorado), the average dates of incubation and hatching are 25 May and 24 June, respectively. The duration of incubation ranges from 13 to 16 days. Nestlings emerge from the cavity at 28 days of age in Colorado. Adults feed juveniles for at least 10 days after fledging. Young often follow parents and give begging calls when adults arrive

with food. In burned forests, adults occasionally move with juveniles from the nest site toward green trees, presumably for protection from predators (Abele et al. 2004).

Breeding habitat for Lewis's woodpecker is characterized by an open canopy, brushy understory, available perch sites and abundant insects. Open forest appears to facilitate foraging and is consistently associated with breeding habitat. While a certain number of trees are necessary for nesting and perching sites, a closed canopy forest is not suitable due to reduced visibility, limited room for aerial maneuvers, and retarded shrub development {Bock, 1970, Breeding bird populations of burned and unburned conifer forest in the Sierra Nevada; Saab, 1998, Responses of cavity-nesting birds to stand-replacement fire and salvage logging in ponderosa pine/Douglas-fir forests of southwestern Idaho}.

Lewis's woodpeckers will nest in a variety of tree species, but the most common nest trees selected in Colorado are ponderosa pine and cottonwood. In Pueblo, Crowley, and Otero counties of Colorado, 100 percent of the nests occurred in dead or decaying cottonwoods (n=47 nests; Tashiro-Vierling 1994 cited in (Abele et al. 2004).

Burned ponderosa pine stands probably represent high quality breeding habitat for Lewis's woodpecker based on nest-site selection and reproductive success. Riparian cottonwood also tends to provide suitable nest sites because of the soft nature of decaying cottonwood, frequent rot conditions in cottonwood trees, and the abundance of aerial insects associated with riparian habitats (Abele et al. 2004).

During the breeding season, Lewis's woodpeckers are primarily aerial foragers. Diets consist of ants, wasps, bees, beetles, grasshoppers, butterflies and other insects. They also forage on nuts and fruits in all seasons. During winter, Lewis's woodpecker feed extensively on nuts and fruit. Trees used for mast storage in southeastern Colorado were predominately dead or decaying cottonwoods that were significantly taller and of greater diameter than random trees. Lewis's woodpeckers tend to use natural cavities and crevices in decayed snags or power poles for storage sites (Abele et al. 2004).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Feeds on adult emergent insects (e.g., ants, beetles, flies, grasshoppers, tent caterpillars, mayflies) in summer, ripe fruit and nuts in fall and winter. Opportunistic and may respond to insect outbreaks and grasshopper swarms by increasing breeding densities. Unlike other woodpeckers, does not bore for insects but will flycatch and glean insects from tree branches or trunks; also drops from perch to capture insects on the ground. Especially favors acorns and commercial nuts and fruit in fall and winter, and caches food in natural crevices such as tree bark and dessication cracks in utility poles, tailoring food to fit crevices. Also eats huckleberry, twinberry, currant, mountain ash and chokecherries. In some areas, wintering birds rely more on insects than on cached food (NatureServe 2024).

May compete with acorn woodpeckers (*Melanerpes formicivorus*) for acorn crop. Will aggressively defend food caches from all comers. Territorial in immediate space around nest sites toward Red-headed Woodpeckers (*Melanerpes erythrocephalus*) and other Lewis's Woodpeckers; however, may nest semi-gregariously where several nest cavities are close together (NatureServe 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Open cottonwood habitat with mature trees is used for breeding and overwintering. The surface area of cottonwood stands declined 31% along the lower Arkansas River and 9% along the South Platte River;

during the same period, shrub understory layer increased, with prominent invasion of tamarisk (*Tamarix* spp.). Loss of cottonwoods was attributed to attrition of standing dead trees and lack of regeneration of seedlings because of flood control, low water flow rates, and intense grazing from cattle. In addition, frequency and severity of fires has increased because fuel loading increases with invading tamarisk(Vierling et al. 2020).

Maps of Species Range and Known Occurrences in Plan Area



Figure 1. Distribution of Lewis's Woodpecker.

This species breeds locally south in Washington and west to Oregon. It winters irregularly south and west.

Figure 23. Distribution map of the Lewis's woodpecker(Vierling et al. 2020).

Loggerhead shrike

(*Lanius ludovicianus*)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Between the iDigBio and GBIF databases there are 964 observations within the planning area.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: There are significant threats to the populations due to pesticide use, loss of prey sources, habitat loss or degradation, and predation.
 - b. Habitat: There are significant threats to the habitat due to agricultural conversion, overgrazing from livestock, and habitat conversion from human use as well as energy development, wildfires, and drought.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Surveys conducted by the Bird Conservancy of the Rockies indicate robust decreasing trends in the Loggerhead shrike population in the Shortgrass Prairie Region (BCR18). BBS indicates population decreases in Kansas and in the United States. eBird reports declining trends in Kansas and in Colorado.
 - b. Habitat: Species uses varied habitats. Shortgrass prairie is stable in Kansas but has deviated in eastern Colorado. Sandsage prairie is declining in both Kansas and Colorado. Pinon-juniper woodlands have increased in the canyonlands of the Comanche NG but the current ecosystem condition is likely well outside the historic range, and the overall trend is unknown.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is not endemic, disjunct, or at the edge of their range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: No population information specific to plan area. IMBCR recorded 17 observations on the CCNG in 8 years of sampling. GBIF reports a total of 964 records in the plan area.
 - b. Ecological conditions: Most of the ecological conditions are not restricted within the plan area; however, P-J woodlands are restricted to the southwestern portion of the Comanche NG in the Picketwire Canyon and Kim area in Las Animas County.

Species Status

G4; S3B in Colorado; S4B, S2N in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Lanius ludovicianus is accepted as valid (ITIS 2024c).

Species range

Overall species range

The loggerhead shrike breeds across the United States and in most of Mexico but has recently been disappearing from the northeastern portion of the breeding range. The breeding populations range includes California, eastern Oregon, eastern Washington, and central Alberta eastward across southern Canada to southwestern New Brunswick and Nova Scotia, and south to southern Baja California, throughout Mexico to Oaxaca and Veracruz, the Gulf Coast, and southern Florida. The northeastern part of the range includes western Maryland, extreme eastern West Virginia, and Virginia (NatureServe 2024).

The non-breeding species range includes central Washington, eastern Oregon, California, southern Nevada, northern Arizona, northern New Mexico (NatureServe 2024). East of the Rockies, the southern half of breeding range is south to the Gulf Coast, southern Florida, and Mexico.

Description of how the population in the plan area fits within the overall range

The unit occurs in the northern portion of the species range and falls within the year-round extent of the species where the species occur for both breeding and non-breeding periods (Yosef 2001). Partners in Flight estimates the global breeding population at 7,000,000. The species rates a 11 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List but is a species of common bird in steep decline (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

The loggerhead shrike is well distributed throughout the planning area and can be found in all parts of the unit. Between the iDigBio and GBIF databases there are 964 observations within the planning area.

Across its range, the long-term trend for the species is considered in a decline of 70-90%, and the short-term trend is a decline of 10-50% (NatureServe 2024).

Surveys conducted by the Bird Conservancy of the Rockies indicate robust decreasing trends in the Loggerhead shrike population in the Shortgrass Prairie Region (BCR18) (Reese et al. 2024). The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases in Kansas and in the United States (Hostetler et al. 2023).

eBird reports decreasing trends in Kansas and in Colorado (Fink et al. 2023).

Habitat

Broadly speaking, the habitat includes old fields, shrubland/chaparral, desert, grassland/herbaceous, Savanna, and cropland/hedgerow (NatureServe 2024). For nesting habitat their requirements include scattered trees, shrubs, or low bushes as nesting substrate, elevated perches for hunting and courtship activities, foraging areas comprised of open, short vegetation with some relatively bare areas; and thorny trees or barbed wire fences for impaling prey (Wiggins 2005). Within Region 2 (and likely elsewhere) shrikes may nest in areas without obvious prey impaling sites, with nest tree/shrub availability being the most critical factor in determining nesting habitat (Wiggins 2005). On the Comanche National Grassland, shrikes breed in similar habitats but appear to avoid areas that are not protected from grazing cattle (Wiggins 2005).

The foraging behavior of the loggerhead shrike has been poorly studied in Region 2, so the foraging habitat has been largely inferred from preferred nesting habitat (Wiggins 2005). Essential components appear to be the availability of exposed perches within open habitat, and in the Great Plains specifically, the typical foraging habitat ranges from short- to tallgrass prairie (Wiggins 2005). In Kansas, the foraging shrikes prefer areas of native grasslands (Wiggins 2005).

For breeding, the species prefers open country with scattered trees and shrubs, savanna, desert scrub in the southwest, and occasionally open woodlands. They're often on perches (poles, wires, fenceposts, etc.) that are suitable for hunting so the availability of these features in the breeding habitat is important. For nesting, the species prefers shortgrass prairies with shrubs or small trees. For the non-breeding habitat, during cold periods with snow cover the species will move into more open forest and shrub habitats where there is more cover and protection from the weather (NatureServe 2024).

The various habitats for this species are widely distributed across the plan area and area readily available to the loggerhead shrike. The shortgrass prairie habitat type is the dominant habitat type across the plan area (80%). It is considered good with a stable condition in Kansas (Rohweder 2022) but has deviated from historical conditions regarding composition in eastern Colorado (Crockett 2020).

The sandsage prairie habitat type is the second-most widespread vegetation type in the plan area, and the most abundant type for the Cimarron National Grassland, specifically {USDA Forest Service, 2005, Cimarron and Comanche National Grassland: Vegetation/Ecology}. In Kansas, the sandsage prairie habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of the historic sandsage habitat has been lost or converted for agricultural uses (CPW 2015). The remaining tracts have good landscape connectivity, but the species composition is highly altered (CPW 2015).

Juniper woodlands are restricted to the southwestern portion of the Comanche National Grassland (Kuhn et al. 2011), where there are extensive pinyon pine forests in Picketwire Canyon and the Kim area in Las Animas County. Juniper has increased in distribution and abundance in some ecosystems within the plan area, particularly the canyonlands of the Comanche National Grassland {USFS, 2005, Cimarron and Comanche National Grassland: Vegetation/Ecology}. The current ecosystem condition is likely well outside the historic range {USFS, 2005, Cimarron and Comanche National Grassland: Vegetation/Ecology}, but the overall trend is unknown.

Threats (arising from on or off the plan area)

Population

According to NatureServe (2024), the degree of threat to this species is high. Pesticides are a significant threat by potentially posing a greater threat in reducing food availability; clutch and brood sizes have been known to decline after the introduction of organochlorines; and there have been significant declines on the Canadian prairies that correspond with dieldrin treatment of grasshoppers, which make up 30-75% of the loggerhead shrike's diet.

Predation is known to be the leading cause of nest failure but does not appear to be an important limiting factor for this species' population stability (NatureServe 2024).

Habitat loss (breeding and winter) and degradation are a threat to this species' ability to successfully reproduce year-to-year as well as find appropriate shelter and protection in the winter season.

According to the USFS Region 2 Loggerhead Shrike Conservation Assessment, the factors most likely responsible for declines in Region 2 are: loss and degradation of suitable habitat, lack of quality nest sites, mortality of adults and recently fledged young due to collisions with vehicles, and low survival of shrikes on wintering grounds (Wiggins 2005).

Given the prevalence of roadside trees throughout much of the breeding range, high rates of nest predation may be a significant factor in the decline of loggerhead shrikes (Wiggins 2005). This is of particular concern in Region 2, where shrikes nesting on the Great Plains often forage near and nest in roadside trees (Wiggins 2005). This proximity to roads also subjects shrikes to vehicular traffic, a factor known to be a significant source of mortality on the Great Plains (Wiggins 2005).

Habitat

Habitat loss has been caused by farmland abandonment, development, and widespread changes in farming practices. In southern Idaho, nearly 70% of the original sagebrush steppe has been lost due to agriculture and other development. Loss of hunting perches may also be impacting this species (NatureServe 2024).

At a broad scale, the primary threats to sandsage prairie are loss and fragmentation of habitat and degradation of ecological integrity (e.g., conversion to agriculture, expanding exurban development, construction of roads, energy development, encroachment of woody plants, and targeted eradication of sandsage with herbicide) (Rohweder, 2022 #36722; Locklear, 2021, The Sandsage prairie ecological system: Biodiversity hotspot for the Great Plains; Colorado Parks and Wildlife (CPW), 2015, Species of greatest conservation need}. Weather, climate, fire, and grazing constitute the most important processes impacting this system, and these processes are also interactive (Locklear 2019). While sandsage prairie is fairly resilient to the effects of drought in the Great Plains, there are biological limits to the ability of this vegetation to tolerate prolonged episodes of severe drought and may be at the limits of its drought tolerance in southeastern Colorado (Rondeau et al. 2018, Locklear 2019).

At the unit level, grazing occurs over most of the plan area across both states. Long-term continuous grazing of domestic livestock has considerably altered these shrubland habitats from their pre-settlement condition (Rohweder, 2022 #36722; Colorado Parks and Wildlife (CPW), 2015, Species of greatest conservation need}. Generally, domestic livestock grazing tends to favor the increase of sandsage over associated native grasses therefore decreasing herbaceous cover. Fire is an important disturbance process for sandsage prairie, and fire suppression has caused encroachment of woody species such as eastern redcedar (Locklear 2019) and less mosaiced successional conditions (USDA Forest Service, 2008, Evaluations of special areas: Cimarron and Comanche National Grasslands land management plan}. Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimarron National Grassland.

While habitat loss and deleterious management practices are recognized as threats to sandsage prairie vegetation, the significance of these losses to the larger Great Plains ecoregion has not been examined (Locklear 2021).

For shortgrass prairie at a broad scale, important processes impacting these grassland systems are drought and grazing, which also greatly influenced fire frequency and extent (NatureServe 2024). Short grasses are generally extremely drought- and grazing-tolerant, although continuous heavy grazing and extended drought will reduce cover of dominant species (CNHP, 2010, Ecological systems: Shortgrass prairie}. As the driest of Great Plains grasslands, shortgrass prairie is susceptible to climate stressors and increasing drought (NatureServe 2024). Other general threats to grassland habitat include heavy continuous livestock grazing, military training, invasive non-native species, altered fire regime (fire suppression), conversion to agriculture, fragmentation from roads and development such as exurban and urban development, gas and oil exploration and extraction, invasive species (in the less xeric regions), renewable energy development, increased irrigation conversion of grassland into cropland, and ongoing depletion of the Ogallala Aquifer (Johnson, 2012 #34398; Rohweder, 2022 #36722; Colorado Parks and Wildlife (CPW), 2015, Species of greatest conservation need}.

At the unit level, cattle grazing occurs over most of the plan area. Livestock grazing can create change in plant composition. This can include lower species diversity, lower abundance of highly palatable grasses

and greater abundance of unpalatable species; increase in weedy species, especially invasive non-native, and bare soil (Crockett 2020). Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimarron National Grassland. Roads traverse the plan area and can cause fragmentation; road density is particularly high in the Cimarron National Grassland {Cleland, 2017, Terrestrial condition assessment for national forests of the USDA Forest Service in the continental US}. Invasive non-native/alien species can threaten native plant species and alter community composition. Cheatgrass (*Bromus tectorum*) has increased in the plan area and represents a major change in the grassland ecosystem relative to historic conditions {USFS, 2005, Cimarron and Comanche National Grassland: Vegetation/Ecology}. Relatively few non-native plants can tolerate the arid summer conditions on the Grassland. Shortgrass prairie is considered highly vulnerable to climate stressors in Colorado and is one of the most vulnerable sites. Lastly, aggressive fire suppression has occurred in the plan area and represents a departure from the natural frequency of fire {USDA Forest Service, 2005, Cimarron and Comanche National Grassland: Vegetation/Ecology}.

Reduced role of recurrent fire in these ecosystems it is thought to be responsible for ecologically adverse shifts in the structure, composition, and diversity of these grasslands, leading specifically to the rise of ruderal species and invasion by less fire-tolerant species (Brockway et al 2007).

Pinyon-juniper (P-J) woodland habitat shifting and alteration is a threat to pinyon-juniper communities {CNHP, 2015, Climate Change Vulnerability Assessment for Colorado Bureau of Land Management}. Livestock grazing can alter the understory composition of juniper woodlands and most of the plan area is actively grazed. Fire suppression has contributed to mature, dense stands of oneseed juniper in the plan area, putting them at greater risk from disease and catastrophic fire {USDA Forest Service, 2008, Evaluations of special areas: Cimarron and Comanche National Grasslands land management plan}. Both pinyon and juniper species have thin bark and low canopies, making this habitat type relatively intolerant of fire (Huffman et al. 2008(Romme et al. 2009). Treatments, including mechanical mastication, are currently occurring in the Comanche National Grassland to try and reduce juniper encroachment. Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimarron National Grassland.

Ecological conditions

Ecological condition requirements

Refer to the Habitat description provided above. Loggerhead shrikes feed primarily on insects and small vertebrates(Wiggins 2005). Vertebrate prey, including mice (*Peromyscus* spp.) and other small mammals, various small birds and reptiles, appears to comprise a larger percentage of the diet in winter(Wiggins 2005).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The required ecological conditions of this species are readily available and widely distributed across the plan area. The trend for these conditions is discussed above under Habitat Trend.

Critical biological characteristics

The documented approximate timing for the loggerhead shrike's arrival and departure on breeding grounds in Colorado is arriving in April and departing in October(Wiggins 2005). In Kansas, they arrive late April to early May and leave between September and mid-October(Wiggins 2005). Loggerhead

shrikes lay relatively large clutches, typically renest following failed nest attempts, and may attempt to raise two broods in a season; thus, reproductive potential is high(Wiggins 2005).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Interspecific competition with kestrels is thought to arise by competition over food resources and for access to perch sites; however, it's been concluded that they are spatially segregated, and that interspecific competition has not been responsible for any local population declines of shrikes (Wiggins 2005).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Loss of adequate perching sources and grassland habitat (due to the threats mentioned above), as well as declines in prey sources would have a direct impact on this species ability to persist and reproduce in the plan area.

Maps of Species Range and Known Occurrences in Plan Area



Figure 24. General species range by season for the loggerhead shrike in North and Central America (AAB 2024).

Long-billed curlew

(*Numenius americanus*)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Many sightings in the plan area. 44 records from Colorado NHP, 7 records from Kansas NHP. 197 records from GBIF.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: In the past, overhunting impacted this species although that may no longer be a concern. Loss of insects as a food source could also impact the species.
 - b. Habitat: Loss of habitat due to conversion of prairie/grassland habitat to agricultural uses, housing/urban uses, wind turbine and solar power generation. Conifer encroachment could also damage habitat.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: eBird reports a declining trend in Colorado.
 - b. Habitat: Prairie and grassland habitats in the plan area appear to be stable.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the eastern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are many records of this species in both units of the plan area.
 - b. Ecological conditions: Prairie habitat within the plan area is not restricted, but may be fragmented enough to impact suitability for long-billed curlew.

Species Status

G4; S2B in Colorado; S1B,S2N in Kansas; listed as Candidate in Colorado; listed as Candidate in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Numenius americanus (Bechstein, 1812) is accepted and valid (ITIS 2024d)

Species range

Overall species range

Long-billed curlew is found year-round throughout coastal areas of North America roughly south of 42 degrees latitude, as well as inland in northern Mexico and in California's central valley. Summer breeding populations occur in the western Great Plains and northern Great Basin.

Description of how the population in the plan area fits within the overall range

The plan area is at the eastern edge of the species' range. Partners in Flight estimates the global breeding population at 140,000. The species rates a 12 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022). Distribution, abundance, and trend in the plan area.

Population

There are many records of this species in the plan area, in both units. Records show the species as present in both sandsage and shortgrass prairie.

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Long-billed curlew population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird, which could produce better trend estimates for Long-billed curlew, reports a decreasing trend in Colorado (Fink et al. 2023).

Habitat

Long-billed curlew shows two very distinct habitat preferences: tidal flats and shortgrass prairie. There are no tidal flats in the plan area. Most of the plan area is prairie, and the USFS managed area is protected from conversion to agriculture. This habitat is somewhat fragmented due to the patchwork nature of land ownership.

Threats (arising from on or off the plan area)

Population

Population decline of this species has been attributed to habitat loss and overhunting. Both issues have slowed in recent years. Off the plan area, sea level rise may impact the species. In the plan area and throughout the inland breeding range may be impacted by drought (NatureServe 2024).

Decline of insect populations could also impact the species (Sedgwick 2006).

Habitat

Habitat loss may be the greatest on-going threat to the species (NatureServe 2024). Inland this occurs in the form of prairie being converted to agriculture or development. Conversion of habitat to agriculture, or housing/urban use, solar power or wind power installation could degrade and fragment that habitat (NatureServe 2024(Sedgwick 2006).

Ecological conditions

Ecological condition requirements

The primary habitat for inland populations of long-billed curlew is mixed-grass and short-grass prairie (Sedgwick, 2006).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Most of the plan area is prairie, and that contains the necessary ecological conditions for this species. That habitat is fragmented due to the fragmented nature of land ownership/possession in the plan area. This fragmentation may be detrimental to the species (Sedgwick 2006).

Critical biological characteristics

This species requires prairie as habitat and insects as food source. It prefers patches of prairie habitat that are at least 250 meters across (Sedgwick 2006).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Long-billed curlew appears to have little impact on other species in the plan area.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

This species prefers areas of shorter-stature vegetation. Moderate grazing, prescribed fire, prairie dogs and other things that maintain the prairie in this condition are necessary for this species (Sedgwick 2006).

Maps of Species Range and Known Occurrences in Plan Area



Figure 25. Distribution of the long-billed curlew in North and Central America.

Long-eared Owl

(*Asio otus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF- 2 observations between 1934 to 1964, KSNHP- 1 occurrence in 2004

Year of Last Known Occurrence: 2004

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Vehicle collisions, illegal shooting, predation by other raptors, rodenticide poisoning.
 - b. Habitat: Nesting habitat is primarily riparian woodlands. This species is likely found in the Cimmaron River Valley year-round.
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: There is no specific population trend in the plan area. eBird, which could produce better trend estimates for Long-eared owl, reports decreasing trends in Kansas and in Colorado
 - b. Habitat is expected to be stable to declining in the plan area. Cottonwood and willow restoration efforts are ongoing.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is not endemic, disjunct, or at the edge of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Long-eared owls have adequate numbers range-wide but are very rarely documented in the plan area though are year-round residents in the Cimmaron River Valley.
 - b. The Cimmaron River valley likely offers year-round habitat to long-eared owls, but riparian woodlands are generally limited in the plan area.

Species Status

G5; S3B in Colorado; S2B,S3N in Kansas.

Taxonomy

Asio otus is valid (ITIS 2024).

Species range

Overall species range

The Long-eared Owl inhabits open and sparsely forested habitats across North America and Eurasia between 30° and 65°N latitude. Isolated populations also occur in North and East Africa, the Azores, and the Canary Islands (Marks et al. 2020).

Description of how the population in the plan area fits within the overall range

Uncommon resident fall through spring. For the Cimarron portion of the plan area, despite the lack of summer records, Long-eared Owls presumably inhabit the Cimarron River valley year-round. Long-eared Owls have been recorded in Morton County every year 1983 to 1996.

Partners in Flight estimates the global breeding population at 520,000. The species rates a 10 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

There is no specific population trend in the plan area as there are limited records. There is no trend data from BBS nor IMBCR at the plan area scale or within the Shortgrass Prairie Bird Conservation region (BCR 18). They likely inhabit the Cimarron River valley year-round.

eBird, which could produce better trend estimates for Long-eared owl, reports decreasing trends in Kansas and in Colorado (Fink et al. 2023).

Habitat

During breeding season, inhabits dense vegetation adjacent to open areas such as grassland or shrubland, including open forest. Nests and roosts in trees, including narrow strips of riparian trees and open forested lands. In winter range, occupies similar habitats to those when breeding, including farmland with hedgerows; often in traditional sites, using same tree groves annually. Roosts communally during non-breeding season, typically 2–20 birds, but can be up to 100 (Marks et al. 2020).

Threats (arising from on or off the plan area)

Population

Vehicle collisions, illegal shooting, starvation and predation are the major threats within the species' range (Marks et al. 2020). They are also prone to rodenticides as their diet consists of small mammals.

Habitat

Loss of riparian woodlands and isolated tree groves is highly detrimental to Long-eared Owls. Such changes would be especially damaging in arid West, where much of nesting habitat occurs in narrow bands along watercourses (Marks et al. 2020).

Ecological conditions

Ecological condition requirements

Requires riparian woodlands for nesting and adequate prey base of small mammals (Marks et al. 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The Cimmaron River valley likely offers year-round habitat to long-eared owls (USDA 1996).

Critical biological characteristics

Requires riparian woodlands for nesting and foraging.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Diet consists of primarily small mammals. Long-eared owls can also be prey to larger raptors (Marks et al. 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Riparian woodlands are critical to this species (Marks et al. 2020).

Maps of Species Range



Figure 26. Distribution of the long-eared owl in North and Central America.

Marsh wren (*Cistothorus palustris*)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: 95 occurrence records on GBIF.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Overhunting was a concern prior to the effective regulation of hunting. Currently there are no clear direct threats to the population other than habitat loss
 - b. Habitat: Loss of wetlands is a threat to all wetland dependent species. Marsh wren can be further impacted through the removal of reeds (phragmites) and other reeds, rushes, and the like (Lazaren et. al 2013).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population data are available in the plan area. eBird reports increasing trends in the United States. eBird reports increasing trends in the United States.
 - b. Habitat: Unknown, but wetland acreage in the plan area appears to be stable.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is not narrow endemic, disjunct populations or species at the edge of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: 95 sightings in the plan area since 1956.
 - b. Ecological conditions: Wetlands are small and uncommon in the plan area. Range is restricted to marshy areas with reeds and rushes. That habitat is uncommon in the plan area. There are roughly 3400 acres of riparian woodland in the plan area, and only a small (but unquantified) portion of that will be marshy and reeds.

Species Status

G5; S3B in Colorado; S1B, S2N in Kansas.

Taxonomy

Cistothorus palustris (A. Wilson, 1810) is accepted and valid (ITIS 2024).

Species range

Overall species range

Marsh wren is found through most of the continental United States, and the Canadian prairie provinces, northern and central Mexico. Breeding habitat includes the great lakes area and northern Rockies (All About Birds 2024f).

Description of how the population in the plan area fits within the overall range

The plan area falls within non-breeding winter habitat. There is year-round habitat to the northeast, covering most of Colorado's great plains and Rocky Mountains. Further east in Kansas there are areas that the species migrates through but does not otherwise reside (All About Birds 2024f).

Partners in Flight estimates the global breeding population at 11,000,000. The species rates a 7 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

GBIF shows 95 sightings in the plan area from 1956 through 2022.

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Marsh wren population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird reports increasing trends in the United States (Fink et al. 2023).

Habitat

Wetlands, especially those with reeds and rushes and cattails. Denser vegetation is preferred. Wetland habitat has declined in the plan area (see Appendix). Marshes once existed in low spots along the Cimarron River and throughout the region. Today, most of these sites are completely dry and there is no trace of the former wetlands (Cable et al. 1996).

Threats (arising from on or off the plan area)

Population

No direct threats to population were found, other than egg destruction from other members of their own species (NatureServe 2024).

Habitat

Loss of wetlands due to changing climatic conditions may be a threat to this species range-wide and in the plan area (Kroodsmas and Verner 2020).

Ecological conditions

Ecological condition requirements

Other than requiring wetlands with reeds and rushes, marsh wren has very general requirements for ecological conditions. The plan area is near the northern edge of non-breeding wintering habitat. A warmer climate might see that non-breeding range extend further north, but that would be no change within the plan area itself.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are roughly 3400 acres of riparian woodland in the plan area, and only a small (but unquantified) portion of that will be marshy and reeds. Relative to a bird that can fly long distances, these wetlands are reasonably close together.

Critical biological characteristics

Requires wetlands with reeds and rushes.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Marsh wren destroys eggs of other reed-nesting bird species, as well as those of other marsh wrens. But they don't appear to do so in large enough numbers to threaten the population of other bird species (Picman and Picman 1980).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

The species appears to have little documented impact to its own habitat.

Maps of Species Range and Known Occurrences in Plan Area

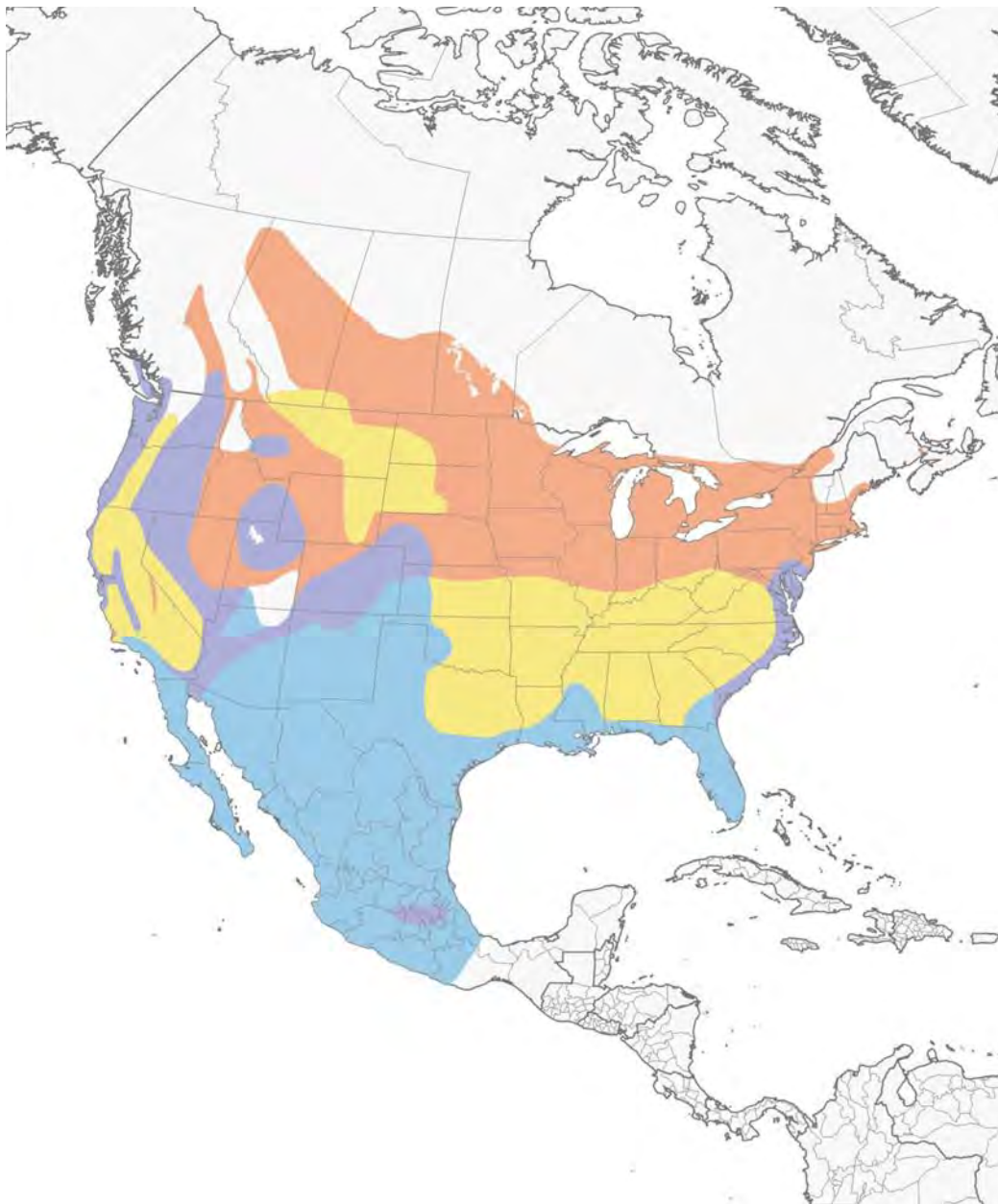


Figure 27. Distribution map the marsh wren in North and Central America.

Mississippi Kite

(*Ictinia mississippiensis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF- 141 observations between 1964-2022.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Human disturbance near nesting areas, illegal shooting, Storm mortality can be a significant factor.
 - b. Habitat: Nesting habitat is primarily in riparian areas with larger trees (usually living). Any loss of nesting habitat would be detrimental.
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: There is no specific population trend in the plan area. Populations range-wide are stable to increasing. BBS reports increasing trend in Kansas. eBird reports increasing trends in Kansas and in Colorado.
 - b. Riparian habitat on the plan area has declined; however, tamarisk control and cottonwood and willow restoration efforts along the Cimarron and Purgatoire Rivers are ongoing. Responds positively to habitat fragmentation as long as large trees are retained for nesting (Parker 2020).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is at the edge of its range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. This species is an uncommon summer resident.
 - b. Most suitable habitat in the plan area occurs along the Cimmaron River. There is generally limited riparian habitat in the plan area, which is the primary nesting habitat for this species

Species Status

G5; S1B in Colorado; S4B in Kansas.

Taxonomy

Ictinia mississippiensis is valid (ITIS 2024).

Species range

Overall species range

Breeds in the central and southern Great Plains, limited areas of the Southwest, and southern states along the Mississippi River and east of it. In the Great Plains it can be locally abundant, usually nests colonially, and since the mid-1970s has nested abundantly in many urban areas. In the east it is less colonial, less abundant, and still nests primarily in old-growth forest (Parker 2020).

Description of how the population in the plan area fits within the overall range

Primarily located on the Cimmaron portion of the plan area in Kansas for breeding habitat. The Cimmaron is the western-most edge of the breeding range with some documented occurrences in southeast Colorado. It is an uncommon summer resident (Parker 2020; USDA 1996). Partners in Flight estimates the global breeding population at 700,000. The species rates a 9 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

There is no specific population trend in the plan area. It is an uncommon summer resident. Primarily found in riparian habitat along the Cimmaron River.

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Marsh wren population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird, which could produce better trend estimates for Mississippi Kite, reports increasing trends in Kansas and in Colorado (Fink et al. 2023).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population increases in Kansas (2.5%) (Hostetler et al. 2023).

Habitat

Rural woodland in mixed and shortgrass prairie, intergrading with oak (*Quercus* spp.) savanna and mesquite (*Prosopis* spp.) and plum (*Prunus* spp.) shrub (Sutton 1939, Allan and Sime 1943, Fitch 1963, Wolfe 1967, Parker 1974b, Parker 1975, Parker 1988a). Lesser use of mixed-species riparian woodlands dominated by cottonwood (*Populus* spp.), but with other hardwood species, now including salt cedar (*Tamarix* spp.).

Nest most abundantly and conspicuously in shelterbelt (windbreak) plantings first established in late 1930s and scattered in sw. Kansas, w. Oklahoma, and n.-central Texas (map and references in Parker and Ogden 1979). These are patches of trees, linear to rectangular, in rows and of several species, usually oriented east-west or north-south, and about 0.2–1.5 km long by 20 m wide. Most have juniper (*Juniperus* spp.) windward, with progressively taller deciduous species toward lee side.

Also nest in mesquite and oak shrub prairie and savanna with innumerable small, dense groves of taller (about 4–6 m) oak trees, or irregularly spreading mesquite thickets with trees to about 6 m. In Arizona, nest in groves of riparian cottonwoods surrounded by dense scrubland of salt cedar and mesquite (Glinski and Ohmart 1983).

During 1960s, began nesting in urban-suburban trees of scores, possibly hundreds, of towns of all sizes in parts of Kansas, Oklahoma, Texas, and more recently New Mexico. Result is widespread problem of nest defense; diving at humans in parks, residential areas, wooded lawns of town centers, and golf courses.

Threats (arising from on or off the plan area)

Population

Human disturbance: Species is defensive of nests which causes conflicts when it nests in urban areas. Illegal shooting is an issue and conflicts are especially notable on golf courses (Parker 2020).

Storm mortality: Severe storms can cause nest failure (Parker 2020).

Pesticides: Susceptible to eggshell thinning from DDT (Parker 2020).

Habitat

Loss of riparian nesting trees and shelterbelt trees would be significant in the western populations (Parker 2020).

Ecological conditions

Ecological condition requirements

Require adequate nesting trees (usually living) for breeding habitat.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There is limited riparian habitat in the plan area which is the primary nesting habitat for this species. Any loss of riparian habitat could be detrimental. The Cimmaron river contains most of the habitat in the plan area.

Critical biological characteristics

Requires adequate nesting trees in breeding habitat (Parker 2020).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Diet consists of insects primarily but will also consume reptiles, amphibians, small mammals and birds (Parker 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Riparian habitat in the plan area with large trees, such as cottonwood, would be the most critical habitat in the plan area (Parker 2020).

Maps of Species Range

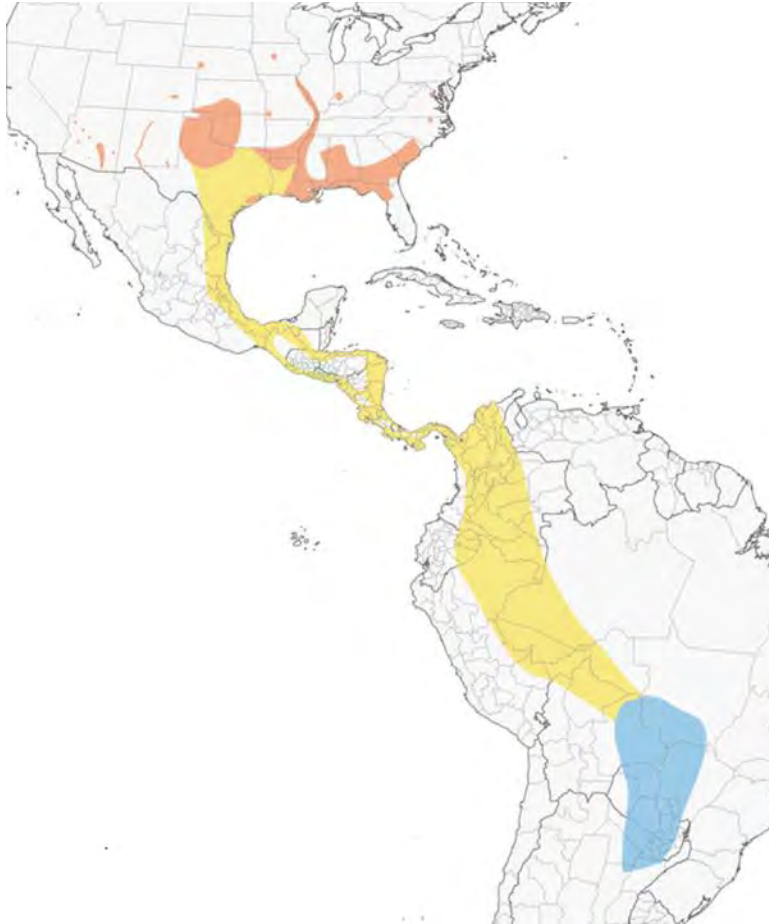


Figure 28. Distribution map of the Mississippi kite in the Americas.

Mountain Plover

(*Anarhynchus montanus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CONHP- 13 observations between 1905 to 1996; GBIF- 44 observations between 1996 and 2021; iDigBio- 2 observations in 1976.

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: The only modern direct threat to the species is occasional mortality from agricultural practices.
 - b. Habitat: Within the plan area, removal of grazing species such as prairie dogs, bison, and pronghorns. Off plan area much habitat has been converted to agriculture, housing, or other non-naturalistic conditions.
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: There is no specific population trend in the plan area. Surveys conducted by the Bird Conservancy of the Rockies indicate robust decreasing trends (-10.62 %) in the Mountain Plover population in the Shortgrass Prairie Bird Conservation Region in Colorado (CO-BCR18). BBS indicates population decrease in the Short Grass Prairie Region (BCR 18) (-2.67 %).
 - b. Habitat: No clear loss of habitat in the plan area. The species often makes use of prairie dog habitat, which also appears to be relatively stable or at pre-plague outbreak levels in the plan area (see black-tailed prairie dog Evaluation).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population is at the Eastern edge of the Breeding range. A narrow endemic that relies on prairie dog towns in short grass prairie of the Great Plains.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are 13 observations reported by CNHP between 1905 to 1996, GBIF reports 44 observations between 1996 and 2021, and iDigBio reports 2 observations in 1976. This species is a rare summer resident in the plan area.
 - b. Ecological conditions: They have preference for areas disturbed by prairie dogs and/or bison within the short-grass prairie

Species Status

G3; S2B in Colorado; S1B in Kansas; listed as Tier 1, Candidate in Colorado; listed as Candidate in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Charadrius montanus valid (ITIS 2024). Some institutions utilize another genus: *Anarhynchus* (Knopf and Wunder 2023). NatureServe recognizes this species as *Anarhynchus montanus* (NatureServe 2024).

Species range

Overall species range

Breeds in east-central and southwest Montana, tablelands of Wyoming, eastern Colorado plains (including the more montane Conejos, Saguache, Fremont, and Park counties, northeast and locally to west-central and north-central New Mexico (south to Roswell area and west to Fence Lake area and in Oklahoma and Texas panhandle (Knopf and Wunder 2023). Dinsmore (2003) notes that, “The mountain plover is one of a small number of endemic Great Plains birds, and its status may be one indicator of the health of this ecosystem. Mountain plovers nest locally in the western Great Plains from Montana south to New Mexico, in Utah, and in Mexico, and they winter in a broad band from Texas west and north to the Central Valley of California.”

Description of how the population in the plan area fits within the overall range

This species is an endemic bird to the Great Plains and a few nesting records exist in the Cimarron portion of the plan area. Two pairs were observed in their courtship displays in 1991, and there were also indications of nesting in plowed fields in Morton County, Kansas, in 1992. A nest with chicks was found in Point Rock pasture in 1993. In 1994 three more nest sites were found in Richfield, Kansas (Cable et al. 1996).

On a north-south basis the plan area is in the middle of the species breeding range. On an east-west axis the plan area may be on the eastern edge of suitable habitat – but changing climatic conditions may push warmer and drier conditions further east, expanding rather than contracting breeding habitat in immediate vicinity of the Comanche-Cimarron National Grasslands.

Partners in Flight estimates the global breeding population at 20,000. The species rates a 17 out of 20 on the Continental Concern Score, which means it is on the Partners in Flight Red Watch List and is a tipping point species (PIF 2022). This species is on the Bird of Conservation Concern list (FWS 2021).

Distribution, abundance, and trend in the plan area

Population

There is no specific population trend in the plan area. Surveys conducted by the Bird Conservancy of the Rockies indicate robust decreasing trends (-10.62 %) in the Mountain Plover population in the Shortgrass Prairie Bird Conservation Region in Colorado (CO-BCR18) (Reese et al. 2024). The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decrease in the Short Grass Prairie Region (BCR 18) (-2.67 %) (Hostetler et al. 2023). The mountain plover is one of a small number of endemic Great Plains birds, and its status may be one indicator of the health of this ecosystem (Dinsmore 2003). Most of the sightings of the species are in the shortgrass prairie and often nest near prairie dog towns.

Habitat

Originally described as an endemic species of the Great Plains and an associate of short-grass prairie. Where taller grasses dominate a landscape, restricted to sites of excessive grazing. Prairie dog colonies can also be preferred habitat for the species (Dinsmore 2003). The prairie dog colonies of the plan area have experienced plague-induced declines in the past (Augustine et al. 2008, Cully et al. 2000). Areas of active prairie dog colonies have been fluctuating, but the colonies appear to be relatively stable or at pre-plague outbreak levels in the plan area (see black-tailed prairie dog Evaluation). The plan area contains suitable breeding habitat.

Threats (arising from on or off the plan area)

Population

Direct threats to the population may be limited to destruction of nests due to agricultural activity (discing, plowing, harvesting, etc.) (Dinsmore 2003).

Habitat

Loss of nesting habitat, loss of native grazers, conversion of prairie to farmland or other non-natural habitat (Dinsmore 2003).

Ecological conditions

Ecological condition requirements

Disturbed or semi-disturbed prairie or semi-desert conditions. Bison, prairie dogs, fire and other natural disturbances that create some bare ground, keep plants from growing too tall and exclude trees will benefit this species (Dinsmore 2003).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The majority of the plan area is suitable habitat for this species.

Critical biological characteristics

Short grass prairie, often in association with prairie dogs (Dinsmore 2003).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity of ecosystem structure and function on this species (includes departure from NRV or new influences)

Mountain plover benefits from conditions created by other species such as prairie dogs and bison. But it appears to have little direct effect its own habitat or habitat conditions required by other species (Dinsmore 2003).

Maps of Species Range



Figure 29. Distribution map of the mountain plover in North and Central America.

Northern Harrier

(*Circus hudsonius*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF- 604 observations between 1969-2022.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Human disturbance near nesting areas, livestock trampling, over-grazing. Avian influenza is also becoming more prevalent in North America and is particularly harmful to raptors (Runstandler and Puryear 2024).
 - b. Habitat: Nesting habitat is primarily uplands and wetlands (ground-nesting species). Requires large expanses of open wetlands and grasslands for foraging (Smith et al. 2020).
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: No population trends are available within the plan area. eBird reports decreasing trends in Colorado and Kansas. BBS reports decreasing trends in Colorado, in Kansas and in the Shortgrass Prairie Bird Conservation Region (BCR18).
 - b. Habitat is stable within the plan area but could decline due to changing climatic conditions and increased fire intervals.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is not endemic, disjunct, or at the edge of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. It is a common winter resident in the plan area, rare summer resident.
 - b. The plan area contains a large amount of suitable nesting and wintering habitat

Species Status

G5; S3B in Colorado; S2B,S4N in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Circus cyaneus is valid (ITIS 2024). However other sources consider it to be a distinct species in North America, *Circus hudsonius*. It differs from that species in genetics and plumage (Smith et al. 2020). NatureServe recognizes this species as *Circus hudsonius*, with *Circus cyaneus* as a synonym (NatureServe 2024).

Species range

Overall species range

Widespread across North and Central America. Breeding range extends into northern Canada and year-round range is found across the northern United States. Winter range extends to Central America (Smith et al. 2020).

Description of how the population in the plan area fits within the overall range

On the Cimmaron portion of the plan area the species is a rare summer resident and a common winter resident. Morton county in Kansas is a particularly important wintering area (USDA 1996). The plan area is primarily wintering habitat though there are records of nesting harriers. Partners in Flight estimates the global breeding population at 820,000. The species rates a 11 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF).

Distribution, abundance, and trend in the plan area

Population

Range-wide the species is experiencing declines but it varies by region (Smith et al. 2020).

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Northern Harrier population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird, which could produce better trend estimates for Northern Harrier, reports decreasing trends in Kansas and in Colorado (Fink et al. 2023).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases in Kansas (-3.84%), in Colorado (-1.9%), in the Shortgrass Prairie Bird Conservation Region (S18) (-1.53) and in the United States (-0.69%) (Hostetler et al. 2023).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. In the Shortgrass Prairie Bird Conservation Region (S18) the trend is decreasing with a trend of -1.53% [95% CI -2.83%, -0.44%], in Colorado the trend is decreasing with a trend of -1.9% [95% CI -3.16%, -0.69%], in Kansas the trend is decreasing with a trend of -3.84% [95% CI -6.2%, -2.07%], and in the United States the trend is decreasing with a trend of -0.69% [95% CI -1.11%, -0.31%] (Hostetler et al. 2023).

Habitat

Open wetlands, including marshy meadows; wet, lightly grazed pastures; old fields; freshwater and brackish marshes, and tundra; also dry uplands, including upland prairies, mesic grasslands, drained marshlands, croplands, cold desert shrub-steppe, and riparian woodland (Smith et al. 2020).

Threats (arising from on or off the plan area)

Population

Human disturbance: Illegal shooting remains an issue in some area. Because this species nests on the ground it is particularly sensitive to disturbance. It is also susceptible to nest destruction by livestock trampling (Smith et al. 2020).

Pesticides: Due to the habitat of savaging dead or dying birds and mammals, harriers are susceptible to secondary poisoning and death from a variety of herbicides, pesticides, and avicides (Mineau et al. 1999, Kostecke et al. 2007).

Habitat

Continued widespread destruction of freshwater and estuarine wetlands in U.S. poses a threat to breeding and wintering populations. Conversion of native grassland prairies for monotypic farming has contributed to local population declines, and remains a major threat to populations. In upland areas, mechanized agriculture and early mowing have increased the threat of nest destruction. Overgrazing of pastures, and the advent of larger crop fields and fewer fencerows, together with the widespread use of insecticides and rodenticides, have reduced prey availability and thus the amount of appropriate habitat for the species. In the Great Plains, Southwest, and U.S. Intermountain West, Northern Harriers reduce their use of livestock-grazed grasslands (Smith et al. 2020).

Ecological conditions

Ecological condition requirements

In both wetland and upland areas, densest populations typically associated with large tracts of undisturbed habitats dominated by thick vegetation growth (Smith et al. 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The plan area contains a significant amount of suitable nesting and wintering habitat (USDA 1996).

Critical biological characteristics

Requires thick vegetation for hiding cover as it is a ground-nesting species (Smith et al. 2020).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Along with Bobolink is a good indicator of wet prairies (Smith et al. 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Requires large expanses of open uplands and wetlands for breeding and foraging. Thick vegetation is critical for this ground-nesting species. Avoids heavily grazed areas(Smith et al. 2020).

Maps of Species Range

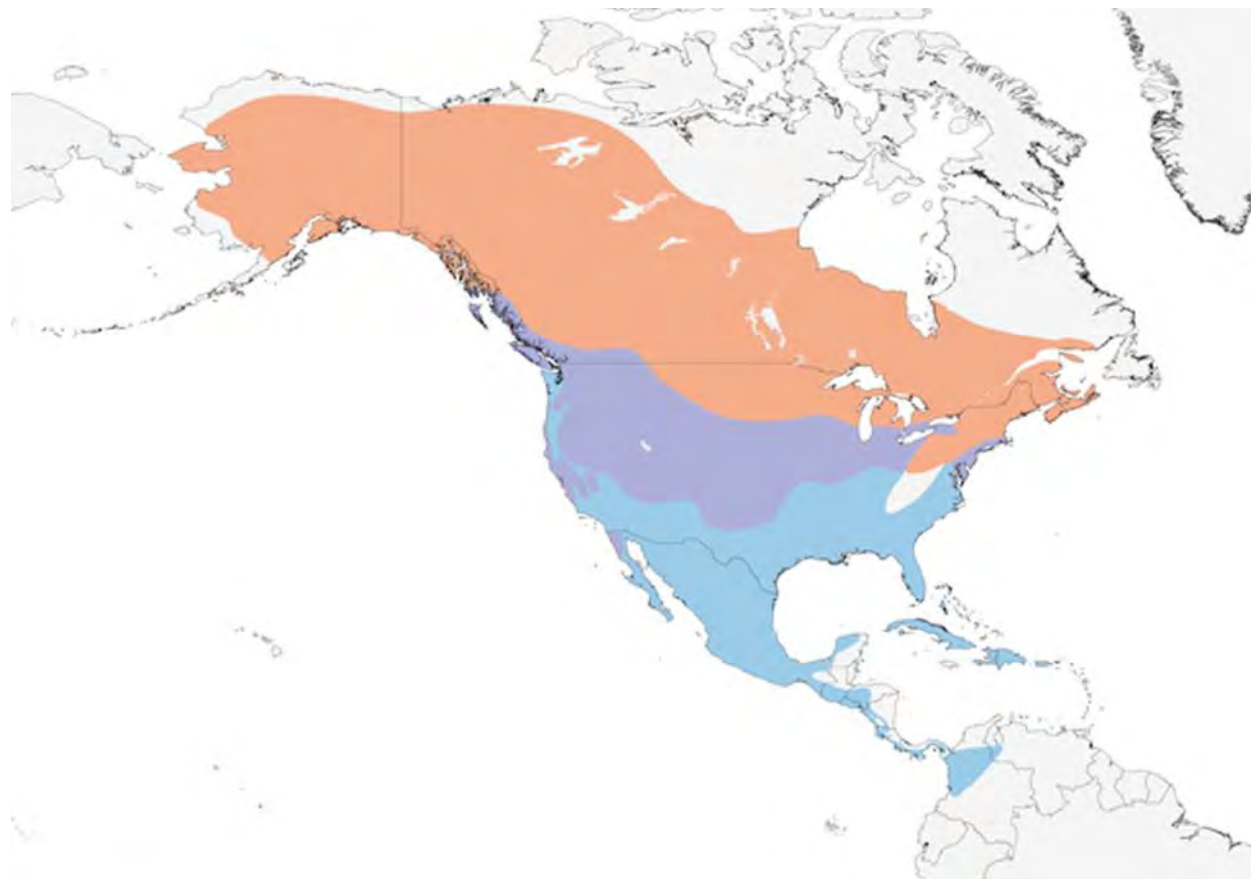


Figure 30. Distribution map of the northern harrier in the Americas.

Pine Siskin

(*Spinus pinus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF- 394 observations between 1950-2022.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Salmonella disease transmission, pesticides, and pollution.
 - b. Habitat: Primarily conifer woodlands for nesting and foraging.
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: There is no specific population trend in the plan area. It is a migrant.
 - b. Habitat is extremely limited in the project area; there is not enough to establish a trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is not endemic, disjunct, or at the edge of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Pine siskin have been frequently documented in the plan area.
 - b. Prefers forested areas for wintering habitat but will forage in more open uplands; all of the plan area is potentially suitable winter habitat.

Species Status

G5; S5 in Colorado; S1B in Kansas.

Taxonomy

Spinus pinus is valid (ITIS 2024).

Species range

Overall species range

Widespread across North and Central America. Breeding and year-round distribution from Canada to Central America.

Description of how the population in the plan area fits within the overall range

Common and abundant winter resident on the Cimmaron (USDA 1996) and southeast Colorado on the Comanche. Species can be irruptive with some years being more abundant than others (Dawson 2020).

Partners in Flight estimates the global breeding population at 46,000,000. The species rates a 10 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List but is a species of common bird in steep decline(PIF 2022).

Distribution, abundance, and trend in the plan area

Population

There is no record of successful breeding in the plan area. Species is most frequently seen during winter.

Surveys conducted by the Bird Conservancy of the Rockies indicate robust increasing trends in the Pine Siskin population in the Shortgrass Prairie Region (BCR18),(Reese et al. 2024).

eBird reports decreasing trends in Colorado(Fink et al. 2023).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases in Colorado (-1.95%) and in the United States (-1.64%)(Hostetler et al. 2023).

Habitat

Primarily open coniferous forests. Also breeds in ornamental conifers in parks, cemeteries, and the like, and in mixed coniferous-deciduous and even deciduous tree associations. May forage in trees, shrubs, and grassy areas. Prefers conifers during migration and winter, but forages in wide array of plant associations (Dawson 2020).

Threats (arising from on or off the plan area)

Population

Susceptible to pesticides and pollution (e.g. gold mines). Salmonella disease transmission at feeders is an ongoing issue. Vehicle collisions during the winter (attracted to salt on the roads) can be a cause of mortality. Reliance on cone crops and seeds of mast-fruited trees subjects this species to periodic regional failures of food supply. Predation is probably a major source of mortality in nesting and unencumbered birds, but quantitative data are lacking. Its gregarious nature could make the species a convenient target for predators, but this disadvantage is presumably mitigated somewhat by the higher level of vigilance and greater feeding efficiency that a flock can sustain while foraging. Communal roosting may also reduce the risk of nocturnal predation. Species is also vulnerable to nest destruction by heavy precipitation or high winds (Dawson 2020).

Habitat

Forest management practices, e.g., fire suppression, that affect habitat structure may have positive as well as negative effects on siskins. Loss of natural habitat for Pine Siskins may also be partly counteracted by silviculture: several reports exist of nesting by this species in shrubs and trees, including conifers, planted as ornamentals around homes and in parks and cemeteries, and as windbreaks or boundary markers. Moreover, increasing provision of seeds at artificial feeders may contribute to

expansion of this bird's breeding range and enhance its winter survival, though, as noted previously, the role of such sites in transmission of salmonellosis is a potential problem (Dawson 2020).

Ecological conditions

Ecological condition requirements

Requires forested areas for breeding habitat. Prefers forested areas for wintering habitat but will forage in more open uplands (Dawson 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

All of the plan area is suitable winter habitat. There is no breeding habitat.

Critical biological characteristics

Requires forested areas, preferably conifers for nesting.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Pine siskin are likely a main prey item for other species, particularly for raptors. They subsist primarily upon seeds but also will consume invertebrates (Dawson 2020). Ecologically important for seed dispersal.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

This is a winter resident in the plan area and utilizes a wide variety of habitats for foraging (USDA 1996).

Maps of Species Range

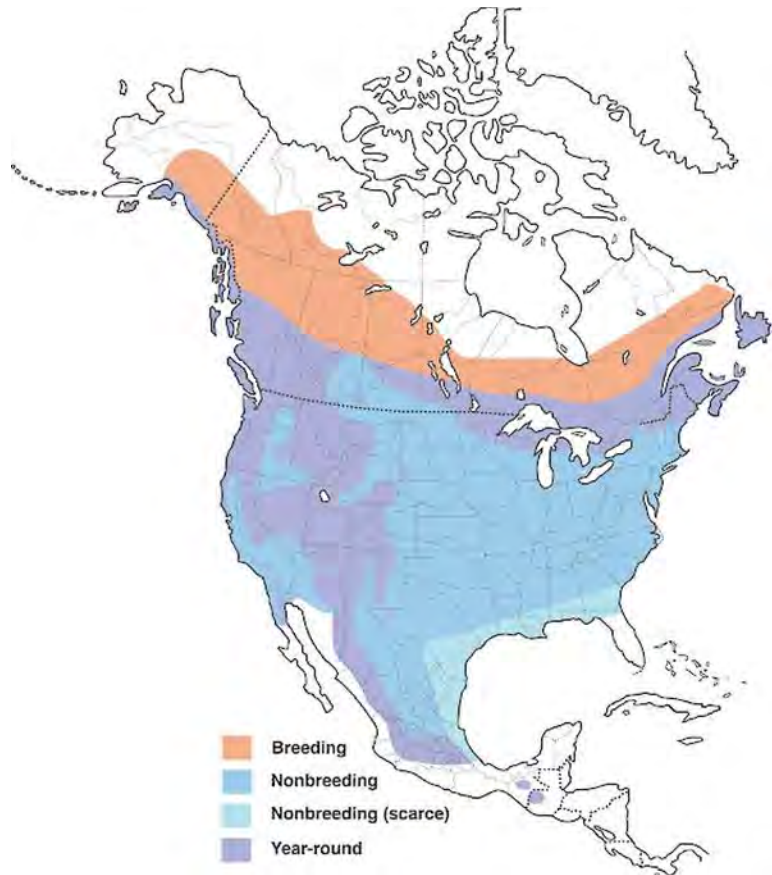


Figure 31. Distribution of the pine siskin in the Americas.

Pinyon Jay

(*Gymnorhinus cyanocephalus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: This species' records are accidental in the Cimarron NG. A flock of more than 100 individuals on 12 September 1982, 21 individuals on 4 October 1991 and 35 individuals on 16 September 1995 were observed in the Cimarron NG. This species is common in Cimarron County, Oklahoma, and Baca County, Colorado, during most winters and can be expected to return to Morton County occasionally (Cable et al. 1996). (GBIF) reports a total of 24 observations between 10/7/2000 and 11/17/2022. The observations were in January, April, May, August, September, October and November. High counts include 180 individuals on 11/6/2017, 60 individuals on 4/3/2021, 50 individuals on 9/19/2002, and 45 individuals on 11/17/2022 (GBIF). This species was detected during the IMBCR surveys on 05/14/2013 (IMBCR).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Loss of pinyon-juniper woodlands caused by long term drought and climate stressors, insects and disease directly contribute to the pinyon jay decline. Wildfire is a secondary threat. Other habitat alterations listed in the threats to the habitat section below.
 - b. Habitat: Threats to the habitat include removal of trees to accomplish other management priorities, long-term fire suppression, changes in woodland age and tree density, and changing climatic conditions that cause reduced piñon nut production and increased piñon pine mortality. Other threats include energy development in piñon-juniper woodlands, commercial piñon nut collection and the decline of insect populations.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends specific to the plan area are available. BBS reports decreasing trends in Colorado and in the United States. eBird reports an increasing trend in Colorado.
 - b. Habitat: Due to long-term drought conditions and increase in beetle kill, pinyon juniper forests in the Rocky Mountain Region are dying back and cone crops less abundant which makes food resources scarcer and more unpredictable for jays.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Accidental in the Cimarron NG but more common in Comanche NG. Flocks were observed three times in the Cimarron NG (Cable et al. 1996). (GBIF) reports 24 observations and IMBCR reports a detection of this species.
 - b. Ecological conditions: Pinyon/juniper habitat is limited in the plan area.

Species Status

G3; S3 in Colorado; USFS Region 2 Sensitive Species; Positive 90-day Finding and under a 12-month Status Review under the Endangered Species Act, Birds of Conservation Concern.

Taxonomy

Gymnorhinus cyanocephalus is accepted as valid (ITIS 2024).

Species range

Overall species range

Resident in central Oregon, mountains and arid slopes of eastern California and southern California, northern Baja California, Nevada, southeastern Idaho, Utah, northern Arizona, central portions of the southern half of Montana, western and central Wyoming, western South Dakota, northwestern Nebraska, western and southern Colorado, extreme western Oklahoma, and portions of New Mexico west of the eastern plains(Johnson and Balda 2020).

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the Eastern edge of the species range. Partners in Flight estimates the global breeding population at 770,000. The species rates a 14 out of 20 on the Continental Concern Score, which means it is on the Partners in Flight Yellow Watch List and is a species of tipping point (Partners in Flight 2024).

Distribution, abundance, and trend in the plan area

Population

This species records are accidental in the Cimarron NG. A flock of more than 100 individuals on 12 September 1982, 21 individuals on 4 October 1991 and 35 individuals on 16 September 1995 were observed in the Cimarron NG. This species is common in Cimarron County, Oklahoma, and Baca County, Colorado, during most winters and can be expected to return to Morton County occasionally(Cable et al. 1996). (GBIF) reports a total of 24 observations between 10/7/2000 and 11/17/2022. The observations were in January, April, May, August, September, October and November. High counts include 180 individuals on 11/6/2017, 60 individuals on 4/3/2021, 50 individuals on 9/19/2002, and 45 individuals on 11/17/2022 (GBIF). This species was detected during the IMBCR surveys on 05/14/2013 (IMBCR).

(Somershoe et al. 2020)states, "Data from the North American Breeding Bird Survey (BBS) indicate that Pinyon Jay numbers have decreased significantly survey-wide by 3.69% per year from 1967–2015, with an overall population loss of approximately 83.5% (Sauer et al. 2017)".

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Pinyon jay population in the plan area or the BCR stratum are available(Reese et al. 2024). eBird reports an increasing trend in Colorado(Fink et al. 2023).

The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases (-2.24%) in Colorado and in the United States (-2.19%)(Hostetler et al. 2023).

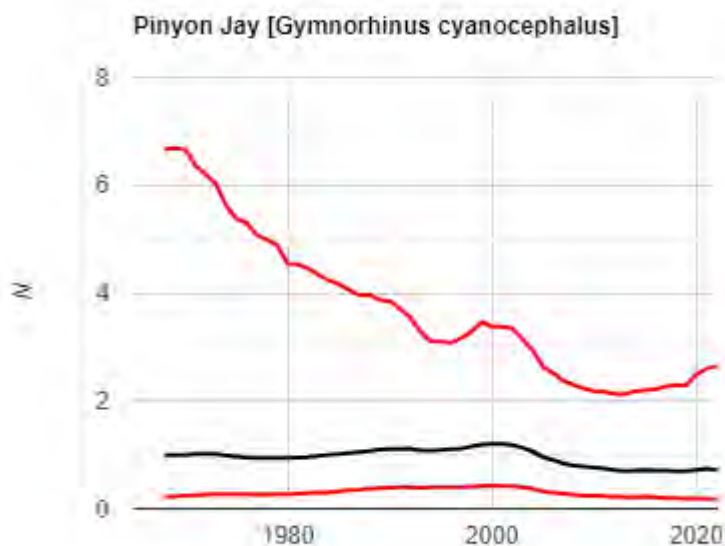


Figure 32. BBS trend data 1966-2022 within BCR 18 (Sauer et al. 2020).

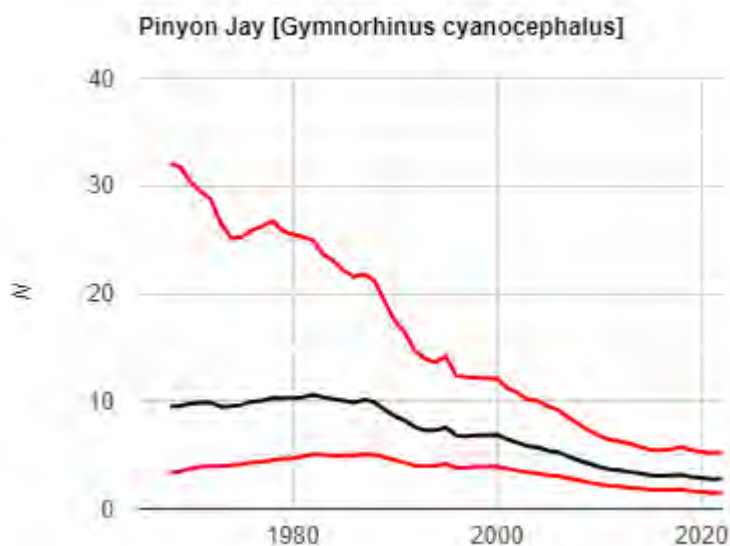


Figure 33. BBS trend data 1996-2022 within Colorado (Sauer et al. 2020).

Van Lanen et al. (2023) created a model of predicted change in pinyon jay (*Gymnorhinus cyanocephalus*) density (birds/km²) from 2008 to 2020 based on Bayesian hierarchical models accounting for incomplete detection. The model was informed by point counts conducted from 2008 to 2020 (Figure 34).

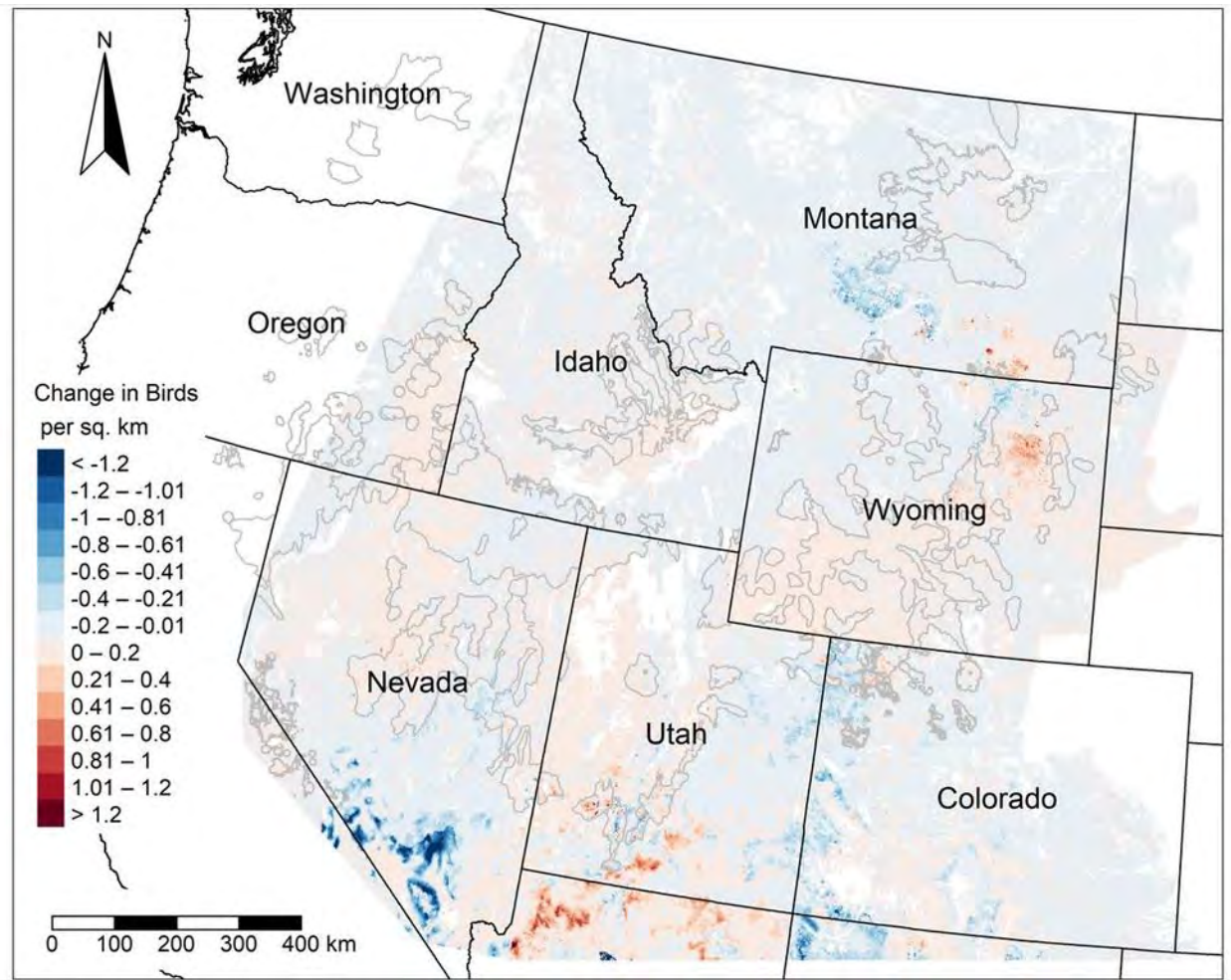


Figure 34. Mean predicted change in pinyon jay (*Gymnorhinus cyanocephalus*) density (birds/km²) from 2008 to 2020 based on Bayesian hierarchical models accounting for incomplete detection (Lanen et al. 2023).

Habitat

Due to long-term drought conditions and increase in beetle kill, pinyon juniper forests in the Rocky Mountain Region are dying back and cone crops less abundant which makes food resources scarcer and more unpredictable for jays (USFS 2022).

Threats (arising from on or off the plan area)

Population

Threats to the population include habitat alterations listed in the threats to the habitat section below (Somershoe et al. 2020).

Habitat

Threats to the habitat include removal of trees to accomplish other management priorities, long-term fire suppression, changes in woodland age and tree density, and changing climatic conditions that cause reduced piñon nut production and increased piñon pine mortality. Other threats include energy

development in piñon-juniper woodlands, commercial piñon nut collection and the decline of insect populations(Somershoe et al. 2020).

(NatureServe 2024) notes the major threat to this species is habitat alteration due to climate stressors, with wildfire as a secondary threat.

Ecological conditions

Ecological condition requirements

(Somershoe et al. 2020)state, “In Colorado, nesting is primarily restricted to piñon-juniper woodlands, but adults feeding fledglings have also been observed in ponderosa pine, riparian and shrubland habitats(Colorado Bird Atlas Partnership 2016). In southwestern Colorado, jays were not observed in extensive ponderosa pine forests(Colorado Bird Atlas Partnership 2016). In 2019, Pinyon Jay nests were found primarily in junipers within moderately dense to sparse piñon-juniper woodland/shrub areas (L. Rossi, unpublished data)”.

(NatureServe 2024) states, “Nests primarily in piñon-juniper habitats. Although piñon-juniper habitats appear abundant, some evidence suggests Pinyon Jays have specific nesting habitat requirements within those habitats, and habitat quality has and is being impacted (see threats). Evolved mutualism with piñon pine mast crops and nesting in piñon-juniper habitats.”

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Piñon-juniper is relatively limited in the plan area (see Appendix). Juniper woodlands are restricted to the southwestern portion of the Comanche National Grassland(Kuhn et al. 2011), where there are extensive pinyon pine forests in Picketwire Canyon and the Kim area in Las Animas County.

Critical biological characteristics

The Pinyon Jay is a highly social corvid of the interior West. This species is an obligate bird of piñon-juniper and other pine-juniper woodlands, is a major seed disperser in these ecosystems, and exhibits high nest site fidelity(Somershoe et al. 2020).

(NatureServe 2024) states, “Complex social organization; gregarious. Lives in loose flocks of multiple breeding pairs and their offspring from previous nesting seasons. The flock has an established home range but may wander to other areas in search of food. During nesting season flocks of yearlings may form. Nesting success often is low due to predation or severe weather.”

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

(NatureServe 2024) states, “Eats pinyon and other pine seeds, berries, small seeds, and grain. Also insects (larvae, nymphs, and adults); beetles, grasshoppers, caterpillars, ants, etc. May eat bird eggs, hatchlings. Communally caches large numbers of seeds.”

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Piñon-juniper habitats have been impacted by climate stressors through widespread piñon mortality and probable reduction in piñon mast crops (important to Pinyon Jay population viability). Models predict further impacts to these habitats, including loss and distributional shifts (Gaylord et al. 2013, Meddens et al. 2015). Habitat has also been altered through thinning of piñon-juniper for fuels reduction, and perceived wildlife management benefits of thinning by USFS, BLM, and state forestry departments is increasing (NatureServe 2024).

Maps of Species Range and Known Occurrences in Plan Area



Figure 1. Distribution of the Pinyon Jay.

This species wanders well outside this range in years when cone crops fail.

Figure 35. Distribution of the pinyon jay(Johnson and Balda 2020).

Ruddy Duck

(*Oxyura jamaicensis*)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are 21 GBIF records between 2001-2023. These observations were in April, May, June, September, October and November. According to (Cable et al. 1996): "Status: Uncommon migrant; one winter record. Dates range from 24 February to 27 May and from 21 August to 23 November. Out of Season: The species has been recorded once on the Cimarron CBC – 29 December 1984".

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Hunting
 - b. Habitat: Drought in the breeding range and drainage of wetland breeding areas.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No trend data available for the plan area. eBird reports a decreasing trend in the United States.
 - b. Habitat: Wetland habitat on the plan area has declined, but ponds created by FS support the species habitat on the Cimarron NG.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is not a narrow endemic, disjunct population, or at the edge of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are 21 GBIF records between 2001-2023. These observations were in April, May, June, September, October and November. According to (Cable et al. 1996): "Status: Uncommon migrant; one winter record. Dates range from 24 February to 27 May and from 21 August to 23 November. Out of Season: The species has been recorded once on the Cimarron CBC – 29 December 1984".
 - b. Ecological conditions: Wetland and open water habitats are restricted in the plan area.

Species Status

G5; S4B in Colorado; S1B, S3N in Kansas.

Taxonomy

Oxyura jamaicensis is accepted as valid (ITIS 2024e).

Species range

Overall species range

In North America, the northern prairies are the most important breeding areas. Nesting occurs in east-central Alaska (casually), and from central and northeastern British Columbia, southwestern Mackenzie, northern Alberta, northern Saskatchewan, and central Manitoba east across southern Canada to Nova Scotia, south to southern California, central Arizona, southern New Mexico, western and southern Texas, southwestern Louisiana, and northern Florida, with scattered, sporadic, or former breeding in several other areas in U.S., Canada, and Mexico. Breeds also in El Salvador, the West Indies (Bahamas [New Providence], Greater Antilles, and the Lesser Antilles south to Grenada) (NatureServe 2024).

Winters southward from southern British Columbia, Idaho, Colorado, Kansas, and the Great Lakes, and on the Atlantic coast mainly in Chesapeake Bay and south through Pamlico Sound, south throughout the southern U.S. and most of Mexico to Honduras (sight record for Nicaragua), and throughout the Bahamas. Areas in North America where migrants may concentrate include the Klamath Basin in northern California, Minidoka NWR in Idaho, marshes adjacent to the Great Salt Lake, Malheur NWR in Oregon, Carson Sink in Nevada, and the region extending from North Dakota across Minnesota, Wisconsin, and southeastern Michigan to Chesapeake Bay (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the eastern edge of the species' breeding range. Partners in Flight estimates the global breeding population at 1,700,000. The species rates an 8 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2022).

Distribution, abundance, and trend in the plan area

Population

There are 21 GBIF records between 2001-2023. These observations were in April, May, June, September, October and November. (Cable et al 2024) states, "Status: Uncommon migrant; one winter record. Dates range from 24 February to 27 May and from 21 August to 23 November. Out of Season: The species has been recorded once on the Cimarron CBC – 29 December 1984".

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Ruddy duck population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird reports a decreasing trend in the United States (Fink et al. 2023).

Habitat

Cable et al. (1996) states, "Marshes once existed in low spots along the river and throughout the region. Today, these sites are completely dry, leaving no trace of their former wetlands. The Forest Service has constructed nine ponds that provide limited habitat for waterfowl, shorebirds, gulls, and herons. Because the Cimarron River seldom has water in it, these ponds support species that otherwise would not occur on Cimarron NG".

Threats (arising from on or off the plan area)

Population

Hunting (NatureServe 2024).

Habitat

Drought in the breeding range and drainage of wetland breeding areas (NatureServe 2024).

Ecological conditions

Ecological condition requirements

Marshes, lakes and coastal areas; when not breeding, on sheltered brackish and marine coastal areas as well as lakes and rivers (Temperate Zone). Nests on freshwater marshes, sloughs, lakes, and ponds, in areas where open water is bordered by dense aquatic vegetation. Nest is a floating structure of marsh plants hidden by growing plants. Often lays eggs in nests of other waterfowl species. May nest at potholes of less than an acre (NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Riparian, wetland and open water habitat is limited in the plan area (see Appendix).

Critical biological characteristics

In much of the range, nest initiation extends from May through July. Clutch size averages about 8 in North America. Incubation, by female, lasts about 23-26 days. In some areas, male often accompanies female and brood. Young can fly at about 6-7 weeks (Manitoba). Probably not all yearling females breed, and generally has high nesting success. Diurnal but appears to migrate mostly at night (NatureServe 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Diet varies with age, season, site (Cassirer et al. 1991). Eats pondweeds, algae, wild celery; seeds of sedges, smartweeds, grasses; also eats insects and their larvae, shellfishes, crustaceans. During the breeding season in North Dakota, ate mainly invertebrates, primarily chironomid larvae and pupae (Woodin and Swanson 1989).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Preservation of or inability to drain semipermanent and permanent wetlands has probably benefited the species (Brua 2020).

Maps of Species Range and Known Occurrences in Plan Area

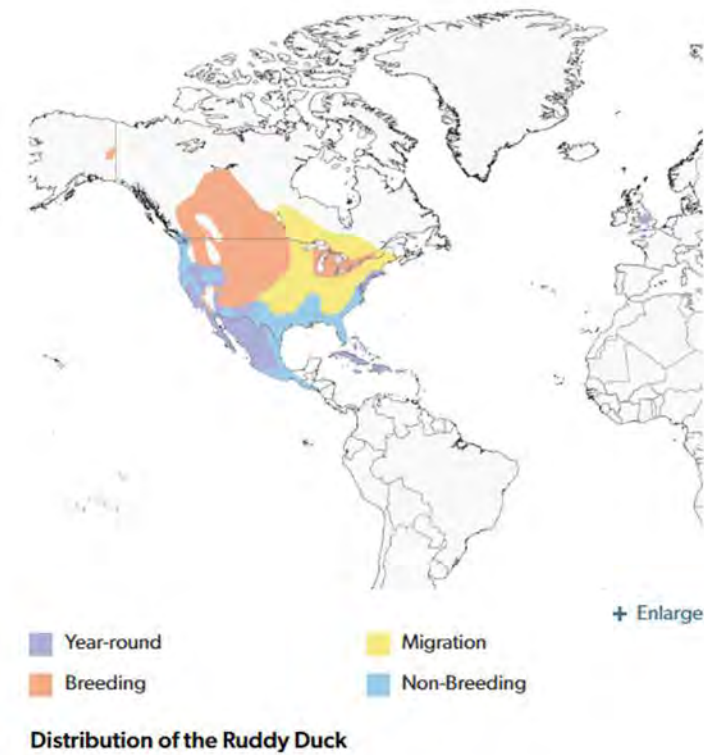


Figure 36. Distribution of the ruddy duck in the Americas.

Rufous-crowned Sparrow

(*Aimophila ruficeps*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are a minimum of nine documented occurrences within CNHP database 2020 by Aaron Ellingson (1994) and six documented locations in iDigBio (records from; 1995, 2010, and 2020).

Last year observed: 2020

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Species has low vulnerability to climate stressors during the summer and winter months in the plan area. There is predicted range gain in all three warming scenarios (+1.5, +2.0, and +3.0 degree Celsius) in both winter and summer ranges.
 - b. Habitat: CNHP Element Occurrence Reports (CNHP 2020) indicated there were no significant threats at the 5 observed locations to either the habitat or population in the plan area. One location mentioned weeds were present and all locations indicated recreation is increasing in the area but did not believe it was a big threat to the habitat or population. There were no definable threats to population or habitat noted within the literature or google searches.
2. Declining trends in populations or habitat in the plan area.
 - a. Population: Surveys conducted by the Bird Conservancy of the Rockies indicate robust increasing trends in the Rufous-crowned sparrow population on the Comanche National Grassland. eBird reports a decreasing trend in the United States.
 - b. Habitat: No known trend in species' habitat.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range).
 - a. Rufous-crowned sparrow in the plan area is at its northern edge of its species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area.
 - a. Population: Known from 9 observation in the plan area (CNHP 2020) and 6 locations in iDigBio. Population noted in CNHP element occurrence records indicate population is abundant at three location points in the plan area.
 - b. Ecological Condition: Extensive undisturbed habitat on all nearby slopes in the canyons at two of the locations.

Species Status

G5; S2 in Colorado; S1 in Kansas.

Taxonomy

Recognized as *Aimophila ruficeps* in Avibase (American Ornithology Society website - 1886 to present) and Cornell Birds of North America ; NatureServe, and ITIS Names: *Aimophila ruficeps*. NatureServe recognizes three subspecies *Aimophila ruficeps canescens*, *Aimophila ruficeps obscura*, and *Aimophila ruficeps rupicola*.

Species range

Overall species range

This passerine is primarily found across the Southwestern United States and much of the interior of Mexico, south to the transverse mountain range, and to the Pacific coast to the southwest of the transverse range. Its distribution is patchy, with populations often being isolated from each other.

Breeding: central California, northern Arizona, southwestern New Mexico, southeastern Colorado, northwestern and central Oklahoma, south discontinuously to southern Baja California and Mexico.

Non-breeding: throughout breeding range except northeastern portion, where usually winters from northeastern New Mexico, northern Texas, and south-central Oklahoma southward (NatureServe 2024)

Description of how the population in the plan area fits within the overall range

The occurrences within the plan lie at their northerly tip of their North American breeding range and the winter range closely parallels their breeding range. Partners in Flight estimates the global breeding population at 1,200,000. The species rates a 10 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (Partners in Flight 2024)

Distribution, abundance, and trend in the plan area:

Population

There are 9 documented occurrences within CNHP database 2020 by Aaron Ellingson in 1994 and six documented locations in iDigBio (records from; 1995, 2010, and 2020).

Surveys conducted by the Bird Conservancy of the Rockies indicate robust increasing trends in the Rufous-crowned sparrow population on the Comanche National Grassland (CO-BCR18-CO)(Reese et al. 2024).

eBird reports a decreasing trend in the United States(Fink et al. 2023).

Habitat

General habitat – inhabits semiarid grassy shrublands and open woodlands on moderate to steep grassy and rocky hillsides and canyons from sea level to almost 3,000 m⁷. All CNHP data locations were within the Purgatoire Canyon PNC and typically in Juniper woodland/grassland in the canyon. There appears to be plenty of potential habitat for this species in the plan area.

Threats (arising from on or off the plan area)

Population:

No threats to the population noted in literature or documented with Colorado Natural Heritage program (Van Scoyoc 2024).

Habitat

Potential threat to habitat from increase recreation in the area was documented at most the observation points with CNHP but did not see it as a problem at the time. Fire suppression is another potential threat to this species habitat needs. Suppression of natural wildfires and a lack of prescribe burning has allowed for open scrub habitat to grow into dense stands that are unsuitable for this species. The EO's stated there was extensive habitat present within the plan area. The known occurrences occurred in two of the habitat types that dominate the plan area (Western Great Plains Sandhill Steppe, Western Great Plains Shortgrass Prairie both combined make up 84% of the plan area). See Trend and Threat habitat table.

Ecological conditions

Ecological condition requirements

Dry, rocky hillsides with plenty of shrubs and grasses. They are also found in open pine-oak woods, chaparral areas (shrubby plants adapted to dry summers and moist winters). Dense woody growth is unsuitable. Periodic wildfire helps Rufous-crowned Sparrows by keeping the habitat open, and this species tends to be more common in areas that have burned in the past 15 years, according to data from California. Rufous-crowned Sparrows eat mainly insects in spring and summer, and mainly stems, shoots, and seeds in winter. They usually build their nests on the ground or in a small depression; occasionally near the base of a shrub up to about 1.5 feet off the ground. Nests are often well concealed under grass, leaves, or rocks.

These sparrows depend on a fairly specific set of habitat requirements, which renders them vulnerable to habitat degradation and fragmentation. Suppression of natural wildfires has allowed their open scrub habitat to grow into dense stands that are unsuitable for this species.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

CNHP Element Occurrence records indicate habitat for this species is plentiful and majority of sites commented habitat is in good condition (CNHP 2020).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Not known.

Influence of ecosystem structure and function on this species (includes departure from HRV or new influences)

Suppression of natural wildfires has allowed for open scrub habitat to grow into dense stands that are unsuitable for this species.

Maps of Species Range and Known Occurrences in Plan Area



Figure 37. Distribution map of the rufous-crowned sparrow in the Americas.

Scaled Quail

(*Callipepla squamata*)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF reports a total of 274 records throughout the plan area between 1969 and 2022 ((Van Scoyoc 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: habitat loss and degradation, principally overgrazing by cattle. Wheat seeds coated with the antifungal chemical Ceresan, may be lethal. Recreational hunting is not considered a threat; however, spent lead shot is eaten and may pose a threat.
 - b. Habitat: Overgrazing reduces residual grass cover, which is important to overwinter survival.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Surveys conducted by the Bird Conservancy of the Rockies indicate decreasing trends on the Cimarron National Grassland and on the Shortgrass Prairie Region (BCR18). BBS reports population decreases in Colorado and in the United States. eBird reports decreasing trends in Kansas and in Colorado
 - b. Habitat: Samson et al. (2004) estimated that the mixed grass and shortgrass provinces of the Great Plains have been reduced to 29% and 52% of their historic extent, respectively, and this reduction continues as grassland is converted to cropland (Augustine et al. 2021)/
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the north-eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: A total of 274 records throughout the plan area between 1969 and 2022 have been reported.
 - b. Ecological conditions: Shortgrass prairie is the most widespread vegetation type in the plan area.

Species Status

G5; S4 in Colorado; S2 in Kansas.

Taxonomy

Callipepla squamata is accepted as valid (ITIS 2024).

Species range

Overall species range

This species is year-round resident in south-central Arizona, northern New Mexico, east-central Colorado, and southwestern Kansas south through western Oklahoma and western Texas. In Mexico, resident at 1000-2000 m in interior from ne. Sonora and Nuevo Leon south (over central plateau) to ne. Jalisco and Hidalgo; also on Atlantic slope (to near sea level) from Texas border to Tamaulipas.

Description of how the population in the plan area fits within the overall range

The plan area is at the North-Eastern edge of the species range. Partners in Flight estimates the global breeding population at 5,100,000. The species rates a 10 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List but is a species of common bird in decline (PIF 2024).

Distribution, abundance, and trend in the plan area

Population

Surveys conducted by the Bird Conservancy of the Rockies indicate robust decreasing trends in the Scaled Quail population on the Cimarron National Grassland (KS-BCR18-CI) and on the Shortgrass Prairie Region (BCR18)(Reese et al. 2024). The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases in Colorado (-3.15%) and in the United States (-1.95%)(Hostetler et al. 2023).

eBird reports decreasing trends in Kansas and in Colorado (Fink et al. 2023).

Habitat

Shortgrass prairie is the most widespread vegetation type in the plan area (Kuhn et al. 2011). Habitats characterized by mid- to tall-grass species (mixed grass prairie) are limited in the plan area, and most commonly occur as small patches interspersed among shortgrass prairie and sandsage, or in mesic areas (Kuhn et al. 2011, CPW 2015).

Threats (arising from on or off the plan area)

Population

Threatened by habitat loss and degradation, principally overgrazing by cattle. Wheat seeds coated with the antifungal chemical Ceresan, may be lethal (Rollins 1981).

Recreational hunting is not considered a threat (Campbell et al. 1973); however, spent lead shot is eaten and may pose a threat (Rollings 2008).

Habitat

Overgrazing attributable to the habitat destruction by spread of weeds, reducing essential food and cover (Dabbert et al. 2020).

Ecological conditions

Ecological condition requirements

Mixed desert grasslands and shrublands; breeding and non-breeding habitat is generally similar in a given area. Considerable variation in the relative percentages of forb, grass, and woody cover among sites used by the species across its range. The relative importance of individual plant species as food items, as primary nesting sites, or as loafing cover sites also varies considerably among occupied sites (Dabbert et al 2020).(Dabbert et al. 2020).

In Colorado, inhabits a variety of elevations ranging from 1,037–2,135 m; found primarily in sand sagebrush grasslands, often interspersed with agricultural areas, and in disturbed areas having an abundance of annual forbs. Scaled Quail also use pinon-juniper woodlands, shrublands, and areas near farmsteads; important shrub species include sand sagebrush, cholla, yucca, wild plum, and skunkbush sumac. Rutherford and Snyder recommend that shrubs compose 5-15% canopy coverage in managed sites in Colorado (Dabbert et al. 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Shortgrass prairie is the most widespread vegetation type in the plan area (Kuhn et al. 2011, and ecological condition is not limited.

Critical biological characteristics

Highly social species; lives in coveys generally from Sep until mid-Apr. In Colorado, covey sizes increase from an average of 14 in Sep to 20 in mid-Nov, suggesting that broods merge in late fall. Winter coveys consist of mergers of broods, their parents, plus unsuccessful pairs and unmated males. Winter coveys in Oklahoma average 31.2 birds (n = 325, range = 4–150); in w. Texas, 25.3, 22.3, and 41.5 during 3 consecutive years (n = 6). In Colorado, a repeated monthly census of a 36.3 km area showed an average winter covey size of 33.4 quail (range = 10–86) (Dabbert et al. 2020).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species feed on seeds of forbs, shrubs, and grain; forb seeds and grains main fall and winter food. Insects and herbaceous leaves consumed on a seasonal basis. A larger proportion of insects in diet than other quail. Hawks, Roadrunners (*Geococcyx californianus*), Magpies (*Pica pica*), snakes, skunks, “wildcats,” and coyotes all take a toll on this bird or its eggs, but evidence was anecdotal (Dabbert et al. 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Moderate grazing is compatible with and can improve habitat conditions. In grass-dominated habitats, moderate grazing improves conditions by reducing grass density, creating more bare ground, and encouraging germination of forbs. Quail prefer pastures grazed intermittently (pasture rotation) over those grazed year-round. Although free-standing water is used, it does not appear to be critical for survival. In

New Mexico, gallinaceous guzzlers are ineffective and impractical. Ramps into and out of stock watering tanks can provide access to water (NatureServe 2024).

Maps of Species Range and Known Occurrences in Plan Area



Figure 38. Distribution of the scaled quail in the Americas.

Scissor-tailed Flycatcher

(Tyrannus forficatus)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Uncommon migrant and summer resident. Dates range from 10 April to 5 October. More than five confirmed nesting with additional sightings of fledged juveniles have been recorded in the Cimarron NG. The first nest was reported on 5 June 1952, a nest with a juvenile was found on 8 June 1960, and a family group of two adults and three juveniles on 20 July 1978. An adult on a nest at Middle Springs on 6 June 1981. More than 10 adults were observed on 26 May 1991 (Cable et al. 1996). A total of 41 observations records with one or more individuals have been reported from both Cimarron and Comanche NG between 1969 to 2021 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Inclement weather can reduce nest success and prey availability. Brush eradication.
 - b. Habitat: Brush eradication in breeding range.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trend data in the plan area is available. Within the Shortgrass Prairie Bird Conservation region (BCR 18), IMBCR show decreasing trends. Both eBird and BBS show declining trends in Kansas.
 - b. Habitat: Shortgrass prairie exhibits many departures from historic conditions, but the current condition in the plan area is believed to be relatively stable.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the north-western edge of the breeding range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Uncommon migrant and summer resident. More than 5 nesting records and 41 observation records.
 - b. Ecological conditions: Shortgrass prairie is the most common ecosystem in the plan area.

Species Status

G5; S1B in Colorado; S5B in Kansas.

Taxonomy

Tyrannus forficatus is accepted as valid (Avibase 2024) (ITIS 2024).

Species range

Overall species range

BREEDING: eastern New Mexico, southeastern Colorado, southern Nebraska, central Missouri, central Arkansas, and western Louisiana south to northern Nuevo Leon and southern Texas.

NON-BREEDING: central and southern Florida, and in Middle America from southern Veracruz and Oaxaca south to central Costa Rica (rarely to western Panama); casual north to California and southern Louisiana (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the North-Western edge of the breeding range. Partners in Flight estimates the global breeding population at 9,100,000. The species rates an 11 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (PIF 2024). This species is not listed in the birds of conservation concern list (FWS 2021).

Distribution, abundance, and trend in the plan area

Population

Uncommon migrant and summer resident. Dates range from 10 April to 5 October. More than five confirmed nesting with additional sightings of fledged juveniles have been recorded. The first nest was reported on 5 June 1952, a nest with a juvenile was found on 8 June 1960, and a family group of two adults and three juveniles on 20 July 1978. An adult on a nest at Middle Springs on 6 June 1981. More than 10 adults were observed on 26 May 1991(Cable et al. 1996). A total of 41 observations records with one or more individuals have been reported from both Cimarron and Comanche NG between 1969 to 2021(Van Scoyoc 2024).

No population trend data in the plan area are available.

Surveys conducted by the Bird Conservancy of the Rockies indicate robust decreasing trends in the Scissor-tailed Flycatcher population in the Shortgrass Prairie Region (BCR18)(Reese et al. 2024). The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases in Kansas (-0.69%) and in the United States (-1.06%) (Hostetler et al. 2023).

eBird reports decreasing trends in Kansas (Fink et al. 2023).

Habitat

(Regosin 2020) states, “breeds mainly in savannas with occasional trees, shrubs, and brush patches.” This type of habitat is abundant and well distributed across the plan area.

Threats (arising from on or off the plan area)

Population

Severe weather and storms can reduce reproductive success by directly dislodging destroying nests or by reducing food availability (Regosin and Pruett-Jones 1995). Brush treatment with herbicides in portions of the breeding range have reduce nesting success (Nolte and Fulbright 1996).

Habitat

Brush treatment with herbicides in portions of the breeding range could reduce nesting habitat (Nolte and Fulbright 1996).

Ecological conditions

Ecological condition requirements

Regosin states, "Breeds mainly in savannas with occasional trees, shrubs, and brush patches. Also in towns, agricultural fields, pastures, landscaped areas such as golf courses or parks with a mix of trees, perches, and open areas. Scattered trees or shrubs (especially honey mesquite [*Prosopis juliflora*]), fences, fencerow vegetation, and forested strips often associated with stream channels provide nesting sites and perches".Habitat in migration is described as "open grasslands with occasional trees and shrubs; agricultural lands; towns" ((Regosin 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species is associated with prairie habitat, which is abundant and generally stable across the plan area (see Appendix).

Critical biological characteristics

Hunts from a perch; darts out and captures insects as they fly by. Also gleans insects off vegetation or captures insect prey on the ground. Rarely hops from branch to branch or hovers near trees to forage on invertebrates and berries. Will forage on insects at night under artificial light (NatureServe 2024).

This species has been observed drinking from puddles and water tanks (Fitch 1950) (Regosin 2020).

Site fidelity to nest site have been observed in this species frequently. Individuals have been observed using the same shrubs for nesting even after the shrubs died (Nolte and Fulbright 1996).(Regosin and Pruett-Jones 1995).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Major food items are grasshoppers and crickets, beetles, bees and wasps (*Hymenoptera*), bugs (*Hemiptera*), and caterpillars (*Lepidoptera*). Occasionally flies (*Diptera*), moths (*Lepidoptera*), spiders (*Arachnida*), dragonflies (*Odonata*), mantids (*Mantidae*), walking sticks (*Phasmatidae*), fruits, and seeds. On wintering grounds, insects and at least some fruit (Regosin 2020).

Predators of eggs/nestlings include kingsnakes (*lampropeltis spp.*), racers (*coluber constrictor*), coachwhips (*masticophis flagellum*), and great-tailed grackles (*cassidix mexicanus*), Cooper's hawks (*accipiter cooperi*) and American crows (*corvus brachyrhynchos*) (Nolte and Fulbright 1996, Regosin and Pruett-Jones 1995, Regosin 2020).

Brown-headed cowbirds (*molothrus ater*) could parasitize nests; however, cowbird eggs can be ejected (Regosin 1994, Regosin and Pruett-Jones 1995).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

On breeding grounds, herbicide application and brush management practices aimed at decreasing density of mesquite may reduce availability of nest sites. Where brush eradication is practiced, managers should leave patches or strips of untreated brush for nesting (Nolte and Fulbright 1996).

Maps of Species Range and Known Occurrences in Plan Area



Distribution of the Scissor-tailed Flycatcher

Figure 39. Distribution of the scissor-tailed flycatcher (Regosin 2020).

Sharp-shinned hawk

(*Accipiter striatus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF- 103 observations between 1988-2022.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Human disturbance near nesting areas, illegal shooting, and collisions. Population is difficult to census and is rarely observed.
 - b. Habitat: Requires forested habitat for breeding. However, it is adaptable to urban areas. There is a lack of data on effects on habitat loss.
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: There is no specific population trend in the plan area. It is a rare winter resident. Within the Shortgrass Prairie Bird Conservation region (BCR 18), IMBCR population trends are declining.
 - b. Habitat is limited in the plan area. It is an uncommon migrant and rare winter resident.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is not endemic, disjunct, or at the edge of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. This species has adequate populations range-wide and is an uncommon winter resident and rare migrant.
 - b. There is limited forested habitat in the plan area to provide for this species.

Species Status

G5; S3B,S4N in Colorado; S1B,S4N in Kansas.

Taxonomy

Accipiter striatus is valid (ITIS 2024).

Species range

Overall species range

Breeds western and central Alaska to northern Saskatchewan, southern Labrador, and Newfoundland, south to South America. Winter in the north to southern Alaska and southern Canada (casually). U.S. and

Canadian populations winter south to Panama and West Indies. RESIDENT populations occur in Middle and South America (northwestern Venezuela, south in Andes to northern Argentina; Paraguay to southeastern Brazil, Uruguay) and Puerto Rico (NatureServe 2024)

Description of how the population in the plan area fits within the overall range

Primarily found on the Cimmaron portion of the plan area as an uncommon winter resident (USDA 1996). Partners in Flight estimates the global breeding population at 1,000,000. The species rates a 9 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (Partners in Flight 2024).

Distribution, abundance, and trend in the plan area

Population

There is no specific population trend in the plan area. Surveys conducted by the Bird Conservancy of the Rockies on the Shortgrass Prairie Region (BCR18), estimated a decreasing median density population trend of -20.93% [95% CL -50.07%, 14.15%] The species population is considered secure range-wide (NatureServe 2024).

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Sharp-shinned hawk population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird, which could produce better trend estimates for Sharp-shinned hawk, reports a decreasing trend in Colorado (Fink et al. 2023).

Habitat

Wide variety of forested habitats, depending on region and subspecies, but usually with some conifers (Bildstein et al. 2020).

Threats (arising from on or off the plan area)

Population

Collisions with vehicles, predation, collisions with windows, and gunshot were the leading identifiable causes. They are also vulnerable to pesticides and illegal shooting (Bildstein et al. 2020).

Habitat

Lack of accurate estimates of Sharp-shinned Hawk abundance at any level (continental, regional, local) precludes assessment of population-level effects of forest management practices and habitat degradation due to agricultural and urban development in North America or the Neotropics. Habitat alteration, especially removal of forest, continues to affect populations, although species capable of adapting to urban areas. Loss of Neotropical forests important to prey species have been suggested as a partial cause of declines at migration watch sites (Bildstein et al. 2020).

Ecological conditions

Ecological condition requirements

Requires forested areas and an abundance of small birds for prey.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There is limited forested habitat in the plan area. It is an uncommon winter resident.

Critical biological characteristics

Preys primarily upon small birds (Bildstein et al. 2020).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Preys primarily upon small birds (Bildstein et al. 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

This species is an uncommon winter resident (Cable et al. 1996).

Maps of Species Range

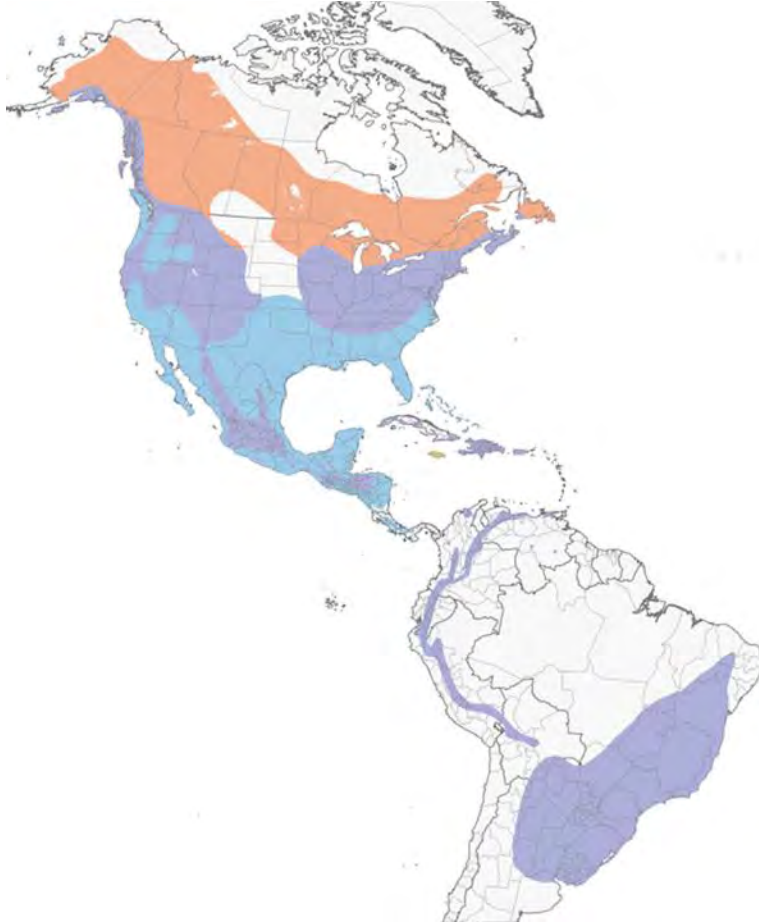


Figure 40. Distribution of the sharp-shinned hawk in the Americas.

Short-eared Owl

(*Asio flammeus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Colorado Natural Heritage- 2 observations, GBIF- 17 observations between 1990 and 2022 ((Van Scoyoc 2024).

Year of Last Known Occurrence: 2022.

Summary of indicators of conservation concern:

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Human disturbance near nesting areas, illegal shooting, predation from other raptors, fence/powerline collisions, drowning in stock tanks, rodenticides, and pesticides are known threats. Avian influenza is also becoming more prevalent in North America and is particularly harmful to raptors.
 - b. Habitat: Loss of habitat, particularly suitable breeding habitat and prey base is the top threat.
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: There is no specific population trend in the plan area. Within the Shortgrass Prairie Bird Conservation region (BCR 18), IMBCR population trends are uncertain.
 - b. Habitat is expected to be stable to declining.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is not endemic, disjunct, or at the edge of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. They have adequate numbers range-wide and are an uncommon winter resident.
 - b. Nearly all of the plan area is potential breeding habitat and winter habitat.

Species Status

G5; S2B in Colorado; S2B,S3N in Kansas; listed as Candidate in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Asio flammeus is valid (ITIS 2024).

Species range

Overall species range

NatureServe states: "The breeding range in North America extends from northern Alaska to northern Labrador, south to California, Utah, Colorado, Missouri, Illinois, Ohio, and Virginia. The species breeds in

small numbers in every province and territory in Canada. It is more numerous in western and central North America than in eastern North America. In the northeastern United States, it currently nests in Vermont, New York, Massachusetts, and Pennsylvania. In Eurasia the short-eared owl ranges from Iceland, British Isles, Scandinavia, northern Russia, and northern Siberia south to southern Europe, Afghanistan, northern Mongolia, the northern Kurile Islands, and Kamchatka. The species also occurs in the Hawaiian Islands, Caroline Islands (Ponape), and Greater Antilles (Cuba, Hispaniola, Puerto Rico). During the nonbreeding season, this owl occurs mostly in the southern parts of most Canadian provinces and southward to southern Baja California, southern Mexico, the Gulf Coast, and Florida; also Hawaii (resident on all main islands) and the Greater Antilles (uncommon in Puerto Rico, including Isla Culebra). In the Old World, nonbreeding occurrences extend from the breeding range south to northwestern Africa, Mediterranean region, Ceylon, southern China, and Japan ((NatureServe 2024).

Description of how the population in the plan area fits within the overall range

Rare. Nesting Records: Ports found one dead juvenile 10 miles north and 6 miles west of Elkhart on 9 June 1978. An adult was seen several miles away on 12 June 1978. High Counts: Three were found on the Cimarron CBC of 30 December 1990. Short-eared Owls were discovered nesting in adjacent Stevens County in June 1995 (Cable et al. 1996). Primarily utilize the plan area as winter habitat. Partners in Flight estimates the global breeding population at 2,300,000. The species rates a 12 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List but is a species of common bird in steep decline (Partners in Flight 2024).

Distribution, abundance, and trend in the plan area

Population

There is no specific population trend in the plan area. Population status is difficult to assess because of the nomadic nature of this species along with annual fluctuations. Nationwide inventories are necessary but difficult to coordinate.

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Short-eared owl population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird, which could produce better trend estimates for Short-eared owl, reports decreasing trends in Colorado (Fink et al. 2023).

Migration patterns are not well known. Apparently more northerly parts of the range are vacated in the fall and the owls move southward. In North America the movement is mostly from Canada and Alaska as far south as the southern U.S. and even Mexico. Toward the central part of the species' range (temperate zones) owls are seen year-round. Because breeding birds move south in fall and winter and are replaced by migrants from more northerly areas, it is possible separate populations may occupy these areas during the different seasons.

It is also possible that the owl migrates only in search of food and therefore may remain year-round in an area that provides sufficient resources. The owl congregates in areas where prey is plentiful. This feature of the biology has earned it a reputation as an "irregular migrant," or as "nomadic," "irruptive," or "vagrant"

Throughout the Midwest, this owl is more commonly seen during migration and in winter (Wiggins et al. 2020).

Habitat

Broad expanses of open land with low vegetation for nesting and foraging are required. Habitat types frequently mentioned as suitable include fresh and saltwater marshes, bogs, dunes, prairies, grassy plains, old fields, tundra, moorlands, river valleys, meadows, savanna, open woodland, and heathland. Any area that is large enough, has low vegetation with some dry upland for nesting, and that supports suitable prey may be considered potential breeding habitat, although many will not have breeding short-eared owls.

Nests on ground, generally in slight depression often beside or beneath a bush or clump of grass. Many nests are near water but generally are on dry sites. Same nest site may be used in successive years. Moves into and breeds in areas with high rodent densities. In winter the ground roosting habit may be abandoned for trees, possibly in response to deep snow (Wiggins et al. 2020).

Threats (arising from on or off the plan area)

Population

Human disturbance: Vehicular traffic, pesticides, domestic animals, and recreational shooting of rodents can negatively impact owl populations directly through mortality or indirectly through their effect on reproductive success or food supply. Short-eared owls are also the victims of illegal shooting. This species is a USFWS bird of conservation concern.

Energy development fence/powerline collisions, and stock tanks: Collisions with powerlines and fences in particular, cause some mortality. Adults have been known to drown in stock watering tanks.

Avian influenza is also becoming more prevalent in North America and is particularly harmful to raptors (Runstandler and Puryear 2024).

Pesticides: Susceptible to eggshell thinning from DDT.

Habitat

Short-eared Owls appear particularly sensitive to habitat loss and fragmentation, as they require relatively large tracts of grassland and are ground nesters, making them susceptible to the increased predation pressure that is typical within fragmented habitats and near rural developments.

Frequency, severity, and intensity of wildfires is causing a decline in the species' habitat across their range (Wiggins et al. 2020).

Ecological conditions

Ecological condition requirements

Broad expanses of open land with low vegetation for nesting and foraging are required.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Nearly all of the plan area is potential winter habitat.

Critical biological characteristics

They require relatively large tracts of grassland and are ground nesters, making them susceptible to the increased predation pressure that is typical within fragmented habitats and near rural developments

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Requires large open areas with ample populations of prey, primarily small mammals.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Intensive agricultural practices, such as annual plowing and biennial fallowing, exclude many prey species (Wakeley 1978, Houston and Bechard 1984).

Maps of Species Range

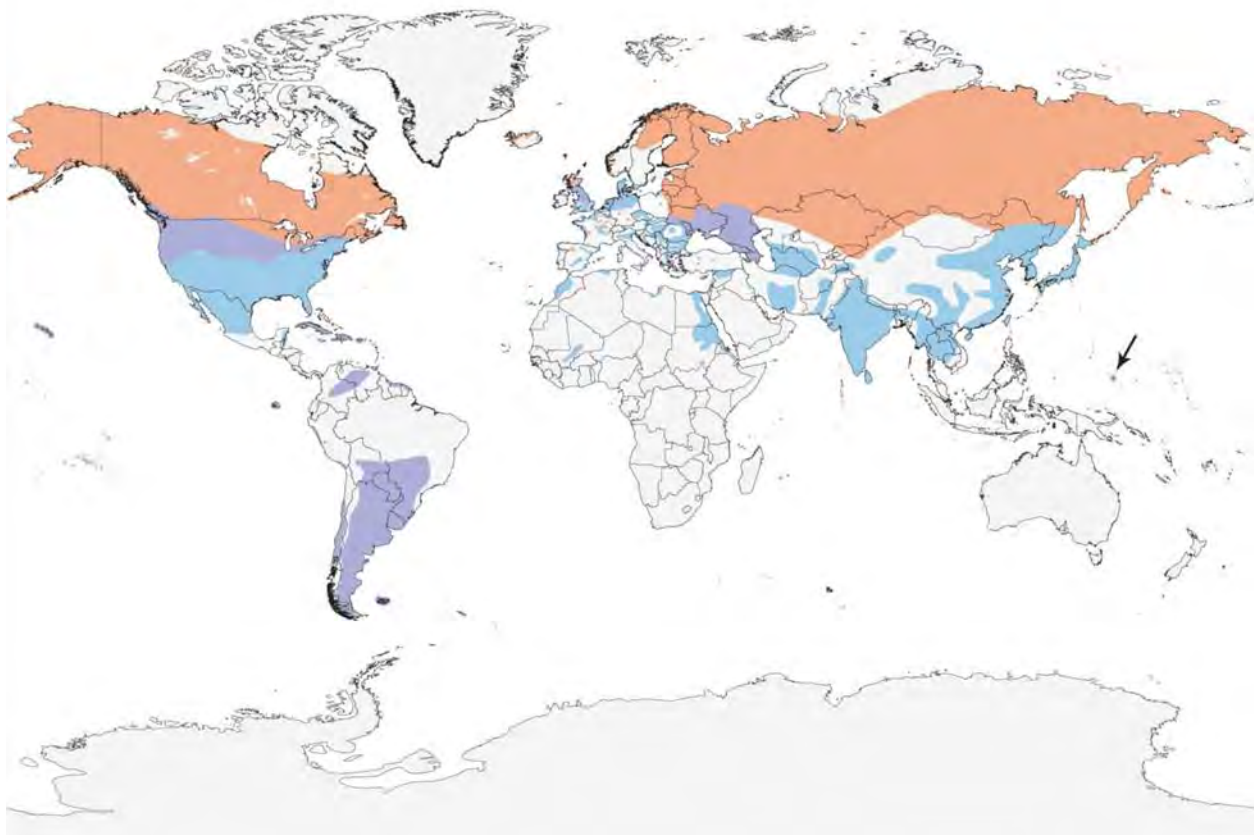


Figure 41. Global distribution of the short-eared owl.

Spotted Towhee

(*Pipilo maculatus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Cable et al. (1996) notes that this species is common migrant and rare winter resident in the Cimarron. More than 50 individuals were observed on 1991-09-28 and 20 individuals on 1987-10-10. During the Cimarron Christmas bird count between 1963 and 1995, this species was observed 7 years of the 24-year survey period. There are 300 observation records between 1973-05-06 and 12/31/2022 in GBIF. (IMBCR) reports four detections in 2014 ((Van Scoyoc 2024)

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Brood parasitism by brown-headed cowbird is known to occur but threats are not significant, but this species is not known to breed in the plan area.
 - b. Habitat: Vulnerable to land management activities that reduce or remove brushy vegetation, particularly along streamsides, in forest understories, and in dry shrubland habitats. Cowbird parasitism rates were higher in grazed plots than ungrazed plots.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: IMBCR report shows an increasing population density and an occupancy trend in the Comanche National Grassland. eBird reports increasing trends in Colorado.
 - b. Habitat: Riparian woodland habitat on the plan area has declined; however, tamarisk control and cottonwood and willow restoration efforts along the Cimarron and Purgatoire Rivers are ongoing.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the northern edge of the year-round or non-breeding range of this species.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Common in the plan area. More than 500 records are available in the plan area.
 - b. Ecological conditions: Riparian woodlands are relatively limited in the plan area.

Species Status

G5; S5 in Colorado; S2B, S3N in Kansas.

Taxonomy

Pipilo maculatus is accepted as valid. Other common names include Tohi tacheté [French] and Toquí moteado [Spanish] (ITIS 2024). The American Ornithologist Union split the rufous-sided towhee into two species, *P. erythrophthalmus* (eastern towhee, central and eastern North America) and *P. maculatus*

(spotted towhee, mainly west of the Great Plains) based on the morphological, behavioral and mtDNA differences (Ball and Avise 1992).

Species range

Overall species range

BREEDING: southern British Columbia, southern Alberta, and southern Saskatchewan south to southern California, northwestern Baja California, southern Nevada, Arizona, and through the Mexican highlands to Chiapas and central Guatemala, and east to the central Dakotas, north-central and western Nebraska, central Colorado, eastern New Mexico, and extreme western Texas; disjunct in southern Baja California.

NON-BREEDING: south coastal British Columbia, Nevada, Utah, and Colorado (casually farther north) south to Baja California, northern Sonora, through the Mexican breeding range to central Guatemala, and to south-central Texas (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the northern edge of the year-round or non-breeding range of this species. Partners in Flight estimates the global breeding population at 40,000,000. The species rates a 9 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (Partners in Flight 2024).

Distribution, abundance, and trend in the plan area

Population

Surveys conducted by the Bird Conservancy of the Rockies indicate robust increasing trends in the Spotted Towhee population on the Comanche National Grassland (CO-BCR18-CO) (Reese et al. 2024). The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases in the United States (-0.32%) (Hostetler et al. 2023).

eBird reports increasing trends in Colorado (Fink et al. 2023).

Habitat

In Northern Great Plains, this species occupies shrubby thickets along prairie coulees, streams and rivers, and brushy undergrowth in woodlands (Smith and Greenlaw 2020). In the plan area, this species has been observed in woodlands and riparian area along Cimarron River, Purgatoire River, or their tributaries. Dense tamarisk thickets and cattle grazing have almost eliminated cottonwood and willow along Timpas Creek. Tamarisk density, live cottonwood stem density, and the density of cottonwood regeneration are all greater in the western portion of the Cimarron River, while dead cottonwood stem density is greater along the eastern portion of the river channel. No inventories have been conducted for the Purgatoire River. Ongoing management efforts in the riparian woodlands are focused on tamarisk control and cottonwood and willow restoration along the Cimarron and Purgatoire Rivers.

Threats (arising from on or off the plan area)

Population

Brood parasitism by brown-headed cowbird is known to occur but threats are not significant (Smith and Greenlaw 2020). This species is not known to breed in the plan area.

Habitat

Vulnerable to land management activities that reduce or remove brushy vegetation, particularly along streambanks, in forest understories, and in dry shrubland habitats (Smith and Greenlaw 2020). Cowbird parasitism rates were higher in grazed plots than ungrazed plots (Goguen and Mathews 1998).

Ecological conditions

Ecological condition requirements

In Northern Great Plains, this species occupies shrubby thickets along prairie coulees, streams and rivers, and brushy undergrowth in woodlands (Smith and Greenlaw 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species depends on riparian woodland, which is relatively limited in the plan area (see Appendix).

Critical biological characteristics

In nonbreeding season, forms loose flocks and can be somewhat gregarious. Family groups remain together throughout summer (NatureServe 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Diet includes many types of beetles (*Coleoptera*); grasshoppers and crickets (*Orthoptera*); true bugs (*Heteroptera*); ants and wasps (*Hymenoptera*); flies (*Diptera*); butterflies and moths, including larvae (*Lepidoptera*); leafhoppers, aphids and allies (*Homoptera*); spiders (*Araneae*); millipedes (*Diplopoda*); and sowbugs (*Isopoda*). Commonly eats seeds and fruits, particularly in nonbreeding season, and sometimes blossoms and young leaves. This species is known to hybridize with Eastern towhee (*Pipilo erythrophthalmus*) in the central Great Plains (Smith and Greenlaw 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Management activities that remove shrub layers (e.g., timber harvest, grazing, or fire) would be detrimental in the immediate term until shrubs return. On the other hand, timber harvest, prescribed fire, and wildfire that eventually promote shrub growth or increase the area of favored shrub habitats would be

beneficial for the time shrub successional habitats remain. Thus management impacts should be analyzed in a context of habitat patterns across landscapes and cumulative effects (NatureServe 2024).

Maps of Species Range and Known Occurrences in Plan Area



Figure 42. Distribution of the spotted towhee in the Americas (Smith and Greenlaw 2020).

Thick-billed Longspur

(*Rhynchophanes mccownii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: (Cable et al 1996) notes: Uncommon migrant and winter resident. Christmas bird count between 1963-1995 shows fluctuations in counts in the Cimarron NG. Counts were as low as 0 and as high as 801 in 1993. Ely reported a flock of several hundred on 31 December 1978. Seltman saw several hundred on 17 October 1987 (Cable et al. 1996). High population count records include 30 individuals on 12-31-2011 and 180 individuals on 03-14-2012 (GBIF 2024). There are 7 element occurrence records during the Rocky Mountain Bird Observatory Section Survey on June 30th, July 2nd and July 4th in 2006 in the Comanche National Grassland. There are 14 non-duplicate observation points reported from the Cimarron NG between 1987 to 2022. Each observation point includes one or multiple individual observations ((Van Scoyoc 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Nest predation and application of insecticide.
 - b. Habitat: Breeds in Northern Great Plains of Canada through Montana and Wyoming, and barely into Colorado. CCNGs are migratory habitat and provide the winter habitat. Nests in heavily grazed pasture suffered higher predation rates (up to 75 percent) compared to nests in moderately grazed pasture (up to 60 percent; (With 1994). Habitat destruction due to agricultural conversion and development of native prairie habitat. Restriction of fire also reduced available shortgrass prairie. Motorized and non-motorized recreation could be a threat for this species (CPW 2015).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Uncommon migrant and winter resident, therefore there are no population trends available in the plan area. Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Thick-billed longspur population in the plan area or the BCR stratum are available.
 - b. Habitat: Shortgrass prairie habitat that may provide migratory or winter stop over habitat has declined in the plan area (CWP 2015,(Rohweder 2022)).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the western edge of the species range (iDigBio 2024).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: (Cable et al. 1996)notes: Uncommon migrant and winter resident. Christmas bird count between 1963-1995 shows fluctuations in counts in the Cimarron NG. Counts were as low as 0 and as high as 801 in 1993. Ely reported a flock of several hundred on 31 December 1978. Seltman saw several hundred on 17 October 1987 (Cable et al. 1996). There are 7 element occurrence records during the Rocky Mountain Bird Observatory Section Survey on June 30th, July 2nd and July 4th in 2006 in Comanche National Grassland (CNHP 2020). There are 14 observation points reported from the Cimarron NG between 1987 to 2022. Each observation

point includes one or multiple individual observations. High population count records include 30 individuals on 12-31-2011 and 180 individuals on 03-14-2012 (GBIF 2024).

- b. Ecological conditions: shortgrass prairie is the most abundant ecosystem in the plan area.

Species Status

G4; S2B in Colorado; S3N in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Rhynchophanes mccownii is accepted as valid (ITIS 2024). (NatureServe 2024) states: "Previously in the genus *Calcarius*, transferred to *Rhynchophanes* by AOU. The common name has been updated to Thick-billed Longspur."

Species range

Overall species range

Breeding range is from southeastern Alberta, southern Saskatchewan, northern North Dakota and (previously) southwestern Minnesota, south through Montana to southeastern Wyoming, northeastern Colorado, Oklahoma, northwestern Nebraska, and Manitoba. Non-breeding range is primarily from western Oklahoma, western Kansas, southeastern Arizona, and central New Mexico south through Sonora and Chihuahua to northern Durango. Rarely in Idaho, Utah, Nevada, and ne and coastal California (NatureServe 2024) (Figure 43).

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the western edge of the species range (Figure 43). Partners in Flight estimates the global breeding population at 840,000. The species rates an 16 out of 20 on the Continental Concern Score, which means it is on the Partners in Flight Red Watch List and is a species of Tipping point (Partners in Flight 2024).

Distribution, abundance, and trend in the plan area

Population

There are 7 element occurrence records during the Rocky Mountain Bird Observatory Section Survey on June 30th, July 2nd and July 4th in 2006 in the Comanche NG. There are 14 observation points reported from the Cimarron NG between 1987 to 2022. Each observation point includes one or multiple individual observations (Van Scoyoc 2024). High population count records include 30 individuals on 12-31-2011 and 180 individuals on 03-14-2012(GBIF 2024). (Cable et al. 1996) notes: Uncommon migrant and winter resident". Christmas bird count between 1963-1995 shows fluctuations in counts in the Cimarron NG. Counts were as low as 0 and as high as 801 in 1993.

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Thick-billed longspur population in the plan area or the BCR stratum are available (Reese et al. 2024).

Habitat

This species has been observed mainly in shortgrass prairie portion of the plan area. Shortgrass prairie exhibits many departures from historic conditions, but the current condition in the plan area is believed to be relatively stable (see Appendix).

Threats (arising from on or off the plan area)

Population

Nest predation believed to limit productivity. In Saskatchewan, Wyoming, and Colorado, about half of all nests were lost to predators, such as the thirteen-lined ground squirrel (With 1994). Nests in heavily grazed pasture suffered higher predation rates (up to 75 percent) compared to nests in moderately grazed pasture. Both eggs and nestling were depredated. Application of insecticide toxaphene resulted in direct poisoning of nestlings. Cowbird parasitism, however, appears rare (With 1994).

Habitat

Habitat destruction due to agricultural conversion and development of native prairie habitat. Restriction of fire also reduced available shortgrass prairie. Population may also be limited by availability of microclimatic features. Initial territories have southern exposure; birds may be sensitive to ground temperature or moisture. Motorized and non-motorized recreation could be a threat for this species (CPW 2015).

Ecological conditions

Ecological condition requirements

(With 2021) states, "Restricted to open habitat and sparse vegetation provided by the semi-arid shortgrass steppe of the Central Plains and Canadian Prairie Provinces, or to structurally similar habitats such as overgrazed pastures. Typical breeding habitat is a matrix of perennial shortgrass species (e.g., *Bouteloua gracilis*, *Buchloe dactyloides*) interspersed with cactus (e.g., *Opuntia polyacantha*), and limited cover of midgrasses (e.g., *Aristida longiseta*, *Agropyron smithii*, *Stipa comata*) and shrubs (e.g., *Gutierrezia sarothrae*, *Chrysothamnus nauseosus*, *Artemesia frigida*)".

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Shortgrass prairie is the most common ecosystem in the plan area (see Appendix).

Critical biological characteristics

Nests usually in a scrape on the ground at the base of a bush or clump of grass, or beside cattle dung. Nests beside shrubs may be subject to heavy predation by ground squirrels (With 1994). Nests tend to be oriented to the north (With and Webb 1993), and about one-third to one-half of nests are placed near clumps of grass, shrubs, plains prickly pear (*Opuntia polyacantha*), or cowpies (Mickey 1943).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

(With 2021) states they consume the “Seeds of grass and forbs, insects (grasshoppers, moths, beetles), and other arthropods”.

Sympatric Chestnut-collared Longspur breeds in the same general habitat, but prefers taller and denser vegetation. It is unusual to find both species nesting in the same pasture unless it is a mosaic of grassland types (e.g., mix of shortgrass and midgrass prairie; KAW). Horned Lark shares the Thick-billed Longspur's preference for heavily grazed, sparsely vegetated grasslands (With 2021).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Protect vegetation that is already sparse and short from overgrazing, especially in areas of low precipitation. Graze areas where grass is too tall or thick for breeding. Heavily grazed areas with aridic boroll soils and moderately grazed areas with aridic ustoll soils appeared to be ideal nesting habitat in portions of North Dakota, Montana, Wyoming, Colorado, and Nebraska (NatureServe 2024).

Little is known about the short- or long-term effects of burning on populations. Some authors have suggested that prairie fire suppression has contributed to the population decline of the species (With 1994).

Maps of Species Range and Known Occurrences in Plan Area

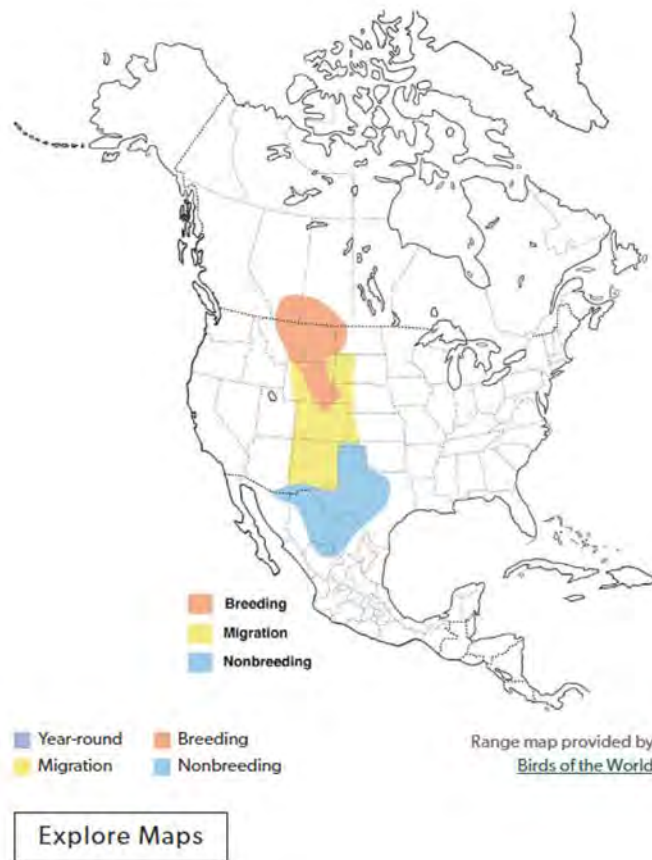


Figure 43. Distribution of the thick-billed longspur in the Americas (With 2021).

Vesper sparrow

(*Pooecetes gramineus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF- 5 observations between 1963-2021. IMBCR-13 observations between 2011 and 2020 ((Van Scoyoc 2024).

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Human disturbance near nesting areas, agricultural practices, predation, pesticides.
 - b. Habitat: A habitat generalist utilizing plains, prairies, and shrub steppe.
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: IMBCR surveys show an uncertain trend in the plan area and uncertain trend within the Shortgrass Prairie Bird Conservation region (BCR 18). eBird reports decreasing trends in Kansas.
 - b. Habitat may decrease in some areas due to forest encroachment, increased fire return intervals, and over-grazing.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is not endemic, disjunct, or at the edge of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. This species has adequate numbers range-wide; it is a common migrant and rare summer and winter resident in the plan area.
 - b. Species is moderate habitat generalist, and plan area provides abundant suitable habitat.

Species Status

G5; S5 in Colorado; S2B in Kansas.

Taxonomy

Pooecetes gramineus is valid (ITIS 2024).

Species range

Overall species range

Breeding range extends primarily from east-central and southern British Columbia eastward across southern Canada to Nova Scotia, and south to eastern and southern California, central Nevada, Arizona,

New Mexico, Kansas, Illinois, Tennessee, and North Carolina. Winter range extends across the southern United States from central California to South Carolina, and south to southern Baja California, southern Oaxaca, southern Tamaulipas, U.S. Gulf Coast, and Florida, with much smaller numbers wintering in areas farther north and south (Jones and Cornely 2002).

Description of how the population in the plan area fits within the overall range

Abundant during migration but a rare summer and winter resident (Cable et al. 1996). Partners in Flight estimates the global breeding population at 35,000,000. The species rates an 11 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (Partners in Flight 2024).

Distribution, abundance, and trend in the plan area

Population

Range-wide the species is experiencing declines (Jones and Cornely 2020).

Surveys conducted by the Bird Conservancy of the Rockies indicate robust increasing trends in the Vesper Sparrow population in the Shortgrass Prairie Region (BCR18) (Reese et al. 2024).

eBird reports decreasing trends in Kansas (Fink et al. 2023).

Habitat

Habitats include plains, prairies, dry shrublands, savannas, weedy pastures, fields, sagebrush, arid scrub, and woodland clearings (NatureServe 2024)

Threats (arising from on or off the plan area)

Population

Changes in farming practices have been implicated in declines of this species range-wide. It is a ground-nesting species. Intensive farming that uses chemicals and large-scale tillage contribute to declines. Predation and pesticide exposure are also potential threats (Jones and Cornely 2020).

Habitat

Heavy grazing can degrade the species' habitat. Much of desert grasslands in wintering range has been destroyed or overgrazed (Jones and Cornely 2020).

Frequency, severity, and intensity of wildfires causes habitat loss, particularly in sagebrush ecosystems.

Ecological conditions

Ecological condition requirements

Considered a moderate habitat generalist, breeding in dry, open habitats with short, sparse, and patchy herbaceous vegetation; some bare ground; and low to moderate shrub or tall forb cover. Occupies a broad range of grassland habitat types, including native prairie, semidesert grasslands, montane and

desert shrublands, sagebrush steppe, montane meadows, old fields, pastures, haylands, reclaimed surface mines, weedy fencelines, croplands, weedy roadsides, and woodland edges with scattered trees and shrubs. Probably requires song perches, such as fences, shrubs, crop residue, tall weeds, woodlands bordering fields (James and Cornely 2020).

During migration utilizes pastures and weeds bordering cultivated fields and roadsides (hedgerows, and barren to overgrown fields. Throughout much of range, commonly found near grassy or weedy ditches and fencerows, since fields are still barren upon arrival in early spring (Jones and Cornely 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Vesper sparrow utilizes the plan area primarily during migration. It is a rare summer and winter resident (Cable et al. 1996). The plan area provides foraging opportunities during migration with grasslands.

Critical biological characteristics

Vesper Sparrow moves around in response to annual rainfall; breeding success may vary greatly from year to year depending on how weather affects habitat. Will not tolerate forested areas (Jones and Cornely 2020).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Diet consists of primarily invertebrates. Likely a popular prey item for raptors (Jones and Cornely 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Will avoid forested areas. As grasslands are encroached or replaced by forested areas Vesper sparrow will no longer utilize them (Jones and Cornely 2020).

Maps of Species Range



Figure 44. Distribution of the vesper sparrow in the Americas.

Virginia Rail

(*Rallus limicola*)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One KNHP data in 2004, 61 GBIF data between 1969-2022. One iDigBio record in 1950 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2019

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Habitat loss. Drying of wetland.
 - b. Habitat: Changing water levels.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Virginia Rail population in the plan area or the BCR stratum are available. eBird reports increasing trends in Kansas and in Colorado.
 - b. Habitat: Wetland habitat has declined.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the Southern edge of the species' breeding range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: unknown; about 60 records.
 - b. Ecological conditions: Most wetlands in the plan area are playas. The Forest Service has constructed nine ponds on the Cimarron National Grassland that provide limited habitat for species such as waterfowl, shorebirds, and herons.

Species Status

G5; S4B in Colorado; S2B,S3N in Kansas.

Taxonomy

Rallus limicola is accepted as valid (ITIS 2024).

Species range

Overall species range

BREEDS: locally from southern British Columbia to Newfoundland, south to northwestern Baja California, southern Arizona, west-central Texas, Missouri, Ohio, North Carolina; also Louisiana, central Mexico, and

South America. NORTHERN WINTER: southern British Columbia to northern Baja California and north to the Gulf Coast and North Carolina (NatureServe 2024)

Description of how the population in the plan area fits within the overall range

The population in the plan area is at the southern edge of the species' breeding range. Partners in Flight estimates the global breeding population at 240,000. The species rates a 10 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (Partners in Flight 2024).

Distribution, abundance, and trend in the plan area

Population

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Virginia Rail population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird, which could produce better trend estimates for Virginia Rail, reports increasing trends in Kansas and in Colorado (Fink et al. 2023).

Habitat

The Forest Service has constructed nine ponds on the Cimarron National Grassland that provide limited habitat for species such as waterfowl, shorebirds, and herons (Cable et al. 1996).

Threats (arising from on or off the plan area)

Population

Habitat loss has contributed to population declines; some of the habitat loss is due to drying of wetlands caused by drought (Conway et al. 1994).

Habitat

Changing water levels adversely affect rails by increasing nest loss, disrupting breeding activities, increasing chick mortality, restructuring location of optimal foraging sites, and increasing rail movements (Conway and Pyle 2024).

Ecological conditions

Ecological condition requirements

Breeds predominantly in freshwater wetlands, but nests have been reported in salt marshes. Inhabits stands of robust emergent vegetation (e.g., cattails [*Typha*] and bulrush [*Scirpus*]) within freshwater and brackish marshes and wetlands, and occasionally coastal salt marshes (Conway and Pyle 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Marshes once existed in low spots along the Cimarron River and throughout the region. Today, most of these sites are completely dry and there is no trace of the former wetlands (Cable et al. 1996).

Critical biological characteristics

In Arizona, annual survival probability was 0.53; all documented mortality occurred between October and March (Conway et al. 1994)

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Food items include small aquatic invertebrates, mainly beetles, snails, spiders, true bugs, and diptera larvae during breeding season and invertebrates, a variety of aquatic plants, and seeds of emergent plants during winter.

Documented nest predators include snakes, muskrat (*Ondatra zibethica*), weasels (*Mustela erminea* and *M. frenata*), raccoon (*Procyon lotor*), hawks, blackbirds, and wrens. Likely nest predators include skunk (*Mephitis spp.*), mink (*Mustela vison*), crows, and Yellow-billed Cuckoo (*Coccyzus americanus*). Pike (*Esox spp.*), bass (*Micropterus spp.*), Sandhill Cranes (*Grus canadensis*), and frogs prey on young chicks, and mink, coyote (*Canis latrans*), feral house cats, Great Egret, Northern Harrier, and owls prey on adults and juveniles (Conway and Pyle 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Shallow flooding of areas with heterogeneous topography, or partial drawdowns of more homogeneous human-made wetlands, concentrate invertebrate prey, resulting in ideal foraging conditions for breeding rails.

Shallow flooding of wetland complexes in early fall has been suggested for managing migrant rails in Missouri. Fall flooding stimulates growth and productivity of many invertebrate species. Flooding too deeply, however, reduces habitat quality for Virginia and other rails.

Fall or winter drawdowns maintained through Aug can also provide attractive fall habitat for migrating rails. Overly aggressive drawdown/flooding strategies, however, can increase turbidity and reduce seed stocks, thereby preventing establishment of persistent emergents and increasing open water areas which reduce benefits to rails (Conway and Pyle 2024).

Maps of Species Range and Known Occurrences in Plan Area

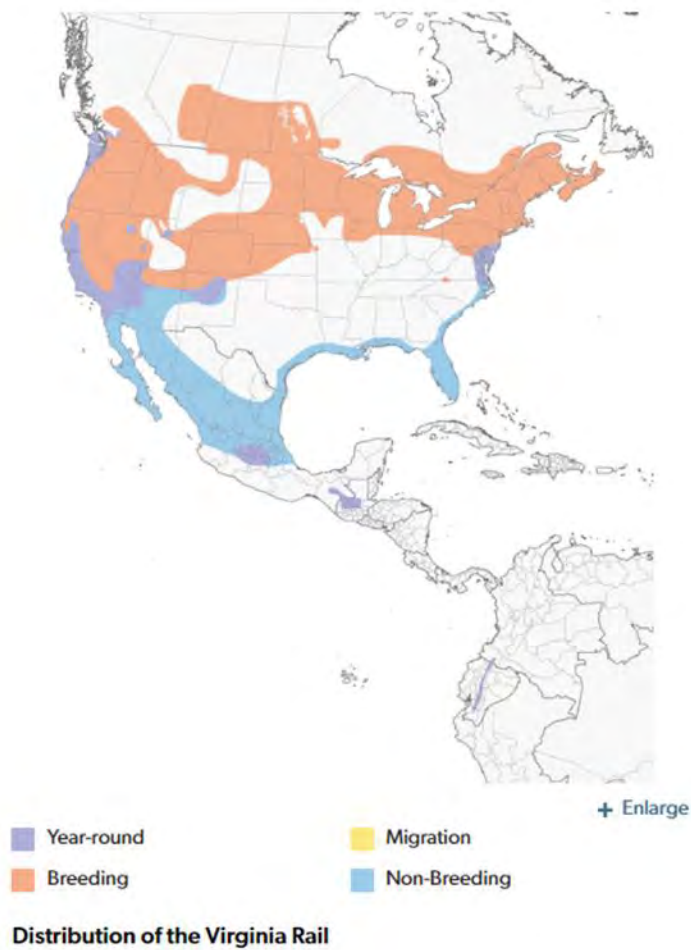


Figure 45. Distribution of the Virginia rail in the Americas.

Virginia's Warbler

(Leiothlypis virginiae)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: 3 observations in the Comanche NG on 5/7/1972, 5/6/1973 and 5/2/2021. 4 observations in the Cimarron NG on 9/3/2000, 9/1/2001, 5/10/2002 and 5/2/2021 (GBIF 2024) 2 iDigBio records from 1950. (Cable et al. 1996) states, "Status: Rare migrant. All reported spring dates occur within the very short period of 4-12 May, but late summer dates range from 24 August to 20 September. High Counts: The Grabers saw two and collected one specimen on 8 May 1950. Many observers saw two north of the Elkhart Cemetery on 7 May 1990 and again on 4 May 1996. Remarks: This species is rare in Kansas and is likely encountered only during the very narrow migration windows listed above. Virginia's Warblers are a common breeding bird in the lower elevations of Colorado's mountains and would be a good candidate for vagrancy in southwestern Kansas during migration. High numbers of this species migrate through the foothills near Trinidad, Colorado (Dan Bridges, personal communication)". Colorado breeding bird atlas shows confirmed breeding in the plan area (Colorado Bird Atlas Partnership 2016).

Year of Last Known Occurrence: 2019

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Narrow geographic distribution on breeding and wintering ranges, lack of large populations in breeding range, and climate stressors.
 - b. Habitat: Activities that reduce or remove preferred shrub habitats (e.g., shrub eradication, fire, some grazing, campgrounds, off-road vehicle use, urbanization) could be detrimental but effects are unstudied.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No robust trend estimates for the Virginia's warbler population in the plan area or the BCR stratum are available. Both BBS and eBird report decreasing trends in the United States.
 - b. Habitat: Juniper woodlands in southeast Colorado have expanded due to fire suppression and drought. Juniper has also increased in distribution and abundance in some ecosystems within the plan area, such as the canyonlands.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the eastern edge of the species' breeding range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: unknown; 9 observations and 2 iDigBio records. Colorado breeding bird atlas shows confirmed breeding in the plan area (Hugh 1998).
 - b. Ecological conditions: Pinyon/juniper habitat is relatively limited in the plan area.

Species Status

G5; S5 in Colorado; USFS Region 2 Sensitive Species.

Taxonomy

Leiothlypis virginiae is accepted as valid (ITIS 2024).

Species range

Overall species range

BREEDING: southeastern Idaho, northeastern Utah, and central Colorado south to southeastern California, southern Nevada, southeastern Arizona, and central New Mexico. NON-BREEDING: southwestern Mexico from Jalisco through Michoacan and Guerrero to Morelos and Oaxaca (NatureServe 2024)

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the eastern edge of the species' breeding range. Partners in Flight estimates the global breeding population at 900,000. The species rates a 14 out of 20 on the Continental Concern Score, which means it is on the Partners in Flight Yellow Watch List (Partners in Flight 2024). This species is a Species of Conservation Concern (FWS 2021).

Distribution, abundance, and trend in the plan area

Population

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Virginia's warbler population in the plan area or the BCR stratum are available (Reese et al. 2024). The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases in the United States (-1.06%) (Hostetler et al. 2023). eBird reports a decreasing trend in the United States (Fink et al. 2023).

Habitat

Juniper woodlands in southeast Colorado have expanded due to fire suppression and drought (CPW 2015). Juniper has also increased in distribution and abundance in some ecosystems within the plan area, such as the canyonlands (USDA Forest Service 2005a).

Threats (arising from on or off the plan area)

Population

This species may be vulnerable due to its narrow geographic distribution on breeding and wintering ranges and lack of large populations in breeding range (NatureServe 2024). Considering the potential for future changes to climatic conditions, this species could face serious demographic hurdles (Martin 2001).

Habitat

Activities that reduce or remove preferred shrub habitats (e.g., shrub eradication, fire, some grazing, campgrounds, off-road vehicle use, urbanization) could be detrimental but effects are unstudied (NatureServe 2024).

Ecological conditions

Ecological condition requirements

Over most of its range, typically found breeding in piñon-juniper and oak woodlands, but associated with other vegetation types as well. In Colorado, most occurrences (30%) are in pygmy oak forests, but piñon-juniper woodlands (18%) and brushy cover along streamsides (17%) also hold large numbers of this bird (n = 343 of 1745 blocks); upland habitat types provide suitable habitat as well, with ranges in elevation of <1,830 to 2,745 m. In general, this species occupies scrubby habitats below the pine belt in northern part of its range, and scrubby habitats within surrounding conifers in southern part of its range (Olson and Martin 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Juniper woodlands in southeast Colorado have expanded due to fire suppression and drought [CPW 2015]. Juniper has also increased in distribution and abundance in some ecosystems within the plan area, such as the canyonlands (USDA Forest Service 2005a). Less than 1% of the plan area is classified as Pinyon/Juniper habitat and ecological condition is limited in the plan area.

Critical biological characteristics

Males intraspecifically territorial on breeding grounds, but will tolerate other closely related warblers. Females territorial around nest. Territories often, but not always, bordered by natural edges such as canyon walls or thick forest. In Arizona, territories ranged between 0.83 to 2.26 hectares and were elongate. Nests on ground among dead leaves, or in small depression under cover of bush, tufts of grass, etc. Well-concealed by vegetation, of bark, grasses, roots, mosses, lichens; rim of nest may be level with surface (NatureServe 2024)

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Insectivorous. Forages on ground in thick brush and flies into air to catch insects; both parents seen carrying caterpillars to young. Will probe, glean, hover, and hang upside down to catch insects. During breeding season in Arizona, mainly take caterpillars, also spiders, carpenter ants, stink bugs, weevils (NatureServe 2024)

Documented predators include Cooper's hawk (*ACCIPITER COOPERII*), red squirrel (*TAMIASCIURUS HUDSONICUS*), and grey-collared chipmunk (*EUTAMIAS CINEREICOLLIS*). Potential predators include other accipiters, long-tailed weasel (*MUSTELA FRENATA*), vagrant shrew (*Sorex VAGRANS*), Steller's jay (*CYANOSITTA STELLERI*), and house wren (*TROGLODYTES AEDON*). BROOD PARASITISM: An occasional cowbird host, but little information on parasitism rates, behavioral adaptations to parasitism, or effects on reproductive success or populations (NatureServe 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Some research shows that the practice of controlled burning to remove some dangerously combustible understory from forests has severe negative impact on number of potential nesting sites, number of foraging opportunities, and number of birds to return to same sites the next year in mixed ponderosa pine (*Pinus ponderosa*)-oak forests of sw. Arizona. This species is unique in that it was the only member of the community to show significantly negative change in abundance on plots that were treated with controlled burns (Olson and Martin 2020).

Maps of Species Range and Known Occurrences in Plan Area



Figure 46. Distribution of the Virginia's warbler in the Americas (Olson and Martin 2020)

Western Screech Owl

(*Megascops kennicottii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF- 2 observations in 2006 ((Van Scoyoc 2024).

Year of Last Known Occurrence: 2006

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Limited nesting cavities, vehicle collisions, predation, and starvation.
 - b. Habitat: Nesting habitat is primarily larger trees or snags in riparian areas (Cannings et al. 2020).
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: Occurrence in the plan area is rare. Populations are generally thought to be stable throughout much of the range. Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Western Screech owl population in the plan area or the BCR stratum are available. eBird reports a decreasing trend in the United States.
 - b. Habitat may decline with changes in precipitation, temperature, and loss of riparian habitat.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is disjunct.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Western Screech Owls are rare in the plan area.
 - b. The plan area has limited riparian and deciduous tree habitat for this species.

Species Status

G4; S4B in Colorado; S1 in Kansas.

Taxonomy

Megascops kennicottii is valid (ITIS 2024).

Species range

Overall species range

Restricted to western North America. Breeds in most wooded areas at lower elevations within range. In Colorado, occurs along Arkansas River east to Bent County, where it overlaps with Eastern Screech-Owl; also east to eastern Las Animas County extreme western Oklahoma (Cimmaron County; Reinking 2004), and casual in extreme southwestern Kansas (Morton County; American Ornithologists' Union 1998). Also

resident throughout Trans-Pecos of Texas and eastward on Edwards Plateau to Kerr County, and north to about Callahan County (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

The population in the plan area appears to be disjunct from the rest of the species' range. Partners in Flight estimates the global breeding population at 180,000. The species rates a 12 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (Partners in Flight 2024).

Distribution, abundance, and trend in the plan area

Population

There is no known population trend in the plan area. Populations are generally thought to be stable throughout much of the range (Cannings et al. 2017). Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Western Screech owl population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird reports a decreasing trend in the United States (Fink et al. 2023).

Habitat

Western Screech-Owls use a diverse array of habitats, but the species is most associated with riparian habitats and deciduous trees over much of its range (Cannings et al. 2017).

Threats (arising from on or off the plan area)

Population

Starvation is likely the most common cause of death for nestlings. Barred owl is a main predator in the Pacific Northwest. May also have to compete with other cavity nesters. Vehicle collisions are a significant source of mortality (Cannings et al. 2017).

Habitat

In much of its range, the Western Screech-Owl is associated with riparian areas. Riparian habitats are often negatively impacted by human development, including agricultural, industrial, or housing (Cannings et al. 2017).

Ecological conditions

Ecological condition requirements

Riparian areas with larger trees or snags are the main habitat as they're cavity nesters.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The plan area has limited habitat for this species.

Critical biological characteristics

Requires trees for cavity nests. Will also use wooden boxes (Cannings et al. 2017).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Diet consists of mostly insects and small animals. Is a source of prey for larger raptors (Cannings et al. 2017).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Riparian habitat is limited and loss of larger trees within riparian corridors would negatively impact this species (Cannings et al. 2017)

Maps of Species Range and Known Occurrences in Plan Area



Figure 47. Distribution of the western screech owl in the Americas.

Western wood-pewee

(*Contopus sordidulus*)

Species is Native and Known to Occur in National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: 306 records in GBIF (Van Scoyoc 2024)/

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Climate stressors appear to impact nesting success, with the species nesting earlier but experiences decreased nesting success (Ortega and Ortega 2016).
 - b. Habitat: No clear threats to habitat were found during literature review.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Western wood-pewee population in the plan area or the BCR stratum are available. eBird reports increasing trend in Colorado.
 - b. Habitat: Western wood-pewee requires trees, open forests are preferred.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is near the edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: A total of 306 records in GBIF. The species appears to be found throughout the plan area, possibly in larger numbers towards the western side.
 - b. Ecological conditions: This species prefers areas with trees, a feature that is somewhat restricted in this plan area.

Species Status

G5; S5 in Colorado; S1B in Kansas.

Taxonomy

Contopus sordidulus is accepted and valid. (ITIS 2024)

Species range

Overall species range

Western North America and south to the Andes in northwestern South America (All About Birds 2024g).

Description of how the population in the plan area fits within the overall range

The Comanche-Cimmaron National Grasslands are with summer breeding habitat for the species, somewhat close to the eastern edge of that range (All About Birds 2024g). Partners in Flight estimates the global breeding population at 9,600,000. The species rates an 11 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (Partners in Flight 2024).

Distribution, abundance, and trend in the plan area

Population

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Western wood-pewee population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird, which could produce better trend estimates for Western wood-pewee, reports increasing trend in Colorado (Fink et al. 2023).

Habitat

The species appears to be found throughout the plan area, possibly in larger numbers towards the western side (GBIF 2024).

Threats (arising from on or off the plan area)

Population

Climate stressors may impact nesting success of the species (All About Birds 2024g).

Habitat

No widespread habitat threats were found in the literature (All About Birds 2024g).

Ecological conditions

Ecological condition requirements

Western wood-pewee requires open woodlands, forest edge and riparian zone (All About Birds 2024g).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Although the grasslands are towards the edge of the species' overall range, habitat within the plan area seems adequate, as riparian woodlands and canyonlands are suitable for the species. Encroachment by juniper may favor this species.

Critical biological characteristics

None identified.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Species has little impact on other species. It makes use of multiple forest types including conifer. As such it may benefit from conifer encroachment.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Western wood-pewee is a species of forests and open woodlands. Encroachment of juniper may benefit the species. Loss of riparian woody vegetation would decrease nesting habitat.

Maps of Species Range and Known Occurrences in Plan Area



Figure 48. Distribution of the western wood pee-wee in the Americas.

Yellow-billed cuckoo – Eastern (*Coccyzus americanus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF- 105 observations between 1978-2022. IMBCR-2 observations between 2011 and 2018 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Building collisions during migration, pesticides and pollutants.
 - b. Habitat: Contiguous riparian woodlands. Highly sensitive to fragmentation and degradation (Hughes 2020).
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Yellow-billed cuckoo population in the plan area or the BCR stratum are available. eBird reports increasing trends in Kansas and in Colorado. BBS indicate population decreases in Kansas and in the United States. Riparian habitat in the plan area will likely remain stable. It is decreasing range-wide.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is at the edge of its range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. This species has adequate numbers range-wide and has been observed somewhat frequently in the plan area.
 - b. There are limited riparian woodlands in the plan area.

Species Status

G5; S3B in Colorado; S5B in Kansas; listed as Tier 1, Candidate in Colorado.

Taxonomy

Coccyzus americanus is valid (ITIS 2024).

Species range

Overall species range

The summer distribution of the Yellow-billed Cuckoo ranges throughout much of the United States, southeastern Canada, the Greater Antilles, and Mexico, but range boundaries have been confused by

recurrent observations of nonbreeding individuals away from breeding sites. Vagrants are not infrequent on Atlantic shores and prairies in Canada, and occasionally wander as far as Alaska and Western Europe. Although generally considered a nearctic-neotropical migrant, some southern populations may prove to be sedentary. Furthermore, immature cuckoos collected in South America in summer suggest isolated breeding sites at tropical latitudes (Hughes 2015).

Description of how the population in the plan area fits within the overall range

Uncommon migrant and summer resident. Only two documented nesting occurrences on the Cimarron (Cable et al. 1996) The yellow-billed cuckoo (eastern population) is separate from the western population which is federally listed as threatened with a distinct population segment in the Southwest, California, Idaho, Montana, and western Colorado (and includes Critical Habitat). Partners in Flight estimates the global breeding population at 9,600,000. The species rates an 11 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List but is a common bird in steep decline (Partners in Flight 2024).

Distribution, abundance, and trend in the plan area

Population

There is no specific population trend in the plan area. The species is a rare migrant and uncommon summer resident (Cable et al. 1996).

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Yellow-billed cuckoo population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird, which could produce better trend estimates for Yellow-billed cuckoo, reports increasing trends in Kansas and in Colorado (Fink et al. 2023). The USGS estimates population trend with data from the North American Breeding Bird Survey collected from 1966 to 2022. Trends indicate population decreases in Kansas (-1.05%) and in the United States (0.93%) (Hostetler et al. 2023).

Habitat

Prefers open woodland with clearings and low, dense, scrubby vegetation; often associated with watercourses. Generally absent from heavily forested areas and large urban areas (Hughes 2015).

Threats (arising from on or off the plan area)

Population

The yellow-billed cuckoo (Eastern) is identified by the US Fish and Wildlife Service as a Bird of Conservation Concern and Partners in Flight identifies this bird as a common species in steep decline. Populations declined approximately 0.8% per year for a cumulative decline of about 34% between 1966 and 2019, according to the North American Breeding Bird Survey. Vulnerable to pesticides and pollutants. Frequently collides with structures during nocturnal migration (Hughes 2015).

Habitat

Sensitive to habitat fragmentation and degradation of riparian woodlands (Hughes 2015).

Ecological conditions

Ecological condition requirements

Species requires contiguous riparian woodlands (Hughes 2015).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are limited riparian woodlands in the plan area.

Critical biological characteristics

Requires riparian woodlands that have limited fragmentation.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Feeds primarily upon insects but will also consume small reptiles and amphibians (Hughes 2015)

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Highly dependent upon contiguous riparian woodlands (Hughes 2015).

Maps of Species Range



Figure 49. Distribution of the yellow-billed cuckoo – eastern in the Americas.

Yellow-headed Blackbird

(*Xanthocephalus xanthocephalus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF- 77 observations between 1950-2022 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Drought, flood pesticides, starvation, lethal control (Twedt and Crawford 2020).
 - b. Habitat: Wetlands for breeding and open fields and grasslands during migration (Twedt and Crawford 2020).
2. Declining trends in populations or habitat in the plan area:
 - a. Populations: Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Yellow-headed blackbird population in the plan area or the BCR stratum are available. eBird reports an increasing trend in Kansas.
 - b. Habitat: Wetlands are threatened by drought in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is not a narrow endemic, disjunct, or species at the edge of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Uncommon summer resident in the plan area.
 - b. Breed in wetlands in prairies, mountain meadows, quaking aspen parklands, and shallow areas of marshes, ponds, and rivers. Wetlands in the plan area are limited.

Species Status

G5; S5 in Colorado; S2B in Kansas.

Taxonomy

Xanthocephalus xanthocephalus is valid (ITIS 2024).

Species range

Overall species range

The Yellow-headed Blackbird, although most numerous in prairie wetlands, is a conspicuous breeding bird in deep-water, emergent wetlands throughout non-forested regions of western North America. (Twedt and Crawford 2020).

Description of how the population in the plan area fits within the overall range

Common migrant and uncommon summer resident (USDA 1996). Partners in Flight estimates the global breeding population at 11,000,000. The species rates a 9 out of 20 on the Continental Concern Score, which means it is not on the Partners in Flight Watch List and is a species of low conservation concern (Partners in Flight 2024).

Distribution, abundance, and trend in the plan area

Population

There is no specific population trend in the plan area. The species is a migrant and uncommon summer resident (USDA 1996).

Surveys were conducted by the Bird Conservancy of the Rockies; however, no robust trend estimates for the Yellow-headed blackbird population in the plan area or the BCR stratum are available (Reese et al. 2024). eBird, which could produce better trend estimates for Yellow-headed blackbird, reports an increasing trend in Kansas (Fink et al. 2023).

Habitat

Primarily prairie wetlands, but also common in wetlands associated with quaking aspen (*Populus tremuloides*) parklands, mountain meadows, and arid regions. Habitat in migration is open agricultural areas: harvested grain fields, plowed fields, meadows, and pastures. Uses emergent vegetation in wetlands for night roosts, loafs during day in wetland vegetation, shrubby vegetation, and small woodlots. (Twedt and Crawford 2020).

Threats (arising from on or off the plan area)

Population

Low delivery rates of prey were correlated with high nestling mortality and starvation was a major cause of nestling mortality. Flooding of nests in areas with high water-level fluctuations can result in high nest failure and nestling mortality; high water levels may submerge nests, whereas low water levels may allow increased predation. Uneven growth of nest support vegetation can, on rare occasions, cause nests to dump their contents (Ammann Heavy mite infestations may contribute directly or indirectly to mortality. There is also competition and exclusion from red-winged blackbirds. Studies have found dietary overlap of >90% in prey of Yellowheads and Redwings (Twedt and Crawford 2020).

Aerial-applied pesticides, applied to agricultural fields, may drift into wetland breeding colonies resulting in mortality of nestlings, either directly or indirectly by reduction in aquatic invertebrate food sources (Twedt and Crawford 2020).

Habitat

As breeding is restricted to wetlands, draining of wetlands constitutes a significant threat. This threat is mitigated somewhat by the fact that breeding occurs in deeper-water, larger-bodied wetlands which may be less affected by drainage and conversion to agriculture. Populations tend to fluctuate naturally with wetland conditions on the breeding grounds, and population recovery after drought is probably rapid.

Indiscriminate use of herbicides, such as glyphosate, may remove nesting habitat and render wetlands unsuitable for breeding. Conversion of upland habitats from grasslands to cultivation of small grains, corn, and sunflower has provided a vast food supply for postbreeding individuals, and has probably increased survival of fledged young (Twedt and Crawford 2020).

Ecological conditions

Ecological condition requirements

Foods vary temporally from a high proportion of insects during the breeding season to primarily cultivated grains and weed seeds during fall and probably winter. Diet also varies geographically with exploitation of the most available resources (Twedt and Crawford 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The grasslands offer foraging habitat and limited breeding habitat. Competition with red-winged blackbird may preclude establishment of a breeding population (Cable et al. 1996).

Critical biological characteristics

Requires wetlands for breeding. Extremely sensitive to drought and floods (Twedt and Crawford 2020).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Foods vary temporally from a high proportion of insects during the breeding season to primarily cultivated grains and weed seeds during fall and probably winter. Diet also varies geographically with exploitation of the most available resources (Twedt and Crawford 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Very sensitive to wetland degradation (Twedt and Crawford 2020).

Maps of Species Range

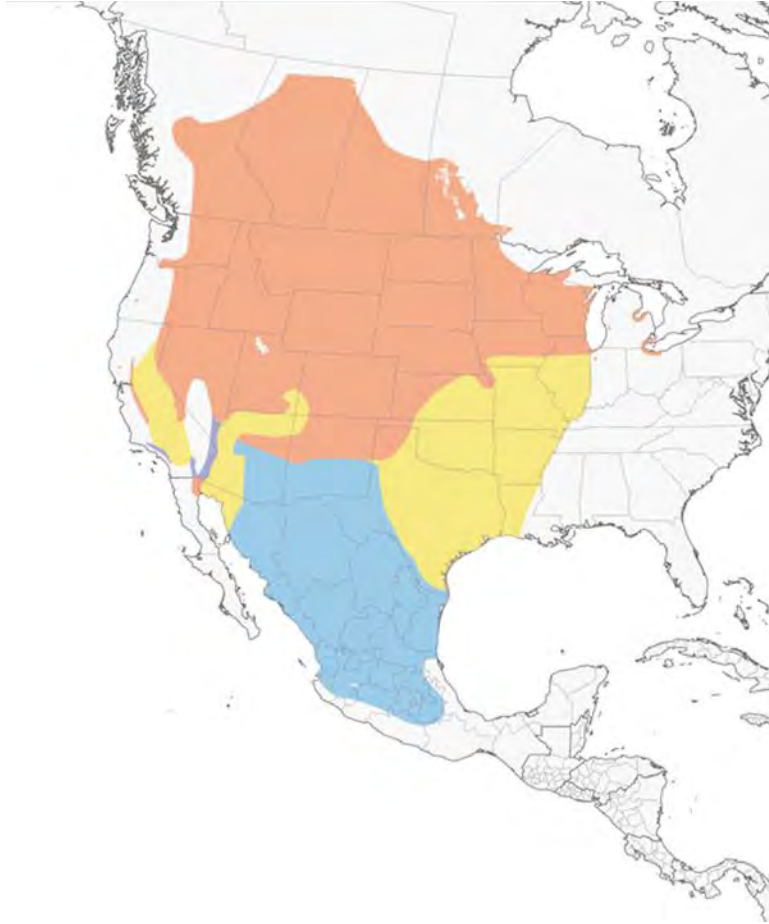


Figure 50. Distribution of the yellow-headed blackbird in the Americas.

Consolidated Literature Cited

- Abele, S.C., Saab, V.A., and Garton, E.O. 2004. Lewis's woodpecker (*Melanerpes lewis*): A technical conservation assessment [online]. Edited by USDA Forest Service, R.M.R. <http://www.fs.fed.us/r2/projects/scp/assessments/lewiswoodpecker.pdf>
- Ackerman, J.T., Hartman, C.A., Herzog, M.P., Takekawa, J.Y., Robinson, J.A., Oring, L.W., Skorupa, J.P., and Boettcher, R. 2020. American Avocet (*Recurvirostra americana*) (online data) Birds of the World. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Date Published: March 4, 2020. Date Accessed: July 30, 2024. Available at: <https://doi.org/10.2173/bow.ameavo.01>
- All About Birds. 2024a. Brewer's sparrow identification (website). Cornell Lab of Ornithology, Last Modified: 2024. Date Accessed: November 6, 2024. https://www.allaboutbirds.org/guide/Brewers_Sparrow/id
- All About Birds. 2024b. Distribution of the ladder-backed woodpecker: *Dryobates scalaris* (website). (Map). Cornell Lab of Ornithology, Last Modified: 2024. Date Accessed: August 21, 2024. <https://birdsoftheworld.org/bow/species/labwoo/cur/introduction?media=figures>
- All About Birds. 2024c. Eastern blue birds (website). Cornell Lab of Ornithology, Last Modified: 2024. Date Accessed: November 6, 2024. https://www.allaboutbirds.org/guide/Eastern_Bluebird/
- All About Birds. 2024d. Grasshopper sparrow (website). Cornell Lab of Ornithology, Last Modified: 2024. Date Accessed: November 6, 2024. https://www.allaboutbirds.org/guide/Grasshopper_Sparrow
- All About Birds. 2024e. Ladder-backed woodpecker: Range map (website). (Map). Cornell Lab of Ornithology, Last Modified: 2024. Date Accessed: November 6, 2024. https://www.allaboutbirds.org/guide/Ladder-backed_Woodpecker/maps-range
- All About Birds. 2024f. Marsh wren: Range map (website). (Map). Cornell Lab of Ornithology, Last Modified: 2024. Date Accessed: November 6, 2024. https://www.allaboutbirds.org/guide/Marsh_Wren/maps-range
- All About Birds. 2024g. Western wood-pewee (website). Cornell Lab of Ornithology, Last Modified: 2024. Date Accessed: November 8, 2024. https://www.allaboutbirds.org/guide/Western_Wood-Pewee/overview
- Amme, N., Pague, C.A., and Redmond, M.D. 2020. Change in piñon-juniper woodland cover since Euro-American settlement: Expansion versus contraction associated with soil properties. *Rangeland ecology & management* 73(6): 847-855. <https://doi.org/10.1016/j.rama.2020.07.001>
- Anacker, B.L., Gogol-Prokurat, M., Leidholm, K., and Schoenig, S. 2013. Climate change vulnerability assessment of rare plants in California. *Madroño* 60: 193-210. <https://doi.org/10.3120/0024-9637-60.3.193>
- Audubon Field Guide. 2024. Spizella pusilla, field sparrow (website). Audubon, Last Modified: 2024. Date Accessed: August 22, 2024. <https://www.audubon.org/field-guide/bird/field-sparrow>
- Augustine, D., Davidson, A., Dickinson, K., and Van Pelt, B. 2021. Thinking like a grassland: Challenges and opportunities for biodiversity conservation in the Great Plains of North America. *Rangeland ecology & management* 78: 281-295. <https://www.doi.org/10.1016/j.rama.2019.09.001>
- Augustine, D.J., Matchett, M.R., Toombs, T.P., Cully Jr, J.F., Johnson, T.L., and Sidle, J.G. 2008. Spatiotemporal dynamics of black-tailed prairie dog colonies affected by plague. *Landscape ecology* 23(3): 255-267. <https://pubs.usgs.gov/publication/70031943>
- Avian Power Line Interaction Committee. 2006. Suggested practices for avian protection on power lines: The state of the art in 2006. Edited by Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA.
- Avibase. 2024. Tyrannus forficatus, Scissor-tailed flycatcher (website). Avibase, Last Modified: 2024. Date Accessed: May 8, 2024. <https://avibase.bsc-eoc.org/species.jsp?avibaseid=6F65F82B>
- Ball, R.M. and Avise, J.C. 1992. Mitochondrial DNA phylogeographic differentiation among avian populations and the evolutionary significance of subspecies. *The auk* 109(3): 626-636. <https://www.jstor.org/stable/4088377>
- Barlow, J.C., Leckie, S.N., and Baril, C.T. 2020a. Gray vireo, Vireo vicinior, conservation and management: Birds of the world. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: March 4, 2020. <https://birdsoftheworld.org/bow/species/gryvireo/1.0/conservation>

- Barlow, J.C., Leckie, S.N., and Baril, C.T. 2020b. Vireo vicinior, gray vireo: Birds of the world. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: March 4, 2020. <https://doi.org/10.2173/bow.gryvir.01>
- Bleho, B., Ellison, K., Hill, D.P., and Gould, L.K. 2020. Calcarius ornatus, chestnut-collared longspur: Birds of the world. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: March 4, 2020. <https://birdsoftheworld.org/bow/species/chclon/cur/introduction>
- Brodhead, K., Dawson, C., Fresques, T., Krening, P., and Sell, R. 2023. BLM Colorado sensitive species list. Washington, DC: U.S. Department of the Interior, Bureau of Land Management (BLM). 100 p. https://www.blm.gov/sites/default/files/docs/2023-09/BLM%20CO%20Sensitive%20Species%20List_2023.pdf
- Brua, R.B. 2020. Oxyura jamaicensis, ruddy duck: Birds of the world. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: March 4, 2020. <https://doi.org/10.2173/bow.rudduc.01>
- Brush, T. 1983. Cavity use by secondary cavity-nesting birds and response to manipulations. The condor 85(4): 461-466. <http://www.jstor.org/stable/1367987>
- Buehler, D.A. 2020. Bald Eagle (Haliaeetus leucocephalus), version 1.0 (website). Cornell Lab of Ornithology, Last Modified: 04 March
- Cable, T.T., Seltman, S., and Cook, K.J. 1996. Birds of Cimarron National Grassland. Gen. Tech. Rep. RM-GTR-281. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 108 p. <https://doi.org/10.2737/RM-GTR-281>
- Cannings, R.J., Angell, T., Pyle, P., and Patten, M.A. 2017. Western Screech-Owl (Megascops kennicottii), Version 3.0 (online data) The Birds of North America [Online]. (Version May 4, 2017). Ithaca, NY: Cornell Lab of Ornithology. Date Published: July 23, 2019 Available at: <https://doi.org/10.2173/bna.wesowl.1.03>
- Cardiff, S.W. and Dittman, D.L. 2020. Myiarchus cinerascens, ash-throated flycatcher: Birds of the world. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: 2020. <https://doi.org/10.2173/bow.astfly.01>
- Cassirer, E.F., Groves, C.R., and Wallen, R.L. 1991. Distribution and population status of Harlequin ducks in Idaho. The Wilson Bulletin 103(4): 723-725.
- Collins, C.P. and Reynolds, T.D. 2005. Ferruginous hawk (Buteo regalis), a technical conservation assessment. Lakewood, CO: USDA Forest Service, Rocky Mountain Region. 64 p.
- Colorado Bird Atlas Partnership. 2016. The Second Colorado Breeding Bird Atlas online database (online data). Denver, CO: Colorado Bird Atlas Partnership and Colorado Parks and Wildlife (CPW) Available at: <http://www.cobreedingbirdatlasii.org>
- Colorado Natural Heritage Program. 2015. Climate Change Vulnerability Assessment for Colorado Bureau of Land Management. Series Editor: Decker, K., Grunau, L., Handwerk, J. and Siemers, J., eds. Fort Collins, CO: Colorado Natural Heritage Program, Colorado State University. 126 p.
- Conway, C., Eddleman, W., and Anderson, S. 1994. Nesting success and survival of Virginia rails and soras. The Wilson bulletin 106(3): 466-473. https://www.researchgate.net/publication/253858145_Nesting_success_and_survival_of_Virginia_Rails_and_Soras
- Conway, C.J. and Pyle, P. 2024. Rallus limicola, Virginia rail: Birds of the world. (Version 1.1). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: October 22, 2024. <https://doi.org/10.2173/bow.virrai.01.1>
- CPW, Colorado Parks and Wildlife. 2015. State wildlife action plan: A strategy for conserving wildlife in Colorado. Denver, CO. 865 p. <https://cpw.widencollective.com/assets/share/asset/nbenjdfemi>
- Cully, J.F., Jr., Carter, L.G., and Gage, K.L. 2000. New records of sylvatic plague in Kansas. Journal of wildlife diseases 36(2): 389-392. <https://pubs.usgs.gov/publication/70022860>
- Dabbert, C.B., Pleasant, G., and Schemnitz, S.D. 2020. Scaled quail (Callipepla squamata), version 1.0 (website). Birds of the World, Last Modified: November 25, 2009. Date Accessed: August 6, 2024. <https://doi.org/10.2173/bow.scaqua.01>
- Dechant, J.A., Zimmerman, A.L., Johnson, D.H., Goldade, C.M., Jamison, B.E., and Euliss, B.R. 2002. Effects of Management Practices on Wetland Birds: American Avocet. Dated: January, 2002. Jamestown, ND: U.S. Department of the Interior, Geological Survey (USGS), Northern Prairie Research Center. 33 p. <https://doi.org/10.3133/70159825>
- DeSante, D.F. and George, T.L. 1994. Population trends in the landbirds of western North America. Studies in avian biology 15: 173-190.

- https://sora.unm.edu/sites/default/files/SAB_015_1994%20P173-190_Population%20Trends%20in%20the%20Landbirds%20of%20Western%20North%20America_David%20F.%20DeSante.%20T.%20Luke%20George.pdf
- Dinsmore, S.J. 2003. Mountain plover (*charadrius montanus*): A technical conservation assessment. Dated: December 8, 2003. Mississippi State, MS: USDA Forest Service, Rocky Mountain Region, Species Conservation Project. 40 p.
https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5182044.pdf
- DUPLICATE, Kuhn, B., Nelson, B.E., and Hartman, R.L. 2011. A Floristic Inventory of the Cimarron National Grassland (Kansas) and the Comanche National Grassland (Colorado). *Journal of the Botanical Research Institute of Texas* 5(2): 753-772. <https://www.jstor.org/stable/41972334>
- eBird. 2024. *Spizella breweri*, Brewer's sparrow (website). Cornell Lab of Ornithology, Last Modified: 2024. Date Accessed: August 22, 2024. <https://ebird.org/species/brespa>
- Eddleman, W.R. 2020a. *Piranga flava*, hepatic tanager: Birds of the world. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: March 4, 2020.
<https://doi.org/10.2173/bow.heptan.01>
- Eddleman, W.R. 2020b. *Piranga flava*, Hepatic tanager, conservation and management: Birds of the world. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: March 4, 2020.
<https://doi.org/10.2173/bow.heptan.01>
- Edwards, E.P. and Lea, R.B. 1955. Birds of the Monserrate Area, Chiapas, Mexico. *The condor* 57(1): 31-54. <http://www.jstor.org/stable/1364696>
- Fink, D., Johnston, A., Strimas-Mackey, M., Auer, T., Hochachka, W.M., Ligocki, S., Oldham Jaromczyk, L., Robinson, O., Wood, C., Kelling, S., and Rodewald, A.D. 2023. A Double machine learning trend model for citizen science data. *Methods in Ecology and Evolution* 14(9): 2435-2448.
<https://doi.org/10.1111/2041-210X.14186>
- Fischer, D.H. 1980. Breeding biology of curve-billed thrashers and long-billed thrashers in southern Texas. *The condor* 82(4): 392-397. <https://www.doi.org/10.2307/1367560>
- Fitch, F.W., Jr. 1950. Life history and ecology of the scissor-tailed flycatcher, *Muscivora forficata*. *The auk* 67(2): 145-168. <http://www.jstor.org/stable/4081209>
- Franzreb, K.E. 1989. Ecology and conservation of the endangered least Bell's vireo. Biological Report 89(1). U.S. Department of the Interior, Fish and Wildlife Service, Sacramento Endangered Species Office. 17 p. <https://apps.dtic.mil/sti/pdfs/ADA322886.pdf>
- FWS, U.S. Fish and Wildlife Service. 2007. National bald eagle management guidelines. Edited by U.S. Fish and Wildlife Service. Dated: May. Washington, DC: U.S. Department of the Interior, Fish and Wildlife Service. 25 p. https://www.fws.gov/sites/default/files/documents/national-bald-eagle-management-guidelines_0.pdf
- FWS, U.S. Fish and Wildlife Service. 2021. Birds of conservation concern 2021. Edited by U.S. Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management. Dated: April 2021. Falls Church, Virginia: U.S. Department of the Interior, Fish and Wildlife Service, Migratory Birds. 48 p.
- Gaylord, M.L., Kolb, T.E., Pockman, W.T., Plaut, J.A., Yezpe, E.A., Macalady, A.K., Pangle, R.E., and McDowell, N.G. 2013. Drought predisposes piñon-juniper woodlands to insect attacks and mortality. *New Phytologist* 198(2) <https://nph.onlinelibrary.wiley.com/doi/full/10.1111/nph.12174>
- GBIF, Global Biodiversity Information Facility. 2024. *Cicadula patoria* (online data) Ball, 1900. Copenhagen, DK: Global Core Biodata Resource. Date Published: 2024. Date Accessed: August 22, 2024. Available at: <https://www.gbif.org/species/9220466>
- Giezentanner, J.B. and Ryder, R.A. 1969. Avian distribution and population fluctuations at the Pawnee site. Tech. Rep. No. 28. Fort Collins, CO: Colorado State University. 30 p.
<http://hdl.handle.net/10217/15785>
- Giroux, J.-F. 1985. Nest-Sites and Superclutches of American Avocets on Artificial Islands. *Canadian Journal of Zoology* 63: 1302-1305. <https://doi.org/10.1139/z85-196>
- Goguen, C.B. and Mathews, N.E. 1998. Songbird community composition and nesting success in grazed and ungrazed piñon-juniper woodlands. *The journal of wildlife management* 62(2): 474-484.
<https://doi.org/10.2307/3802321>
- Gray, V.M. and Greaves, J.m. 1991. Riparian forest as habitat for the least Bell's vireo. Los Angeles, CA: Sepulveda Basin Wildlife Reserve. 605-611 pp.

- <https://www.sepulveda-basin-wildlife.org/pdf/Riparian%20Forest%20as%20Habitat%20for%20Least%20Bell%20Vireo.pdf>
- Greaves, J.M. 1987. Nest-site tenacity of least Bell's vireos. Santa Barbara, CA: Western Field Ornithologists. 5 p. [https://archive.westernfieldornithologists.org/archive/V18/18\(1\)-p0050-p0054.pdf](https://archive.westernfieldornithologists.org/archive/V18/18(1)-p0050-p0054.pdf)
- Greaves, J.M. 1989. Maintaining site integrity for breeding least Bell's vireos. Gen. Tech. Rep. PSW-GTR-110. Berkeley, CA: USDA Forest Service, Pacific Southwest Forest and Range Experiment Station. 293-298 pp. https://www.fs.usda.gov/psw/publications/documents/psw_gtr110/psw_gtr110_f_greaves.pdf
- Holmes, J.A. and Johnson, M.J. 2005a. Brewer's sparrow (*Spizella breweri*): A technical conservation assessment. Dated: January 13, 2005. Durango, CO: USDA Forest Service, Rocky Mountain Region, Species Conservation Project. 57 p. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5182051.pdf
- Holmes, J.A. and Johnson, M.J. 2005b. Brewer's sparrow (*Spizella breweri*): A technical conservation assessment [online]. Edited by U.S. Department of Agriculture, Forest Service, Rocky Mountain Region. <http://www.fs.fed.us/r2/projects/scp/assessments/brewerssparrow.pdf>
- Hostetler, J.A., Sauer, J.R., Hines, J.E., Ziolkowski, D., and Lutmerding, M. 2023. The North American breeding bird survey, analysis results 1966 - 2022 (ScienceBase Online Data) U.S. Department of the Interior, Geological Survey (USGS), Eastern Ecological Center. Originally Released: September 29, 2023. <https://doi.org/10.5066/P9IU1UZ6>
- Hubbard, J.P. 1978. Revised check-list of the birds of New Mexico. Albuquerque, NM: New Mexico Ornithological Society. 103 p. <https://archive.org/details/revisedchecklist0000jphu>
- Hughes, J.M. 2015. Yellow-billed Cuckoo (*Coccyzus americanus*). Version 2.0. In Poole, A., ed. The Birds of North America Online. Ithaca, NY: Cornell Lab of Ornithology. <https://doi.org/10.2173/bna.418>
- IMBCR, Integrated Monitoring in Bird Conservation Regions. 2024. Rocky Mountain Avian Data Center [BETA] (website). Bird Conservancy of the Rockies, Last Modified: 2024. Date Accessed: April 25, 2024. <https://bird-conservancy.shinyapps.io/rmadc/>
- Integrated Taxonomic Information System (ITIS). 2024a. ITIS (online data) ITIS. Date Published: 11/22/2024. Date Accessed: 11/22/2024. Available at: <https://doi.org/10.5066/F7KH0KBK>
- Integrated Taxonomic Information System (ITIS). 2024b. *Spizella pusilla*, (A. Wilson, 1810), Taxonomic serial number 179443 (website). (Virtual Dataset). United States Department of Interior, Geological Survey (USGS), Last Modified: 2024. Date Accessed: August 8, 2024. https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=179443#null
- Integrated Taxonomic Information System (ITIS). 2024c. *Toxostoma curvirostre*, (Swainson, 1827), Taxonomic serial number 178637 (website). (Virtual Dataset). United States Department of Interior, Geological Survey (USGS), Last Modified: 2024. Date Accessed: April 29, 2024. https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=178637#null
- ITIS, Integrated Taxonomic Information System. 2024a. *Calamospiza melanocorys*, Stejneger, 1885, Taxonomic serial number 179312 (website). (Virtual Dataset). U.S. Department of the Interior, Geological Survey (USGS), Last Modified: 2024. Date Accessed: August 5, 2024. https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=179312#null
- ITIS, Integrated Taxonomic Information System. 2024b. *Dryobates scalaris*, (Wagler, 1829), Taxonomic serial number 1145275 (website). (Virtual Dataset). U.S. Department of the Interior, Geological Survey (USGS), Last Modified: 2024. Date Accessed: August 20, 2024. https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=1145275#null
- ITIS, Integrated Taxonomic Information System. 2024c. *Lanius ludovicianus*, Linnaeus, 1766, Taxonomic serial number 178515 (website). (Virtual Dataset). U.S. Department of the Interior, Geological Survey (USGS), Last Modified: 2024. Date Accessed: June 24, 2024. https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=178515#null
- ITIS, Integrated Taxonomic Information System. 2024d. *Numenius americanus*, Bechstein, 1812, Taxonomic serial number 176953 (website). (Virtual Dataset). U.S. Department of the Interior, Geological Survey (USGS), Last Modified: 2024. Date Accessed: August 23, 2024. https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=176953#null
- ITIS, Integrated Taxonomic Information System. 2024e. *Oxyura jamaicensis*, (J. F. Gmelin, 1789), Taxonomic serial number 175175 (website). (Virtual Dataset). U.S. Department of the Interior,

- Geological Survey (USGS), Last Modified: 2024. Date Accessed: August 5, 2024.
https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=175175#null
- ITIS, Integrated Taxonomic Information System. 2024f. *Piranga flava*, (Vieillot, 1822), Taxonomic serial number 179884 (website). (Virtual Dataset). U.S. Department of the Interior, Geological Survey (USGS), Last Modified: 2024. Date Accessed: May 8, 2024.
https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=179884#null
- Johnson, K. and Balda, R.P. 2020. Pinyon jay (*Gymnorhinus cyanocephalus*): Birds of the world. (Version 2.0). Ithaca, NY, USA: Cornell Lab of Ornithology. Originally Released: March 19, 2020.
<https://doi.org/10.2173/bow.pinjay.02>
- Johnson, L.A., Haukos, D.A., Smith, L.M., and McMurry, S.T. 2012. Physical loss and modification of Southern Great Plains playas. *Journal of Environmental Management* 112: 275-283.
<https://doi.org/10.1016/j.jenvman.2012.07.014>
- Knopf, F.L. and Wunder, M.B. 2023. *Anarhynchus montanus*, mountain plover: Birds of the world. (Version 1.1). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: October 24, 2023.
<https://birdsoftheworld.org/bow/species/mouplo/cur/introduction>
- Kochert, M.N., Steenhof, K., Carpenter, L.B., and Marzluff, J.M. 1999. Effects of fire on golden eagle territory occupancy and reproductive success. *The Journal of Wildlife Management* 63(3): 773-780. <https://doi.org/10.2307/3802790>
- Kochert, M.N., Steenhof, K., McIntyre, C.L., and Craig, E.H. 2002. Golden Eagle (*Aquila chrysaetos*). In Poole, A. and Gill, F., eds., *The Birds of North America*, No. 684. Philadelphia, PA: The Birds of North America, Inc. 1-19 pp.
- Kroodsma, D.E. and Verner, J. 2020. *Cistothorus palustris*, marsh wren: Birds of the world. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: March 4, 2020.
<https://birdsoftheworld.org/bow/species/marwre/cur/introduction>
- Kuhn, B., Nelson, B.E., and Hartman, R.L. 2011. A Floristic Inventory of the Cimarron National Grassland (Kansas) and the Comanche National Grassland (Colorado). *Journal of the Botanical Research Institute of Texas* 5(2): 753-772. <http://www.jstor.org/stable/41972334>
- Kus, B., Hopp, S.L., Johnson, R.R., Brown, B.T., and Reiley, B.M. 2022. *Vireo bellii*, Bell's vireo: Birds of the world. (Version 2.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: November 18, 2022. <https://doi.org/10.2173/bow.belvir.02>
- Locklear, J.H. 2019. Sandsage prairie: floristics, structure, and dynamics of a Great Plains plant community. *Journal of the botanical research institute of texas* 13(1): 253-278.
<https://doi.org/10.17348/jbrit.v13.i1.851>
- Locklear, J.H. 2021. The Sandsage prairie ecological system: Biodiversity hotspot for the Great Plains. *Natural areas journal* 41(1): 64-74. <https://doi.org/10.3375/043.041.0109>
- Lowther, P.E., Pyle, P., and Patten, M.A. 2020. *Dryobates scalaris*, ladder-backed woodpecker: Birds of the world. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: March 4, 2020. <https://birdsoftheworld.org/bow/species/labwoo/cur/introduction>
- Marks, J.S., Evans, D.L., and Holt, D.W. 2020. Long-eared Owl (*Asio otus*): Birds of the World (Online data). (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: March 4, 2020.
<https://doi.org/10.2173/bow.loeowl.01>
- Martin, T.E. 2001. Abiotic vs. biotic influences on habitat selection of coexisting species: Climate change impacts? *Ecology* 82(1): 175-188. [https://doi.org/10.1890/0012-9658\(2001\)082\[0175:AVBIOH\]2.0.CO;2](https://doi.org/10.1890/0012-9658(2001)082[0175:AVBIOH]2.0.CO;2)
- Marzluff, J.M., Knick, S.T., Vekasy, M.S., Schueck, L.S., and Zarriello, T.J. 1997. Spatial use and habitat selection of golden eagles in southwestern Idaho. *The Auk* 114(4): 673-687.
<https://doi.org/10.2307/4089287>
- Meddens, A.J.H., Hicke, J.A., Macalady, A.K., Buotte, P.C., Cowles, T.R., and Allen, C.D. 2015. Patterns and causes of observed piñon pine mortality in the southwestern United States. *New Phytologist* 206(1): 91-97. <https://www.doi.org/10.1111/nph.13193>
- Mickey, F.W. 1943. Breeding habits of McCown's longspur. *The Auk* 60(2): 181-209.
<https://www.doi.org/10.2307/4079644>
- NatureServe. 2024. NatureServe Explorer (online data) NatureServe. Date Published: April 17, 2024. Date Accessed: June 9, 2024. Available at: <https://explorer.natureserve.org>
- Nolte, K.R. and Fulbright, T.E. 1996. Nesting ecology of scissor-tailed flycatchers in south Texas. *The Wilson bulletin* 108(2): 302-316. <https://www.jstor.org/stable/4163684>

- Olson, C.R. and Martin, T.E. (2020). Virginia's Warbler (*Leiothlypis virginiae*), version 1.0. Cornell Lab of Ornithology. Date Created: 3/28/2023. Available at: <https://doi.org/10.2173/bow.virwar.01>
- Ortega, J.C. and Ortega, C.P. 2016. Contributing variables to nest survival, and the breeding biology, of the western wood-pewee (*Contopus sordidulus*) in southwestern Colorado. *The southwestern naturalist* 61(4): 312-320. <https://www.jstor.org/stable/26748660>
- Paige, C. and Ritter, S.A. 1999. Birds in a sagebrush sea. Managing sagebrush habitats for bird communities. Edited by Partners in Flight, Western Working Group. Boise, ID. 52 p.
- Parker, T.H. 1999. Responses of Bell's vireos to brood parasitism by the brown-headed cowbird in Kansas. *The Wilson bulletin* 111: 499. <https://sora.unm.edu/sites/default/files/journals/wilson/v111n04/p0499-p0504.pdf>
- Petersen, K.L. and Best, L.B. 1985. Nest-site selection by sage sparrows. *The Condor* 87(2): 217-221. <http://www.jstor.org/stable/1366885>
- PIF, Partners in Flight. 2022. Avian conservation assessment and population estimates databases (online data). Date Published: May 16, 2022 Available at: <https://pif.birdconservancy.org/ACAD/Database.aspx>
- Reese, J., McLaren, M.F., Timmer, J.M., Smith, M., Walker, T., White, C., Latif, Q., Pavlacky, D., and Sparks, R.R.A. 2024. 2023 Field Season Report: Integrated Monitoring in Bird Conservation Regions (Online dataset). Brighton, CO: Bird Conservancy of the Rockies. Originally Released: March 20, 2024. https://bird-conservancy-of-the-rockies.github.io/IMBCR_AnnualReport_2023
- Regosin, J.V. 1994. Scissor-tailed flycatchers eject brown-headed cowbird eggs (expulsión de huevos de molothrus ater por Tyrannus forficata). *Journal of field ornithology* 65(4): 508-511. <https://www.jstor.org/stable/20065863>
- Regosin, J.V. 2020. *Tyrannus forficatus*, scissor-tailed flycatcher: Birds of the world. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: March 4, 2020. <https://birdsoftheworld.org/bow/species/sctfly/cur/introduction>
- Regosin, J.V. and Pruett-Jones, S. 1995. Aspects of breeding biology and social organization in the scissor-tailed flycatcher. *The condor* 97(1): 154-164. <https://doi.org/10.2307/1368993>
- Rohweder, M.R. 2022. Kansas Wildlife Action Plan. 3rd ed. Dated: June, 2022. Pratt, KS: Ecological Services Section, Kansas Department of Wildlife and Parks. 183 p. <https://ksoutdoors.com/Services/Kansas-SWAP>
- Romme, W.H., Allen, C.D., Bailey, J.D., Baker, W.L., Bestelmeyer, B.T., Brown, P.M., Eisenhart, K.S., Floyd, M.L., Huffman, D.W., Jacobs, B.F., Miller, R.F., Muldavin, E.H., Swetnam, T.W., Tausch, R.J., and Weisberg, P.J. 2009. Historical and modern disturbance regimes, stand structures, and landscape dynamics in piñon-juniper vegetation of the western United States. *Rangeland ecology & management* 62(3): 203-222. <https://doi.org/10.2111/08-188R1.1>
- Rondeau, R.J., Decker, K.L., and Doyle, G.A. 2018. Potential consequences of repeated severe drought for shortgrass steppe species. *Rangeland Ecology & Management* 71(1): 91-97. <https://doi.org/10.1016/j.rama.2017.07.002>
- Rotenberry, J.T., Patten, M.A., and Preston, K.L. 1999. Brewer's sparrow: *Spizella breweri*. In Rodewald, P.G., ed. *The Birds of North America*. Ithica: Cornell Lab of Ornithology.
- Runstadler, J.A. and Puryear, W.B. 2024. The virus is out of the barn: the emergence of HPAI as a pathogen of avian and mammalian wildlife around the globe. *American Journal of Veterinary Research* 85(5): 1-7. <https://doi.org/10.2460/ajvr.24.01.0018>
- Rush, S.A., Weitzel, S.L., Trent, J.A., and Soehren, E.C. 2024. Will a changing climate affect hatching success in cavity-nesting birds: A case study with eastern bluebirds (*Sialia sialis*)? *Science progress* 107(2): 14. <https://doi.org/10.1177/00368504241245222>
- Sedgwick, J.A. 1987. Avian habitat relationships in pinyon-juniper woodland. *Wilson Bulletin* 99(3): 413-431.
- Sedgwick, J.A. 2006. Long-billed curlew (*numenius americanus*): A technical conservation assessment. Dated: December 12, 2006. Durango, CO: USDA Forest Service, Rocky Mountain Region, Species Conservation Project. 2-56 pp. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5182037.pdf
- Shane, T.G. 2020a. *Calamospiza melanocorys*, lark bunting: Birds of the world. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: March 4, 2020. <https://birdsoftheworld.org/bow/species/larbun/cur/introduction>

- Shane, T.G. (2020b). Lark Bunting (*Calamospiza melanocorys*), version 1.0. Cornell Lab of Ornithology. Available at: <https://doi.org/10.2173/bow.larbun.01>
- Shane, T.G. and Seltman, S.S. 1995. Recent bird mortality at a Topeka television tower. Kansas Ornithological Society bulletin 46: 36-40.
https://www.researchgate.net/publication/340417753_Recent_bird_mortality_at_a_Topeka_tlevision_tower
- Sialis. 2024. All about eastern bluebirds (*Sialia sialis*) (EABL) (website). Sialis, Last Modified: 2024. Date Accessed: August 23, 2024. <https://www.sialis.org/eablbio/>
- Sidle, J.G., Ball, M., Byer, T., Chynoweth, J.J., Foli, G., Hodorff, R., Moravek, G., Peterson, R., and Svingen, D.N. 2001. Occurrence of Burrowing Owls in black-tailed prairie dog colonies on Great Plains National Grasslands. *Journal of Raptor Research* 35(4): 316-321.
- Slater, G.L. 2004. Grasshopper sparrow (*Ammodramus savannarum*): A technical conservation assessment. Dated: October 7, 2004. Lakewood, CO: USDA Forest Service, Rocky Mountain Region. 45 p. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5182057.pdf
- Smith, D.M., Driscoll, K.P., Warren, S.D., and Finch, D.M. 2020. Riparian and groundwater-dependent ecosystems of the Bridger-Teton National Forest: An assessment of resources and current conditions. Gen. Tech. Rep. RMRS-GTR-407. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 204 p. <https://doi.org/10.2737/RMRS-GTR-407>
- Smith, J. 2024. Colorado's shortgrass prairies at risk of dying off as extreme droughts become more common. *Colorado Sun*, February 2, 2024 Agriculture, 4 p.
<https://coloradosun.com/2024/02/02/colorados-shortgrass-prairies-dying-off-drought/>
- Smith, S.B. and Greenlaw, J.S. 2020. *Pipilo maculatus*, spotted towhee: Birds of the world. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: March 4, 2020.
<https://birdsoftheworld.org/bow/species/spotow/cur/introduction>
- Somershoe, S.G., Ammon, E., Boone, J.D., Johnson, K., Darr, M., Witt, C., and Duvuvuei, E. 2020. Conservation Strategy for the Pinyon Jay (*Gymnorhinus cyanocephalus*), Version 1. Pinyon Jay Multi-State Working Group. Lakewood, CO: Partners in Flight, Western Working Group and U.S. Department of the Interior, U.S. Fish and Wildlife Service (FWS). 56 p.
<https://partnersinflight.org/resources/pinyon-jay-working-group/>
- Sordahl, T.A. 1996. Breeding Biology of the American Avocet and Black-Necked Stilt in Northern Utah. *The southwestern naturalist* 41(4): 348-354. <http://www.jstor.org/stable/30055189>
- Spiller, K.J. and Dettmers, R. 2019. Evidence for multiple drivers of aerial insectivore declines in North America. *The Condor* 121(2): 1-13. <https://doi.org/10.1093/condor/duz010>
- Tweit, R.C. 2020. *Toxostoma curvirostre*, curve-billed thrasher: Birds of the world. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: March 4, 2020.
<https://doi.org/10.2173/bow.cubthr.01>
- UDWR, Utah Division of Wildlife Resources. 2024. *Dryobates scalaris*, ladder-backed woodpecker (website). Last Modified: 2024. Date Accessed: August 20, 2024.
<https://fieldguide.wildlife.utah.gov/?species=dryobates%20scalaris>
- USDA Forest Service. 2005a. Cimarron and Comanche National Grassland: Vegetation/Ecology. Specialist Reports. Dated: May 10, 2006. Washington, DC: U.S. Department of Agriculture. 150 p.
- USDA Forest Service. 2005b. Cimarron and Comanche National Grasslands Land Management Plan: Ecological Sustainability. Dated: October 6, 2005. Washington, DC: U.S. Department of Agriculture. 150 p.
- USDA Forest Service. 2008. Cimarron and Comanche National Grasslands: Land Management Plan. Dated: October, 2008. Pueblo, CO: USDA Forest Service. 233 p.
- van Lanen, N.J., Monroe, A.P., and Aldridge, C.L. 2023. A hidden cost of single species management: Habitat-relationships reveal potential negative effects of conifer removal on a non-target species. *Biological Conservation* 280: 1-10. <https://www.doi.org/10.1016/j.biocon.2023.109959>
- Van Riper, C., III, Hatten, J.R., Giernakowski, J.T., Mattson, D., Holmes, J.A., Johnson, M.J., Nowak, E.M., Ironside, K., Peters, M., Heinrich, P., Cole, K.L., Truettner, C., and Schwalbe, C.R. 2014. Projecting climate effects on birds and reptiles of the southwestern United States. Open-File Rep 2014-1050. Reston, VA: U.S. Department of the Interior, Geological Survey (USGS). 112 p.
<https://pubs.usgs.gov/publication/ofr20141050>

- Van Scoyoc, M. 2024. Species Occurrence Data for the Cimarron-Comanche National Grasslands (HTML output auto-generated from multiple data sources such as iDigBio, GBIF, and others). Dated: April 2024. Denver, CO: USDA Forest Service, Mountain Planning Service Group.
- Vierling, K.T., Saab, V.A., and Tobalske, B.W. 2020. *Melanerpes lewis*, Lewis's woodpecker: Birds of the world. (Version 1.0). Ithaca, NY: Cornell Lab of Ornithology. Originally Released: March 4, 2020. <https://birdsoftheworld.org/bow/species/lewoo/cur/introduction>
- Wiens, J.A. and Rotenberry, J.T. 1981. Habitat associations and community structure of birds in shrubsteppe environments. *Ecological Monographs* 51(1): 21-42.
- Wiggins, D.A. 2005. Loggerhead shrike (*Lanius ludovicianus*): A technical conservation assessment. Dated: February 10, 2005. Oklahoma City, OK: USDA Forest Service, Rocky Mountain Region, Species Conservation Project. 41 p. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5182049.pdf
- Wilson, J.K. 1976. Nesting success of the lark bunting near the periphery of its breeding range. *Kansas Ornithological Society bulletin* 27(2): 13-24. <https://www.ksbirds.org/kos/bulletin/Vol27No2.pdf>
- Winter, S. 1999a. Plant and breeding bird communities of black-tailed prairie dog colonies and non-colonized areas in southwest Kansas and southeast Colorado. Master of Science Thesis. School of natural resources: Dissertations, theses, and student research, Kansas State University, Manhattan, KS. 200 p. <https://digitalcommons.unl.edu/natresdiss/95>
- Winter, S.L. 1999b. Plant and breeding bird communities of black-tailed prairie dog colonies and non-colonized areas in southwest Kansas and southeast Colorado. Master of Science. College of Arts and Sciences, Kansas State University, Manhattan, KS. 196 p. <https://digitalcommons.unl.edu/natresdiss/95/>
- With, K.A. 1994. The hazards of nesting near shrubs for a grassland bird, the McCown's longspur. *The Condor* 96(4): 1009-1019. <https://doi.org/10.2307/1369110>
- With, K.A. 2021. Thick-billed longspur (*Rhynchophanes mccownii*). (Version 1.1) Birds of the World. Originally Released: August 18, 2021. <https://doi.org/10.2173/bow.mcclon.01.1>
- Woodin, M.C. and Swanson, G.A. 1989. Foods and dietary strategies of prairie-nesting ruddy ducks and redheads. *The condor* 91(2): 280-287. <http://www.jstor.org/stable/1368305>
- Yosef, R. 2001. Nesting ecology of resident loggerhead shrikes in southcentral Florida. *Wilson Bulletin* 113(3): 279-284.



Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Cimarron and Comanche National Grasslands | Fish Species Evaluations for Assessment | June 2025

Species Evaluation Report for Fish on the Cimarron and Comanche National Grasslands

**Prepared by USDA Forest Service, Mountain Planning Service
Group, Lakewood, Colorado**

Prepared for the Cimarron and Comanche National Grasslands



Cover Photo: Arkansas River Shiner (*Alburnops girardii*)

This is a working document and the information contained herein may be changed or updated by the USDA Forest Service at any time in the future.

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Arkansas Darter

(*Etheostoma cragini*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: The Arkansas Darter is native to the Arkansas River basin and the Grasslands are within its historic range. Arkansas Darters were translocated into Windmill Pond within the Comanche National Grassland in the 1990s (Colorado Parks and Wildlife 2024). The species was last observed in the pond in 2002 (Colorado Parks and Wildlife 2024). CPW surveyed the pond in 2023 and found it was fishless (Colorado Parks and Wildlife 2024). Therefore, it is not known to occur in the plan area.

Year of Last Known Occurrence: 2002

Species Status

G3; S2 in Colorado; S2 in Kansas.

References

Colorado Parks and Wildlife. 2024. Comanche National Grasslands Fisheries Summary Report 2024. Edited by Journey, A. and Vangel, P. Denver, CO: Colorado Parks and Wildlife. 25 p.

Arkansas River Shiner

(Alburnops girardi)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: GBIF contains two records of this species in the plan area from 1962 and 1987, both in the Cimarron River near Point of Rocks within the Cimarron National Grassland (Van Scoyoc 2024).

The Arkansas River Shiner is listed as 'threatened' under the Endangered Species Act. Historically, the species inhabited six major river systems (Lower and Upper Arkansas River, Cimarron River, North Canadian River, and Lower and Upper South Canadian River) (USDI Fish and Wildlife Service (FWS) 2020) (Figure 1). Currently, it is restricted to two isolated populations in the South Canadian River in eastern New Mexico, the Texas panhandle, and Oklahoma (USDI Fish and Wildlife Service (FWS) 2023) (Figure 1).

Federally designated critical habitat occurs in the Cimarron River (70 FR 59808) over 40 miles downstream of the plan area (Figure 1). The species is presumed to be extirpated from the plan area (USDI Fish and Wildlife Service (FWS) 2023) (Figure 1). Therefore, it is not known to occur.

Year of Last Known Occurrence: 1987

Species Status

G2; S1 in Kansas; listed as Tier 1, "Endangered" in Kansas; listed as "Threatened" under the Endangered Species Act.

Maps of Species Range and Known Occurrences in Plan Area

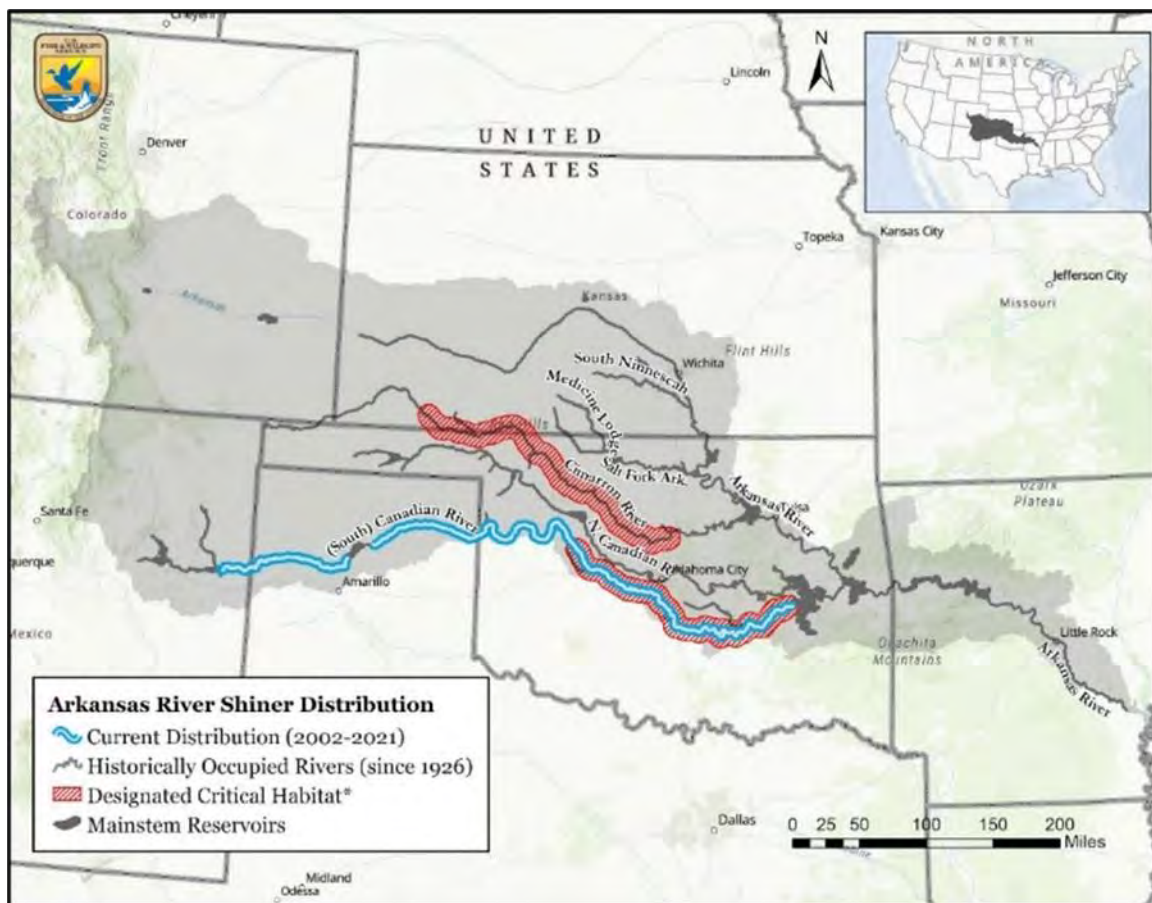


Figure 1. Arkansas River shiner historical and current distributions and designated critical habitat from (USDI Fish and Wildlife Service (FWS) 2023). *Note that the width of critical habitat displayed on this map is not to scale. Designated critical habitat includes the river channel and 300 feet of riparian habitat to each side (left and right) of the riverbank.

References

- USDI Fish and Wildlife Service (FWS). 2020. Arkansas River Shiner (*Notropis girardi*). 5 Year Review: Summary and Evaluation. Dated: September 28, 2020. Tulsa, OK: United States Department of Interior, Fish and Wildlife Service (FWS), Oklahoma Ecological Services Field Office. 20 p.
<https://www.fws.gov/species/arkansas-river-shiner-notropis-girardi>
- USDI Fish and Wildlife Service (FWS). 2023. Arkansas River Shiner (*Notropis girardi*). Draft Recovery Plan. Dated: August, 2023. United States Department of Interior, Fish and Wildlife Service (FWS). 37 p.
- Van Scoyoc, M. 2024. Species Occurrence Data for the Cimarron-Comanche National Grasslands (HTML output auto-generated from multiple data sources such as iDigBio, GBIF, and others). Dated: April 2024. Denver, CO: USDA Forest Service, Mountain Planning Service Group.

Flathead Chub

(*Platygobio gracilis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CNHP contains one occurrence polygon of the species that partially overlaps with the Purgatoire River basin within the Timpas Unit of the Comanche National Grassland from 2007 (Van Scoyoc 2024).; GBIF contains six records of the species in the plan area from 1964-2006 (Van Scoyoc 2024); KSNHP contains one occurrence record of the species in the plan area from 1964. Therefore, this species is known to occur in the plan area.

Year of Last Known Occurrence: 2011 (Colorado Parks and Wildlife 2024)

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Heavy metal contamination, severe storms, non-native piscivores, large impoundments and reservoirs, passage barriers and habitat fragmentation, competition for resources with other fish species, and groundwater depletion represent threats to populations.
 - b. Threats to habitat include altered hydrological regime (surface or aquifer), wastewater from coalbed methane production, heavy metal contamination from mining and quarrying, large impoundments and reservoirs, passage barriers and habitat fragmentation, excessive drought, temperature warming, groundwater depletion, and overgrazing.
2. Declining trends in populations or habitat in the plan area:
 - a. The species is believed to be extirpated from the historic position of its range within the Cimarron National Grassland and is now only present in the Comanche National Grassland. Trends in time also indicate that relative abundance of flathead chub is getting lower in the Comanche National Grassland.
 - b. Habitat quantity and quality for this species has decreased in the plan area, as evidenced by the extirpation of the species from the Cimarron River in the Cimarron National Grassland.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Low relative abundance in the plan area.
 - b. The reach of the Purgatoire River in the plan area is an order of magnitude less than what the species needs to maintain a viable population. Therefore, its ecological conditions are restricted in the plan area due to presence of only a short fragment of suitable aquatic habitat in the plan area.

Species Status

G5; S3 in Colorado; S1 in Kansas; listed as Tier 1, "Candidate" in Colorado; listed as Tier 1, "Threatened" in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Platygobio gracilis is accepted as valid; taxonomic synonyms include *Coregonus angusticeps*, *Pogonichthys communis*, *Cyprinus gracilis*, *Hybopsis gracilis*, *Pogonichthys gulonellus*, *Platygobio pallidus*, *Ceraticthys physignathus* (Integrated Taxonomic Information System (ITIS) 2024a).

Species range

Overall species range

The native range of the Flathead Chub includes Mackenzie, Saskatchewan, and Lake Winnipeg drainages in Yukon, Northwest Territories, Manitoba, Saskatchewan, Alberta, and British Columbia; Missouri-Mississippi River basin from southern Alberta and Montana to Louisiana; upper Rio Grande (including Pecos) drainage, New Mexico. Restricted to Mississippi River proper in Missouri, Illinois, and south; localized in Arkansas River drainage in Oklahoma, Texas, and New Mexico (U.S. Geological Survey (USGS) and Nico) (Figure 2, Figure 3, Figure 4).

Description of how the population in the plan area fits within the overall range

The plan area is located at the edge of the species' range (Figure 2, Figure 3, Figure 4).

Distribution, abundance, and trend in the plan area

Population

Across its range, the Flathead Chub is "generally considered secure in the northern and western portion of its range but imperiled in the southern and eastern parts of its range including the states of Arkansas, Illinois, Kansas, Kentucky, Mississippi, Missouri, Oklahoma, and Texas" (NatureServe 2024, Rahel and Thel 2005). Population declines have occurred throughout the major rivers of Kansas and the species is listed as a threatened species under the Kansas Nongame and Endangered Species Conservation Act (Kansas Department of Wildlife & Parks 2024). Rahel and Thel (2005) state that "in Colorado, the species is considered to be either common or abundant and at a relatively low risk of imperilment in the Arkansas River drainage." However, since then its range and abundance within Colorado has been reduced and it is now recognized as a Tier 1 Species of Greatest Conservation Need by Colorado Parks and Wildlife (Colorado Parks and Wildlife 2015, Bestgen et al. 2016). The population in the Purgatoire River is considered relatively strong (Bramblett and Fausch 1991, Haworth 2015), but its relative abundance declined markedly between 1987 and 2007 (Bestgen et al. 2017). CPW (2024) also suggests a declining trend in the plan area, stating "Trends in time would indicate that relative abundance is getting lower as the most recent samples recorded Flathead Chub making up 2.0% or less of the total catch, compared with 5.0% in historic samples."

The Flathead Chub is believed to be extirpated from the Cimarron River within Kansas, except possibly during high flows (Kansas Department of Wildlife & Parks 2024). It was documented in the Cimarron River within the Cimarron National Grassland in 1964 (Van Scoyoc 2024), but subsequent surveys have been conducted and it has not been found since (Rahel and Thel 2005). It is now considered absent from the Cimarron National Grassland, and only present within the Purgatoire and Timpas Basin of the Comanche National Grassland (Rahel and Thel 2005, Colorado Parks and Wildlife 2024).

The exact population size in the plan area is not known but suspected to be low (Colorado Parks and Wildlife 2024). Bestgen et al. (2017) found that Flathead Chub was the fifth most common native fish species within the Purgatoire River, representing 5.7% of the overall abundance of species in all reaches

sampled. It was considerably less common within the downstream reach of the Purgatoire River that includes the plan area, where it comprised only 3% of overall abundance versus 37% in the upstream reach (Bestgen et al. 2017). This sharp decline in relative abundance is believed to reflect a low population of the species in the plan area.

Habitat

Suitable habitat for the flathead chub includes turbid prairie rivers and their tributaries (Rahel and Thel 2005). In plains rivers, adults primarily use the main channel but can be found in side-channels and backwaters (Rahel and Thel 2005). Younger fish use side-channels and shallower border habitats for rearing (Rahel and Thel 2005). Flathead Chub are rarely found in the clear quiet waters of ponds or lakes, preferring instead highly dynamic and turbid lotic environments (Rahel and Thel 2005). In rivers, they are most common in fast water habitats with predominately small substrates such as sand and gravel (Rahel and Thel 2005). In streams, they occupy fast water habitats and pools with a wider range of substrates (Rahel and Thel 2005). The Flathead Chub has been associated with both high-velocity, deep-water habitats and with lower velocity, shallower habitats (Rahel and Thel 2005). Presence of pools or cover (e.g., tree roots, aquatic plants, woody debris) may facilitate congregations of fish (Rahel and Thel 2005).

The distribution of Flathead Chub in the plan area is currently restricted to the Purgatoire River Basin and Timpas Basin within the Timpas Unit of the Comanche National Grassland, which is a reduction compared to its historic range (Rahel and Thel 2005, Van Scoyoc 2024). CPW (2024) call the Purgatoire River a “bastion” for Flathead Chub because of the low occurrence of barriers. The Minnie Canyon Tributary of the Purgatoire River may be a habitat refuge for Flathead Chub that travel upstream to spawn (Colorado Parks and Wildlife 2024). However, the Purgatoire River is also a relatively small amount of fragmented habitat bounded by the Trinidad Dam upstream and the John Martin Dam downstream on the Arkansas River. As Bestgen et al. (2017) describe, this relatively short reach of habitat threatens persistence of Flathead Chub: “Stable populations of Great Plains pelagic spawning cyprinids are normally associated with continuous stream segments 300-600 river km in length. In contrast, pelagic spawning fishes such as Flathead Chub are either declining or are extirpated from streams the length of the Purgatoire River or shorter (176 river km from Trinidad Reservoir downstream to the Arkansas River, a conservative straight-line distance) ...Flathead Chub have persisted in the Purgatoire River despite being isolated by closure of John Martin Dam downstream in 1943, although their abundance is at the lowest levels ever documented.”

Today, the Cimarron River within the plan area flows only intermittently because of extensive water diversions, groundwater mining and impoundments that have resulted in loss of surface flow. Current occasional flows in the Cimarron after rainfall would not provide the Flathead Chub the full suite of ecological conditions necessary for survival. Habitat in the Purgatoire River has also declined in the plan area due to activities upstream of the plan area, including regulation of discharge by Trinidad Dam, irrigation and crop production, and intensive cattle feeding operations on private property. These activities outside of the plan area have reduced habitat quality within the plan area. Invasive tamarisk has also become the primary riparian species within the Purgatoire River in the plan area, which alters bank stability, channel width, and floodplain hydrology (USDA Forest Service 2005a). Maximum annual peak flows have steadily declined in the Purgatoire River downstream of Trinidad Reservoir (U.S.G.S. station # 07128500, Las Animas gauge, Bestgen et al. 2017). Therefore, there has been a decline in both habitat quality and quantity for this species in the plan area.

Threats (arising from on or off the plan area)

Population

Heavy metal contamination from mining activities represents a threat to populations, as this has been proposed as a contributing factor to the loss of flathead chub in the Arkansas River (Colorado Parks and

Wildlife 2015). This threat is exacerbated by stochastic events such as extreme rainstorms and mudslides, which can flush heavy metals and cause fish kills (Colorado Parks and Wildlife 2015). Non-native piscivores threaten populations through competition and predation, and these effects can be compounded by impoundments that afford other species an advantage over Flathead Chub (Colorado Parks and Wildlife 2015). Reservoirs at the upstream and downstream ends of the Purgatoire River support many invasive species that could potentially invade habitat in the Purgatoire River, particularly Smallmouth Bass in Trinidad Reservoir (Bestgen et al. 2017). Smallmouth Bass have been implicated in the extirpation of Flathead Chub elsewhere across its range (Hoagstrom et al. 2007). Passage barriers, such as dams or diversions, threaten populations by blocking fish movement, impeding spawning, and reducing genetic exchange (Colorado Parks and Wildlife 2015). Flathead Chub has been extirpated in the Arkansas River in western Kansas due to groundwater pumping from the Ogallala Aquifer, so groundwater depletion represents a threat to both populations and habitats (Colorado Parks and Wildlife 2015). Likewise, habitat fragmentation has been associated with extirpation of Flathead Chub and represents a threat to both populations and habitats (Perkin and Gido 2011). While the species is well-adapted to turbid environments, high sediment loads can threaten egg survival by causing suffocation (Bestgen et al. 2016). Red Shiner and Sand Shiner are numerous in the plan area and tend to outcompete Flathead Chub for food resources (Colorado Parks and Wildlife 2024).

Habitat

Threats to habitat include altered hydrological regime (surface or aquifer) from dams and water management, heavy metal contamination of streams from mining and quarrying, and altered flows from urban runoff (Colorado Parks and Wildlife 2015). Impoundments and reservoirs make habitat less favorable for the flathead chub by reducing turbidity and dynamism of the river system (Colorado Parks and Wildlife 2015). Passage barriers reduce habitat quantity and quality via fragmentation or altered turbidity levels (Colorado Parks and Wildlife 2015). Effects of overgrazing can also reduce habitat quality by decreasing channel depth, increasing stream width and intermittency, reducing pool frequency, and altering oxygen and ammonia concentrations through waste production (Colorado Parks and Wildlife 2015, Rahel and Thel 2005). Coalbed methane production presents another threat to habitat by increasing streamflows, converting tributaries from intermittent to perennial flow regimes, altering thermal regimes, and degrading water quality via wastewater (Rahel and Thel 2005). The species has been extirpated in the Arkansas River in western Kansas due to groundwater pumping from the Ogallala Aquifer, so groundwater depletion represents a threat to both populations and habitats (Colorado Parks and Wildlife 2015). Likewise, habitat fragmentation has been associated with extirpation of Flathead Chub and represents a threat to both populations and habitats (Perkin and Gido 2011). The impacts of stream fragmentation are expected to worsen (Perkin et al. 2010) and Great Plains fish species are expected to have a very high vulnerability to increased warming and drying trends (Rice, Seixas, et al. 2018).

Ecological conditions

Ecological condition requirements

The Flathead Chub is associated with turbid plains river and stream systems (Colorado Parks and Wildlife 2015). Its ecological condition requirements include preservation of natural streamflows and turbidity levels appropriate for each life stage, maintenance of stream connectivity and habitat complexity, and prevention of nonnative predators and competitors (Fitzpatrick 2020, Rahel and Thel 2005). Rahel and Thel (2005) indicate that Flathead Chub have a wide temperature range, from 32 to 92.3°F; however, Haworth (2015) found reduced juvenile recruitment when water temperatures exceeded 71.6°F. Recruitment was highest when average daily water temperatures ranged from 63 to 69°F (Haworth 2015). Larvae require stable, low flow conditions to hatch (Haworth 2015).

The Flathead Chub requires freedom from reservoirs and other impoundments, and freedom from the effects of coalbed methane production and overgrazing (Rahel and Thel 2005). Instream barriers can

impair spawning migrations and cause populations to shift downstream over time (Colorado Parks and Wildlife 2024). Flathead Chub also requires sufficient water table to maintain stream surface flows (Rahel and Thel 2005). The species appears to have high tolerance to alkalinity, ammonia, and organic enrichment (Rahel and Thel 2005). In summer and presumably also in winter, deep pools are important as refuge (Rahel and Thel 2005). Backwater habitat may not be heavily used by adults but can be used by other life stages and helps increase prey resources, so reduction in natural flooding is likely detrimental (NatureServe 2024, Colorado Parks and Wildlife 2024, Rahel and Thel 2005).

There is some uncertainty about the spawning habitat preferences of Flathead Chub, with some studies indicating a preference for riffle habitat while others suggesting that spawning may occur in pools (Rahel and Thel 2005). Bestgen et al. (2016) conclude that eggs of the Flathead Chub can “likely successfully reproduce in a variety of stream environments...However, high sediment loads sometimes present in turbid plains streams may suffocate fish eggs deposited in low velocity areas such as floodplains or large pools.” The Flathead Chub relies on flood flows and sufficiently long stream reaches to successfully spawn (Haworth and Bestgen 2016, Kansas Department of Wildlife & Parks 2024). Its eggs are non-adhesive and can be swept downstream (Bestgen et al. 2016). Therefore, longer, connected stream reaches with sufficient flow are optimal for supporting flathead chub (Bestgen et al. 2016).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Perkin and Gido (2011) estimated the species requires a minimum river fragment length of approximately 114 miles to maintain a stable population, with stream fragments shorter than this being vulnerable to extirpation. The fragment of the Purgatoire River within the plan area is only about 10 miles long, and therefore the plan area does not contain a sufficient quantity of habitat to provide for this species' ecological condition requirements. Historic habitat for the Flathead Chub in the Cimarron River has been eliminated in the plan area due to loss of surface flow, as described above. In terms of habitat quality, the reach of the Purgatoire River in the plan area has been heavily impacted by activities upstream of the plan area, including regulation of discharge by Trinidad Dam, irrigation and crop production, and intensive cattle feeding operations on private property. These activities outside of the plan area have reduced habitat quality within the plan area. Invasive tamarisk has also become the primary riparian species within the Purgatoire River in the plan area, which alters bank stability, channel width, and floodplain hydrology (USDA Forest Service 2005a). Collectively, these factors contribute to a decline in habitat quality within the plan area for Flathead Chub.

Critical biological characteristics

The timing of flathead chub spawning “appears to coincide with lower flows, reduced turbidity levels, and warmer water temperatures in summer” (Rahel and Thel 2005). It has a long reproductive season (Haworth 2015). Spawning can occur from mid-May into September, peaking in late May to the end of June (Haworth 2015). The onset of spawning seems to coincide with when mean daily temperatures exceed 59°F. Although its reproductive ecology is understudied, it is considered broadcast spawner that releases its eggs and sperm into prevailing currents for external fertilization (Bestgen et al. 2016, Haworth and Bestgen 2016). Its eggs are non-adhesive and may be retained near spawning sites or transported downstream depending on habitat and streamflow (Bestgen et al. 2016, Haworth and Bestgen 2016). Its egg incubation time has been shown to be 6 to 7 days at 68-71.6°F (Bestgen et al. 2016). Larvae hatch from mid-May to early September, peaking in late May to mid (Haworth 2015).

Flathead Chub move most in summer and very little in winter (Fitzpatrick 2020). In summer, they move mostly upstream to spawn, and downstream in other seasons to seek out refuge habitats (Fitzpatrick 2020). Adults are strong swimmers, capable of moving long distances in short periods of time; Fitzpatrick (2020) documented upstream movements of 36 miles.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Adult flathead chubs have been characterized as a general invertivore whose diet consists of 10-25% plants/detritus and 75-90% invertebrates (Bramblett and Fausch 1991).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Flathead Chub populations have been strongly affected by habitat fragmentation, including diversions, dams and other barriers, and channel dewatering (Colorado Parks and Wildlife 2015). Plains streams in eastern Colorado are threatened by drying and fragmentation due to groundwater irrigation depleting underlying aquifers (Colorado Parks and Wildlife 2015). Perkin et al. (2010) found that stream fragments in the southern Great Plains are projected to lose up to 12% of their discharge before 2060. Conservation measures that restore connectivity of river fragments and natural flow regimes will likely benefit the Flathead Chub (Perkin et al. 2010).

Maps of Species Range and Known Occurrences in Plan Area

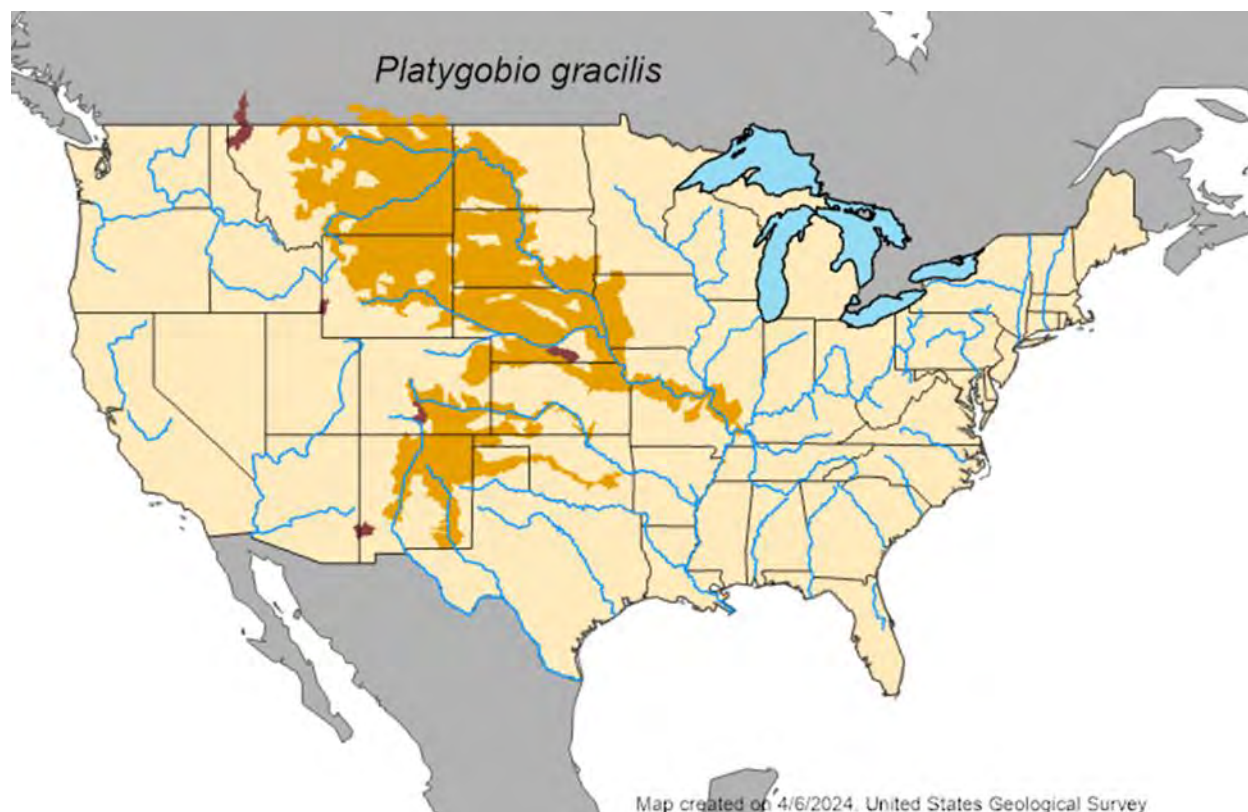


Figure 2. Range map and status of the Flathead Chub from USGS Non-indigenous Aquatic Species (NAS) (USGS 2024).

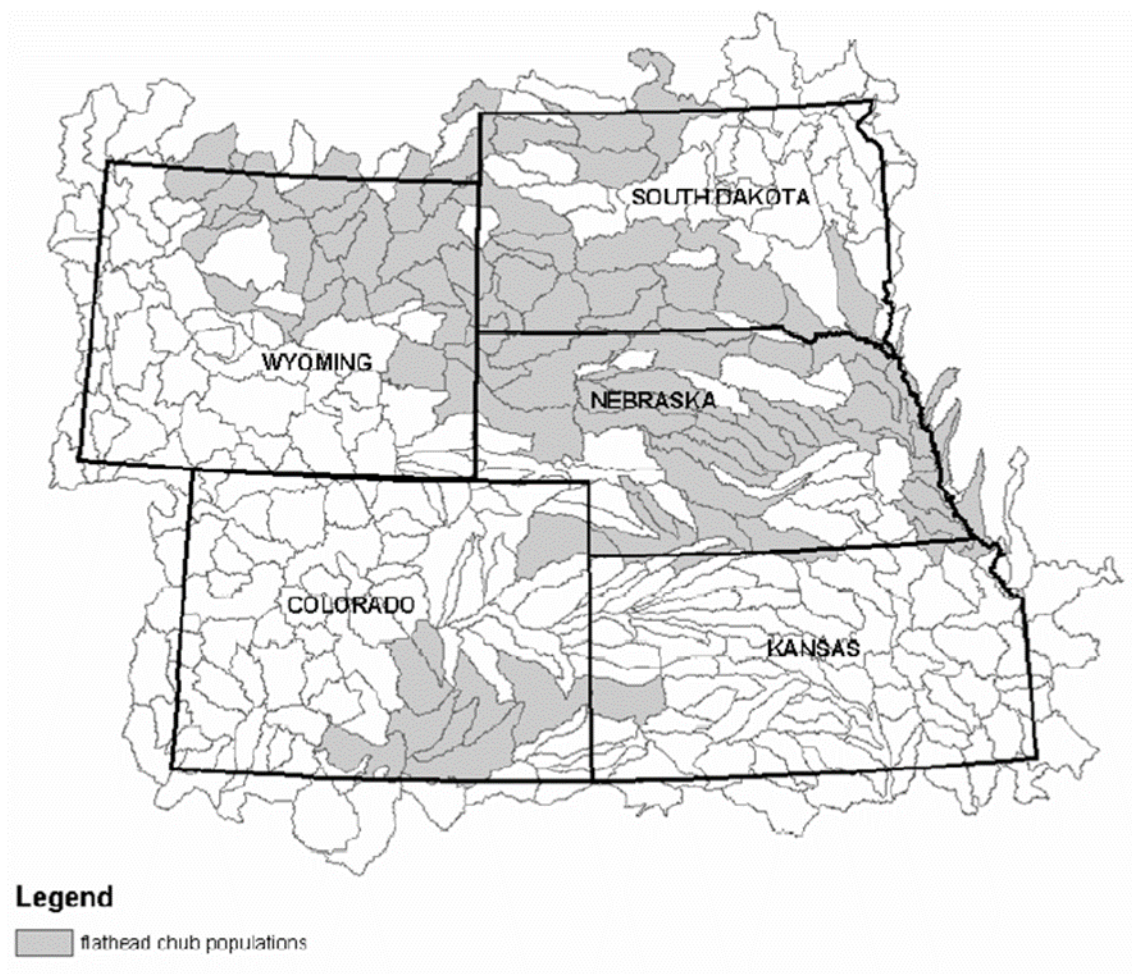


Figure 3. Distribution of flathead chub by hydrologic units (HUC 4 level) within the Rocky Mountain Region (Region 2) of the USDA Forest Service from Rahel and Thel (2005).



Figure 4. Range map of Flathead Chub in Colorado at the HUC-12 scale from [Colorado Parks and Wildlife](#).

References

- Bestgen, K.R., Crockett, H.J., Haworth, M.R., and Fitzpatrick, R.M. 2016. Production of Nonadhesive Eggs by Flathead Chub and Implications for Downstream Transport and Conservation. *Journal of Fish and Wildlife Management* 7(2): 434-443. <https://doi.org/10.3996/022016-JFWM-018>
- Bestgen, K.R., Wilcox, C.T., Hill, A.A., and Fausch, K.D. 2017. A Dynamic Flow Regime Supports an Intact Great Plains Stream Fish Assemblage. *Transactions of the American Fisheries Society* 146(5): 903-916. <https://doi.org/10.1080/00028487.2017.1310137>
- Bramblett, R.G. and Fausch, K.D. 1991. Fishes, Macroinvertebrates, and Aquatic Habitats of the Purgatoire River in Piñon Canyon, Colorado. *The Southwestern Naturalist* 36(3): 281-294. <https://doi.org/10.2307/3671678>
- Colorado Parks and Wildlife. 2015. State Wildlife Action Plan: A Strategy for Conserving Wildlife in Colorado. Dated: 2015. Colorado Springs, CO. 865 p.
- Colorado Parks and Wildlife. 2024. Comanche National Grasslands Fisheries Summary Report 2024. Edited by Journey, A. and Vangel, P. Denver, CO: Colorado Parks and Wildlife. 25 p.
- Fitzpatrick, R.M. 2020. Eastern Plains Native Fish Research. Dated: March, 2020. Fort Collins, CO: Colorado Parks & Wildlife, Aquatic Wildlife Research Section. 35 p.
- Haworth, M.R. 2015. Reproduction and Recruitment Dynamics of Flathead Chub *Platygobio Gracilis* Relative to Flow and Temperature Regimes in Fountain Creek, Colorado. M.S. Thesis, Colorado State University, Fort Collins, CO. 85 p. <https://api.mountainscholar.org/server/api/core/bitstreams/ad6eff27-5873-4a83-b0c9-ee3f8347f5db/content>
- Haworth, M.R. and Bestgen, K.R. 2016. Flow and Water Temperature Affect Reproduction and Recruitment of a Great Plains Cyprinid. *Canadian Journal of Fisheries and Aquatic Sciences* 74(6): 853-863. <https://doi.org/10.1139/cjfas-2016-023>

- Hoagstrom, C.W., DeWitte, A.C., Gosch, N.J.C., and Berry Jr, C.R. 2007. Historical fish assemblage flux in the Cheyenne River below Angostura Dam. *Journal of freshwater ecology* 22(2): 219-229.
<https://doi.org/10.1080/02705060.2007.9665041>
- Integrated Taxonomic Information System (ITIS). 2024a. Flathead Chub (*Platygobio gracilis*) (online data) Richardson, 1836, 163882. Reston, VA: United States Department of Interior, Geologic Survey (USGS). Date Published: 2024. Date Accessed: April 19, 2024. Available at:
<https://www.itis.gov/servlet/SingleRpt/SingleRpt>
- Kansas Department of Wildlife & Parks. 2024. Flathead Chub (*Platygobio gracilis*) (online data). Topeka, KS: Kansas Department of Wildlife and Parks. Date Published: 2024. Date Accessed: July 8, 2024. Available at: <https://ksoutdoors.com/Services/Threatened-and-Endangered-Wildlife/All-Threatened-and-Endangered-Species/FLATHEAD-CHUB>
- NatureServe. 2024. NatureServe Explorer (online data) NatureServe. Date Published: April 17, 2024. Date Accessed: June 9, 2024. Available at: <https://explorer.natureserve.org/>
- Perkin, J.S. and Gido, K.B. 2011. Stream Fragmentation Thresholds for a Reproductive Guild of Great Plains Fishes. *Fisheries* 36(8): 371-383. <https://doi.org/10.1080/03632415.2011.597666>
- Perkin, J.S., Gido, K.B., Johnson, E., and Tabor, V.M. 2010. Consequences of Stream Fragmentation and Climate Change for Rare Great Plains Fishes. Dated: September 30, 2010. Washington, DC: United States Department of Interior, Fish and Wildlife Service. 35 p.
<https://ecos.fws.gov/ServCat/DownloadFile/58286?Reference=57424>
- Rahel, F.J. and Thel, L.A. 2005. Flathead Chub (*Platygobio gracilis*): A Technical Conservation Assessment. Laramie, WY: University of Wyoming.
<http://www.fs.fed.us/r2/projects/scp/assessments/flatheadchub.pdf>
- Rice, J., Seixas, C.S., Zaccagnini, M.E., Bedoya-Gaitan, M., Valderrama, N., Anderson, C.B., Arroyo, M.T.K., Bustamante, M., Cavender-Bares, J., Diaz-de-Leon, A., Fennessy, S., Ricardo, J., Marquez, G., Garcia, K., Helmer, E.H., Herrera, B., Klatt, B., Ometo, J.P., Osuna, V.R., Scarano, F.R., Schill, S., and Farinaci, J.S. 2018. Summary for policymakers of the regional assessment report on biodiversity and ecosystem services for the Americas of the Intergovernmental Science-Policy Platform on biodiversity and ecosystem services. Bonn, Germany: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.
- U.S. Geological Survey (USGS) and Nico, L. 2024. Aquatic Species Database: Flathead Club (*Platygobio gracilis*) (online data) Richardson, 1836. (Version December 2, 2019). Reston, VA: United States Department of Interior, Geological Survey (USGS). Date Published: 2024. Date Accessed: April 19, 2024. Available at: <https://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=625>
- USDA Forest Service. 2005a. Cimarron and Comanche National Grasslands Land Management Plan: Ecological Sustainability. Dated: October 6, 2005. Washington, DC: US Department of Agriculture. 150 p.
- Van Scoyoc, M. 2024. Species Occurrence Data for the Cimarron-Comanche National Grasslands (HTML output auto-generated from multiple data sources such as iDigBio, GBIF, and others). Dated: April 2024. Denver, CO: USDA Forest Service, Mountain Planning Service Group.

Plains Minnow

(Hybognathus placitus)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Plains Minnow is designated as “S2S3” in the state of Kansas and is listed as a threatened species under the Kansas Nongame and Endangered Species Conservation Act. There is no designated critical habitat for Plains Minnow in the plan area and there are no records of the species in Morton County (KDPW, pers. comm. 6/28/2024). In Colorado, Plains Minnow is designated as “SH,” indicating it is “possibly extirpated.” In 2023, CPW stocked 50,000 Plains Minnow from Colorado’s Native Aquatic Species Restoration Facility (NASRF) into the Purgatoire River at the Dinosaur Tracks on the Comanche National Grassland (Colorado Parks and Wildlife 2024). Subsequent surveys in 2024 demonstrated the minnows had overwinter survival and adults are present in the plan area. Additional stocking occurred in the fall 2024. Therefore, the species is native and becoming re-established in the plan area after having been extirpated.

Year of Last Known Occurrence: 2024

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Non-native fish species represents a threat to populations.
 - b. Water management and flow modification, fish passage barriers, excessive drought, temperature warming, and stream fragmentation are threats to habitat.
2. Declining trends in populations or habitat in the plan area:
 - a. Population in the plan area was extirpated and recently re-introduced in 2023; insufficient information to determine current population trend.
 - b. Habitat quality for this species is likely decreasing in the plan area because land management activities upstream, tamarisk invasion, and hydrologic alteration of the Purgatoire River high flows.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is disjunct.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size not known; 50,000 minnows were stocked into the plan area in 2023, but overwinter survival is not known and ongoing re-introductions are planned for 2024.
 - b. Only a short fragment of suitable aquatic habitat occurs in the Purgatoire River occurs in the plan area and therefore its ecological conditions are considered restricted.

Species Status

G4; SH in Colorado; S2 in Kansas; listed as Tier 1, “Threatened” in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Hybognathus placitus is accepted as valid; taxonomic synonyms include *Hybognathus churchilli* and *Hybognathus evansi* (ITIS 2024).

Species range

Overall species range

The native range for Plains Minnow is within the Missouri, Arkansas, Red, Brazos, and Colorado River drainages in Kentucky, Tennessee, Illinois, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Texas, Montana, Wyoming, Colorado, and New Mexico; they have been introduced into Utah (Rees et al. 2005) (Figure 5).

Description of how the population in the plan area fits within the overall range

The population in the plan area is disjunct from the rest of the species' range given that this species is otherwise extirpated from most of Colorado aside from a stocking augmentation program in the Arkansas River (Figure 6).

Distribution, abundance, and trend in the plan area

Population

This species has undergone a long-term, pronounced decline in distribution and abundance across its range (Rees et al. 2005, NatureServe 2024). Once the most common fish of the Arkansas River system, the abundance and distribution of Plains Minnow decreased substantially in both Colorado and Kansas—to the point that the species is considered “possibly extirpated” in Colorado (Rees et al. 2005). CPW initiated a stocking augmentation program in the Arkansas River in 2013 (Colorado Parks and Wildlife 2015). Historical records of Plains Minnow in the Arkansas River and associated tributaries suggest that Plains Minnow likely inhabited the Purgatoire River, but due to a lack of distributional data prior to European settlement of the Great Plains, it is impossible to know the entire historical distribution of the species (Rees et al. 2005, Colorado Parks and Wildlife 2024).

In 2023, CPW stocked 50,000 Plains Minnow into the Purgatoire River at the Dinosaur Tracks on the Comanche National Grassland (Colorado Parks and Wildlife 2024). In addition, 30,000 Plains Minnow were also stocked into the Purgatoire River at a private ranch downstream of the Comanche National Grassland (Colorado Parks and Wildlife 2024). Due to the lack of barriers in this system, these two populations are expected to coexist across public and private land (Colorado Parks and Wildlife 2024). CPW plans on continued surveys of these areas in the future to assess the relative success of stocking efforts, monitor existing populations of fish in the area, and continue to search for new populations.

Habitat

While the Plains Minnow can persist in both turbid and clear streams, this fish is usually found in shallow channels with exposed, loose sandy substrate (Rees et al. 2005, Colorado Parks and Wildlife 2024). Its range in the plan area is restricted to the Purgatoire River on the Comanche National Grassland.

The decline or extirpation of Plains Minnow in many river systems, including the Arkansas River, has been attributed to habitat degradation caused by construction of dams (Rees et al. 2005). Dams reduce habitat quality for Plains Minnow by narrowing of formerly braided channels downstream, with

concomitant changes to riparian vegetation, reduction in turbidity and moderation of flow regimes (Rees et al. 2005). These same processes of habitat degradation have occurred in the plan area. The Purgatoire River is bounded between the Trinidad Dam upstream and the John Martin Dam and Reservoir downstream on the Arkansas River. Habitat in the Purgatoire River in the plan area has declined in the plan area due to activities upstream of the plan area, including irrigation and crop production, intensive cattle feeding operations on private property, and construction of the Trinidad Reservoir in 1977. These activities outside of the plan area have reduced habitat quality within the plan area. Within the plan area, tamarisk has become the primary riparian species within the Purgatoire River, and this invasive species alters bank stability, channel width, water table, and floodplain hydrology (USDA Forest Service 2005a). Maximum annual peak flows have steadily declined in the Purgatoire River downstream of Trinidad Reservoir (U.S.G.S. station # 07128500, Las Animas gauge, (Bestgen et al. 2017)). Elimination of flood events removes the spawning cues for this species and also reduce the quality and quantity of its spawning habitat (NatureServe 2024). Therefore, habitat quality has likely declined for this species in the plan area compared to historical levels.

Threats (arising from on or off the plan area)

Population

The decline or extirpation of the Plains Minnow has predominantly been habitat-mediated (Rees et al. 2005). Non-habitat threats include negative interactions with other non-native fish species, such as blackstripe topminnow, bluegill sunfish, largemouth bass, and creek chub (Rees et al. 2005, Colorado Parks and Wildlife 2015). Hybridization may pose another threat (Rees et al. 2005, NatureServe 2024). Reservoirs at the upstream and downstream ends of the Purgatoire River support many invasive species that could potentially invade habitat in the Purgatoire River, particularly Smallmouth Bass in Trinidad Reservoir (Bestgen et al. 2017). However, there is a paucity of research on the interactions between Plains Minnow and non-native fish species (Colorado Parks and Wildlife 2015).

Habitat

The most pervasive habitat threat to Plains Minnow is channelization and degradation of braided channel systems that are caused by the elimination of historical hydrological cycles involving flood and drought stages (Rees et al. 2005). Other threats to habitat include erosion and siltation from cattle grazing, groundwater pumping and diversions, passage barriers, and excessive drought (Colorado Parks and Wildlife 2015, NatureServe 2024). Stream fragmentation is expected to worsen (Perkin et al. 2010) and Great Plains fish species are expected to have a very high vulnerability to increased warming and drying trends (Rice, Joyce, et al. 2018).

Ecological conditions

Ecological condition requirements

Plains Minnow is adapted to the highly variable spring-summer hydrology characteristics of Great Plains stream ecosystems (Rees et al. 2005). It requires long stretches of flowing water to complete its life cycle and is most apt to persist in higher, more unstable reaches of the stream where impoundments do not restrict their upstream movement (Rees et al. 2005, NatureServe 2024). Preferred habitats include areas of low current velocity, such as backwaters and gentle eddies, and areas with aquatic vegetation (Osterhaus and Martin 2019, Rees et al. 2005, Colorado Parks and Wildlife 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Perkin and Gido (2011) estimated the species requires a minimum river fragment length of approximately 71 miles to maintain a stable population, with stream fragments shorter than this being vulnerable to extirpation. The fragment of the Purgatoire River within the plan area is only about 10 miles long, and therefore the plan area does not contain sufficient quantity of habitat to fully provide for this species' ecological condition requirements.

In terms of habitat quality, the reach of the Purgatoire River in the plan area has been heavily impacted by activities upstream of the plan area, including regulation of discharge by Trinidad Dam, irrigation and crop production, and intensive cattle feeding operations on private property. These activities outside of the plan area have reduced habitat quality within the plan area. Invasive tamarisk has also become the primary riparian species within the Purgatoire River in the plan area, which alters bank stability, channel width, and floodplain hydrology (CCNG 2005).

Critical biological characteristics

Plains Minnow are pelagic broadcast spawners with non-adhesive, semi-buoyant eggs (Rees et al. 2005). It reaches sexual maturity at age one or two but is a short-lived species and few fish live to age two (Rees et al. 2005). Spawning generally occurs in two pulses between April and August (Colorado Parks and Wildlife 2024). The species has a high mortality rate from egg through age 1, and a high mortality rate following the first year of spawning; its recruitment success depends heavily on location and fluctuating environmental conditions (Rees et al. 2005). Plains Minnows aggregate to spawn in areas of lower current velocity, such as backwaters and alongside sandbars, but also sufficient water movement to keep their semi-buoyant eggs suspended in the water column as they drift downstream and develop (Osterhaus and Martin 2019).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The plains minnow hybridizes with the Rio Grande silvery minnow, a federally endangered species, and may be partially responsible for the decline of the Rio Grande silvery minnow (Rees et al. 2005).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Plains Minnow is a broadcast spawner that releases its eggs suspended in water to be carried downstream. Because of this, ongoing losses of stream flows may cause its populations to become more geographically limited, lessening resiliency to stochastic events (Colorado Parks and Wildlife 2024).

Maps of Species Range and Known Occurrences in Plan Area

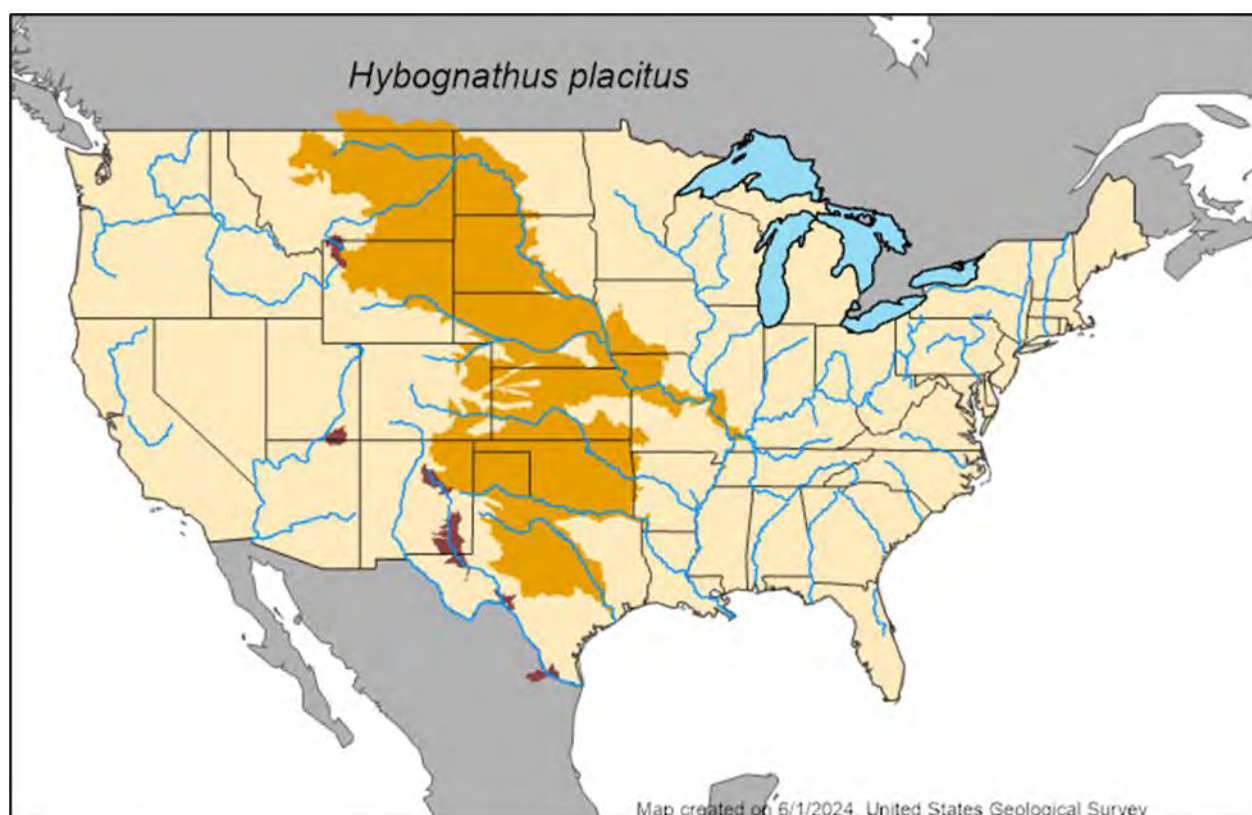


Figure 5. Range map and status of the Plains Minnow from USGS Non-indigenous Aquatic Species (NAS) (USGS 2024).



Figure 6. Range map of Plains Minnow in Colorado at the HUC-12 scale from [Colorado Parks and Wildlife](#).

References

- Bestgen, K.R., Wilcox, C.T., Hill, A.A., and Fausch, K.D. 2017. A Dynamic Flow Regime Supports an Intact Great Plains Stream Fish Assemblage. *Transactions of the American Fisheries Society* 146(5): 903-916. <https://doi.org/10.1080/00028487.2017.1310137>
- Colorado Parks and Wildlife. 2015. State Wildlife Action Plan: A Strategy for Conserving Wildlife in Colorado. Dated: 2015. Colorado Springs, CO. 865 p.
- Colorado Parks and Wildlife. 2024. Comanche National Grasslands Fisheries Summary Report 2024. Edited by Journey, A. and Vangel, P. Denver, CO: Colorado Parks and Wildlife. 25 p.
- NatureServe. 2024. NatureServe Explorer (online data) NatureServe. Date Published: April 17, 2024. Date Accessed: June 9, 2024. Available at: <https://explorer.natureserve.org/>
- Osterhaus, D. and Martin, E. 2019. Trends in Distribution of Plains Minnow (*Hybognathus placitus*) in Kansas from 1964 to 2017. *The American Midland Naturalist* 182: 203. <https://doi.org/10.1674/0003-0031-182.2.203>
- Perkin, J.S. and Gido, K.B. 2011. Stream Fragmentation Thresholds for a Reproductive Guild of Great Plains Fishes. *Fisheries* 36(8): 371-383. <https://doi.org/10.1080/03632415.2011.597666>
- Perkin, J.S., Gido, K.B., Johnson, E., and Tabor, V.M. 2010. Consequences of Stream Fragmentation and Climate Change for Rare Great Plains Fishes. Dated: September 30, 2010. Washington, DC: United States Department of Interior, Fish and Wildlife Service. 35 p. <https://ecos.fws.gov/ServCat/DownloadFile/58286?Reference=57424>
- Rees, D.E., Carr, R.J., and Miller, W.J. 2005. Plains Minnow (*Hybognathus placitus*): A Technical Conservation Assessment. USDA Forest Service, Rocky Mountain Region. <http://www.fs.fed.us/r2/projects/scp/assessments/plainsminnow.pdf>
- Rice, J.R., Joyce, L.A., Regan, C., Winters, D., and Truex, R. 2018. Climate Change Vulnerability Assessment of Aquatic and Terrestrial Ecosystems in the U.S. Forest Service Rocky Mountain Region. Gen. Tech. Rep. RMRS-GTR-376. Fort Collins, CO: United States Department of Agriculture, Forest Service, Rocky Mountain Research Station. <https://doi.org/10.2737/RMRS-GTR-376>
- USDA Forest Service. 2005a. Cimarron and Comanche National Grasslands Land Management Plan: Ecological Sustainability. Dated: October 6, 2005. Washington, DC: US Department of Agriculture. 150 p.

Suckermouth Minnow (*Phenacobius mirabilis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF contains five records of the species in the plan area from 2003-2006 from the Purgatoire River basin within the Timpas Unit of the Comanche National Grassland (Van Scoyoc 2024).

There is some uncertainty about how and when Suckermouth Minnow became established in the Purgatoire River within the plan area. As described by Bestgen et al. (2003), "Historical status of suckermouth minnow in the Purgatoire River is confusing. Intensive sampling in the upstream canyon-bound reach of the Purgatoire River did not detect suckermouth minnows (Bramblett and Fausch 1991), nor were they found in historical sampling downstream near the confluence with the Arkansas River near Las Animas (Loeffler et al. 1982, Univ of Kansas, unpublished collection records). More recent sampling by CDOW and us at that same site revealed presence of a relatively strong population of suckermouth minnows there. Why suckermouth minnows are not more widespread in that system, which is dominated by native fishes (Bramblett and Fausch 1991), and why they were only recently found there, is an enigma." USGS (2024) shows the plan area as within the species' native range (**Error! Reference source not found.**). Bestgen et al. (2017). consider it native to the Purgatoire River because of "collection records from 1926 in tributaries of the Arkansas River near Lamar, Colorado, less than 80 km downstream of the Purgatoire River confluence. The Suckermouth Minnow is also presently widespread in portions of the Arkansas River mainstem in Colorado and was widespread and considered native in the basin downstream in Kansas, including a record just downstream of the Colorado border during 1884–1950." Therefore, it is considered native and known to occur in the plan area.

Year of Last Known Occurrence: 2019 (CPW 2024)

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. De-watering of streams and potential spread of nonnative aquatic species represents a threat to populations.
 - b. Dams/impoundments, fish passage barriers, excessive drought, temperature warming, and stream fragmentation are threats to habitat.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known, but no sources suggest a declining trend.
 - b. Habitat quality for this species is likely decreasing in the plan area because land management activities upstream, tamarisk invasion, and hydrologic alteration of the Purgatoire River high flows.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Low relative abundance in the plan area.

- b. Only a short fragment of suitable aquatic habitat occurs in the Purgatoire River occurs in the plan area and therefore its ecological conditions are considered restricted. Microhabitats with suitable spawning gravels are also expected to be limited.

Species Status

G5; S2 in Colorado; S5 in Kansas; listed as Tier 1, “Endangered” in Colorado

Taxonomy

Phenacobius mirabilis is accepted as valid; taxonomic synonyms include *Exoglossum mirabile*, *Sarcidium scopiferum*, and *Phenacobius teretulus liosternus* (Integrated Taxonomic Information System (ITIS) 2024b).

Species range

Overall species range

The native range for the Suckermouth Minnow is within the Mississippi River basin from Ohio and West Virginia to Wyoming, Colorado, and New Mexico, and from southeastern Minnesota to northern Alabama and southern Oklahoma; western Lake Erie drainage, Ohio; isolated populations in Gulf Coast drainages (Sabine Lake, Louisiana and Texas, Galveston Bay, Texas, Colorado River, Texas, and upper Pecos River, New Mexico) (U.S. Geological Survey (USGS) et al. 2024) (Figure 7, Figure 8).

Description of how the population in the plan area fits within the overall range

The plan area is located at the western edge of the species’ range (Figure 7, Figure 8).

Distribution, abundance, and trend in the plan area

Population

The Suckermouth Minnow is widespread and abundant throughout much of the Mississippi River Basin (NatureServe 2024) but has experienced local population declines and extirpations (Propst 1999, Bestgen et al. 2003). In Colorado, it is listed as Endangered and may be extirpated from the Republican River Basin (Colorado Parks and Wildlife 2015). Intensive sampling of the Purgatoire River, including the reach within the Comanche National Grassland, did not detect suckermouth minnows from 1987 through 1989 (Bramblett and Fausch 1991). The species has been detected in the plan area in more recent sampling (Van Scoyoc 2024, Colorado Parks and Wildlife 2024), with a relatively strong population of suckermouth minnows now in the Purgatoire River (Bestgen et al. , Bestgen et al. 2017, Colorado Parks and Wildlife 2024). It has been described as a “native invader” to the Purgatoire River (Bestgen et al. 2017). While Bestgen et al. (2003) suggested its population in the Purgatoire River may be increasing, more recent work by CPW (2024). shows little population growth through time.

Certain sections of Purgatoire River show higher relative abundance of Suckermouth Minnow than others (Colorado Parks and Wildlife 2024). Within the plan area, its abundance is relatively low (Colorado Parks and Wildlife 2024). Bestgen et al. (2017) found it was the least abundant of the 12 native species in the mainstem Purgatoire River, representing ~1% of the overall fish composition in the downstream reach of the Purgatoire River that includes the plan area. However, it is important to note that the Purgatoire watershed experiences wide variations in flow annually and fish migrate in accordance with these

hydrological changes (Colorado Parks and Wildlife 2024). The dynamic nature of these systems requires contextual interpretation of discrete survey data that may not necessarily capture overall species abundance and distribution (Colorado Parks and Wildlife 2024). CPW (2024) states that “Although Suckermouth Minnow occur at many sites and have a geographically even distribution within the Purgatoire River, they tend to occur in lower relative densities than other species. These smaller populations of fish are at a high risk of extirpation from the system due to lower resiliency to stochastic events.”

Habitat

The Suckermouth Minnow has been classified as a big river habitat, silt tolerant species (Bestgen et al. 2003). Its suitable habitat includes shallow to moderately deep plains streams with sand and gravel substrates of low to moderate gradient (Propst 1999). Bestgen et al. (2003) indicate it can also use high gradient streams. It is tolerant of high turbidity, fluctuating water levels, and varying water chemistry but requires clean substrate extirpations (Propst 1999, Bestgen et al. 2003). Optimal habitats include riffles that are at least ~250 ft (75 m) long and 4 inches (100 mm) deep, with coarse gravel (Bestgen et al. 2003). Both adults and juveniles occupy gravel riffles, but juveniles can also use sand riffles (Bestgen et al. 2003). Juveniles likely require low velocity habitat such as backwaters or pools for rearing (Bestgen et al. 2003). It seems to benefit from deep-water scour pool habitat created below diversion dams (Bestgen et al. 2003).

Within the plan area, the Suckermouth Minnow has only been documented in the Purgatoire River basin within the Timpas Unit of the Comanche National Grassland (Van Scoyoc 2024). Although Suckermouth Minnow have not been documented in the Timpas watershed within the Comanche National Grassland, CPW has records of the species in this basin, and it is possible that they occur in this portion of the Grassland and just have not been documented (Colorado Parks and Wildlife 2024).

Suckermouth Minnow is threatened by the upstream effect of impoundments (Quist et al. 2005), and the Purgatoire River is bounded between the Trinidad Dam upstream and the John Martin Dam and Reservoir downstream on the Arkansas River. Habitat in the Purgatoire River in the plan area has declined in the plan area due to activities upstream of the plan area, including irrigation and crop production, intensive cattle feeding operations on private property, and construction of the Trinidad Reservoir in 1977. These activities outside of the plan area have reduced habitat quality within the plan area. Within the plan area, tamarisk has become the primary riparian species within the Purgatoire River, and this invasive species alters bank stability, channel width, and floodplain hydrology (USDA Forest Service 2005b). Maximum annual peak flows have steadily declined in the Purgatoire River downstream of Trinidad Reservoir (U.S.G.S. station # 07128500, Las Animas gauge, Bestgen et al. 2017). Therefore, habitat quality has declined for this species in the plan area, even while its range and population seem to have expanded.

Threats (arising from on or off the plan area)

Population

De-watering of occupied streams represents a threat to populations in Colorado (Colorado Parks and Wildlife 2015). Reservoirs at the upstream and downstream ends of the Purgatoire River support many invasive species that could potentially invade habitat in the Purgatoire River, particularly Smallmouth Bass in Trinidad Reservoir (Bestgen et al. 2017). Smallmouth Bass have been implicated in the extirpation of native plains fishes elsewhere (Hoagstrom et al. 2007) and are suspected to be detrimental to suckermouth minnow (Quist et al. 2005). CPW (2015) notes “more information is needed on the impact of nonnative fish species on suckermouth minnow.”

Habitat

Threats to habitat include dewatering of streams, as well dams and diversions that block fish passage (Colorado Parks and Wildlife 2015). Dams may both benefit and threaten the species—they can pose a threat by blocking fish passage and facilitating habitat conditions for exotic piscivores but can also create deep pools that are favored by suckermouth minnow and otherwise have become rare in the Eastern Plains rivers of Colorado (Colorado Parks and Wildlife 2015, Bestgen et al. 2003). Quist et al. (2005) found suckermouth minnows were extirpated from the Laramie River upstream of Grayrocks Reservoir after impoundment. Reduced flows, increased siltation, and the species' reliance on multiple habitat types for the completion of their life cycle are all considered threats to Suckermouth Minnow (Brewer et al. 2006). Drought is also likely to pose a threat to habitat connectivity (Bestgen et al. 2003). Stream fragmentation is expected to worsen (Perkin et al. 2010) and Great Plains fish species are expected to have a very high vulnerability to the increased warming and drying trends (Rice, Joyce, et al. 2018).

Ecological conditions

Ecological condition requirements

The Suckermouth Minnow requires connected mainstem and tributary habitat and stream flow of sufficient quality and quantity to complete its life cycle (Bestgen et al. 2003). It requires freedom from establishment of other species that prey upon or compete with it (Bestgen et al. 2003). It requires sufficient gradient and flow to maintain clean gravel substrate (Bestgen et al. 2003). Its requisite spawning habitat is believed to be gravel riffles; gravel particles of varying sizes can be used for spawning, but eggs will not attach to sand (Bestgen et al. 2003). The Suckermouth Minnow also requires deep pools that do not exceed their thermal tolerances as refugia during low water, drought, and possibly overwinter (Bestgen et al. 2003). The Suckermouth Minnow is suspected to be a selective feeder, and its diet seems to depend heavily on aquatic fly larvae in the order *Diptera* (Bestgen et al. 2003).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The Suckermouth Minnow requires unhindered river reaches for long distance movements, including connection between main-stem rivers and tributaries (Bestgen et al. 2003). The fragment of the Purgatoire River within the plan area is only about 10 miles long, and therefore the plan area does not contain sufficient quantity of habitat to provide for this species' ecological condition requirements.

In terms of habitat quality, the reach of the Purgatoire River in the plan area has been heavily impacted by activities upstream of the plan area, including regulation of discharge by Trinidad Dam, irrigation and crop production, and intensive cattle feeding operations on private property. These activities outside of the plan area have reduced habitat quality within the plan area. Invasive tamarisk has also become the primary riparian species within the Purgatoire River in the plan area, which alters bank stability, channel width, and floodplain hydrology (USDA Forest Service 2005a). Suitable gravel substrate may also be limited in the plan area. CPW (2024) state that "The specificity of this vital habitat [gravel substrate] may limit Suckermouth Minnow populations in Southeast Colorado due to the prevalence of ephemeral flows and varying hydrologic conditions in these river systems."

Critical biological characteristics

The reproductive ecology of the Suckermouth Minnow is not well characterized (Bestgen et al. 2003). It reaches sexual maturity at age one or two and has an extended spawning season in spring and summer (Propst 1999, Bestgen et al. 2003, NatureServe 2024). Females spawn two or three times in a season (Bestgen et al. 2003, NatureServe 2024, Colorado Parks and Wildlife 2024). The timing of spawning depends on the location, but ranges from April to August across the species' range at temperatures from 59 to 63°F (15 to 17°C) extirpations (Propst 1999, Bestgen et al. 2003, Colorado Parks and Wildlife 2024). The species prefer shallow microhabitats for spawning (Brewer et al. 2006) including gravel riffles (Bestgen et al. 2003). Its eggs are adhesive and attach to gravel particles but will not attach to sand (Bestgen et al. 2003). Suckermouth Minnows have a ventral mouth and fleshy lips that indicate benthic feeding (Colorado Parks and Wildlife 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The Suckermouth Minnow is a bottom-feeding insectivore that eats mainly aquatic fly (dipteran) larvae and caddisfly larvae, with detritus and plant material comprising a smaller part of its diet (Bestgen et al. 2003, NatureServe 2024). It may feed selectively by using touch and taste rather than sight (Bestgen et al. 2003). Adult Suckermouth Minnows have been observed to cannibalize embryos in the laboratory environment, but it is unknown to what extent this occurs in the field (Bestgen et al. 2003).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Bestgen et al. (2003) note that the Suckermouth Minnow seems to have benefited from some aspects of environmental degradation, such as land conversion, water diversion and other stream modifications, that may have facilitated eastern range expansion. However, this contradicts the findings of Quist et al. (2005). As CPW (2015) describe, "dams likely have a complex effect on the species."

Maps of Species Range and Known Occurrences in Plan Area

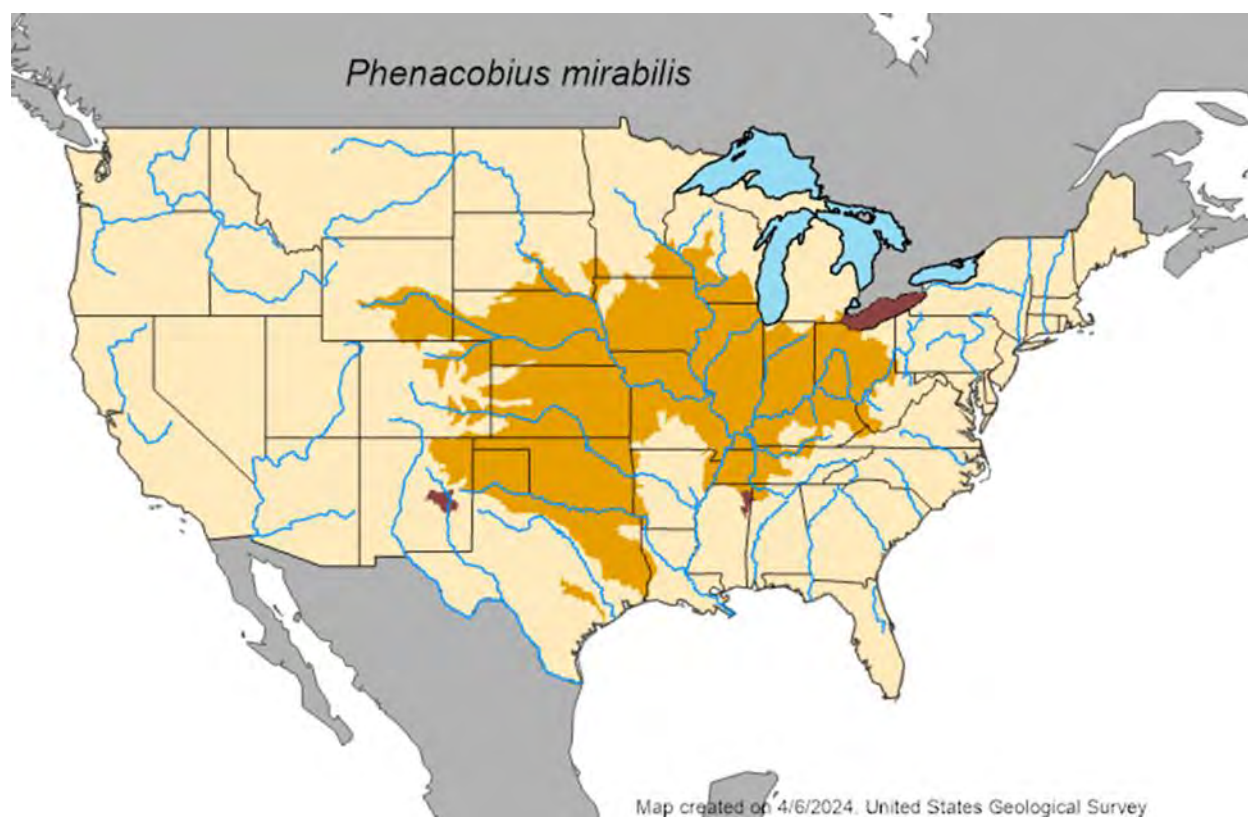


Figure 7. Range map and status of the Suckermouth Minnow from USGS Non-indigenous Aquatic Species (NAS) (USGS 2024).

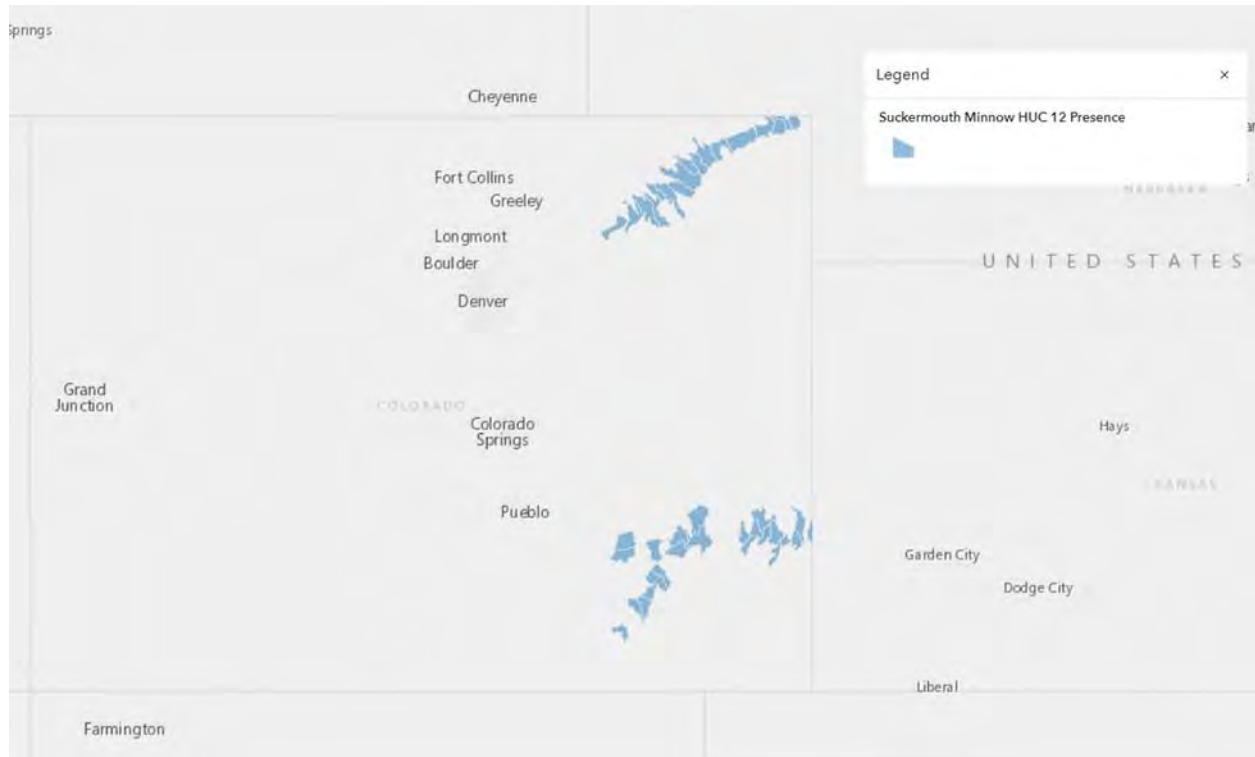


Figure 8. Range map of Suckermouth Minnow in Colorado at the HUC-12 scale, from [Colorado Parks and Wildlife](#).

References

- Bestgen, K., Zelasko, K., and Compton, R. 2003. Environmental Factors Limiting Suckermouth Minnow *Phenacobius Mirabilis* Populations in Colorado. <http://dx.doi.org/10.13140/RG.2.2.16252.74883>
- Bestgen, K.R., Wilcox, C.T., Hill, A.A., and Fausch, K.D. 2017. A Dynamic Flow Regime Supports an Intact Great Plains Stream Fish Assemblage. *Transactions of the American Fisheries Society* 146(5): 903-916. <https://doi.org/10.1080/00028487.2017.1310137>
- Bramblett, R.G. and Fausch, K.D. 1991. Fishes, Macroinvertebrates, and Aquatic Habitats of the Purgatoire River in Piñon Canyon, Colorado. *The Southwestern Naturalist* 36(3): 281-294. <https://doi.org/10.2307/3671678>
- Brewer, S.K., Papoulias, D.M., and Rabeni, C.F. 2006. Spawning habitat associations and selection by fishes in a flow-regulated prairie river. *Transactions of the American Fisheries Society* 135(3): 763-778. <https://doi.org/10.1577/T05-021.1>
- Colorado Parks and Wildlife. 2015. State Wildlife Action Plan: A Strategy for Conserving Wildlife in Colorado. Dated: 2015. Colorado Springs, CO. 865 p.
- Colorado Parks and Wildlife. 2024. Comanche National Grasslands Fisheries Summary Report 2024. Edited by Journey, A. and Vangel, P. Denver, CO: Colorado Parks and Wildlife. 25 p.
- Hoagstrom, C.W., DeWitte, A.C., Gosch, N.J.C., and Berry Jr, C.R. 2007. Historical fish assemblage flux in the Cheyenne River below Angostura Dam. *Journal of freshwater ecology* 22(2): 219-229. <https://doi.org/10.1080/02705060.2007.9665041>
- Integrated Taxonomic Information System (ITIS). 2024b. Suckermouth Minnow (*Phenacobius mirabilis*) (online data) Girard, 1856, 163502. Reston, VA: United States Department of Interior, Geologic Survey (USGS). Date Published: 2024. Date Accessed: April 19, 2024. Available at: <https://www.itis.gov/servlet/SingleRpt/SingleRpt>

- NatureServe. 2024. NatureServe Explorer (online data) NatureServe. Date Published: April 17, 2024. Date Accessed: June 9, 2024. Available at: <https://explorer.natureserve.org/>
- Perkin, J.S., Gido, K.B., Johnson, E., and Tabor, V.M. 2010. Consequences of Stream Fragmentation and Climate Change for Rare Great Plains Fishes. Dated: September 30, 2010. Washington, DC: United States Department of Interior, Fish and Wildlife Service. 35 p. <https://ecos.fws.gov/ServCat/DownloadFile/58286?Reference=57424>
- Propst, D.L. 1999. Threatened and Endangered Fishes of New Mexico. Tech. Rpt. No. 1. Santa Fe, NM: New Mexico Department of Game and Fish. 84 p. <https://www.nativefishlab.net/library/textpdf/18713.pdf>
- Quist, M.C., Hubert, W.A., and Rahel, F.J. 2005. Fish assemblage structure following impoundment of a Great Plains river. *Western North American naturalist* 65(1): 53-63. <https://pubs.usgs.gov/publication/70029156>
- Rice, J.R., Joyce, L.A., Regan, C., Winters, D., and Truex, R. 2018. Climate Change Vulnerability Assessment of Aquatic and Terrestrial Ecosystems in the U.S. Forest Service Rocky Mountain Region. Gen. Tech. Rep. RMRS-GTR-376. Fort Collins, CO: United States Department of Agriculture, Forest Service, Rocky Mountain Research Station. <https://doi.org/10.2737/RMRS-GTR-376>
- U.S. Geological Survey (USGS), Nico, L., Larson, J., Makled, T.H., and Fusaro, A. 2024. Aquatic Species Database: Suckermouth Minnow (*Phenacobius mirabilis*) (online data) Girard, 1856. (Version December 2, 2019). Reston, VA: United States Department of Interior, Geological Survey (USGS). Date Published: 2024. Date Accessed: April 19, 2024. Available at: <https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=617>
- USDA Forest Service. 2005a. Cimarron and Comanche National Grasslands Land Management Plan: Ecological Sustainability. Dated: October 6, 2005. Washington, DC: US Department of Agriculture. 150 p.
- USDA Forest Service. 2005b. Cimarron and Comanche National Grasslands: Ecological sustainability. Dated: June 10, 2005. Washington, DC: United States Department of Agriculture, Forest Service. 115 p.
- Van Scoyoc, M. 2024. Species Occurrence Data for the Cimarron-Comanche National Grasslands (HTML output auto-generated from multiple data sources such as iDigBio, GBIF, and others). Dated: April 2024. Denver, CO: USDA Forest Service, Mountain Planning Service Group.

Consolidated Literature Cited

- Bestgen, K., Zelasko, K., and Compton, R. 2003. Environmental Factors Limiting Suckermouth Minnow *Phenacobius Mirabilis* Populations in Colorado. <http://dx.doi.org/10.13140/RG.2.2.16252.74883>
- Bestgen, K.R., Crockett, H.J., Haworth, M.R., and Fitzpatrick, R.M. 2016. Production of Nonadhesive Eggs by Flathead Chub and Implications for Downstream Transport and Conservation. *Journal of Fish and Wildlife Management* 7(2): 434-443. <https://doi.org/10.3996/022016-JFWM-018>
- Bestgen, K.R., Wilcox, C.T., Hill, A.A., and Fausch, K.D. 2017. A Dynamic Flow Regime Supports an Intact Great Plains Stream Fish Assemblage. *Transactions of the American Fisheries Society* 146(5): 903-916. <https://doi.org/10.1080/00028487.2017.1310137>
- Bramblett, R.G. and Fausch, K.D. 1991. Fishes, Macroinvertebrates, and Aquatic Habitats of the Purgatoire River in Piñon Canyon, Colorado. *The Southwestern Naturalist* 36(3): 281-294. <https://doi.org/10.2307/3671678>
- Brewer, S.K., Papoulias, D.M., and Rabeni, C.F. 2006. Spawning habitat associations and selection by fishes in a flow-regulated prairie river. *Transactions of the American Fisheries Society* 135(3): 763-778. <https://doi.org/10.1577/T05-021.1>
- Colorado Parks and Wildlife. 2015. State Wildlife Action Plan: A Strategy for Conserving Wildlife in Colorado. Dated: 2015. Colorado Springs, CO. 865 p.
- Colorado Parks and Wildlife. 2024. Comanche National Grasslands Fisheries Summary Report 2024. Edited by Journey, A. and Vangel, P. Denver, CO: Colorado Parks and Wildlife. 25 p.
- Fitzpatrick, R.M. 2020. Eastern Plains Native Fish Research. Dated: March, 2020. Fort Collins, CO: Colorado Parks & Wildlife, Aquatic Wildlife Research Section. 35 p.
- Haworth, M.R. 2015. Reproduction and Recruitment Dynamics of Flathead Chub *Platygobio Gracilis* Relative to Flow and Temperature Regimes in Fountain Creek, Colorado. M.S. Thesis, Colorado State University, Fort Collins, CO. 85 p. <https://api.mountainscholar.org/server/api/core/bitstreams/ad6eff27-5873-4a83-b0c9-ee3f8347f5db/content>
- Haworth, M.R. and Bestgen, K.R. 2016. Flow and Water Temperature Affect Reproduction and Recruitment of a Great Plains Cyprinid. *Canadian Journal of Fisheries and Aquatic Sciences* 74(6): 853-863. <https://doi.org/10.1139/cjfas-2016-023>
- Hoagstrom, C.W., DeWitte, A.C., Gosch, N.J.C., and Berry Jr, C.R. 2007. Historical fish assemblage flux in the Cheyenne River below Angostura Dam. *Journal of freshwater ecology* 22(2): 219-229. <https://doi.org/10.1080/02705060.2007.9665041>
- Integrated Taxonomic Information System (ITIS). 2024a. Flathead Chub (*Platygobio gracilis*) (online data) Richardson, 1836, 163882. Reston, VA: United States Department of Interior, Geologic Survey (USGS). Date Published: 2024. Date Accessed: April 19, 2024. Available at: <https://www.itis.gov/servlet/SingleRpt/SingleRpt>
- Integrated Taxonomic Information System (ITIS). 2024b. Suckermouth Minnow (*Phenacobius mirabilis*) (online data) Girard, 1856, 163502. Reston, VA: United States Department of Interior, Geologic Survey (USGS). Date Published: 2024. Date Accessed: April 19, 2024. Available at: <https://www.itis.gov/servlet/SingleRpt/SingleRpt>
- Kansas Department of Wildlife & Parks. 2024. Flathead Chub (*Platygobio gracilis*) (online data). Topeka, KS: Kansas Department of Wildlife and Parks. Date Published: 2024. Date Accessed: July 8, 2024. Available at: <https://ksoutdoors.com/Services/Threatened-and-Endangered-Wildlife/All-Threatened-and-Endangered-Species/FLATHEAD-CHUB>

- NatureServe. 2024. NatureServe Explorer (online data) NatureServe. Date Published: April 17, 2024. Date Accessed: June 9, 2024. Available at: <https://explorer.natureserve.org/>
- Osterhaus, D. and Martin, E. 2019. Trends in Distribution of Plains Minnow (*Hybognathus placitus*) in Kansas from 1964 to 2017. *The American Midland Naturalist* 182: 203. <https://doi.org/10.1674/0003-0031-182.2.203>
- Perkin, J.S. and Gido, K.B. 2011. Stream Fragmentation Thresholds for a Reproductive Guild of Great Plains Fishes. *Fisheries* 36(8): 371-383. <https://doi.org/10.1080/03632415.2011.597666>
- Perkin, J.S., Gido, K.B., Johnson, E., and Tabor, V.M. 2010. Consequences of Stream Fragmentation and Climate Change for Rare Great Plains Fishes. Dated: September 30, 2010. Washington, DC: United States Department of Interior, Fish and Wildlife Service. 35 p. <https://ecos.fws.gov/ServCat/DownloadFile/58286?Reference=57424>
- Propst, D.L. 1999. Threatened and Endangered Fishes of New Mexico. Tech. Rpt. No. 1. Santa Fe, NM: New Mexico Department of Game and Fish. 84 p. <https://www.nativefishlab.net/library/textpdf/18713.pdf>
- Quist, M.C., Hubert, W.A., and Rahel, F.J. 2005. Fish assemblage structure following impoundment of a Great Plains river. *Western North American naturalist* 65(1): 53-63. <https://pubs.usgs.gov/publication/70029156>
- Rahel, F.J. and Thel, L.A. 2005. Flathead Chub (*Platygobio gracilis*): A Technical Conservation Assessment. Laramie, WY: University of Wyoming. <http://www.fs.fed.us/r2/projects/scp/assessments/flatheadchub.pdf>
- Rees, D.E., Carr, R.J., and Miller, W.J. 2005. Plains Minnow (*Hybognathus placitus*): A Technical Conservation Assessment. USDA Forest Service, Rocky Mountain Region. <http://www.fs.fed.us/r2/projects/scp/assessments/plainsminnow.pdf>
- Rice, J., Seixas, C.S., Zaccagnini, M.E., Bedoya-Gaitan, M., Valderrama, N., Anderson, C.B., Arroyo, M.T.K., Bustamante, M., Cavender-Bares, J., Diaz-de-Leon, A., Fennessy, S., Ricardo, J., Marquez, G., Garcia, K., Helmer, E.H., Herrera, B., Klatt, B., Omoto, J.P., Osuna, V.R., Scarano, F.R., Schill, S., and Farinaci, J.S. 2018. Summary for policymakers of the regional assessment report on biodiversity and ecosystem services for the Americas of the Intergovernmental Science-Policy Platform on biodiversity and ecosystem services. Bonn, Germany: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.
- Rice, J.R., Joyce, L.A., Regan, C., Winters, D., and Truex, R. 2018. Climate Change Vulnerability Assessment of Aquatic and Terrestrial Ecosystems in the U.S. Forest Service Rocky Mountain Region. Gen. Tech. Rep. RMRS-GTR-376. Fort Collins, CO: United States Department of Agriculture, Forest Service, Rocky Mountain Research Station. <https://doi.org/10.2737/RMRS-GTR-376>
- U.S. Geological Survey (USGS) and Nico, L. 2024. Aquatic Species Database: Flathead Club (*Platygobio gracilis*) (online data) Richardson, 1836. (Version December 2, 2019). Reston, VA: United States Department of Interior, Geological Survey (USGS). Date Published: 2024. Date Accessed: April 19, 2024. Available at: <https://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=625>
- U.S. Geological Survey (USGS), Nico, L., Larson, J., Makled, T.H., and Fusaro, A. 2024. Aquatic Species Database: Suckermouth Minnow (*Phenacobius mirabilis*) (online data) Girard, 1856. (Version December 2, 2019). Reston, VA: United States Department of Interior, Geological Survey (USGS). Date Published: 2024. Date Accessed: April 19, 2024. Available at: <https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=617>
- USDA Forest Service. 2005a. Cimarron and Comanche National Grasslands Land Management Plan: Ecological Sustainability. Dated: October 6, 2005. Washington, DC: US Department of Agriculture. 150 p.

- USDA Forest Service. 2005b. Cimarron and Comanche National Grasslands: Ecological sustainability. Dated: June 10, 2005. Washington, DC: United States Department of Agriculture, Forest Service. 115 p.
- USDI Fish and Wildlife Service (FWS). 2020. Arkansas River Shiner (*Notropis girardi*). 5 Year Review: Summary and Evaluation. Dated: September 28, 2020. Tulsa, OK: United States Department of Interior, Fish and Wildlife Service (FWS), Oklahoma Ecological Services Field Office. 20 p.
<https://www.fws.gov/species/arkansas-river-shiner-notropis-girardi>
- USDI Fish and Wildlife Service (FWS). 2023. Arkansas River Shiner (*Notropis girardi*). Draft Recovery Plan. Dated: August, 2023. United States Department of Interior, Fish and Wildlife Service (FWS). 37 p.
- Van Scoyoc, M. 2024. Species Occurrence Data for the Cimarron-Comanche National Grasslands (HTML output auto-generated from multiple data sources such as iDigBio, GBIF, and others). Dated: April 2024. Denver, CO: USDA Forest Service, Mountain Planning Service Group.



Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Cimarron and Comanche National Grasslands | Herpetofauna Species Evaluations for Assessment | June 2025

Species Evaluation Report for Herpetofauna on the Cimarron and Comanche National Grasslands

**Prepared by USDA Forest Service, Mountain Planning Service
Group, Lakewood, Colorado**

Prepared for the Cimarron and Comanche National Grasslands



Cover Photo: Smooth Softshell Turtle (*Apalone mutica*)

This is a working document and the information contained herein may be changed or updated by the USDA Forest Service at any time in the future.

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Black-necked gartersnake (*Thamnophis cyrtopsis*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CNHP has five occurrence polygons of this species that overlap the plan area from 1988-2023 (Van Scoyoc 2024). Some of these records have sufficient spatial precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: There are no significant threats to the population.
 - b. Habitat: Threats to habitat include loss or degradation from land conversion (urbanization or farmland) and deforestation, as well as climate stressors and groundwater depletion which are directly impacting the availability of perennial water sources.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trend in the population for the plan area is not known.
 - b. Habitat: Aquatic/riparian habitat has declined in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Species is at the northern edge of its range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population numbers are not known, but species is considered rare in Colorado.
 - b. Ecological Conditions: aquatic/riparian habitats are restricted within the plan area.

Species Status

G5; S2 in Colorado; SNR in Kansas.

Taxonomy

The currently accepted valid name is *Thamnophis cyrtopsis* Kennicott, 1860 (TSN 174141) (ITIS 2024i). A synonym for this species is *Eutaenia cyrtopsis* Kennicott, 1860, and common names include Black-necked Garter Snake, Culebra-listonada cuello negro (Spanish), Blackneck Garter Snake, and Black-necked Gartersnake (ITIS 2024i).

There is also the Western black-necked gartersnake (*Thamnophis cyrtopsis cyrtopsis*) that is known to occur in Colorado.

Species range

Overall species range

The range extends from southern Colorado and Utah south through Arizona, New Mexico, western and central Texas, and much of Mexico to Guatemala, at elevations from near sea level to around 2,700 meters (8,700 feet), but the distribution is spotty in many areas (NatureServe 2024d).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range (Figure 1).

Distribution, abundance, and trend in the plan area

Population

This species has a relatively restricted distribution in southeastern and southwestern Colorado that overlaps with much of the Comanche National Grassland (Figure 2). Population size within the plan area is not known. Possible declines have been recorded at the extreme northern limit of the range in southwestern Colorado (Colorado Partners in Amphibian and Reptile Conservation 2023) as cited in (NatureServe 2024d). There are five occurrence records in the plan area, two of which are classified as historical by CNHP. Hammerson (2023) states "In general, this snake is uncommon in Colorado, as it is sparsely distributed throughout the state." The species' presence in Kansas is unlikely; it has only been observed once based on a single specimen (KU 2088) collected in Hamilton County, Kansas (Collins 1984).

Habitat

This snake is chiefly a stream snake that occurs in a wide range of habitats, from desert flats, dry grasslands, and tropical lowlands to pine-oak habitats and cloud forest in mountains; in the southwestern United States it is often in the vicinity of permanent and intermittent streams, spring seepages, and irrigation canals, usually in canyons, foothills, or mountains (Stebbins 2003, NatureServe 2024d). This snake wanders far from water into adjacent grassland, desert, woodland, and shrubland, but mostly it is restricted to the vicinity of consistent water sources in the arid Southwest (NatureServe 2024d). It eats frogs, toads, tadpoles, salamanders, lizards, and crustaceans, and is an opportunistic forager that forages mainly along stream banks and at pools, and at or near the water's surface (NatureServe 2024d).

This snake is mostly restricted to consistent water sources and have a high dependence on riparian corridors and seasonally variable, aquatic resources (Jones 1990). Their prey availability is a function of the amount and distribution of aquatic habitats (Jones 1990). It has recently been observed near Sand Canyon, Vogel Canyon, and Picture Canyons in the Comanche National Grassland according to data from CNHP.

Threats (arising from on or off the plan area)

Population

No major threats to populations are known. The pet trade is a potential threat to this species (NatureServe 2024d). Hammerson (2023) states "It is unlikely that its scarcity [in Colorado] is due to habitat loss, degradation, or other observable factors." Competition from the American bullfrog may also

be an issue for the gartersnake, and bullfrogs are expected to benefit somewhat under future climate scenarios (USDA Forest Service No Date).

Habitat

In some areas, habitat has been lost or degraded because of urbanization, deforestation, or conversion to intensive agricultural uses (NatureServe 2024d). Climate stressors such as drought and groundwater depletion may threaten the persistence of riparian areas that support many of the black-necked garter snake's prey sources (Jones 1990).

Ecological conditions

Ecological condition requirements

These snakes are most often found near water, and they are most active during the day, but nighttime activity is not unusual (Ahmad 2013). If they are threatened, they attempt to escape into surrounding cover or use nearby water as an escape route (Ahmad 2013). As with other snakes, their body temperature is largely dependent on environmental temperatures, and they hibernate in dens during winter months (Ahmad 2013).

Water and adequate cover sources (vegetation, rocky areas, rodent holes) near water are important requirements for this species for safety/protection, hunting, and hibernation or body temperature regulation in extreme weather.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

See Appendix for a description of the quantity, distribution and trend of riparian habitats.

Critical biological characteristics

Black-necked garter snakes serve as prey for a variety of other vertebrates, including bullfrogs, sunfish, and other snake species (Ahmad 2013). The expulsion of foul-smelling excrement and anal secretions serves to deter predators when these snakes are threatened (Ahmad 2013).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

In addition to their roles as predator and prey, black-necked garter snakes may serve as hosts to a number of endoparasites (Ahmad 2013).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Hunting techniques change during the spring and summer, depending on the availability of prey items (due to changes in water levels) (Ahmad 2013). For example, water and prey items are abundant in the spring, so these snakes actively forage to locate sedentary prey (Ahmad 2013). During summer, when

food items are lower in abundance, these snakes tend to use the "sit-and-wait" method to capture more active prey such as tadpoles and frogs (Ahmad 2013).

Maps of Species Range and Known Occurrences in Plan Area

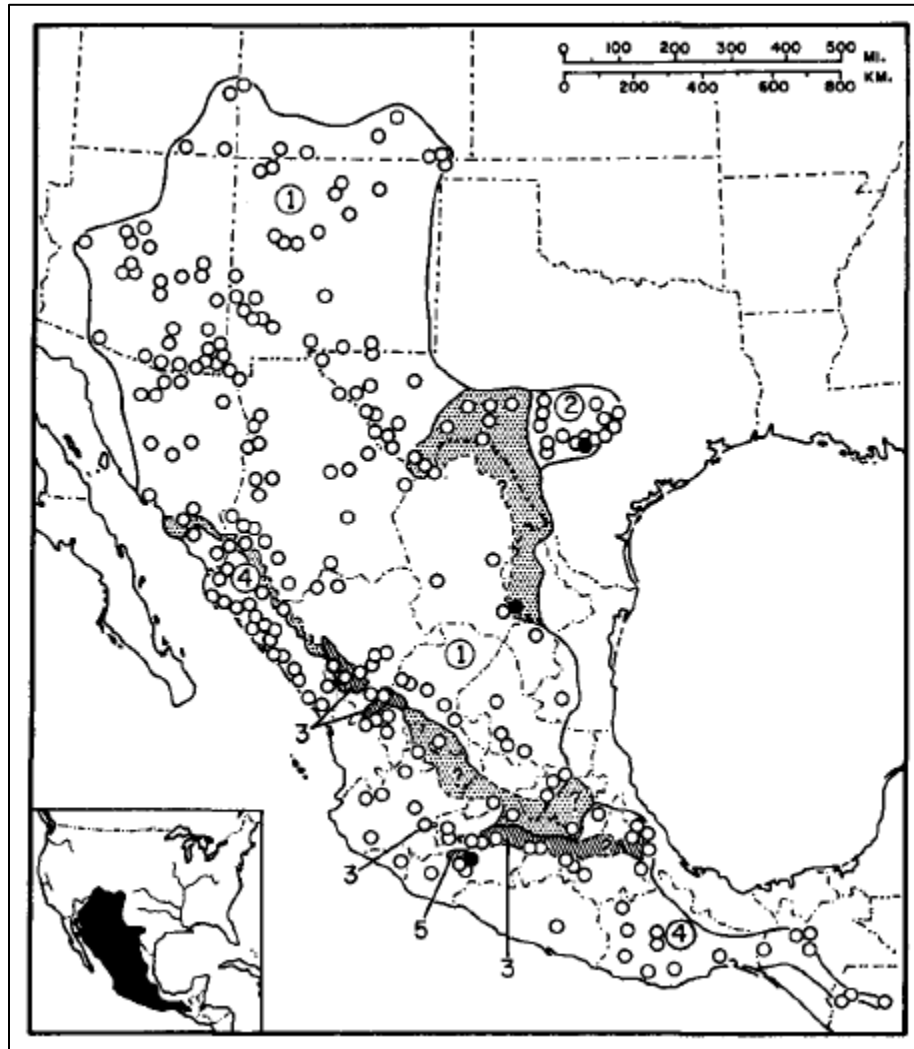


Figure 1. Range map of the black-necked garter snake from (Webb 1980). Only type-localities with precise data are plotted, as solid circles; open circles indicate other localities. Zones of intergradation are stippled. Question marks indicate uncertain limits of distribution and intergradation.

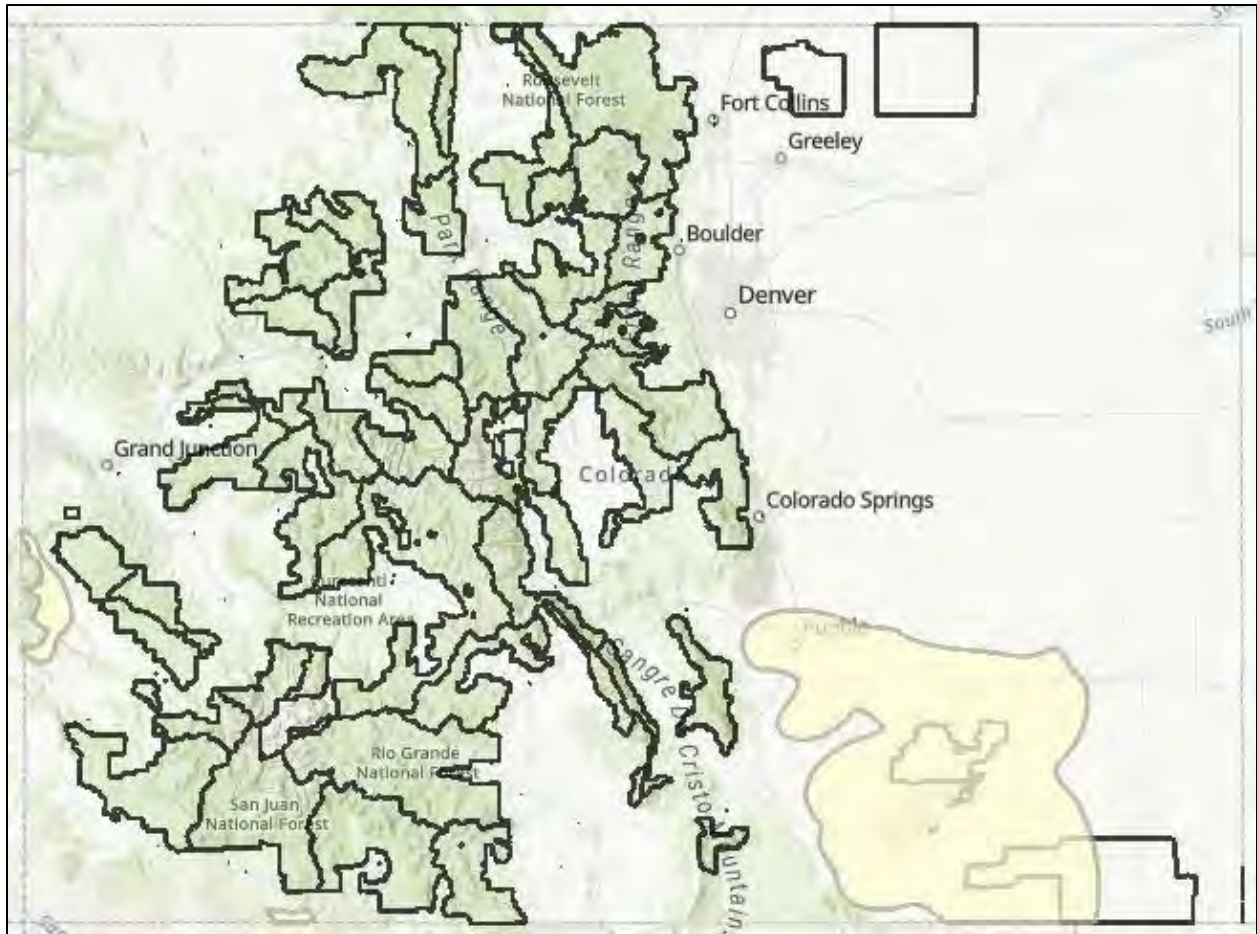


Figure 2. Distribution map of the black-necked garter snake in Colorado (yellow polygons) in relation to the plan area. Map from CNHP.

Blanchard's cricket frog *(Acris blanchardi)*

Species is Native and Known to Occur on National Forest System lands in Plan Area: No

Rationale/Evidence of Occurrence: The plan area is outside the species' range in Colorado (Figure 3) and it has a "Possibly Extirpated" rating for the state of Colorado. GBIF contains two occurrence records, both from 1978 at two locations in the Cimarron National Grassland (Collins and Collins 1991). The Kansas Herpetofaunal Atlas states "Abundant throughout the eastern two-thirds of Kansas along the level muddy or gravel, sparsely vegetated, banks of streams, rivers, and impoundments. Historically, it was more widespread in the western two-thirds of Kansas, though largely confined to stream corridors. The lack of surface water due to decreased runoff (terracing and dams) and aquifer use (irrigation and municipal) has rendered extended stretches of these streams uninhabitable to this frog. This species is missing from much of its former range in Colorado and Nebraska. Historic populations need to be re-assessed in the western quarter of Kansas" (Lynch 1985), (Lehtinen and Witter 2014). It is therefore uncertain if this species persists in the plan area given changes in surface and groundwater in the Cimarron National Grassland since this species was last observed in 1978.

Year of Last Known Occurrence: 1978

Species Status

G5; SH in Colorado; S4 in Kansas; listed as "Candidate" in Colorado.

Maps of Species Range and Known Occurrences in Plan Area

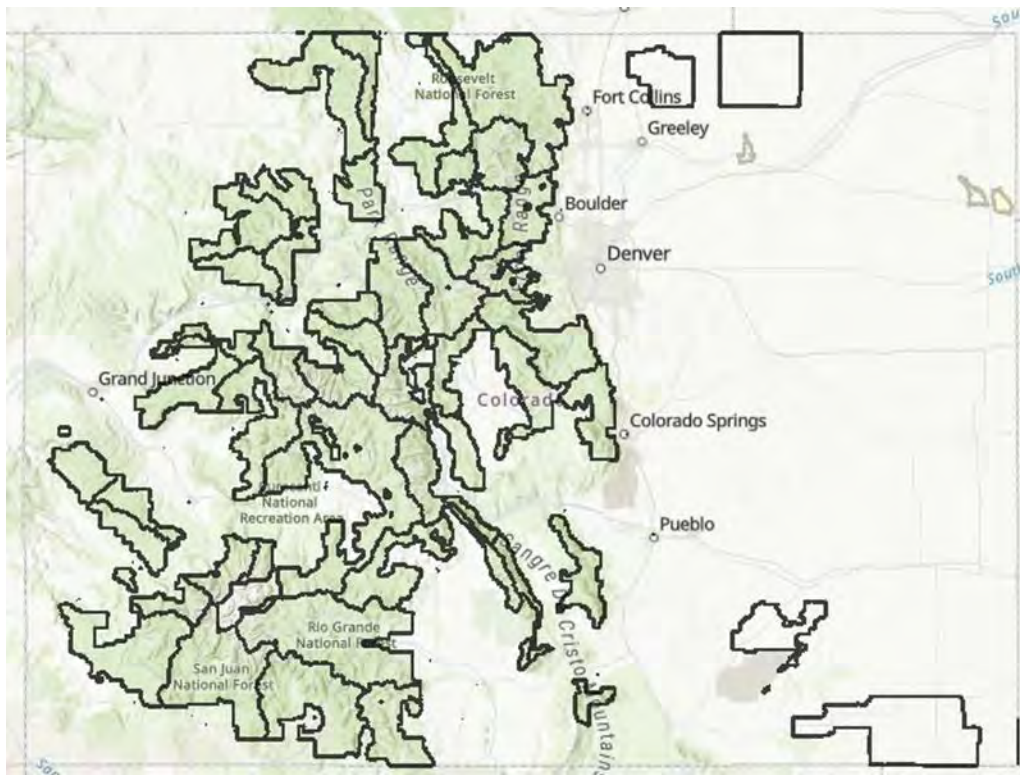


Figure 3. Colorado Parks and Wildlife distribution map of Blanchard cricket's frog (yellow polygons) in relation to the plan area. Note that the range in Colorado is well north of the plan area (Lehtinen and Witter 2014).

Checkered gartersnake (*Thamnophis marcianus*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: No

Rationale/Evidence of Occurrence: Kansas NHP has one occurrence record from 1926, from which two individuals were collected (Van Scoyoc 2024). The locality description states "Cimarron NG Site. Morton Co: Spring Creek." Spring Creek occurs squarely within the plan area; however, the snake has not been observed on the Grasslands since 1929. (Collins and Collins 1991) state "It is possible that this serpent no longer occurs in the Grasslands, having succumbed to the 'Dust Bowl' drought of the 1930s, when water was scarce and one of its favorite foods, amphibians (frogs and toads), were few." Because there is uncertainty whether this species has been extirpated from the plan area, it is not known to occur.

Year of Last Known Occurrence: 1926

Species Status

G5; SNR in Colorado; S2 in Kansas; listed as Tier 1, "Threatened" in Kansas.

Chihuahuan green toad

(*Anaxyrus debilis*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Three specimens have been collected from two locations on Comanche National Grassland on July 22, 2011 (Figure 4) (iDigBio 2024). There are 31 element occurrence records between 1964 and 2012 on the Comanche National Grassland (Colorado Natural Heritage Program 2020f). One specimen on 06-12-1928 (KU 5648) and another specimen on 08-15-1926 (KU5646) were collected possibly from the Cimarron National Grassland (Taylor 1929); however, “the reports from Morton County ((Taylor 1929) KU 5646 and KU5648) were all taken before the Dust Bowl conditions of the 1930s” (Kansas Herpetofaunal Atlas 2023) (Figure 5). All suitable habitat within the Cimarron National Grasslands in Morton County is designated as critical habitat by Kansas Department of Wildlife and Parks (Kansas Department of Wildlife and Parks 2024).

Year of Last Known Occurrence: 2012

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Enigmatic declines have had a particularly major impact on toads in the Bufonidae family. In the plan area, Lambert and Gaughan, and Sivils et al. in (Colorado Natural Heritage Program 2020f) indicated that the area was actively grazed and could negatively affect this species. Sivils also commented that over-predation was a threat (Colorado Natural Heritage Program 2020f).
 - b. Habitat: Locally threatened by conversion of desert or grassland habitat to human uses and probably also by pesticide use. Separation barriers include busy major highway such that toads rarely if ever cross successfully; roads with nonpermeable barriers to toad movement; urbanized areas dominated by buildings and pavement (NatureServe 2024d). Studies of herpetofauna of the Cimarron National Grassland indicated that the severe change in habitat conditions due to the drought of the 1930s, combined with the prevailing farming and ranching practices at that time, resulted in the extirpation of *Bufo debilis* from Morton County and adjacent areas. Morton County was one of the most devastated areas during the Dust Bowl (Taggart 1997).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: A repatriation effort was initiated by the Kansas Department of Wildlife and Parks (Taggart 1997) to introduce the species back into managed areas of their former range in Kansas. Releases were made in 1991, 1992, and 1993 at several sites in the Cimarron National Grassland. Despite annual surveys at the release sites since 2001, no Chihuahuan Green Toads have been re-discovered.
 - b. Habitat: Taggart (1997) states: “Collins and Collins (1991) thoroughly studied the herpetofauna of the Cimarron National Grassland and indicated that the severe change in habitat conditions due to the drought of the 1930’s, combined with the prevailing farming and ranching practices at that time, resulted in the extirpation of *Bufo debilis* from Morton County and adjacent areas. Morton County was one of the most devastated areas during the Dust Bowl. Today 43,777 ha of Morton County has been incorporated into the Cimarron National Grassland and reseeded to native grasses and forbs, thereby restoring suitable habitat and offering protection under the auspices of the United States Forest Service.”

3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: population size not known; 31 element occurrence records between 1964 and 2012 on Comanche NG (Colorado Natural Heritage Program 2020f); species may be extirpated from the Cimarron National Grassland.
 - b. Ecological conditions: Wetland and riparian habitats are limited in the plan area.

Species Status

G5; S2 in Colorado; S2 in Kansas; listed as Tier 1, “Threatened” in Kansas.

Taxonomy

Genus/Species *Anaxyrus debilis* is accepted as valid. Other common names associated with this species include: Green Toad, Eastern Green Toad (ITIS 2024a). *Anaxyrus debilis insidior* is invalid (ITIS 2024_A.debilis.insidior).

Species range

Overall species range

This species occurs from south-central United States to Zacatecas and San Luis Potosi, Mexico, then north to Colorado and Kansas in the United States (Figure 6, Figure 7, Figure 8).

Description of how the population in the plan area fits within the overall range

The population in the plan area is at the northern edge of the species range (Figure 6, Figure 7, Figure 8).

Distribution, abundance, and trend in the plan area

Population

Three specimens were collected from two locations on the Comanche National Grassland on July 22, 2011 (Van Scoyoc 2024). There are 31 element occurrence records between 1964 and 2012 on the Comanche National Grassland (Colorado Natural Heritage Program 2020f). One specimen on 06-12-1928 (KU 5648) and another specimen on 08-15-1926 (KU5646) were collected possibly from Cimarron NG (Taylor 1929); however, “the reports from Morton County ((Taylor 1929); KU 5646 and KU5648); were all taken before the Dust Bowl conditions of the 1930s” (Kansas Herpetofaunal Atlas 2023) (Figure 8). A repatriation effort was initiated by the Kansas Department of Wildlife and Parks (Taggart 1997) to introduce the species back into managed areas of their former range in Kansas. Releases were made in 1991, 1992, and 1993 at several sites in the Cimarron National Grassland. Despite annual surveys at the release sites since 2001, no Chihuahuan Green Toads have been re-discovered. The current population trend in the plan area is not known, but the species may be extirpated from the Cimarron NG.

Habitat

Ponds, pools of stagnant water, bare ground and shortgrass canyon bottom, dry riparian area dominated by yucca, prickly pear, cheat grass, snakeweed, tamarisk, and blue gramma. Some rocky areas, hills of gently sloping terrain leading to the riparian areas, shortgrass area with a lot of bare ground, under and in rock cracks along a limestone outcrop, intermittent gully (Van Scoyoc 2024). (Cable et al. 1996) state, "Marshes once existed in low spots along the river and throughout the region. Today, these sites are completely dry, leaving no trace of their former wetlands. The Forest Service has constructed nine ponds that provide limited habitat for waterfowl, shorebirds, gulls, and herons. Because the Cimarron River seldom has water in it, these ponds support species that otherwise would not occur on Cimarron NG". Shortgrass prairie exhibits many departures from historic conditions, but the current condition in the plan area is believed to be relatively stable (see Threats and Trends Appendix). All suitable habitat within the Cimarron National Grasslands in Morton County is designated as critical habitat by Kansas Department of Wildlife and Parks (Kansas Department of Wildlife and Parks 2024).

Threats (arising from on or off the plan area)

Population

Amphibians are one of the most threatened groups of organisms worldwide, but threats vary across species' ecological preferences, geographic ranges, and taxonomic associations (Stuart et al. 2004). Chihuahuan green toad belongs in the "true toad" family (Bufonidae), which is one of the most rapidly-declining amphibian families worldwide (Stuart et al. 2004). Declines of bufonids have been enigmatic, taking place even within well-protected habitats: "Enigmatic-decline species present the greatest challenge for conservation, because there are currently no known techniques for ensuring their survival in the wild" (Stuart et al. 2004). More recent research suggests that contaminants, climate stressors, and emerging infectious diseases are likely responsible for the so-called 'enigmatic decline' of amphibians in protected areas (Collins 2010).

Lambert and Gaughan 2007, Sivils et. al 1995 in (Van Scoyoc 2024) indicated that the area was actively grazed and could negatively affect this species. Sivils (2020g) also commented that overpredation was a threat (Colorado Natural Heritage Program 2020f).

Habitat

Tolerates livestock grazing. Locally threatened by conversion of desert or grassland habitat to human uses and probably also by pesticide use. Separation barriers include busy major highway such that toads rarely if ever cross successfully; roads with nonpermeable barriers to toad movement; urbanized areas dominated by buildings and pavement (NatureServe 2024d). Collins and Collins (1991) thoroughly studied the herpetofauna of the Cimarron National Grassland and indicated that the severe change in habitat conditions due to the drought of the 1930s, combined with the prevailing farming and ranching practices at that time, resulted in the extirpation of *Bufo debilis* from Morton County and adjacent areas.

Ecological conditions

Ecological condition requirements

The animal is restricted to the short grass prairies on the high plains, typically not found below elevations of 3,000 feet. The preferred habitat for Green Toad is arid grassland plains and valleys with few or no trees or shrubs. Soils with good water holding capacity seem to be required (NatureServe 2024d).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Only two possible historic records are available on the Cimarron National Grassland; however, records from Morton County are in need of verification (Kansas Herpetofaunal Atlas 2023). A repatriation effort was initiated by the Kansas Department of Wildlife and Parks (Taggart 1997) to introduce the species back into managed areas of their former range in Kansas. (Taggart 2006) states: “Releases were made in the early 1990s at several sites in the Cimarron National Grassland. Despite repeated surveys at the release sites from 2001 through 2005, no Green Toads have been discovered”.

Critical biological characteristics

During unfavorable climatic periods, the animals seek refuge underground in rodent burrows, ant nests, or cracks in the soil surface (Kansas Department of Wildlife and Parks 2024). Metamorphosed toads probably eat various small terrestrial arthropods. Larvae eat suspended matter, organic debris, algae, and plant tissue (NatureServe 2024d).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Taggart (1997) states: “Green Toads were observed consuming various small insects, principally ants (Hymenoptera) and small Lepidopterans, Coleopterans, and Orthopterans. Harvester ants (*Pogonomyrmex occidentalis*), which were common in areas of suitable habitat, were typically ignored”. Taggart (1997) states; “*Thamnophis radix* (Plains Garter Snake) was the most commonly observed predator on the adults, toadlets, and tadpoles of *Bufo debilis*. A larval *Ambystoma mavortium* was observed consuming a young *B. debilis* near metamorphosis at night on 13 August 1993 in Wallace County. Creusere and Whitford (1976) observed predation on *B. debilis* by *Heterodon nasicus* (Western Hognose Snake), *Masticophis flagellum* (Coachwhip), and *Pituophis catenifer* (Gopher Snake) in the Chihuahuan Desert. All three of these serpents are common throughout western Kansas (Collins and Collins 1991)”.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

The shortgrass prairie ecoregion is considered highly vulnerable to climate stressors with a high degree of confidence (CPW 2015). CPW (2015) states; “In combination with expected changes in temperature, however, even a slightly wetter scenario may not be sufficient to maintain soil moisture conditions similar to those of the recent past. This is due to the fact that increased precipitation could be more than offset by warmer temperatures increasing evaporation and transpiration rates.” Taggart (1997) states: “(Collins and Collins 1991) thoroughly studied the herpetofauna of the Cimarron National Grassland and indicated that the severe change in habitat conditions due to the drought of the 1930's, combined with the prevailing farming and ranching practices at that time, resulted in the extirpation of *Bufo debilis* from Morton County and adjacent areas. Morton County was one of the most devastated areas during the Dust Bowl. Today 43,777 ha of Morton County has been incorporated into the Cimarron National Grassland and reseeded to native grasses and forbs, thereby restoring suitable habitat and offering protection under the auspices of the United States Forest Service.”

Maps of Known Occurrences in Plan Area

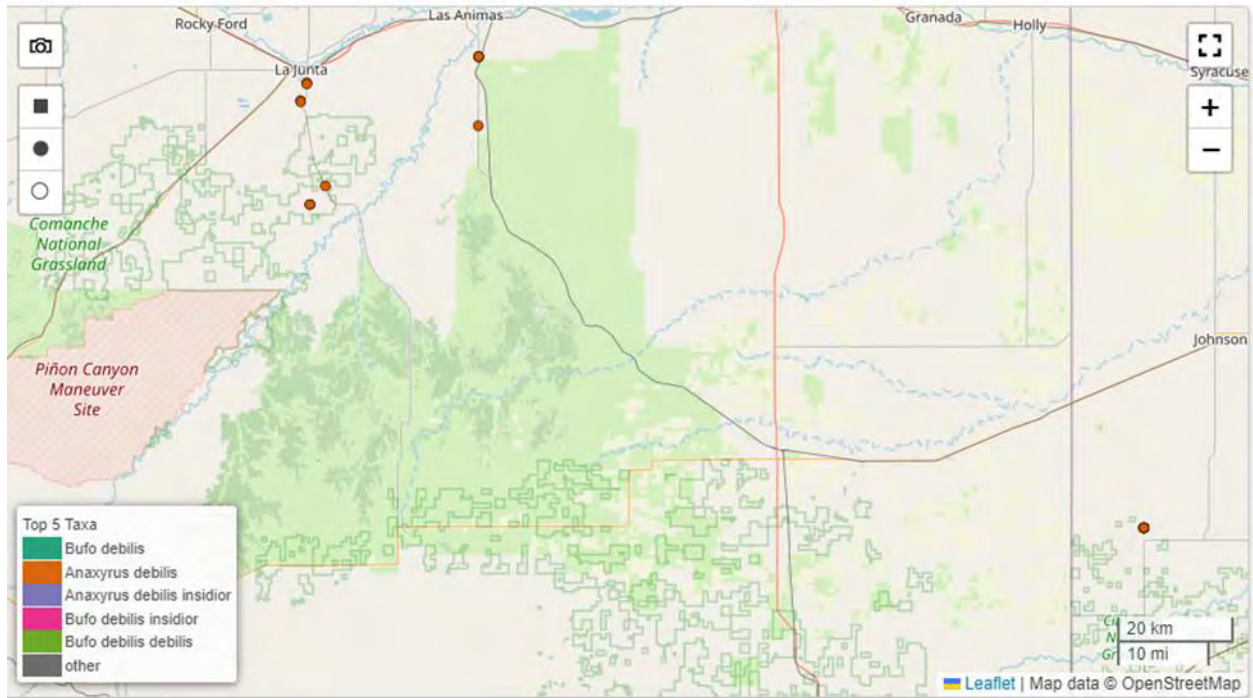


Figure 4. Occurrence records of *Anaxyrus debilis* in the plan area (Van Scoyoc 2024).

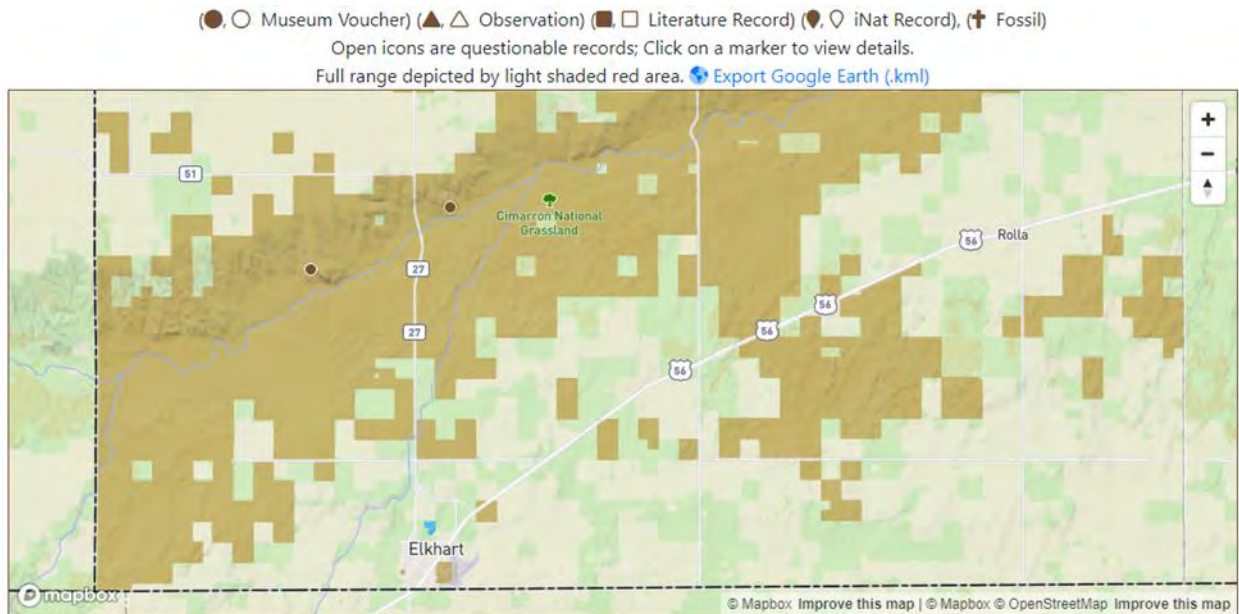


Figure 5. Occurrence records of *Anaxyrus debilis* in the plan area (Kansas Herpetofaunal Atlas 2023).

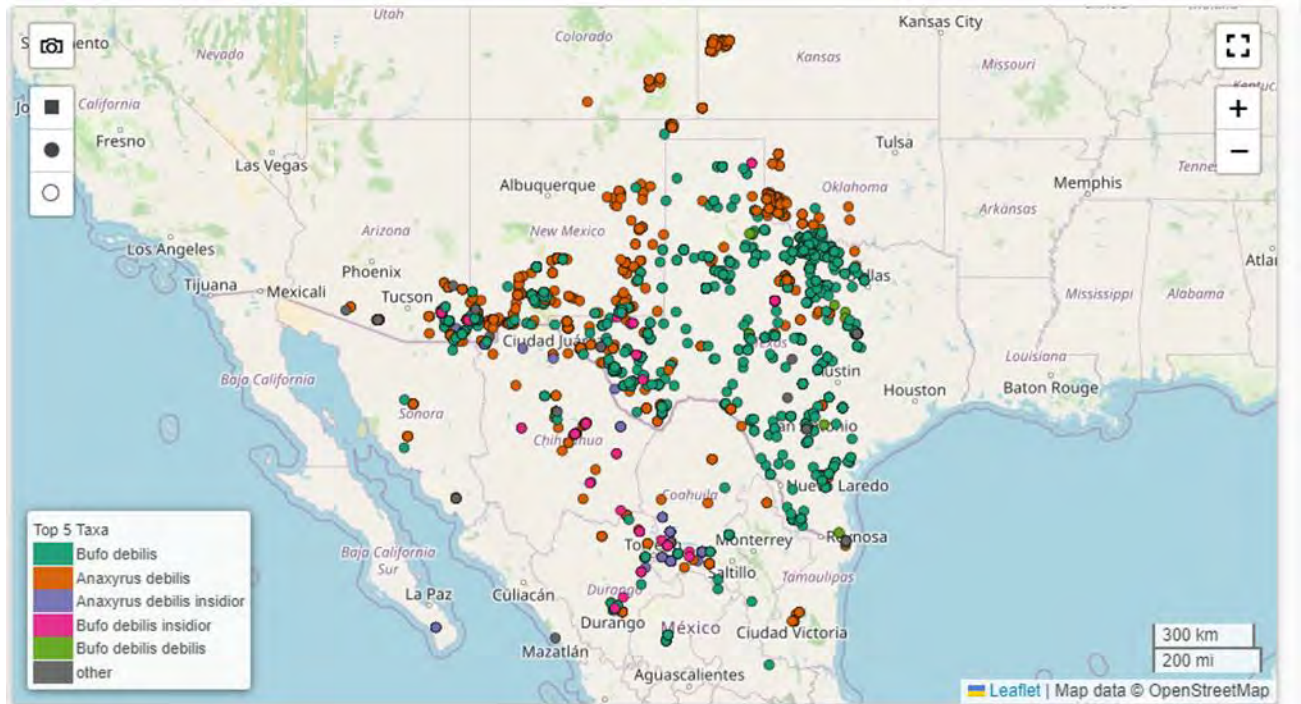


Figure 6. Distribution of occurrences of *Anaxyrus debilis* (Van Scoyoc 2024).

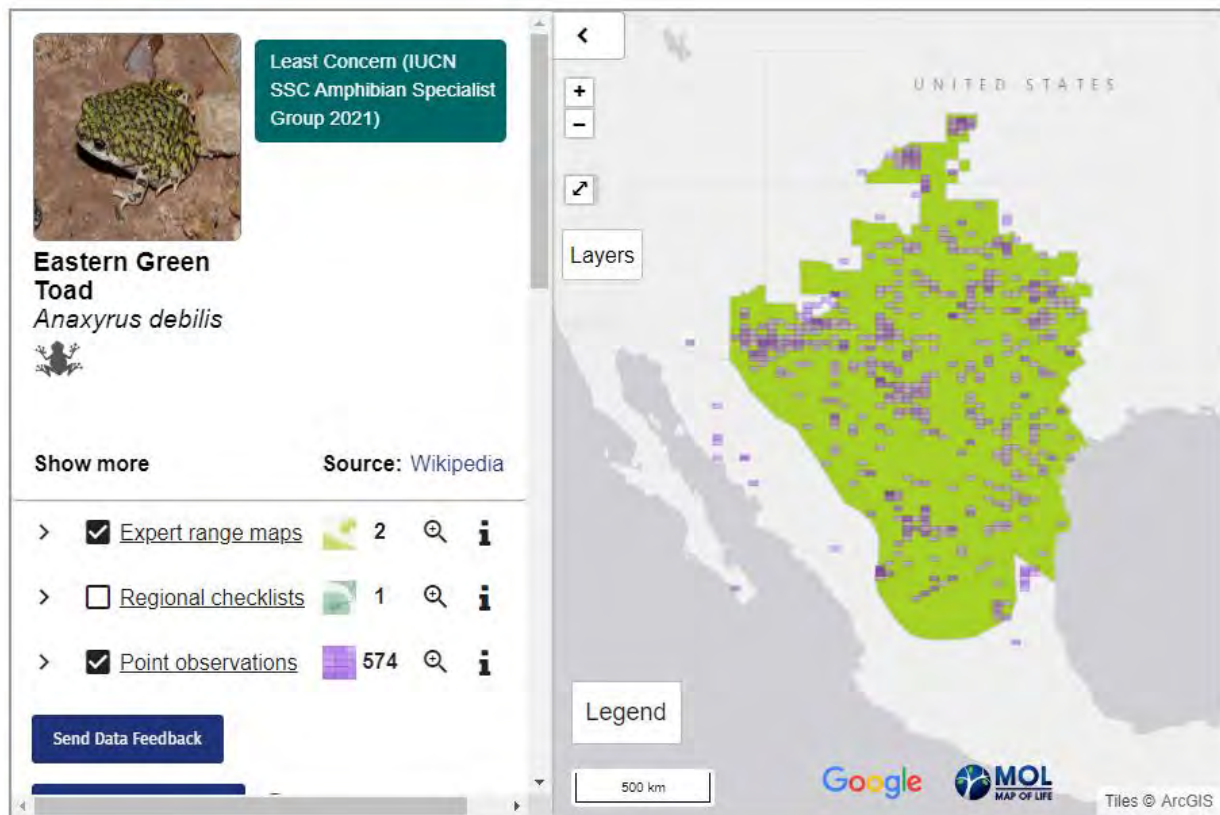


Figure 7. Distribution of occurrences of *Anaxyrus debilis* (AmphibiaWeb 2012).

Herpetofauna Species Evaluations



Figure 8. Distribution of the *Anaxyrus debilis* (Map of Life 2024).

Chihuahuan nightsnake

(*Hypsiglena jani*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has 15 records of occurrences within the plan area since 2015 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. No known threats to populations.
 - b. Habitat should be free from major threats due to rocky nature being incompatible with human use.
2. Declining trends in populations or habitat in the plan area:
 - a. No known population trends.
 - b. Species can use varied habitats; no discernable trend
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size is unknown.
 - b. Species is a habitat generalist and therefore its ecological conditions are not restricted .

Species Status

G5; S2 in Colorado; S2 in Kansas; listed as "Candidate" in Kansas.

Taxonomy

The currently accepted valid name for this species is *Hypsiglena jani* (Dugès 1865) according to ITIS (TSN 1082439). Another synonym for this species includes *Liophis janii* (Dugès 1865). Common names for this species include San Louis Potosi Nightsnake and Chihuahuan Nightsnake.

Species range

Overall species range

Range extends from southwestern and southeastern Colorado and southwestern and south-central Kansas south through most of eastern Arizona, New Mexico, western Oklahoma, and most of Texas (but not most of eastern Texas) to central and northeastern Mexico (NatureServe 2024d).

Description of how the population in the plan area fits within the overall range

The predicted range of this species includes the plan area.

Distribution, abundance, and trend in the plan area

Population

Outside of the plan area, trend over the past 10 years or three generations is uncertain, but extent of occurrence, area of occupancy, number of subpopulations, and population size have probably been relatively stable (NatureServe 2024d). Within the plan area, there is no information on species population counts, distribution, abundance or trend.

Habitat

This species of snake is found in terrestrial habitats. It generally inhabits arid and semiarid plains, canyons, and hillsides, usually in rocky, dissected, or hilly terrain with sandy or gravelly soils, including areas dominated by desert, grassland, shrubland, savanna, or woodland (NatureServe 2024d). Periods of inactivity are spent under rocks or other surface cover, in crevices, or underground (NatureServe 2024d). The habitat conditions needed for this species are widely distributed across the plan area.

Threats (arising from on or off the plan area)

Population

No major threats have been identified (NatureServe 2024d).

Habitat

No major threats have been identified. In many areas the rocky habitat tends to be unsuitable for incompatible human uses (NatureServe 2024d).

Ecological conditions

Ecological condition requirements

This species requires rocky areas with good sources of cover (rocks or other vegetative cover). Due the areas this species is found in there is little concern regarding threats from human uses.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The habitat and ecological conditions required by the species are widely distributed and available to the species.

Critical biological characteristics

Due to being unable to regulate its body temperature it is critical that this species has adequate cover sources for both the cold and hot months of the year.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species does not provide a significant or unique influence on other species or ecosystem diversity or integrity.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Sandy or gravelly soils and rocky terrain are important aspects of the species' necessary habitat structure to provide protection and cover. This species is a carnivore that consumes mainly lizards and lizard eggs, as well as other small animals.

Maps of Known Occurrences in Plan Area

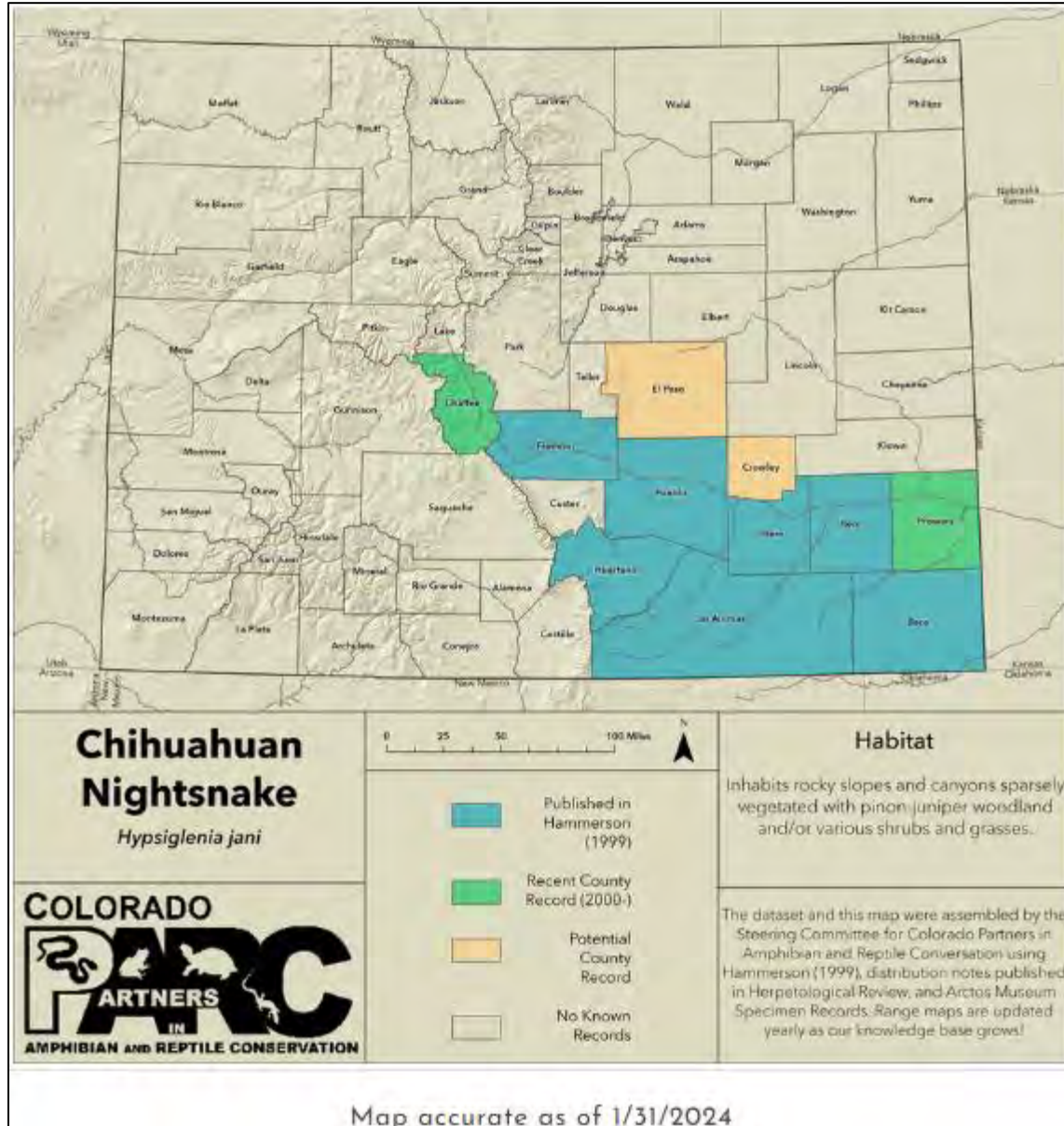


Figure 9. Map of species records by county in Colorado from COPARC (<http://www.coparc.org/chihuahuan-nightsnake.html>; (Colorado Partners in Amphibian and Reptile Conservation 2021).

Colorado checkered whiptail

(*Aspidoscelis neotesselata*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are five element occurrences (EO) on Comanche NG between 07/09/1988 to 05/25/2007 (Van Scoyoc 2024). One of the EO contains 8 specimens collected between 1988 and 1991, another EO contains 3 specimens collected in 1993 and 1994 on Comanche NG. Three other EOs contain observations of individuals between 1998 and 2007 on Comanche NG.

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Populations are threatened by urbanization or agricultural development; populations in natural areas appear to be stable but expected to experience greater habitat loss.
 - b. Habitat: Major threat on the plan area is habitat loss due to climate stressors. Threats off the plan area include loss of suitable habitat to residential and commercial development, habitat alteration and conversion to cropland, excessive grazing, chemical brush control, alteration of riparian habitat, invasion of non-native plant species and mining. Any increase in the frequency and intensity of fire in these habitats could threaten persistence of this subspecies (CPW 2015).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends are available in the plan area. IUCN states: "The total adult population size is unknown but is probably at least a few thousand. The extent of occurrence, area of occupancy, number of subpopulations, and populations size have declined in recent decades; the rate of decline probably has been less than 30% in any particular period of 10 years or three generations". Population has declined in some areas because of urbanization or agricultural development, but populations in natural areas appear to be stable (Walker et al. 2021).
 - b. Habitat: Short grass prairie with juniper trees comprising less than 10% total vegetation cover. Pinyon/juniper, yucca, rocky outcrop (Van Scoyoc 2024). Shortgrass prairie exhibits many departures from historic conditions, but the current condition in the plan area is believed to be relatively stable.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Native range is endemic to southeastern Colorado below 7,000 feet. Distribution is spotty. The plan area is at the southeastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Five element occurrences from Comanche National Grassland.
 - b. Ecological conditions: Pinyon/juniper is limited in the plan area.

Species Status

G3; S2 in Colorado; SNR in Kansas; listed as Tier 1, Candidate in Colorado.

Taxonomy

Aspidoscelis neotesselatus is accepted as valid (ITIS 2024a). Other common names associated with this species include Colorado Checkered Whiptail, Triploid Checkered Whiptail, Southeastern Colorado Whiptail.

Species range

Overall species range

The known native range includes El Paso, Teller, Fremont, Las Animas, Otero and Pueblo counties in southeastern Colorado at elevations below 2,135 meters (7,000 feet). An established, introduced (likely accidental) population outside of its native range occurs in central Washington (NatureServe 2024d) (Figure 10 and Figure 11).

Description of how the population in the plan area fits within the overall range

Native range is endemic to southeastern Colorado below 7,000 feet. Distribution is spotty. The population in the plan area is at the southeastern edge of the species range (Colorado Parks and Wildlife 2024).

Distribution, abundance, and trend in the plan area

Population

Element occurrences (EOs) in plan area are located both sides of David Canyon Road and within 2 miles from the road. No known trend data for population in plan area are available. IUCN states: “The total adult population size is unknown but is probably at least a few thousand. The extent of occurrence, area of occupancy, number of subpopulations, and populations size have declined in recent decades; the rate of decline probably has been less than 30% in any particular period of 10 years or three generations”.

Habitat

Shortgrass prairie with juniper trees comprising less than 10% total vegetation cover. Pinyon/juniper, yucca, rocky outcrop (Van Scoyoc 2024). See Appendix for trends in shortgrass prairie habitat.

Threats (arising from on or off the plan area)

Population

This species has been extirpated from or has greatly declined in some areas as a result of urbanization or conversion of habitat to agricultural uses, whereas other populations exist in moderately or heavily disturbed areas (e.g., around buildings in parks and at rural landfills) and in nearby undisturbed habitats (Walker et al. 1997b, a). Population has declined in some areas because of urbanization or agricultural development, but populations in natural areas appear to be stable (Walker et al. 2021).

Habitat

Urbanization or agricultural development, excessive grazing, chemical brush control, alteration of riparian habitat, invasion of non-native plant species and mining, and any increase in the frequency and intensity of fire (CPW 2015). Walker et al. (2019) considered it unlikely that foreseeable anthropogenic causations other than climate would threaten the habitation of *A. tessellatus* at Carrizo Canyon Picnic Area, an area regulated by restrictive federal and state strictures and private land-use practices. Alvarez et al. (2017) indicated that the Colorado checkered whiptail will likely experience greater habitat loss due to climate stressors.

Ecological conditions

Ecological condition requirements

Hillsides, arroyos, canyons, the canyon-grassland transition, roadsides, shrubby areas, and juniper-grass associations in valleys, arroyos, and canyons (CPW 2024). Pinyon-juniper woodlands dominated by *Pinus edulis* and/or *Juniperus monosperma*, and shrublands with sagebrush (*Artemisia tridentata*), fourwing saltbush (*Atriplex canescens*) or rabbitbrush (*Ericameria nauseosa*) (Dicus et al. 2009).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

One of the element occurrences is the most heavily used areas in Comanche NG due to well-developed trails used for hiking, mountain biking and horseback riding. No motor vehicles are permitted. This occurrence area is grazed also. This area can be developed for additional recreation, but not likely for other purposes (Van Scoyoc 2024).

Critical biological characteristics

This is an all-female species that arose through hybridization between other whiptail species. This population of triploid (having three sets of chromosomes instead of the usual two) animals is entirely made up of females, who are able to reproduce parthenogenetically. In parthenogenetic species, reproduction is asexual, and egg cells develop without having been fertilized by male gametes. Consequently, offspring are genetically identical with their mother (Colorado Parks and Wildlife 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species could be prey for raptors and other predatory species. This species may compete for prey and habitat with other lizard species.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

There are studies suggesting that *Aspidoscelis* lizards tolerate fire well (Rice et al. 2018); however, any increase in the frequency and intensity of fire in pinyon-juniper woodland and shrubland habits could threaten persistence of this species (CPW 2015). The shortgrass prairie ecoregion is also considered highly vulnerable to climate stressors with a high degree of confidence (Rice et al. 2018).

Maps of Known Occurrences in Plan Area

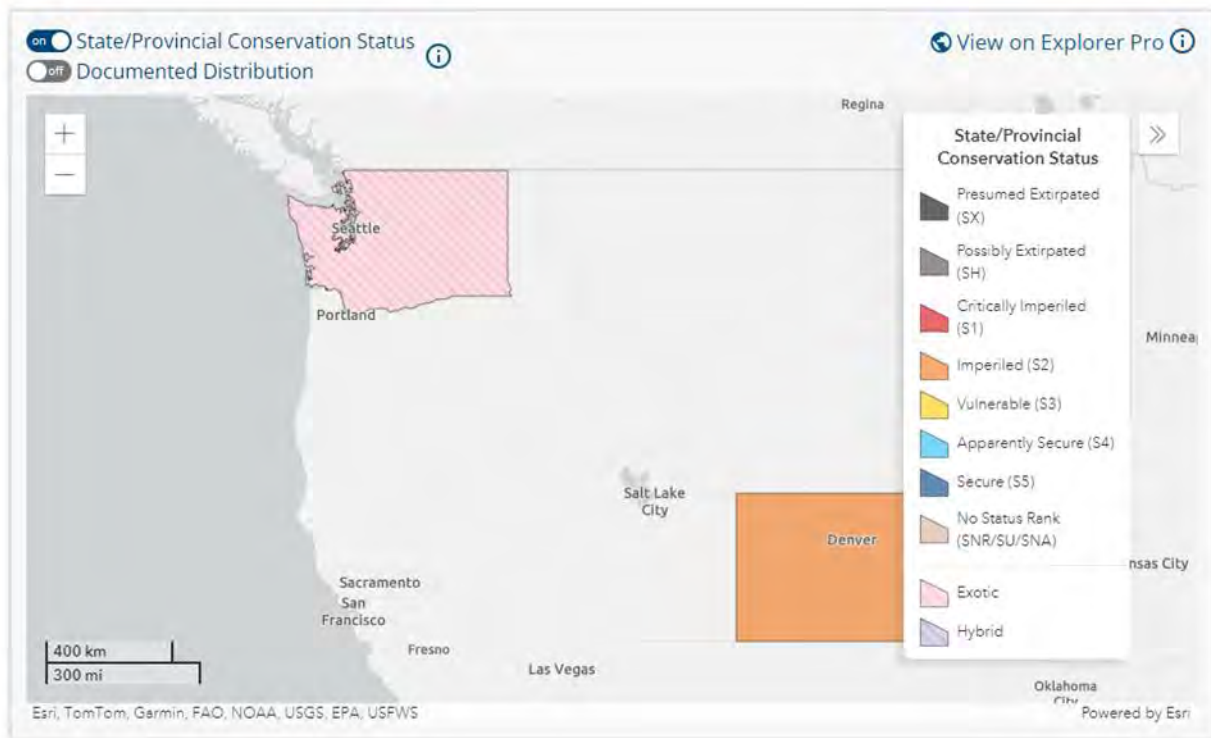


Figure 10. Overall species range for Colorado checkered whiptail (NatureServe 2024d).

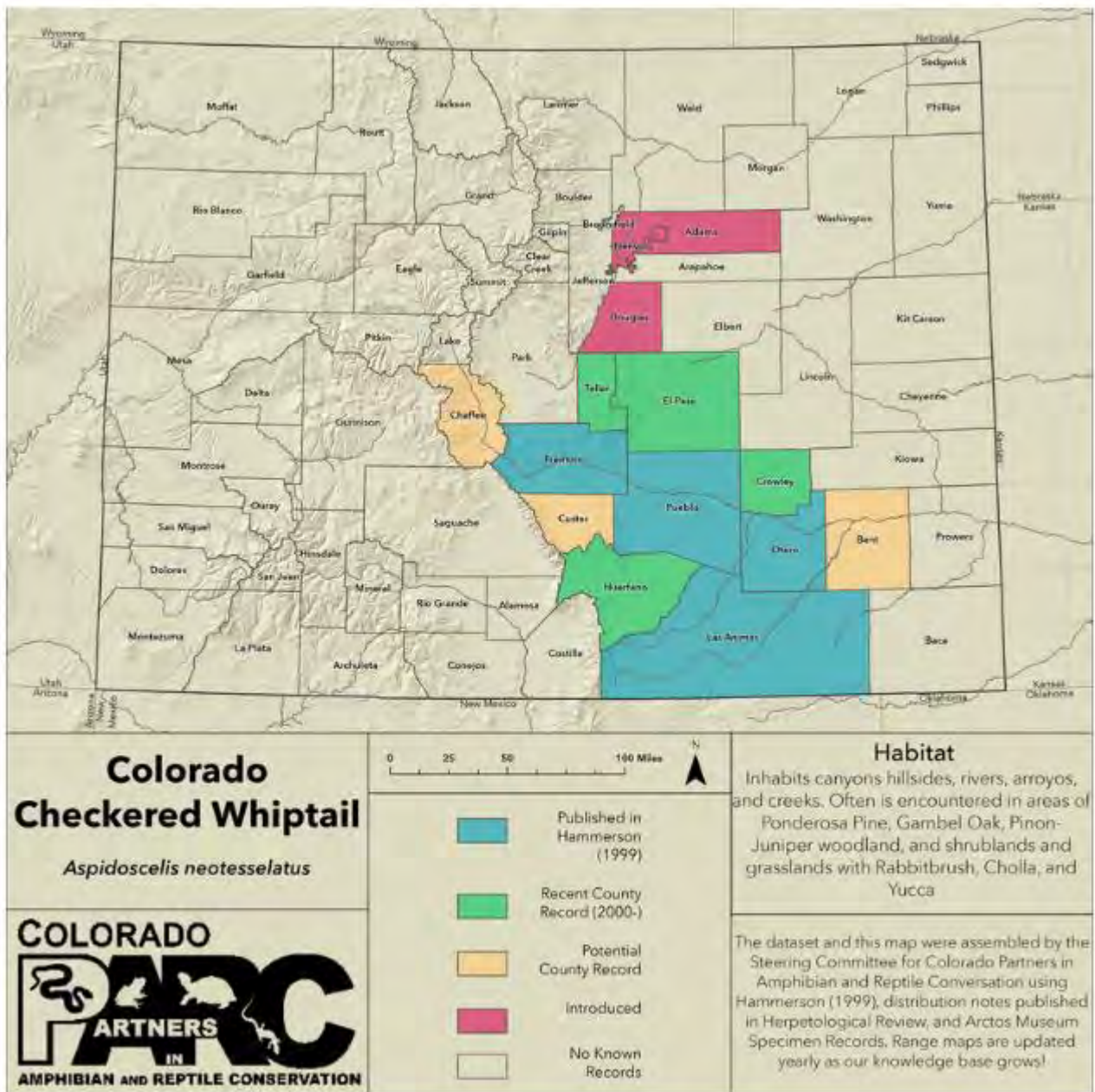


Figure 11. Colorado Partners in Amphibian and Reptile Conservation (Hammerson 1999d). Overall species range in Colorado for Colorado checkered whiptail.

Common checkered whiptail

(*Aspidoscelis tesselatus*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are 23 records of occurrence from GBIF in the plan area (Van Scoyoc 2024), some of which have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No major threats have been identified, but some local declines have been noted as a result of urbanization and land conversion.
 - b. Habitat: Loss of habitat due to conversion of lands to agricultural uses or urbanization is a threat at the local level, but range-wide the species is considered relatively stable (NatureServe 2024d). Climate stressors are a threat to this species as well (Walker et al. 2019).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trends in the plan area are unknown.
 - b. Habitat: The grassland types are generally stable or declining (see Habitat Trend discussion below). The pinyon-juniper woodlands trend is unclear as there are many factors affecting this vegetation community (See Habitat Trend discussion below).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Species is at the far northern edge of its range and is not considered to extend into Kansas according to the USGS.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Numbers are unknown at this time.
 - b. Ecological Conditions: Species uses varied habitat that is collectively well-distributed across the plan area, including pinyon-juniper woodland, yucca grassland, mesquite-creosotebush associations, and cottonwood-tamarisk-willow stands.

Species Status

G5; S2 in Colorado; SNR in Kansas.

Taxonomy

This species has a complex nomenclatural history, and nomenclature remains unsettled. All taxonomic information was retrieved from the Integrated Taxonomic Information System (ITIS). Currently, ITIS has *Aspidoscelis tesselatus* (Say in James 1823, ITIS 2024h) as the accepted valid scientific name for this species. Synonyms include *Cnemidophorus dixonii* (Scudder 1973), *Cnemidophorus tesselatus* (Say in

James 1823), *Ameiva tessellata* (Say in James 1823), *Cnemidophorus grahamii* (Baird and Girard 1852), *Aspidoscelis dixonii* (Scudday 1973), and *Aspidoscelis tessellata* (Say in James 1823).

Common names for this species include common checkered whiptail, gray checkered whiptail, and huico teselado (Spanish).

Species range

Overall species range

The range extends from southeastern Colorado through New Mexico, extreme southeastern Arizona, and western Texas to Chihuahua and Coahuila, Mexico (Herpedia 2024). It also includes subpopulations in very small areas of Texas and New Mexico that formerly were recognized as a separate species, *Aspidoscelis dixonii*. The distribution is mostly discontinuous and localized (Herpedia 2024).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species range. There have been 23 records of observations within the planning area ranging from 1960 to 2023 according to GBIF.

Distribution, abundance, and trend in the plan area

Population

There are 23 species record occurrences for the plan area, however there is no available data regarding population counts and the trend.

Habitat

In general, this lizard inhabits sparsely vegetated areas: canyon slopes, bluffs, gullies, flatlands; soil may be sandy, gravelly, or rocky; vegetation may include pinyon-juniper woodland, yucca grassland, mesquite-creosotebush associations, and cottonwood-tamarisk-willow stands (NatureServe 2024d). Lizards take shelter underground or under rocks, and eggs are laid in soft well-drained soil in an open area (NatureServe 2024d). The plan area contains the majority of the habitat conditions utilized by this species and should not be a limiting concern.

The shortgrass prairie habitat type is the dominant habitat type across the plan area (80%). It is considered good with a stable condition in Kansas (Rohweder 2022) but has deviated from historical conditions regarding composition in eastern Colorado (Crockett et al. 2023).

The sandsage prairie habitat type is the second-most widespread vegetation type in the plan area, and the most abundant type for the Cimarron National Grassland, specifically (USDA Forest Service 2005a). In Kansas, the sandsage prairie habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of the historic sandsage habitat has been lost or converted for agricultural uses (CPW 2015). The remaining tracts have good landscape connectivity, but the species composition is highly altered (CPW 2015).

Juniper woodlands are restricted to the southwestern portion of the Comanche National Grassland (Kuhn et al. 2011), where there are extensive pinyon pine forests in Picketwire Canyon and the Kim area in Las Animas County. Juniper has increased in distribution and abundance in some ecosystems within the plan area, particularly the canyonlands of the Comanche National Grassland (USDA Forest Service 2005b).

The current ecosystem condition is likely well outside the historic range (USDA Forest Service 2005a), but the overall trend is unknown.

Threats (arising from on or off the plan area)

Population

No major threats have been identified. At a local level, populations have declined as a result of urbanization and conversion of habitat to agricultural uses (NatureServe 2024d).

Habitat

Conversion of areas for urbanization or agricultural uses (NatureServe 2024d). Walker et al. (2019) considered it unlikely that foreseeable anthropogenic causations other than climate would threaten the habitation of *A. tessellatus* at Carrizo Canyon Picnic Area, an area regulated by restrictive federal and state strictures and private land-use practices.

At a broad scale, the primary threats to sandsage prairie are loss and fragmentation of habitat and degradation of ecological integrity (e.g., conversion to agriculture, expanding exurban development, construction of roads, energy development, encroachment of woody plants, and targeted eradication of sandsage with herbicide) (Locklear 2021, CPW 2015, Rohweder 2022). Weather/climate, fire and grazing constitute the most important processes impacting this system, and these processes are also interactive (Locklear 2019). While sandsage prairie is fairly resilient to the effects of drought in the Great Plains, there are biological limits to the ability of this vegetation to tolerate prolonged episodes of severe drought and may be at the limits of its drought tolerance in southeastern Colorado (Rondeau et al. 2018, Locklear 2019).

At the unit level, grazing occurs over most of the plan area in both states. Long-term continuous grazing of domestic livestock has considerably altered these shrubland habitats from their pre-settlement condition (Colorado Natural Heritage Program 2015, Rohweder 2022). Generally, domestic livestock grazing tends to favor the increase of sandsage over associated native grasses therefore decreasing herbaceous cover (CNHP 2015). Fire is an important disturbance process for sandsage prairie, and fire suppression has caused encroachment of woody species such as eastern redcedar (Locklear 2019) and less mosaiced successional conditions (USDA Forest Service 2008). Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimarron National Grassland.

While habitat loss and deleterious management practices are recognized as threats to sandsage prairie vegetation, the significance of these losses to the larger Great Plains ecoregion has not been examined (Locklear 2021).

For shortgrass prairie at a broad scale, important processes impacting these grassland systems are drought and grazing, which also greatly influenced fire frequency and extent (NatureServe 2024, LandFire BpS 11490 2020). Short grasses are generally extremely drought- and grazing-tolerant, although continuous heavy grazing and extended drought will reduce cover of dominant species (Colorado Natural Heritage Program 2010), NatureServe 2024, LandFire BpS 11490 2020). As the driest of Great Plains grasslands, shortgrass prairie is susceptible to climate stressors such as increasing drought (NatureServe 2024d). Other general threats to grassland habitat include heavy continuous livestock grazing, military training, invasive non-native species, altered fire regime (fire suppression), conversion to agriculture, fragmentation from roads and development such as exurban and urban development, gas and oil exploration and extraction, invasive species (in the less xeric regions), renewable energy development, increased irrigation conversion of grassland into cropland, and ongoing depletion of the Ogallala Aquifer (Johnson et al. 2012, Colorado Natural Heritage Program 2015, Rohweder 2022, NatureServe 2024d).

At the unit level, cattle grazing occurs over most of the plan area. Livestock grazing can create change in plant composition. This can include lower species diversity, lower abundance of highly palatable grasses and greater abundance of unpalatable species; increase in weedy species, especially invasive non-native, and bare soil (Crockett et al. 2023). Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimarron National Grassland. Roads traverse the plan area and can cause fragmentation; road density is particularly high in the Cimarron National Grassland (USDA Forest Service 2024). Invasive non-native/alien species can threaten native plant species and alter community composition. Cheatgrass (*Bromus tectorum*) has increased in the plan area and represents a major change in the grassland ecosystem relative to historic conditions (CCNG 2005). Relatively few non-native plants can tolerate the arid summer conditions on the Grassland. Shortgrass prairie is considered highly vulnerable to climate stressors in Colorado and is one of the most vulnerable sites (Smith et al. 2024b) (CPW 2015). Lastly, aggressive fire suppression has occurred in the plan area and represents a departure from the natural frequency of fire (CCNG 2005).

Reduced role of recurrent fire in these ecosystems it is thought to be responsible for ecologically adverse shifts in the structure, composition, and diversity of these grasslands, leading specifically to the rise of ruderal species and invasion by less fire-tolerant species (Brockway et al. 2002).

Pinyon-juniper (P-J) woodland habitat shifting and alteration due to climate stressors is a threat to pinyon-juniper communities (CNHP 2015). Livestock grazing can alter the understory composition of juniper woodlands and most of the plan area is actively grazed. Fire suppression has contributed to mature, dense stands of oneseed juniper in the plan area, putting them at greater risk from disease and catastrophic fire (CCNG 2008). Both pinyon and juniper species have thin bark and low canopies, making this habitat type relatively intolerant of fire (Romme et al. 2009, Huffman et al. 2001). Treatments, including mechanical mastication, are currently occurring in the Comanche National Grassland to try and reduce juniper encroachment. Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimarron National Grassland.

Ecological conditions

Ecological condition requirements

The species forages opportunistically, and the most common food items for adults are grasshoppers and termites, while spiders and leafhoppers were the primary food items for young lizards (Hammerson 1999a). Other reported food items include cicadas, moths, and larval lepidopterans (Hammerson 1999a).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The plan area contains widely dispersed ecological conditions required by this species to persist. The trend of these conditions and habitat types are addressed up above under Habitat Trends in the Plan Area.

Critical biological characteristics

Teiid lizards (Whiptails and others) have home ranges that are generally less than 1 ha but sometimes move hundreds of meters from one location to another (NatureServe 2024d). Little is known about dispersal distances, but these lizards appear to be capable of making extensive movements (NatureServe 2024d).

Separation barriers include busy highways or highways with obstructions such that lizards rarely, if ever, cross successfully; major rivers, lakes, ponds, or deep marshes; densely urbanized areas dominated by buildings and pavement (but note that some rural residential areas are suitable habitat for some species) (NatureServe 2024d).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Natural predators of this species are reported to include coachwhips and likely other snakes, the eastern collard lizard, roadrunners (Hammerson 1999).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Based on the noted separation barriers above, intact, continuous large patches of unobstructed habitat is needed to support species movement.

Maps of Species Range and Known Occurrences in Plan Area

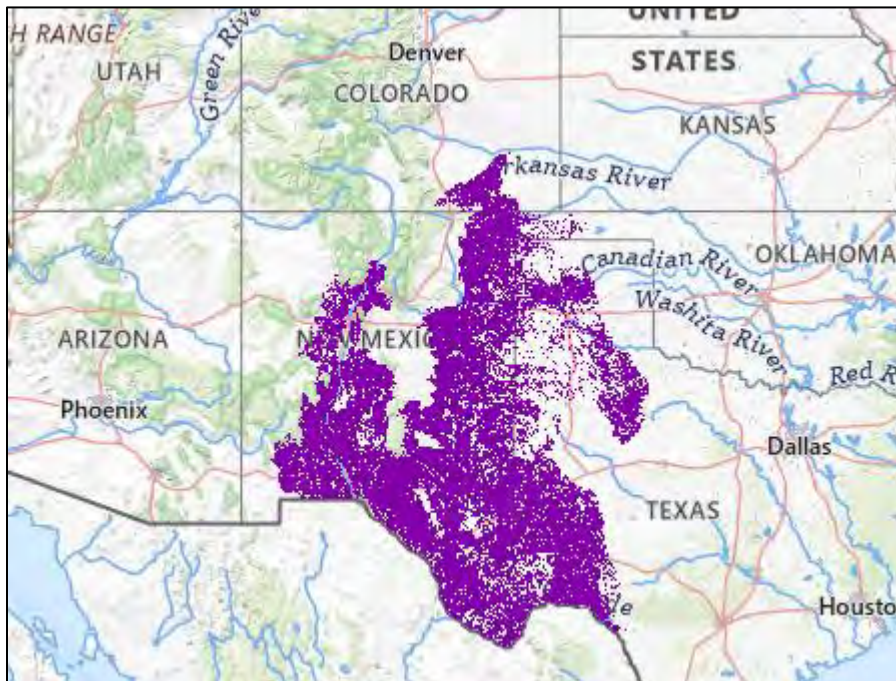


Figure 12. Predicted spatial distribution of suitable environmental and land cover conditions for the common checkered whiptail (USGS 2018).

Couch's spadefoot

(*Scaphiopus couchii*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are five element occurrences with a total of 18 records between 5/15/1977 to 5/15/2012 in various locations in Comanche National Grassland (Van Scoyoc 2024). Observations of all life forms have been observed (Colorado Natural Heritage Program 2020b, c, d, e, a). On 2007-06-25, approximately 500 tadpoles were observed by Lambert and Gaughan (Colorado Natural Heritage Program 2020c).

Year of Last Known Occurrence: 2012

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: habitat loss, climate stressors and road mortality.
 - b. Habitat: habitat loss, grazing and exotic species (*Tamarix* spp., weeds).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends are available in the plan area.
 - b. Habitat: This species' habitat has likely declined to some degree in the past due to exotic species (weeds). Aquatic/riparian habitat on the plan area has declined.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the northern edge of the species range and is a disjunct population (Figure 13).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. There are five element occurrences with a total of 18 records between 5/15/1977 to 5/15/2012 in various locations in the Comanche NG. Observations of all life forms have been observed. On 2007-06-25, approximately 500 tadpoles were observed.
5. Ecological conditions: Wetland and riparian habitats are restricted in the plan area.

Species Status

G5; S1 in Colorado; SNR in Kansas; listed as "Candidate" in Colorado.

Taxonomy

Scaphiopus couchii is accepted as valid. Synonyms: *Scaphiopus varius*, *Spea laticeps*. (ITIS 2024g).

Species range

Overall species range

Couch's spadefoot is found in southeastern Colorado, western Oklahoma, western Texas, New Mexico, Arizona, and southeastern California in the United States and southern Baja California, Nayarit, Zacatecas, San Luis Potosi, and northern Veracruz in Mexico, (Stebbins 2003, Mulcahy and Setser 2002) (Figure 13, Figure 14).

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the northern edge of the species range and a disjunct population (Figure 13, Figure 14, Figure 15).

Distribution, abundance, and trend in the plan area

Population

No population trends in the plan area are available. There are five element occurrences with a total of 18 records between 5/15/1977 to 5/15/2012 in various locations in the Comanche National Grassland. Observations of all life forms have been observed. On 2007-06-25, approximately 500 tadpoles were observed. One specimen was collected from the Comanche National Grassland on July 21, 2011.

Habitat

Habitat includes arid and semi-arid shrublands, shortgrass plains. These toads spend most of their time underground or in rodent burrows, except when rains stimulate activity and bring them to the surface. Females attach eggs to vegetation in shallow ephemeral water resulting from heavy rains (NatureServe 2024d). This species' habitat has likely declined to some degree in the past due to exotic species (weeds) (Colorado Natural Heritage Program 2020c).

Threats (arising from on or off the plan area)

Population

Amphibians are one of the most threatened groups of organisms worldwide, but threats vary across species' ecological preferences, geographic ranges, and taxonomic associations (Stuart et al. 2004). Couch's spadefoot belongs in the "spadefoot toad" family (*Scaphiropodidae*), which has relatively few rapidly-declining species (Stuart et al. 2004). The dominant cause of decline of spadefoot toads is habitat loss (Stuart et al. 2004), and the plan area is expected to serve as refugia in this regard.

This species is considered extremely vulnerable under all climate models examined, although the impact and timing is not known (Griffis-Kyle et al. 2018). At this time, chytrid fungus (*Batrachochytrium dendrobatidis*) does not appear to be threatening this species (Christman and Jennings 2018, Waters et al. 2016)".

Individuals were found dead and alive on the road (Van Scoyoc 2024)".

Habitat

NatureServe (2024) states “Invasive saltcedar (*Tamarix* spp.) degrades habitat quality in riparian areas and can reduce or even eliminate Couch's spadefoot from the habitat (Riddle and Bateman 2020)”. Grazing and exotic species (weeds) are noted as threats for one of the EOs (Colorado Natural Heritage Program 2020c).

Ecological conditions

Ecological condition requirements

Habitat includes arid and semi-arid shrublands, shortgrass plains, mesquite savanna, creosote bush desert, thornforest, cultivated areas, and tropical deciduous forest (Mexico). These toads spend most of their time underground or in rodent burrows, except when rains stimulate activity and bring them to the surface. Females attach eggs to vegetation in shallow ephemeral water resulting from heavy rains. Almost all feeding and breeding activity occur during and shortly after heavy spring and summer rains. Otherwise, these toads stay buried in the ground (NatureServe 2024d). This species relies on abundant summer rains to create optimal breeding conditions, generally in ephemeral ponds, but adults can survive at least two years in hibernation (Seymour 1973).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Wetland and riparian habitats are restricted in the plan area (see Appendix). Short Grass Prairie is not restricted in the plan area. This species has been observed in variety of areas in the Comanche National Grassland.

Critical biological characteristics

This species relies on abundant summer rains to create optimal breeding conditions, generally in ephemeral ponds, but adults can survive at least two years in hibernation (Seymour 1973). Females lay a clutch of more than 3,000 eggs, which hatch in less than a day, and tadpoles transform faster than any other North American anurans - in about 7 or 8 days. The duration can depend on the duration of the pool and the food source. Tadpoles will sometimes remain in long-lasting pools, growing very large before they transform (Nafis 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Eats a variety of invertebrates, many of which are winged and larval termites which also emerge during rains. Beetles, ants, grasshoppers, spiders, and crickets are also eaten. *S. couchii* can consume up to 55 percent of their body weight, which can be enough food to last a full year. *S. couchii* releases irritating skin secretions which probably deters predators (Nafis 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

In combination with expected changes in temperature, however, even a slightly wetter scenario may not be sufficient to maintain soil moisture conditions similar to those of the recent past. This is due to the fact that increased precipitation could be more than offset by warmer temperatures increasing evaporation and transpiration rates (CPW 2015).

Maps of Species Range and Known Occurrences in Plan Area

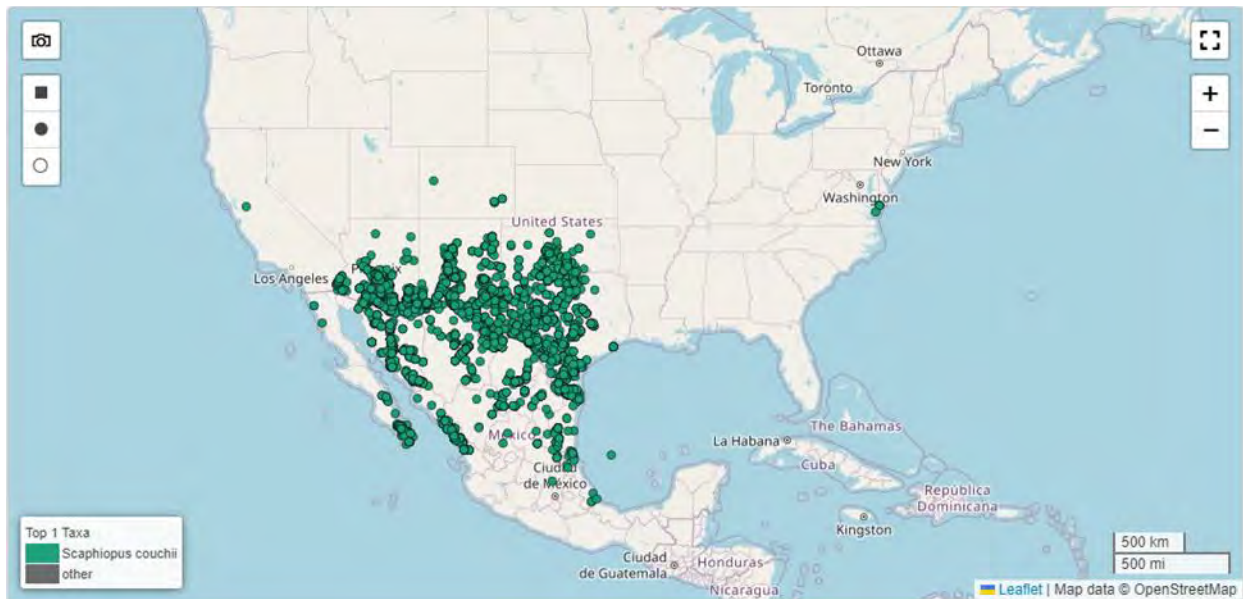


Figure 13. Species distribution map of the Couch's spadefoot (Van Scoyoc 2024).



Figure 14. Species distribution map of the Couch's spadefoot (ARMI 2024).

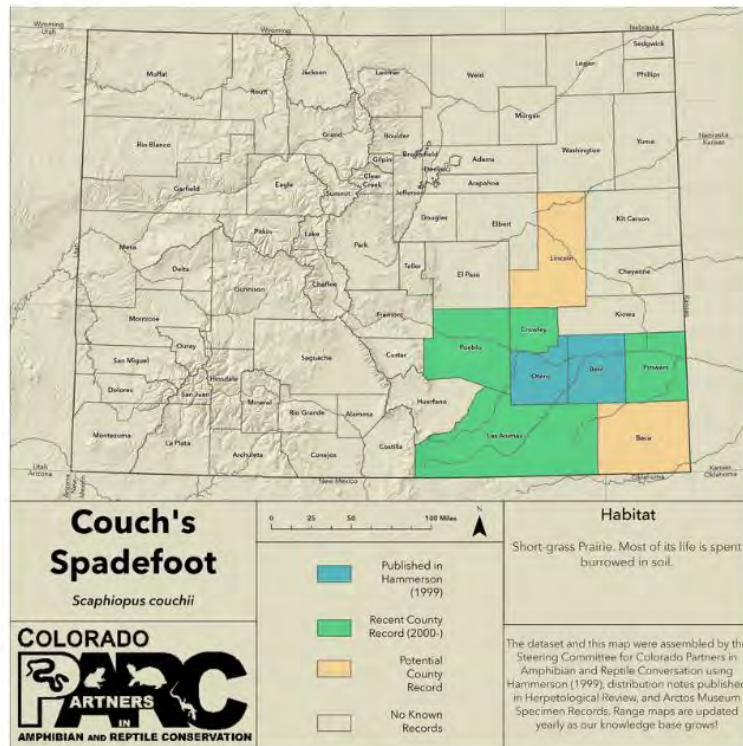


Figure 15. Species distribution map of the Couch's spadefoot in Colorado (Hammerson 1999b).

Eastern hog-nosed snake (*Heterodon platirhinos*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: No

Rationale/Evidence of Occurrence: There is one record of occurrence from 1927 in or near the Cimarron National Grassland (Van Scoyoc 2024). This record does not provide sufficient spatial precision to demonstrate the species occurs in the plan area; the locality just states “Elkhart, 81 Ranch.” No other records of the species have been found, and this is the only record of the species in Morton County, Kansas (Schmidt et al. 2024). (Hammerson 1999b) characterizes records in the Colorado counties that overlap the plan area as “potential.” Therefore, this species is not known to occur in the plan area.

Year of Last Known Occurrence: N/A

Species Status

G5; S1 in Colorado; S4 in Kansas; listed as “Candidate” in Kansas.

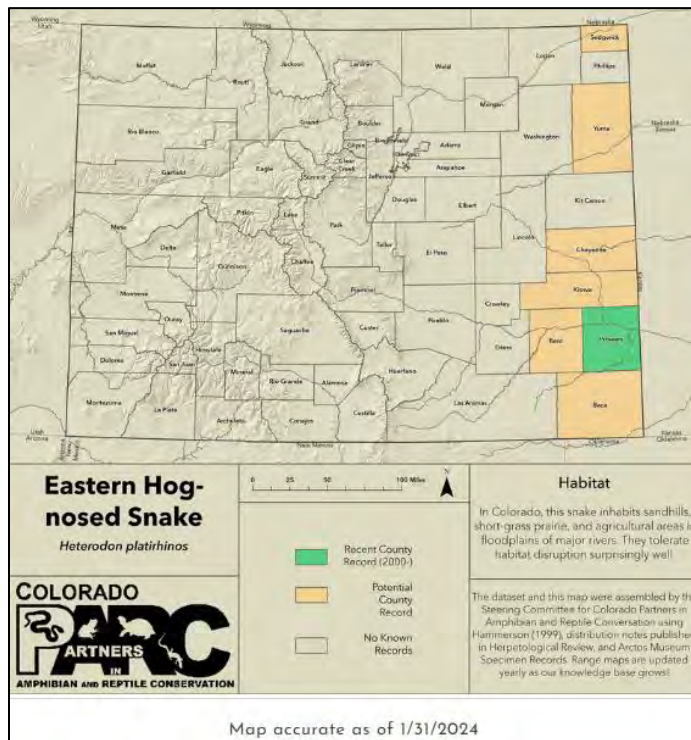


Figure 16. Map of Eastern hog-nosed snake records by county in Colorado from COPARC (Hammerson 1999b).

Glossy snake (*Arizona elegans*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: KSNHP has four occurrence polygons from 1927-1997 (Van Scoyoc 2024). In the plan area, GBIF has 28 occurrence records from 1971-2023 (Van Scoyoc 2024). Some of these records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Loss of habitat through several mechanisms is a threat to this species. At a wider scale, this species is not very threatened at this time.
 - b. Habitat: Agricultural development and urbanization are primary threats to the habitat, as well as grazing, wildfires, climate stressors, energy development, and non-native invasives.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trend in population is not known at this time
 - b. Habitat: Shortgrass prairie is stable in Kansas but has deviated in eastern Colorado. Sandsage prairie has declined in both Kansas and Colorado.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. This species' range is not restricted. The plan area is in the northern part of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Numbers are unknown.
 - b. Ecological Conditions: Species uses a variety of habitats that collectively are not restricted within the plan area; however, the two most abundant grassland vegetation types that this species could use are declining in either one or both states.

Species Status

G5; S3 in Colorado; S4 in Kansas; listed as "Candidate" in Kansas.

Taxonomy

Genus/species according to ITIS is *Arizona elegans* (ITIS 2024i) (TSN 174202) and is accepted as valid (NatureServe 2024d). Several subspecies exist: *Arizona elegans candida*, *Arizona elegans eburnata*, *Arizona elegans noctivaga*, *Arizona elegans occidentalis*, and *Arizona elegans philipi* (ITIS 2017).

Species range

Overall species range

In the United States, glossy snake is found in Arizona, California, Colorado, Kansas, Nebraska, Nevada, New Mexico, Oklahoma, and Texas, and can also be found in much of the northern half of Mexico (iNaturalist 2024a).

Description of how the population in the plan area fits within the overall range

The plan area falls within the northern end of the species range.

Distribution, abundance, and trend in the plan area

Population

There is no available information for the current trend or abundance of the species within the plan area. According to HerpMapper there are no records within Baca county.

At a global scale, the short-term trend is considered relatively stable ($\leq 10\%$ change) and the long-term trend is considered to range from a decline of less than 30% to increase by 25% (NatureServe 2024d).

Habitat

Glossy snakes are commonly associated with sandy soils found in a variety of different habitats: creosote flats, grasslands, and sagebrush plains (iNaturalist 2024a). Trend for sandsage prairie and shortgrass prairie vegetation types are discussed under Ecological Conditions.

Threats (arising from on or off the plan area)

Population

In general, intensive agricultural development and urbanization probably have eliminated or reduced some populations, but in most areas this species does not appear to be very threatened at the present time (NatureServe 2024d). Loss or fragmentation of habitat could also impact existing and future populations.

Habitat

At a broad scale, the primary threats to sandsage prairie are loss and fragmentation of habitat and degradation of ecological integrity (e.g., conversion to agriculture, expanding exurban development, construction of roads, energy development, encroachment of woody plants, and targeted eradication of sandsage with herbicide) (Locklear 2021). Weather/climate, fire and grazing constitute the most important processes impacting this system, and these processes are also interactive (Locklear 2019). While sandsage prairie is fairly resilient to the effects of drought in the Great Plains, there are biological limits to the ability of this vegetation to tolerate prolonged episodes of severe drought and may be at the limits of its drought tolerance in southeastern Colorado (Rondeau et al. 2018).

At the unit level, grazing occurs over most of the plan area across both states. Long-term continuous grazing of domestic livestock has considerably altered these shrubland habitats from their pre-settlement

condition (Colorado Natural Heritage Program 2015) (Rohweder 2022). Generally, domestic livestock grazing tends to favor the increase of sandsage over associated native grasses therefore decreasing herbaceous cover (CNHP 2015). Fire is an important disturbance process for sandsage prairie, and fire suppression has caused encroachment of woody species such as eastern redcedar (Locklear 2019) and less mosaiced successional conditions (CCNG 2008). Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimmaron National Grassland.

While habitat loss and deleterious management practices are recognized as threats to sandsage prairie vegetation, the significance of these losses to the larger Great Plains ecoregion has not been examined (Locklear 2021).

At a broad scale, important processes impacting these grassland systems are drought and grazing, which also greatly influenced fire frequency and extent (NatureServe 2024, LandFire BpS 11490 2020). Short grasses are generally extremely drought- and grazing-tolerant, although continuous heavy grazing and extended drought will reduce cover of dominant species (Colorado Natural Heritage Program 2010), NatureServe 2024, LandFire BpS 11490 2020). As the driest of Great Plains grasslands, shortgrass prairie is susceptible to increasing drought (NatureServe 2024d). Other general threats to grassland habitat include heavy continuous livestock grazing, military training, invasive non-native species, altered fire regime (fire suppression), conversion to agriculture, fragmentation from roads and development such as exurban and urban development, gas and oil exploration and extraction, invasive species (in the less xeric regions), renewable energy development, increased irrigation conversion of grassland into cropland, and ongoing depletion of the Ogallala Aquifer (Johnson et al. 2012, CPW 2015, Rohweder 2022, NatureServe 2024d).

At the unit level, cattle grazing occurs over most of the plan area. Livestock grazing can create change in plant composition. This can include lower species diversity, lower abundance of highly palatable grasses and greater abundance of unpalatable species; increase in weedy species, especially invasive non-native, and bare soil (Crockett 2020). Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimmaron National Grassland. Roads traverse the plan area and can cause fragmentation; road density is particularly high in the Cimarron National Grassland (USDA TCA 2023). Invasive non-native/alien species can threaten native plant species and alter community composition. Cheatgrass (*Bromus tectorum*) has increased in the plan area and represents a major change in the grassland ecosystem relative to historic conditions (USDA Forest Service 2005b). Relatively few non-native plants can tolerate the arid summer conditions on the Grassland. Shortgrass prairie is considered highly vulnerable to climate stressors in Colorado and is one of the most vulnerable sites (Smith et al. 2024a), (CPW 2015). Lastly, aggressive fire suppression has occurred in the plan area and represents a departure from the natural frequency of fire (USDA Forest Service 2005b).

Reduced role of recurrent fire in these ecosystems it is thought to be responsible for ecologically adverse shifts in the structure, composition, and diversity of these grasslands, leading specifically to the rise of ruderal species and invasion by less fire-tolerant species (Brockway et al. 2007).

Ecological conditions

Ecological condition requirements

Glossy snakes occupy semi-arid grasslands, barren, sandy deserts and scrub, and rocky washes, preferring open areas and sandy or loamy soil. They can be found from below sea level to approximately 2,220 meters above sea level; most are found slightly above sea level (Batko 2013).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The shortgrass prairie habitat type is the dominant habitat type across the plan area (80%). It is considered good with a stable condition in Kansas (Rohweder 2022) but has deviated from historical conditions regarding composition in eastern Colorado (Crockett 2020). The sandsage prairie habitat type is the second-most widespread vegetation type in the plan area, and the most abundant type for the Cimarron National Grassland, specifically (USDA Forest Service 2005b). In Kansas, the sandsage prairie habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of the historic sandsage habitat has been lost or converted for agricultural uses (CPW 2015). The remaining tracts have good landscape connectivity, but the species composition is highly altered (CPW 2015).

Critical biological characteristics

They are crepuscular and nocturnal and are generally most active between April and September (this can vary slightly depending on latitude and elevation). Glossy snakes are excellent burrowers and often use crevices or rodent burrows as retreats during the day (Batko 2013).

Glossy snakes are carnivorous. About half of their diet is composed of other reptiles, including zebra-tailed lizards (*Callisaurus draconoides*), western whiptails (*Cnemidophorus tigris*), desert iguanas (*Dipsosaurus dorsalis*), spotted leaf-nosed snakes (*Phyllorhynchus decurtatus*), coast horned lizards (*Phrynosoma coronatum*), greater short-horned lizards (*Phrynosoma hernandesi*), desert spiny lizards (*Sceloporus magister*), common side-blotched lizards (*Uta stansburiana*), and desert night lizards (*Xantusia vigilis*). The remainder of their diet is comprised of small mammals such as long-tailed pocket mice (*Chaetodipus formosus*), Merriam's kangaroo rats (*Dipodomys merriami*), Ord's kangaroo rats (*Dipodomys ordii*), eastern moles (*Scalopus aquaticus*), Salinas pocket mice (*Perognathus inornatus*), and small birds. Alternative hunting techniques may exist for capturing different prey types. Percentages of prey types within diet are directly correlated to the size and mass of a given snake: Glossy snakes that consume more birds are larger than those that consume more mammals, which are larger than those that mainly consume small lizards (Batko 2013).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Glossy snakes control the populations of many small rodents, reptiles, and mammals. As burrowing animals, they also serve to aerate the soil. They are known hosts of a number of endoparasitic flatworms and nematodes (Goldberg and Bursey 2001), (Hammerson et al. 2007).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

None known at this time.

Maps of Species Range and Known Occurrences in Plan Area

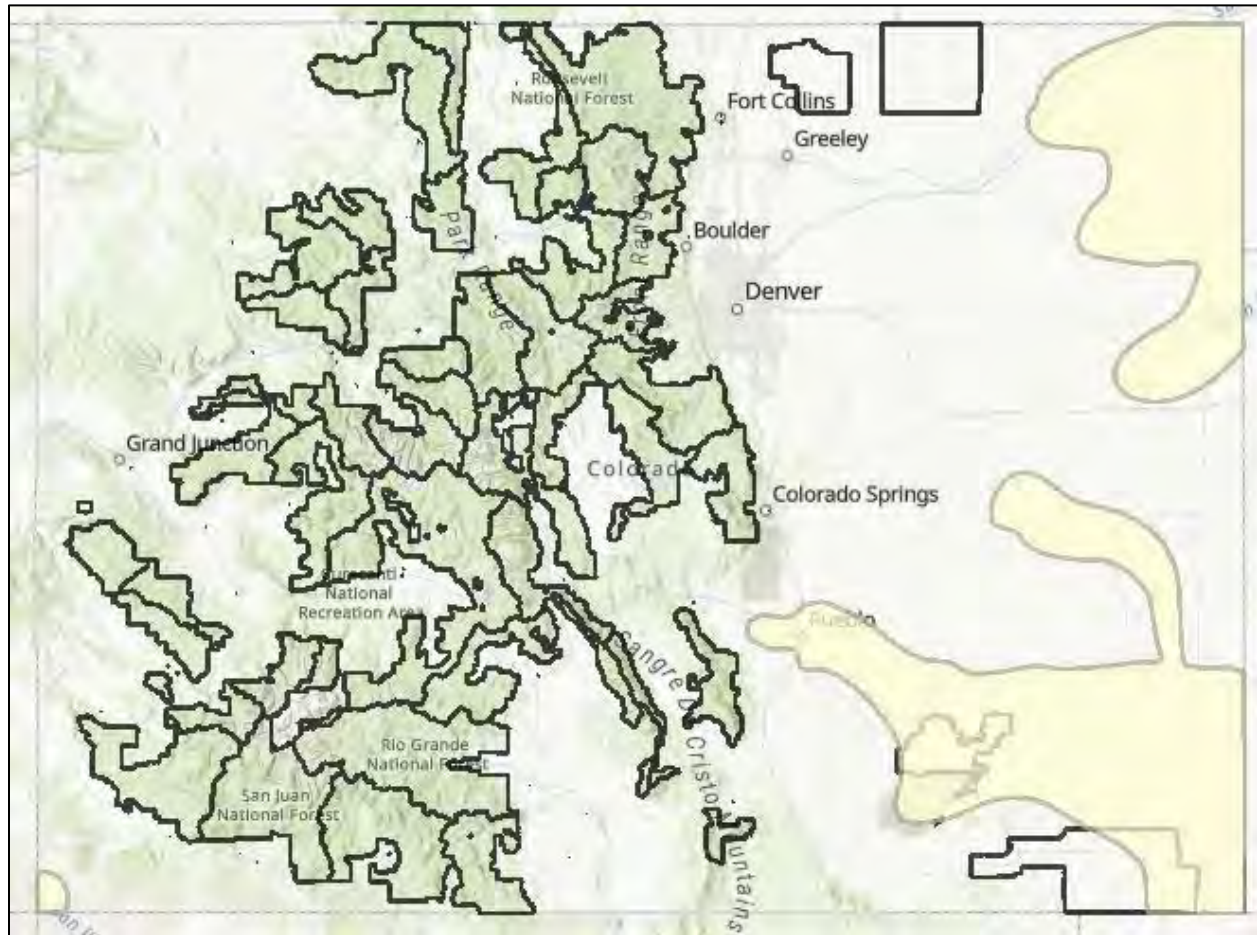


Figure 17. Distribution map of the glossy snake in Colorado (yellow polygons) in relation to the plan area. Map from CNHP.



Figure 18. Complete species range according to (iNaturalist 2024a).

Long-nosed snake

(*Rhinocheilus lecontei*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has 8 occurrence records from 1963-1991, KSNHP has 12 occurrence records from 1934- 2023, CNHP has 5 occurrence records from 1949-2023 (Van Scoyoc 2024). Many of these records have sufficient precision to demonstrate this species is known to occur in the plan area.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: road mortality
 - b. Habitat: urbanization and habitat conversion are considered minor threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: trend not known, but small population in Colorado is considered small but secure.
 - b. Habitat: species uses varied habitat; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size unknown; KSNHP has 12 occurrence records and CNHP has 5.
 - b. Ecological conditions: the species and its requisite habitat are well distributed across both grasslands.

Species Status

G5; S1 in Colorado; S4 in Kansas; listed as "Candidate" in Kansas.

Taxonomy

Rhinocheilus lecontei is currently accepted as valid (ITIS 2017); *Rhinocheilus lecontei tessellatus* and *Rhinocheilus lecontei lecontei* are taxonomic synonym (ITIS 2017). Another common name is Western Long-nosed Snake (ITIS 2017).

Species range

Overall species range

This species' range extends from northern California, southern Idaho, Utah, southeastern Colorado, and southwestern Kansas south to central Baja California, Jalisco, San Luis Potosi, and Tamaulipas, at elevations ranging from below sea level in desert sinks to around 6,233 feet (NatureServe 2024d) (Figure 19, Figure 20, Figure 21, Figure 22).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range (Figure 19, Figure 20, Figure 21, Figure 22).

Distribution, abundance, and trend in the plan area

Population

Across its range, NatureServe (2024d) states that "Total adult population size is unknown but probably exceeds 100,000. This snake is common in most of its Mexican range and in southern part of its U.S. range. In some areas of the United States, it appears to be uncommon but secretive habits may make it seem less numerous than it actually is."

In Colorado, Hammerson (1999b) state "Although records of long-nosed snakes are not common, this snake is likely more widespread than it would appear. In Colorado, the population is considered to be small, but secure." In Kansas, the long-nosed snake was listed as a Kansas Threatened species in 1987 and downlisted to a "Species In Need of Conservation" in 2015. The Kansas Herpetofaunal Atlas states "The majority of the records come from rocky areas in the High Plains and the Red Hills Prairie. This is most likely because these areas are searched most often. However, records from less easily sampled sandy areas (i.e. Pratt, southern Finney, and Logan counties) indicate that this species may be more widespread (and thus more difficult to collect) than currently understood. It probably reaches its peak abundance in the sand-sage prairies south of the Arkansas River west of Gray County." The scarcity of observations are believed to reflect this species' nocturnal, fossorial habits rather than its rarity (Kansas Herpetofaunal Atlas 2024). The population size and trend in the plan area is not known.

Habitat

Across its range, the long-nosed snake inhabits deserts, plains grassland, sandhills, and weedy areas in river valleys (Stebbins 2003), (Hammerson 1999b). It is restricted to the southeast portion of Colorado where it occurs at elevations below about 5,000 ft in Colorado (Hammerson 1999b). In Kansas, it is strongly associated with sand-sage habitat, typically in fine, loose soils of alluvium, dune sand, and loess, and also rockier soils (Kansas Herpetofaunal Atlas 2024). Occurrence records are distributed across the Timpas Unit of the Comanche and the Cimarron.

Threats (arising from on or off the plan area)

Population

The Kansas Herpetofaunal Atlas states "Like many other reptiles along the southwest border of Kansas, there are no easily identifiable environmental threats. Their rarity undoubtedly is a function of our ineptness at turning them up and thus is more perceived than real." Road mortality is presumably a

threat, since most observations of this species occur as specimens are intercepted attempting to cross roadways at night (Kansas Herpetofaunal Atlas 2024).

Habitat

NatureServe (2024) states that “No major threats are known. Locally, some habitat has been lost or degraded as a result of urbanization or conversion to intensive agricultural uses.” See Appendix for general threats to sandsage prairie.

Ecological conditions

Ecological condition requirements

This species occupies a variety of habitats within the Great Plains, including grassland, sandhills, and river valleys (Hammerson 1999b). It seems to have a strong association with sand-sage prairie in Kansas (Kansas Herpetofaunal Atlas 2024). It requires loose soil suitable for burrowing to maintain its optimal body temperature during the day (Kansas Herpetofaunal Atlas 2024). During winter it requires burrows as hibernacula deep beneath the ground to avoid cold temperatures (Kansas Herpetofaunal Atlas 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The sand-sage ecosystem is well-represented and distributed in the plan area (see Appendix). The species and its requisite habitat are widely distributed across both grasslands.

Critical biological characteristics

This species is primarily nocturnal and resides in burrows during the day. It hibernates in the winter and are most active from mid-May to early-September in Colorado (Hammerson 1999b) and April to September in Kansas (Kansas Herpetofaunal Atlas 2024). Four to nine eggs are laid in an underground nest in June to August (Kansas Herpetofaunal Atlas 2024). It preys upon lizards and their eggs, rodents, small snakes, and occasionally insects (Hammerson 1999b).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Common predators of the long-nosed snake include large birds, mammals, and other snakes (Collins and Collins 1991) (Kansas Herpetofaunal Atlas 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Although many sources classify long-nosed snake as primarily nocturnal (Hammerson 1999, Kansas Herpetofaunal Atlas 2024) (Sinervo et al. 2024) classified is as a “heliotherm,” meaning it is a diurnal species that uses behavioral thermoregulation such as burrowing, as opposed to a “conformer” that are mostly nocturnal and “conform” their body temperature to ambient temperature while active. Among desert-endemic herpetofauna, heliotherms generally have higher risk of extinction under warming climate scenarios at lower elevations than species that thermoconform (Sinervo et al. 2024).

Maps of Species Range and Known Occurrences in Plan Area

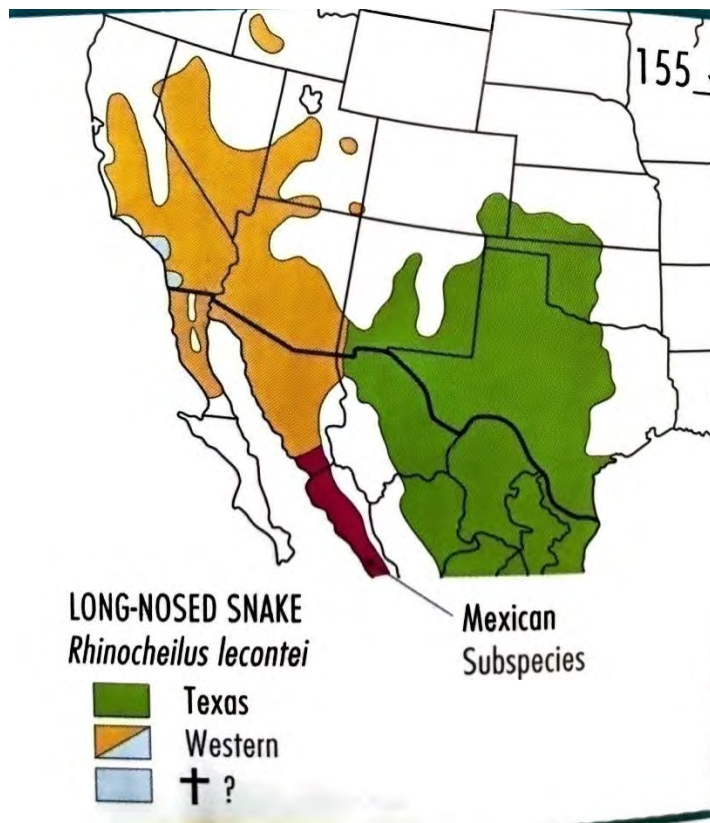


Figure 19. Range map of the long-nosed snake (Stebbins 2003).



Figure 20. Map of long-nosed snake records by county in Colorado from COPARC (Hammerson 1999b).



Figure 21. Distribution map of the long -nosed snake in Colorado (yellow polygon) in relation to the plan area (CNHP).

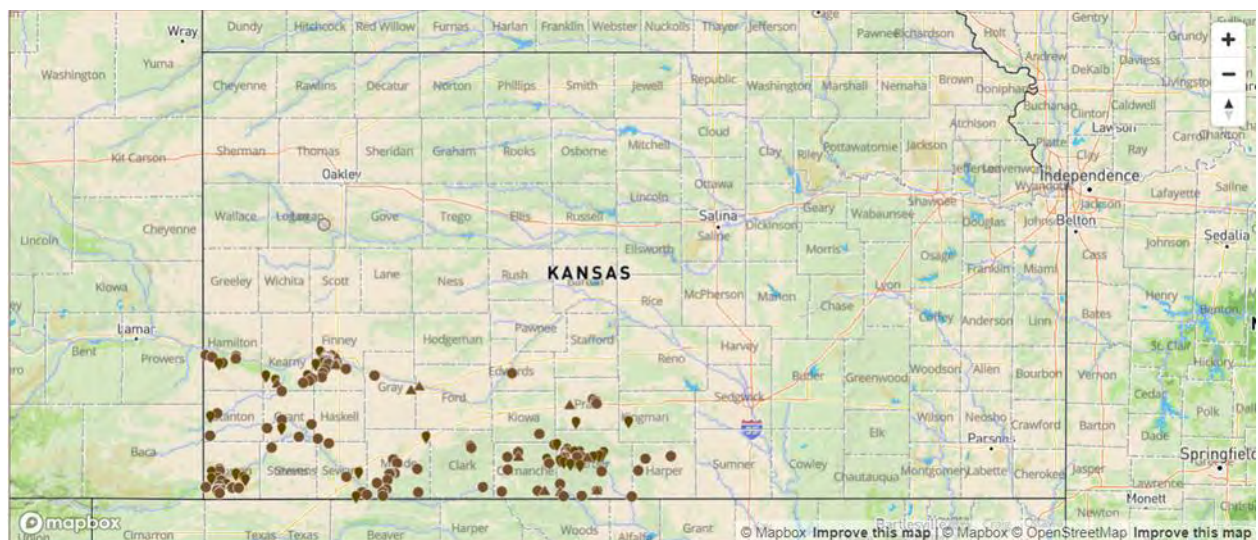


Figure 22. Occurrence map long -nosed snake in Kansas (Kansas Herpetofaunal Atlas 2024).

New Mexico threadsnake

(*Rena dissecta*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Kansas NHP has two occurrence records from 1987 and 2022 (Van Scoyoc 2024). These occurrence polygons fall squarely within the plan area and have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. No significant threats are known to this species' populations or habitat.
2. Declining trends in populations or habitat in the plan area:
 - a. Trends unknown in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Plan area at northern edge of its range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population numbers unknown in the plan area.
 - b. Species is a habitat generalist and therefore its ecological conditions are not restricted.

Species Status

G4; S1 in Colorado; S3 in Kansas; listed as "Candidate" in Colorado; listed as Tier 1, "Threatened" in Kansas.

Taxonomy

The currently accepted valid name is *Rena dissecta* (TSN 1107610) (ITIS 2024f). Synonyms for this species include *Leptotyphlops dulcis dissectus*, *Glaucania dissecta*, and *Leptotyphlops dissectus* (ITIS 2024). Common names for this species include New Mexico Threadsnake and New Mexico Blind Snake (ITIS 2024).

Species range

Overall species range

The range extends from southeastern Colorado and southwestern Kansas south through New Mexico, Oklahoma, and northern and western Texas to southeastern Arizona and northern Chihuahua and Coahuila, Mexico (NatureServe 2024e).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range.

Distribution, abundance, and trend in the plan area

Population

Kansas NHP has 3 occurrence records from 1987 to 2022. There is no information at this time regarding population counts, known distribution, species abundance or trend in the Plan Area.

Habitat

Habitats include prairies and prairie canyons, rocky and sandy deserts, and pinyon-juniper and juniper-oak woodland (NatureServe 2024d). This secretive, fossorial snake is usually in damp loose soil and sometimes can be found under rocks, logs, or debris (NatureServe 2024d). Eggs are laid in an underground chamber, in a hollow in decaying vegetation, or in a rocky fissure (NatureServe 2024d).

According to Kansas Department of Wildlife and Parks, Barber County contains critical habitat (as defined by Kansas Administrative Regulations) for the New Mexico threadsnake (Kansas Department of Wildlife & Parks 2024). In Colorado, threadsnakes have been found beneath rocks in pinion-juniper woodlands and hillsides in deep canyons (Hammerson 1999c). The Plan Area is composed widely throughout with prairies, rocky and sandy deserts, and woodlands.

Threats (arising from on or off the plan area)

Population

No major threats are known.

Habitat

No major threats are known.

Ecological conditions

Ecological condition requirements

Requires moist/damp loose soils and adequate ground cover from rocks, logs or vegetation.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The status of the ecological conditions is not known but the plan area does contain the required ecological conditions for this species.

Critical biological characteristics

The New Mexico threadsnake is primarily nocturnal and crepuscular (New Mexico Herpetological Society 2024). It spends the majority of its time underground but is occasionally encountered on the surface crossing roadways on rainy nights (New Mexico Herpetological Society 2024). It forages underground for ants, termites, other small insects, and spiders, and locates prey by following ant scent trails to the nest (New Mexico Herpetological Society 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

None known at this time.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Requires moist/damp loose soils and adequate ground cover from rocks, logs or vegetation.

Maps of Species Range and Known Occurrences in Plan Area



Figure 23. General species range (iNaturalist 2024d).



Figure 24. Species and habitat range of New Mexico threadsnake in Colorado (Hammerson 1999c).

Plains hog-nosed snake

(*Heterodon nasicus*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: 25 records of occurrence within CCNG from 1926 to 2007 (Van Scoyoc 2024), some of which have sufficient precision to demonstrate this species is known to occur in the plan area.

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: road mortality, habitat destruction
 - b. Habitat: urbanization and conversion of prairie to high-density agriculture
2. Declining trends in populations or habitat in the plan area:
 - a. Population: trend not known.
 - b. Habitat: species uses varied habitat; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Plan area is not at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size unknown; 25 occurrence records.
 - b. Ecological conditions: sandy or gravelly prairie habitat is well distributed across the plan area.

Species Status

G5; S4 in Colorado; S5 in Kansas; listed as "Candidate" in Colorado; listed as "Candidate" in Kansas.

Taxonomy

Heterodon nasicus is currently accepted as valid (ITIS 2017); *Heterodon nasicus nasicus* is a taxonomic synonym (ITIS 2017). Another common name is Western Hog-nosed Snake (ITIS 2017).

Species range

Overall species range

This species has a wide range across the arid interior plains of central North America (NatureServe 2024d) (Figure 25).

Description of how the population in the plan area fits within the overall range

In Colorado, the Plains Hog-nosed Snake can be found along the eastern half of the state at elevations less than 6,000 feet; its range in Colorado overlaps all of the Comanche National Grassland (Figure 26, Figure 27). They also occur throughout the western two-thirds of Kansas (Collins and Collins 1991) (Figure 28). The plan area is not at the edge of the species' range (Figure 25).

Distribution, abundance, and trend in the plan area

Population

Across its range, NatureServe (2024d) states that "The current population size is probably under 10,000 mature individuals, but robust estimates are lacking. Recent population trends are unknown, but continuing decline is suspected based on threats. These include ongoing habitat loss, fragmentation and degradation from agriculture, fire suppression, energy development, and road mortality. The species is near to meeting criteria for Threatened status [in Canada] and could continue to decline if threats are not effectively managed. The current trend probably is relatively stable overall, with local declines associated with habitat loss or degradation."

In Colorado, Averill-Murray (2006). state "Because the Plains Hog-nosed Snake is tolerant of habitat changes typically brought by rural ranching and semi-agricultural landscapes, this species has continued to occupy its historic range in Colorado. In areas with a high density of agricultural activities, the Plains Hog-nosed Snake has probably been eliminated or its populations have been greatly reduced despite it being locally common. Especially along the eastern Front Range, urbanization and heavy road traffic have most likely been the cause of declines (Averill-Murray 2006). In northwestern Colorado, the current distribution and abundance of *H. nasicus* is uncertain but records of this species marked the first confirmed appearance of this species on the west side of the Continental Divide in Colorado."

In Kansas, the Kansas Herpetofaunal Atlas states, "Observably abundant in the western half of the state in areas with loose sandy soils, this species becomes noticeably scarce toward the east." It reports 22 occurrence records in Morton County. The population size and trend in the plan area is not known. GBIF has 25 occurrence records.

Habitat

Across its range, this species occurs within prairies, open brushland and woodland, farmlands, and river floodplains, and occasionally extends into semidesert areas or mountain canyon bottoms (Averill-Murray 2006). It typically occurs at elevations below about 6,000 ft in Colorado (Averill-Murray 2006). Occurrence records are distributed across the Timpas Unit of the Comanche and the Cimarron National Grassland.

Threats (arising from on or off the plan area)

Population

Threats to populations include road mortality and habitat destruction (Averill-Murray 2006, NatureServe 2024d).

Habitat

Threats to habitat include urbanization and conversion of prairie to high-density agriculture (Averill-Murray 2006, NatureServe 2024d). NatureServe (2024) notes that “Conversion of prairie habitat to agricultural use has caused local declines.”

Ecological conditions

Ecological condition requirements

This species occupies a variety of habitats within the Great Plains, including sandy or gravelly prairies, open brushland and woodlands, farmlands, and river floodplains (Stebbins 2003). It requires loose soil suitable for burrowing to maintain its optimal body temperature (Collins and Collins 1991, Stebbins 2003), freedom from road mortality, and freedom from habitat destruction although it is generally tolerant of semi-agricultural landscapes (Averill-Murray 2006, NatureServe 2024d). During winter it requires burrows as hibernacula deep beneath the ground to avoid cold temperatures (Collins and Collins 1991). Its staple food is inflated toads, but it is an opportunistic predator that uses highly varied prey types (Averill-Murray 2006).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Sandy or gravelly prairie habitat is well distributed across the plan area. NatureServe (2024) notes that “This species probably is effectively protected in at least several areas of federal, state, and private lands (e.g., national parks and grasslands, state wildlife management areas, large cattle ranches).”

Critical biological characteristics

This species is diurnal. It hibernates in the winter, emerges in late March or early April and is active until October or November (Averill-Murray 2006). The species reaches sexual maturity in 2-3 years, and mating usually occurs in late March to May (Averill-Murray 2006). Females may lay eggs in alternate years (NatureServe 2024d). Its underground hibernaculum is usually within its home range and below the frost line (Averill-Murray 2006). It preys upon amphibians, lizards, smaller snakes, small turtles and birds and their eggs, small mammals, and insects. It is especially adapted to eat large, inflated toads (Averill-Murray 2006).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Common predators of the Plains Hog-nosed Snake include hawks, crows, and coyotes (Averill-Murray 2006).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Plains Hog-nosed Snake is tolerant of habitat changes typically brought by rural ranching and semi-agricultural landscape (Averill-Murray 2006).

Maps of Known Occurrences in Plan Area

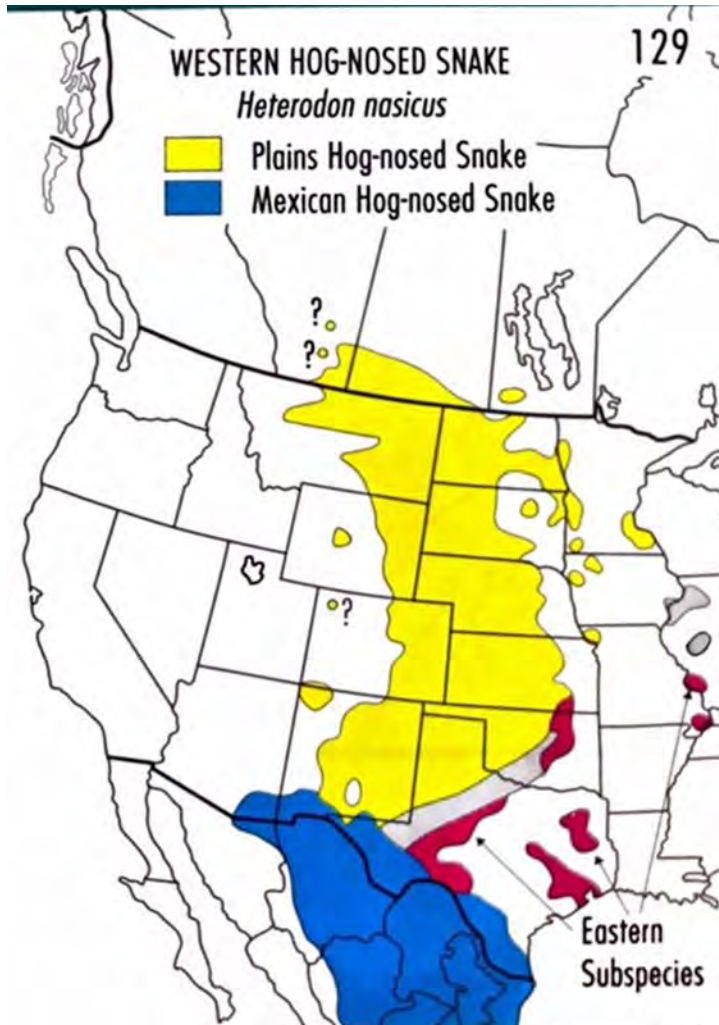


Figure 25. Range map of plains hog-nosed snake (Stebbins 2003).

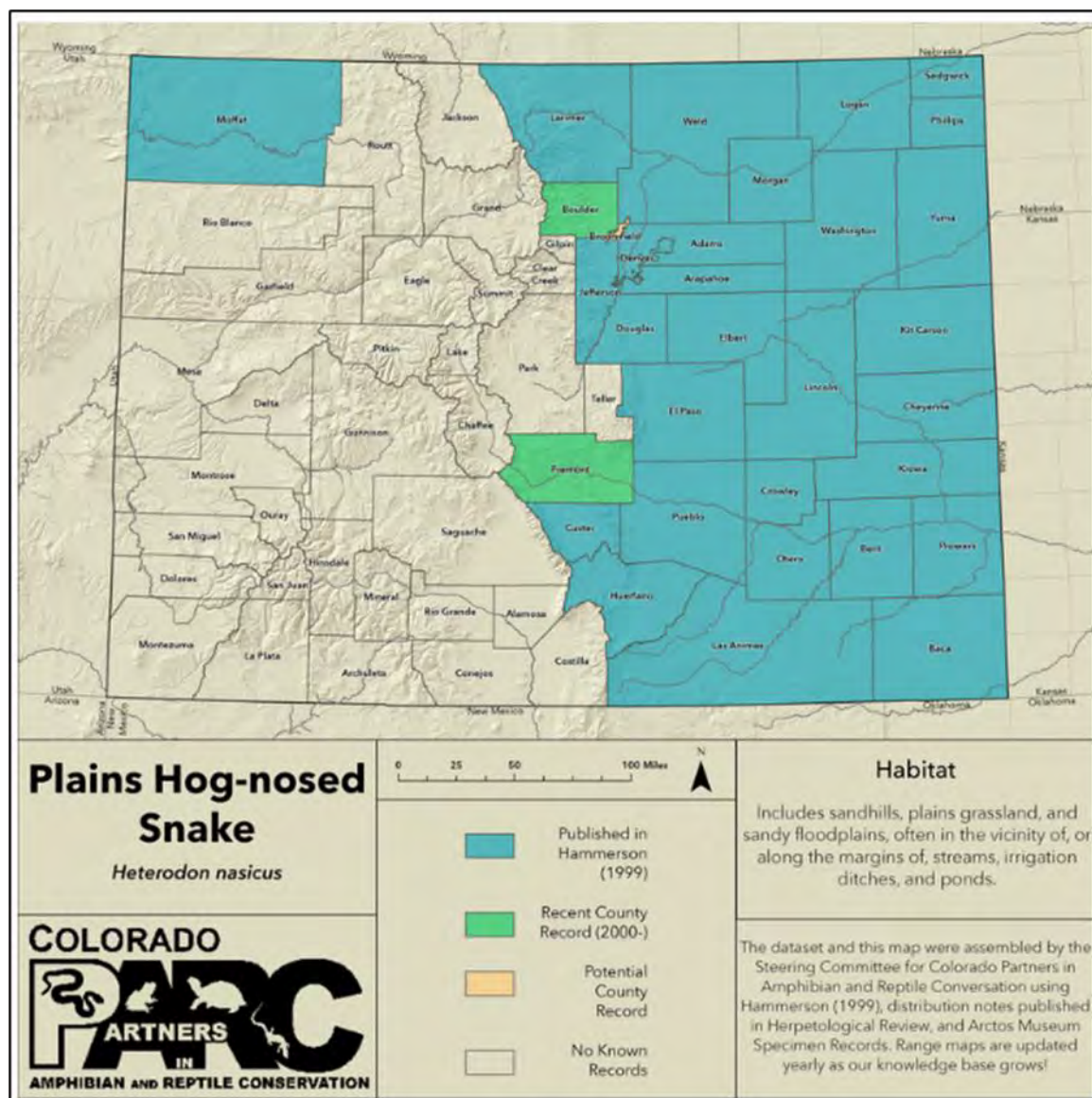


Figure 26. Map of Plains hog-nosed snake records by county in Colorado from COPARC (Hammerson 1999b).



Figure 27. Distribution map of the plains hog-nosed snake in Colorado (yellow polygon) in relation to the plan area. Map (CNHP).

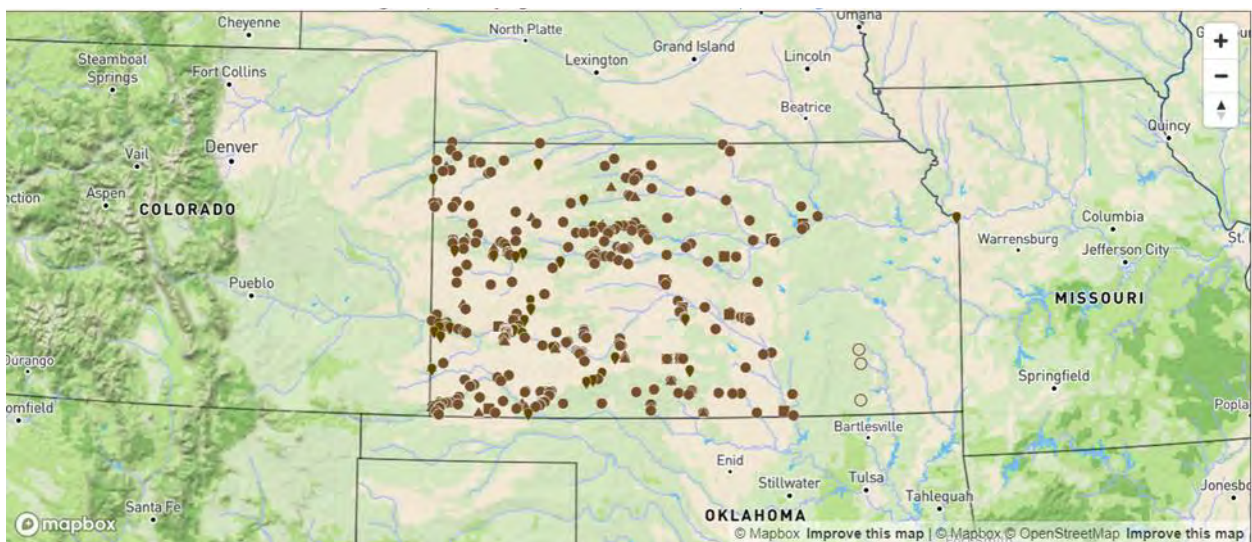


Figure 28. Occurrence map of plains hog-nosed snake from the Kansas Herpetofaunal Atlas.

Plains leopard frog (*Lithobates blairi*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CNHP contains 11 element occurrence records in the plan area, spanning 1975 to 2011 2023 (Van Scoyoc 2024). GBIF contains 26 records from 1926-2023. Some of these records have sufficient precision to demonstrate that the species occurs in the plan area.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Threats to populations include habitat loss, introduced species and infectious diseases.
 - b. Threats to habitat include increasing drought, habitat loss and alteration, groundwater depletion, livestock grazing, and agricultural development.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is uncertain but declines on the Comanche are suspected.
 - b. Aquatic/riparian in the plan area has declined.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Plan area is at the western edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size in the plan area is not known; species is locally common across the plan area.
 - b. Aquatic generalist; wetland and riparian habitats are restricted in the plan area.

Species Status

G5; S3 in Colorado; S5 in Kansas; listed as "Candidate" in Colorado; USFS Region 2 Sensitive Species.

Taxonomy

Lithobates blairi is accepted as valid (ITIS 2024e); taxonomic synonyms include: *Rana blairi*. There has been confusion in the literature on the taxonomy of this species, and it has incorrectly been referred to as the "southern plains form" of the Northern leopard frog (*Lithobates pipiens*) (Dodd 2023).

Species range

Overall species range

The species is widely distributed across the prairie grasslands of the central United States (Figure 31, Figure 32). The Kansas Herpetofaunal Atlas indicates the species is distributed nearly statewide, except

the extreme southeastern corner. Isolated or disjunct populations occur in southeast Arizona, north and northwest Nebraska, northern and southern New Mexico, southeast Illinois, and southern Indiana. Range expansion is occurring in northern Iowa (Dodd 2023).

Description of how the population in the plan area fits within the overall range

The plan area is at the western edge of the species' range (Figure 30, Figure 31, Figure 32) (Dodd 2023).

Distribution, abundance, and trend in the plan area

Population

Across its range, the plains leopard frog has experienced serious historical declines, but it's now considered "common and stable in most of its range" (NatureServe 2024d).

Local declines were reported in the Comanche National Grassland in the 1990s, possibly due to introduced bullfrogs (*Rana catesbeiana*) or polluted habitat (Smith and Keinath 2005). This observation "was based on qualitative estimates and limited sampling. More work is needed to determine whether observed changes reflect a consistent trend (i.e., declining leopard frog populations) or variations associated with environmental changes that could eventually lead to reestablishment of leopard frogs as the dominant ranid (Hammerson personal communication 2005)" (Smith and Keinath 2005).

In Colorado, the species is considered widespread and locally common throughout its historical range (NatureServe 2024d). The Colorado Herpetofaunal Atlas describes the species as "locally common" in the Great Plains portion of the Arkansas River drainage in southeastern Colorado and the Republican River drainage in northeastern Colorado (CPW 2024). It occurs widely across Kansas, where it is considered secure (S5) with no conservation status.

Habitat

In Colorado, the Plains Leopard Frog occupies both aquatic and upland habitats below 6,000 ft, including eastern plains rivers, streams, riparian woodlands and shrublands, and wetlands (CPW 2015), (Dodd 2023) and references therein). It is largely confined to aquatic areas but moves significant distances during summer. The species has been found across both the Comanche and Cimarron National Grasslands (CNHP; Kansas Herpetofaunal Atlas) (Figure 29). Based on Colorado Parks and Wildlife's herptile database, the following HUC12s in the plan area contain a verified occurrence of Plains Leopard Frog since 1970 in the Colorado portion of the plan area: East Carrizo Creek, Lower Anderson Arroyo, Salt Arroyo-Purgatorie River, and Tobe Creek (Van Scoyoc 2024) (Figure 30). In Kansas, most observations and vouchers in the plan area have been near the Cimarron River.

Plains Leopard Frogs often inhabit the edges of flowing streams, but breed in permanent and temporary pools lacking a significant current (Hammerson 1986). Aquatic and riparian habitat has declined in the plan area due to several factors, including the increased abundance of invasive tamarisk (USDA Forest Service 2005a) and severe declines in stream flows downgradient from the Ogallala- High-Plains Aquifer (Brikowski 2008). Drawdown of the aquifer has substantially decreased the discharge to most of the rivers in the Carrizo unit of the Comanche and the entire Cimarron National Grassland (USDA Forest Service 2005a) (see Appendix for more information).

The Plains Leopard Frog is inefficient at constructing its own burrow, and benefits from crevice habitat provided by caves and the burrows of other animals, including prairie dogs (Dodd 2023).

Threats (arising from on or off the plan area)

Population

Amphibians are one of the most threatened groups of organisms worldwide, but threats vary across species' ecological preferences, geographic ranges, and taxonomic associations (Stuart et al. 2004). Plains leopard frog belongs in the "true frog" family (Ranidae), which is one of the most rapidly declining amphibian families in the world (Stuart et al. 2004). The dominant cause of Ranid declines is habitat loss, followed closely by over-exploitation (Stuart et al. 2004). Overexploitation of Ranids reflects the extensive harvest of these species for human consumption, especially in Asia (Stuart et al. 2004). These overarching threats of habitat loss and over-exploitation are expected to be considerably diminished in the plan area, serving as refugia for this species (Smith and Keinath 2005).

Other threats to Plains Leopard Frogs include non-native predators, including bull frogs and introduced game fish, and infectious diseases including chytrid fungus, red-leg syndrome, and *Ranavirus* (Smith and Keinath 2005, Dodd 2023). Peripheral populations of the species have declined or disappeared due to these factors (Dodd 2023).

The prevalence of chytrid fungus in Plains Leopard Frog in the plan area is not known. Chytrid fungus has been detected in Colorado (Muths et al. 2003), but negative impacts on Plains Leopard Frog have not been demonstrated. (Snyder et al. 2021) Snyder et al. (2021) found chytrid fungus was not yet negatively impacting amphibian populations in Kansas, including plains leopard frog. At this time, however, chytrid fungus does not appear to be a major threat to Plains Leopard Frog (NatureServe 2024d).

Bull frogs are a prevalent threat in the plan area: "The frog fauna along Carrizo Creek in Baca County shifted from clearly leopard frog dominated to overwhelmingly bullfrog dominated; while at Picture Canyon bullfrogs seem to have dominated for decades with few plains leopard frogs in the area" (Smith and Keinath 2005).

Habitat

Threats to this species' habitat include drought, habitat loss and alteration, altered hydrological regime (both surface water and groundwater depletion), wetland conversion to cropland, livestock grazing, and water pollution (CPW 2015). Smith and Keinath (2005) characterize wetland conversion to cropland as the biggest threat to the species. Additionally, they discuss that cattle grazing has detrimental effects on all life stages of frogs, particularly through degradation of breeding pond habitat (Smith and Keinath 2005).

Ecological conditions

Ecological condition requirements

Adults occupy a wide variety of habitats that provide suitable cover, moist refugia, and foraging sites (Dodd 2023). Suitable breeding habitat includes prairie potholes, marshes, streams and floodplains, ephemeral pools or permanent ponds, or even artificial water sources. Water drainages or irrigation ditches may facilitate species dispersal (Dodd 2023). Preferred breeding habitat includes warm, standing water with high silt, but it can also use turbid, silty water (Dodd 2023). Breeding is dependent on precipitation. The egg masses require shallow water, oxygenation, vegetation for attachment, and persistence of water to hatch (Smith and Keinath 2005, Dodd 2023). Smith and Keinath (2005) speculate that the species is unable to respond to rapid drying of temporary ponds, and that such drying could occasionally cause mass mortality. They emphasize the importance of small ponds and isolated wetlands for persistence of metapopulations (Smith and Keinath 2005). Tadpoles are benthic grazers that depend on presence of bacteria, protozoa, algae, etc. to feed until they metamorphose (Dodd 2023). Larvae that

result from late-season breeding may overwinter (Dodd 2023). Adults overwinter in the muddy substrate of ponds or stream-bottoms, or in burrows (Dodd 2023). Plains leopard frog requires freedom from introduced predaceous fish and bullfrogs (Smith and Keinath 2005, Dodd 2023).

Adults have been documented to move great distances (>8 miles) between aquatic and upland habitat (Dodd 2023). An ecological condition requirement is intact overland migration routes for the species to colonize new ponds (Smith and Keinath 2005). During movement in hot or dry weather, the species digs its own burrows, or makes use of existing burrows, to retain moisture (Dodd 2023). It dries easily in hot conditions without such refugia (Smith and Keinath 2005, Dodd 2023).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species is an aquatic generalist that can be found in nearly every aquatic situation, both permanent and temporary (NatureServe 2024d) (Kansas Herpetofaunal Atlas 2024). Riparian and wetland habitats are relatively limited in the plan area (see Appendix). There are several man-made fishing ponds in the plan area that are stocked with species such as channel catfish and trout. The plan area also has non-native bull frogs that overlap with Plains Leopard Frog—for example, in Carrizo Creek. Introduced predaceous fish and bullfrogs are recognized as a threat to the species (Smith and Keinath 2005; Dodd 2023) and their presence and prevalence in turn represents a decline in the quality of the habitat for Plains Leopard Frog.

Smith and Keinath (2005) note that “Because of the extensive habitat losses on private lands that predominate in the range of the Plains Leopard Frog, we should note that although comparatively small, the Comanche and Cimarron national grasslands may be important island habitats that can serve as refuges for the species.”

Critical biological characteristics

Depending on precipitation, breeding can occur over an extended period from spring to fall (Dodd 2023). Calling for mate selection typically occurs from spring to autumn. Disturbance causes the cessation of calling (Dodd 2023). In southeastern Colorado, most breeding likely occurs from May to July (Dodd 2023). Eggs may hatch in five to 20 days (Smith and Keinath 2005) and the larval period can last 24-50 days (Dodd 2023). Smith and Keinath (2005) describe that “In late September and October, they tend to gather at large bodies of water in which they overwinter; but they may be active during warm periods through November”. The Kansas Herpetofaunal Atlas states that adults are active from February to October, and that breeding in Kansas can occur as early as February.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The species can hybridize with the Rio Grande Leopard Frog (*Lithobates berlandieri*), producing fertile hybrids (Dodd 2023). Interspecific competition with other leopard frogs also occurs, particularly at the larval phase (Dodd 2023).

Adult Plains leopard frogs prey primarily upon non-aquatic invertebrates such as flies, beetles, worms, snails, grasshoppers, and crickets (Smith and Keinath 2005), and has once been observed to consume a tricolored bat (Dodd 2023). They may opportunistically feed on invertebrates that accumulate around bat guano in caves (Dodd 2023). The frog is a prey species for fish, snakes, raccoons, opossums, skunks, and cranes (Dodd 2023).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Smith and Keinath (2005) describe: "Throughout much of the range of the Plains leopard frog in Region 2, a large number of wetland sites have been drained and converted to cropland. In fact, the Great Plains of the United States may be one of the most altered habitats in the country due to extensive conversion to agriculture. The conversion of habitat to cropland has probably also extensively altered migration patterns since it no longer consists of a complex matrix, but rather monocultures of various crops."

The shortgrass prairie ecoregion is also considered highly vulnerable to climate stressors with a high degree of confidence (Rice et al. 2018). Warmer and drier conditions are expected, with changes in precipitation patterns and associated impacts to soil moisture, as well as reduced flows in streams and potentially increased intermittent nature of streams (CPW 2015). Plains leopard frogs is believed to be threatened by intensification or alteration of normal weather patterns, particularly droughts (CPW 2015).

Maps of Species Range and Known Occurrences in Plan Area

Plains Leopard Frog (*Lithobates blairi*)

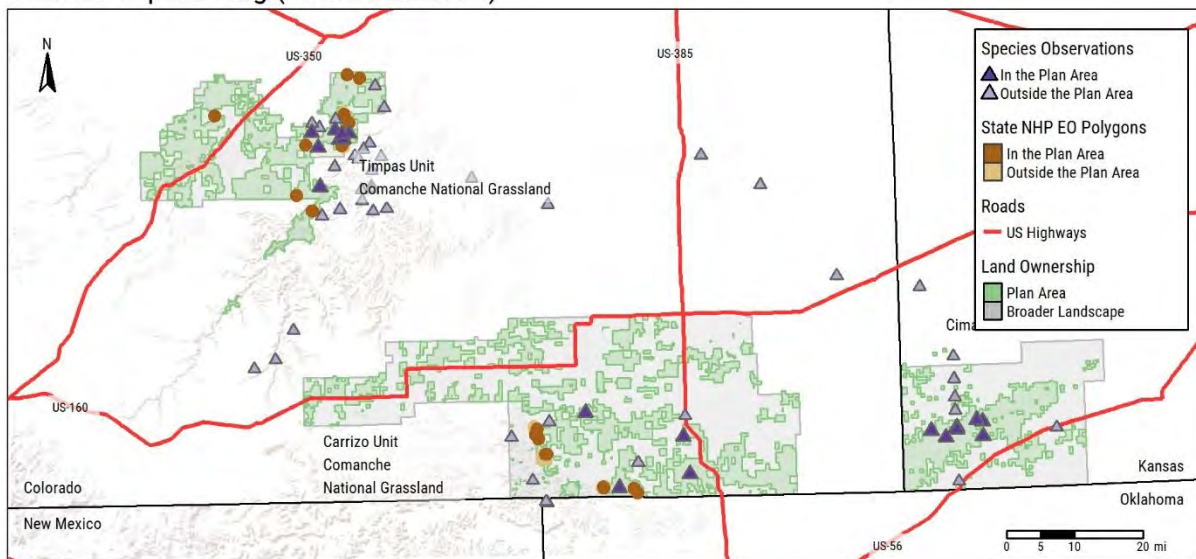


Figure 29. Species occurrence records within the plan area and broader landscape.

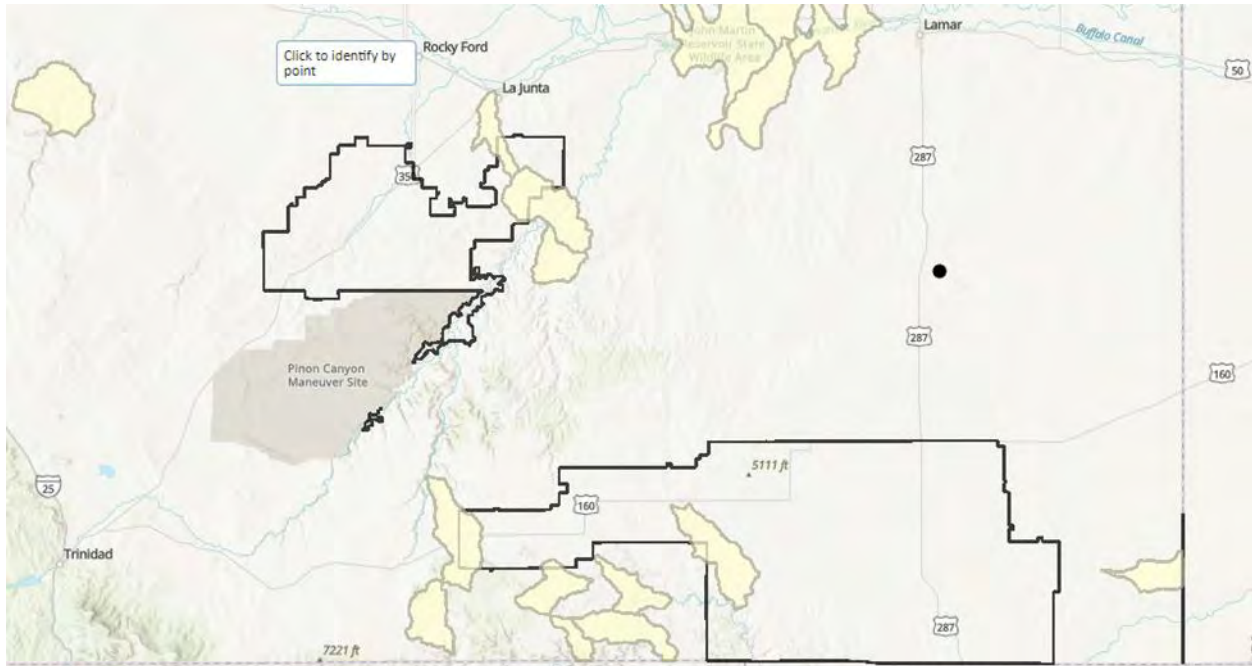


Figure 30. Colorado Parks and Wildlife distribution map of plains leopard frog (yellow polygons) in relation to the plan area.

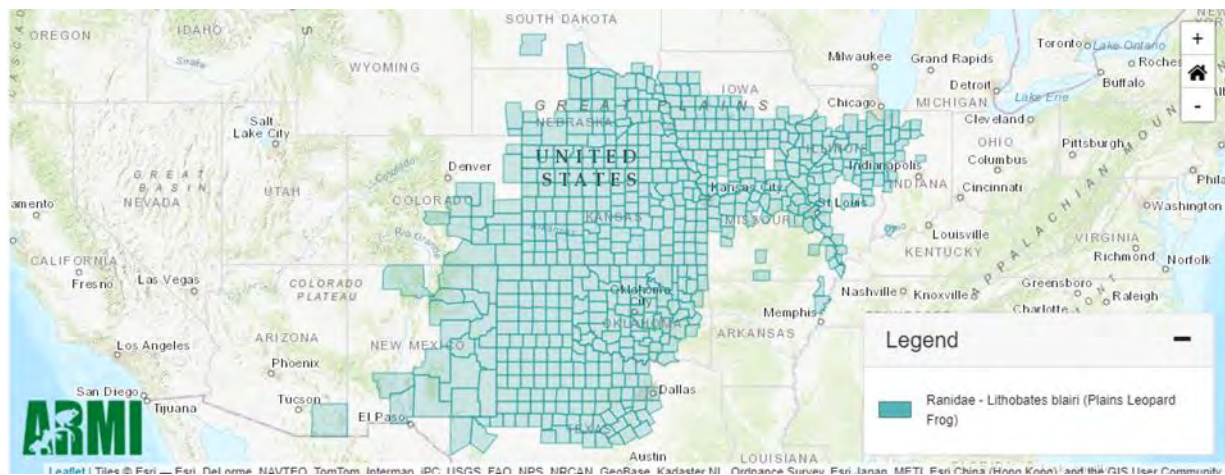


Figure 31. National Amphibian Atlas map of county-level distribution data for plains leopard frog.



Figure 32. Range map of Plains leopard frog from Smith and Keinath (2005). Dark green represents estimated contiguous range. Light green areas are extensions that encompass historic and some current, but disjunct, populations.

Prairie ring-necked snake

(*Diadophis punctatus arnyi*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: 12 records of occurrence within Cimarron-Comanche National Grasslands from 2007 to 2023 (Van Scoyoc 2024), some of which have sufficient precision to demonstrate this species is known to occur in the plan area.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Loss or destruction of habitat has been shown to reduce populations across the species' range.
 - b. Loss of riparian cottonwood gallery conditions and replacement with non-natives (salt cedar).
2. Declining trends in populations or habitat in the plan area:
 - a. Population trends not known.
 - b. Salt cedar replacement of native riparian vegetation degrades habitat quality for this species.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is disjunct.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population numbers unknown at this time.
 - b. Species is a habitat generalist and therefore its ecological conditions are not restricted.

Species Status

T5; S2 in Colorado; SNR in Kansas.

Taxonomy

The name *Diadophis punctatus arnyi* Kennicott, (1859) (TSN 209170) is currently accepted as valid according to the Integrated Taxonomic Information System (ITIS). There is one known synonym: *Diadophis arnyi* Kennicott, (1859). Accepted common names for this species include prairie ringneck snake and prairie ring-necked snake.

Species range

Overall species range

This species is considered widespread with populations found scattered from northern Baja California north to Washington, Idaho, Nevada, Utah, and Arizona (Hammerson 1999d). From Arizona the species'

range extends south into north-central Mexico and northeast through New Mexico and Texas to the Great Lakes region, and into south-eastern Canada and Maine (Hammerson 1999d). It occupies most of the southeastern United States, including the Gulf Coast and southern Florida (Hammerson 1999d).

Description of how the population in the plan area fits within the overall range

This species can be found in the southeastern portion of Colorado, including Baca County where the plan area occurs (Hammerson 1999d). The location of the plan area falls within the known range of the species; however, Colorado is disconnected from the rest of the species range according to NatureServe (2024b).

Distribution, abundance, and trend in the plan area

Population

GBIF contains 12 records of occurrence within the plan area. The current trend of the species in the plan area is unknown.

Habitat

Generally, this species lives in or near prairies and can often be found sunbathing or slithering out in the open (iNaturalist 2024c). It can also be found under old logs, rocks, pieces of wood and sheets of tin (iNaturalist 2024b). It likes to live under dead leaves and foliage in the woods, and in grasses in the prairie (iNaturalist 2024b). Ring-necked snakes may be found within plains grassland, canyon bottoms or riparian areas with plentiful cover at elevations below 6000 ft (1830 m) in southeastern Colorado (Hammerson 1999d). This species prefers areas with moist soils at or at least beneath the surface in the spring and fall, and will stay dormant through hot, dry periods (Hammerson 1999d). The habitat conditions for this species are well distributed across the plan area.

This species' habitat is threatened by the replacement of cottonwood trees with salt cedar (Hammerson 1999d), which is occurring in the plan area and may contribute to a decline in habitat quality (see Appendix).

Threats (arising from on or off the plan area)

Population

Separation barriers include busy highways or highways with obstructions such that the snakes rarely, if ever, cross successfully; major rivers, lakes, ponds or deep marshes; and densely urbanized areas dominated by buildings and pavements (NatureServe 2024b). Habitat destruction has been attributed to lost or reduced local populations in some parts of the overall distribution (Hammerson 1999d).

Habitat

In Colorado, the replacement of cottonwood trees with salt cedar may degrade habitat due to lost area under which the species relies on to hide and lay eggs (Hammerson 1999d).

Ecological conditions

Ecological condition requirements

This species requires a variety of open or partially open canopy settings in a variety of habitats (prairies, rocky areas, woodlands).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The required ecological conditions are well distributed in the plan area and this species is a generalist. Conversion of native riparian corridors to saltcedar may reduce habitat quality in some areas.

Critical biological characteristics

This species requires adequate cover (vegetative or rock) to hide and lay its eggs, as well as to assist with body temperature regulation during extreme hot and cold periods.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Food source for red-tailed hawks, great horned owls, the North American racer, moles, longnose snakes, mice and American bullfrogs (Hammerson 1999d).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Adequate availability and variety of cover sources for the species to lay and hide its eggs as well as regulate its body temperature during extreme hot or cold weather.

Maps of Known Occurrences in Plan Area



Figure 33. Map of prairie ring-necked snake records by county in Colorado from COPARC (<http://www.coparc.org/prairie-ring-necked-snake.html>; Hammerson 1999d).

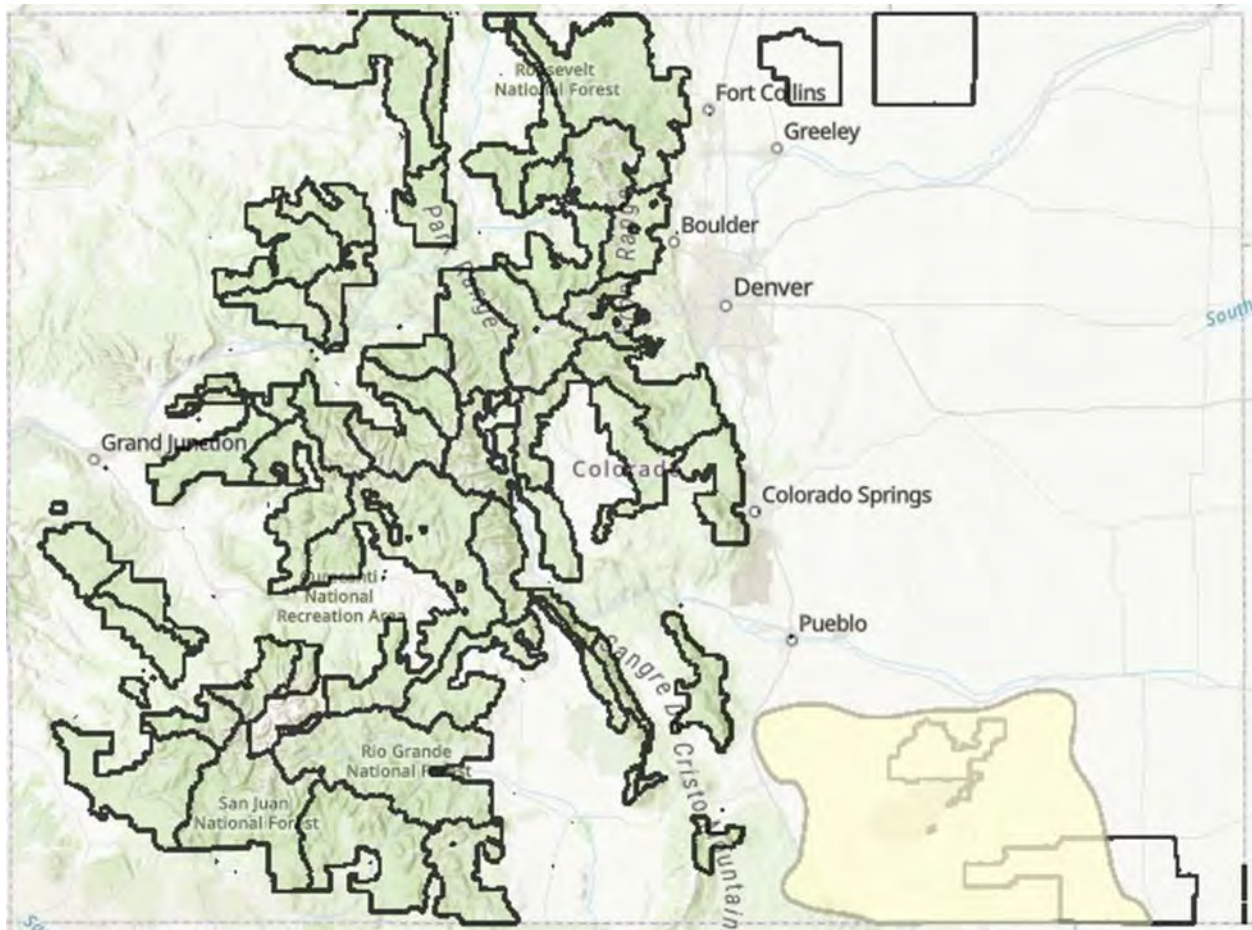


Figure 34. Distribution map of the ring-necked snake in Colorado (yellow polygon) in relation to the plan area. Map from CNHP.

Red-spotted toad

(*Anaxyrus punctatus*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are three research-grade records of the species in the plan area, all from iNaturalist between 2015-2023 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Enigmatic declines have had a particularly major impact on toads in the Bufonidae family. Other threats to red-spotted toad populations include Chytrid fungus, flash flooding, road mortality, introduced predators, and changes in precipitation patterns.
 - b. Threats to habitat include urbanization, loss of wetlands, riparian modification, dam building, agricultural runoff, gypsum mining, overgrazing, and red cedar encroachment.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known; species thought to be extirpated from the Cimarron National Grassland and extant only in the Comanche National Grassland.
 - b. Aquatic/riparian habitat in the plan area has declined.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size not known; species is considered very rare in the Grasslands.
 - b. Species is considered extirpated from the Cimarron NG, and its only remaining habitat in the plan area are rocky canyon-bottom streams in the Comanche NG.

Species Status

G5; S4 in Colorado; S2 in Kansas; listed as "Candidate" in Kansas.

Taxonomy

Anaxyrus punctatus is accepted as valid (ITIS 2024b); taxonomic synonyms include: *Bufo punctatus* and *Bufo beldingi* (ITIS 2024b). Taxonomy within the genus *Bufo* remains controversial (NatureServe 2024a). Natural hybridization occurs between Red-spotted toad (*Anaxyrus punctatus*) and Woodhouse's toad (*Anaxyrus woodhousii*) in Colorado (Dodd 2023).

Species range

Overall species range

The species has a large range in the southwestern United States and Mexico, extending from southern Nevada to south central and southwestern Kansas, southwestern and southeastern Colorado, western Oklahoma, and central and west Texas (Figure 35, Figure 36).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range (Figure 35, Figure 36).

Distribution, abundance, and trend in the plan area

Population

The species is generally present in high abundance across its range with many stable populations (NatureServe 2024a). Range-wide, populations are probably stable to slightly declining (NatureServe 2024d).

Within the plan area, no information could be found on the population trend (ARMI 2024). However, this species is considered very rare in the Grasslands (Collins and Collins 1991) and is presumed to have been extirpated from the Cimarron National Grassland (Collins and Collins 1991). The Kansas Herpetofaunal Atlas speculates that "the population that previously existed in Morton County was likely extirpated during the 1930s, however, they do persist in along the Cimarron River drainage in Oklahoma and may eventually make their way back into Kansas along that river."

Habitat

Across its range, adult red-spotted toads occupy a wide range of habitats, including desert stream canyons, mesas, short- and mixed-grass prairie, floodplains, wetlands, and forest habitats (Dodd 2023). It is a lower elevation species that prefers flat to moderate slopes and cobble or gravel soils (Dodd 2023). In Colorado, it is associated with juniper and scrub habitats. In Kansas, Red-spotted Toads are associated with more rocky areas in dry prairies, canyons, and open areas such as gypsum outcrops (Dodd 2023); (Miller 1983); (Russell 2023).

Red-spotted toads have not been found in Morton County, Kansas since 1927 (Kansas Herpetofaunal Atlas 2024) and are presumed to have been extirpated from the Cimarron River Valley of Morton County during the drought of the 1930s (Collins and Collins 1991). Therefore, the species' current distribution in the plan area is likely restricted to the Comanche National Grassland (Collins and Collins 1991). It has been documented in PICTURE, Withers, and Vogel Canyons in the Comanche National Grassland (Van Scoyoc 2024) (Figure 36).

Red-spotted toads predominantly use canyon pools, streams, temporary rain pools, and spring-fed pools to mate and deposit eggs (Hammerson 1986), (Collins and Collins 1991). Aquatic and riparian habitat has declined in the plan area due to several factors, including the increased abundance of invasive tamarisk (USDA Forest Service 2005c) and severe declines in stream flows downgradient from the Ogallala-High-Plains Aquifer (Brikowski 2008) (see Appendix). Drawdown of the aquifer has substantially decreased the discharge to most of the rivers in the Carrizo unit of the Comanche and the entire Cimarron National Grassland (USDA Forest Service 2005c). This species is expected to be particularly vulnerable to changes in precipitation patterns (Dodd 2023), and the plan area has experienced prolonged drought.

Threats (arising from on or off the plan area)

Population

Amphibians are one of the most threatened groups of organisms worldwide, but threats vary across species' ecological preferences, geographic ranges, and taxonomic associations (Stuart et al. 2004). Red-spotted toad belongs in the "true toad" family (Bufonidae), which is one of the most rapidly declining amphibian families (Stuart et al. 2004). Declines of bufonids have been enigmatic, taking place even within well-protected habitats: "Enigmatic-decline species present the greatest challenge for conservation, because there are currently no known techniques for ensuring their survival in the wild" (Stuart et al. 2004). More recent research suggests that contaminants, climate stressors, and emerging infectious diseases are likely responsible for the so-called 'enigmatic decline' of amphibians in protected areas (Collins 2010).

NatureServe identifies no major threats to populations of red-spotted toads, except for natural hybridization with Woodhouse's toad (*Anaxyrus woodhousii*), which can be a localized threat (NatureServe 2024a). Dodd (2023) identifies several threats: flash flooding that can cause mass mortality of eggs and tadpoles, highway mortality, introduced fish and crayfish that can predate on eggs and tadpoles, and chytrid fungus, which has been reported in the species in Texas. This species is also sensitive to changes in precipitation patterns (Dodd 2023).

Habitat

NatureServe identifies no major threats to habitat (NatureServe 2024a). Dodd (2023) indicates that urbanization, loss of wetlands, riparian modification, and dam building represent threats to habitat. The Kansas Herpetofaunal Atlas lists additional "potential threats" of agricultural runoff, gypsum mining, overgrazing, and the encroachment of red cedar.

Ecological conditions

Ecological condition requirements

Adults prefer rocky canyon habitat along streams with well-drained rocky soils, and typically remain close to aquatic habitat (Dodd 2023). Occasionally, adults can move long distances for breeding or to seek shelter (range: 295-2953 feet) (Dodd 2023). During movement in hot or dry weather, the species digs its own shallow burrows, or makes use of rodent burrows, rocky crevices, or surface debris to retain moisture (Dodd 2023). They also burrow or seek shelter under structures such as vegetation, logs, or stones during winter (Dodd 2023). Sufficient humidity and habitat connectivity is necessary for the species to conduct its different movement patterns and facilitate genetic exchange (Dodd 2023). The toad is also sensitive to light for orientation (Dodd 2023).

Breeding is dependent on precipitation events, as well as temperature (>70-75.2°F) (Dodd 2023). Suitable breeding habitat can include both temporary and permanent pools and ponds, intermittent streams, springs, desert wetlands, floodplains, etc. (Dodd 2023). Breeding pools can be very small and shallow but must contain algae or organic matter (Dodd 2023). The eggs require shallow, slow water, such as backwater habitat or stream margins (Dodd 2023).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species requires both terrestrial and riparian/aquatic habitat to complete its life cycle, with sufficient humidity and habitat connectivity to move between the two (Dodd 2023). Suitable aquatic habitat, such as

pools, are required for breeding and egg and larval development (Hammerson 1986). Red-spotted toads are usually found in rocky canyon-bottom streams, particularly canyons with junipers (Hammerson 1986). These habitats are relatively limited in the plan area, and the species has been lost from the Cimarron National Grassland, further restricting its habitat to just the Comanche portion of the plan area (Collins and Collins 1991).

Critical biological characteristics

The species is nocturnal (Kansas Herpetofaunal Atlas). In Colorado, activity occurs from April to October, with breeding beginning in early August (Dodd 2023). Eggs hatch in just 2-5 days (Dodd 2023). The larval period can last 35-60 days, depending on temperature and food availability (Dodd 2023). In Colorado, metamorphosis occurs in October (Dodd 2023). Adults are sensitive to disturbance and often respond by jumping into the water, which is uncharacteristic behavior for toads (Dodd 2023).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The red-spotted toad preys upon a variety of invertebrates, including bees, bugs, beetles, and especially ants (Dodd 2023). Adults and tadpoles may be preyed upon by turtles, snakes, and other amphibians (Dodd 2023).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Plains streams in eastern Colorado are threatened by drying and fragmentation due to groundwater irrigation depleting underlying aquifers (CPW 2015). The shortgrass prairie ecoregion is considered highly vulnerable to climate stressors with a high degree of confidence; (Rice et al. 2018). Warmer and drier conditions are expected, with changes in precipitation patterns and associated impacts to soil moisture (CPW 2015). This species is expected to be particularly vulnerable to changes in precipitation patterns (Dodd 2023). Dodd (2023) also highlights the importance of terrestrial-aquatic connectivity for this species, describing that “A general lack of mobility, landscape resistance, and different life history characteristics make the population genetic structure of this species more complex....”

Maps of Species Range and Known Occurrences in Plan Area

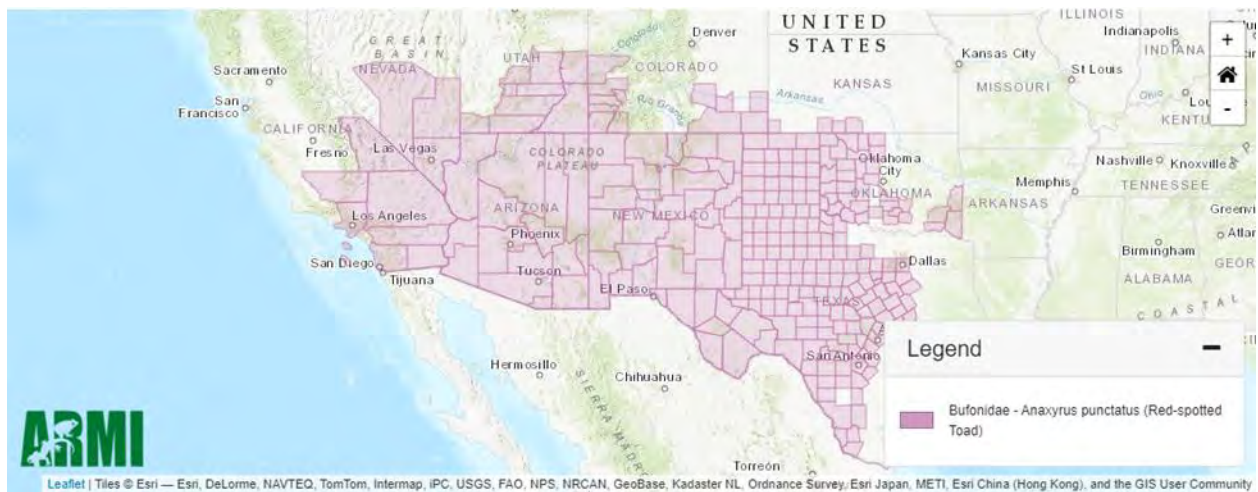


Figure 35. National Amphibian Atlas map of county-level distribution data for red-spotted toad.

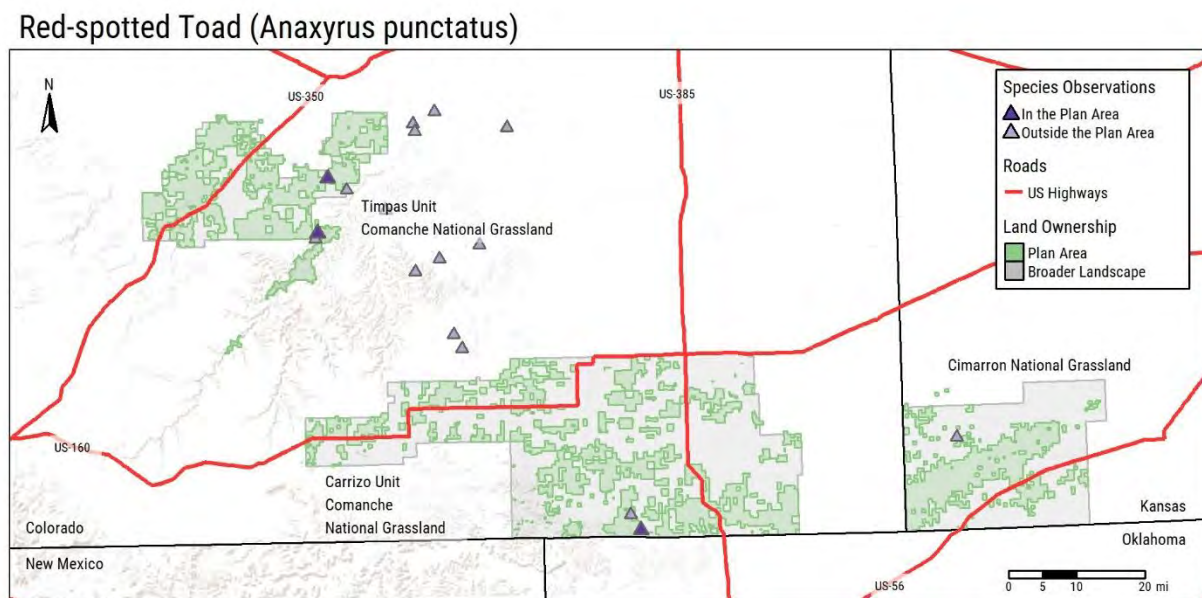


Figure 36. Red-spotted toad occurrence records within the plan area and broader landscape.

Smooth softshell turtle

(*Apalone mutica*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has one occurrence record in the plan area from 2021 and CONHP has one occurrence record in the plan area, which was surveyed in 2018 and again in 2022 (Van Scoyoc 2024). These records are not duplicates but are within 200 feet of each other. This species was first documented in Colorado in 2018. Previously, Colorado was thought to be outside of the species' range (Figure 37, Figure 38). The smooth softshell turtle now has a ranking of S1 in Colorado, indicative of critical imperilment. This aquatic turtle is not a highly mobile species and is very vulnerable to desiccation. The species is a known native in Kansas, and its eastern distribution limits have recently expanded there due to concerted surveys (Powell and Sievert 2022). Therefore, the species is considered native and known to occur to the plan area although, it is unknown whether its occurrence in Colorado reflects a range expansion or increased detection.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: road mortality, flooding of nests, predation on nests, off-road vehicle damage to nests, climate stressors
 - b. Habitat: roads, aquatic passage barriers, off-road vehicle use in nesting habitats; dams and dam operations, stabilization of sand bars by vegetation
2. Declining trends in populations or habitat in the plan area:
 - a. Population: trend not known.
 - b. Habitat: Habitat quality for this species is likely decreasing in the plan area because of land management activities upstream, impaired water quality, and tamarisk invasion.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Plan area is at the extreme western edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size unknown; GBIF and CNHP each have one occurrence record; species has only been documented in the Purgatoire River of the Timpas Unit of the Comanche.
 - b. Ecological conditions: only a short fragment of suitable aquatic habitat occurs in the Purgatoire River occurs in the plan area and therefore its ecological conditions are considered restricted.

Species Status

G5; S1 in Colorado; S4 in Kansas.

Taxonomy

Apalone mutica is currently accepted as valid (ITIS 2024); *Trionyx muticus* is a taxonomic synonym (ITIS 2024). There are two recognized subspecies: the Gulf Coast Smooth Softshell Turtle (*Apalone mutica calvata*) and the Midland Smooth Softshell Turtle (*Apalone mutica mutica*) (ITIS 2024).

Species range

Overall species range

This species has a large distribution from western Florida to eastern Texas, north to eastern New Mexico, southern South Dakota, Wisconsin, and northwestern Pennsylvania (NatureServe 2024d) (Figure 37).

Description of how the population in the plan area fits within the overall range

This species has only recently been documented in Colorado, which was previously thought to be west of the species' range (Figure 37, Figure 38). The plan area is at the extreme western edge of the species' range (Figure 39).

Distribution, abundance, and trend in the plan area

Population

Across its range, NatureServe (2024) considers this species globally secure (G5) with no documented declines. It is known only from the Comanche National Grasslands (Figure 40) and is not known to occur in the Cimarron National Grasslands (Figure 41). Given this species' sensitivity to desiccation and dependence on perennial water, the Cimarron does not provide its requisite habitat.

The smooth softshell turtle is considered critically imperiled in the state of Colorado (S1), where it was only recently discovered. Ross, Bluett, et al. (2019) states "they have been found in the Arkansas and Purgatory River, at elevations below 4,500ft (1372m). This species was first documented in the state of Colorado in Otero County during the 2018 COPARC Southeast Colorado Herpetofauna Inventory but has since had its distribution expanded to Bent, Prowers, and Las Animas counties." The population size and trend in the plan area is not known.

Habitat

Across its range, the smooth softshell turtle inhabits large rivers and streams, and in some areas can also be found in lakes, impoundments, and shallow bogs (NatureServe 2024d). It is restricted to the southeast portion of Colorado where it occurs at elevations below about 4,500 ft (Powell and Sievert 2022). In Kansas, it is believed to occur statewide although there have been no observation records in Morton County nor any counties in the southwest corner of the state (Kansas Herpetofaunal Atlas 2023). Within the plan area, the species has only been documented in the Purgatoire River in the Timpas Unit of the Comanche (Van Scoyoc 2024). Sandbars relatively free from vegetation are preferred for nesting, as are small permanent river islands high enough to be relatively safe from flooding and predation (Fitch and Plummer 1975).

Riparian habitat in the plan area is departed from historic conditions, including an increased abundance of cottonwoods and tamarisks. This can stabilize stream banks, bars, and islands lead to changes in stream morphology, which likely to reduce habitat for this species that depends on unvegetated sand bars for nesting. (Plummer 1976) found smooth softshell turtle nests that were laid in dense, permanent

vegetation were shaded or became invaded by roots and did not hatch. The Purgatoire River in the plan area has also declined in the plan area due to activities upstream of the plan area, including irrigation and crop production and intensive cattle feeding operations on private property. The reach of the mainstem Purgatoire River where this species has been observed is a 303(d) listed Water-Quality-Limited Segment for arsenic and manganese (Assessment Unit ID: COARLA07_A)(Colorado Department of Public Health & Environment 2024). This species is likely sensitive and susceptible to water pollution (Powell and Sievert 2022). For these collective reasons, habitat quality has likely declined for this species in the plan area, even while its documented range has expanded in Colorado (Powell and Sievert 2022).

Threats (arising from on or off the plan area)

Population

Mortality of the egg and hatchling stages is important in population dynamics, as predation on adults is minimal (Plummer 1976). Common predators on eggs include domestic dogs, coyotes (*Canis latrans*), striped skunks (*Mephitis mephitis*) and raccoons (*Procyon lotor*) (Fitch and Plummer 1975). The Kansas Herpetofaunal Atlas (2024) states “In Kansas, people are the chief predators of full-grown Smooth Softshells,” and the state currently has a daily creel limit of eight turtles. The species is protected from human harvest in the state of Colorado. Flooding and off-road vehicle use can both threaten eggs, which are typically laid on sandbars and can be washed away or driven over (Kansas Herpetofaunal Atlas 2023). Climate models are projecting significant increases in winter and spring precipitation for grasslands in the North Central region of the U.S., which is considered a threat to this species (Miller Hesel et al. 2023). Excessive rainfall or rapidly rising water levels can cause mortality of entire broods of smooth softshell turtle (Plummer 1976). Roads are another threat because they can present crossing barriers, fragment habitat and cause direct mortality (NatureServe 2024d). Smooth softshell turtles can also be injured or intentionally killed by fishing nets or lines, and can be considered a pest by fishers, including in Kansas (Fitch and Plummer 1975).

Habitat

NatureServe (2024) identifies no major threats to habitat, nor does CPW (2015). Roads can present crossing barriers, fragmenting habitat and causing mortality (NatureServe 2024d). Offroad vehicles can damage nesting habitat (Kansas Herpetofaunal Atlas 2023). This species requires aquatic movement corridors and aquatic passage barriers fragment its habitat.

The only documented habitat for this species in the plan area is downstream of the Trinidad Dam and Reservoir. As described by Tornabene et al. (2017), this can pose a threat to turtle habitat: “Dams and dam operations can have varied effects on riverine turtles. Regulated downstream reaches of rivers can have less island and bar areas, fewer bars, less active floodplain areas, and less geomorphic complexity than upstream unregulated reaches (Tornabene et al. 2017). Dams can influence growth rates (Snover et al. 2015), demography, diets, spatial ecology and genetics, and nesting ecology of riverine turtles (Tornabene et al. 2017). Dams convert lotic to lentic habitats, prevent migrations, fragment populations, and alter hydrologic cycles and geomorphology, thereby changing the availability of riverine habitat.” River regulation could also afford some benefits to this species by reducing fluctuations in water levels, and thereby increasing nesting success. Fitch and Plummer (1975) conclude that “Artificial control of the river’s flow undoubtedly results in greater security and a higher survival rate for the nests.”

Ecological conditions

Ecological condition requirements

This species is highly aquatic and found in rivers and large streams with sandy or muddy bottoms. A soft substrate that permits burying is an important habitat component (Plummer et al. 2008). Features such as sandbars and mud flats are important for basking and egg-laying; nesting habitat is vulnerable to it is vulnerable to hydrological and morphological modification of river/stream systems, as well as certain recreational activities (e.g., off-road use, predation by dogs) during nesting periods (Kansas Herpetofaunal Atlas 2023). The eggs can withstand short periods of water inundation, but typically not longer than two days (Plummer 1976). Adults seem to prefer larger rivers and live in colonies along certain portions, avoiding open water (Kansas Herpetofaunal Atlas 2023). During winter it burrows deep into the mud on the bottoms of rivers and streams (Kansas Herpetofaunal Atlas 2023). Most smooth softshell turtles have well-defined home ranges, with a mean home range size of approximately 44 acres (Ross, Bluett, et al. 2019). The linear distance of home ranges varies from 0.6 to 22 miles for females and 0.3 to 9.4 miles for males—in essence, this species requires an unimpeded aquatic movement corridor (Ross, Infante, et al. 2019). A number of environmental factors influence this species' movement, including water temperature, the day of the year, and river gage height (Ross et al. 2019).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

American softshell turtles are very sensitive to desiccation and therefore are largely restricted to aquatic environments for dispersal and migration (Weisrock and Janzen 2000). This species makes fairly extensive movements upstream and downstream, potentially related to nesting (Ross et al. 2019). It requires relatively large river and stream systems, which are limited in the plan area. The fragment of the Purgatoire River within the plan area is only about 10 miles long, and therefore the plan area may not contain enough habitat to fully provide for this species' linear home range, which can be as high as 22 miles (Ross et al. 2019).

In terms of habitat quality, the reach of the Purgatoire River in the plan area has been heavily impacted by activities upstream of the plan area, including regulation of discharge by Trinidad Dam, irrigation and crop production, and intensive cattle feeding operations on private property. These activities outside of the plan area have reduced habitat quality within the plan area. Invasive tamarisk has also become the primary riparian species within the Purgatoire River in the plan area, which alters bank stability, channel width, and floodplain hydrology, likely to the detriment of this species' habitat needs (Plummer 1976, (USDA Forest Service 2005b).

Critical biological characteristics

This species is diurnal (Kansas Herpetofaunal Atlas 2023). It hibernates in the winter and are typically active from May to September in Colorado (Hammerson 1999) and April to October in Kansas (Kansas Herpetofaunal Atlas 2023). Males mature at age four while females mature at six to nine years (Kansas Herpetofaunal Atlas 2023). It mates twice per year in both spring and fall, laying 3 to 25 eggs per clutch with an average of about eleven in Kansas (Kansas Herpetofaunal Atlas 2023). The species conducts non-migratory movements and can move 1.2-2.5 miles upstream or downstream in one day (Ross et al. 2019, NatureServe 2024). This turtle is carnivorous and preys primarily upon insects but also eats fishes, frogs, tadpoles, salamanders, crayfishes, snails, and worms (Kansas Herpetofaunal Atlas 2023).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Smooth softshell turtle eggs are predated upon by many species, including raccoons and skunks (Kansas Herpetofaunal Atlas 2023). Juveniles are preyed upon by birds, snakes, large fish, bullfrogs, other turtles and small to medium sized mammals (Kansas Herpetofaunal Atlas 2023, Hammerson 1999). As adults they have very few predators (Hammerson 1999).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Water level or discharge appear to influence its space use to some degree (Ross et al. 2019).

Maps of Known Occurrences in Plan Area

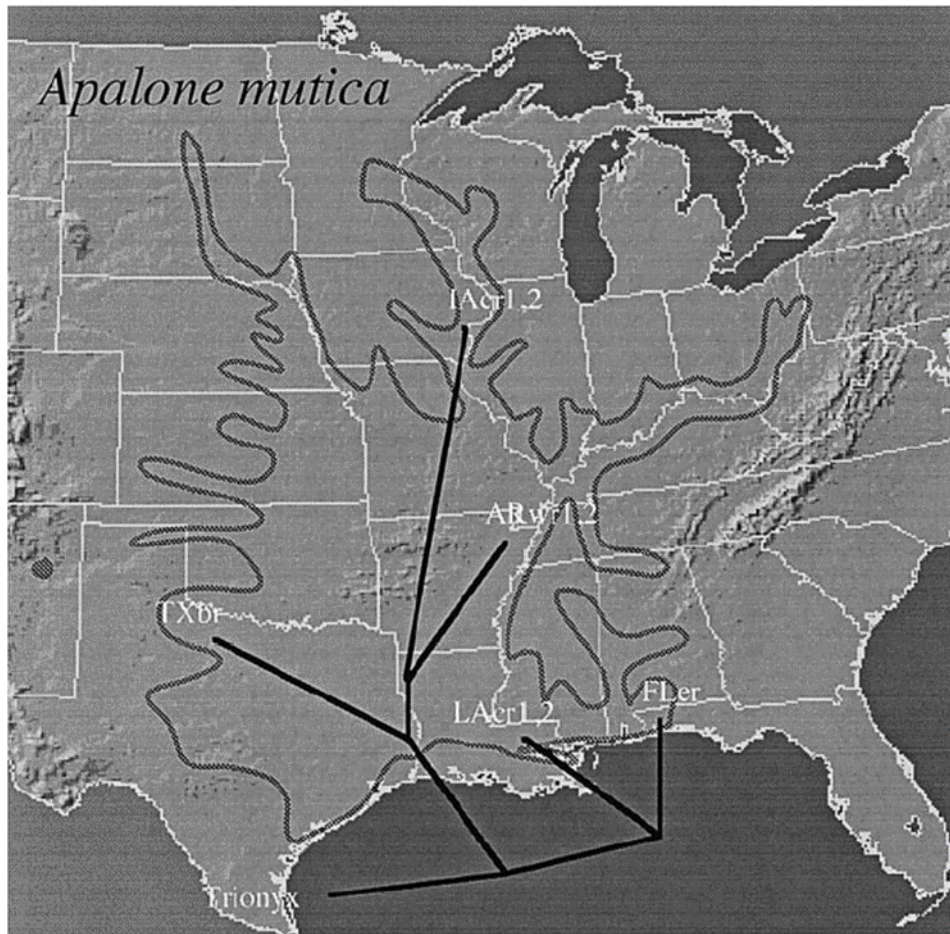
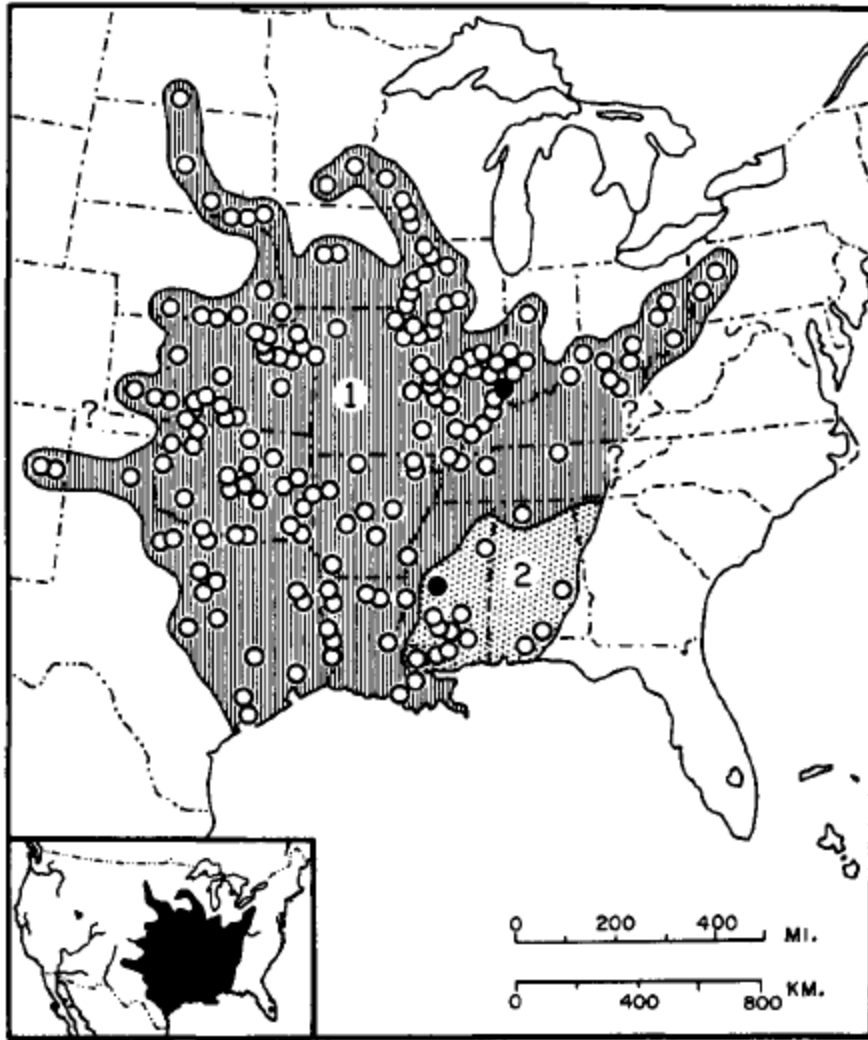


Figure 37. The North American distribution of the smooth softshell turtle from Weisrock and Janzen (2000). Genetic “parsimony tree” is overlaid over its range.



MAP. Solid circles mark type-localities; open circles represent other localities; question marks signify uncertain distributional limits eastward in Kentucky and Tennessee, and an alleged record from western Oklahoma.

Figure 38. Range map of the smooth softshell turtle (Webb 1973).

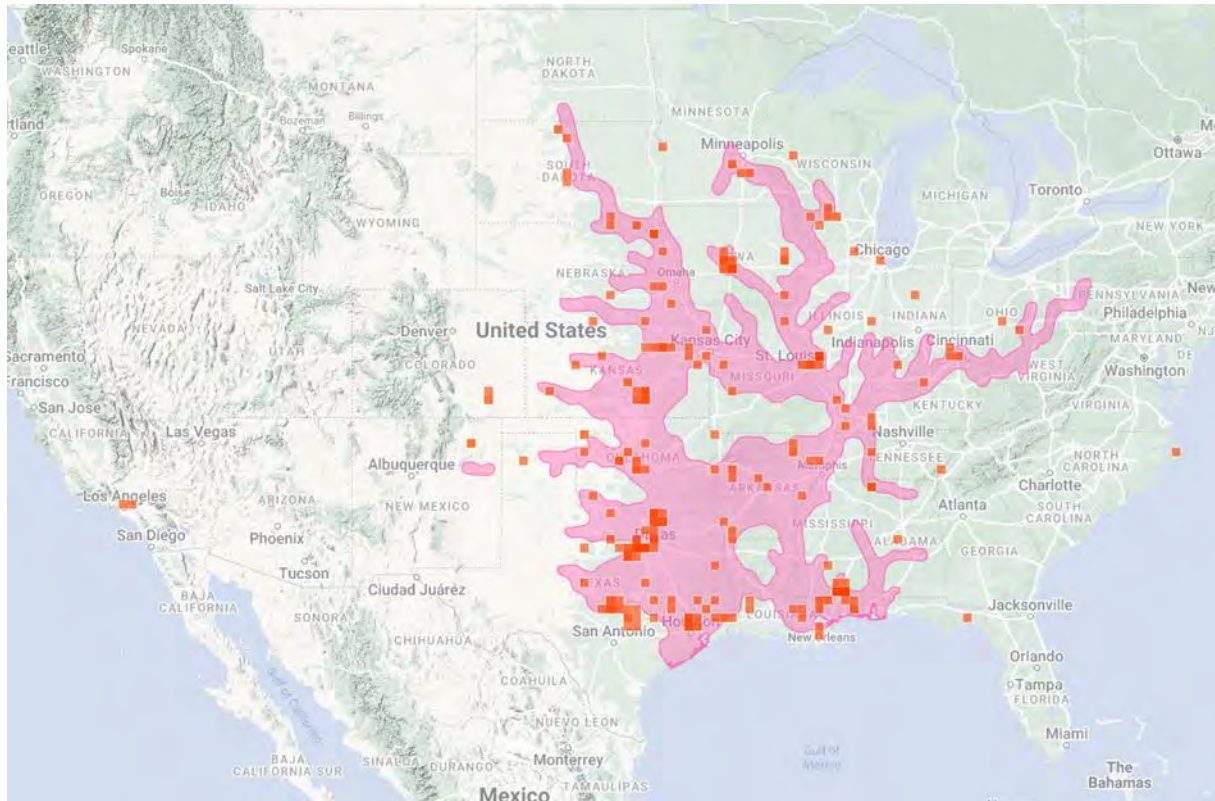


Figure 39. Range map of the smooth softshell turtle (iNaturalist 2024b).

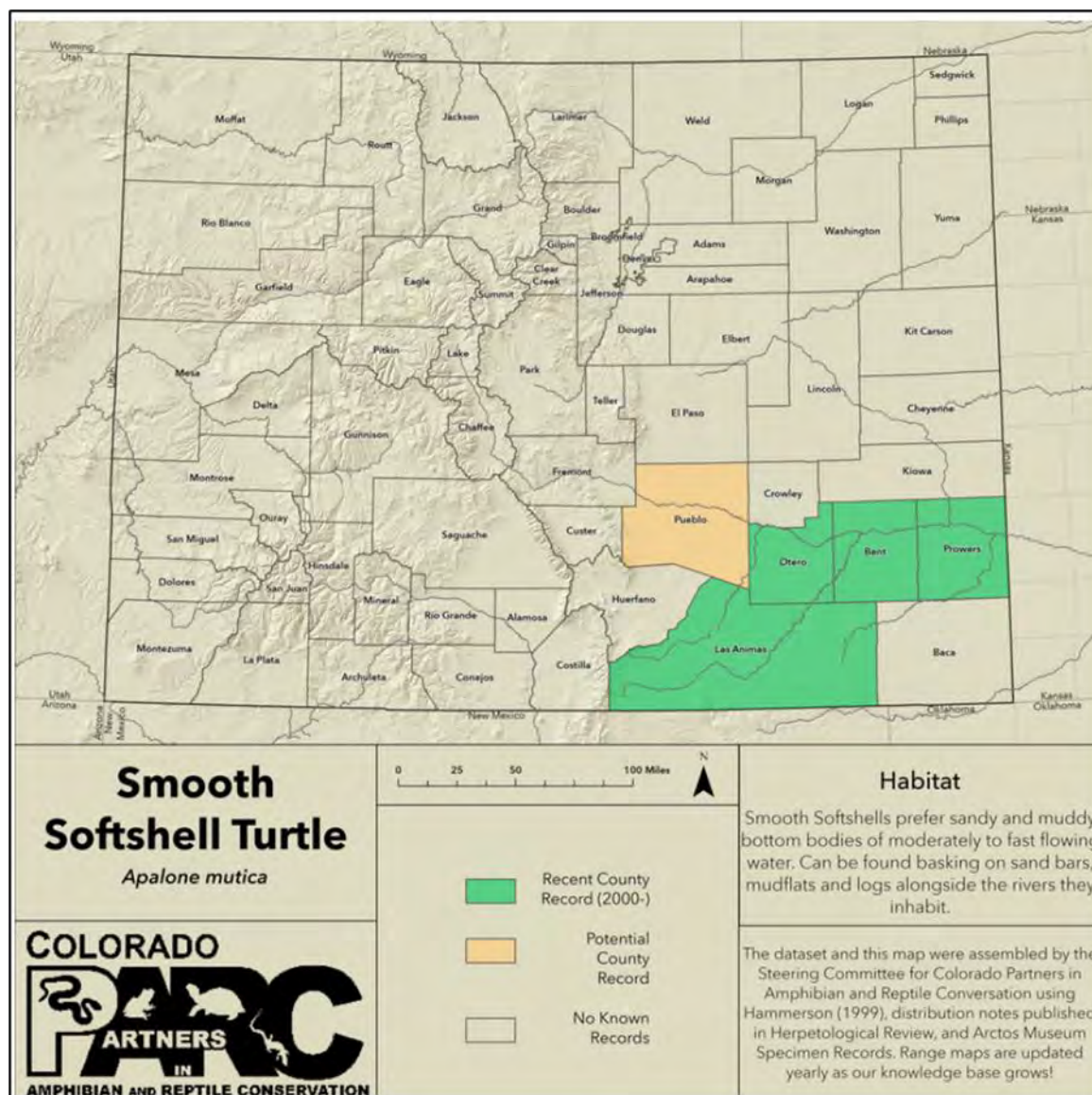


Figure 40. Map of smooth softshell turtle records by county in Colorado from COPARC (Hammerson 1999).

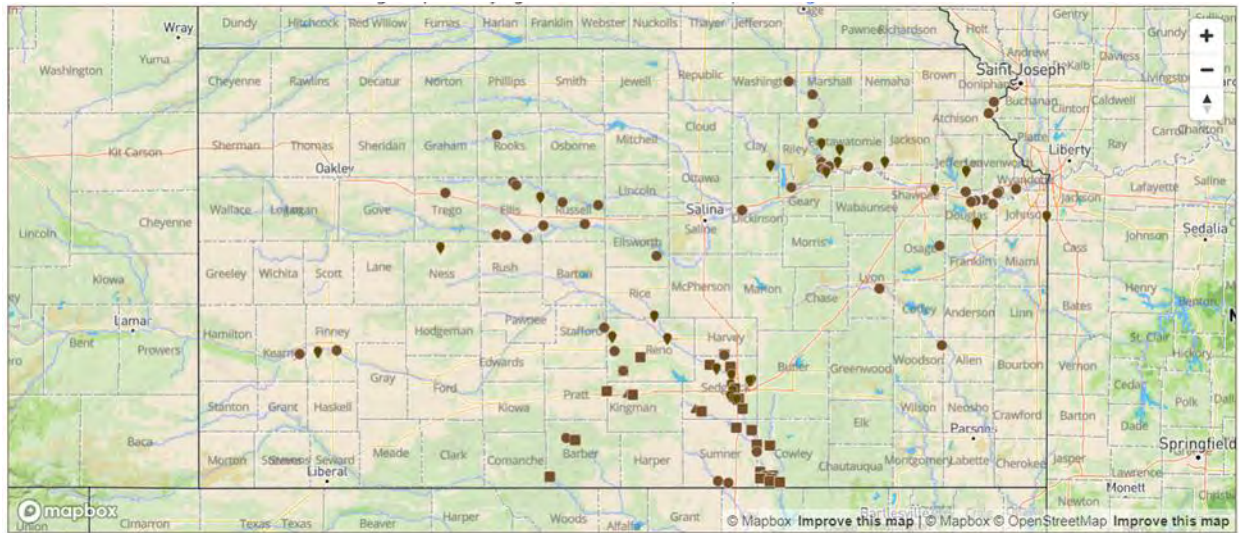


Figure 41. Occurrence map smooth softshell turtle records from the Kansas Herpetofaunal Atlas.

Texas horned lizard

(*Phrynosoma cornutum*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has 43 occurrence records from 1932-2019 and CNHP has 50 occurrence records from 1947-2023 (Van Scoyoc 2024). Some of these records may be duplicates. Many of these records have sufficient precision to demonstrate this species is known to occur in the plan area.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: poisoning, collision/road mortality, and illegal take
 - b. Habitat: conversion to cropland
2. Declining trends in populations or habitat in the plan area:
 - a. Population: trend not known, but species appears to be locally common and stable in the plan area.
 - b. Habitat: species uses varied arid habitat with sparse vegetation; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size unknown; GBIF has 43 occurrence records and CNHP has 50.
 - b. Ecological conditions: the species and its requisite habitat are well distributed across both grasslands.

Species Status

G4; S3 in Colorado; S4 in Kansas; listed as "Candidate" in Colorado.

Taxonomy

Phrynosoma cornutum is currently accepted as valid (ITIS 2024); *Agama cornuta* is a taxonomic synonym (ITIS 2024).

Species range

Overall species range

This species is relatively widespread across the south-central U.S. and northern Mexico (NatureServe 2024d) (Figure 42, Figure 43, Figure 44, Figure 45). The species is now absent from parts of its native range but has also expanded outside of its native range because of human releases (Stebbins 2003 (Stebbins 2003)).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range (Figure 42, Figure 43, Figure 44, Figure 45).

Distribution, abundance, and trend in the plan area

Population

Across its range, NatureServe (2024) characterizes the long-term trend of Texas horned lizard as a decline of <50% to relatively stable, and short-term trend as a decline of <30% to relatively stable (NatureServe 2024d). Population declines have been noted in Texas, Oklahoma, and southeastern portions of Kansas (NatureServe 2024d). NatureServe (2024) states that that "In Colorado no trend information is available, but recent surveys indicate that the species appears to be locally common and stable." The Kansas Herpetofaunal Atlas states "The Texas Horned Lizard is locally abundant across much of Kansas. It avoids most of the High Plains north of the Arkansas River basin, northeast Kansas east and north of the Blue and Kansas rivers. Areas of peak abundance include the Smoky Hills (between the Dakota Sandstone and the Fort Hays Limestone), the Flint Hills south of Pottawatomie County, the Cross Timbers, the Red Hills, and the High Plains south of the Kansas River." Collins and Collins (1991) describe it as abundant on the Cimarron National Grassland. The population size and trend in the plan area is unknown, but available information suggest this species is relatively abundant and stable in the plan area.

Habitat

Across its range, the Texas horned lizard inhabits open arid and semiarid regions with sparse vegetation (deserts, prairies, playa edges, bajadas, dunes, foothills) with grass, cactus, or scattered brush or scrubby trees (NatureServe 2024d). It is restricted to the southeast portion of Colorado (Hammerson 1999). In Kansas, it generally inhabits dry, flat areas with sandy, loamy, or rocky surfaces and little vegetation (Kansas Herpetofaunal Atlas 2024). Occurrence records are distributed across all units of the plan area, with most occurring in the Timpas Unit of the Comanche and the Cimarron.

Threats (arising from on or off the plan area)

Population

Threats to populations include poisoning (especially fire ant insecticides), collision (e.g., auto), and illegal take (CPW 2015) (NatureServe 2024d).

Habitat

Conversion of habitat to cropland is considered a threat in Colorado (CPW 2015). NatureServe (2024) notes that this species is extremely vulnerable to changes in habitat, especially the loss of native harvester ants that are being outcompeted by introduced fire ants (NatureServe 2024d). This threat may be significant in parts of Texas but probably not elsewhere (NatureServe 2024d).

Ecological conditions

Ecological condition requirements

This species occupies a variety of arid and semiarid habitats with sparse vegetation, including bunchgrass grasslands, cactus, juniper, acacia, and mesquite, with ground may be of sand, loam, hardpan, or rock (Stebbins 2003). It requires cover, such as rock, shrubs, or burrows of other animals, to escape the heat during mid-day, and some loose soil for burrowing at night (Stebbins 2003, Kansas Herpetofaunal Atlas 2024). Eggs are laid in loose soil or under rocks (Kansas Herpetofaunal Atlas 2024). Ants make up a major part of its diet, and it requires freedom from poisoning by insecticides and invasive fire ants that can outcompete its native ant prey (CPW 2015, Kansas Herpetofaunal Atlas 2024, NatureServe 2024). Home range size is rarely more than 2.5 acres (1 ha) (NatureServe 2024d).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The species and its requisite habitat are well distributed across both grasslands.

Critical biological characteristics

This species is strictly diurnal and forages, basks, or hides during the day (Collins and Collins 1991). It hibernates in the winter for about four months (Fair and Henke 1999) and are active from April to September in Kansas (Kansas Herpetofaunal Atlas 2024). Mating probably occurs no earlier than May or June (Collins and Collins 1991). Females lay a single clutch per season with an average of 22 eggs per clutch (Collins and Collins 1991). It specializes upon ants but can also consume other insects (Collins and Collins 1991).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species predares upon native harvester ants (*Pogonomyrmex* spp.); it produces toxins that render it distasteful to lessen predation (Kansas Herpetofaunal Atlas 2024, NatureServe 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Exotic grasses do not seem to provide significantly poorer habitat for this species than native grass plantings because both support similar densities of harvester ant colonies (McIntyre 2003).

Haney et al. (2022) found evidence of a likely contraction in the geographic range of Texas horned lizard, particularly in the eastern portion of its range (i.e., westward contraction), which may be associated with urbanization and/or the invasion and range expansion of the red imported fire ant (*Solenopsis invicta*).

Maps of Known Occurrences in Plan Area



Figure 42. Range map of the Texas horned lizard (Stebbins 2003).

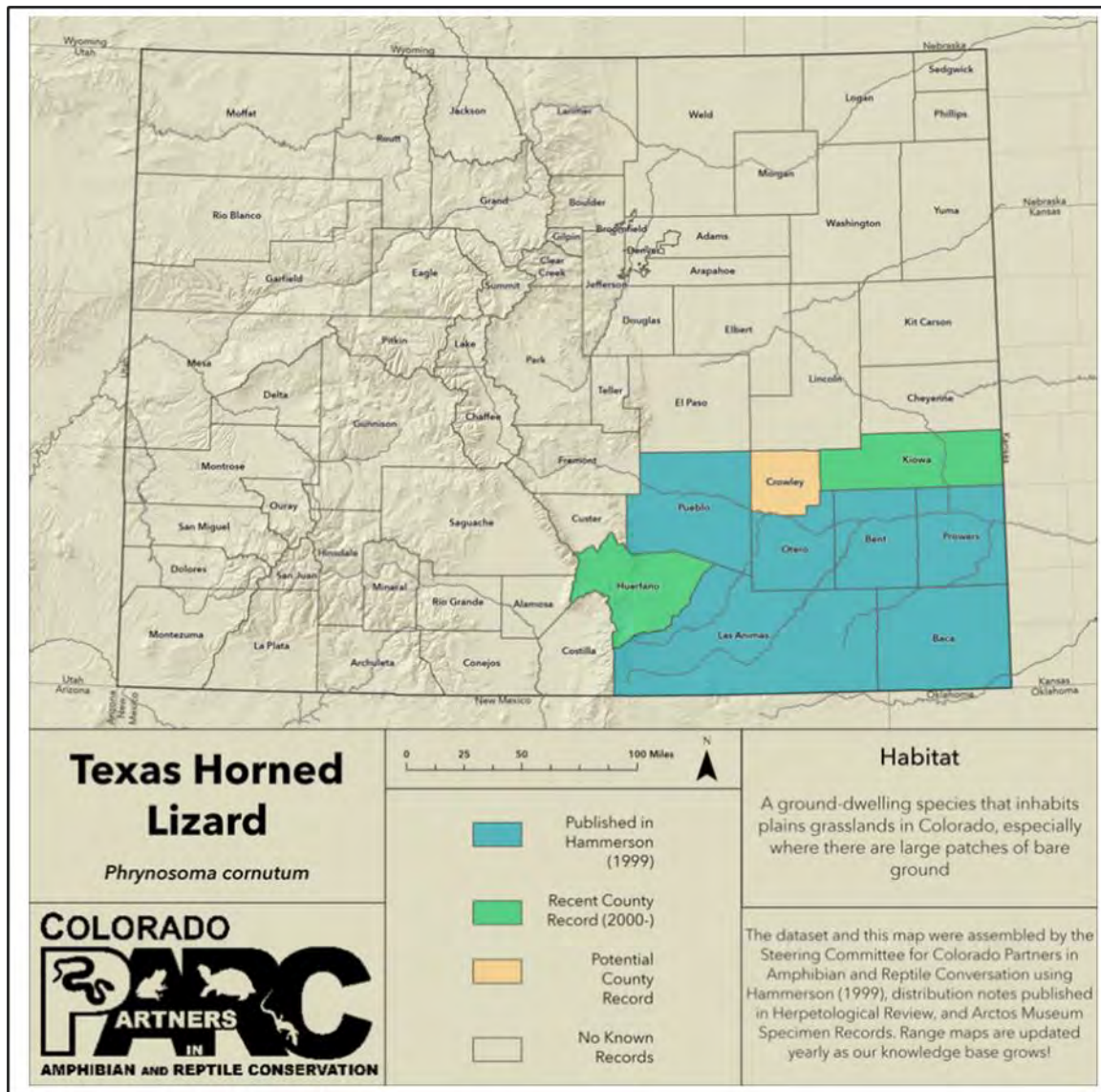


Figure 43. Map of Texas horned lizard records by county in Colorado from COPARC (Hammerson 1999).



Figure 44. Distribution map of the Texas horned lizard in Colorado (yellow polygon) in relation to the plan area (CNHP).

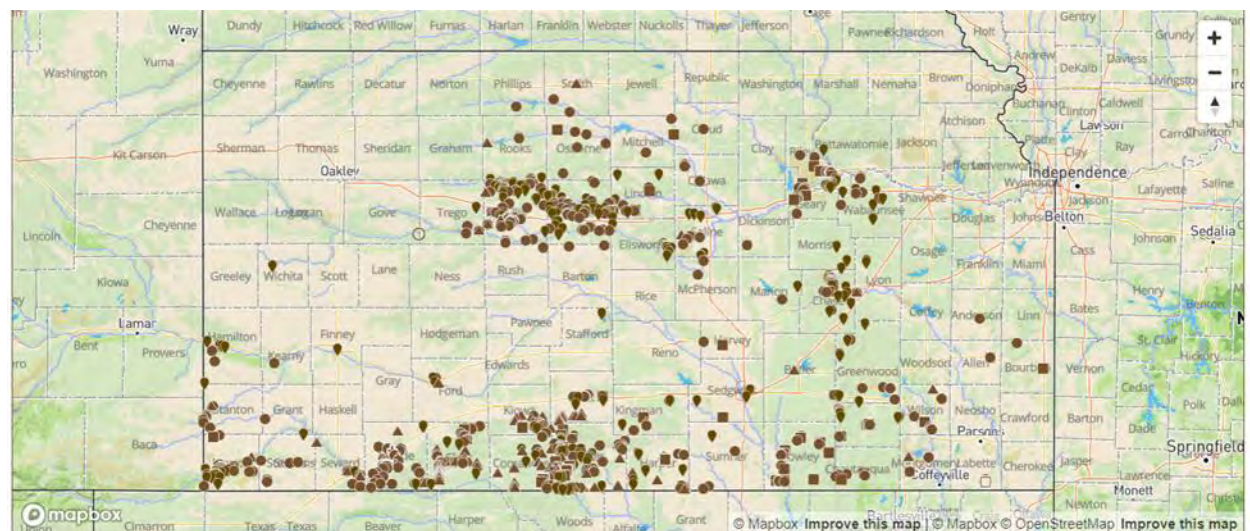


Figure 45. Occurrence map of the Texas horned lizard from the Kansas Herpetofaunal Atlas.

Western massasauga (*Sistrurus tergeminus*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CNHP has 5 occurrence records from 1961-2023 (Van Scoyoc 2024), some of which have sufficient precision to demonstrate this species is known to occur in the plan area.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: predation by native predators; road mortality; anthropogenic persecution
 - b. Habitat: loss and fragmentation of habitat, grazing, encroachment by invasive vegetation, loss of burrows for over-wintering, prescribed fire, energy production, high density road networks, and climate stressors.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: trend not known, but likely that the species has declined on the national grasslands compared to historical abundance levels.
 - b. Habitat: quality likely declining because of extended drought conditions, groundwater depletion, and shrub encroachment.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is disjunct.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size unknown but believed to be low.
 - b. Ecological conditions: species seems to have narrow ecological tolerances and has only been documented in the Timpas Unit of the Comanche despite seemingly suitable habitat elsewhere across the plan area.

Species Status

G3; S2 in Colorado; S4 in Kansas; listed as "Candidate" in Colorado.

Taxonomy

Sistrurus tergeminus is currently accepted as valid (ITIS 2024h); *Sistrurus catenatus tergeminus* is a taxonomic synonym (ITIS 2024). Another common name is Prairie Massasauga (ITIS 2024). There has been considerable taxonomic uncertainty regarding the validity of subspecies for this species. NatureServe (2024d) summarized research by Kubatko, Gibbs and Bloomquist who used a multigene data set to infer two clades among the three previously recognized subspecies. One clade contained the eastern subspecies (*S. c. catenatus*) and the other clade contained the two western subspecies (*S. c.*

tergeminus and *S. c. edwardsii*). Kubatko et al. (2011) recommended elevating *S. c. catenatus*. However, if the recommendation was followed at that time, it would also require elevating *S. c. tergeminus* and the formation of three new combinations. In addition, Holycross et al. (2008) discovered that *S. c. tergeminus* is actually subsumed by *S. c. catenatus* because the type locality of *catenatus* is within the range of *tergeminus*, and that the name *Crotalus massassaugus* Kirtland, 1838 would be the available and valid name for the eastern subspecies. As such, *tergeminus* was not currently a valid name and if the Kubatko et al. recommendation was followed, the specific epithet for the eastern form would be *massassaugus*. A petition was submitted to the ICZN for conservation of the names *catenatus* and *tergeminus*. The subsequent opinion by the ICZN (2013) retained the names *S. catenatus* and *S. tergeminus* by designation of neotypes for both species. In this database we follow SSAR and the recommendation of Kubatko et al. (2011) and elevate *tergeminus*, leaving no recognized subspecies of *catenatus*." The Eastern Massasauga (*Sistrurus catenatus*) is now considered a separate species, which is listed as threatened under the Endangered Species Act.

Species range

Overall species range

This species is represented by discontinuous populations within its range spanning northern Mexico, north through parts of central and western Texas; west through eastern and central New Mexico to eastern Arizona; north into southeastern Colorado and through central Oklahoma into northern and central Kansas with the northern-most currently documented occurrence in northern Missouri and the southeastern tip of Nebraska (NatureServe 2024d) (Figure 46, Figure 47, Figure 48, Figure 49, Figure 50).

Description of how the population in the plan area fits within the overall range

The population in southeast Colorado is now apparently isolated (Figure 46, Figure 47, Figure 25) and intermediate in its characteristics between the Desert Massasauga and the Western Massasauga to the east (Stebbins 2003). This is supported by Hammerson (1999), which states "The range of the Western massasauga in Colorado appears to be significantly disjunct from populations in neighboring states of New Mexico, Oklahoma, and Kansas." The population in the plan area is portrayed as a disjunct subspecies (*Sistrurus catenatus edwardsii*) by (Wastell and Mackessy 2016) (Figure 46), although as discussed above this subspecies is no longer considered valid by ITIS (2024) or NatureServe (2024). Regardless of taxonomy, the population in the plan area is spatially disjunct from the species' range (Figure 46, Figure 47).

Distribution, abundance, and trend in the plan area

Population

Across its range, NatureServe (2024) identifies a long-term declining trend of 50-70% and a short-term declining trend of 10-30%. Hammerson (1999) states that "Although the Western massasauga has a limited range in Colorado, it can be locally common in some areas." While it is locally abundant throughout much of the eastern two-thirds of Kansas (Kansas Herpetofaunal Atlas 2024), it seems to be absent from the Cimarron National Grassland (Collins and Collins 1991). It is possible the Cimarron National Grassland can support the species, and it has just not been documented, as it contains suitable habitat (Mackessy 2005) states "We consider it probable but as yet undocumented on the Cimarron National Grassland in Kansas, which appears to have habitat appropriate for desert massasaugas."

The population size and trend in the plan area is not known. It likely that the species has declined on the national grasslands compared to historical abundance levels (Mackessy 2005). CNHP has 5 occurrence records. Mackessy (2005) state that “In National Forest System lands, it occurs uncommonly in parts of three counties: Otero, Las Animas, and Baca [in Colorado]. Their rarity here perhaps makes them more susceptible to local extirpation. Since 1995, we have recorded over 800 specimens of desert massasaugas in Colorado, but only 14 of these were found on or near the Comanche National Grassland. Sampling bias alone cannot explain this lack of specimens because both sections of the national grassland were subject to extensive survey work.”

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The geographic range of Western Massasauga is relatively wide but patchy and thought to be shaped by narrow ecological tolerances (Walkup et al. 2022). Observations within the plan area have been restricted to the Timpas Unit of the Comanche, despite considerable survey effort and seemingly suitable habitat widely distributed across the plan area (Mackessy 2005, Van Scoyoc 2024). The species’ tolerance of xeric conditions is restricted, affected by both groundwater depletion and drought conditions (Mackessy 2005). Climate warming scenarios show reduced likelihood of this species occurring in southeast Colorado (Walkup et al 2022). Western Massasauga tends to avoid woodlands and areas with dense shrubs, and encroachment of woody vegetation into grasslands is problematic for this species because it can increase predation risk (Panella and Johnson 2014). Juniper woodlands in southeast Colorado have expanded due to fire suppression and drought (CPW 2015), and juniper has also increased in distribution and abundance in some ecosystems within the plan area (CCNG 2005). Roads may be a significant source of mortality for this species through direct exposure to predators as well as through vehicle-based mortality, since the species undergoes long-distance seasonal movements (Mackessy 2005), (Wastell and Mackessy 2016). Roads traversing the plan area likely contribute to habitat fragmentation, predation and road mortality for this species.

Habitat

Across its range, this species occurs in grasslands and marshlands on the edge of open woodlands or on rocky hillsides and often makes use of the burrows of other animals for shelter (NatureServe 2024d). It typically occurs at elevations below about 5,500 ft in Colorado and can use varied habitats including arid open sagebrush prairie and shortgrass prairie (Mackessy 2005). The species is absent from agricultural lands, preferring open grasslands across its range (Walkup et al. 2022). All occurrence records have been in the Timpas Unit of the Comanche, and most have been individuals basking on roads (Van Scoyoc 2024) (Figure 47).

Hibernacula are considered a limiting resource for Western Massasauga populations. (Wastell and Mackessy 2016) note that habitat quality for Western Massasauga in southeast Colorado is likely declining because of extended drought conditions that appear to favor an increase in invasive weed species such as Russian Thistle (*Salsola* sp.), Kochia (*Kochia scoparia*), Sandbur (*Cenchrus longissimus*), and various grasses, which also affects this species’ prey abundance. Juniper encroachment in the plan area is expected to have decreased habitat quality for this species because large shrubs and trees provide more perching habitat for raptors to use as they hunt snakes (Panella and Johnson 2014). Additionally, this species is affected by groundwater depletion, which has occurred in the plan area. Mackessy (2005) states “Changes in groundwater uses in the area may also be contributing to the loss of habitat for massasaugas in Colorado. Desert massasaugas are much more adapted to xeric grasslands conditions than are the eastern and western subspecies (Holycross and Mackessy 2002), but they still are most abundant in Colorado (including Region 2) in areas with somewhat greater surface water availability, suggesting that their tolerance of xeric conditions is restricted.”

Threats (arising from on or off the plan area)

Population

Threats to populations include increased levels of predation by native predators; road mortality; illegal collection for the herpetoculture trades, anthropogenic persecution (intentional killing) primarily through “rattlesnake roundups” (Wastell and Mackessy 2016, Mackessy 2005, NatureServe 2024d).

Habitat

Threats to this species' habitat include loss and fragmentation of habitat from urbanization and conversion of grasslands to agricultural uses, overgrazing; the effects of modified habitat on predation risk; loss and degradation of all forms of grass prairie and wet meadow habitats; loss of marsh habitat; encroachment by invasive vegetation that degrades habitat quality; loss of crayfish and rodent burrows essential for over-wintering cover for this species; extended drought conditions and the interactive effects with invasive weeds; prescribed fires; energy production and its accompanying high density road networks that functionally fragment habitat (Wastell and Mackessy 2016, Mackessy 2005, NatureServe 2024d, Panella and Johnson 2014). Under models of future climate conditions, the potential distribution of Western Massasauga moves northward and the center of its range shifts to Kansas-Nebraska-Iowa-Missouri (Walkup et al. 2022). However, many of these lands at the northern edge of its current range have considerable agriculture, which is likely to make it challenging for this species to track suitable climates northward over time (Walkup et al 2022).

Ecological conditions

Ecological condition requirements

This species conducts undergoes long-distance seasonal movements (Wastell and MacKessy 2016) and requires spring/summer foraging and breeding habitat, fall/winter hibernacula (underground burrows in which to overwinter), and connectivity to safely move between the two. The dominant habitat type used by Western Massasaugas for hibernation in southeast Colorado is a shortgrass prairie association (adjacent to an intermittent stream), with a dense clay soil type (Wastell and MacKessy 2016). Summer foraging habitat is dominated by an upland mixed-grass/sand sagebrush association and sandy soils (Wastell and MacKessy 2016). Wastell and MacKessy (2016) observed a preference for small rodent burrows for birthing sites in the mixed grass/sand sagebrush habitat with exposed sandy sites that were used for basking. Rodent burrows are also used as fall/winter hibernacula (Wastell and MacKessy 2016). Quality hibernacula provide stable hibernation conditions, extensive underground refugia, stable clay-type soils and (relatively) high soil moisture levels (Wastell and MacKessy 2016). It also requires freedom from road mortality (e.g., by construction of strategic roadway exclosures in high impact road mortality areas or safe underpasses) and protection from direct mortality by anthropogenic persecution (MacKessy 2005).

Critical biological characteristics

This species is cathemeral, with spring and fall activity taking place during the day while around dusk and into the night during summer (Panella and Johnson 2014). It hibernates in the winter and can make long-distance seasonal migrations in spring/fall to and from its hibernacula (Wastell and MacKessy 2016). In southeast Colorado it is active from mid-May until late October (Wastell and MacKessy 2016). Mating and courtship can occur in both the spring and the fall, with clutch sizes of 3-7 (Wastell and MacKessy 2016). The species appears to reproduce biennially, and, on average, an adult female in Colorado can be expected to reproduce only once (Wastell and MacKessy 2016). In captivity, western massasauga can live to at least 20 years old, but survivorship in the wild in southeast Colorado appears to be low, rarely exceeding five years total age (Wastell and MacKessy 2016). It is an opportunistic predator that preys

upon amphibians, lizards, other snakes, rodents, insects, eggs, and occasionally scavenged roadkill (Kansas Herpetofaunal Atlas 2024, Hammerson 1999).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Common predators of the Western Massasauga include raptorial birds, carnivorous mammals, and several species of snakes (Mackessy 2005). The species is venomous and therefore often killed by people (NatureServe 2024d). Massasaugas prey upon several mammals, particularly pocket mice (*Perognathus*) and harvest mice (*Reithrodontomys*).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

MacKessy (2005) suggests that “cattle ranching and maintenance of habitat for desert massasaugas are completely compatible, provided that herd rotation to simulate natural grazer effects is implemented. In the absence of native bison, rotational grazing at moderate herd densities may actually improve habitat by promoting growth of grasses and quality of forage.” Other influences on this species include invasive vegetation, prescribed fire, and fragmentation of habitat by road networks (MacKessy 2005, Panella and Johnson 2014). More specific management considerations and recommendations for this species are provided in Mackessy (2005) and Panella and Johnson (2014).

Maps of Species Range and Known Occurrences in Plan Area

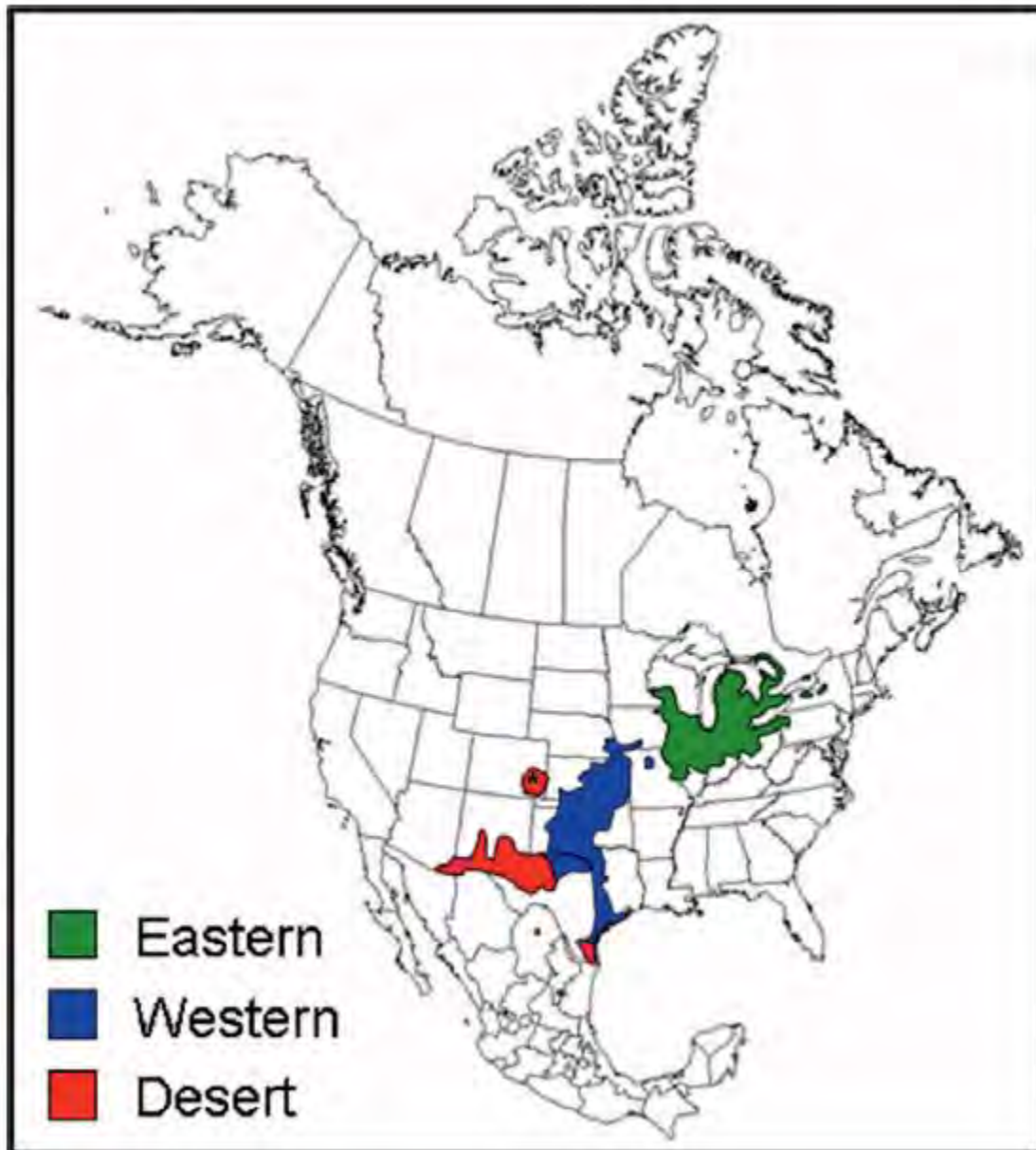


Figure 46. Range of Massasauga Rattlesnakes (*Sistrurus catenatus*) in North America from (Wastell and Mackessy 2016). Note that the population in the plan area was considered the “Desert” subspecies in this figure (*Sistrurus catenatus edwardsii*). The Eastern Massasauga Rattlesnake is now considered a separate species (*Sistrurus catenatus*), which is listed as threatened under the Endangered Species Act.

(a)

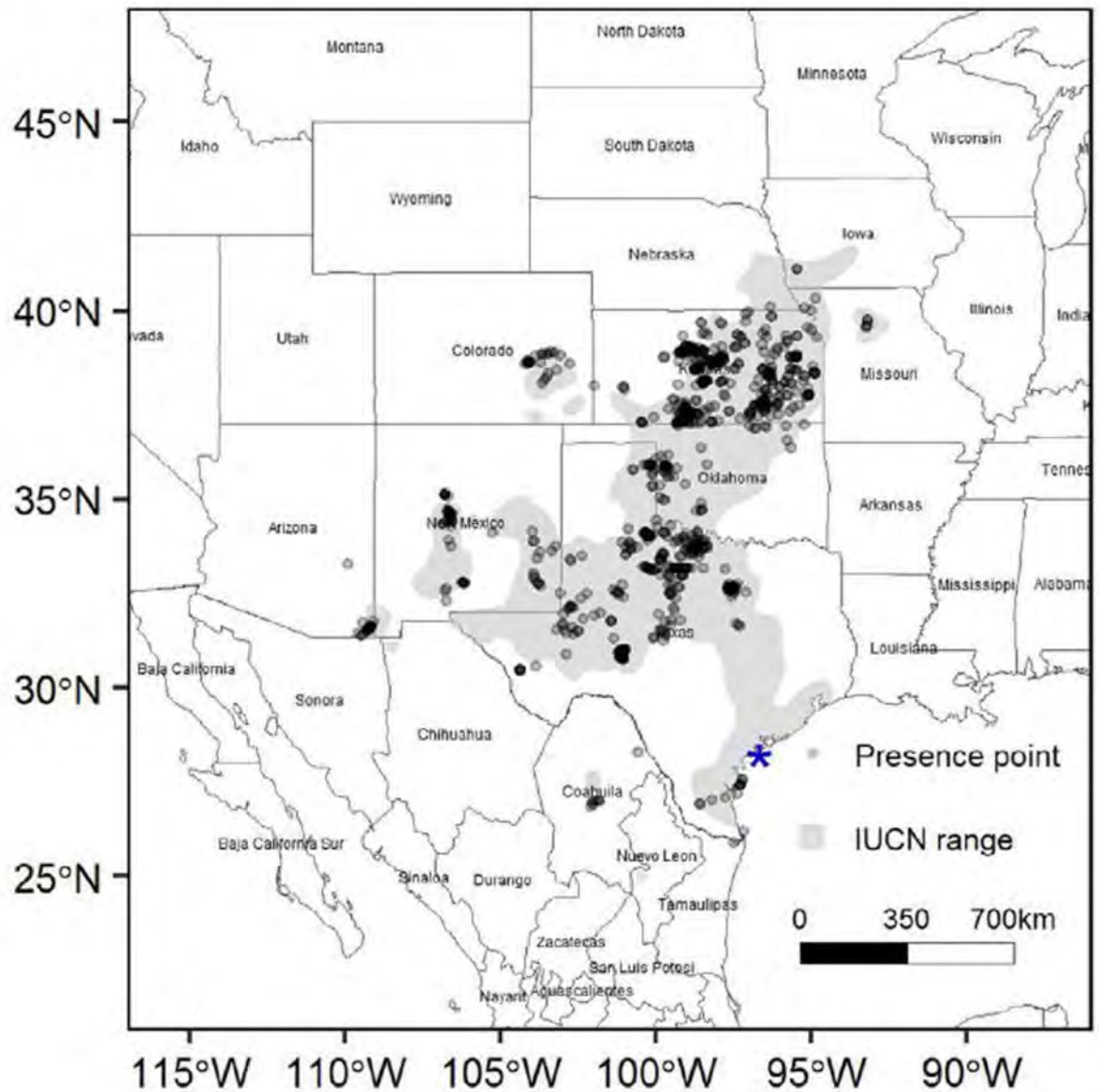


Figure 47. Presence points for Western massasauga, aggregated from natural history museum records, iNaturalist, and the Global Biodiversity Information Facility, overlaying the IUCN range. The points are a transparent gray, so the more points that aggregate in an area, the darker those points appear. Map from (Walkup et al. 2022).

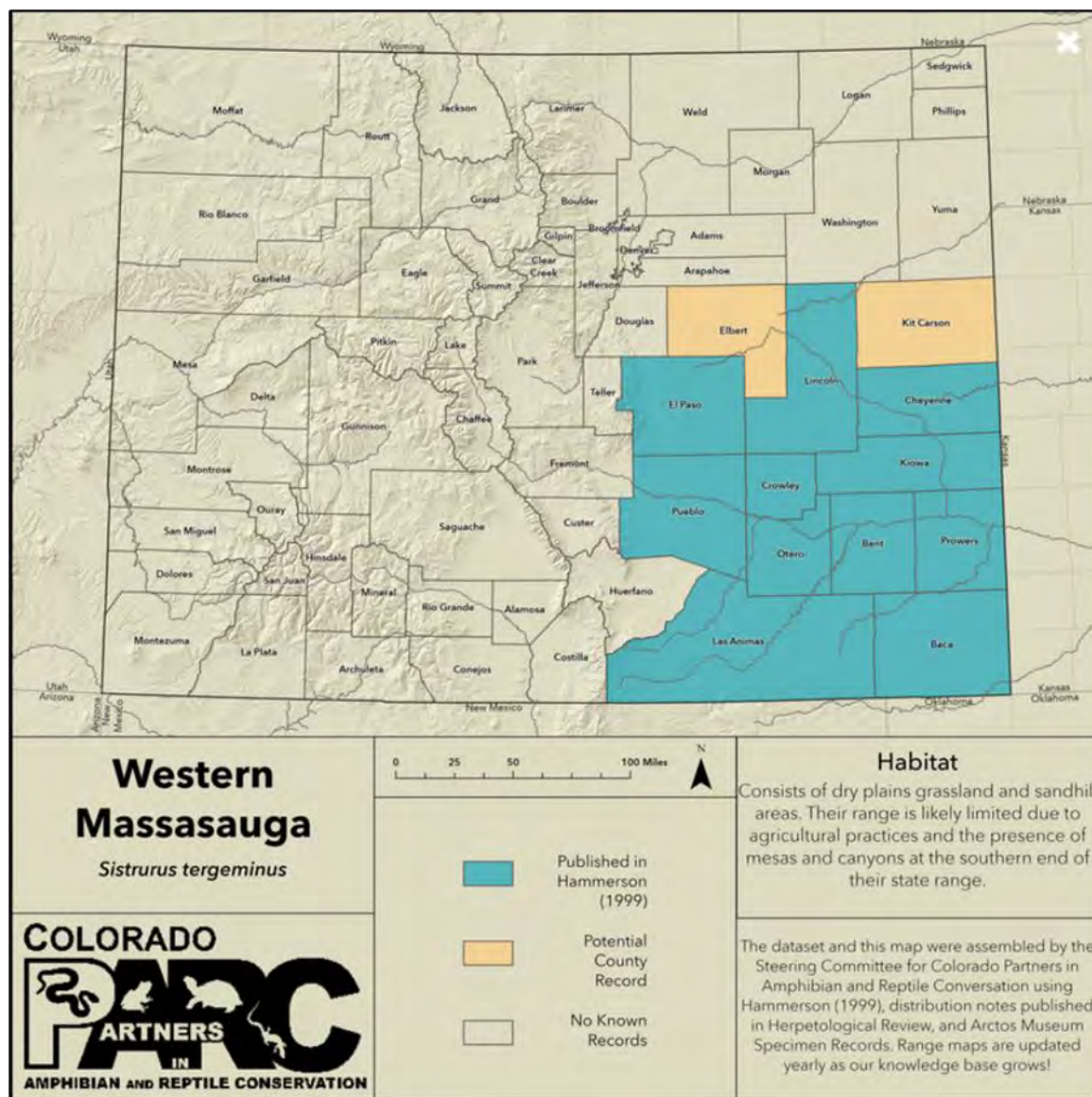


Figure 48. Map of Western massasauga records by county in Colorado from COPARC (Hammerson 1999).



Figure 49. Distribution map of the western massasauga in Colorado (yellow polygon). Map from CNHP.

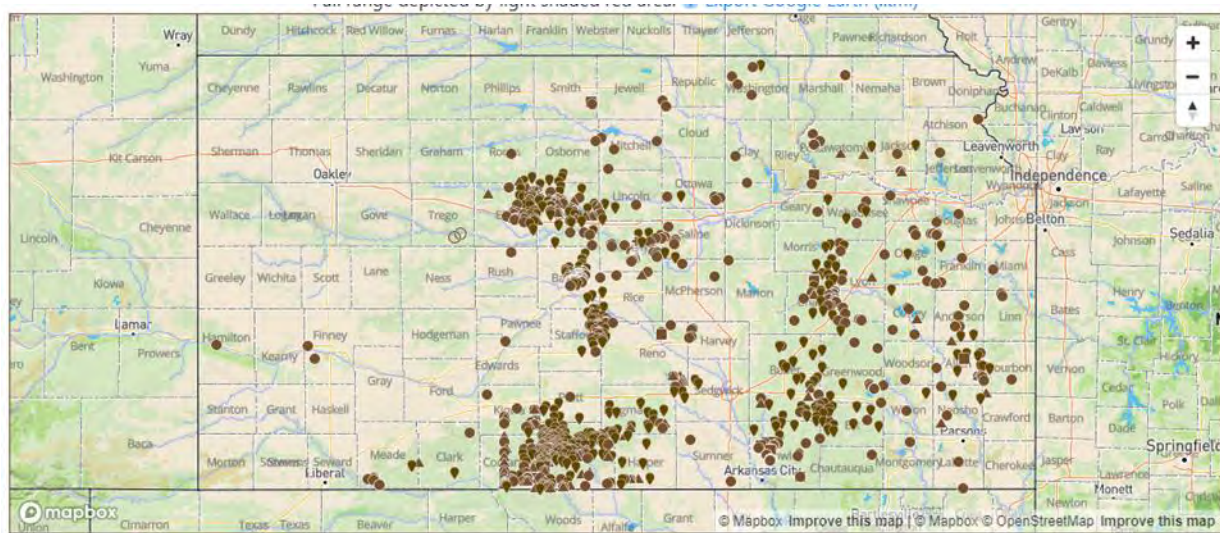


Figure 50. Occurrence map of western massasauga from the Kansas Herpetofaunal Atlas.

Western narrow-mouthed toad

(*Gastrophryne olivacea*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CONHP contains six occurrence records from 1979-1982 that partially overlap the plan area. Additionally, GBIF contains six occurrence records from 2021-2023, but these records have an uncertainty of over 17 miles ($\pm 28,447$ m) and as such are not considered "known occurrences" in the plan area. Only one of the CONHP records from 1982 (EO ID 5728) has sufficient precision to demonstrate this species is known to occur in the plan area.

Year of Last Known Occurrence: 1982

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Threats to populations include *Ranavirus*.
 - b. Threats to habitat include hydrological alteration, land use alteration such as conversion to cropland, pesticide runoff, and climate stressors.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trends unknown.
 - b. Aquatic/riparian habitat on the plan area has declined.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is on the northwestern edge of the species range or may be a disjunct population.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size not known; one known occurrence record in the plan area.
 - b. Wetland and riparian habitats are relatively limited in the plan area; species' known distribution is restricted to four HUC12 watersheds in the southwest corner of the Carrizo Unit of the Comanche NG. This species also has ecological specialization as a dietary specialist on ants, and a mutualism with tarantula spiders.

Species Status

G5N5; S1 in Colorado; S5 in Kansas; listed as "Candidate" in Colorado.

Taxonomy

Gastrophryne olivacea is accepted as valid (ITIS 2024c); taxonomic synonyms include: *Engystoma texense*, *Engystoma olivaceum*, *Gastrophryne areolate*, *Gastrophryne texense*, *Microhyla areolate*, *Microhyla carolinensis olivacea*, *Microhyla olivacea* (Dodd 2023). Other common names associated with this species include Great Plains Narrow-mouthed Toad (ITIS 2024c), Sapo-boca angosta oliváceo (ITIS 2024c).

Species range

Overall species range

The Western Narrow-mouthed Toad is distributed throughout the southern Great Plains of the U.S. and in northern Mexico (Figure 51, Figure 52, Figure 53, Figure 54) (Dodd 2023). Populations occur in southeastern Colorado and while some range maps show the Colorado population as disjunct (Figure 52, Figure 54), Dodd (2023) notes “the range is probably more contiguous than the range map indicates, pending further fieldwork.” The Kansas Herpetofaunal Atlas states that the species apparently avoids much of the Western Plains.

Description of how the population in the plan area fits within the overall range

The population in the plan area is at the northwest edge of the species range and may or may not represent a disjunct population (Figure 51, Figure 52, Figure 53, Figure 54) (Dodd 2023). Its occurrence in southeast Colorado appears relatively isolated from the rest of its range (NatureServe 2024c) (Figure 52), as the species is not known to occur in southwestern Kansas (Kansas Herpetofaunal Atlas 2024).

Distribution, abundance, and trend in the plan area

Population

The population size in the plan area is unknown. Records have been widely distributed around the Carrizo Unit of the Comanche (Figure 54), but there is only one occurrence record with sufficient precision to demonstrate that this species is known to occur in the plan area. An unknown number of adults were found just north of the Carrizo picnic area on the Comanche National Grassland in June 1982 (Bolt 1982 personal communication, as cited in CNHP EO ID: 5728). No information could be found on the population trend in the plan area (ARMI 2024). CPW characterizes the population status and trend in Colorado as unknown (CPW 2015). It is considered critically imperiled in Colorado, and while it is secure (S5) in Kansas, it is not known from the southwestern corner of the state.

Habitat

Across its range, suitable habitat for adult Western Narrow-mouthed Toads can include open woodlands, rock outcrops, wetlands, sloughs, seasonal waterbodies, streams, playas, prairie grasslands, mesquite flats, and desert scrub (Dodd 2023). The species is usually found within 2,000 ft of a water source (Dodd 2023). Eggs and larvae develop in temporary pools formed by heavy rains and larger ponds that dry up in some years (Hammerson 1986), NatureServe 2024c).

In Colorado, the Western Narrow-mouthed Toad is limited to four HUC12 watersheds in the southeast corner of the state (Figure 53) (Van Scoyoc 2024). It occupies a variety of lowland habitats below 5,000 ft (Dodd 2023). These subwatersheds occur on the southern edge of the Comanche and represent a small portion of the plan area (Figure 53). The species has not been documented in the Cimarron National Grassland and is known from the eastern three-fourths of Kansas, apparently avoiding much of the Western Plains (Kansas Herpetofaunal Atlas 2024) (Figure 54).

Aquatic and riparian habitat have declined in the plan area due to several factors, including the increased abundance of invasive tamarisk (USDA Forest Service 2005a) and severe declines in stream flows downgradient from the Ogallala- High-Plains Aquifer (Brikowski 2008). Drawdown of the aquifer has substantially decreased the discharge to most of the rivers in the Carrizo unit of the Comanche and the entire Cimarron National Grassland (USDA Forest Service 2005b) (see Appendix).

The Western Narrow-mouthed Toad is fossorial or semi-fossorial, and benefits from crevice habitat provided by caves, downed wood, limestone rocks, and the burrows of other animals, including prairie dogs (Dodd 2023).

Threats (arising from on or off the plan area)

Population

Amphibians are one of the most threatened groups of organisms worldwide, but threats vary across species' ecological preferences, geographic ranges, and taxonomic associations (Stuart et al. 2004). Western narrow-mouthed toad belongs in the "narrow-mouthed frog" family (Microhylidae), which consists of very few rapidly-declining species (Stuart et al. 2004).

(Mims et al. 2020) characterized the Western Narrow-mouthed Toad as threatened by "community dynamics" in the southwestern United States (Mims et al. 2020). This was based on a laboratory study by (Dayton and Fitzgerald 2001) Dayton and Fitzgerald (2001), which showed Western Narrow-mouthed Toad larvae can be competitively excluded by other amphibians that breed in ephemeral habitats. Competitive exclusion may affect distribution patterns but does not seem to present a significant threat to the species. Dodd (2023) describes the species as "widespread and generally abundant," but notes *Ranavirus* has been documented in Oklahoma. While there is currently no evidence that ranaviruses are causing extinctions of the host species, they can cause population declines and even local extinctions (Collins 2010).

Habitat

In the southwestern United States, hydrological and land use alteration have been identified as threats to the Western narrow-mouthed toad's habitat (Mims et al. 2020). The species is threatened by degradation of playa wetland in northwest Texas (Anderson et al. 1999). Playa habitat is also threatened in Colorado (CPW 2015). Western Narrow-mouthed Toad is sensitive to water quality changes and changes in vegetative cover in breeding habitats (Anderson et al. 1999). Other threats identified by CPW (2015) include conversion to cropland, pesticide runoff, and climate variability. Dodd (2023) concludes that "as with all amphibians, populations may have been lost due to habitat destruction and alteration." Global climatic changes can also affect seasonal arid cycles in parts of its range (NatureServe 2024d).

Ecological conditions

Ecological condition requirements

Adults occupy a wide variety of habitats that provide suitable cover, moist refugia, and foraging sites. The species is an ant specialist that depends upon presence of ant colonies or hills. Suitable breeding habitat includes wetlands, floodplains, ephemeral pools or permanent ponds, or even artificial water sources (Dodd 2023). Breeding habitat typically includes dense vegetation or other cover such as rock ledges or tree roots to provide protection from predators. Breeding is dependent on precipitation events. The eggs require suitable substrate such as vegetation for attachment, persistence of water until hatching, and water of sufficiently warm temperature to hatch (>62.6°F). Tadpoles depend on presence of phyto- or zooplankton to feed until they metamorphose (Dodd 2023). Overwintering adults require suitable refuge such as burrows, logs, or rocks.

Adults can perform short (~100 ft) daily movements, as well as larger movements associated with shifts in home range, breeding, or dispersal. Sufficient humidity and habitat connectivity is necessary for the species to conduct its different movement patterns and facilitate genetic exchange (Dodd 2023). The toad is also sensitive to light for orientation (Dodd 2023).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species requires both terrestrial and riparian/aquatic habitat to complete its life cycle, with close proximity to a water source and presence of ant hills (Dodd 2023). Suitable aquatic habitat is required for breeding and egg and larval development. Riparian and wetland habitats are relatively limited in the plan area (DUPLICATE 2004) and several wetlands have been lost on the Cimarron (see Appendix). This species' known distribution is further restricted to four HUC12 watersheds in the southwest corner of the Carrizo Unit of the Comanche NG (Figure 53).

Critical biological characteristics

Depending on precipitation, breeding can occur over an extended period. Precipitation in the form of large storm events often initiates large choruses. Calling for mate selection typically occurs May – August but can be earlier (Dodd 2023). Disturbance causes the cessation of calling (Dodd 2023). Eggs hatch in just 2-3 days. The larval period can last 24-50 days, depending on temperature and food availability (Dodd 2023). Breeding may occur 1 year after metamorphosis (Dodd 2023). The Kansas Herpetofaunal Atlas indicates that the species is nocturnal and its active season in Kansas is April to early October.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The Western narrow-mouthed toad is a specialist predator that feeds primarily on ants (Dodd 2023). Predators of the toad include other frogs, snakes, and birds, and its eggs are consumed by fish (Dodd 2023).

The Western narrow-mouthed toad has a mutualistic symbiotic relationship with tarantula spiders: the toad co-inhabits the tarantula burrow, which provides a moist microclimate that may reduce desiccation and/or predation risk, and the toad reduces ant predation on the spiders' eggs (Dundee et al. 2012).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Plains streams in eastern Colorado are threatened by drying and fragmentation due to groundwater irrigation depleting underlying aquifers (Colorado Parks and Wildlife 2015). Warmer and drier conditions are expected, with changes in precipitation patterns and associated impacts to soil moisture (CPW 2015). The Western narrow-mouthed toad is affected by drought, humidity, soil moisture, and persistence of surface water (Dodd 2023).

Maps of Species Range and Known Occurrences in Plan Area



Figure 51. National Amphibian Atlas map of county-level distribution data for Western narrow-mouthed toad.

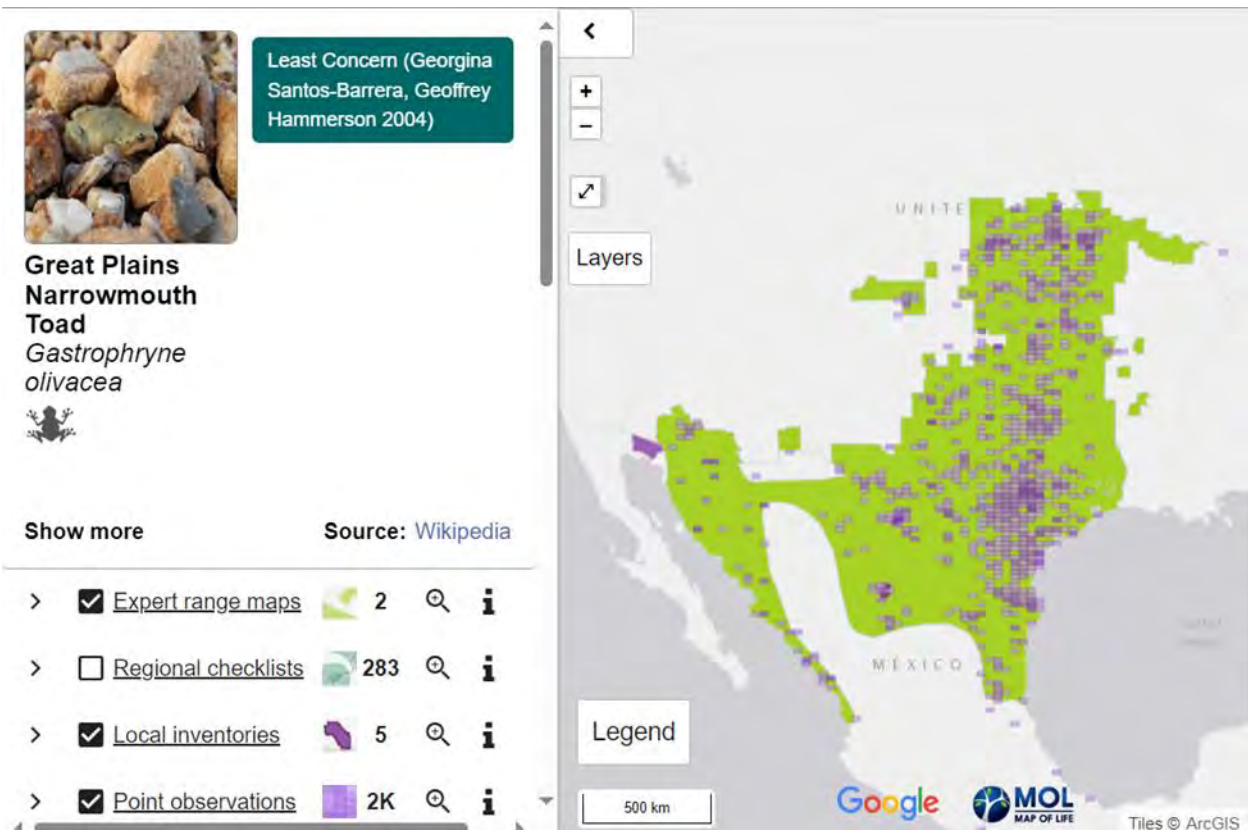


Figure 52. AmphibiaWeb range map for Western narrow-mouthed toad. Green polygon shows resident range; purple squares show a heat map of point observations, where darker colors indicate more observations.

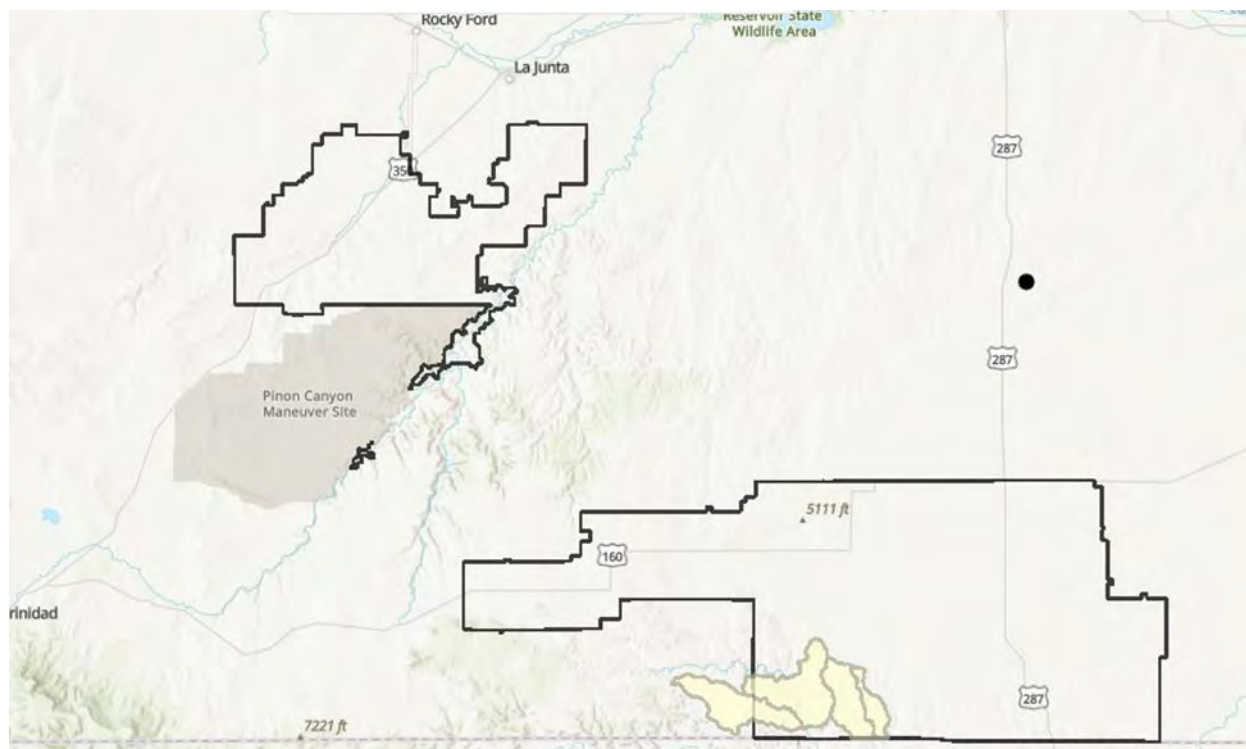


Figure 53. Colorado Parks and Wildlife distribution map of Western narrow-mouthed toad (yellow polygons) in relation to the plan area.

Western Narrow-Mouthed Toad (*Gastrophryne olivacea*)

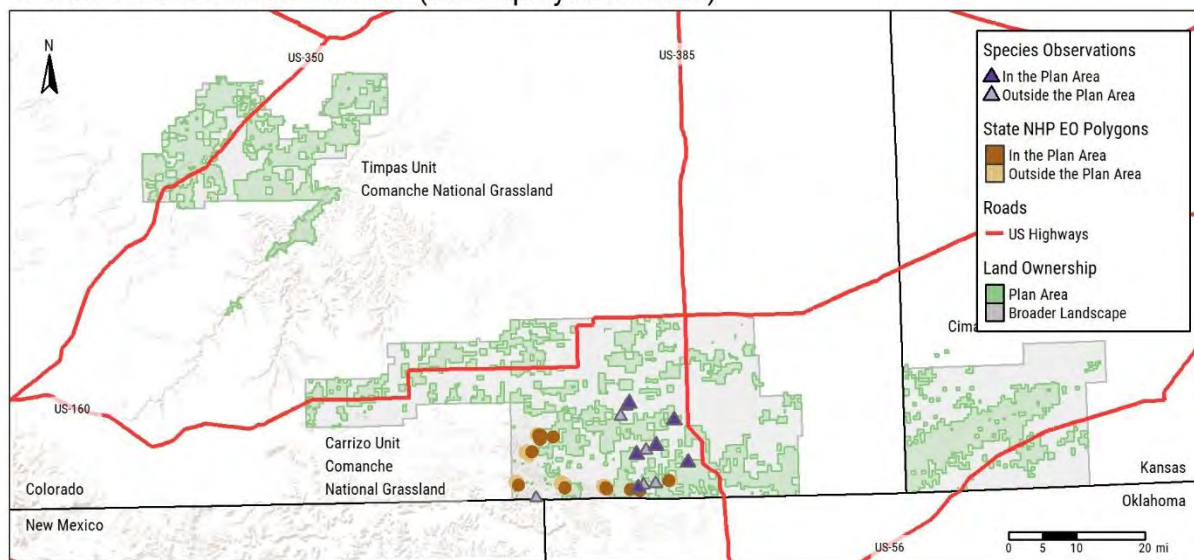


Figure 54. Species occurrence of Western narrow-mouthed toad within the plan area and broader landscape.

Yellow mud turtle

(Kinosternon flavescens)

Species is Native and Known to Occur on National Forest System lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CNHP has 11 observation records from 1963 to 2023. GBIF has 27 observation records from 1926 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No significant threats are clearly identified.
 - b. Habitat: increased drought conditions and habitat degradation due to anthropogenic disturbances are all significant threats to this species' ability to maintain viable populations in the plan area. Artificial water bodies are providing an alternative habitat source for this species.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trends in population are unknown
 - b. Habitat: Natural aquatic/riparian habitat on the plan area has declined, but artificial water body sources (i.e., stock tanks) are available. Shortgrass prairie is stable in Kansas but has deviated in eastern Colorado. Sandsage prairie is declining in both Kansas and Colorado.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Plan area is at the northern end of its range, but near the western edge.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size is unknown within the plan area.
 - b. Ecological Conditions: Although naturally-occurring wetland and riparian habitats are limited in the plan area there are artificial water sources available for this species. Grasslands are not restricted.

Species Status

G5; S1 in Colorado; S5 in Kansas; listed as "Candidate" in Colorado.

Taxonomy

The currently accepted valid name is *Kinosternon flavescens* (Agassiz, 1857) (TSN 173766) (ITIS 2024). Other known synonyms include *Platythya flavescens* (Agassiz, 1857), *Kinosternon flavescens flavescens* (Agassiz, 1857), *Kinosternon flavescens spooneri* (Smith, 1951), and *Cinosternon flavescens* Agassiz, 1857 (ITIS 2024d).

Common names for this species include yellow mud turtle and Tortuga-pecho quebrado amarilla (Spanish) (ITIS 2024d).

Species range

Overall species range

The species range includes Arizona, New Mexico, Texas, Oklahoma, Colorado, Kansas, Nebraska, Iowa, Illinois, and Missouri (NatureServe 2024d).

Description of how the population in the plan area fits within the overall range

The plan area is at the northwest edge of the species' range (Figure 55).

Distribution, abundance, and trend in the plan area

Population

The trend in population for the plan area is not known.

For the range-wide long-term trend, populations of this species have likely increased over the past two centuries with the establishment of stock tanks, cattle ponds, and windmill overflow ponds (NatureServe 2024d). For the range-wide short-term trend, the population is likely stable in the heart of the range in the Great Plains but declining in peripheral populations (NatureServe 2024d). Inventories of this species are needed in the occupied peripheral areas (i.e., Missouri, Illinois, Nebraska, Colorado and Arizona) (NatureServe 2024d).

Habitat

Inhabits various quiet or slow-flowing bodies of water, usually with soft mud or sand bottom, in areas of grassland and open woodland, desert in Southwest (NatureServe 2024d). Often in temporary water, often travels overland but only for short distances – rarely moves more than 200 m from pond edges (NatureServe 2024d). It seeks shelter underground on land or burrows in mud underwater and may lay its eggs in soft soil among scattered clumps of grass within a few hundred feet of water or while completely buried underground (NatureServe 2024d).

Its habitats include shallow water (lacustrine habitat); herbaceous wetland, forested wetland, temporary pool, and riparian (palustrine habitat); pools, medium rivers, creeks, low gradients (riverine habitats); and shrubland/chaparral, grassland/herbaceous, cropland/hedgerow, desert (terrestrial habitats) (NatureServe 2024d).

The Forest Service has constructed nine ponds on the Cimarron National Grassland that provide limited habitat for species such as waterfowl, shorebirds, and herons (Cable et al. 1996).

Nationwide, the rate of net wetland loss increased substantially across the United States, and the dominant driver is conversion to upland (Lang et al. 2024). Mechanisms of upland conversion include drainage and other less direct mechanisms, including increased temperature and evaporation and future changes in precipitation patterns (Lang et al. 2024). Within the Interior Plains ecoregion, the National Wetland Condition Assessment (NWCA) found that 24% of wetland areas rated good for the vegetation index and 11% rated good for the nonnative plant indicator. In Kansas, the current quality of herbaceous wetland habitat is unknown, but the trend in quantity is declining (Rohweder 2022).

The shortgrass prairie habitat type is the dominant habitat type across the plan area. It is considered good with a stable condition in Kansas (Rohweder 2022) but has deviated from historical conditions regarding composition in eastern Colorado (Crockett et al. 2023).

The sandsage prairie habitat type is the second-most widespread vegetation type in the plan area, and the most abundant type for the Cimarron National Grassland, specifically (USDA Forest Service 2005a). In Kansas, the sandsage prairie habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of the historic sandsage habitat has been lost or converted for agricultural uses (CPW 2015). The remaining tracts have good landscape connectivity, but the species composition is highly altered (CPW 2015).

Threats (arising from on or off the plan area)

Population

Not generally threatened, although local threats may impact some populations (NatureServe 2024d).

Habitat

These threats are habitat modification including loss of ephemeral ponds due to agricultural activities and water management (NatureServe 2024d). Also, habitat degradation or habitat succession are threats in areas surrounding breeding areas where the animals may remain in a prolonged dormancy during hot or dry periods (NatureServe 2024d). Declines in the Illinois River are thought to be caused by sewage runoff (NatureServe 2024d).

At a broad scale, the primary threats to sandsage prairie are loss and fragmentation of habitat and degradation of ecological integrity (e.g., conversion to agriculture, expanding exurban development, construction of roads, energy development, encroachment of woody plants, and targeted eradication of sandsage with herbicide) (Locklear 2021, CPW 2015, Rohweder 2022). Weather/climate, fire and grazing constitute the most important processes impacting this system, and these processes are also interactive (Locklear 2019). While sandsage prairie is fairly resilient to the effects of drought in the Great Plains, there are biological limits to the ability of this vegetation to tolerate prolonged episodes of severe drought and may be at the limits of its drought tolerance in southeastern Colorado (Rondeau et al. 2018), (Locklear 2019).

At the unit level, grazing occurs over most of the plan area across both states. Long-term continuous grazing of domestic livestock has considerably altered these shrubland habitats from their pre-settlement condition (Colorado State Wildlife Action Plan 2015; Rohweder 2022). Generally, domestic livestock grazing tends to favor the increase of sandsage over associated native grasses therefore decreasing herbaceous cover (CNHP 2015). Fire is an important disturbance process for sandsage prairie, and fire suppression has caused encroachment of woody species such as eastern redcedar (Locklear 2019) and less mosaiced successional conditions (USDA Forest Service 2008). Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimarron National Grassland.

While habitat loss and deleterious management practices are recognized as threats to sandsage prairie vegetation, the significance of these losses to the larger Great Plains ecoregion has not been examined (Locklear 2021).

For shortgrass prairie at a broad scale, important processes impacting these grassland systems are drought and grazing, which also greatly influenced fire frequency and extent (NatureServe 2024, LandFire BpS 11490 2020). Short grasses are generally extremely drought- and grazing-tolerant, although continuous heavy grazing and extended drought will reduce cover of dominant species (Colorado Natural Heritage Program 2010). As the driest of Great Plains grasslands, shortgrass prairie is susceptible to increasing drought and other climate stressors (NatureServe 2024d). Other general threats to grassland habitat include heavy continuous livestock grazing, military training, invasive non-native species, altered fire regime (fire suppression), conversion to agriculture, fragmentation from roads and development such as exurban and urban development, gas and oil exploration and extraction, invasive species (in the less

xeric regions), renewable energy development, increased irrigation conversion of grassland into cropland, and ongoing depletion of the Ogallala Aquifer (Johnson et al. 2012).

At the unit level, cattle grazing occurs over most of the plan area. Livestock grazing can create change in plant composition. This can include lower species diversity, lower abundance of highly palatable grasses and greater abundance of unpalatable species; increase in weedy species, especially invasive non-native, and bare soil (Crockett 2020). Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimarron National Grassland. Roads traverse the plan area and can cause fragmentation; road density is particularly high in the Cimarron National Grassland (USDA Forest Service 2024). Invasive non-native/alien species can threaten native plant species and alter community composition. Cheatgrass (*Bromus tectorum*) has increased in the plan area and represents a major change in the grassland ecosystem relative to historic conditions (USDA Forest Service 2005a). Relatively few non-native plants can tolerate the arid summer conditions on the Grassland. Shortgrass prairie is considered highly vulnerable to climate stressors in Colorado and is one of the most vulnerable sites (Smith 2024). Lastly, aggressive fire suppression has occurred in the plan area and represents a departure from the natural frequency of fire (USDA Forest Service 2005b).

Reduced role of recurrent fire in these ecosystems is thought to be responsible for ecologically adverse shifts in the structure, composition, and diversity of these grasslands, leading specifically to the rise of ruderal species and invasion by less fire-tolerant species (Brockway et al 2007).

Ecological conditions

Ecological condition requirements

Closely-connected riparian areas with herbaceous or woody cover in between to allow short-distance migration. They prey on insects, mollusks, crustaceans, amphibian larvae, carrion, worms, and occasionally aquatic vegetation (NatureServe 2024d). They forage mostly in the water but sometimes on land and are capable of subterranean feeding (NatureServe 2024d).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Naturally-occurring wetland and riparian habitats are restricted in the plan area (see Appendix). Artificial sources of water bodies such as tanks do exist across the plan area; however, the amount and distribution of these tanks is not available at this time. It is likely more stock tanks and other artificial water sources will continue to be provided in the Plan Area in order to support a variety of wildlife and livestock. Additional trend information for habitat can be found above.

Critical biological characteristics

This species lives for a fairly long amount of time but has a low annual reproductive output (NatureServe 2024d).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

How this species may influence other species or ecosystem diversity is unknown at this time.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Reduction in available water/riparian sources (natural or artificial) would reduce the availability of the species' food source as well as essential habitat for reproducing and surviving.

Maps of Species Range and Known Occurrences in Plan Area



Figure 55. Species' range map for yellow mud turtle from USGS (Gregoire 2024).

Consolidated Literature Cited

- Ahmad, A. 2013. Blackneck Garter Snake (*Thamnophis cyrtopsis*) (online data). Ann Arbor, MI: Animal Diversity Web. Date Published: 2013. Date Accessed: June 20, 2024. Available at: https://animaldiversity.org/accounts/Thamnophis_cyrtopsis/
- Alvarez, G., Salas, E.A.L., Harings, N.M., and Boykin, K.G. 2017. Projections of future suitable bioclimatic conditions of parthenogenetic whiptails. *Climate* 5(2) <https://www.doi.org/10.3390/cli5020034>
- AmphibiaWeb. 2012. Green Toad (*Anaxyrus debilis*) (online data). Berkeley, CA: University of California. Date Published: August 15, 2012. Date Accessed: June 20, 2024. Available at: https://amphibiaweb.org/cgi/amphib_query?where-genus=Anaxyrus&where-species=debilis&account=mol
- Anderson, A.M., Haukos, D.A., and Anderson, J.T. 1999. Habitat Use by Anurans Emerging and Breeding in Playa Wetlands. *Wildlife Society Bulletin* (1973-2006) 27(3): 759-769. <http://www.jstor.org/stable/3784099>
- ARMI, Amphibian Research & Monitoring Initiative. 2024. Scaphiropodidae - scaphiopus couchii (couch's spadefoot). U.S. Geological Survey. <https://armi.usgs.gov/atlas/>
- Averill-Murray, R. 2006. Natural history of the western hog-nosed snake (*Heterodon nasicus*) with notes on envenomation. *Sonoran herpetologist* 19: 98-101. [https://www.dropbox.com/scl/fo/a9d9g2c68k7w83wy5zquu/h?dl=0&e=1&preview=19+\(9\)_97-108.pdf&rlkey=s1b9bf75w5wks8wn8qjd2nvwwq](https://www.dropbox.com/scl/fo/a9d9g2c68k7w83wy5zquu/h?dl=0&e=1&preview=19+(9)_97-108.pdf&rlkey=s1b9bf75w5wks8wn8qjd2nvwwq)
- Batko, K. 2013. Arizona elegans arenicola (online data) Animal Diversity Web. Date Published: 2013. Date Accessed: May 2, 2024. Available at: https://animaldiversity.org/accounts/Arizona_elegans/
- Brikowski, T.H. 2008. Doomed Reservoirs in Kansas, USA? Climate Change and Groundwater Mining on the Great Plains Lead to Unsustainable Surface Water Storage. *Journal of Hydrology* 354(1): 90-101. <https://doi.org/10.1016/j.jhydrol.2008.02.020>
- Brockway, D.G., Gatewood, R.G., and Paris, R.B. 2002. Restoring fire as an ecological process in shortgrass prairie ecosystems: Initial effects of prescribed burning during the dormant and growing seasons. *Journal of environmental management* 65(2): 135-152. <https://doi.org/10.1006/jema.2002.0540>
- Cable, T.T., Seltman, S., and Cook, K.J. 1996. Birds of Cimarron National Grassland. Gen. Tech. Rep. RM-GTR-281. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 108 p. <https://doi.org/10.2737/RM-GTR-281>
- Christman, B.L. and Jennings, R.D. 2018. Distribution of the Amphibian Chytrid Fungus *Batrachochytrium dendrobatidis* (Bd) in New Mexico. Dated: April 25, 2018. Silver City, New Mexico: New Mexico Department of Fish and Game. 41 p.
- Collins, J.P. 2010. Amphibian decline and extinction: What we know and what we need to learn. *Diseases of aquatic organisms* 92(2-3): 93-99. <https://doi.org/10.3354/dao02307>
- Collins, J.T. 1984. New records of fishes, amphibians and reptiles in Kansas for 1983. *Kansas Herpetological Society newsletter* 56(June): 15-26. <https://webapps.fhsu.edu/ksherp/bibFiles/4090.pdf>
- Collins, J.T. and Collins, S.L. 1991. Reptiles and Amphibians of the Cimarron National Grasslands, Morton County, Kansas. Elkhart, KS: USDA Forest Service. 60 p. <https://webapps.fhsu.edu/ksherp/bibFiles/4179.pdf>
- Colorado Department of Public Health & Environment. 2024. 2024 Integrated Water Quality Monitoring and Assessment Report: Use Attainment Table for Streams and Rivers. Colorado Department of Public Health & Environment. 250 p.
- Colorado Natural Heritage Program. 2010. Ecological systems: Shortgrass prairie (website). Colorado Natural Heritage Program, Last Modified: September 21, 2010. Date Accessed: October 27, 2024. <https://cnhp.colostate.edu/cnhpblog/2010/09/21/ecological-systems-shortgrass-prairie/>
- Colorado Natural Heritage Program. 2015. Climate Change Vulnerability Assessment for Colorado Bureau of Land Management. Series Editor: Decker, K., Grunau, L., Handwerk, J. and Siemers, J., eds. Fort Collins, CO: Colorado Natural Heritage Program, Colorado State University. 126 p.
- Colorado Natural Heritage Program. 2020a. Couch's Spadefoot (*Scaphiopus couchii*) (EO ID 3011): Level 1 Element Occurrence Report. Colorado Ownership, Management and Protection (COMaP)

- dataset V9, 2011. Boulder, CO: Colorado State University. Originally Released: February 21, 2020.
- Colorado Natural Heritage Program. 2020b. Couch's Spadefoot (*Scaphiopus couchii*) (EO ID 4177): Level 1 Element Occurrence Report. Colorado Ownership, Management and Protection (COMaP) dataset V9, 2011. Boulder, CO: Colorado State University. Originally Released: February 21, 2020.
- Colorado Natural Heritage Program. 2020c. Couch's Spadefoot (*Scaphiopus couchii*) (EO ID 13992): Level 1 Element Occurrence Report. Colorado Ownership, Management and Protection (COMaP) dataset V9, 2011. Boulder, CO: Colorado State University. Originally Released: February 21, 2020.
- Colorado Natural Heritage Program. 2020d. Couch's Spadefoot (*Scaphiopus couchii*) (EO ID 17673): Level 1 Element Occurrence Report. Colorado Ownership, Management and Protection (COMaP) dataset V9, 2011. Boulder, CO: Colorado State University. Originally Released: February 21, 2020.
- Colorado Natural Heritage Program. 2020e. Couch's Spadefoot (*Scaphiopus couchii*) (EO ID 17674): Level 1 Element Occurrence Report. Colorado Ownership, Management and Protection (COMaP) dataset V9, 2011. Boulder, CO: Colorado State University. Originally Released: February 21, 2020.
- Colorado Natural Heritage Program. 2020f. Green Toad (*Anaxyrus debilis*) (EO ID 736): Level 1 Element Occurrence Report. Colorado Ownership, Management and Protection (COMaP) dataset V9, 2011. Boulder, CO: Colorado State University. Originally Released: 2020.
- Colorado Natural Heritage Program. 2020g. Green Toad (*Anaxyrus debilis*) (EO ID 2217): Level 1 Element Occurrence Report. Colorado Ownership, Management and Protection (COMaP) dataset V9, 2011. Boulder, CO: Colorado State University. Originally Released: 2020.
- Colorado Parks and Wildlife. 2024. Comanche National Grasslands Fisheries Summary Report 2024. Edited by Journey, A. and Vangel, P. Denver, CO: Colorado Parks and Wildlife. 25 p.
- Colorado Partners in Amphibian and Reptile Conservation. 2021. *Hypsiglena jani*, Chihuahuan nightsnake (website). Colorado Partners in Amphibian and Reptile Conservation, Last Modified: 2021. Date Accessed: October 30, 2024. <http://www.coparc.org/chihuahuan-nightsnake.html>
- Colorado Partners in Amphibian and Reptile Conservation. 2023. *Thamnophis cyrtopsis cyrtopsis*, Western black-necked gartersnake (website). University of Colorado Press, Last Modified: January 30, 2024 <http://www.coparc.org/western-black-necked-gartersnake.html>
- CPW, Colorado Parks and Wildlife. 2015. State wildlife action plan: A strategy for conserving wildlife in Colorado. Denver, CO. 865 p. <https://cpw.widencollective.com/assets/share/asset/nbenjdfemi>
- CPW, Colorado Parks and Wildlife. 2024. Plains Leopard Frog (website). Colorado Parks and Wildlife <https://cpw.state.co.us/species/plains-leopard-frog#>
- Creusere, F.M. and Whitford, W.G. 1976. Ecological relationships in a desert anuran community. *Herpetologica* 32(1): 7-18. <http://www.jstor.org/stable/3891893>
- Crockett, E.T.H., Atkins, J.W., Guo, Q., Sun, G., Potter, K.M., Ollinger, S., Silva, C.A., Tang, H., Woodall, C.W., Holgerson, J., and Xiao, J. 2023. Structural and species diversity explain aboveground carbon storage in forests across the United States: Evidence from GEDI and forest inventory data. *Remote Sensing of Environment* 295: 113703. <https://doi.org/10.1016/j.rse.2023.113703>
- Dayton, G.H. and Fitzgerald, L.A. 2001. Competition, Predation, and the Distributions of Four Desert Anurans. *Oecologia* 129: 430-435. <https://www.jstor.org/stable/4223102>
- Dicus, C.A., Delfino, K., and Weise, D.R. 2009. Predicted fire behavior and societal benefits in three eastern Sierra Nevada vegetation types. *Fire Ecology* 5(1): 67-78. <https://doi.org/10.4996/fireecology.0501067>
- Dodd, C.K., Jr 2023. *Frogs of the United States and Canada*. 2nd ed. Baltimore: John Hopkins University Press.
- Dundee, H.A., Shillington, C., and Yeary, C.M. 2012. Interactions Between Tarantulas (*Aphonopelma hentzi*) and Narrow-Mouthed Toads (*Gastrophyrne olivacea*): Support for a Symbolic Relationship. *Tulane Studies in Zoology and Botany* 32(1): 31-38. <https://journals.tulane.edu/TSZB/article/view/3>
- DUPLICATE, H., Donald L. 2004. Vascular Plant Species of the Comanche National Grassland in Southeastern Colorado. Gen. Tech. Rep. RMRS-GTR-130. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 36 p. <https://doi.org/10.2737/RMRS-GTR-130>

- Fair, W.S. and Henke, S.E. 1999. Movements, home ranges, and survival of Texas horned lizards (*Phrynosoma cornutum*). *Journal of herpetology* 33(4): 517-525. <https://doi.org/10.2307/1565567>
- Fitch, H.S. and Plummer, M.V. 1975. A preliminary ecological study of the soft-shelled turtle *Trionyx muticus* in the Kansas River. *Israel journal of zoology* 24(1-2): 28-42. <https://doi.org/10.1080/00212210.1975.10688409>
- Goldberg, S.R. and Bursey, C.R. 2001. Helminths of Six Species of Colubrid Snakes from Southern California. *Bulletin* 100: 109-116. <https://www.biodiversitylibrary.org/part/75253>
- Gregoire, D.R. 2024. *Kinosternon flavescens* (Agassiz, 1857): Nonindigenous Aquatic Species Database. Reston, VA: U.S. Department of the Interior, Geological Survey (USGS), Wetland and Aquatic Research Center. Originally Released: October 28, 2009. <https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=2564>
- Griffis-Kyle, K.L., Mougey, K., Vanlandeghem, M., Swain, S., and Drake, J.C. 2018. Comparison of Climate Vulnerability Among Desert Herpetofauna. *Biological Conservation* 225: 164-175. <https://doi.org/10.1016/j.biocon.2018.06.009>
- Hammerson, G. 1999a. Colorado Checkered Whiptail (*Aspidoscelis neotesselatus*) (online data) Colorado Partners in Amphibian and Reptile Conservation. Date Published: January 30, 2023. Date Accessed: May 30, 2024. Available at: <http://www.coparc.org/colorado-checked-whiptail.html>
- Hammerson, G. 1999b. Eastern Hog-Nosed Snake (*Heterodon platirhinos*) (online data) Colorado Partners in Amphibian and Reptile Conservation. Date Published: 2021. Date Accessed: June 27, 2024. Available at: <http://www.coparc.org/eastern-hog-nosed-snake.html>
- Hammerson, G. 1999c. New Mexico Threadsnake (*Rena dissotacta*) (online data). (Version January 31, 2024) Colorado Partners in Amphibian and Reptile Conservation. Date Published: 2021. Date Accessed: July 29, 2024. Available at: <http://www.coparc.org/new-mexico-threadsnake.html>
- Hammerson, G. 1999d. Ring-Necked Snake (*Diadophis punctatus*) (online data) Colorado Partners in Amphibian and Reptile Conservation. Date Published: 2022. Date Accessed: May 31, 2024. Available at: <http://www.coparc.org/prairie-ring-necked-snake.html>
- Hammerson, G.A. 1986. Amphibians and reptiles in Colorado. Denver, CO: Colorado Division of Wildlife. 4 p. <https://archive.org/details/amphibiansreptil00hamm/page/n7/mode/2up>
- Hammerson, G.A., Frost, D.R., Santos-Barrera, G., Vasquez Díaz, J., and Quintero Díaz, G.E. 2007. Glossy Snake (*Arizona elegans*) (online data) The IUCN Red List of Threatened Species 2016 International Union for Conservation of Nature (IUCN). Date Published: 2007. Date Accessed: June 30, 2024. Available at: <http://dx.doi.org/10.2305/IUCN.UK.2007.RLTS.T63734A12711788.en>
- Haney, J.W., Veech, J., A., Castro-Arellano, I., and R., F.S. 2022. Museum and citizen-science data indicate contraction in the range of Texas horned lizards (*Phrynosoma cornutum*). *Herpetologica* 78(2): 102-109. <https://doi.org/10.1655/Herpetologica-D-21-00022>
- Herpedita. 2024. Common Checkered Whiptail (*Aspidoscelis tessellatus*) (online data) Herpedita. Date Published: 2024. Date Accessed: May 30, 2024. Available at: <https://herpedita.com/lizards/teiidae/common-checked-whiptail.html>
- Holycross, A.T., Anton, T.G., Douglas, M.E., and Frost, D.R. 2008. The type localities of *sistrurus catenatus* and *crotalus viridis* (serpentes: viperidae), with the unraveling of a most unfortunate tangle of names. *Copeia* 2008(2): 421-424. <https://www.jstor.org/stable/25140792>
- Huffman, E.L., MacDonald, L.H., and Stednick, J.D. 2001. Strength and persistence of fire-induced soil hydrophobicity under ponderosa and lodgepole pine, Colorado Front Range. *Hydrological Processes* 15(15): 2877-2892. <https://doi.org/10.1002/hyp.379>
- ICZN, International Commission on Zoological Nomenclature. 2013. Opinion 2328 (Case 3571) *crotalinus catenatus* *rafinesque*, 1818 (currently *sistrurus catenatus*) and *crotalus tergeminus* *say* in *james*, 1822 (currently *sistrurus tergeminus*; reptilia, serpentes): usage conserved by designation of neotypes for both species. *The Bulletin of Zoological Nomenclature*, 70 (4): 282-283 pp. <https://doi.org/10.21805/bzn.v70i4.a13>
- iDigBio. 2024. Green Toad (*Anaxyrus debilis*) (online data). Gainesville, FL: Florida Museum of Natural History, University of Florida. Date Published: 2024. Date Accessed: June 20, 2024. Available at: <https://www.idigbio.org/portal/search>
- iNaturalist. 2024a. Glossy Snake (*Arizona elegans*) (online data) iNaturalist. Date Published: 2024. Date Accessed: May 2, 2024. Available at: https://www.inaturalist.org/guide_taxa/840554

- iNaturalist. 2024b. iNaturalist (website). iNaturalist, Last Modified: 2024. Date Accessed: October 31, 2024. <https://www.inaturalist.org/>
- iNaturalist. 2024c. Prairie Ringneck Snake (*Diadophis punctatus amnyi*) (online data) iNaturalist. Date Published: 2024. Date Accessed: May 31, 2024. Available at: https://www.inaturalist.org/guide_taxa/840586
- iNaturalist. 2024d. *Rena dissecta*, New Mexico blind snake (website). iNaturalist, Last Modified: 2024. Date Accessed: October 30, 2024. https://www.inaturalist.org/guide_taxa/840576
- ITIS, Integrated Taxonomic Information System. 2017. Authoritative taxonomic information on plants, animals, fungi, and microbes of North America and the world (website). <http://www.itis.gov/>
- ITIS, Integrated Taxonomic Information System. 2024a. *Anaxyrus debilis*, (Girard, 1854) (online data) Taxonomic Serial Number 773518. Virtual Dataset: U.S. Department of the Interior, Geological Survey (USGS). Date Published: June 20, 2024. Date Accessed: June 20, 2024. Available at: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=773518#null
- ITIS, Integrated Taxonomic Information System. 2024b. *Anaxyrus punctatus*, Baird, Girard, 2024, 773527 (online data) Report. Virtual Dataset: U.S. Department of the Interior, Geological Survey (USGS). Date Published: April 2, 2024. Date Accessed: 4/2/2024. Available at: <https://www.itis.gov/servlet/SingleRpt/SingleRpt#null>
- ITIS, Integrated Taxonomic Information System. 2024c. *Gastrophryne olivacea*, Hallowell, 2024, 173468 (online data) Hallowell, 1856, 173468. Virtual Dataset: U.S. Department of the Interior, Geological Survey (USGS). Date Published: April 2, 2024. Date Accessed: 4/2/2024. Available at: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=173468#null
- ITIS, Integrated Taxonomic Information System. 2024d. *Kinosternon flavescens*, (Agassiz, 1857), Taxonomic serial number 173766 (website). (Virtual Dataset). U.S. Department of the Interior, Geological Survey (USGS), Last Modified: 2024. Date Accessed: October 30, 2024. https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=173766#null
- ITIS, Integrated Taxonomic Information System. 2024e. *Lithobates blairi*, Mecham, Littlejohn, Oldham, Brown and Brown, 2024, 775080 (online data) Report. Virtual Dataset: U.S. Department of the Interior, Geological Survey (USGS). Date Published: April 2, 2024. Date Accessed: 4/2/24. Available at: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=775080#null
- ITIS, Integrated Taxonomic Information System. 2024f. *Rena dissecta*, (Cope, 1896) (online data) Taxonomic Serial Number 1107610. Virtual Dataset: U.S. Department of the Interior, Geological Survey (USGS). Date Published: June 20, 2024. Date Accessed: June 20, 2024. Available at: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=1107610#null
- ITIS, Integrated Taxonomic Information System. 2024g. *Scaphiopus couchii*, Baird, 1854 (online data) Taxonomic Serial Number 173429. Virtual Dataset: U.S. Department of the Interior, Geological Survey (USGS). Date Published: April 29, 2024. Date Accessed: April 29, 2024. Available at: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=173429#null
- ITIS, Integrated Taxonomic Information System. 2024h. *Sistrurus tergeminus*, (Say in James, 1823), Taxonomic serial number 1058575 (website). (Virtual Dataset). U.S. Department of the Interior, Geological Survey (USGS), Last Modified: 2024. Date Accessed: October 30, 2024. https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=1058575#null
- ITIS, Integrated Taxonomic Information System. 2024i. *Thamnophis cyrtopsis*, (Kennicott, 1860) (online data) Taxonomic Serial Number 174141. Virtual Dataset: U.S. Department of the Interior, Geological Survey (USGS). Date Published: June 20, 2024. Date Accessed: June 20, 2024. Available at: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=174141#null
- Johnson, L.A., Haukos, D.A., Smith, L.M., and McMurry, S.T. 2012. Physical loss and modification of Southern Great Plains playas. *Journal of Environmental Management* 112: 275-283. <https://doi.org/10.1016/j.jenvman.2012.07.014>
- Jones, K.B. 1990. Habitat use and predatory behavior of *Thamnophis cyrtopsis* (Serpentes: Colubridae) in a seasonally variable aquatic environment. *The southwestern naturalist* 35(2): 115-122. <https://doi.org/10.2307/3671531>
- Kansas Department of Wildlife & Parks. 2024. *Rena dissecta*, New Mexico threadsnake (website). Kansas Department of Wildlife & Parks, Last Modified: 2024. Date Accessed: October 30, 2024.

- <https://ksoutdoors.com/Services/Threatened-and-Endangered-Wildlife/All-Threatened-and-Endangered-Species/NEW-MEXICO-THREADSNAKE>
- Kansas Department of Wildlife and Parks. 2024. Green Toad (*Anaxyrus debilis*) (online data). Pratt, KS: Kansas Department of Wildlife and Parks. Date Published: 2024. Date Accessed: June 20, 2024. Available at: <https://ksoutdoors.com/Services/Threatened-and-Endangered-Wildlife/All-Threatened-and-Endangered-Species/GREEN-TOAD>
- Kansas Herpetofaunal Atlas. 2023. Chihuahuan Green Toad (*Anaxyrus debilis*) (website). Kansas Herpetofaunal Atlas, Last Modified: September 4, 2023. Date Accessed: August 1, 2024. <https://webapps.fhsu.edu/ksHerp/account.aspx?o=30&t=3>
- Kansas Herpetofaunal Atlas. 2024. Plains Leopard Frog (*Lithobates blairi*) (online data) Kansas Herpetofaunal Atlas. Date Published: January 13, 2024. Date Accessed: 1/13/2024. Available at: <https://webapps.fhsu.edu/ksHerp/account.aspx?o=30&t=121>
- Kubatko, L.S., Gibbs, H.L., and Bloomquist, E.W. 2011. Inferring species-level phylogenies and taxonomic distinctiveness using multilocus data in *Sistrurus* rattlesnakes. *Systematic Biology* 60(4): 393-409. <https://www.jstor.org/stable/41316544>
- Kuhn, B., Nelson, B.E., and Hartman, R.L. 2011. A Floristic Inventory of the Cimarron National Grassland (Kansas) and the Comanche National Grassland (Colorado). *Journal of the Botanical Research Institute of Texas* 5(2): 753-772. <http://www.jstor.org/stable/41972334>
- Lang, M.W., Ingebritsen, J.C., and Griffin, R.K. 2024. Status and trends of wetlands in the conterminous United States 2009 to 2019. Dated: March 22, 2024. Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service (FWS). 43 p. <https://www.fws.gov/media/status-and-trends-wetlands-conterminous-united-states-2009-2019>
- Lehtinen, R.M. and Witter, J.R. 2014. Detecting frogs and detecting declines: An examination of occupancy and turnover patterns at the range edge of Blanchard's cricket frog (*Acris blanchardi*). *Herpetological conservation and biology* 9(3): 502-515. https://www.herpconbio.org/Volume_9/Issue_3/Lehtinen_Witter_2014.pdf
- Locklear, J.H. 2019. Sandsage prairie: floristics, structure, and dynamics of a Great Plains plant community. *Journal of the botanical research institute of texas* 13(1): 253-278. <https://doi.org/10.17348/jbrit.v13.i1.851>
- Locklear, J.H. 2021. The Sandsage prairie ecological system: Biodiversity hotspot for the Great Plains. *Natural areas journal* 41(1): 64-74. <https://doi.org/10.3375/043.041.0109>
- Lynch, J.D. 1985. Annotated checklist of the amphibians and reptiles of Nebraska. *Transactions of the Nebraska Academy of Sciences* XIII: 33-57. <https://digitalcommons.unl.edu/tnas/225/>
- Mackessy, S. 2005. Desert massasauga rattlesnake (*Sistrurus catenatus edwardsii*): A technical conservation assessment. Dated: December 12, 2005. Washington, DC: USDA Forest Service, Rocky Mountain Region. 56 p. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5182073.pdf
- Map of Life. 2024. *Anaxyrus debilis*, (Girard, 1854), eastern green toad (website). Yale University, Last Modified: 2024. Date Accessed: June 20, 2024. <https://mol.org/species/map/Anaxyrus-debilis>
- McIntyre, N.E. 2003. Effects of conservation reserve program seeding regime on harvester ants (*Pogonomyrmex*), with implications for the threatened Texas horned lizard (*Phrynosoma cornutum*). *The southwestern naturalist* 48(2): 274-277. <https://www.jstor.org/stable/3672325>
- Miller Hesed, C.D., Yocum, H.M., Rangwala, I., Symstad, A., Martin, J.M., Ellison, K., Wood, D.J.A., Ahlering, M., Chase, K.J., Crausbay, S., Davidson, A.D., Elliott, J.L., Giocomo, J., Hoover, D., Klemm, T., Lightfoot, D.A., McKenna, O.P., Miller, B.W., Mosher, D., Nagy, R.C., Nippert, J.B., Pittman, J., Porensky, L.M., Stephens, J., and Zale, A.V. 2023. Synthesis of climate and ecological science to support grassland management priorities in the North Central Region (Report). Open-File Report. Edited by U.S. Geological Survey (USGS). Dated: April 14, 2023. Open-File Report 2023-1036. Reston, VA: U.S. Department of the Interior, Geological Survey (USGS). 21 p. <https://doi.org/10.3133/ofr20231036>
- Miller, L. 1983. The Status of the Red-Spotted Toad in Barber County, Kansas. (Report)
- Mims, M.C., Moore, C.E., and Shadle, E.J. 2020. Threats to Aquatic Taxa in an Arid Landscape: Knowledge Gaps and Areas of Understanding for Amphibians of the American Southwest. *Wires Water* 7(4): e1449. <https://doi.org/10.1002/wat2.1449>
- Mulcahy, D.G. and Setser, K.W. 2002. Natural history notes: *Scaphiopus couchi* (couch's spadefoot). *Herpetological Journal* 30(2):163-171: 63.

- https://www.researchgate.net/publication/349475686_NATURAL_HISTORY_NOTES_Rana_neovolcanica_RANA_NEOVOLCANICA_Transverse_Volcanic_Leopard_Frog_MEXICO_MEXICO
- Muths, E., Corn, P.S., Pessier, A.P., and Green, D.E. 2003. Evidence for disease-related amphibian decline in Colorado. *Biological Conservation* 110(2003): 357-365.
- Nafis, G. 2024. Couch's Spadefoot (*Scaphiopus couchii*) (online data) California Herps - A Guide to the Amphibians and Reptiles of California CaliforniaHerps.Com. Date Published: July, 2024. Date Accessed: July 30, 2024. Available at: <https://californiaherps.com/frogs/pages/s.couchii.html>
- NatureServe. 2024a. *Anaxyrus punctatus*, Red-spotted Toad (online data) (NatureServe Explorer Species Account) NatureServe. Date Published: March 1, 2024. Date Accessed: March 1, 2024. Available at: https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.103152/Anaxyrus_punctatus
- NatureServe. 2024b. *Diadophis punctatus amnyi*, Prairie Ring-Necked Snake (online data) (NatureServe Explorer Species Account). Arlington, VA: Nature Serve. Date Published: May 3, 2024. Date Accessed: May 31, 2024. Available at: <https://explorer.natureserve.org/>
- NatureServe. 2024c. *Gastrophryne olivacea*, Western Narrow-Mouthed Toad (online data) (NatureServe Explorer Species Account) NatureServe. Date Published: March 1, 2024. Date Accessed: March 1, 2024. Available at: https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.1163616/Gastrophryne_olivacea
- NatureServe. 2024d. NatureServe Explorer (online data) NatureServe. Date Published: April 17, 2024. Date Accessed: June 9, 2024. Available at: <https://explorer.natureserve.org>
- NatureServe. 2024e. *Rena dissecta*, New Mexico Threadsnake (online data) (NatureServe Explorer Species Account). Arlington, VA: NatureServe. Date Published: May 31, 2024. Date Accessed: June 20, 2024. Available at: https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.768288/Rena_dissecta
- New Mexico Herpetological Society. 2024. *Leptotyphlops dissectus*, New Mexico Blind Snake (online data). Albuquerque, NM: New Mexico Herpetological Society. Date Published: 2024. Date Accessed: June 20, 2024. Available at: <http://nmherpsociety.org/reptiles/snakes/leptotyphlopsdissectus/index.html>
- Panella, M. and Johnson, B. 2014. Western Massasauga (*Sistrurus tergeminus*): A species conservation assessment for the Nebraska Natural Legacy Project. Dated: June, 2014. Lincoln, NE: Nebraska Game and Parks Commission, Wildlife Division. 17 p. <https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1143&context=nebgamepubs>
- Plummer, M.V. 1976. Some aspects of nesting success in the turtle, *Trionyx muticus*. *Herpetologica* 32(4): 353-359. <https://www.jstor.org/stable/3891915>
- Plummer, M.V., Lee, T.N., and Mills, N.E. 2008. Effect of a sand substrate on the growth and condition of *Apalone mutica* hatchlings. *Journal of herpetology* 42(3): 550-554. <https://www.jstor.org/stable/40060550>
- Powell, A. and Sievert, G. 2022. New distributional records of turtles in eastern Kansas and western Missouri, USA. *Herpetological review* 53: 265-271. <https://webapps.fhsu.edu/ksherp/bibFiles/22203.pdf>
- Rice, J.R., Joyce, L.A., Regan, C., Winters, D., and Truex, R. 2018. Climate Change Vulnerability Assessment of Aquatic and Terrestrial Ecosystems in the U.S. Forest Service Rocky Mountain Region. Gen. Tech. Rep. RMRS-GTR-376. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. <https://doi.org/10.2737/RMRS-GTR-376>
- Riddle, S.B. and Bateman, H.L. 2020. Habitat and Soil Associations of a Fossorial Toad in a Sonoran Desert Riparian Forest. *Journal of Arid Environments* 181: 104239. <https://doi.org/10.1016/j.jaridenv.2020.104239>
- Rohweder, M.R. 2022. Kansas Wildlife Action Plan. 3rd ed. Dated: June, 2022. Pratt, KS: Ecological Services Section, Kansas Department of Wildlife and Parks. 183 p. <https://ksoutdoors.com/Services/Kansas-SWAP>
- Romme, W.H., Allen, C.D., Bailey, J.D., Baker, W.L., Bestelmeyer, B.T., Brown, P.M., Eisenhart, K.S., Floyd, M.L., Huffman, D.W., Jacobs, B.F., Miller, R.F., Muldavin, E.H., Swetnam, T.W., Tausch, R.J., and Weisberg, P.J. 2009. Historical and modern disturbance regimes, stand structures, and landscape dynamics in piñon-juniper vegetation of the western United States. *Rangeland ecology & management* 62(3): 203-222. <https://doi.org/10.2111/08-188R1.1>

- Rondeau, R.J., Decker, K.L., and Doyle, G.A. 2018. Potential consequences of repeated severe drought for shortgrass steppe species. *Rangeland Ecology & Management* 71(1): 91-97. <https://doi.org/10.1016/j.rama.2017.07.002>
- Ross, J.A., Infante, D.M., Martin, D.J., and Rey, M. 2019. Effects of Riparian Timber Harvest on Southeast Alaska Stream Habitat after 30–40 Years: Insights for Management. *North American Journal of Fisheries Management* 39(2): 328-342. <https://doi.org/10.1002/nafm.10270>
- Ross, J.P., Bluett, R.D., and Dreslik, M.J. 2019. Movement and home range of the smooth softshell turtle (*Apalone mutica*): Spatial ecology of a river specialist. *Diversity* 11(8) <https://doi.org/10.3390/d11080124>
- Russell, E. 2023. Habitat Associations and Fine-Scale Movements of the Red-Spotted Toad (*Anaxyrus punctatus*) in Kansas and the Efficacy of Remote Telemetry for Monitoring Small-Scale Movements. Master of Science Thesis. Biology, Fort Hays State University, Hays, KS. i-81 pp. <https://doi.org/10.58809/TGSN5167>
- Schmidt, C.J., Peek, G.A., Kaufman, D.W., Kaufman, E.J., Finck, L., Patrick, A., and Hope, R. 2024. Kansas Mammal Atlas: An On-line Reference (website). (Electronic dataset). Sternberg Museum of Natural History, Fort Hays State University. Date Accessed: 20241112. <https://webapps.fhsu.edu/ksmammal>
- Seymour, R.S. 1973. Energy Metabolism of Dormant Spadefoot Toads (*Scaphiopus*). *Copeia* 1973(3): 435-445. <https://doi.org/10.2307/1443107>
- Sinervo, B., Lara Reséndiz, R.A., Miles, D.B., Lovich, J.E., Rosen, P.C., Gadsden, H., Gaytán, G.C., Tessaro, P.G., Luja, V.H., Huey, R.B., Whipple, A., Cordero, V.S., Rohr, J.B., Caetano, G., Santos, J.C., Sites, J.W., and Méndez de la Cruz, F.R. 2024. Climate change and collapsing thermal niches of desert reptiles and amphibians: Assisted migration and acclimation rescue from extirpation. *Science of the total environment* 908: 168431. <https://doi.org/10.1016/j.scitotenv.2023.168431>
- Smith, B.E. and Keinath, D.A. 2005. Plains Leopard Frog (*Rana blairi*): A Technical Conservation Assessment: Prepared for the USDA Forest Service, Rocky Mountain Region, Species Conservation Project. Dated: December 20, 2005. Lakewood, CO: USDA Forest Service, Rocky Mountain Region. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5182079.pdf
- Smith, D.M., Martinez, L.F., King, C., Pearson, T.L., and Driscoll, K.P. 2024a. Rogue River-Siskiyou National Forest. Riparian, aquatic, and groundwater-dependent ecosystems of the Klamath, Mendocino, Shasta-Trinity, Six Rivers, and Rogue River-Siskiyou National Forests. Vol. 2. Gen. Tech. Rep. RMRS-GTR-434. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 162 p. https://www.fs.usda.gov/rm/pubs_series/rmrs/gtr/rmrs_gtr434_vol2.pdf
- Smith, D.M., Martinez, L.F., King, C., Pearson, T.L., and Driscoll, K.P. 2024b. Six Rivers National Forest. Riparian, aquatic, and groundwater-dependent ecosystems of the Klamath, Mendocino, Shasta-Trinity, Six Rivers, and Rogue River-Siskiyou National Forests. Vol. 4. Gen. Tech. Rep. RMRS-GTR-434. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 86 p. https://www.fs.usda.gov/rm/pubs_series/rmrs/gtr/rmrs_gtr434_vol4.pdf
- Smith, J. 2024. Colorado's shortgrass prairies at risk of dying off as extreme droughts become more common. *Colorado Sun*, February 2, 2024 Agriculture, 4 p. <https://coloradosun.com/2024/02/02/colorados-shortgrass-prairies-dying-off-drought/>
- Snover, M.L., Adams, M.J., Ashton, D.T., Bettaso, J.B., and Welsh Jr, H.H. 2015. Evidence of counter-gradient growth in western pond turtles (*Actinemys marmorata*) across thermal gradients. *Freshwater Biology* 60(9): 1944-1963. <https://doi.org/10.1111/fwb.12623>
- Snyder, A., Riedle, D., and Stark, W. 2021. *Batrachochytrium dendrobatidis* in Kansas. *Transactions of the Kansas Academy of Science* 124(1-2): 125-131. <https://doi.org/10.1660/062.124.0116>
- Stebbins, R.C. 2003. A field guide to western reptiles and amphibians. 3rd ed. Boston, MA: Houghton Mifflin. 533 p. https://archive.org/details/fieldguidetowest0000steb_v9j9/page/n7/mode/2up
- Stuart, S.N., Chanson, J.S., Cox, N.A., Young, B.E., Rodrigues, A.S.L., Fischman, D.L., and Waller, R.W. 2004. Status and trends of amphibian declines and extinctions worldwide. *Science* 306(5702): 1783-1786. <https://www.doi.org/10.1126/science.1103538>
- Taggart, T.W. 1997. Status of *Bufo debilis* (Anura: Bufonidae) in Kansas. *Kansas Herpetological Society Newsletter* 109: 7-12. <https://webapps.fhsu.edu/ksherp/bibFiles/80.pdf>

- Taggart, T.W. 2006. Distribution and Status of Kansas Herpetofauna in Need of Information. Dated: January 30, 2006. Hays, KS: Sternberg Museum of Natural History. 113 p.
<https://webapps.fhsu.edu/ksHerp/bibFiles/18691.pdf>
- Taylor, E.H. 1929. List of Reptiles and Batrachians of Morton County, Kansas, Reporting Species New to the State Fauna. The University of Kansas Science Bulletin 19(6): 63-65.
<https://doi.org/10.5962/bhl.part.10870>
- Tornabene, B., Bramblett, R., Zale, A., and Leathe, S. 2017. Spatiotemporal ecology of *Apalone spinifer* in a large, Great Plains river ecosystem. *Herpetological conservation and biology* 12(1): 252-271.
https://www.herpconbio.org/Volume_12/Issue_1/Tornabene_et_al_2017.pdf
- USDA Forest Service. 2005a. Cimarron and Comanche National Grassland: Vegetation/Ecology. Specialist Reports. Dated: May 10, 2006. Washington, DC: U.S. Department of Agriculture. 150 p.
- USDA Forest Service. 2005b. Cimarron and Comanche National Grasslands Land Management Plan: Ecological Sustainability. Dated: October 6, 2005. Washington, DC: U.S. Department of Agriculture. 150 p.
- USDA Forest Service. 2005c. Cimarron and Comanche National Grasslands: Ecological sustainability. Dated: June 10, 2005. Washington, DC: USDA Forest Service. 115 p.
- USDA Forest Service. 2008. Cimarron and Comanche National Grasslands: Land Management Plan. Dated: October, 2008. Pueblo, CO: USDA Forest Service. 233 p.
- USDA Forest Service. 2024. Terrestrial condition assessment report for Cimarron-Comanche National Grasslands. Dated: September, 2024. Washington, DC: USDA Forest Service. 22 p.
- USDA Forest Service. No Date. Black-necked Gartersnake (*Thamnophis cyrtopsis*): Overview. USDA Forest Service.
- USGS, Geological Survey. 2018. Gap Analysis Project: Common Checkered Whiptail (*Aspidoscelis tessellata*) (online data) rCCWHx_CONUS_2001V1 (Habitat Map). Reston, VA: U.S. Department of the Interior, Geological Survey (USGS). Date Published: August 15, 2018. Date Accessed: May 30, 2024. Available at:
<https://www.sciencebase.gov/catalog/item/59f5e1fde4b063d5d307dbff>
- Van Scoyoc, M. 2024. Species Occurrence Data for the Cimarron-Comanche National Grasslands (HTML output auto-generated from multiple data sources such as iDigBio, GBIF, and others). Dated: April 2024. Denver, CO: USDA Forest Service, Mountain Planning Service Group.
- Walker, J., Montgomery, C., Cordes, J., and Mangan, M. 2019. Morphological variation, habitat, and conservation status of parthenogenetic *Aspidoscelis tessellatus* pattern class C in the canyonlands of southeastern Colorado, USA. *Herpetological conservation and biology* 14: 119-131. https://www.herpconbio.org/Volume_14/Issue_1/Walker_et_al_2019.pdf
- Walker, J.M., Cordes, J.E., and Taylor, H.L. 1997a. Distributional relationships and community assemblages of three members of the parthenogenetic *Cnemidophorus tessellatus* complex and *C. sexlineatus* (Squamata: Teiidae) at Higbee, Otero County, Colorado. *Herpetological natural history* 5(2): 165-174.
- Walker, J.M., Cordes, J.E., and Taylor, H.L. 1997b. Parthenogenetic *Cnemidophorus tessellatus* complex (Sauria: Teiidae): A neotype for *Diploid C. tessellatus* (Say, 1823), redescription of the taxon, and description of a new triploid species. *Herpetologica* 53(2): 233-259.
<http://www.jstor.org/stable/3893333>
- Walker, J.M., Livo, L.J., and Cordes, J.E. 2021. Triploid parthenogenetic *Aspidoscelis neotessellatus* (Colorado checkered whiptail): Persistence in fragmented urban habitat. *Western wildlife* 11: 1-5.
https://wwwjournal.org/wp-content/uploads/sites/9/2024/01/Walker_et_al_WW_2024.pdf
- Walkup, D.K., Lawing, A.M., Hibbitts, T.J., and Ryberg, W.A. 2022. Biogeographic consequences of shifting climate for the western massasauga (*Sistrurus tergeminus*). *Ecology and evolution* 12(2): 18. <https://doi.org/10.1002/ece3.8599>
- Wastell, A.R. and Mackessy, S.P. 2016. Desert Massasauga Rattlesnakes (*Sistrurus catenatus edwardsii*) in southeastern Colorado: Life history, reproduction, and communal hibernation. *Journal of herpetology* 50(4): 594-603. <https://doi.org/10.1670/15-084>
- Waters, J.L., Farkas, J., Davis, D.R., Kerby, J.L., LaBonte, M.J., Penrod, M., Siler, C.D., and Flanagan, R.L. 2016. Screening natural history collections for historical presence of *Batrachochytrium dendrobatidis* in anurans from Oklahoma, USA. *Herpetological Review* 47: 214-220.

- https://www.researchgate.net/publication/308136853_Screening_natural_history_collections_for_historical_presence_of_Batrachochytrium_dendrobatidis_in_anurans_from_Oklahoma_USA
- Webb, R.G. 1973. *Trionyx muticus* lesueur smooth softshell turtle. *In* Society for the Study of Amphibians and Reptiles, ed. Catalogue of American Amphibians and Reptiles. Ann Arbor, MI: Society for the Study of Amphibians and Reptiles. 2 p.
<https://repositories.lib.utexas.edu/server/api/core/bitstreams/d424c73f-871e-4a8e-b074-b3a772a0cc7c/content>
- Webb, R.G. 1980. *Thamnophis cyrtopsis*. *In* Society for the Study of Amphibians and Reptiles, ed. Catalogue of American Amphibians and Reptiles. Ann Arbor, MI: Society for the Study of Amphibians and Reptiles,. 4 p.
<https://repositories.lib.utexas.edu/server/api/core/bitstreams/c36f9f4d-fdc8-4b64-b5cf-97664f1584fe/content>
- Weisrock, D.W. and Janzen, F.J. 2000. Comparative molecular phylogeography of North American softshell turtles (apalone): Implications for regional and wide-scale historical evolutionary forces. *Molecular phylogenetics and evolution* 14(1): 152-164. <https://doi.org/10.1006/mpev.1999.0689>



Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Cimarron and Comanche National Grasslands | Invertebrate Species Evaluations for Assessment | June 2025

Species Evaluation Report for Invertebrates on the Cimarron and Comanche National Grasslands

**Prepared by USDA Forest Service, Mountain Planning Service
Group, Lakewood, Colorado**

Prepared for the Cimarron and Comanche National Grasslands



Cover Photo: American bumblebee (*Bombus pensylvanicus*)

This is a working document and the information contained herein may be changed or updated by the USDA Forest Service at any time in the future.

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American Bumble Bee

(Bombus pensylvanicus)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are 19 occurrence records of this species in the plan area, spanning 1947-2023 (Van Scoyoc 2024). Data sources for these observations include University of Colorado Museum of Natural History, Denver Museum of Nature & Science, and iNaturalist. Some of these records have the locational precision to confirm the occurrence was within the plan area. In 2023, it was observed in two locations within the Picket Wire Canyonlands along the Purgatoire River corridor in the Comanche National Grassland.

Year of Last Known Occurrence: 2023

Summary of indicators of substantial concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Threats to populations include pesticides, pathogens, parasites, competition with honeybees, climate stressors, and reduced genetic diversity.
 - b. Threats to habitat include overgrazing, invasive species, habitat destruction from agricultural intensification, pesticide use, loss of grassland habitat, warming climate and changes in floral availability.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known, but still seems common on the eastern plains of Colorado and southwest Kansas.
 - b. Declining trend in habitat quality for the species in the plan area due to altered fire regime, invasive cheatgrass, and range condition in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is not at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; nineteen occurrence records in the plan area.
 - b. Ecological conditions: the highly fragmented landownership pattern of the plan area may not fully meet the species' needs for connectivity and is considered a restricted ecological condition.

Species Status

G3; S2 in Colorado; SNR in Kansas; listed as Tier 1 in Kansas; Petitioned for ESA listing (2021), Positive 90-day Finding, and under review in a 12-month Status Review by US Fish and Wildlife Service (FWS 2024).

Taxonomy

Bombus pensylvanicus is accepted as valid (Integrated Taxonomic Information System (ITIS) 2024d); the species has many taxonomic synonyms including: *Bombus pennsylvanicus*, *Apis pensylvanica*, *Bremus americanorum*, *Psithyrus cevalliae*, *Bombus titusi*, *Apis antiguensis*, *Apis americanorum*, *Bombus pallidus*, and *Bombus pennsylvanicus umbratus* (Integrated Taxonomic Information System (ITIS) 2024d). A population from the south of Mexico is morphologically and genetically distinct from the rest of North America and could be a separate undescribed species (Williams et al. 2014, NatureServe 2024).

Species range

Overall Species range

The current range of the American bumble bee includes the Eastern Temperate Forest and Great Plains regions throughout the eastern and central US and extreme southern Canada, the Desert West and adjacent areas of California and Oregon (Williams et al. 2014) (Figure 1, Figure 2, Figure 3, Figure 4, Figure 5). It is considered a low elevation species, and its elevation range is Colorado is 3,315 to 7,000 feet (Wright et al. 2017).

Description of how the population in the plan area fits within the overall range

The plan area is in the west-central portion of the species' range, although the species is absent from much of the Mountain West (Figure 1, Figure 2, Figure 3, Figure 4, Figure 5).

Distribution, abundance, and trend in the plan area

Population

In a 90-day petition finding, USFWS (2024) found this species may be warranted for listing and have initiated a status review. This species has a decreasing population trend across its entire geographic range; Hatfield et al. (2014) found an 88.56% drop in relative abundance of American bumble bee from pre-1912 to 2012, along with a range loss of ~50%. Population declines have been most severe in the northern and northeastern portion of its range (Hatfield et al. 2014) (Figure 2).

Across Colorado, Wright et al. (2017) state that "It is considered to be in decline across some parts of its North American range, but it still seems common on the eastern plains of Colorado." The sampling effort within the plan area is depicted as low in Hatfield et al. (2014) (Figure 2), and there is uncertainty in trends where there has been limited sampling. Systematic surveys have been done in for bumble bees in Kansas through the Great Plains Bumble Bee Atlas, and American bumble bee has been documented in Kansas through those efforts (Society). It is uncertain whether the species occurs in the Cimarron portion of the plan area, as Great Plains Bumble Bee Atlas surveys are ongoing in Kansas in 2024. The species' population size and trend in the plan area is currently uncertain.

Habitat

Typical habitat for the American bumble bee includes open farmland and fields (Williams et al. 2014). It has also been associated with coarse woody debris, rodent burrows, and a lower native to non-native flowering plant species ratio (Center for Biological Diversity et al. 2021). In the plan area, the species' range overlaps with broad portions of the Comanche National Grasslands (Figure 4) and the Cimarron National Grassland. It has been observed in two locations within the Picket Wire Canyonlands along the

Purgatoire River in 2023: along the Picket Wire Canyonlands trail (#1871) and along the Dinosaur Track spur trail (#1871-A) (Figure 5). Older records have been in both the Timpas and Carrizo Units of the Comanche (e.g., Picture Canyon, Canyon Lookout Road 2360G, East Carrizo Creek, off State Hwy 109) (Figure 5).

Overgrazing and invasive cheatgrass all threaten the species' habitat (Xerces Society for Invertebrate Conservation et al. 2023). Most of the plan area is grazed, and the current livestock grazing regime differs from the historic bison-dominated grazing regime in several ways; downward trends in range condition have also been documented in some portions of the plan area (USDA Forest Service 2005c); CCNG Ch 20). Cheatgrass (*Bromus tectorum*) has increased in the plan area and represents a major change in the grassland ecosystem relative to historic conditions (USDA Forest Service 2005b). These factors collectively contribute to a decline in habitat quality for the American bumble bee in the plan area.

Threats (arising from on or off the plan area)

Population

North American bumble bee species are generally threatened by pesticides, and pathogens and parasites associated with managed bees (NatureServe 2024). American bumble bee is threatened by the fungal pathogens *Nosema ceranae* and *Nosema bombi*, which spill over to American bumble bees from domesticated bees used to pollinate greenhouse crops (FWS 2024). These pathogens reduce fecundity, immune function, growth and survivorship of American bumble bees (FWS 2024). Climate stressors are expected to threaten populations of American bumble bee by reducing the length of time bees can fly, thereby reducing foraging trips (Center for Biological Diversity et al. 2021). Low genetic diversity and effective population sizes are also considered a possible threat (MacPhail et al. 2019). The underlying cause for widespread declines of American bumble bee across its range remains unclear, but a combination of different factors and interaction effects is suspected (MacPhail et al. 2019).

Habitat

North American bumble bee species are generally threatened by habitat loss and climate stressors (NatureServe 2024). Habitat threats that have identified for the American bumble bee include habitat destruction from agricultural intensification, livestock grazing, pesticide use, loss of grassland habitat, climate stressors, and competition from nonnative honeybees (Center for Biological Diversity et al. 2021, FWS 2024, MacPhail et al. 2019). Grazing can reduce habitat quality through several mechanisms including compaction of the soils that reduces suitable nesting sites, removal of floral resources, and alteration of microhabitat temperature and moisture (Center for Biological Diversity et al. 2021, Hanberry et al. 2021). Warming climate and changes in floral availability may cause gaps in the availability of food resources and make parts of its range unsuitable (Center for Biological Diversity et al. 2021). These multiple threats also produce synergistic effects (Center for Biological Diversity et al. 2021).

Ecological conditions

Ecological condition requirements

The American bumble bee has three basic habitat requirements: suitable nesting sites for the colonies, nectar and pollen from floral resources available throughout the duration of the colony period (spring, summer and fall), and suitable overwintering sites for the queens.

The American bumble bee may opportunistically nest above- or underground (Wright et al. 2017).but usually nests on the surface of the ground among tall grass (MacPhail et al. 2019), (Center for Biological

Diversity et al. 2021). The percentage of native grasslands within 0.3 miles of a nest is an important predictor of bumble bee diversity (Center for Biological Diversity et al. 2021).

The American bumble bee is a long-tongued bee (Williams et al. 2014). There are many floral associates in Colorado (Wright et al. 2017). The nutritional content of pollen affects bee performance and plant associations; bumble bees (*Bombus*) prefer plants that offer pollen with high ratios of protein to lipids (Vaudo et al. 2024).

There is little information regarding overwintering habitat, or hibernacula, specific to the American bumble bee. The specific requirements of overwintering nest sites of American bumble bee females are not yet known, but bumble bees generally hibernate “in undisturbed sites, close to the ground surface an inch or two under loose soil or under leaf litter or other debris, in sites that have adequate organic material to provide shelter” (Center for Biological Diversity et al. 2021). Williams et al. (2014) note compost piles or burrows of other animals as possible hibernacula.

In addition to these habitat requirements, the species’ ecological conditions requirements include freedom from competition with honeybees, pathogen rates within the normal range, freedom from broadcast exposure to certain classes of pesticides, freedom from overgrazing (Center for Biological Diversity et al. 2021), and gene flow among isolated populations (Lozier and Cameron 2009). Although effects of grazing on pollinators is species-specific, Hanberry et al. (2021) generalize that “One strategy to reduce the likelihood of overgrazing is to focus on utilization rates of forbs and host plants rather than stocking rates, as the same stocking can result in different grazing pressure depending on area, weather, and other disturbances.”

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The highly fragmented landownership pattern of the plan area may not fully meet the species’ needs for connectivity for genetic exchange. CBD et al. (2021) suggest that habitat fragments smaller than ~815 – 2,500 acres may not sustain viable populations. Many fragments of the plan area are smaller than this. The fragmented nature of the planning area also has an impact on the connectivity of vegetation (USDA Forest Service 2005c) Ch 20), including floral resources.

Most of the planning area is also within an active grazing allotment. In a recent review, Hanberry et al. (2021) state that “Livestock grazing effects on soils can have major impacts on bee communities, both directly by influencing nesting habitat and indirectly by altering vegetation.”

Critical biological characteristics

CBD et al. (2021) describe the annual life cycle of the American bumble bee: “Queen bees that mated the previous fall emerge in the spring from their overwintering shelters and begin building colonies. Once a new queen has chosen a nesting site, she forages for nectar and pollen for herself and combines pollen and nectar together into provisions called “bee bread” within the nest for her offspring. The queen lays an egg on each provision which hatches and feeds on the provision until entering pupation. Worker bees emerge after they pupate. The colony grows and expands through mid-summer when males are produced. The males leave the colony and go in search of reproductive females from other colonies. Reproductive females are produced at the end of the summer who leave the natal colony, mate, and then find a suitable place to overwinter. The members of the original colony die and the new, mated queens overwinter to begin the cycle the next year.”

In Colorado, queens typically fly late April through late September but are most abundant in May through early June. Males fly early August through early October, but peak abundantly is in early August and early September. Workers (females) fly late June through early October, with peak abundance in August and early September (Wright et al. 2017).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Bees are the most important pollinators in the Great Plains (Hanberry et al. 2021). Bumble bees, including the American bumble bee, are able to “buzz pollinate”—a vibrational pollination technique that dislodges more pollen. The American bumble bee may pollinate some important crop plants, including blueberries, raspberries, chives, cucumbers, apples, blackberries, soybeans, cherries, beans, plums, almonds, apricots, alfalfa, eggplants, nectarines, peaches, and cranberries that greatly benefit from buzz pollination (Center for Biological Diversity et al. 2021). In addition to commercially important crops, the American bumble bee also plays a vital role as a generalist pollinator of native flowering plants (Center for Biological Diversity et al. 2021).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

The American bumble bee is experiencing range compression, with population losses throughout the entire northern part of its range and shrinking ranges at the southern portion of its range due to rising temperatures (Center for Biological Diversity et al. 2021).

Decker and Harmon-Threatt (2019) concluded that fire may benefit bees in tallgrass prairies. They found that tallgrass prairie exposed to growing and dormant-season fire had higher overall bee abundance relative to unburned sites, potentially due to producing increased nesting habitat for ground-nesting bees. However, the impact of fire is dependent on several variables, including the species' life history. Shallow-nesting bees, or those that nest above ground, are at a greater risk of direct mortality from fire than species that nest deeper in the soil (Cane and Neff 2011). Since the American bumble bee mostly nests on the surface of the ground (Center for Biological Diversity et al. 2021), this could make it more vulnerable to wildfire and prescribed fire. No information could be found on the response of this species to fire. For pollinators of the Great Plains, Hanberry et al. (2021) advise that “Retention of unburned areas as refugia is critical, particularly for species of conservation concern. Managers should plan conservatively, by assuming 100% mortality of pollinators in the burn unit.” The Council on the Status of Pollinators in North America (2007) also recommends inclusion of specific practices that provide nest sites for pollinator species in management protocols.

Maps of Species Range and Known Occurrences in Plan Area

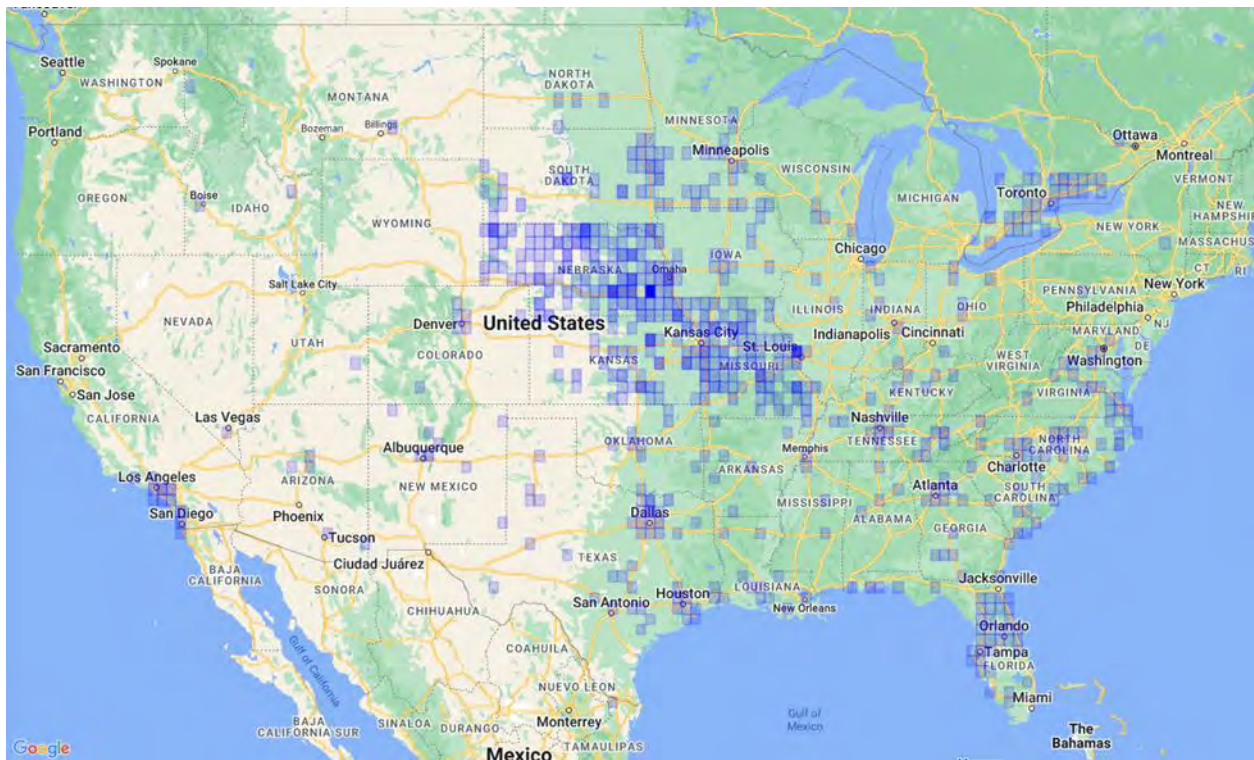


Figure 1. Verifiable observations of the American bumble bee from the Bumble Bee Atlas.

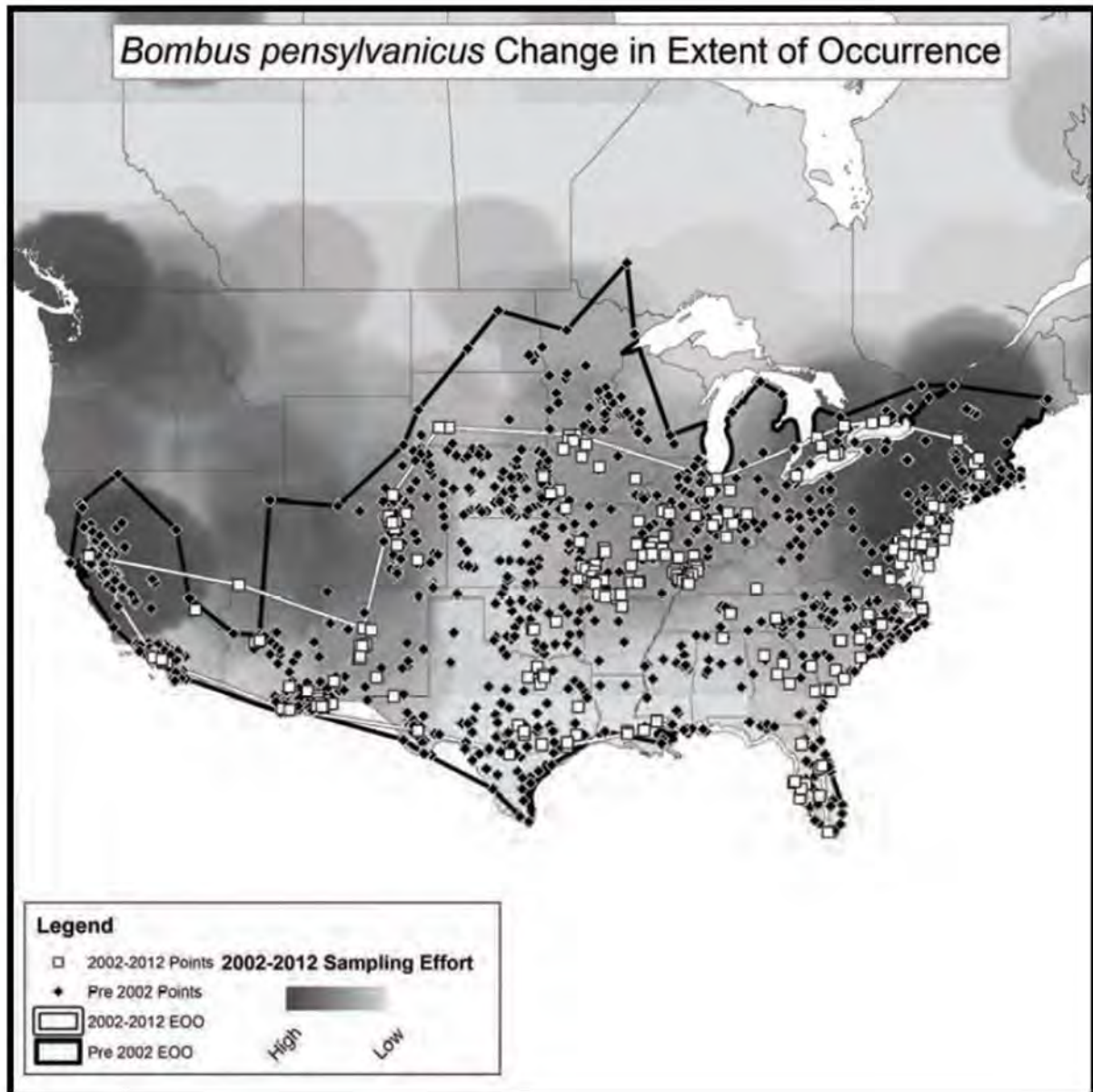


Figure 2. Map used to measure range decline for American bumble bee from Hatfield et al. (Hatfield et al. 2014).

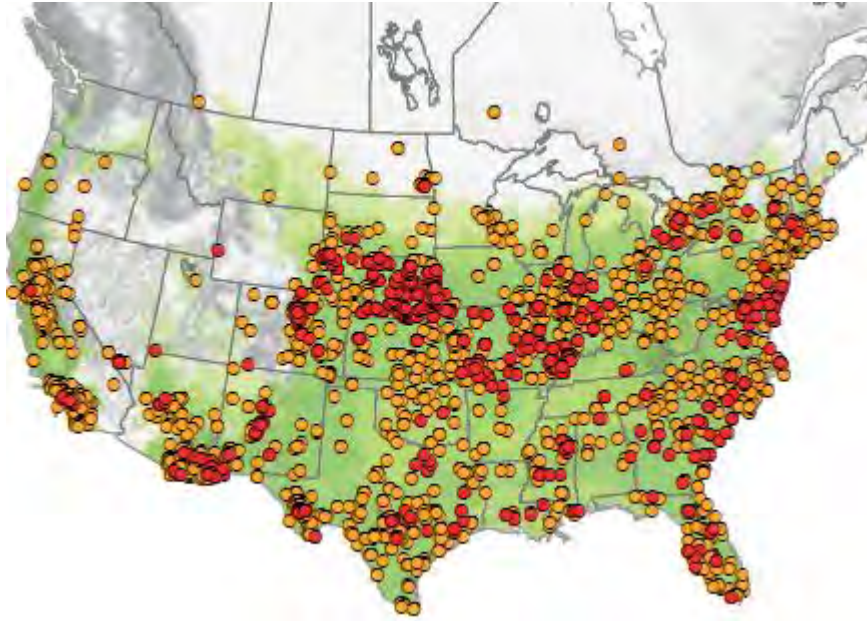


Figure 3. Range map for American bumble bee from Williams et al. (2014). Orange circles show specimens collected before 1996; red circles show specimens collected between 1996 and 2012.

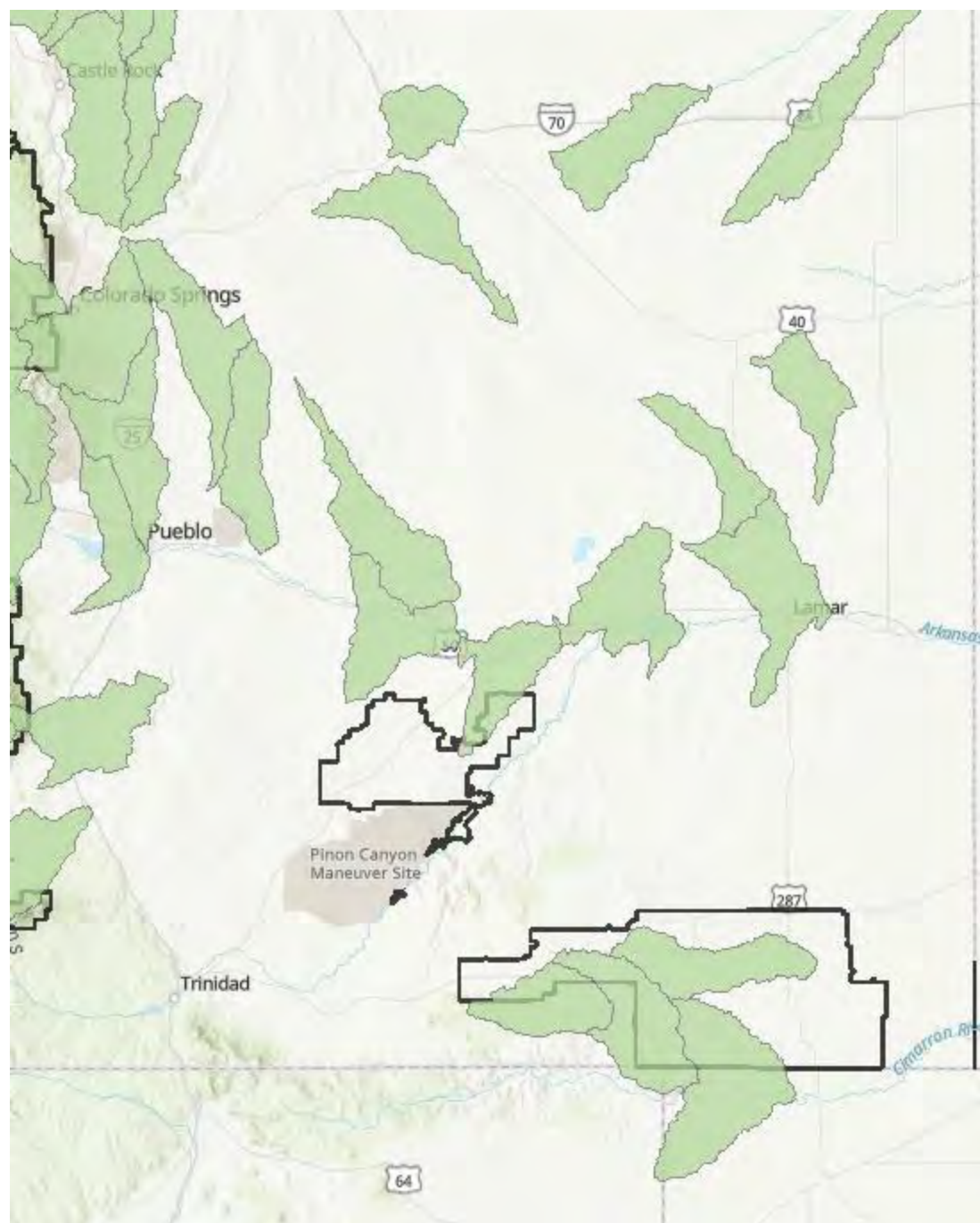


Figure 4. CNHP species range map for American bumble bee (green polygons) in relation to the plan area.

American Bumble Bee (*Bombus pensylvanicus*)

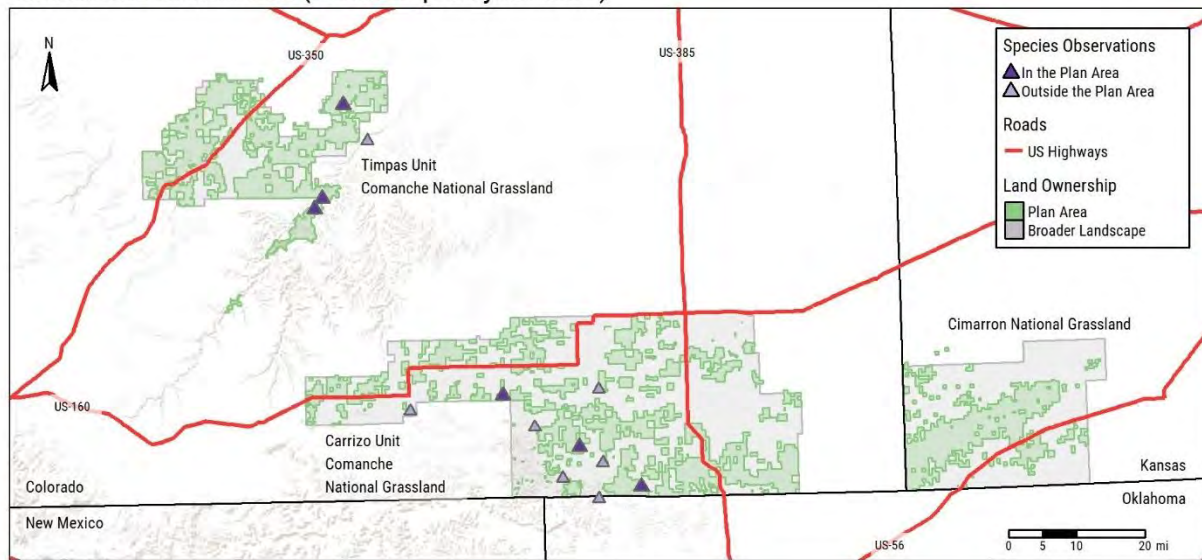


Figure 5. American bumble bee observations within and around the plan area.

Blue-ringed Dancer

(*Argia sedula*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one occurrence record in the plan area from 2023 (Van Scoyoc 2024). It is a research-grade iNaturalist observation at Cimarron River Campground within the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. No known threats to populations.
 - b. Large dams can be a threat to habitat connectivity.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known.
 - b. Declining trend in aquatic and riparian habitat in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; one occurrence record in the plan area.
 - b. Ecological conditions: wetland and riparian habitats are restricted in the plan area.

Species Status

G5; S2 in Colorado; SNR in Kansas.

Taxonomy

Argia sedula is accepted as valid (ITIS 2024b).

Species range

Overall Species range

The species has a wide range from Florida north to Pennsylvania, west to California, and south into Mexico (Figure 6, (Paulson et al. 2024).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species range (Figure 6).

Distribution, abundance, and trend in the plan area

Population

Population size and trend in the plan area is not known. There is one occurrence record in the plan area.

Habitat

Robinson et al. (1983) state that the Blue-ringed Dancer is “often found along the banks of slow moving streams and ditches.” In Nebraska, it has been shown to use very small stream systems—“down to those so small the grass on both sides touches in the middle” (Osborn 2005). It can also use lake habitat (Osborn 2005), as well as wetlands and ponds (Stewart and Vodopich 2018).

In Colorado, adult blue-ringed dancers “typically occur along rivers, sloughs, and irrigation ditches on the Great Plains near the Kansas border” (Prather and Prather 2015). The one observation of the species in the plan area was by the Cimarron Fishing Ponds in the Cimarron National Grassland.

This species is considered a river-breeding damselfly and therefore dependent on lotic systems for reproduction (NatureServe 2024). Aquatic and riparian habitat has declined in the plan area due to several factors, including the increased abundance of invasive tamarisk (USDA Forest Service 2005c) and severe declines in stream flows downgradient from the Ogallala-High-Plains Aquifer (Brikowski 2008). Drawdown of the aquifer has substantially decreased the discharge to most of the rivers in the Carrizo unit of the Comanche and the entire Cimarron National Grassland (USDA Forest Service 2005b). Since this species is dependent on flowing water, this represents a decline in its requisite habitat conditions.

Threats (arising from on or off the plan area)

Population

The species has no known threats to populations (NatureServe 2024). In general, Odonata (damselflies and dragonflies) have among the lowest extinction risk threat levels among invertebrate groups that have been assessed to date (Clausnitzer et al. 2009). They generally have above-average dispersal ability, relatively wide distribution ranges, ability to live in partially degraded habitats, and relatively high capability to rapidly colonize new or restored habitats, all of which contributes to relatively lower extinction risk than other taxonomic groups (Clausnitzer et al. 2009).

Habitat

NatureServe (2024) identifies large dams as a general threat to the habitat of the river-breeding damselflies in the order Odonata because they can create separation barriers to movement of sexually mature adults between microhabitats. No additional information could be found regarding habitat threats specifically for this species but see Appendix for general threats to aquatic/wetland/riparian habitats.

Ecological conditions

Ecological condition requirements

Adult Blue-ringed Dancers seem to prefer sunny, exposed habitat and avoid shade (Robinson et al. 1983). Unsuitably shady conditions can even be cast by the shadow of a bridge (Robinson et al. 1983). Robinson et al. (1983) also speculates that the species may be disturbed by human traffic (e.g., walking traffic that disperses dense aggregations or deters individuals from aggregating in highly trafficked areas).

The species can use diverse perching structures, including cement, aquatic plants, and algal mats (Robinson et al. 1983). Robinson et al. (1983) found that the preferred perching structure shifted temporally, with algal mats becoming more used as aquatic arrowhead plants (*Sagittaria*) became denser.

Osborn (2005) showed the species was only present at a lake that exhibited lower pH, ammonia, conductivity, and higher oxygen and emergent and floating vegetation than other lakes.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species depends on aquatic habitat for breeding and larval development. Riparian and wetland habitats are relatively limited in the plan area (see Appendix) and therefore habitat is considered restricted for the aquatic portion of this species' life history cycle.

Critical biological characteristics

Adult odonates generally forage within ~980 feet (300 meters) of a breeding site (NatureServe 2024). Inter-habitat movement typically occurs more often in fragmented landscapes than within continuous forested landscapes (NatureServe 2024). Flight season in Nebraska has been documented from early July to late August (Sibley et al. 2019). The one observation of an adult in the plan area was from mid-July (Van Scoyoc 2024). Their reproductive life can be up to two weeks, but averages four or five days (Stewart and Vodopich 2018).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Damselflies in the genus *Argia* predate upon aquatic and terrestrial invertebrates and can also be an important prey item for other insects and vertebrates (Caesar 2012).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Smith and Patten (2020) describe that the Blue-ringed Dancer has begun to spread eastward to more mesic habitats, likely a response to drought and inadequate rainfall. However, they caveat this discussion of range shifts by stating: "Nevertheless, a more accurate means to quantify streamflow depletion, and hence desiccation of lotic habitats, is needed before we can bring a species distribution model approach fully to bear on the question of range retraction of lotic odonate species of Odonata" (pg. 86). The species has also been suggested to be an indicator species for good water quality in lakes (Osborn 2005).

Maps of Species Range and Known Occurrences in Plan Area

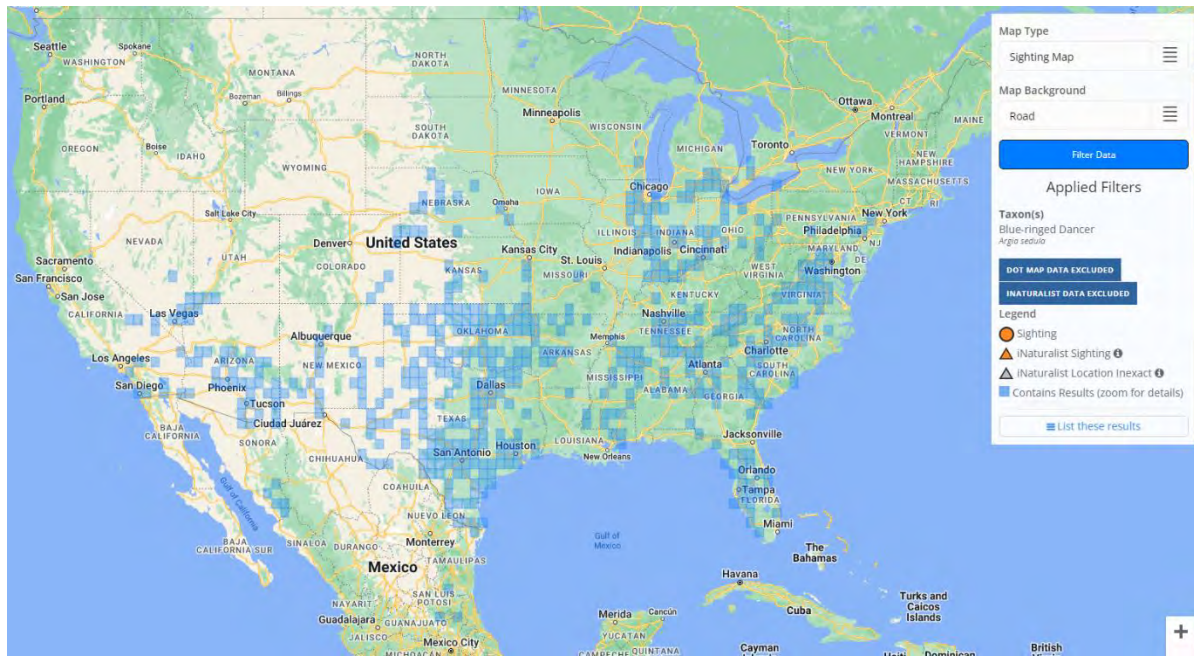


Figure 6. Sighting map of blue-ringed dancer from Odonata Central.

Brimstone Clubtail

(Stylurus intricatus)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CNHP contains one occurrence polygon of the species in the plan area from 1994; GBIF contains two records from 1994 (Van Scoyoc 2024). These records have sufficient precision to demonstrate this species is known to occur in the plan area.

Year of Last Known Occurrence: 1994

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Insecticides can pose a threat to populations.
 - b. Development of water resources, including large dams, represent a threat to habitat.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known.
 - b. Declining trend in aquatic and riparian habitat in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is within the central portion of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; two occurrence records in the plan area.
 - b. Ecological conditions: lotic habitat is restricted in the plan area.

Species Status

G4; S2 in Colorado; SNR in Kansas.

Taxonomy

Stylurus intricatus is accepted as valid (Integrated Taxonomic Information System (ITIS) 2024b).

Species range

Overall Species range

The species' range includes southern California east to Iowa and Missouri, south to Chihuahua and western Texas; north to Montana, Alberta and Saskatchewan (Paulson et al. 2024) (Figure 7, Figure 8).

Description of how the population in the plan area fits within the overall range

Observations of this species are very sparse; however, the plan area seems to be in a relatively central portion of its known range (Figure 7, Figure 8). CNHP considers the plan area outside its range in Colorado (Figure 8), but this conflicts with the range described by Prather and Prather (2015).

Distribution, abundance, and trend in the plan area

Population

The brimstone clubtail is considered an elusive or rare species, with limited and scattered occurrence records across its range (Cannings 2014, Myrup and Baumann 2016, Montana Natural Heritage Program 2024a). There are two occurrence records in the plan area. Population size and trend in the plan area is not known.

Habitat

NatureServe (2024) classifies this species as a river-breeding odonate. Its habitat includes “slow-moving, sand-bottomed, warm muddy rivers in open country and occasionally irrigation canals as well” (Montana Natural Heritage Program 2024a). Its distribution is restricted to prairie ecozones (Cannings 2014).

In Colorado, the brimstone clubtail has been documented in the Dolores River in Mesa County in the far western portion of the state and the Purgatoire River in Otero County in the southeastern portion of the state (Prather and Prather 2015). Prather and Prather (2015) state that “suitable riverine habitat (for the brimstone clubtail) in Colorado has been eliminated in most areas by development of water resources.” Within the plan area, the species has been documented in two locations, both along the Purgatoire River in the Timpas Unit of the Comanche National Grassland.

Aquatic and riparian habitat has declined in the plan area due to several factors, including the increased abundance of invasive tamarisk that alters floodplain hydrology (USDA Forest Service 2005b) and severe declines in stream flows downgradient from the Ogallala- High-Plains Aquifer (Brikowski 2008). Drawdown of the aquifer has substantially decreased the discharge to most of the rivers in the Carrizo unit of the Comanche and the entire Cimarron National Grassland (USDA Forest Service 2005b).

Threats (arising from on or off the plan area)

Population

Insecticides can pose a threat to populations. Application of methoxychlor, in an attempt to control blackfly larvae, caused a massive die-off of brimstone clubtail larvae in the North Saskatchewan River (Cannings 2014). In general, Odonata (damselflies and dragonflies) have among the lowest extinction risk threat levels among invertebrate groups that have been assessed to date (Clausnitzer et al. 2009). They generally have above-average dispersal ability, relatively wide distribution ranges, ability to live in partially degraded habitats, and relatively high capability to rapidly colonize new or restored habitats, all of which contributes to relatively lower extinction risk than other taxonomic groups (Clausnitzer et al. 2009).

Habitat

Development of water resources represents a significant threat to the brimstone clubtail's habitat in Colorado (Prather and Prather 2015). Large dams have been identified as threat to habitat in Montana

because they remove the dynamic river sandbars this species relies on (Montana Natural Heritage Program 2024a, Myrup and Baumann 2016).

Ecological conditions

Ecological condition requirements

To successfully complete its life cycle, the brimstone clubtail needs suitable habitat for both its aquatic and terrestrial life stages. This species is a prairie specialist (Cannings 2014). Its ecological conditions include presence of warm, slow-moving prairie rivers with shifting sandbars, perch sites such as grass or open group, and intact riparian vegetation for females to seek shelter (Montana Natural Heritage Program 2024a, Myrup and Baumann 2016, Acorn 2011).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species depends on lotic habitat for breeding and larval development. Riparian habitats are relatively limited in the plan area (see Appendix) and therefore habitat is considered restricted for the aquatic portion of this species' life history cycle.

Critical biological characteristics

Adult odonates generally forage within ~980 feet (300 meters) of a breeding site (NatureServe 2024). Males alternate between making short runs above riffles and perching in streamside vegetation; females use nearby riparian vegetation away from the water's edge (Myrup and Baumann 2016).

The adult flight season is mid-June to mid-August (Sibley et al. 2019).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Larvae of the brimstone clubtail feed on a wide variety of aquatic insects, and adult dragonflies will eat almost any soft-bodied flying insect (Montana Natural Heritage Program 2024a).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Persistence probability predictions for odonate presence in the plan area due to effects of global change (change in temperature and precipitation, cropland use, and pesticide application) ranges from medium to low; persistence probability is higher in southeast Colorado than in southwest Kansas (Fig. 4 in (Sirois-Delisle and Kerr 2022)). Recent modeling work suggests that pesticide application and temperature change interact in a compounding way in terms of their impact on odonate persistence (Sirois-Delisle and Kerr 2022). No information could be found specific to the brimstone clubtail.

Maps of Species Range and Known Occurrences in Plan Area

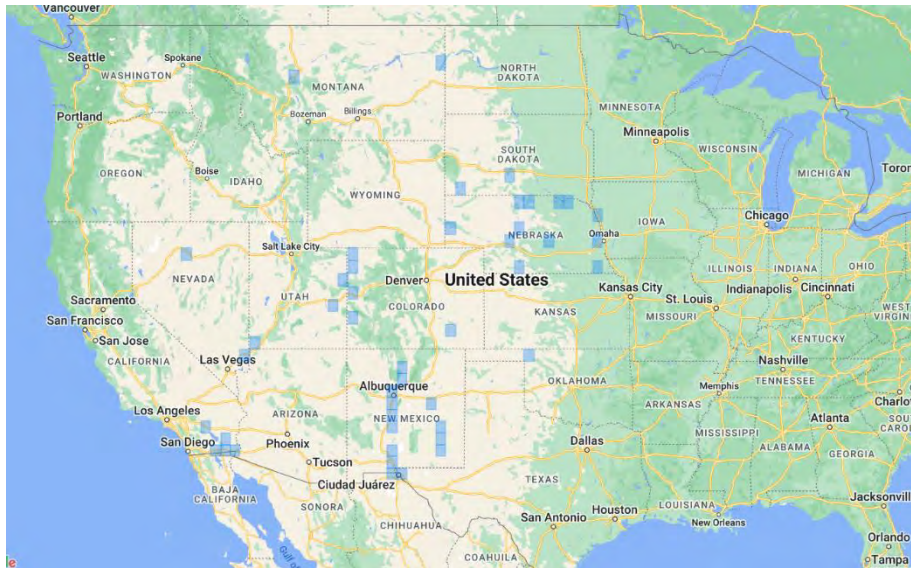


Figure 7. Sighting map of the brimstone clubtail from Odonata Central.



Figure 8. Distribution map of the brimstone clubtail in Colorado (green polygons) from CNHP.

Bronze Roadside-skipper

(*Amblyscirtes aenus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has 11 element occurrence records of this species in the plan area, some of which are duplicates, all from Picture Canyon on the Comanche National Grassland in August 1978 (Van Scoyoc 2024). Four specimens were identified by an entomologist and preserved within the entomology collection at the Denver Museum of Nature & Science (Van Scoyoc 2024). Aerial imagery of the habitat in Picture Canyon where the occurrence records occur shows intact prairie and canyonlands (Figure 9). Therefore, these occurrence records are considered reliable, and the species is known to occur in the plan area.

Year of Last Known Occurrence: 1978 (Van Scoyoc 2024)

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known.
 - b. Quality of habitat for pollinators is generally reduced in the plan area because of reduced herbaceous diversity (USDA Forest Service 2024a, b, c).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known.
 - b. Ecological conditions: shortgrass prairie habitat is not restricted in the plan area.

Species Status

G5; S4 in Colorado; S1 in Kansas; listed as Tier 1 in Kansas.

Taxonomy

Amblyscirtes aenus is accepted as valid (ITIS 2024a); the species has three recognized subspecies valid (ITIS 2024a). It is possible some of the occurrence records reflect the subspecies *Amblyscirtes aenus aenus*, but records only list *Amblyscirtes aenus* and NatureServe does not have separate rankings for the subspecies.

Species range

Overall Species range

The species' range spans Colorado and southern Utah south to Arizona, New Mexico, and northern Mexico; south and east to central Texas, western Oklahoma, and south-central Kansas ((NatureServe 2024, Lotts and Naberhaus 2024); Figure 10; Figure 11; Figure 12). The Bronze Roadside-Skipper has the widest altitudinal range of the various different species of roadside skippers (Bailowitz et al. 2007).

Description of how the population in the plan area fits within the overall range

The plan area is at the edge of the species' range (Figure 10; Figure 11; Figure 12).

Distribution, abundance, and trend in the plan area

Population

The population size and trend in the plan area is not known. There are 11 occurrence records in the plan area from 1978.

Habitat

The species occupies a variety of habitat types, which can vary regionally (NatureServe 2024). Bailowitz et al. (Bailowitz et al. 2007) state that the species is common around puddles, mud, cliffsides, rocky gulch bottoms, and riparian canopy, and benefits from perching habitat provided by boulders in creek beds (Scott 2020, Bailowitz et al. 2007). In Colorado, its primary habitat is rocky gulches in the foothills and canyons (Scott 2020). The species depends on wide-leafed grasses as its larval food plant (Scott 2020), although the mere presence of the larval foodplant does not necessarily mean suitable habitat (NatureServe 2024). Quality of habitat for pollinators is generally reduced in the plan area because of reduced herbaceous diversity (USDA Forest Service 2024a) (USDA Forest Service 2024e, f). In the plan area, the species has been found only in a few locations within Picture Canyon on the Comanche National Grassland (Van Scoyoc 2024), but records with less spatial precision also occur near the Timpas Unit (Figure 12).

Threats (arising from on or off the plan area)

Population

The species has no known threats to populations (NatureServe 2024, Lotts and Naberhaus 2024).

Habitat

The species has no known threats to habitat (NatureServe 2024, Lotts and Naberhaus 2024), but see Appendix for general threats to habitats in the plan area.

Ecological conditions

Ecological condition requirements

The species requires suitable habitat with larval foodplant grasses and nectar flowers for successful larval and adult butterfly survival and reproduction. Caterpillar host plants are grasses and sedges (Scott and Epstein 1987), including Indian woodoats grass (*Chasmanthium latifolia*), sideoats grama (*Bouteloua curtipendula*), nodding brome (*Bromus anomalus*), and probably other grasses (NatureServe 2024, Lotts and Naberhaus 2024). In Colorado, hostplants include Colorado wildrye (*Agropyron ambiguous*), Scribner's needlegrass (*Achnatherum scribneri*), and other wide-leaf grasses (Scott 2020). Nectar flowers include beebalm, dogbane, milkweed, and wild geranium (Behrstock 2021, Bailowitz et al. 2007).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The four occurrence records of this species spatially map within Landfire Existing Vegetation Type layer (EVT) as Western Great Plains Shortgrass Prairie, which is the most abundant habitat type in the plan area. The caterpillar host plants include mid-height or tall native grasses such as sideoats grama (*Bouteloua curtipendula*).

Critical biological characteristics

As a larval grass/sedge feeder that overwinters as mature larvae, adult flight begins relatively late (Scott and Epstein 1987). The exact timeframe for adult flight varies regionally (Pyle 2004, Bailowitz et al. 2007) (Scott and Epstein 1987). For the southern Rocky Mountains Area, Scott (2020) indicates it occurs late April through early July (mostly mid-May-June). Pyle (2004) gives an adult flight period of May – June for Colorado. Observations of Bronze Roadside-Skipper in the plan area were from August (iDigBio 2024).

Skippers—named for their rapid, “skipping” style of flight—can be strong fliers, capable of speeds over 0.6 miles/hr for short distances (Pyle 2004), (NatureServe 2024). Adult males wait in small rocky gulches or valley bottoms to await females (Scott 2020). The species typically only has one brood per year (Pyle 2004).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Butterflies, including Bronze Roadside-Skippers, play an important role in pollination (Behrstock 2021, Bailowitz et al. 2007). Probable predators include birds, reptiles, and amphibians (Bowers et al. 1985, Ghanzar et al. 2016).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Nelson (2007) ranked the Bronze Roadside-Skipper as highly sensitive to anthropogenic riparian disturbance. Butterflies as a group are generally highly sensitive to environmental change, including climatic fluctuations (Thomas 2005). The response of butterflies to grazing and burning practices in prairie habitat has been shown to be highly variable by species and so cannot be generalized (Panzer 2002, Hanberry et al. 2021), (Vogel et al. 2007). Fire can influence butterflies both directly via mortality of eggs

and larvae and indirectly via effects on habitat features such changes in the litter layer and the amount of bare ground (Vogel et al. 2010). Although the short-term responses of butterflies to fire can be either positive or negative, local populations in fragmented habitat may not survive repeated prescribed burns (Panzer 2002). Several species of skippers (not including the Bronze Roadside Skipper) have been shown to suffer negative effects from fire with effects continuing for approximately 5 years post-fire (Swengel 1996, Vogel et al. 2010). For all pollinators of the Great Plains, Hanberry et al. (2021) advise that “Retention of unburned areas as refugia is critical, particularly for species of conservation concern. Managers should plan conservatively, by assuming 100% mortality of pollinators in the burn unit.”

Within the Great Plains region, tallgrass prairie has been found to supported significantly higher butterfly species richness than shortgrass plots (Collinge et al. 2003). Urbanization appears to have no impact on butterfly species richness and composition in grassland ecosystems where parcels of grassland are at least 12 acres (5 hectares) (Collinge et al. 2003). Urbanization impacts likely increase in more fragmented grasslands composed of smaller parcel sizes (Collinge et al. 2003). Habitat characteristics at the patch scale (as opposed to the landscape scale) explain a greater proportion of the variation in abundance and richness of grassland butterflies (Collinge et al. 2003).

Maps of Species Range and Known Occurrences in Plan Area



Figure 9. Example intact canyonlands and prairie habitat in Picture Canyon within the plan area where element occurrence records were made in 1978 (yellow pin shows one of the four occurrence records).

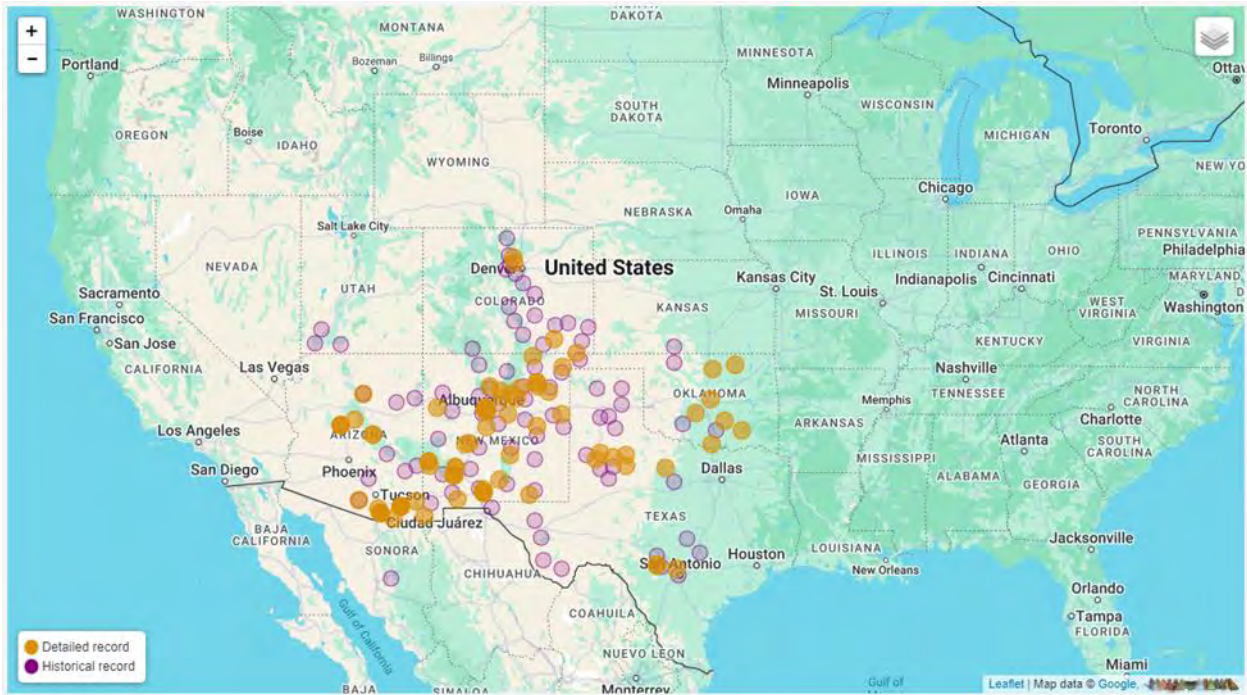


Figure 10. Range map of the bronze roadside-skipper from Butterflies and Moths of North America (BAMONA) project (Lotts and Naberhaus 2024).

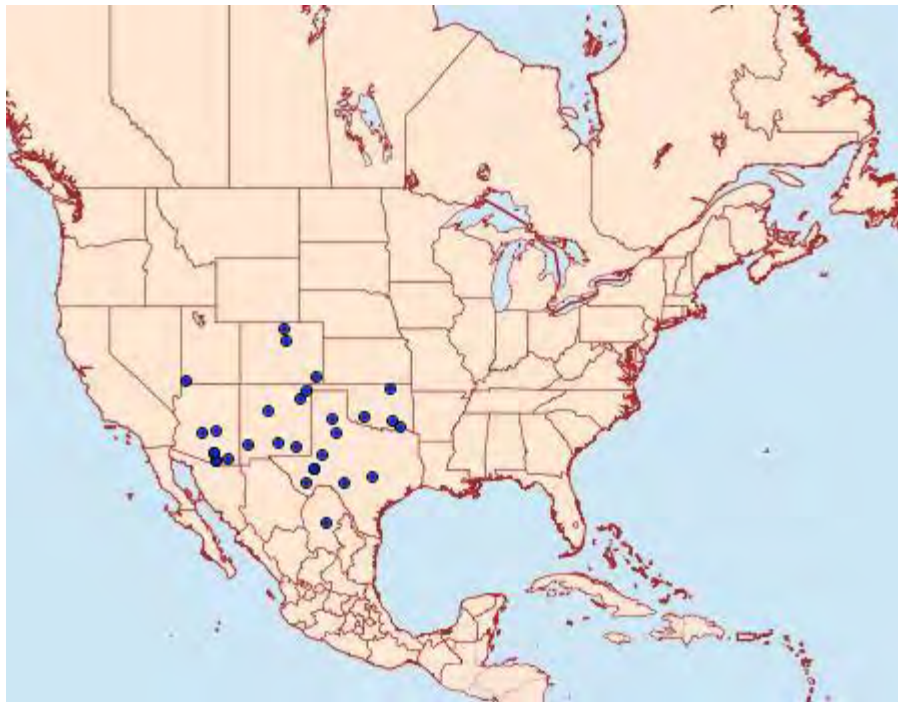


Figure 11. Distribution map of the bronze roadside-skipper from the “Moth Photographers Group” (2019) at the Mississippi Entomological Museum at Mississippi State University (Note that data points are normalized to reflect center-of-county locations).

Bronze Roadside-Skipper (*Amblyscirtes aenus*)

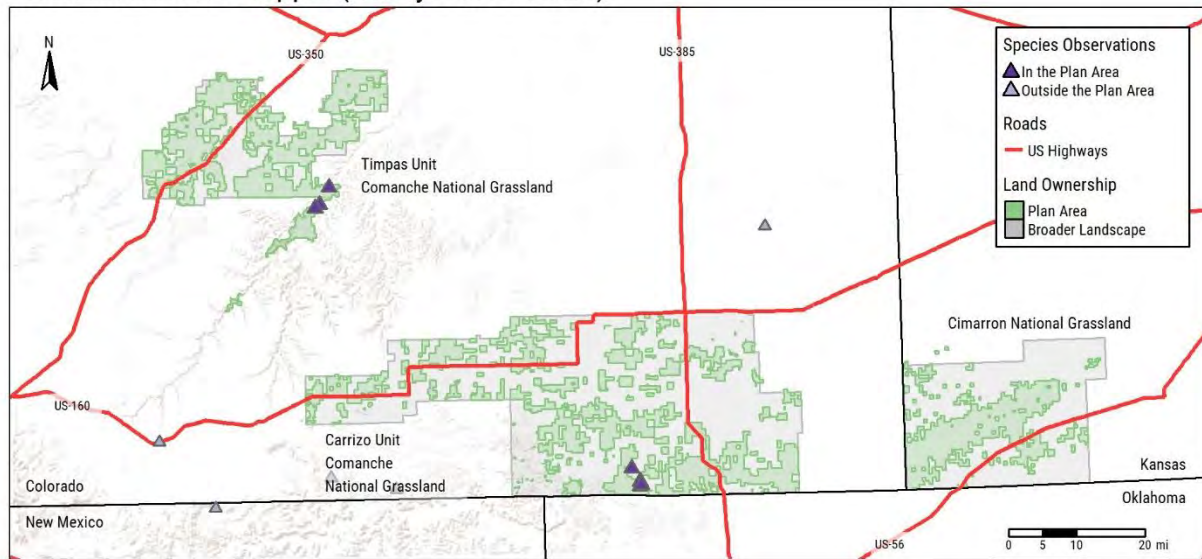


Figure 12. Observations of bronze roadside-skipper within and around the plan area.

Drooping Star-of-Bethlehem

(Pygarctia neomexicana)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF contains one record of the species in the plan area (Van Scoyoc 2024). This record comes from the C.P. Gillette Museum of Arthropod Diversity. A male specimen was collected in a UV trap and the locality for this collection is described as “Comanche National Grassland, David Canyon Road, 17 Miles South And 4 Miles West Of La Junta.” Therefore, it is known to occur in the plan area.

Year of Last Known Occurrence: 2004

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: loss of its host plant (milkweeds).
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known.
 - b. There is limited information on this species' habitat preferences, but its only confirmed hostplant is wheel milkweed, which has experienced declines across its range including eastern Colorado. Quality of habitat for pollinators is generally reduced in the plan area because of reduced herbaceous diversity (USDA Forest Service 2024a, b, c).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is endemic to the Jack Canyon-Purgatoire River basin in Colorado.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size: not known, but species is believed to be a rare endemic; one occurrence record in the plan area.
 - b. This species is associated with shale barrens, which are restricted in the plan area, and is a specialist on milkweeds.

Species Status

G3; S1 in Colorado.

Taxonomy

Pygarctia neomexicana is accepted as valid (ITIS 2024e).

Species range

Overall Species range

Nationwide, there are sparse occurrence records for the drooping star-of-Bethlehem (Figure 13, Figure 14, Figure 15), but it seems to be primarily distributed within the southwestern U.S. in Arizona, southeast Colorado, New Mexico, Texas and central Utah (NatureServe 2024), (Rondeau et al. 2011), (Fisher 2018a).

Description of how the population in the plan area fits within the overall range

The population in the plan area is believed to be endemic to the Jack Canyon-Purgatoire River basin—the only place in Colorado that this species is known to occur (Figure 15).

Distribution, abundance, and trend in the plan area

Population

The drooping star-of-Bethlehem is believed to be rare in Colorado (Rondeau et al. 2011) and ranked as critically imperiled in the state (S1). There is a singular occurrence record in the plan area. Population size and trend in the plan area are not known. It is a nocturnal moth and may be underreported due to lack of concerted surveys.

Habitat

The habitat associations for the drooping star-of-Bethlehem are not well characterized; (Rondeau et al. 2011) indicate it may rely on grassland, barrens, woodland, savanna, and foothills shrubland habitats, and state it is “closely tied (although not restricted)” to the shale hills, barrens, and escarpments of eastern Colorado.” The species’ only known range in Colorado overlaps with the Timpas Unit of the Comanche National Grassland (Figure 15). The larval host plant for drooping-star-of-Bethlehem are milkweeds in the genus *Asclepias* (Rondeau et al. 2011).

Within the plan area, the species has been documented only in the Shale Hills of the Timpas Unit of the Comanche National Grassland (Van Scoyoc 2024). This species has been found to use wheel milkweed (*Asclepias uncialis* ssp. *uncialis*) to lay its eggs, and wheel milkweed is considered imperiled in the state of Colorado. Wheel milkweed has declined across its range (NatureServe 2024), and perhaps as much as 50% of its range in eastern Colorado no longer being suitable habitat (Neid et al. 2007). Declines in milkweed would likely reduce habitat quality for the drooping-star-of-Bethlehem. Quality of habitat for pollinators is generally reduced in the plan area because of reduced herbaceous diversity (USDA Forest Service 2024a, b, c).

Threats (arising from on or off the plan area)

Population

There is limited information on this species; no consulted sources identified threats to populations (Rondeau et al. 2011, Fisher 2018 (NatureServe 2024, Butterflies and Moths of North America 2024a).

Habitat

There is limited information on this species; no consulted sources identified threats to habitat (Rondeau et al. 2011), (Fisher 2018a), (NatureServe 2024, Butterflies and Moths of North America 2024a). Threats to milkweed presumably affect this species (Neid et al. 2007). Its only documented host plant (*Asclepias uncialis* ssp. *uncialis*) has experienced historical and recent declines due to habitat conversion heavy grazing, invasive species, and off-road vehicle use (NatureServe 2024).

Ecological conditions

Ecological condition requirements

The species requires suitable habitat with larval foodplant and nectar flowers for successful larval and adult tiger moth survival and reproduction; however, these ecological conditions are not well characterized for the drooping star-of-Bethlehem (Rondeau et al. 2011), (Fisher 2018a)). It requires suitable cushion plants to lay its eggs and support its larvae, which are believed to be milkweeds in the genus *Asclepias* (Rondeau et al. 2011). Other moths in the genus *Pygarctia* have been found to be specialists restricted to one plant genus or even one species (Bernays et al. 2004), (NatureServe 2024), and the same seems true of the drooping star-of-Bethlehem. It has been found to lay its eggs on wheel milkweed (*Asclepias uncialis* ssp. *uncialis*) in the Pinon Canyon Maneuver Site near the plan area (Neid et al. 2007). Most of the known populations of wheel milkweed are small, discrete, and isolated from each other (Colorado Natural Heritage Program (CNPH) 2024). Adult food preferences are unknown (NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species is closely tied to the shale barrens within the arid shortgrass prairie of the Timpas Unit (Rondeau et al. 2011). The drooping star-of-Bethlehem is believed to require milkweeds for its host plant (Rondeau et al. 2011). Many records of broadleaf milkweed (*Asclepias latifolia*) and bedstraw milkweed (*Asclepias subverticillata*) overlap with its range in the Timpas Unit of the Comanche, but wheel milkweed occurrences are scarcer (Van Scoyoc 2024). The shale barrens are small (less than 1,000 acres) and patchily distributed (USDA Forest Service 2005c) and therefore considered restricted in the plan area.

Critical biological characteristics

Little is known about the life cycle of the drooping star-of-Bethlehem (Rondeau et al. 2011). Unlike most other Lepidopterans, where adult females deposit eggs on appropriate larval host species, tiger moth eggs can be laid on non-host plants and caterpillars must find their own food sources (Fisher 2018b). Rondeau et al. (Rondeau et al. 2011) indicate adult females may use shale barren-endemic species as cushion plants to lay their eggs. Larvae of the drooping star-of-Bethlehem and related genera “are all specialists on milky-sapped plants such as Euphorbs, milkweeds or dogbanes” (NatureServe 2024). Adult food is unknown (NatureServe 2024).

The adult flight season for the drooping star-of-Bethlehem is May – June (Fisher 2018a).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found specifically for the drooping star-of-Bethlehem.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found specifically for the drooping star-of-Bethlehem, but it is presumably influenced by impacts to its host plant(s). NatureServe (2024) gives the following management recommendations for wheel milkweed: “On lands used for grazing, the grazing cattle should be managed to protect plants. Fences or barriers could be erected to protect plants from hikers and off road vehicle use.”

Maps of Species Range and Known Occurrences in Plan Area

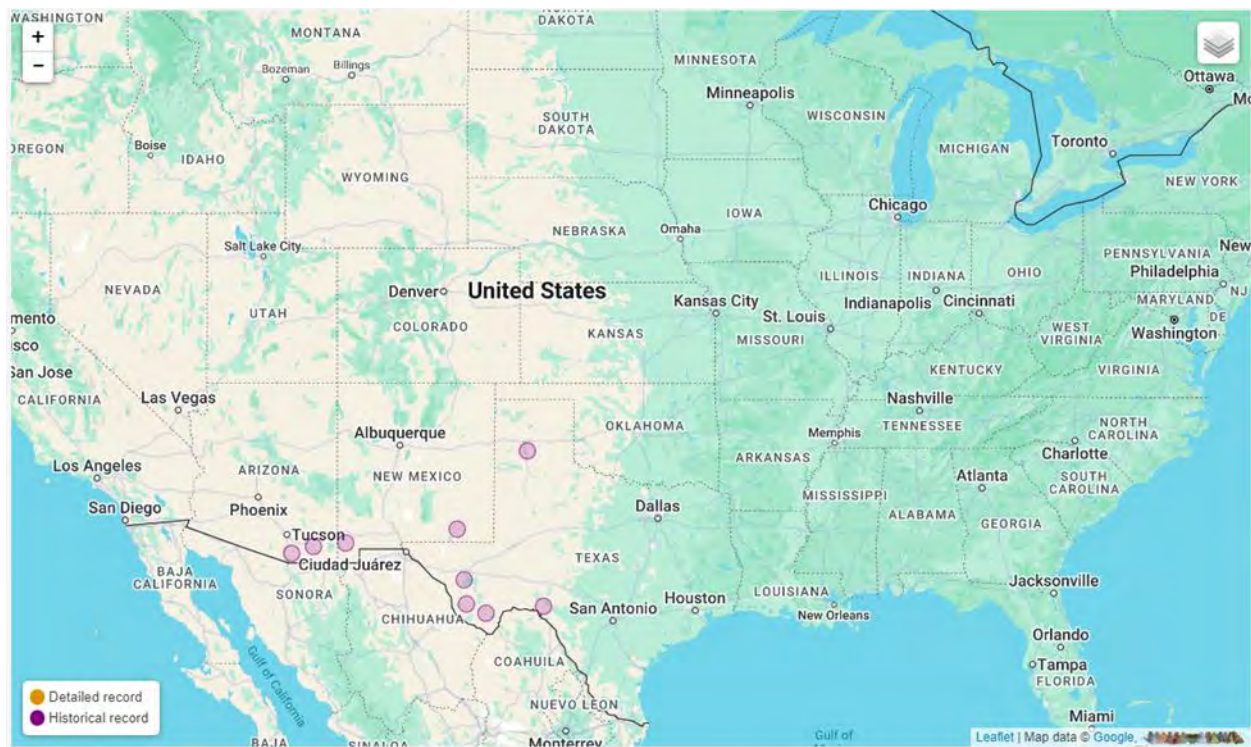


Figure 13. Range map of the drooping star-of-Bethlehem from Butterflies and Moths of North America (BAMONA) project (Lotts and Naberhaus 2024).



Figure 14. Distribution map of the drooping star-of-Bethlehem from the “Moth Photographers Group” (2019) at the Mississippi Entomological Museum at Mississippi State University (Note that data points are normalized to reflect center-of-county locations).

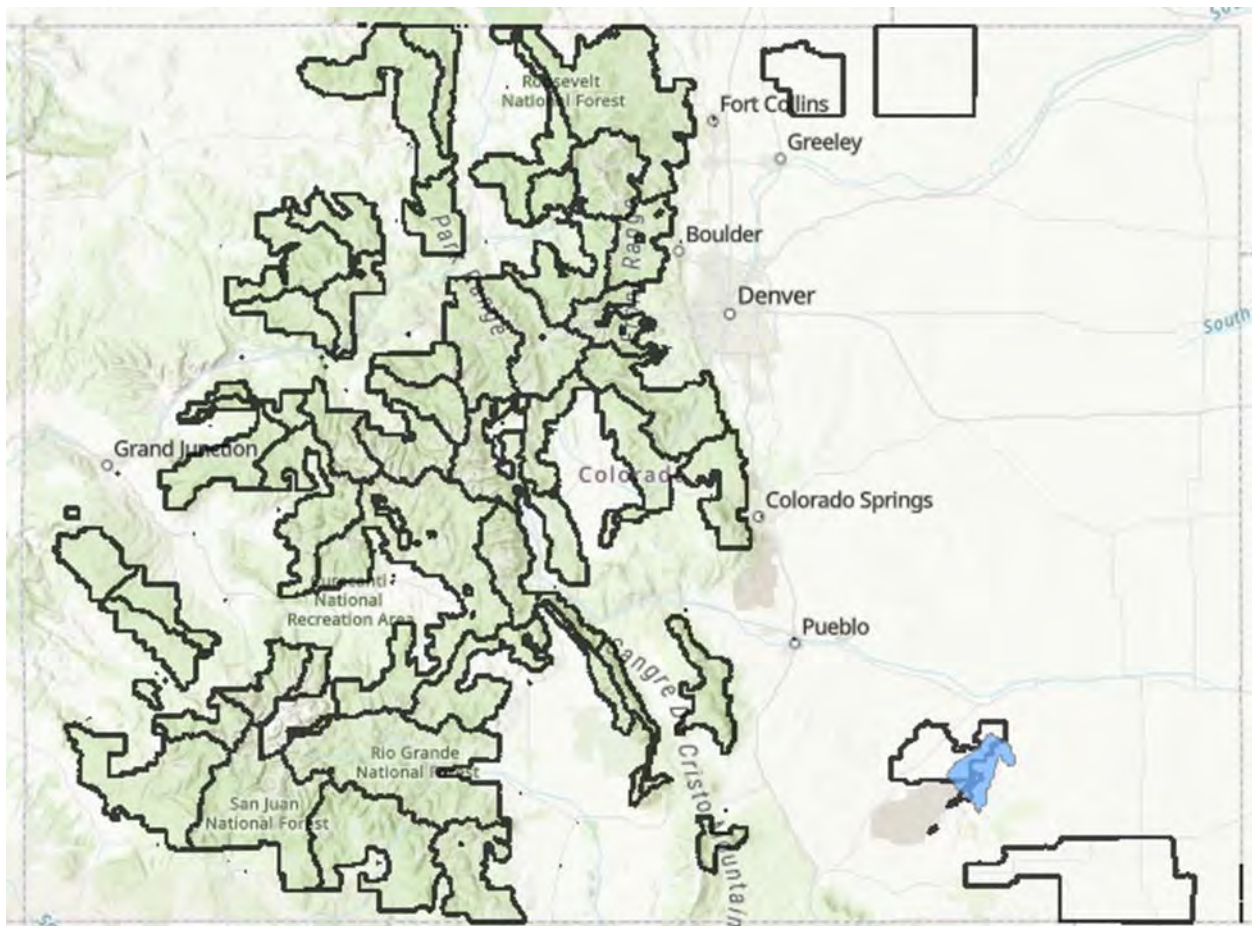


Figure 15. Distribution map of the drooping star of Bethlehem in Colorado (blue polygon) in relation to the plan area. Map from CNHP.

Eastern Ringtail

(Erpetogomphus designates)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF contains six records of the species in the plan area, spanning 2005-2023 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Insufficient water quantity and degraded water quality can pose a threat to populations by causing mortality of aquatic larvae.
 - b. Large dams, altered hydrologic regime, dredging, and pollution are all threats to habitat.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known.
 - b. Aquatic/riparian habitat on the plan area has declined related to drought.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is not at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size not known; six occurrence records in the plan area.
 - b. Aquatic and riparian habitats are restricted in the plan area related to drought.

Species Status

G5; S2 in Colorado, SNR in Kansas.

Taxonomy

Erpetogomphus designatus is accepted as valid (ITIS 2024c).

Species range

Overall Species range

The species range is primarily the southeastern United States, but also includes a disjunct population in the Black Hills of South Dakota, Illinois and Maryland south to Durango and Florida, with isolated records in Montana, Wyoming, Nevada, and Arizona (Figure 16; (Paulson et al. 2024, Sibley et al. 2019).

Description of how the population in the plan area fits within the overall range

The plan area is not at the edge of the species' range (Figure 16).

Distribution, abundance, and trend in the plan area

Population

The eastern ringtail is considered globally secure (G5) but vulnerable, imperiled, or critically imperiled in several states (NatureServe 2024). The species is considered imperiled (S2) in Colorado (NatureServe 2024), but can be locally common along Arkansas River at Lamar, the lower Purgatoire River, and John Martin Reservoir (Prather and Prather 2015). Population size and trend in the plan area are not known. There are six occurrence records in the plan area.

Habitat

The eastern ringtail is classified as a river-breeding dragonfly odonate (NatureServe 2024) that prefers clear streams and riffle habitat with moderate current (Mahato and Kennedy 2008). It is considered a strictly lotic species (Patten et al. 2015), but also has been shown to use lake habitat (Osborn 2005). They also tend to associate themselves with detritus materials (Mahato and Kennedy 2008).

In Colorado, the eastern ringtail has been associated with "suitable habitats in the Arkansas and Republican River drainages in the southeastern and eastern Great Plains" (Prather and Prather 2015). Within the plan area, the species has been documented only in the Timpas Unit of the Comanche National Grassland. Most observations in the plan area have been near the Purgatoire River.

Aquatic and riparian habitat has declined in the plan area due to several factors, including the increased abundance of invasive tamarisk that alters floodplain hydrology (USDA Forest Service 2005c) and severe declines in stream flows downgradient from the Ogallala- High-Plains Aquifer (Brikowski 2008). Drawdown of the aquifer has substantially decreased the discharge to most of the rivers in the Carrizo unit of the Comanche and the entire Cimarron National Grassland (USDA Forest Service 2005b).

Threats (arising from on or off the plan area)

Population

Insufficient water quantity and degraded water quality, including sedimentation and anaerobic conditions, can be a threat to populations by causing mortality of larvae (Mahato and Kennedy 2008). In general, Odonata (damselflies and dragonflies) have among the lowest extinction risk threat levels among invertebrate groups that have been assessed to date (Clausnitzer et al. 2009). They generally have above-average dispersal ability, relatively wide distribution ranges, ability to live in partially degraded habitats, and relatively high capability to rapidly colonize new or restored habitats, all of which contributes to relatively lower extinction risk than other taxonomic groups (Clausnitzer et al. 2009).

Habitat

NatureServe (2024) identifies large dams as a general threat to the habitat of the river-breeding damselflies in the order Odonata because they can create separation barriers to movement of sexually mature adults between microhabitats. Altered hydrologic regime, including reduced water flow, can reduce habitat quality for the eastern ringtail (Mahato and Kennedy 2008). Dredging and pollution are

also considered habitat threats to eastern ringtail habitat in Florida (Florida Natural Areas Inventory 2023).

Ecological conditions

Ecological condition requirements

To successfully complete its life cycle, the eastern ringtail needs suitable habitat for both its aquatic and terrestrial life stages. It has been shown to prefer waters with lower pH, emergent and floating vegetation (Osborn 2005), and detritus materials (Mahato and Kennedy 2008). Water temperature affects larval growth (Mahato and Kennedy 2008). Suitable terrestrial habitat can include more open areas away from water (Wisconsin Aquatic and Terrestrial Resources Inventory and Wisconsin Department of Natural Resources 2024). The eastern ringtail will use both the ground and low vegetation for perching (Wisconsin Aquatic and Terrestrial Resources Inventory and Wisconsin Department of Natural Resources 2024). Riffle habitat also seems to be preferred by patrolling adult males (Wisconsin Aquatic and Terrestrial Resources Inventory and Wisconsin Department of Natural Resources 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species depends on aquatic habitat for breeding and larval development. Riparian and wetland habitats are limited in the plan area (see Appendix) and therefore habitat is considered restricted for the aquatic portion of this species' life history cycle.

Critical biological characteristics

Adult odonates generally forage within ~980 feet (300 meters) of a breeding site (NatureServe 2024). Flight season in Nebraska has been documented as early July – late September (Sibley et al. 2019). Observations of adults in the plan area were from July – early October (Van Scoyoc 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

As aquatic larvae, dragonflies such as the eastern ringtail are benthic predators and play an important role in aquatic ecosystems (Mahato and Kennedy 2008).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Larvae of the eastern ringtail have a relatively high tolerance of cadmium and copper and is considered moderately tolerant to organic pollution (Mahato and Kennedy 2008).

Maps of Species Range and Known Occurrences in Plan Area

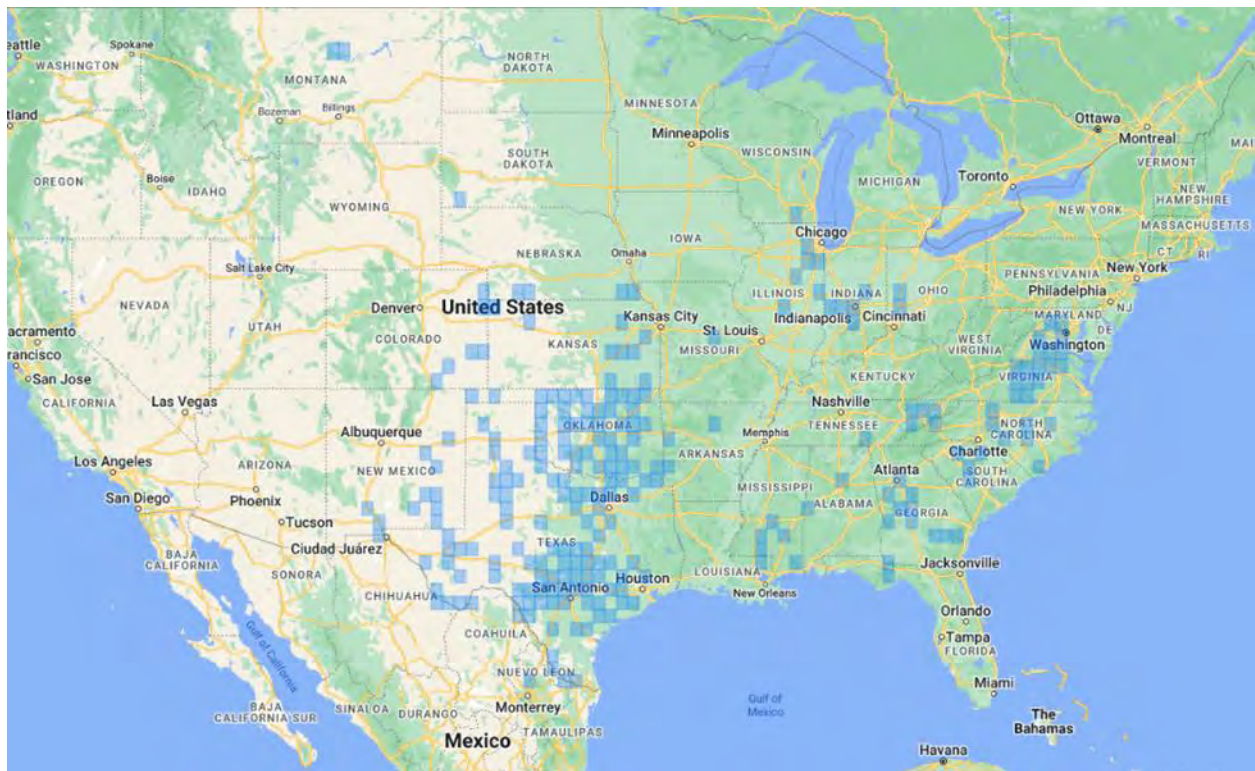


Figure 16. Sighting map of eastern ringtail from Odonata Central.

Elsa Sphinx Moth

(*Sagenosoma elsa*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one element occurrence (EO) with two records on the Comanche NG between 08/15/1994 to 08/17/1994 (Van Scoyoc 2024).

Year of Last Known Occurrence: 1994

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. No significant threats are reported. Increased recreational use in the plan area was noted (Van Scoyoc 2024).
2. Declining trends in populations or habitat in the plan area:
 - a. Quality of habitat for pollinators is generally reduced in the plan area because of reduced herbaceous diversity (USDA Forest Service 2024a, b, c).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in plan area is on the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Only one element occurrence (EO) with two specimen records on Rourke Ranch in Purgatoire Canyon in Comanche NG is found from 1994, but *Lycium pallidum* which is associated with larvae of this species has been found throughout Comanche NG.

Species Status

G4; S1 in Colorado.

Taxonomy

Sagenosoma elsa is accepted as valid (Integrated Taxonomic Information System (ITIS) 2024d).

Species range

Overall Species range

This species occurs in much of Arizona and western and northern New Mexico, extending into adjacent counties in Colorado and Utah, and perhaps a bit of Mexico. As mapped by Tuttle (2007) the range is roughly the size of Arizona, about 300,000 km² (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

Northern edge of the range (Figure 17).

Distribution, abundance, and trend in the plan area

Population

One element occurrence (EO) with two specimen records on Comanche NG between 08/15/1994 to 08/17/1994 on Rourke Ranch in Purgatoire Canyon in Comanche NG.

Habitat

The specimens were collected from Canyon bottom. *Juniperus monosperma* woodland above, *Opuntia imbricata* grasslands in bottom, very weedy (Van Scoyoc 2024). Quality of habitat for pollinators is generally reduced in the plan area because of reduced herbaceous diversity (USDA Forest Service 2024a, b, c).

Threats (arising from on or off the plan area)

Population

No threats noted for this species. This has a moderate range, but it is fairly common in parts of it. There is a lot of uncertainty as to number of occurrences, especially where it occurs at relatively low elevations (NatureServe 2024).

Habitat

No known threats are documented. The foodplant is thorny so probably not preferred by grazing ungulates (NatureServe 2024). The EO area was historically grazed but discontinued. Recreational use increasing (Van Scoyoc 2024).

Ecological conditions

Ecological condition requirements

The larvae have been recorded on *Lycium pallidum*. *Lycium pallidum* is associated with sagebrush, desert shrub, mountain shrubs, pinyon-juniper and desert grasslands (Matthews 1994). *Lycium pallidum* is found on plains and flats, along washes and arroyos, on dry rocky hills, mesas, and bajadas, and on rocky slopes and canyons of hills and mountains. No information what adults feed on. Tuttle (2007) note the tongue is somewhat short which suggests they feed on some shallow or smallish flowers, or possibly something other than nectar (NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

One element occurrence of *Sagenosoma elsa* on Rourke Ranch in Purgatoire Canyon in Comanche NG is found, but *Lycium pallidum* has been found throughout Comanche NG.

Critical biological characteristics

Caterpillars pupate in underground burrows. The larvae have been recorded on *Lycium pallidum*.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Sphinx moth caterpillars are preyed upon by many creatures, including mantids, assassin bugs, birds, and spiders. Sphinx moths are also eaten by many creatures, but they often have subdued colors which help to provide camouflage (Entomology 2010).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information suggests ecosystem structure and function influence this species on the plan area.

Maps of Known Occurrences in Plan Area

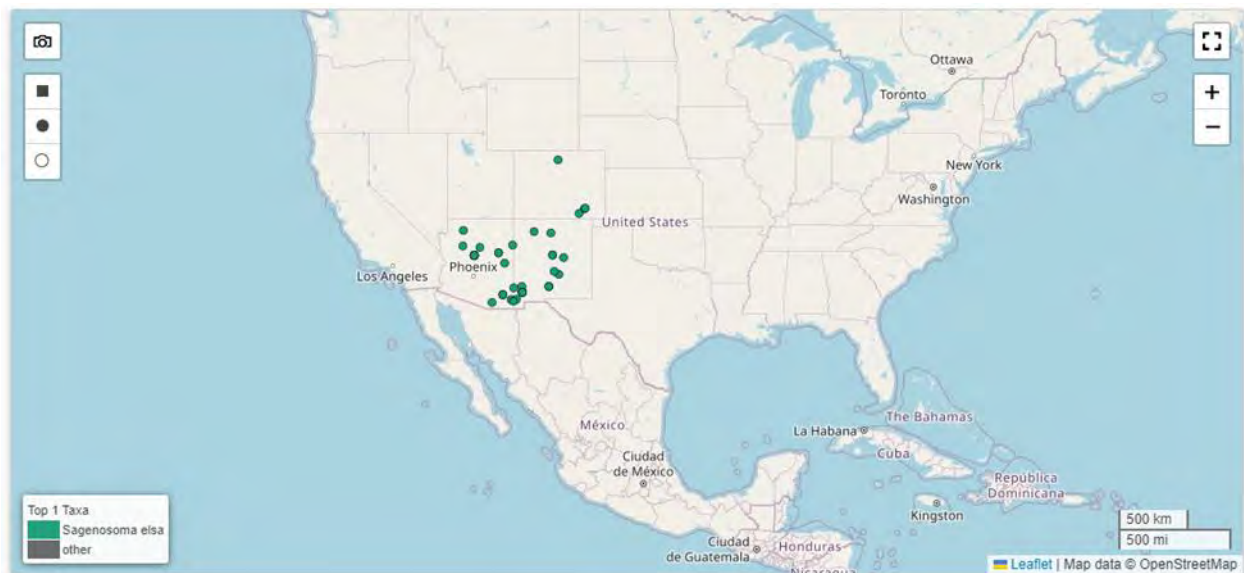


Figure 17. Map of known occurrences of the Elsa sphinx moth in the United States.

Ghost Tiger Beetle

(*Ellipsoptera lepida*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF contains one record of the species in the plan area (Van Scoyoc 2024). The source data is the C.P. Gillette Museum of Arthropod Diversity, which has a preserved specimen of one adult. Although the coordinate uncertainty is 1.9 miles (3,000 meters), the locality for the collection is described as "Picture Canyon, Comanche National Grassland" (Colorado State University 2024). Therefore, this species is known to occur in the plan area.

Year of Last Known Occurrence: 1994

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Trampling (e.g., livestock, foot, or vehicular traffic) and severe storms represent threats to populations.
 - b. Sand excavation, development, and stabilization of sand dunes by lack of natural disturbance and encroaching vegetation represent threats to habitat.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known.
 - b. The distribution of open less vegetated sand dunes in the plan area is naturally constantly shifting, with no discernable trends identified (USDA Forest Service 2024e).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size: not known; one occurrence record in the plan area.
 - b. Open, unstable sand dunes are a restricted microhabitat.

Species Status

G3; S3 in Colorado; S2 in Kansas.

Taxonomy

Ellipsoptera lepida is accepted as valid; a taxonomic synonym is *Cicindela lepida* (ITIS 2024d).

Species range

Overall Species range

The ghost tiger beetle is patchily but widely distributed from New York to Arizona, USA but it is absent from southeastern states. It is also found in southeastern Canada, from Alberta to Quebec (Pearson et al. 2006, NatureServe 2024) (Figure 18).

Description of how the population in the plan area fits within the overall range

The plan area is located at the western edge of the species' range (Figure 18).

Distribution, abundance, and trend in the plan area

Population

Across its range, the ghost tiger beetle is uncommon to rare (Hall et al. 2024) and population declines have occurred in the eastern portion of its range (NatureServe 2024). Pearson et al. (2006) state the species "is now absent from many of its historical breeding sites, probably due to sand excavation, land development, and stabilization of dunes by encroaching vegetation." There is a singular occurrence record in the plan area. The species has solitary behavior and is usually present at low densities (Pearson et al. 2006). Population size and trend in the plan area is not known. Because it is a cryptic species, it may be underreported due to lack of concerted surveys.

Habitat

Most tiger beetles have high ecological niche specificity—occupying a narrow or highly specialized habitat, usually with open microhabitat patches for the larvae (Knisley 2011); (Pearson and Wiesner 2023). Suitable habitat for the ghost tiger beetle includes loose sand with sparse vegetation, and well-drained open ground: sand dunes, dune fields, blowouts, sand flats, roadside banks, sandy riverbanks and bars, coastal dunes, sand ridges in open forest (Montana Natural Heritage Program 2024b). The species requires early successional conditions with open, unstable sand (Smith et al. 2021). Larval tiger beetles are typically absent from microhabitats with high plant cover and may disappear if vegetation encroaches in areas of larval burrows (Knisley 2011).

There is a history of land management practices aimed at dune minimization and eradication of blowouts via revegetation and sand control (Kelso et al. 2007). Dynamic dune systems have generally been reduced because of these active eradication programs (Kelso et al. 2007). In the plan area, dynamic dunes primarily occur in the sandsage prairie ecosystem (Locklear 2021). Unstable dunes and blowouts are very patchily distributed and generally small within this ecosystem. The distribution of open less vegetated sand dunes in the plan area is naturally constantly shifting, with no discernable trends identified (USDA Forest Service 2024e).

Within the plan area, the ghost tiger beetle has only been observed in Picture Canyon, Comanche National Grassland (Van Scoyoc 2024). Its distribution in the plan area is not known, presumably due to lack of concerted surveys although tiger beetles are well-studied compared to other insects (Pearson and Wiesner 2023).

Threats (arising from on or off the plan area)

Population

Trampling by either foot, livestock, or vehicular traffic represent a significant threat to larvae of these species (Hall et al. 2024, Montana Natural Heritage Program 2024b). Severe storms threatened coastal populations of this species because they have limited potential for recolonization (NatureServe 2024).

Habitat

Threats to habitat include recreational ATV use on open sand dune habitat, sand excavation, development, and stabilization of sand dunes by lack of natural disturbance, fire suppression, and encroaching vegetation (NatureServe 2024, Pearson et al. 2006). Anthropogenic disturbances can have both positive and negative effects on tiger beetle habitats—for example, dirt trails can help create open patches of favorable microhabitats for tiger beetles, but repeated disturbance of the soil surface by vehicles can also affect populations (Knisley 2011).

Ecological conditions

Ecological condition requirements

The ghost tiger beetle has narrow habitat requirements for dynamic sand dunes that shift with the winds rather than being stabilized by vegetation (NatureServe 2024) (Hall et al. 2024). NatureServe (2024) describes that “Larvae of this species burrow deeper (2-3 m) than most other tiger beetle species and require deep, loose, and sparsely vegetated sandy areas.” Suitable larval burrow habitat is often in sheltered bowl areas of dunes or slopes of banks exposed to wind (Montana Natural Heritage Program 2024b). The larvae require freedom from trampling by either foot or vehicular traffic (Hall et al. 2024). The adults require shelter, such as grass or burrows, from excessive heat (Montana Natural Heritage Program 2024b).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species benefits from a mosaic of successional conditions, particularly natural disturbance such as fire that reduces vegetation from encroaching and stabilizing sand dunes (Montana Natural Heritage Program 2024b, NatureServe 2024), (Hall et al. 2024).

Dune habitat in the plan area occurs within the sandsage prairie ecological system, which are stabilized by sand sagebrush (*Artemisia filifolia*). Unstable dunes and blowouts are very patchily distributed and generally small.

Most of the plan area is grazed, and grazing can have complex effects on tiger beetle habitat. Heavy and persistent livestock grazing often degrades habitat quality for tiger beetles and cause direct mortality of larvae via trampling (Knisley 2011). Limited grazing can improve tiger beetle habitat by reducing vegetation density and creating favorable microhabitats such as cattle trails (Knisley 2011).

Critical biological characteristics

The ghost tiger beetle has a two-year life cycle with two broods; adults of each brood emerge in alternate years (Montana Natural Heritage Program 2024b).

It is a summer species that emerge as adults in early summer, then mate and lay eggs before dying (Montana Natural Heritage Program 2024b). In Colorado, the active period for adults is June to August (Montana Natural Heritage Program 2024b). Adults can be active during the day but may seek shelter during particularly hot periods; they are also active in the evening (Hall et al. 2024). Adults are capable of dispersing “many kilometers” from breeding habitat (Montana Natural Heritage Program 2024b).

Hall et al. (2024) state that “Larval burrows are found within sand drifts, usually at the base of dunes.” The larvae live for approximately 22 months, molting through three instars to pupation in the larval burrow (Montana Natural Heritage Program 2024b). Adults also overwinter in burrows (Montana Natural Heritage Program 2024b).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Adult and larval ghost tiger beetles are generalist invertivores, both of which prey heavily upon ants (Montana Natural Heritage Program 2024b, NatureServe 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

There is limited information about the importance of sandsage prairie to insects, but the ecological integrity of this plant community is suspected to play a significant role within the Great Plains, especially for ghost tiger beetle (Locklear 2021).

“Sandy habitats favored by the species (Smith et al. 2021) experience vegetation encroachment and stabilization as succession proceeds (Shelford 1907, Catling et al. 2008), and benefit from disturbance that retains a mosaic of successional conditions...Some colonies (particularly the larval burrows) could open sand dune, but grazing at appropriate times and stocking levels could also be beneficial by keeping vegetation cover more open (Knisley 2011). Prescribed fire in late autumn could also be a useful tool for sustaining habitat once larvae are in deeper overwinter burrows” (Montana Natural Heritage Program 2024b).

Where human disturbance has been found to negatively affect larval development of rare tiger beetles, fencing of dunes to prevent traffic has improved larval survival (Knisley 2011).

Maps of Species Range and Known Occurrences in Plan Area

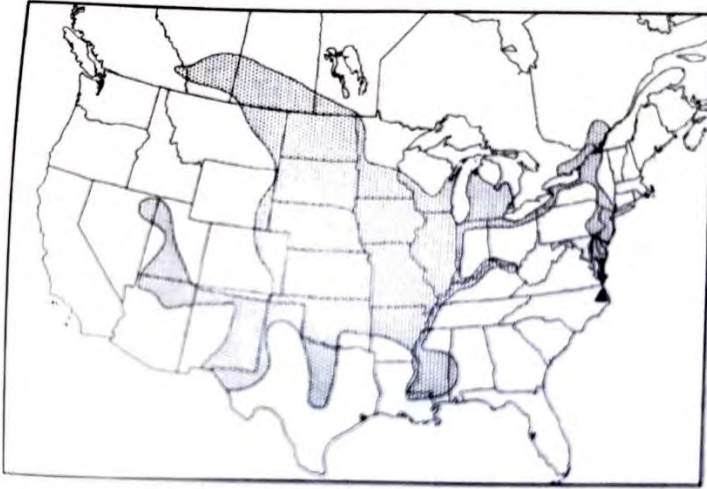


Figure 18. Range map of the ghost tiger beetle from Pearson et al. (2006).

Green Skipper

(*Hesperia viridis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF contains ten records of the species in the plan area, spanning 1970-2021 (Van Scoyoc 2024). These records come from iNaturalist and Colorado State University's C.P. Gillette Museum of Arthropod Diversity (Van Scoyoc 2024) and are considered reliable.

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known.
3. Quality of habitat for pollinators is generally reduced in the plan area because of reduced herbaceous diversity (USDA Forest Service 2024b, c, a). Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is in the central portion of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: not known; ten occurrence records in the plan area.
 - b. Ecological conditions: the habitat of the Green Skipper is varied and abundant and does not represent a restricted ecological condition.

Species Status

G5; S5 in Colorado; S2 in Kansas.

Taxonomy

Hesperia viridis is accepted as valid (ITIS 2024d).

Species range

Overall Species range

The species' range includes Eastern Wyoming and western Nebraska south through the foothills and high plains of Colorado, western Kansas, eastern Arizona, New Mexico, western Oklahoma, west Texas, and

northern Mexico (Butterflies and Moths of North America 2024b) (Figure 19, Figure 20). It is a low- to mid-elevation species (Glassberg 2001).

Description of how the population in the plan area fits within the overall range

The plan area is located in the central portion of the species' range (Figure 19, Figure 20).

Distribution, abundance, and trend in the plan area

Population

The population size and trend in the plan area is not known. There are ten occurrence records in the plan area. Across its range, it is generally common and “there is no indication of a species-wide population decline” (NatureServe 2024). Lotts and Naberhaus (Butterflies and Moths of North America 2024b) note that it may still be “quite rare in parts of its range, especially at the periphery.”

Habitat

Within the plan area, the species has been documented at several locations across the Comanche National Grassland (Picture Canyon, Vogle Canyon, Withers Canyon, Purgatorie Canyon, and near East Carrizo Creek), but has not been documented in the Cimarron National Grassland (Van Scoyoc 2024). Habitat includes mesquite and juniper grassland, chaparral, pine or oak woodland, prairie, gullies, bases of mesas, canyons, ravines, roadsides, and dunes (Butterflies and Moths of North America 2024b, NatureServe 2024, Pyle 2004). Records of the species in the plan area have been associated with varied habitat types, including shortgrass prairie, pinyon-juniper woodland, and riparian woodland. Quality of habitat for pollinators is generally reduced in the plan area because of reduced herbaceous diversity (USDA Forest Service 2024a, b, c).

Threats (arising from on or off the plan area)

Population

The species has no known threats to populations (Butterflies and Moths of North America 2024b, NatureServe 2024).

Habitat

The species has no known threats to habitat (Butterflies and Moths of North America 2024b, NatureServe 2024).

Ecological conditions

Ecological condition requirements

The species requires suitable prairie habitat with larval foodplant grasses and nectar flowers for successful larval and adult butterfly survival and reproduction. The caterpillars depend on grasses as the host species, including blue grama (*Bouteloua gracilis*), fluff grass (*Erioneuron pulchellum*), and buffalograss (*Buchloe dactyloides*) (Butterflies and Moths of North America 2024b, Pyle 2004). Adults consume nectar from a variety of flowers (Butterflies and Moths of North America 2024b), but rabbit brush

is singled out in one source (Pyle 2004). In Texas, the preferred nectar sources are milkweeds (*Asclepias*) in the spring and thistles (*Cirsium*), blazing star (*Liatris*), and yellow composites in the fall (McGuire 1982).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Most occurrence records of this species in the plan area spatially map within the Landfire Existing Vegetation Type layer (EVT) of Western Great Plains Shortgrass Prairie, with a lesser proportion occurring in Central Mixedgrass Prairie Shrubland, Southern Rocky Mountains Pinyon-Juniper Woodland, and Western Great Plains Riparian Woodland. Given the species' use of varied habitat types and the abundance of shortgrass prairie habitat in the plan area, this does not represent a restricted ecological condition.

Critical biological characteristics

As a larval grass/sedge feeder, it likely overwinters as mature larvae (Edwards 2024). Across its range, the Green Skipper can have one or two broods per year, but two broods are more common (Glassberg 2001). In the plan area, the species likely has two broods per year, with adults flying from April to June and again from August to October (Glassberg 2001, Pyle 2004). The adults can tolerate cold weather and persist into fall (Pyle 2004). The fall flight is often higher magnitude than the spring flight (McGuire 1982).

Skippers—named for their rapid, “skipping” style of flight—can be strong fliers, capable of speeds over 0.6 miles/hr for short distances (NatureServe 2024, Pyle 2004). Adult males wait in canyons and gulches to await females (Glassberg 2001, Butterflies and Moths of North America 2024b).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Butterflies, including skippers, play an important role in pollination of prairie wildflowers and shrubs while feeding on nectar (Xerces Society for Invertebrate Conservation 2019). Probable predators include birds, reptiles, and amphibians (Bowers et al. 1985, Ghanzar et al. 2016).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found specifically for this species. Butterflies as a group are generally highly sensitive to environmental change, including climatic fluctuations (Thomas 2005). The response of butterflies to grazing and burning practices in prairie habitat has been shown to be highly variable by species and so cannot be generalized (Panzer 2002) (Vogel et al. 2007). Fire can influence butterflies both directly via mortality of eggs and larvae and indirectly via effects on habitat features such as changes in the litter layer and the amount of bare ground (Vogel et al. 2010). Although the short-term responses of butterflies to fire can be either positive or negative, local populations in fragmented habitat may not survive repeated prescribed burns (Panzer 2002). Several species of skippers (not including the Green Skipper) have been shown to suffer negative effects from fire with effects continuing for approximately 5 years post-fire (Swengel 1996, Vogel et al. 2010). For all pollinators of the Great Plains, Hanberry et al. (2021) advise that “Retention of unburned areas as refugia is critical, particularly for species of conservation concern. Managers should plan conservatively, by assuming 100% mortality of pollinators in the burn unit.”

Within the Great Plains region, tallgrass prairie has been found to support significantly higher butterfly species richness than shortgrass plots (Collinge et al. 2003). Urbanization appears to have no impact on butterfly species richness and composition in grassland ecosystems where parcels of grassland are at least 12 acres (5 hectares) (Collinge et al. 2003). Urbanization impacts likely increase in more fragmented grasslands composed of smaller parcel sizes ((Collinge et al. 2003). Habitat characteristics at the patch scale (as opposed to the landscape scale) explain a greater proportion of the variation in abundance and richness of grassland butterflies (Collinge et al. 2003).

Maps of Species Range and Known Occurrences in Plan Area

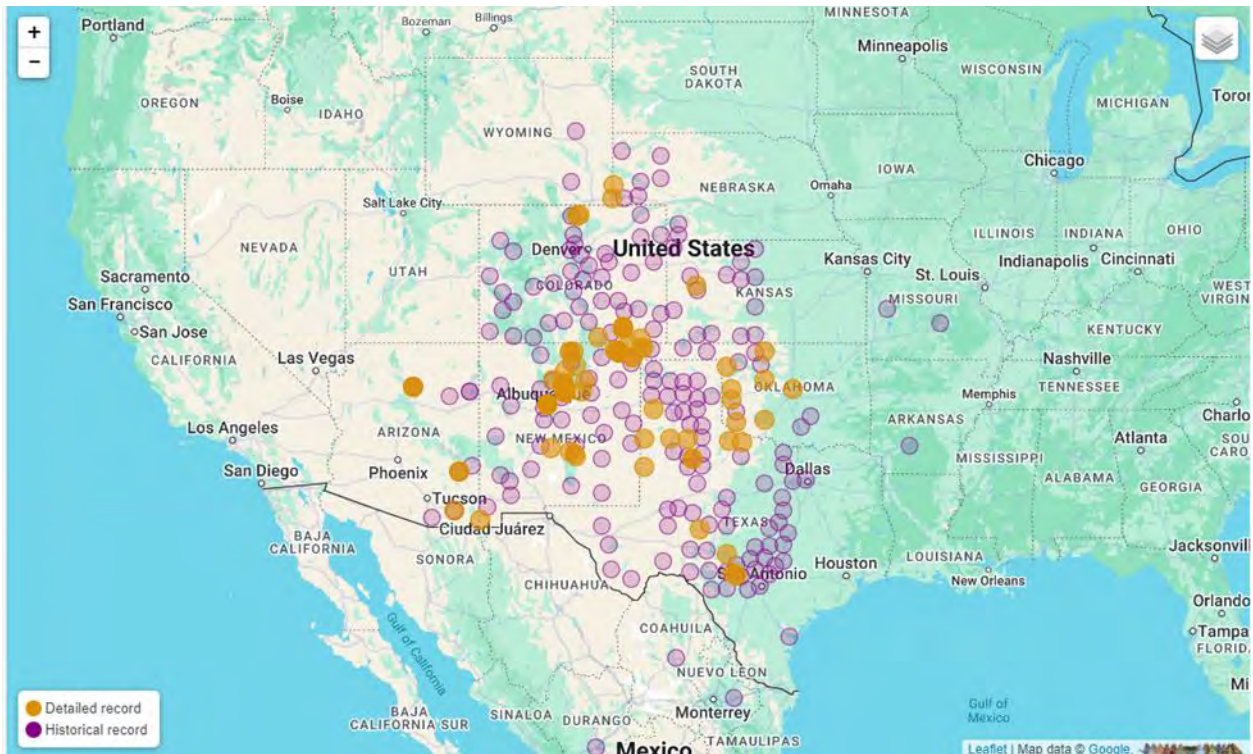


Figure 19. Range map of the Green Skipper from Butterflies and Moths of North America (BAMONA) project (Lotts and Naberhaus 2024).

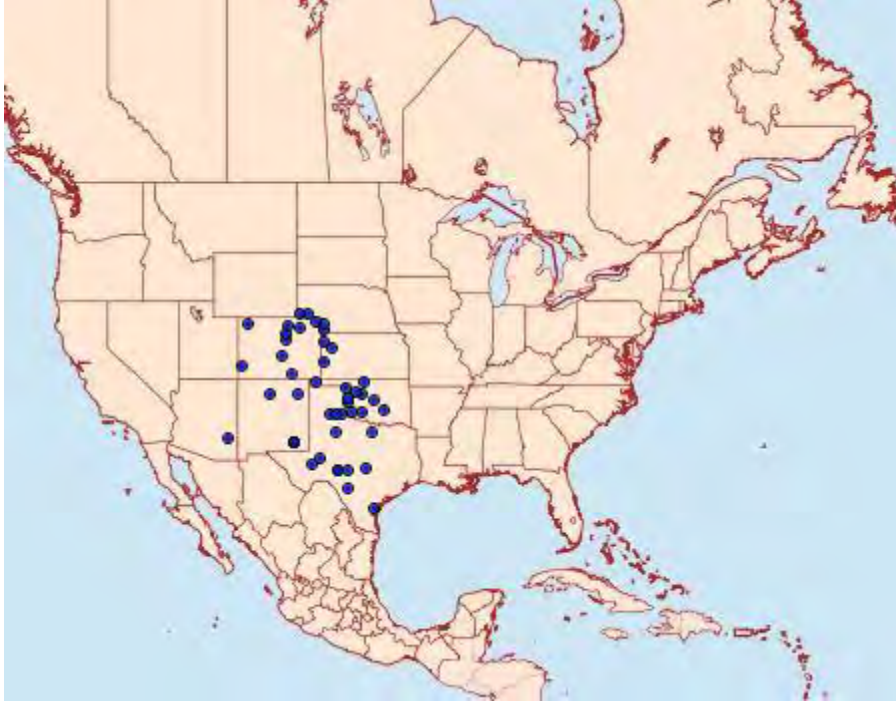


Figure 20. Distribution map of the Green Skipper from the “Moth Photographers Group” (2019) at the Mississippi Entomological Museum at Mississippi State University (Note that data points are normalized to reflect center-of-county locations).

Iowa Skipper

(*Atrytone arogos iowa*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one historical occurrence record in the plan area according to the USGS Northern Prairie Wildlife Research Center, as reported by the Butterflies and Moths of North America (BAMONA) project (Lotts and Naberhaus 2024). This record does not include an observation date or observation notes but was verified in 2004 (Lotts and Naberhaus 2024).

Year of Last Known Occurrence: 2004

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Threats to population include both wildfires and prescribed burning if not conducted carefully due to this subspecies being completely reliant on grasses for all of its life stages.
 - b. Threats to habitat include fire (both wildland and prescribed), overgrazing, fragmentation and disturbance from anthropogenic uses, roads, non-native invasive species, and drought conditions.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trend in the plan area is not known for this species as there is only one known occurrence record.
 - b. Habitat: Declining trend in habitat quality for this species due to altered fire regime, invasive cheatgrass, encroachment of woody species, and range condition in the plan area.
3. Quality of habitat for pollinators is generally reduced in the plan area because of reduced herbaceous diversity (USDA Forest Service 2024a, b, c). Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the western edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population numbers within the plan area are unknown; one occurrence record.
 - b. Ecological Conditions: Ecological conditions are not restricted within the plan area.

Species Status

T2; SNR in Colorado; S3 in Kansas; Region 2 Regional Forester Sensitive Species (RFSS); Positive 90-day Finding and under review in a 12-month Status Review by US Fish and Wildlife Service (USFWS 2024).

Taxonomy

There are no other known synonyms for this subspecies. There are two recognized subspecies for the parent, arogos skipper (*Atrytone arogos*): *Atrytone arogos arogos* and *A. arogos iowa* (NatureServe 2024).

References made to the arogos skipper that fall within the geographical range of the Iowa skipper are in fact for the Iowa skipper. In the consulted literature there does not appear to be a separation between references made to the parent versus the subspecies. NatureServe (NatureServe 2024) states that "Populations presently assigned to this subspecies range from Minnesota and the Dakotas through southwestern Missouri to central Texas, USA. There are also isolated colonies in Illinois and Arkansas. Also, in the Colorado Front Range and Wyoming. All records for the species in those areas refer to subspecies *iowa*. Populations in and east of Louisiana are subspecies *arogos*."

Species range

Overall Species range

According to the Minnesota Department of Natural Resources, this subspecies is roughly coincident with the midcontinent grassland biome, from North Dakota and eastern Montana east to Illinois and south to Texas (Minnesota Department of Natural Resources 2024a). This subspecies is rare and sporadic in much of its range, especially in the eastern portion, although is fairly common in Oklahoma and regular in Nebraska and Colorado and may not be well managed (too much fire) on some preserves (NatureServe 2024). In most of the range it seems indicative of rather pristine habitats; however, it seems less rare in some western parts of range (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

The plan area is on the western edge of the range for the Iowa skipper according to the BAMONA project (see Figure 21; (Lotts and Naberhaus 2024)).

Distribution, abundance, and trend in the plan area

Population

The population size and trend in the plan area is not known. There is one occurrence record in the plan area but there is no observation date or observation notes associated with it (Lotts and Naberhaus 2024). It is considered rare and sporadic across a good portion of its range but is seen as regular in Nebraska and Colorado (NatureServe 2024).

Swengel et al. (2010) documented continued declines of this subspecies in the upper prairie states. During the period 2010-2019, this subspecies was reported 8-12 times annually from observations and specimens mostly from Nebraska, Colorado, and Oklahoma (NatureServe 2024). A 2018 resurvey of 18 historical sites for this subspecies in Iowa reported seeing no individuals (Olsen 2018); the subspecies is rarely if ever seen now in the state (NatureServe 2024). As of January 2020, the subspecies has not been seen in Minnesota since 2008 (NatureServe 2024). However, the subspecies is regularly reported in Oklahoma (53 records are from 2010-2019), with some populations being numerous (over 100 individuals) (NatureServe 2024).

Habitat

This is strictly a prairie subspecies; however, habitats range from shortgrass prairie in Colorado to mesic or dry tall grass prairie in several areas (NatureServe 2024). Throughout most of the species range it seems indicative of pristine habitats (NatureServe 2024).

Quality of habitat for pollinators is generally reduced in the plan area because of reduced herbaceous diversity (USDA Forest Service 2024a, b, c).

Threats (arising from on or off the plan area)

Population

This subspecies is vulnerable to virtually any fire at any season due to all its life stages being associated with grassland prairie habitats (NatureServe 2024).

Habitat

Specifically for this subspecies in the western portion of the range, inappropriate management (including frequent rotational burning) and loss of habitat to agricultural activities are threats, whereas in the eastern portion of the range some fire or other disturbance is needed to maintain habitat (NatureServe 2024).

Threats to shortgrass prairie habitat in the plan area include overgrazing by livestock and fire suppression (CPW 2015), disturbance or fragmentation from anthropogenic activities, development and existence of roads (USDA Forest Service 2024d)), encroachment of non-native invasive species (USDA Forest Service 2005c), and persisting drought conditions (Smith 2024), (CPW 2015). Aggressive fire suppression has also occurred in the plan area and represents a departure from the natural frequency of fire (USDA Forest Service 2005c).

Although a more natural fire return interval may be beneficial for the shortgrass prairie habitat in general, it would have adverse implications for this subspecies based on several sources cited throughout this species evaluation.

Ecological conditions

Ecological condition requirements

This subspecies has been known to favor grasses of the genus *Andropogon* where females lay their eggs singly on the undersides of the grass blades two or three inches below the tips (Heitzman 1966). *Andropogon gerardii* (big bluestem) is the confirmed foodplant in Missouri, but other grasses are almost certainly used as well such as *Schizachyrium scoparium* (little bluestem) (NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Although this species is associated with shortgrass prairie habitat, which is abundant in the plan area, they are known to also use other mesic or dry tall grass prairies in other areas; therefore, this does not represent a restricted ecological condition.

Critical biological characteristics

Larval stage is most of the year. Pupal stage would be about the two or three weeks preceding adult flight. Adults fly in late June and July northward and in Colorado. Two broods southward with the second partial in Missouri. In Missouri first brood in June, second in mid-August into September. Generally late May-June and late August-September elsewhere.

This species is considered endemic to a single nation (NatureServe 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Butterflies, including skippers, play an important role in pollination of prairie wildflowers and shrubs while feeding on nectar (Xerces Society for Invertebrate Conservation 2019). Probable predators include birds, reptiles, and amphibians (Ghanzar et al. 2016, Bowers et al. 1985).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Larvae live in nest high on the grass and so far, is known even to hibernate and pupate there (Heitzman 1966). Thus, all stages would be vulnerable virtually any fire at any season. Like most specialized prairie Lepidoptera this one seems to have no particular adaptations to fires (NatureServe 2024).

See additional general influences described in the green skipper species evaluation.

Maps of Species Range and Known Occurrences in Plan Area

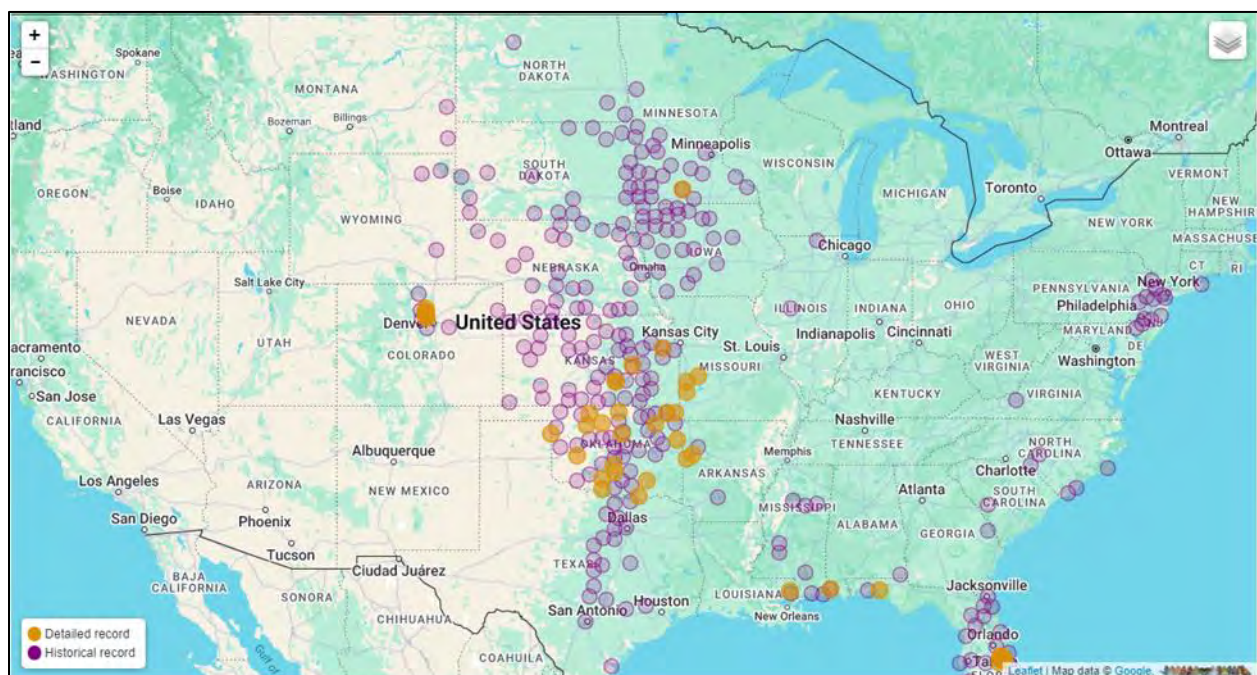


Figure 21. Species distribution based on detailed and historic records from the BAMONA project (Lotts and Naberhaus 2024).

A Mayfly

(*Neochoroterpes oklahoma*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CNHP contains one Level One occurrence polygon of the species in the Purgatoire River within the plan area from 1989 (Van Scoyoc 2024). This record has sufficient precision to demonstrate this species is known to occur in the plan area.

Year of Last Known Occurrence: 1989

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Degraded water quality (via organic pollution, pesticide pollution, eutrophication, heavy metals, etc.), artificial lighting, asphalt roads, solar panels, and pesticides can all pose a threat to populations.
 - b. Habitat: pollution, invasive species, habitat loss and degradation, and climate stressors.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known.
 - b. Declining trend in aquatic and riparian habitat in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; one occurrence polygon in the plan area in a ~2-mile reach of the Purgatoire River.
 - b. Ecological conditions: aquatic/riparian habitat is restricted in the plan area.

Species Status

G5; S1 in Colorado.

Taxonomy

Neochoroterpes oklahoma is accepted as valid with three taxonomic synonyms (*Choroterpes mexicanus*, *Choroterpes oklahoma*, *Choroterpes mexicana*) (Integrated Taxonomic Information System (ITIS) 2024d).

Species range

Overall Species range

This mayfly is widely distributed throughout much of Texas, Oklahoma, Colorado, New Mexico, and northern Mexico; North Dakota represents its northern and eastern range limit (NatureServe 2024) (Figure 22, Figure 23).

Description of how the population in the plan area fits within the overall range

Observations of this species are very sparse; however, the plan area seems to be at the edge of its known range in Colorado and the species is absent from Kansas (Figure 22, Figure 23).

Distribution, abundance, and trend in the plan area

Population

The population size and trend in the plan area is not known. There is only one occurrence record from 1989, which CNHP classifies as historic. There is no information about this species in McCafferty et al. (1993). Based on its wide distribution, NatureServe (2024) considers it globally secure.

Habitat

Within the plan area, this species has only been documented within a ~2-mile reach of the Purgatoire River at the southern edge of the Timpas Unit of the Comanche National Grassland. Its mapped range overlaps much of the Timpas Unit, but no other units of the plan area (Figure 23).

Habitat in the Purgatoire River has declined in the plan area due to activities upstream of the plan area, including regulation of discharge by Trinidad Dam, irrigation and crop production, and intensive cattle feeding operations on private property. These activities outside of the plan area have reduced habitat quality within the plan area. Invasive tamarisk has also become the primary riparian species within the Purgatoire River in the plan area, which alters bank stability, channel width, and floodplain hydrology (USDA Forest Service 2005c). Maximum annual peak flows have steadily declined in the Purgatoire River downstream of Trinidad Reservoir (U.S.G.S. station # 07128500, Las Animas gauge, (Bestgen et al. 2017). These aspects are presumed to represent a decline in both habitat quality and quantity for this species in the plan area.

Threats (arising from on or off the plan area)

Population

Evaluations of the conservation status of mayfly species are generally lacking, but Jacobus et al. (2019) identify several suspected and known threats to mayfly populations globally. Mayflies are very sensitive to water quality, and are vulnerable to organic and pesticide pollution, including neonicotinoid insecticides commonly used in agriculture (Raby et al. 2018), (Jacobus et al. 2019). Increase in the intensity and distribution of lights next to rivers may have a negative impact on populations because bankside lights may lure adults away from their natural waterside habitat (Jacobus et al. 2019). Both solar panels and asphalt roads can act as ecological traps for mayflies, which are attracted to the horizontally polarized light reflected from their surfaces (Jacobus et al. 2019). Pesticides, particularly neonicotinoid pesticides, can be acutely toxic to mayflies (Jacobus et al. 2019).

Habitat

No threats could be found specific to this species (NatureServe 2024). General threats to mayfly habitat include pollution (fine sediments, heavy metals, chemical pollution, agricultural and urban runoff, pesticides, salinization., etc.) invasive species, habitat loss and degradation (hydropower, dams, diversions, loss of suitable aquatic habitat, etc.), and climate stressors (Jacobus et al. 2019). Water quality in the plan area is considered compromised (Ecological Integrity Worksheet 2024). The Purgatoire River, where this species has been documented, is impaired for arsenic and manganese (USDA Forest Service 2024g). The reasons for water quality impairments in the plan area may be naturally occurring minerals and metals coupled with increased runoff from both private and NFS lands (USDA Forest Service 2024g). The tolerances of this species to specific water quality parameters have not been evaluated.

Ecological conditions

Ecological condition requirements

To successfully complete its life cycle, mayflies need suitable habitat for both its aquatic and terrestrial life stages. While adults are terrestrial, they tend to be found near the bodies of water where the larvae develop (Voshell 2002). Mayflies can use a wide variety of aquatic habitats, and the ecological condition requirements for this species are not well characterized. It has been found in one of the few perennial, large river systems in the plan area.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species depends on aquatic habitat for breeding and larval development. Riparian habitats are relatively limited in the plan area (see Appendix) and therefore habitat is considered restricted for the aquatic portion of this species' life history cycle.

Critical biological characteristics

Mayflies are an order of insects with an aquatic larval stage and terrestrial adult stage. Larvae usually undergo numerous molts, typically over the timeframe of weeks to months. Following the larval molts, mayflies enter a short-lived winged stage that is sexually immature (called a "subimago"). The subimago is typically found perched on shoreline vegetation and lasts for minutes to hours (usually around 24 hours) until it completes adult development. The sexually mature adult phase is ephemeral, usually lasting only around a day (Voshell 2002).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Most mayfly larvae are collector-gathers or scrapers that convert plants into animal tissue. Mayfly larvae are a critical aquatic prey species consumed by a variety of species including many fish (Voshell 2002). Adult mayflies are so short-lived that they do not feed, but they can produce swarms around aquatic habitats that are a valuable source of food for many species (Voshell 2002).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Mayflies are typically quite sensitive to aquatic pollution, and as such can be an indicator species for water quality (Voshell 2002). Since the majority of mayfly species having relatively short life cycles and high mobility, they are likely to be one of the first groups to show the impact of a changing climate (Jacobus et al. 2019). Proliferation of renewable solar energy is a cause for concern from the perspective of mayfly conservation (Jacobus et al. 2019).

Maps of Species Range and Known Occurrences in Plan Area

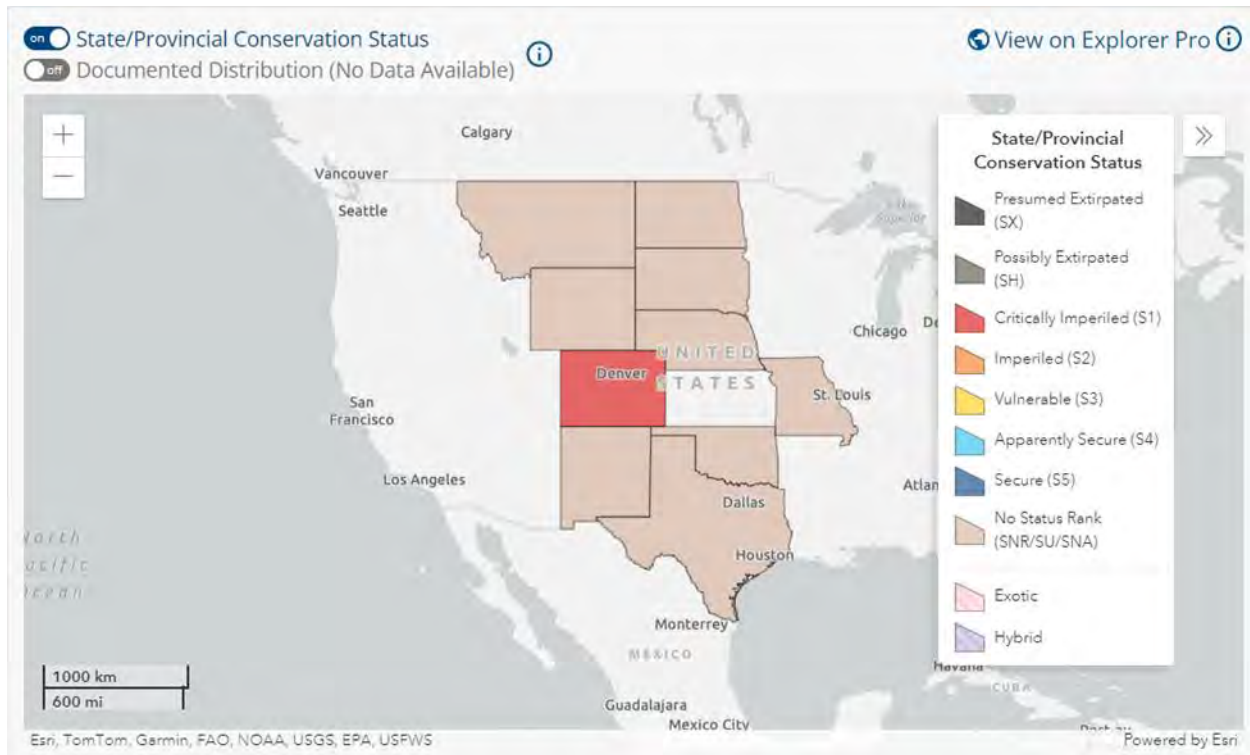


Figure 22. NatureServe State/Provincial Conservation Status for the mayfly.

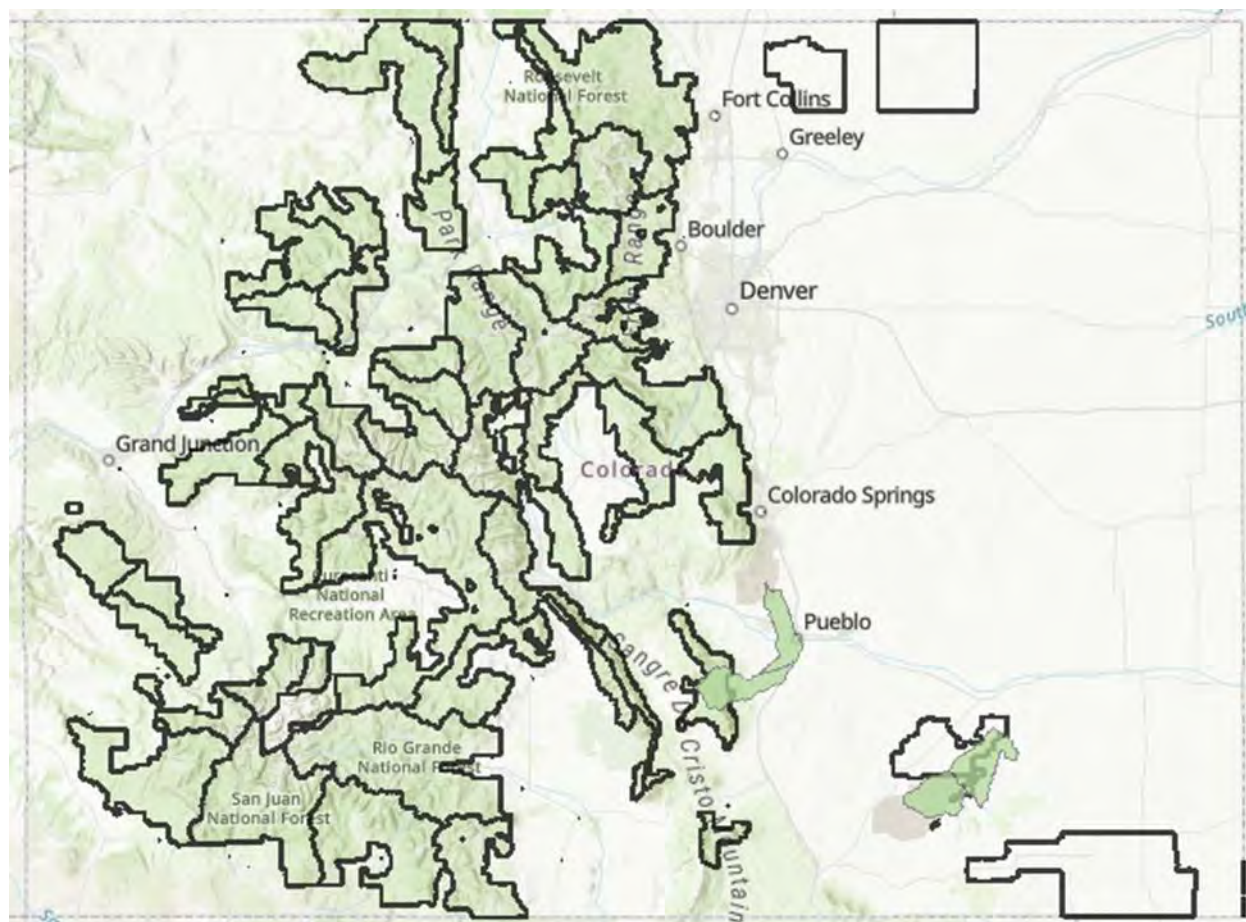


Figure 23. Distribution map of the mayfly in Colorado (green polygons) from CNHP.

Mexican Forktail

(Ischnura demorsa)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF contains three records of the species in the plan area, spanning 1975-2004 (Van Scoyoc 2024). Most recently, the species was observed at Carrizo Creek Picnic Area and the specimen is archived in the C.P. Gillette Collection at Colorado State University.

Year of Last Known Occurrence: 2004

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Desiccation due to altered hydrology represents a threat to populations.
 - b. Altered hydrology, particularly loss of flowing water, represents a threat to habitat.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known.
 - b. Declining trend in aquatic and riparian habitat in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size not known; three occurrence records in the plan area.
 - b. Lentic and lotic habitat is restricted in the plan area.

Species Status

G5; S2 in Colorado, SNR in Kansas.

Taxonomy

Ischnura demorsa is accepted as valid (Integrated Taxonomic Information System (ITIS) 2024d).

Species range

Overall Species range

The species' range includes Nevada, Colorado and Kansas south to Oaxaca, Mexico (Paulson et al. 2024) (Figure 24).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range (Figure 24).

Distribution, abundance, and trend in the plan area

Population

Population size and trend in the plan area are not known. There are three occurrence records in the plan area.

Habitat

NatureServe (2024) classifies this species as a pond-breeding odonate, but Johnson (1966) found it exhibits a strong preference for lotic habitat. Westfall and May (2006) state it is "principally an inhabitant of springs and streams rather than ponds." Its larvae have also been found in lentic waters but are more common in streams (Johnson 1966).

In Colorado, the Mexican forktail has been documented in Baca and Las Animas counties and Conejos and Costilla counties in the San Luis Valley (Prather and Prather 2015). Within the plan area, the species has been documented in the Carrizo Unit of the Comanche (Carrizo Canyon) and in the Cimarron National Grassland near Middle Spring.

Aquatic and riparian habitat has declined in the plan area due to several factors, including the increased abundance of invasive tamarisk that alters floodplain hydrology (USDA Forest Service 2005c) and severe declines in stream flows downgradient from the Ogallala-High-Plains Aquifer (Brikowski 2008). Drawdown of the aquifer has substantially decreased the discharge to most of the rivers in the Carrizo unit of the Comanche and the entire Cimarron National Grassland (USDA Forest Service 2005c).

Threats (arising from on or off the plan area)

Population

Extensive loss of flowing water is believed to have caused population declines of the Mexican forktail in the panhandle of Oklahoma (Smith and Patten 2020). Desiccation of lotic habitats can cause direct mortality of aquatic larvae (Smith and Patten 2020). In general, Odonata (damselflies and dragonflies) have among the lowest extinction risk threat levels among invertebrate groups that have been assessed to date (Clausnitzer et al. 2009). They generally have above-average dispersal ability, relatively wide distribution ranges, ability to live in partially degraded habitats, and relatively high capability to rapidly colonize new or restored habitats, all of which contributes to relatively lower extinction risk than other taxonomic groups (Clausnitzer et al. 2009).

Habitat

Altered hydrology is a threat to the Mexican forktail's habitat (Smith and Patten 2020).

Ecological conditions

Ecological condition requirements

To successfully complete its life cycle, the Mexican forktail needs suitable habitat for both its aquatic and terrestrial life stages. However, its ecological conditions requirements are not well characterized, aside from its dependence on lotic systems (Johnson 1966). Availability of perch sites, type of materials available for egg-laying, and extent of emergent vegetation are presumably a part of this species' ecological condition requirements but are not well understood (Johnson 1966).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species depends on aquatic habitat for breeding and larval development. Riparian and wetland habitats are relatively limited in the plan area (see Appendix) and therefore habitat is considered restricted for the aquatic portion of this species' life history cycle.

Critical biological characteristics

Adult odonates generally forage within ~980 feet (300 meters) of a breeding site (NatureServe 2024).

In terms of damselfly life history, McPeck (1990) describe that most species' larvae "hatch from eggs in late summer and complete much of their development in the fall, overwintering in the middle-to-late instars. They complete larval development the following spring and emerge as adults to reproduce in late spring through early summer." The adult flight season is not well documented for this species, but observations of adults in the plan area were from July – August (Van Scoyoc 2024). There are two female phenotypes of this species (Cordero-Rivera 1990).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Damselfly larvae are generalist predators that feed on a wide variety of small invertebrates within macrophytes (McPeck 1990).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Persistence probability predictions for odonate presence in the plan area due to effects of global change (change in temperature and precipitation, cropland use, and pesticide application) ranges from medium to low; persistence probability is higher in southeast Colorado than in southwest Kansas (Figure 4 in Sirois-Delisle and Kerr 2022). Recent modeling work suggests that pesticide application and temperature change interact in a compounding way in terms of their impact on odonate persistence (Sirois-Delisle and Kerr 2022).

Damselflies, such as the Mexican forktail, disperse less rapidly than dragonflies and their distributions are often constrained by specific ecological and behavioral requirements (Sirois-Delisle and Kerr 2022). Because of this, damselflies are generally expected to have lower adaptive capacity to respond to climatic disturbances, but Sirois-Delisle and Kerr (2022) acknowledge "There are limits to the extent to which such

generalized traits predict probabilities of persistence” and different genera exhibit different responses. No information could be found specifically for the Mexican forktail.

Maps of Species Range and Known Occurrences in Plan Area

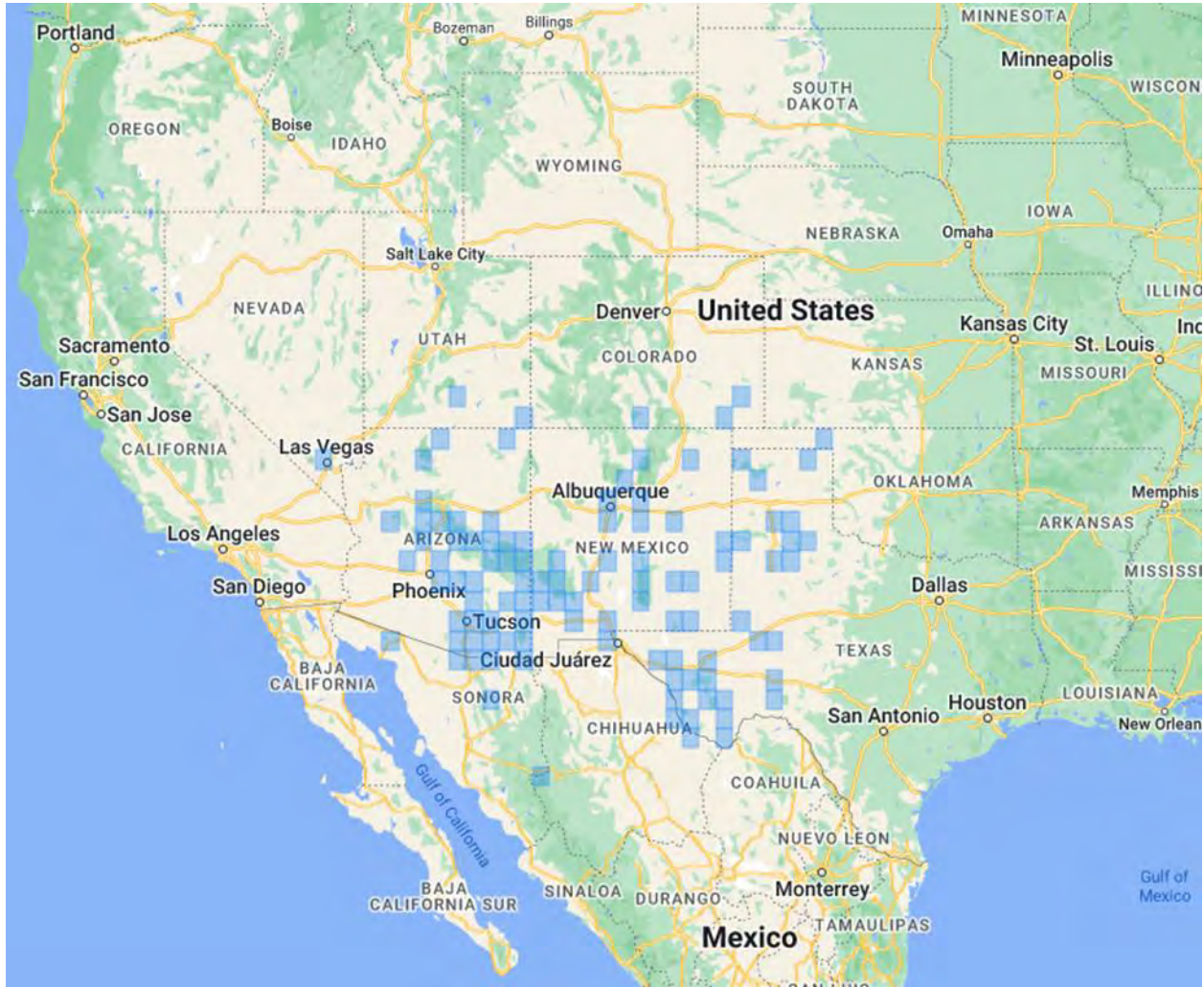


Figure 24. Sighting map of the Mexican forktail from Odonata Central.

Morrison's Bumble Bee

(Bombus morrisoni)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are five occurrences in the plan area from 1947, 1977, and 2021 (Van Scoyoc 2024). The records from 1947 and 1977 are based on preserved specimens from the University of Colorado Museum of Natural History Entomology Collection, and uncertainty associated with these point locations would not on its own provide sufficient evidence of occurrence in the plan area. However, in 2021, the species had a research-grade iNaturalist observation in Vogel Canyon in the Comanche National Grassland. This observation has sufficient locational precision to determine that the species is known to occur in the plan area.

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Threats to populations include pesticides, pathogens, parasites, competition with honeybees, climate stressors, and reduced genetic diversity.
 - b. Threats to habitat include exotic species invasion, altered fire regime, agricultural conversion, urbanization, habitat loss and habitat fragmentation, overgrazing, lithium mine and solar development, road development, encroachment of woody species, and climate stressors.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known, but species has a decreasing population trend across its range.
 - b. Declining trend in habitat quality for this species due to altered fire regime, invasive cheatgrass, encroachment of woody species, and range condition in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the eastern edge of the species' range and species' range in the plan area is limited to just the Comanche National Grassland.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size not known; one occurrence record in the plan area.
 - b. The highly fragmented landownership pattern of the plan area may not fully meet the species' needs for connectivity and is considered a restricted ecological condition.

Species Status

G3; S3 in Colorado; SNR in Kansas.

Taxonomy

Bombus morrisoni is accepted as valid (Integrated Taxonomic Information System (ITIS) 2024a); there is one recognized subspecies (*Bombus morrisoni umbrosus*) (Integrated Taxonomic Information System (ITIS) 2024d). Another common name is Morrison bumble bee (Xerces Society for Invertebrate Conservation et al. 2023).

Species range

Overall Species range

This species occurs throughout the west from California east of the Sierra-Cascade Ranges to southern British Columbia; east to New Mexico, Texas, and north to western South Dakota; it has been sporadically found west of the Sierra-Cascade crest in Oregon and California (Xerces Society for Invertebrate Conservation et al. 2023) (Figure 25, Figure 26, Figure 27). The IUCN Red List shows the species as possibly extinct in all of Oregon, much of Washington, and eastern Idaho (IUCN 2024) (Figure 26). Its elevational range in Colorado is 4,000 to 9,000 feet (Wright et al. 2017).

Description of how the population in the plan area fits within the overall range

The plan area is at the extreme eastern edge of the species' range (Figure 25, Figure 26, Figure 27).

Distribution, abundance, and trend in the plan area

Population

This species has a decreasing population trend across its range; it has declined in relative abundance by 74% in recent years (2011-2021) when compared to historic values (Xerces Society for Invertebrate Conservation et al. 2023). Declines have occurred in both the interior portion of the species' range (Hatfield et al. 2014) and the edges of its range (Xerces Society for Invertebrate Conservation et al. 2023). Across Colorado, Wright et al. (2017) state that "it no longer seems to be as common as it previously was." Analysis of the species' persistence across its home range shows only historical records in the grid cells adjacent to the plan area in southeast Colorado (Guzman et al. 2021, Figure 4 in Xerces Society for Invertebrate Conservation et al. 2023). The sampling effort within the plan area is depicted as low in Hatfield et al. (2014), and there is uncertainty in trends where there has been limited sampling. The species' population size and trend in the plan area are currently uncertain. Morrison's bumble bee has not ever been documented in Kanas, although systematic surveys have been done in that state through the Great Plains Bumble Bee Atlas since 2022 (Xerces Society for Invertebrate Conservation et al. 2023). Therefore, its distribution in the plan area is limited to just the Comanche National Grassland.

Habitat

The range of Morrison's bumble bee overlaps much of the Comanche National Grassland (Figure 27). The one known occurrence record of this species within the plan area was at Vogel Canyon Picnic Area in the Timpas Unit. Older occurrence records were in Sand Canyon and East Carrizo Creek in the vicinity of the Carrizo Unit of the Comanche. Typical habitat for Morrison bumble bee includes open dry scrub, shrubland, grassland, and dry coniferous forests (Williams et al. 2014).

Encroachment of woody species, overgrazing, altered fire regime, and invasive cheatgrass all threaten the species' habitat (Xerces Society for Invertebrate Conservation et al. 2023). Juniper woodlands have

expanded in southeast Colorado (CPW 2015). Most of the plan area is grazed, and the current livestock grazing regime differs from the historic bison-dominated grazing regime in several ways; downward trends in range condition have also been documented in some portions of the plan area (USDA Forest Service 2005c); CCNG Ch 20). Aggressive fire suppression has occurred in the plan area and represents a departure from the natural frequency of fire (USDA Forest Service 2005c). Cheatgrass (*Bromus tectorum*) has increased in the plan area and represents a major change in the grassland ecosystem relative to historic conditions (USDA Forest Service 2005a). These factors collectively contribute to a decline in habitat quality for Morrison's bumble bee in the plan area.

Threats (arising from on or off the plan area)

Population

North American bumble bee species are generally threatened by pesticides, pathogens and parasites associated with managed bees (NatureServe 2024). Pathogens and parasites that have been documented in Morrison's bumble bee include *Apicystis*, *Crithidia bombi*, *Vairimorpha bombi*, Deformed wing virus, sacbrood virus, and black queen cell virus (Society 2023). The Xerces Society (2023) indicates these are all significant threats to Morrison's bumble bee, along with reduced genetic diversity and competition with honeybees. Drought and increased temperatures can also stress individuals (Society 2023).

Habitat

North American bumble bee species are generally threatened by habitat loss and climate stressors (NatureServe 2024). For Morrison's bumble bee, the Xerces Society (2023) also lists threats of habitat loss, fragmentation, and degradation due to overgrazing, lithium mine and solar development, exotic species invasion (e.g., cheatgrass), altered fire regime, agricultural conversion, urbanization, road development, and habitat fragmentation. Grazing can reduce habitat quality through several mechanisms including compaction of the soils that reduces suitable nesting sites, removal of floral resources, and alteration of microhabitat temperature and moisture (Xerces Society for Invertebrate Conservation et al. 2023, Hanberry et al. 2021). Encroachment of woody species, such as Pinyon/Juniper, can represent a threat to habitat by competing with herbaceous perennials (Xerces Society for Invertebrate Conservation et al. 2023). Drought and increased temperatures stress the plant communities that bumble bees depend on (Xerces Society for Invertebrate Conservation et al. 2023). These multiple threats also produce synergistic effects (Xerces Society for Invertebrate Conservation et al. 2023).

Ecological conditions

Ecological condition requirements

Morrison's bumble bee has three basic habitat requirements: suitable nesting sites for the colonies, nectar and pollen from floral resources available throughout the duration of the colony period (spring, summer and fall), and suitable overwintering sites for the queens.

Its nesting habitat is not well characterized. It is assumed to nest underground, such as in abandoned rodent burrows (Williams et al. 2014, Wright et al. 2017, Xerces Society for Invertebrate Conservation et al. 2023). However, one recent study found a nest beneath chopped straw on the plywood floor of a doghouse (Koch and Cane 2022). Based on this, Koch and Kane (2022) suggest that Morrison's bumble bee may not nest underground but rather in protected areas on the ground surface. Xerces Society (2023) state "nesting sites may be limited by the abundance of rodents."

Morrison's bumble bee is a short-tongued bee, which are better suited to pollinate open flowers with short corollas (Xerces Society for Invertebrate Conservation et al. 2023). Range-wide, its commonly used plant genera include: *Chrysothamnus*, *Helianthus*, *Asclepias*, *Cleome*, *Trifolium*, *Astragalus*, *Penstemon*, *Monarda*, *Cirsium*, and *Melilotus* (Xerces Society for Invertebrate Conservation et al. 2023). It has many floral associates in Colorado (Wright et al. 2017). The nutritional content of pollen affects bee performance and plant associations; bumble bees (*Bombus*) prefer plants that offer pollen with high ratios of protein to lipids (Vaudo et al. 2024). To meet its nutritional needs, Morrison's bumble bee "requires a constant supply of flowers that bloom throughout the duration of the colony life cycle, which is from approximately March to October" (Xerces Society for Invertebrate Conservation et al. 2023). Floral resources also likely need to be relatively close to its nest sites (<0.62 miles, or 1 km) (Xerces Society for Invertebrate Conservation et al. 2023).

There is little information regarding overwintering habitat, or hibernacula, specific to Morrison's bumble bee. Xerces Society (2023) speculates on its hibernacula based on what is known for other bumble bee species: "...queens of other species frequently dig a few centimeters into soft, disturbed soil and form an oval shaped chamber in which she will spend the duration of the winter. Compost in gardens or mole hills may provide suitable sites for queens to overwinter (Goulson 2010). Although there may be species specific preferences for Morrison bumble bee, the queens of bumble bee species generally have been found to overwinter on north-facing slopes, in sandy, well-drained soil, and in areas with limited vegetation cover (Licznar & Colla 2019)."

In addition to these habitat requirements, the species' ecological conditions requirements include freedom from competition with honeybees, pathogen rates within the normal range, freedom from broadcast exposure to certain classes of pesticides, appropriate fire conditions (e.g., periodic occurrence of low severity wildfire in fire-adapted landscapes; freedom from large-scale, homogenous, high-severity burns), and freedom from overgrazing (Xerces Society for Invertebrate Conservation et al. 2023). Although effects of grazing on pollinators is species-specific, Hanberry et al. (2021) generalize that "One strategy to reduce the likelihood of overgrazing is to focus on utilization rates of forbs and host plants rather than stocking rates, as the same stocking can result in different grazing pressure depending on area, weather, and other disturbances."

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The highly fragmented landownership pattern of the plan area may not fully meet the species' needs for connectivity for genetic exchange. Xerces Society (2023) suggest that habitat fragments smaller than ~2,570 – 3700 acres (10 – 15 km²) "may not be large enough to support genetically diverse bumble bee populations." Many fragments of the plan area are smaller than this. The fragmented nature of the planning area also has an impact on the connectivity of vegetation ((USDA Forest Service 2005c) Ch 20), including floral resources.

Most of the plan area is grazed, with a high proportion of range condition in the plan area being at "fair," "poor," or "very poor" condition ((USDA Forest Service 2005c) Ch 20; Kansas SWAP). In a recent review, Hanberry et al. (2021) state that "Livestock grazing effects on soils can have major impacts on bee communities, both directly by influencing nesting habitat and indirectly by altering vegetation." Grazing in the plan area has likely reduced habitat quality for bumble bees via impacts to nesting habitat and vegetation.

Critical biological characteristics

Morrison's bumble bee is a social bumble bee. Xerces Society (2023) describes that it "lives in colonies consisting of a queen (foundress) and her offspring, the workers, and near the end of the season the reproductive members of the colony, the males and new queens. There is a division of labor among these three types of bees. The foundress is responsible for initiating colonies and laying eggs. Workers are

responsible for most food collection, colony defense, and feeding of the young. Males leave the nest once they reach maturity and their sole function is to mate with new queens. New queens remain with the nest until the end of the season when they leave to mate and find a hibernaculum. Colonies are annual, progressing from colony initiation by solitary queens in spring, to production of workers, and, for successful colonies, finally to production of queens and males.”

Foraging can occur up to 1.2 miles (2 km) from a nest but is typically within 0.62 miles (1 km) (Xerces Society for Invertebrate Conservation et al. 2023). In Colorado, queens typically fly late April through early July, but are most abundant in May through early June. Males fly early August through early October, but peak abundantly is in late August and all of September. Workers (females) fly late May through late September, with peak abundance in early July plus all of August and early September (Wright et al. 2017).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Bees are the most important pollinators in the Great Plains (Hanberry et al. 2021). Bumble bees, including Morrison’s bumble bee, are able to “buzz pollinate”—a vibrational pollination technique that dislodges more pollen. Some important crop plants, including tomatoes, peppers, blueberries, and cranberries require or benefit greatly from buzz pollination (Xerces Society for Invertebrate Conservation et al. 2023). In addition to commercially important crops, Morrison’s bumble bee also plays a vital role as a generalist pollinator of native flowering plants (Xerces Society for Invertebrate Conservation et al. 2023).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Morrison’s bumble bee is considered significantly at-risk due to climate stressors, particularly through range loss (Sirois-Delisle and Kerr 2018). It is among the southern-most bumble bees in North America and occurs in some of the most arid habitats (Xerces Society for Invertebrate Conservation et al. 2023). Bumble bees have been shown to not expand their northern range limits to track recent warming (Roitberg and Mangel 2016), so hotter and drier conditions are expected to result in continued constrictions and increased patchiness in the range of Morrison’s bumble bee (Xerces Society for Invertebrate Conservation et al. 2023).

Decker and Harmon-Threatt (2019) concluded that fire may benefit bees in tallgrass prairies. They found that tallgrass prairie exposed to growing and dormant-season fire had higher overall bee abundance relative to unburned sites, potentially due to producing increased nesting habitat for ground-nesting bees. However, the impact of fire is dependent on several variables, including the species’ life history. Shallow-nesting bees, or those that nest above ground, are at a greater risk of direct mortality from fire than species that nest deeper in the soil (Cane and Neff 2011). Although the nesting preferences of Morrison’s bumble bee are not well known, recent work suggests that it may opportunistically nest above ground (Koch and Cane 2022), which could make it more vulnerable to wildfire and prescribed fire. For pollinators of the Great Plains, Hanberry et al. (2021) advise that “Retention of unburned areas as refugia is critical, particularly for species of conservation concern. Managers should plan conservatively, by assuming 100% mortality of pollinators in the burn unit.” The Committee on the Status of Pollinators in North America (2007) also recommends inclusion of specific practices that provide nest sites for pollinator species in management protocols.

Maps of Species Range and Known Occurrences in Plan Area

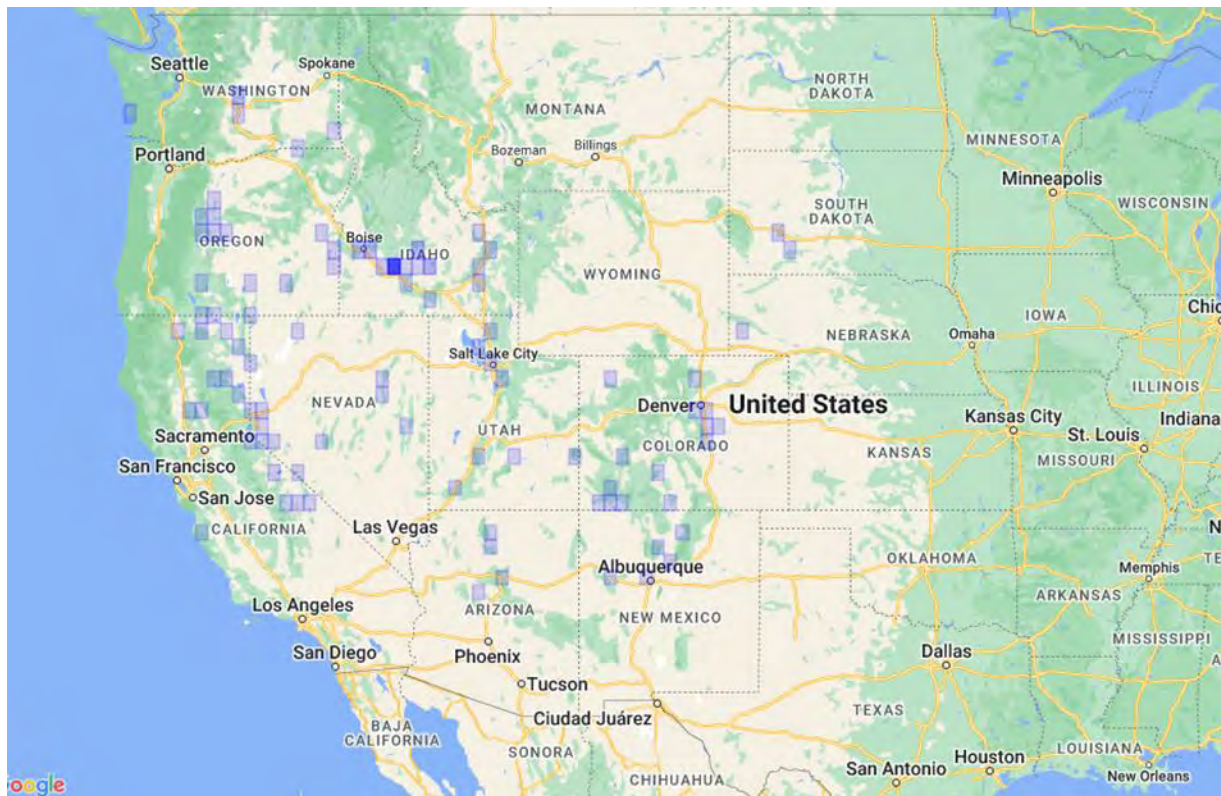


Figure 25. Verifiable observations of Morrison's bumble bee from the Bumble Bee Atlas.

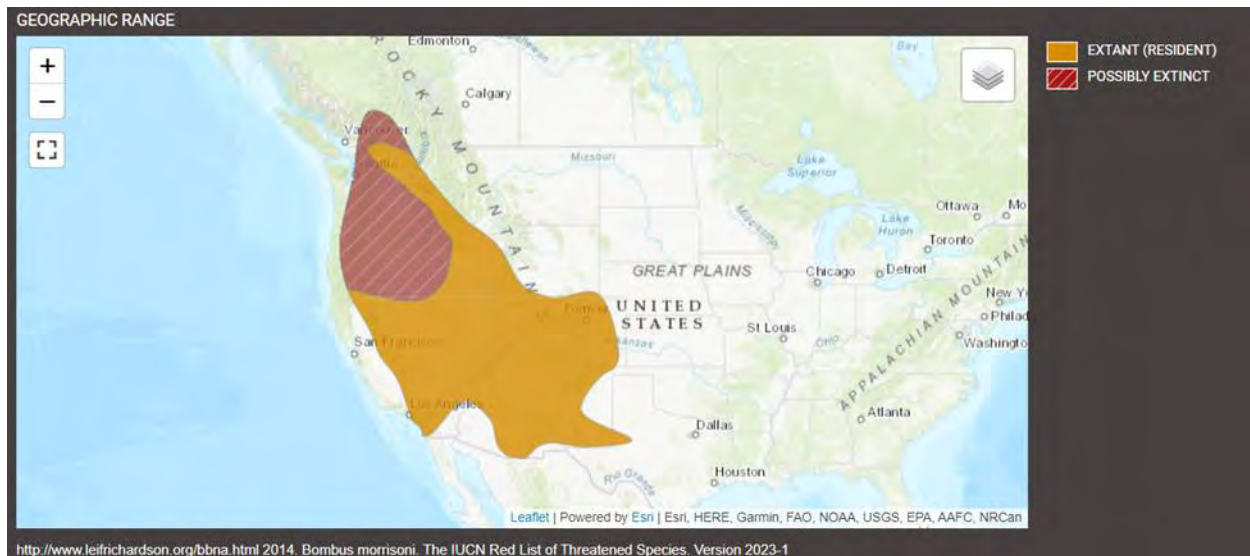


Figure 26. IUCN Redlist range map for Morrison's bumble bee, showing both where it is extant and possibly extinct across its range.

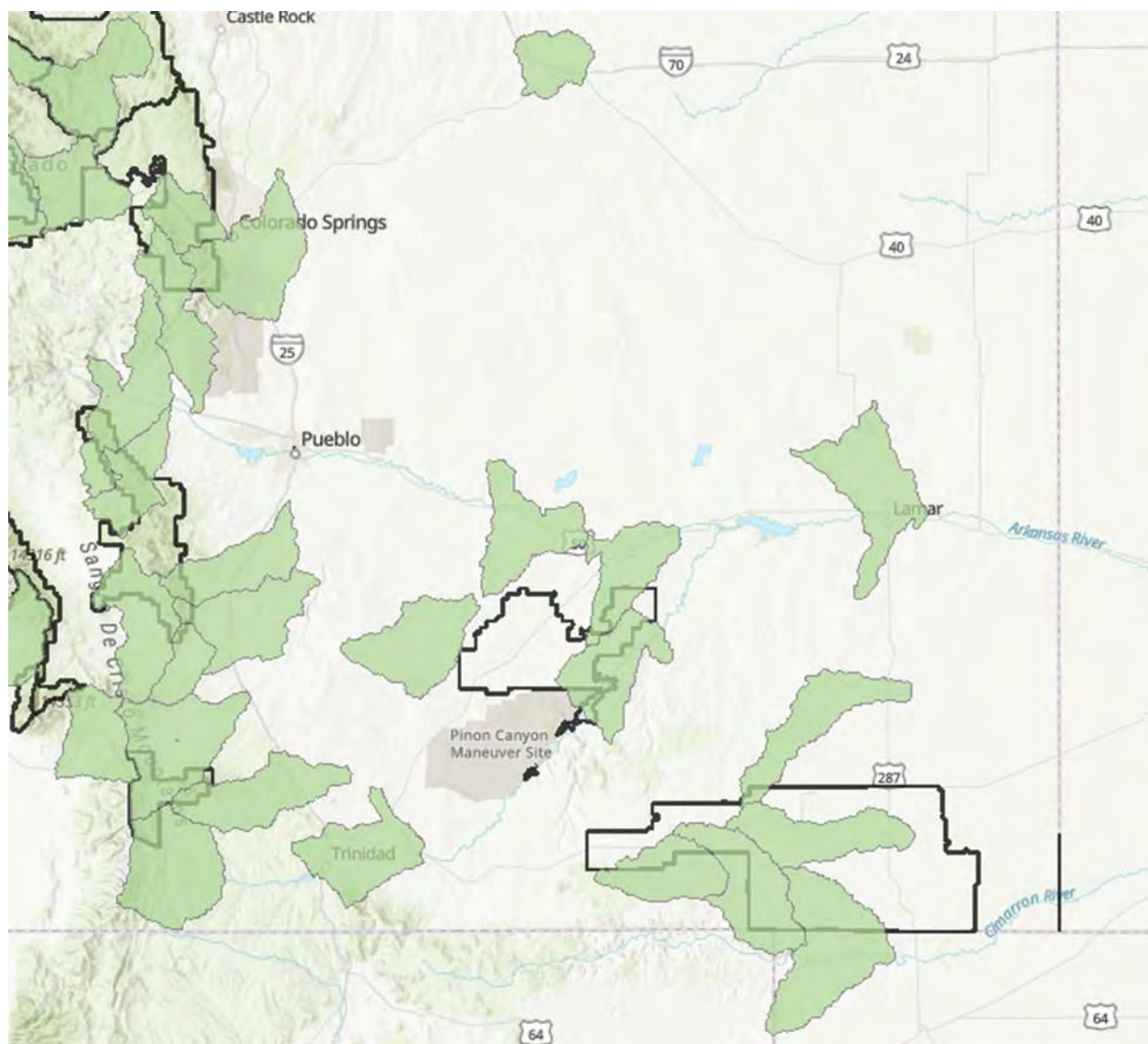


Figure 27. CNHP species range map for Morrison's bumble bee (green polygons) in relation to the plan area.

Pondhorn

(Uniomerus tetralasmus)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: The plan area overlaps with small amounts of this species' range in Colorado (Figure 28), but the species has not been documented in Colorado since 2001 and it may be extirpated from the state (Harrold and Guralnick 2010). CNHP contains one occurrence polygon from 1933 that partially overlaps the Cimarron National Grassland. However, historical populations from the Cimarron River, Carrizo Creek, and Lake Henry are believed to be extinct (Anderson 2005). The Cimarron River where historical populations were recorded was re-surveyed in the 1990s and the Cimarron River did not hold water to support the species (Anderson 2005). Recent maps of pondhorn distribution show it as absent from the upper Cimmaron subregions that overlaps the Cimarron National Grassland at the southwestern corner of Kansas (Figure 28) (Carr and Fancher 2021). It is uncertain if this species still occurs in the plan area and therefore it is not known to occur.

Year of Last Known Occurrence: N/A

Species Status

G5; S1 in Colorado; S3 in Kansas.

Maps of Species Range

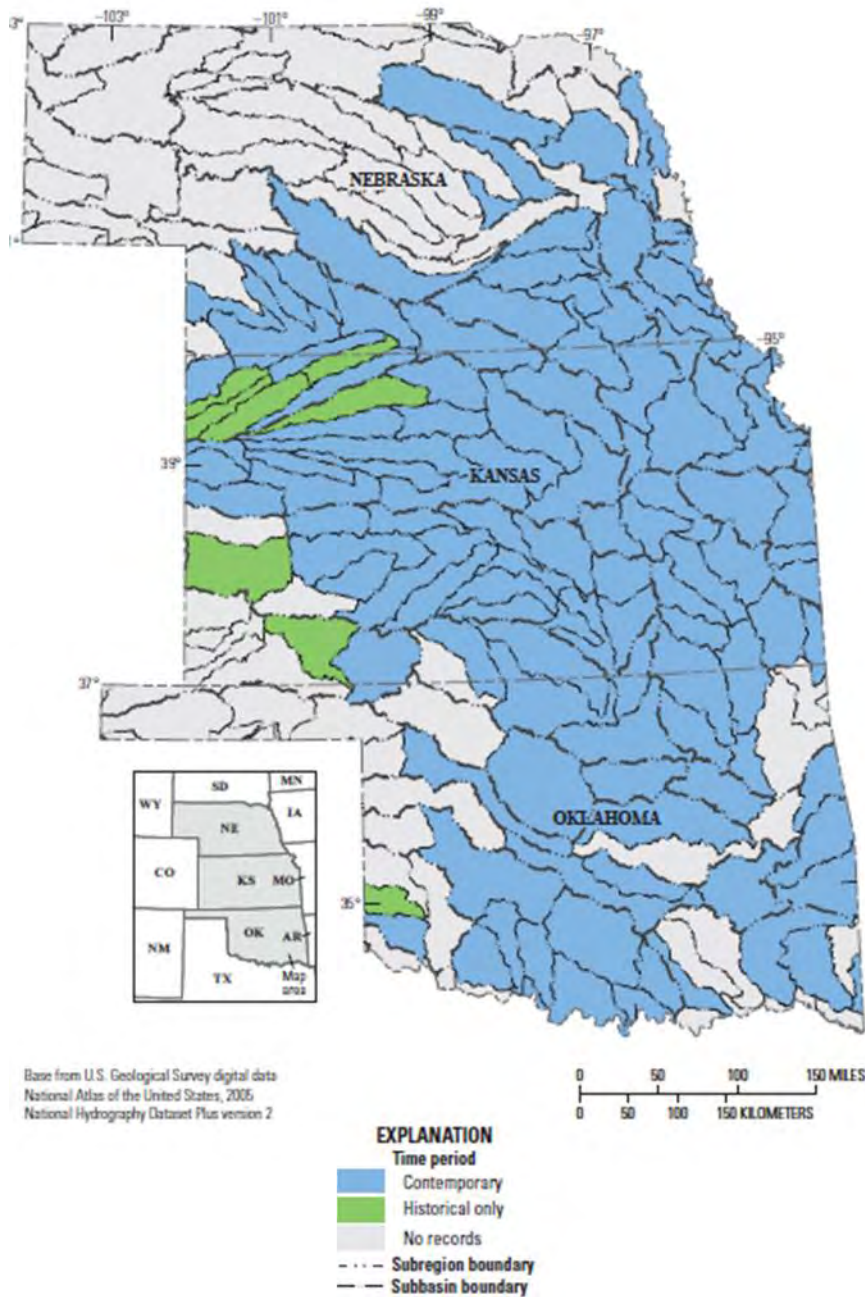


Figure 28. Map showing the distribution of *Uniomerus tetralasmus* (pondhorn) in Nebraska, Kansas, and Oklahoma from Carr and Fancher (2021).

Rainbow Bluet

(Enallagma antennatum)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF contains one record of the species in the plan area (Van Scoyoc 2024). This record reflects a specimen from the Snow Entomological Museum Collection. The collection locality is described as "Elkhart, 8.5 mi N, 2 mi W, Middle Springs." Middle Spring is within the Cimarron National Grassland and therefore this species is known to occur in the plan area.

Year of Last Known Occurrence: 1983

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Desiccation due to altered hydrology represents a threat to populations.
 - b. Altered hydrology, particularly loss of flowing water, represents a threat to habitat.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known.
 - b. Aquatic/riparian habitat on the plan area has declined.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the southern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size not known; one occurrence record in the plan area.
 - b. Lentic and lotic habitat is restricted in the plan area.

Species Status

G5; S2 in Colorado; SNR in Kansas.

Taxonomy

Enallagma antennatum is accepted as valid (ITIS 2024f). NatureServe (2024) notes that "This genus is in need of thorough taxonomic and phylogenetic study; some of the subgroups may deserve taxonomic recognition."

Species range

Overall Species range

The species' range includes Saskatchewan, Manitoba and Quebec south to Colorado, northern Texas, Illinois and New York, with isolated records in Tennessee (Paulson et al. 2024) (Figure 29). The species has been expanding its range eastward around Vermont (Hunt et al. 2010).

Description of how the population in the plan area fits within the overall range

The plan area is at the southern edge of the species' range (Figure 29).

Distribution, abundance, and trend in the plan area

Population

The species is considered common in eastern Nebraska and in northern Wyoming and may be increasing in abundance and extending its range in certain areas (Sibley et al. 2019). It is ranked as critically imperiled in Oklahoma (Hunt et al. 2010), (Smith and Patten 2020). It is ranked as "S2?" in Colorado, which denotes an inexact numeric rank. Population size and trend in the plan area are not known. There is one occurrence record in the plan area.

Habitat

NatureServe (2024) classifies this species as a pond-breeding odonate, but Smith and Patten (2020) and Hunt et al. (2010) both call it a lotic species. Sibley et al. (2019) state "It seems equally likely at ponds or small, clear streams, and even irrigation ditches." In Colorado, rainbow bluets are "found mostly as small local populations in widely scattered habitats, including both streams and ponds throughout the Great Plains" (Prather and Prather 2015). The only documented occurrence of this species in the plan area has been at Middle Spring in the Cimarron National Grassland.

Aquatic and riparian habitat has declined in the plan area due to several factors, including the increased abundance of invasive tamarisk that alters floodplain hydrology (USDA Forest Service 2005c) and severe declines in stream flows downgradient from the Ogallala- High-Plains Aquifer (Brikowski 2008). Drawdown of the aquifer has substantially decreased the discharge to most of the rivers in the Carrizo unit of the Comanche and the entire Cimarron National Grassland (USDA Forest Service 2005c).

Threats (arising from on or off the plan area)

Population

Extensive loss of flowing water is believed to have caused population declines of the rainbow bluet in the panhandle of Oklahoma (Smith and Patten 2020). Desiccation of lotic habitats can cause direct mortality of aquatic larvae (Smith and Patten 2020). In general, Odonata (damselflies and dragonflies) have among the lowest extinction risk threat levels among invertebrate groups that have been assessed to date (Clausnitzer et al. 2009). They generally have above-average dispersal ability, relatively wide distribution ranges, ability to live in partially degraded habitats, and relatively high capability to rapidly colonize new or restored habitats, all of which contributes to relatively lower extinction risk than other taxonomic groups (Clausnitzer et al. 2009).

Habitat

Altered hydrology is a threat to the rainbow bluet's habitat (Smith and Patten 2020).

Ecological conditions

Ecological condition requirements

Adult habitat preferences are not well described for this species, but it seems to use a broad range of aquatic habitats opportunistically (Sibley et al. 2019). It is often associated with emergent vegetation (Prather and Prather 2015). Larval development takes almost a year to complete (10-11 months in Michigan); this prolonged development precludes vernal pools as suitable breeding habitat (McPeck 1990). The larval phase of this species is therefore dependent on perennial waterbodies. Larvae also benefit from presence of macrophytes, which provides habitat for their prey (McPeck 1990).

It has been suggested that there is niche partitioning within the *Enallagma* genus between species whose larvae can persist in lakes containing fish versus those whose larvae require fishless lakes (McPeck 1990). Larvae of the rainbow bluet have been found in lakes containing fish, even though fish predate some upon the larvae (McPeck 1990). There is not a clear understanding of how larval rainbow bluet populations are regulated in lakes containing fish (McPeck 1990).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Although the plan area has some wetlands and constructed ponds, these features are typically small and rare. Perennial streams in the plan area are also limited (see Appendix).

Critical biological characteristics

Pond-breeding odonates generally remain within 1.9 miles (3 km) of their natal emergence sites, with most foraging occurring within 0.3 miles (500 m) of a breeding site (NatureServe 2024).

Rainbow bluet larvae can detect chemical cues arising from predators eating conspecifics and respond by reducing foraging behavior in the presence of predators, which can reduce their growth rates (Mortensen and Richardson 2008).

In terms of damselfly life history, McPeck (1990) describe that most species' larvae "hatch from eggs in late summer and complete much of their development in the fall, overwintering in the middle-to-late instars. They complete larval development the following spring and emerge as adults to reproduce in late spring through early summer." The adult flight season for rainbow bluet in Nebraska has been documented as mid-May to late July (Sibley et al. 2019). The species was documented in the plan area in late June.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Damselfly larvae are generalist predators that feed on a wide variety of small invertebrates within macrophytes (McPeck 1990). The larvae are a prey source for fish, dragonflies, and newts (McPeck 1990).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Persistence probability predictions for odonate presence in the plan area due to effects of global change (change in temperature and precipitation, cropland use, and pesticide application) ranges from medium to low; persistence probability is higher in southeast Colorado than in southwest Kansas (Fig. 4 in (Sirois-Delisle and Kerr 2022)). Recent modeling work suggests that pesticide application and temperature change interact in a compounding way in terms of their impact on odonate persistence (Sirois-Delisle and Kerr 2022).

Damselflies, such as the rainbow bluet, disperse less rapidly than dragonflies and their distributions are often constrained by specific ecological and behavioral requirements (Sirois-Delisle and Kerr 2022). Because of this, damselflies are generally expected to have lower adaptive capacity to respond to climatic disturbances, but Sirois-Delisle and Kerr (2022) acknowledge “There are limits to the extent to which such generalized traits predict probabilities of persistence” and different genera exhibit different responses. No information could be found specifically for the rainbow bluet.

Maps of Species Range and Known Occurrences in Plan Area

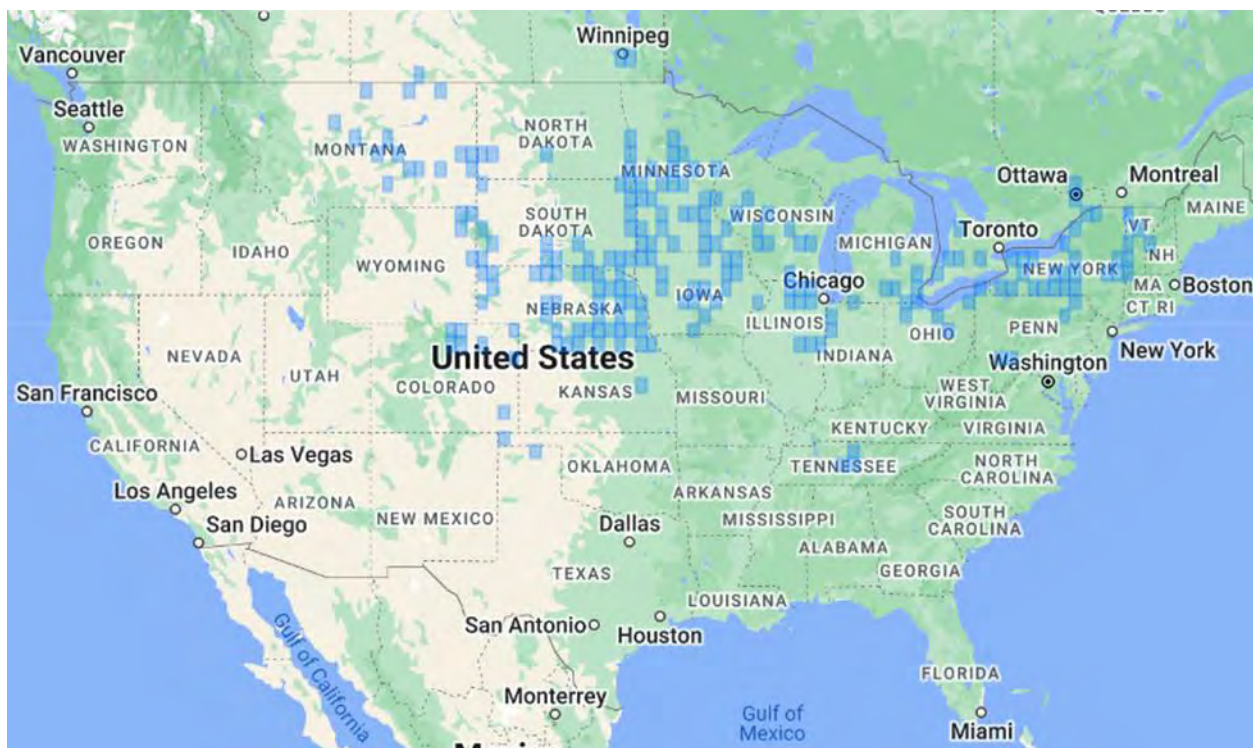


Figure 29. Sighting map of the rainbow bluet from Odonata Central.

Rhesus Skipper (*Polites rhesus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: Van Scoyoc (2024) contains an Element Occurrence polygon that partially overlaps the plan area (Figure 31); however, review of the Element Occurrence Report (EO ID 8338) shows that the 1995 survey spans both private and NFS lands in the vicinity of the Carrizo Picnic Grounds. The survey location is described as “4700’, 23.5 mi., W. Campo. Baca County, Colorado.” There is insufficient spatial precision in this record to determine that this species is known to occur in the plan area.

Year of Last Known Occurrence: N/A

Species Status

G3; S2 in Colorado; S3 in Kansas.

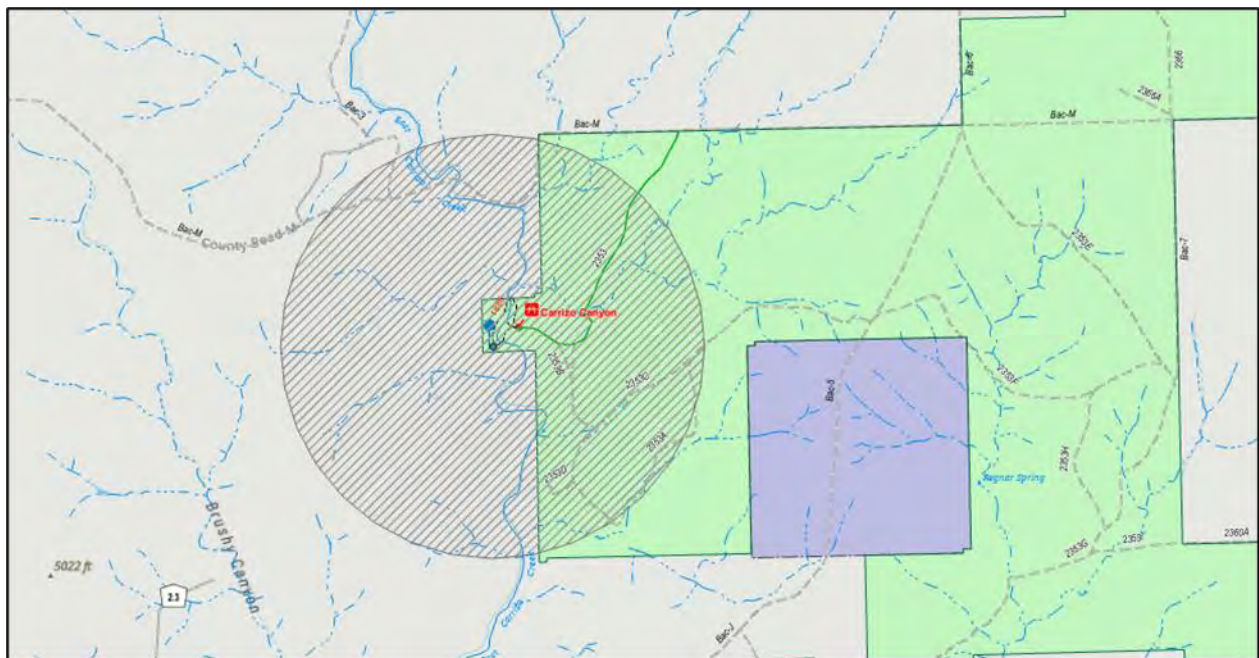


Figure 30. Rhesus skipper element occurrence polygon (hatched circle) from CNHP (2020) that partially overlaps the plan area (green polygon) near Carrizo Picnic Area. The centroid point (green dot) is located within the plan area, but there is insufficient spatial precision in the occurrence record to determine if this species was observed in the plan area.

Rita Dotted-blue

(Euphilotes rita coloradensis)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: Van Scoyoc (2024) contains an Element Occurrence polygon from 1994 that partially overlaps the plan area; however, review of the Element Occurrence Report (EO ID 2817) shows the land status associated with the record as private. The confidence extent states, "Uncertain whether full extent of EO is known." There is insufficient spatial precision in this record to determine that this species is known to occur in the plan area.

Year of Last Known Occurrence: N/A

Species Status

T3; S2 in Colorado.

Small Checkered Skipper

(Pyrgus scriptura ssp. scriptura)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one occurrence record in the plan area from 1994 (Van Scoyoc 2024). This record describes the locality as “Comanche National Grassland, south of Timpas.” Therefore, this subspecies is known to occur in the plan area.

Year of Last Known Occurrence: 1994 (Van Scoyoc 2024)

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: warming and precipitation changes, habitat loss.
 - b. Habitat: warming and precipitation changes, habitat loss.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known, but species is declining across its range.
 - b. Quality of habitat for pollinators is generally reduced in the plan area because of reduced herbaceous diversity (USDA Forest Service 2024a, b, c).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the eastern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; one occurrence record in the plan area.
 - b. Ecological conditions: open prairie habitat is not restricted in the plan area.

Species Status

G3; S4 in Colorado.

Taxonomy

Pyrgus scriptura ssp. scriptura is accepted as valid (Integrated Taxonomic Information System (ITIS) 2024d), although the subspecies is not in NatureServe. The NatureServe rankings are for the species (*Pyrgus scriptura*).

Species range

Overall Species range

The species ranges from Montana and Wyoming south through California and New Mexico to northern Mexico (NatureServe 2024, Lotts and Naberhaus 2024); Figure 32, Figure 33).

Description of how the population in the plan area fits within the overall range

The plan area is outside the species' typical range (Scott 1986) and would be at the extreme eastern edge of the species' range (Figure 32, Figure 33).

Distribution, abundance, and trend in the plan area

Population

The population size and trend in the plan area is not known. No information could be found for the subspecies, but the species has experienced recent population declines in the western United States and is possibly extirpated from Nebraska (NatureServe 2024). Scott (2020) characterize it as "uncommon to common" in the southern Rocky Mountains, noting that it has "disappeared just west of Denver (where it was found around Green Mtn. and South Table Mtn.) due to development." There is one occurrence record of a single adult male in the plan area from 1994 (Van Scoyoc 2024).

Habitat

The species occupies dry open habitats with patches of bare ground including alkalai flats, old fields, short grass prairie, and open woodlands (NatureServe 2024). The caterpillars rely on presence of mallows, which are often patchy or sparse (NatureServe 2024). In the plan area, the species has been found only in the Comanche National Grassland, south of Timpas. Quality of habitat for pollinators is generally reduced in the plan area because of reduced herbaceous diversity (USDA Forest Service 2024a, b, c).

Threats (arising from on or off the plan area)

Population

The species and its habitat are threatened by warming and precipitation changes and habitat loss due to development in the western United States (NatureServe 2024, Scott 2020).

Habitat

The species and its habitat are threatened by warming and precipitation changes and habitat loss due to development in the western United States (NatureServe 2024, Scott 2020).

Ecological conditions

Ecological condition requirements

The species requires suitable habitat with larval host plants and nectar flowers for successful larval and adult butterfly survival and reproduction. The caterpillar host plants are all in the mallow family (Malvaceae): Alkali mallow (*Sida hederacea*), scarlet globemallow (*Sphaeralcea coccinea*), and desert globemallow (*S. ambigua*) (NatureServe 2024, Scott 1986, Lotts and Naberhaus 2024). Nectar flowers can be of any color, including hairy false goldenaster (*Heterotheca villosa*); adults also consume mud and manure (Scott 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The small checkered skipper uses open prairie habitat (Scott 2020). It requires host plants in the mallow family, nectar flowers, and mud/manure for adults (Scott 2020). It also requires freedom from habitat conversion to development (Cervený et al. 2020). The plan area has an abundance of open prairie habitat.

Critical biological characteristics

For the southern Rocky Mountains Area, Scott (2020) indicates that there are three adult flight periods: late April through early May, June through late July, and late August to mid-September. The single observation in the plan area was from July (Van Scoyoc 2024). Larvae eat the leaves of their host plant and live in silked-leaf nests; pupae hibernate in a thin “cocoon” (Scott 2020).

Skippers—named for their rapid, “skipping” style of flight—can be strong fliers, capable of speeds over 0.6 miles/hr for short distances (NatureServe 2024, Pyle 2004). Adult males wait in gulch bottoms to await females, and also actively patrol widely about the habitat (Scott 2020).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Butterflies, including skippers, play an important role in pollination (Bailowitz et al. 2007) (Behrstock 2021). Probable predators include birds, reptiles, and amphibians (Bowers et al. 1985, Ghanzar et al. 2016).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Butterflies as a group are generally highly sensitive to environmental change, including climatic fluctuations (Thomas 2005). The response of butterflies to grazing and burning practices in prairie habitat has been shown to be highly variable by species and so cannot be generalized (Panzer 2002), (Vogel et al. 2007, Hanberry et al. 2021). Fire can influence butterflies both directly via mortality of eggs and larvae and indirectly via effects on habitat features such as changes in the litter layer and the amount of bare ground (Vogel et al. 2010). Although the short-term responses of butterflies to fire can be either positive or negative, local populations in fragmented habitat may not survive repeated prescribed burns (Panzer 2002). Several species of skippers (not including the Bronze Roadside Skipper) have been shown to

suffer negative effects from fire with effects continuing for approximately 5 years post-fire (Swengel 1996, Vogel et al. 2010). For all pollinators of the Great Plains, Hanberry et al. (2021) advise that “Retention of unburned areas as refugia is critical, particularly for species of conservation concern. Managers should plan conservatively, by assuming 100% mortality of pollinators in the burn unit.”

Within the Great Plains region, tallgrass prairie has been found to supported significantly higher butterfly species richness than shortgrass plots (Collinge et al. 2003). Urbanization appears to have no impact on butterfly species richness and composition in grassland ecosystems where parcels of grassland are at least 12 acres (5 hectares) (Collinge et al. 2003). Urbanization impacts likely increase in more fragmented grasslands composed of smaller parcel sizes (Collinge et al. 2003). Habitat characteristics at the patch scale (as opposed to the landscape scale) explain a greater proportion of the variation in abundance and richness of grassland butterflies (Collinge et al. 2003).

Maps of Species Range and Known Occurrences in Plan Area

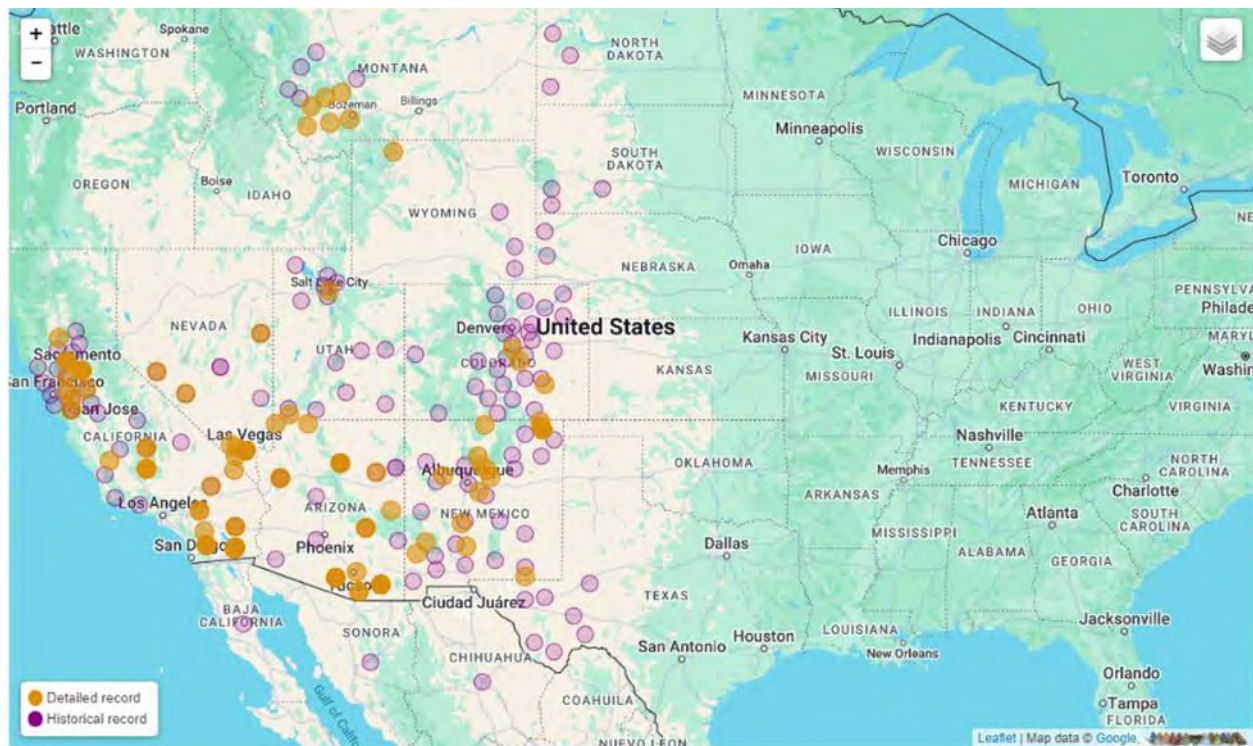


Figure 31. Range map of the small checkered skipper from Butterflies and Moths of North America (BAMONA) project (Lotts and Naberhaus 2024). Note map is for the species, as no information could be found for the subspecies.

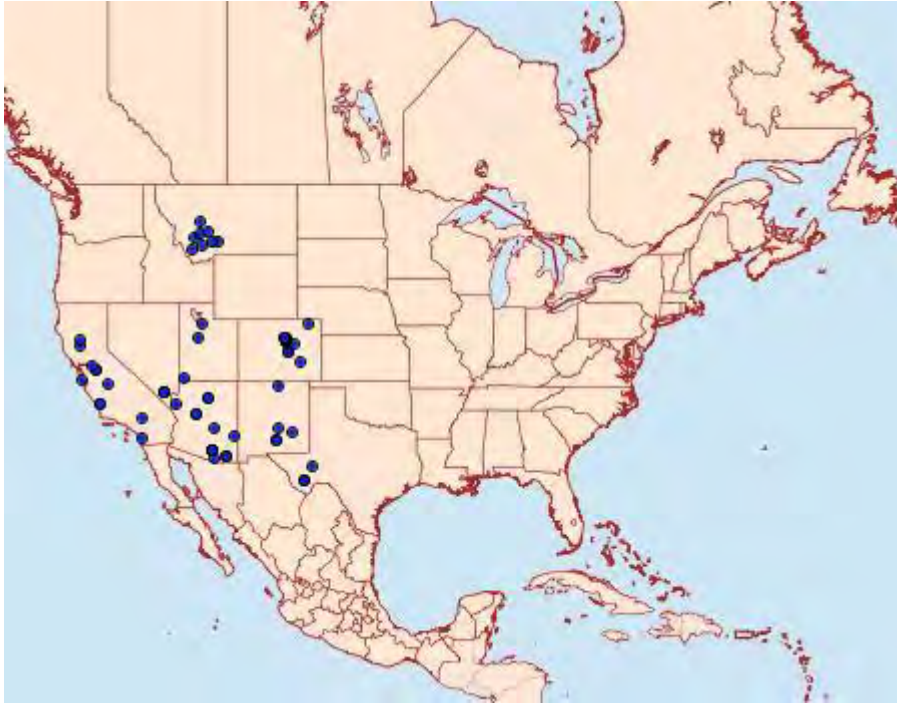


Figure 32. Distribution map of the small checkered skipper from the “Moth Photographers Group” (2019) at the Mississippi Entomological Museum at Mississippi State University (Note that data points are normalized to reflect center-of-county locations). Map is for the species, as no information could be found for the subspecies.

Sooty Dancer

(*Argia lugens*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are two occurrence records in the plan area: one in 2013 and one in 2023 (Van Scoyoc 2024). Both of these observations are from the Odonata Central database and are rated with “high” identification confidence by certified observers. One has a specimen associated with it, which is deposited in the C.P. Gillette Museum at Colorado State University.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. No known threats to populations.
 - b. Large dams, altered hydrology, and low flows are habitat threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known.
 - b. Declining trend in aquatic and riparian habitat in the plan area related to drought.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Populations size not known; two occurrence records in the plan area.
 - b. Wetland and riparian habitats are restricted in the plan area.

Species Status

G5; S2 in Colorado.

Taxonomy

Argia lugens is accepted as valid; a taxonomic synonym is *Hyponeura lugens* (Integrated Taxonomic Information System (ITIS) 2024d).

Species range

Overall Species range

The species range extends from Oregon and Colorado south to Chiapas, Mexico, with an isolated population in South Dakota (Figure 34) (Paulson et al. 2024).

Description of how the population in the plan area fits within the overall range

The plan area is at the eastern edge of the species range (Figure 34).

Distribution, abundance, and trend in the plan area

Population

The species was thought to have been extirpated from Oklahoma but has since been observed in low numbers (Smith and Patten 2020). Population size and trend in the plan area are not known. There are two occurrence records in the plan area.

Habitat

In Colorado, the sooty dancer is “found at widely dispersed habitats along streams and rivers in the Arkansas River drainage from the southeastern corner of the state north and west to Fremont and El Paso counties” (Prather and Prather 2015). Both observations in the plan area were from the Comanche National Grassland: one at Carrizo Picnic Area and one from Vogel Canyon. Observations in the plan area were both near creeks. The species has a strong preference for lotic habitat (Johnson 1966, Smith and Patten 2020). In the western part of its range, it uses small, rocky desert streams (Garrison 1994).

Aquatic and riparian habitat has declined in the plan area due to several factors, including the increased abundance of invasive tamarisk (USDA Forest Service 2005c) and severe declines in stream flows downgradient from the Ogallala- High-Plains Aquifer (Brikowski 2008). Drawdown of the aquifer has substantially decreased the discharge to most of the rivers in the Carrizo unit of the Comanche and the entire Cimarron National Grassland (USDA Forest Service 2005b). Since this species is dependent on flowing water, this represents a decline in its requisite habitat conditions.

Threats (arising from on or off the plan area)

Population

The species has no known threats to populations (NatureServe 2024). In general, Odonata (damselflies and dragonflies) have among the lowest extinction risk threat levels among invertebrate groups that have been assessed to date (Clausnitzer et al. 2009). They generally have above-average dispersal ability, relatively wide distribution ranges, ability to live in partially degraded habitats, and relatively high capability to rapidly colonize new or restored habitats, all of which contributes to relatively lower extinction risk than other taxonomic groups (Clausnitzer et al. 2009).

Habitat

NatureServe (2024) identifies large dams as a general threat to the habitat of the river-breeding damselflies in the order Odonata because they can create separation barriers to movement of sexually mature adults between microhabitats. Declines of this species in the western panhandle of Oklahoma are believed to be due to the extensive loss of flowing water in that region (Smith and Patten 2020).

Ecological conditions

Ecological condition requirements

To successfully complete its life cycle, the sooty dancer needs suitable habitat for both its aquatic and terrestrial life stages. However, its ecological conditions requirements are not well characterized, aside from its dependence on lotic systems for its larval and adult phase (Johnson 1966). Availability of perch sites, type of materials available for egg-laying, and extent of emergent vegetation are presumably a part of this species' ecological condition requirements but are not well understood (Johnson 1966).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species depends on lotic habitat for breeding and larval development. Riparian and wetland habitats are limited in the plan area (see Appendix) and therefore habitat is considered restricted for the aquatic portion of this species' life history cycle.

Critical biological characteristics

Adult odonates generally forage within ~980 feet (300 meters) of a breeding site (NatureServe 2024). Inter-habitat movement typically occurs more often in fragmented landscapes than within continuous forested landscapes (NatureServe 2024). Flight season is not well documented, but observations of adults in and around the plan area were from July-August (Van Scoyoc 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Damselflies in the genus *Argia* predate upon aquatic and terrestrial invertebrates and can also be an important prey item for other insects and vertebrates (Caesar 2012).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

High flows in the Cimarron River seemed to increase abundance and broaden this species' distribution in Oklahoma in 2013 (Smith and Patten 2020).

Maps of Species Range and Known Occurrences in Plan Area

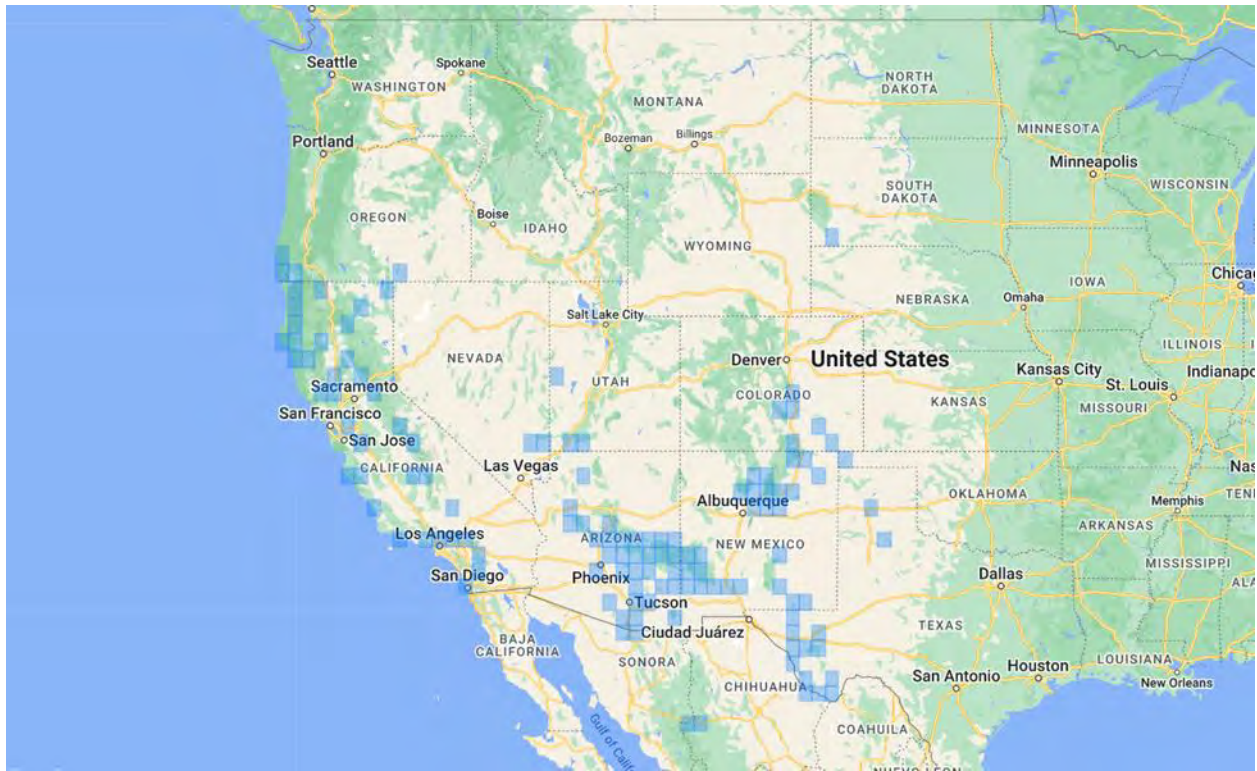


Figure 33. Sighting map of sooty dancer from Odonata Central.

Southern Plains Bumble Bee

(Bombus fraternus)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: There are six occurrences in the plan area from 1976-1977 (Van Scoyoc 2024). All records are based on preserved specimens from the University of Colorado Museum of Natural History Entomology Collection. The coordinate uncertainty of these observations ranges between 21,119 ft (6,437 m) to 34,406 ft (10,487 m). All six occurrence records occur within ~1,640 ft (500 m) the edge of the plan area. Therefore, the point locations are too imprecise to determine whether these observations occurred in the plan area.

Year of Last Known Occurrence: N/A

Species Status

G3; S2 in Colorado, SNR in Kansas.

Splendid Tiger Beetle

(Cicindela splendida)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF contains 32 records of the species in the plan area, spanning 1991-2011 (Van Scoyoc 2024). Not all of these records have sufficient precision to determine they occurred in the plan area, but some do.

Year of Last Known Occurrence: 2011

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. No known threats to populations.
 - b. No known threats to habitat.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known.
 - b. Suitable habitat for the splendid tiger beetle can be created or maintained by anthropogenic disturbances such as roads, paths, or powerline cuts, and these habitat features are generally stable in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The range is not restricted, narrow endemic, disjunct, or species at the edge of their range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population size in plan area is not known; 32 occurrence records.
 - b. Clay substrate microhabitats can be provided through numerous habitat features (e.g., road cuts, powerline rights-of-way, banks, old gravel pits, steep slopes) and therefore these conditions are not considered restricted.

Species Status

G5; S1 in Colorado; S5 in Kansas.

Taxonomy

Cicindela splendida is accepted as valid; a taxonomic synonym is *Cicindela splendida cyanocephalata* (Integrated Taxonomic Information System (ITIS) 2024c). There is some evidence this species may hybridize with other species of tiger beetles, including at least *C. denverensis* in Nebraska (University of Nebraska 2024).

Species range

Overall Species range

The species' range includes Pennsylvania and South Carolina through the Ohio River Valley region to Wisconsin, Mississippi, Texas, eastern Colorado, and southernmost South Dakota (Brust et al. 2005) (Figure 35).

Description of how the population in the plan area fits within the overall range

The plan area is at the edge of the species' range (Figure 35).

Distribution, abundance, and trend in the plan area

Population

The splendid tiger beetle is considered quite common across North America, with a global rank of G5, yet can still be locally rare in certain parts of its range (Brust et al. 2005, Hall et al. 2024, Minnesota Department of Natural Resources 2024b). There are dozens of occurrence records in the plan area. Population size and trend in the plan area is not known.

Habitat

Most tiger beetles have high ecological niche specificity—occupying a narrow or highly specialized habitat, usually with bare microhabitat patches for the larvae (Knisley 2011, Pearson and Wiesner 2023). The splendid tiger beetle uses outcrop and woodland habitat (NatureServe 2024). It is associated with steep, bare slopes consisting of clay, loess, very fine sand, or loam, shale barrens, old gravel pits, as well as steep road cuts and occasionally flatter roads (University of Nebraska 2024), (NatureServe 2024). Several sources indicated a preference for clay soils, particularly in the prairie portion of its range (Schultz 1989), (Minnesota Department of Natural Resources 2024b), (University of Nebraska 2024)). Suitable habitat for the splendid tiger beetle can be created or maintained by anthropogenic disturbances such as roads, paths, or powerline cuts (Knisley 2011). These habitat components are generally stable in the plan area.

Within the plan area, the splendid tiger beetle has been observed in both the Timpas and Carrizo Units of the Comanche—in Carrizo, Picture, and Picketwire Canyons, and along roads (Van Scoyoc 2024).

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species' populations (Schultz 1989, NatureServe 2024, Choate 2013, Knisley 2011, Pearson et al. 2006, Brust et al. 2005, Minnesota Department of Natural Resources 2024b, Hall et al. 2024) University of Nebraska 2024. Knisley (2011) identify general threats to tiger beetle populations, but the applicability of these threats varies by species, and nothing could be found specific to the splendid tiger beetle.

Habitat

No sources consulted identified threats to this species' habitat ((Schultz 1989), (Brust et al. 2005), (Pearson et al. 2006), (Knisley 2011), (Choate 2013), (NatureServe 2024), (University of Nebraska 2024), (Minnesota Department of Natural Resources 2024b), (Hall et al. 2024)). Knisley (2011) identify general threats to tiger beetle habitats, but the applicability of these threats varies by species, and nothing could be found specific to the splendid tiger beetle. Anthropogenic disturbances can have both positive and negative effects on tiger beetle habitats—for example, dirt trails can help create open patches of favorable microhabitats for tiger beetles, but repeated disturbance of the soil surface by vehicles can also affect populations (Knisley 2011).

Ecological conditions

Ecological condition requirements

The species requires suitable clay microhabitats (Schultz 1989), which can occur in a variety of habitat types such as road cuts (University of Nebraska 2024), banks, powerline rights-of-way, dirt roads and trails (Choate 2013), old gravel pits or other disturbances (NatureServe 2024).

Larval habitats are more sensitive to disturbance than adult foraging area (NatureServe 2024). Larvae typically require “microhabitats with high plant cover and may disappear if vegetation encroaches in areas of larval burrows” (Knisley 2011).

Adults commonly fly along trails, over brush and low woods, and often sun on rocks (NatureServe 2024). Open sunlit habitat patches are an ecological condition requirement for adults to attain high body temperatures to efficiently capture prey (Knisley 2011). Trails and lightly traveled roads can help provide connectivity between colonies, because adults are more apt to fly over these areas than dense lowland forest or developed areas (NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

A variety of habitats can provide suitable clay microhabitats for this species (Hall et al. 2024), which appear to be fairly widespread in the plan area since human-altered areas such as roads and trails can be readily used by the splendid tiger beetle. Clayey plains, dominated by clay loam or silty clay loam surface soils, comprise approximately 26,349 acres of the plan area (~5%) (NRCS 2024). Several other soil types in the plan area, such as loamy plains, also include a high clay content (Bowen et al. 2010). Therefore, the ecological conditions for the splendid tiger beetle are not considered to be restricted in the plan area.

Critical biological characteristics

The splendid tiger beetle is a spring-fall species (Schultz 1989). Adult splendid tiger beetles emerge from pupae in the fall (late August - September), hunt until winter, overwinter underground in borrows, then re-emerge in early spring ((Schultz 1989), (Minnesota Department of Natural Resources 2024b), (University of Nebraska 2024)). In late March to May, the adults mate and lay eggs, and then slowly die-off as summer progresses ((Minnesota Department of Natural Resources 2024b), (University of Nebraska 2024)). The adults are usually uncommon by the third week of May (University of Nebraska 2024). The larvae and adults typically occupy the same microhabitat (Knisley 2011).

Tiger beetle larvae live and prey from within their burrows (Minnesota Department of Natural Resources 2024b). They are ambush predators that lie in wait in the top of their burrow (Minnesota Department of Natural Resources 2024b). The burrows are usually less than 15.7 inches (40 cm) in depth (University of

Nebraska 2024). Larvae may sense vibrations in the ground created by large predators (Minnesota Department of Natural Resources 2024b).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Adult and larval splendid tiger beetles are generalist invertivores (Minnesota Department of Natural Resources 2024b).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Tiger beetles generally, benefit from disturbance regimes that counter the loss of open habitat from encroaching vegetation from natural succession and the spread of invasive plants (Knisley 2011). No information could be found specifically for the splendid tiger beetle.

Maps of Species Range and Known Occurrences in Plan Area

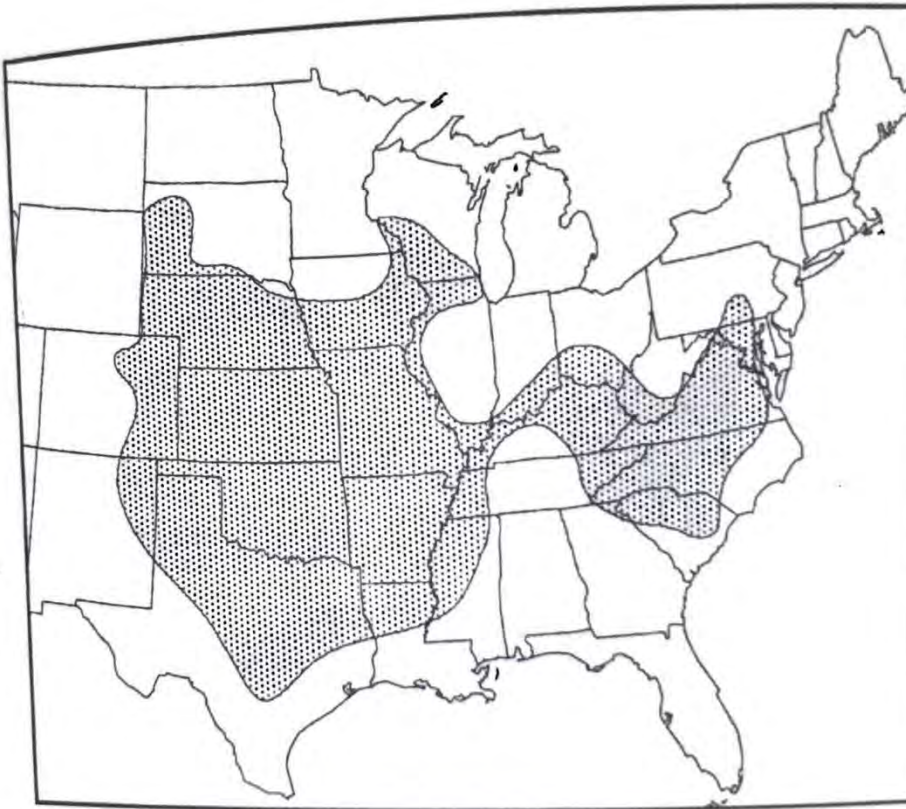


Figure 34. Range map of the splendid tiger beetle from Pearson et al. (2006).

Yellow Bumble Bee

(Bombus fervidus)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: One adult female worker was collected from Carrizo Creek bottoms near Troy in August 1947 (Van Scoyoc 2024). The georeferencing notes from the University of Colorado Museum of Natural History Entomology Collection state that the geographic coordinate associated with the specimen was missing a geodetic datum, and so was assumed to be WGS84 even though WGS84 was not developed at the time the specimen was collected. The record has a coordinate uncertainty of 9,961 feet (3,036 meters). The location is within ~656 ft (200 meters) of the boundary of the plan area; therefore, there is insufficient precision to determine if this is within the plan area or adjacent state or private land. Because of the uncertainty in the location of the occurrence record, this species is not known to occur in the plan area and is not analyzed further.

Year of Last Known Occurrence: N/A

Species Status

G3; SNR in Colorado; SNR in Kansas.

Yucca Giant-Skipper

(*Megathymus yuccae*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one record of an adult Yucca Giant-Skipper in Picture Canyon within the plan area in April 2020 (Van Scoyoc 2024). The record is from iNaturalist, was submitted by an entomologist, and has a data quality assessment of research grade. Therefore, the record is considered reliable, and the species is known to occur in the plan area.

Year of Last Known Occurrence: 2020

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population trend in the plan area is not known.
 - b. No information to indicate declining trend in habitat. This species' host plant (yucca) has increased in the plan area in part due to Dust Bowl legacy effects (USDA Forest Service 2024b).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is in the north-central portion of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: not known; one occurrence record in the plan area.
 - b. Ecological conditions: The species depends on yucca but can use varied habitat types. Its ecological conditions are not restricted in the plan area.

Species Status

G5; SNR in Colorado; S2 in Kansas.

Taxonomy

Megathymus yuccae is accepted as valid; the species has nine recognized subspecies (Integrated Taxonomic Information System (ITIS) 2024d).

Species range

Overall Species range

The species' range includes Utah and the Great Basin east through Arkansas and the Carolinas, south to Florida and the Gulf, west to Nevada, southern California, and Mexico (Figure 36, Figure 37) (Pyle 2004). It is the most widely distributed species of the Giant-Skipper subfamily (Megthymidae) (Pyle 2004).

Description of how the population in the plan area fits within the overall range

The plan area is located in the central to north-central portion of the species' range (Figure 36, Figure 37).

Distribution, abundance, and trend in the plan area

Population

The population size and trend in the plan area is not known; there is one occurrence record in the plan area. Glassberg (2001) notes "adults are rarely seen."

Habitat

Habitat for the Yucca Giant Skipper includes desert, semi-deserts and grasslands with yucca, scrubby woodland, forest edges, desert canyons, old fields and granite outcroppings (Feltwell 1992, Glassberg 2001, Pyle 2004, Lotts and Naberhaus 2017). The species has been documented in Picture Canyon on the Comanche National Grassland. There are dense stands of soapweed yucca (*Yucca glauca*) in the sandsage prairie of the Cimarron National Grassland (Kuhn et al. 2011). Yucca is also common in the bottoms and on the slopes of canyons in the plan area (USDA Forest Service 2005b). No information indicates a decline in these varied habitats within the plan area. This species' host plant (yucca) has increased in the plan area in part due to Dust Bowl legacy effects (USDA Forest Service 2024b).

Threats (arising from on or off the plan area)

Population

The species has no known threats to populations (Lotts and Naberhaus 2024); (NatureServe 2024).

Habitat

The species has no known threats to habitat (Lotts and Naberhaus 2024); (NatureServe 2024).

Ecological conditions

Ecological condition requirements

The species depends on abundance of yuccas (Glassberg 2001); (Feltwell 1992). Caterpillars feed on all native yuccas except Whipple's yucca (*Yucca whipplei*) (Pyle 2004). Lotts and Naberhaus (2017) highlight the following species as caterpillar hosts: bear-grass (*Yucca filamentosa*), Small's yucca (*Y. smalliana*), Spanish dagger (*Y. gloriosa*), soaptree yucca (*Y. elata*), Schott's yucca (*Y. arizonica*), and Spanish bayonet (*Y. aloifolia*). Adults benefit from moisture from mud (Lotts and Naberhaus 2017).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The occurrence records of this species spatially map within Landfire Existing Vegetation Type layer (EVT) as Western Great Plains Shortgrass Prairie, which is the most abundant habitat type in the plan area. *Yucca* is also a prevalent component of several ecological systems across the plan area, including the sandsage shrubland, juniper woodland and savanna, and canyonland communities in the plan area (USDA Forest Service 2005c), (CPW 2015), (Kuhn et al. 2011)). *Yucca* is one of the most widespread species in the plan area, in part due to Dust Bowl legacy effects. Therefore, ecological conditions are not considered restricted in the plan area.

Critical biological characteristics

Across its range, the *Yucca* Giant Skipper has one brood per year (Glassberg 2001). Caterpillars overwinter and pupate in spring, feeding on yucca (Pyle 2004). Adult flight can span January through early June, mainly March through April (Glassberg 2001), (Feltwell 1992). The adults do not appear to feed (Pyle 2004), (Lotts and Naberhaus 2017).

As a subfamily (*Megathymidae*), Giant Skippers are fast flyers that can exceed 60 mph (Pyle 2004). Outside of Florida, the adults only spent about 4 weeks in any one locale (Pyle 2004).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species has a highly specialized foodplant relationship with *Yucca* (Remington 1958).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Female *Yucca* Giant Skippers seem to prefer larger *Yucca* plants in open areas for egg-laying (Trager et al. 2009a). Larval survival increases on *Yucca* located in areas with relatively low herbaceous plant density, possibly due to reduced predation or more optimal microclimate (Trager et al. 2009a). Egg-laying was reduced on plants that had been damaged by fire, although limited information is available on this species' long-term response to fire (Trager et al. 2009b). For pollinators of the Great Plains, Hanberry et al. (2021) advise that "Retention of unburned areas as refugia is critical, particularly for species of conservation concern. Managers should plan conservatively, by assuming 100% mortality of pollinators in the burn unit."

One of its host plants, Adam's needle (*Yucca filamentosa*), has been widely introduced to non-native habitats and thrives in many disturbed habitats (e.g., utility rights-of-way or open roadsides), but it is unclear how this has affected *Yucca* Giant Skipper populations (Trager et al. 2009b). *Yucca* is expected to benefit from projected warmer and drier conditions in the future (CPW 2015). Trager et al. (Trager et al. 2009b) suggest that "regular anthropogenic disturbance that is cognizant of *M. yuccae*'s reproductive phenology (e.g., summer burning or mowing) may be important for maintaining the high habitat and host plant quality required for the long-term conservation of this insect."

Maps of Species Range and Known Occurrences in Plan Area

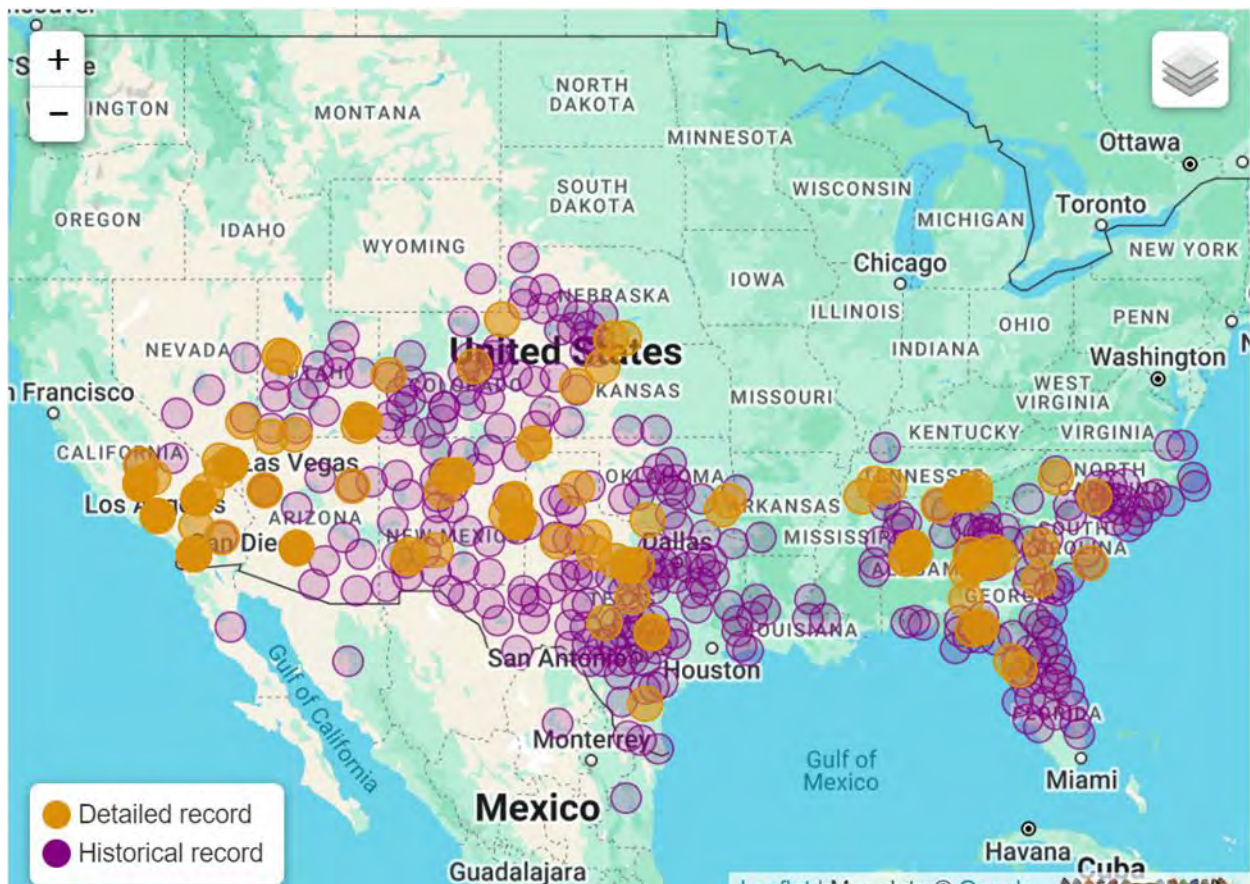


Figure 35. Range map of the Yucca Giant-Skipper from Butterflies and Moths of North America (BAMONA) project (Lotts and Naberhaus 2024).

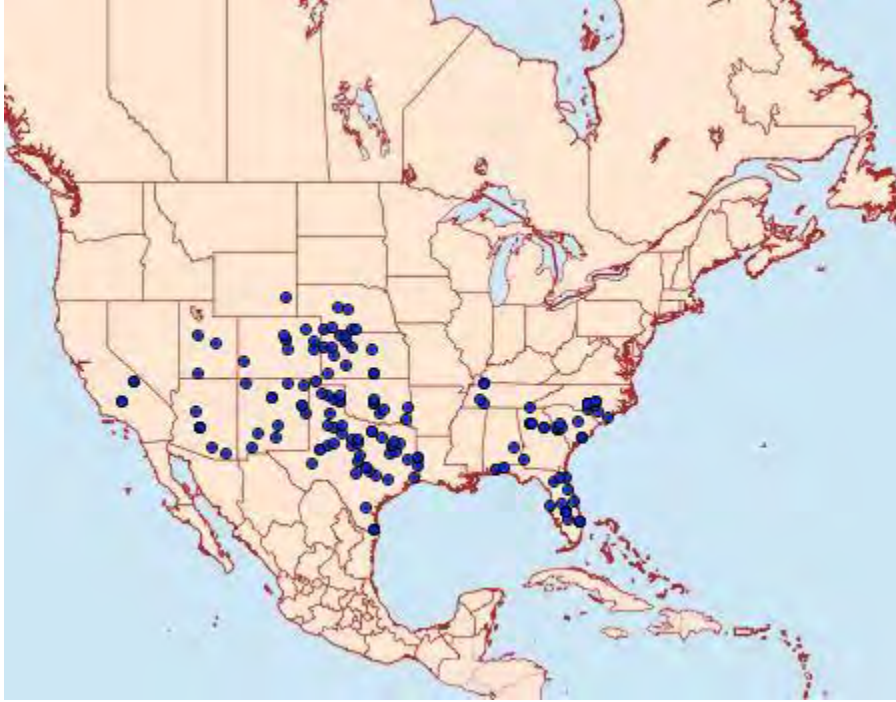


Figure 36. Distribution map of the Yucca Giant-Skipper from the “Moth Photographers Group” (2019) at the Mississippi Entomological Museum at Mississippi State University (Note that data points are normalized to reflect center-of-county locations).

Consolidated Literature Cited

- Acorn, J.H. 2011. Sand Hill Arthropods in Canadian Grassland. Chapter 2. *In* Floate, K.D., ed. Arthropods of Canadian Grasslands (Volume 2): Inhabitants of a Changing Landscape. Ottawa, ON: Biological Survey of Canada. 25-43 pp. <https://docslib.org/doc/6687878/sand-hill-arthropods-in-canadian-grasslands>
- Anderson, T. 2005. Uniomerus tetralasmus (Pondhorn): A Technical conservation assessment. Date: February 15, 2005. Lander, WY: U.S. Department of Agriculture, Forest Service, Rocky Mountain Region, Species Conservation Project. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5206810.pdf
- Bailowitz, R.A., Brodtkin, H., and Brodtkin, P. 2007. Finding Butterflies in Arizona: A Guide to the Best Sites. Johnson Books. <https://books.google.com/books?id=qenXk2VG1sQC>
- Behrstock, R.A. 2021. New Records of Pollinators and Other Insects Associated with Arizona Milkweed, *Asclepias angustifolia*, at Four Sites in Southeastern Arizona. *Journal of Pollination Ecology* 27: 1-27. [https://doi.org/10.26786/1920-7603\(2021\)621](https://doi.org/10.26786/1920-7603(2021)621)
- Bernays, E.A., Singer, M.S., and Rodrigues, D. 2004. Foraging in nature: Foraging efficiency and attentiveness in caterpillars with different diet breadths. *Ecological entomology* 29(4): 389-397. <https://www.doi.org/10.1111/j.0307-6946.2004.00615.x>
- Bestgen, K.R., Wilcox, C.T., Hill, A.A., and Fausch, K.D. 2017. A Dynamic Flow Regime Supports an Intact Great Plains Stream Fish Assemblage. *Transactions of the American Fisheries Society* 146(5): 903-916. <https://doi.org/10.1080/00028487.2017.1310137>
- Bowen, M.W., Johnson, W.C., Egbert, S.L., and Klopfenstein, S.T. 2010. A GIS-based approach to identify and map playa wetlands on the High Plains, Kansas, USA. *Wetlands* 30(4): 675-684. <https://www.doi.org/10.1007/s13157-010-0077-z>
- Bowers, M.D., Brown, I.L., and Wheye, D. 1985. Bird Predation as a Selective Agent in a Butterfly Population. *Evolution* 39(1): 93-103. <http://www.jstor.org/stable/2408519>
- Brikowski, T.H. 2008. Doomed Reservoirs in Kansas, USA? Climate Change and Groundwater Mining on the Great Plains Lead to Unsustainable Surface Water Storage. *Journal of Hydrology* 354(1): 90-101. <https://doi.org/10.1016/j.jhydrol.2008.02.020>
- Brust, M.L., Spomer, S.M., and Hoback, W.W. 2005. Splendid Tiger Beetle (online data) Tiger Beetles of Nebraska. University of Nebraska at Kearney. Accessed: 2005. Available at: http://www.lopers.net/student_org/NebraskaInverts/tbeetles/genera/cicindela/splendida.htm
- Butterflies and Moths of North America. 2024a. Barnes (*Pygarcia neomexicana*) (online data) Butterflies and Moths of North America. Accessed: 2024. Available at: <https://www.butterfliesandmoths.org/species/Pygarcia-neomexicana>
- Butterflies and Moths of North America. 2024b. Green Skipper (*Herperia viridis*) (online data) Butterflies and Moths of North America. Accessed: 2024. Available at: https://www.butterfliesandmoths.org/species/Hesperia-viridis?region=All&sort_by=field_sightingdate_value&sort_order=ASC
- Caesar, R.M. 2012. Phylogeny of the Genus *Argia* (Odonata: coenagrionidae) with Emphasis on Evolution of Reproductive Morphology. Doctor of Philosophy Doctoral Thesis. Evolution, Ecology and Organismal Biology, The Ohio State University, Columbus, OH. 210 p. http://rave.ohiolink.edu/etdc/view?acc_num=osu1339703828
- Cane, J.H. and Neff, J.L. 2011. Predicted Fates of Ground-Nesting Bees in Soil Heated by Wildfire: Thermal Tolerances of Life Stages and a Survey of Nesting Depths. *Biological Conservation* 144(11): 2631-2636. <https://doi.org/10.1016/j.biocon.2011.07.019>
- Cannings, R. 2014. The Dragonflies and Damselflies (Odonata) of Canadian Grasslands. Chapter 8. *In* Carcamo, H.A. and Giberson, D.J., eds., Biodiversity and Systematics Part 1. Vol. 3. British

- Columbia, CA: Biological Survey of Canada. 231-269 pp. <https://staff.royalbcmuseum.bc.ca/wp-content/uploads/2014/06/Odonata-Cannings-in-Arthropods-of-Canadian-Grasslands-Vol3-Ch8-2014.pdf>
- Carr, N.B. and Fancher, T.S. 2021. Compilation of information on occurrence and conservation status for the freshwater mussel fauna of Nebraska, Kansas, and Oklahoma. Data Series 1133. Reston, VA: U.S. Department of the Interior, Geological Survey (USGS). 22 p. <https://pubs.usgs.gov/publication/ds1133>
- Center for Biological Diversity, Bombus Pollinators Association of Law Students, and Tyler, J. 2021. Petition to List the American Bumble Bee *Bombus pensylvanicus* (De Geer, 1773) as an Endangered Species Under the U.S. Endangered Species Act. Date: February 1, 2021. Portland, OR: Center for Biological Diversity. 72 p. <https://www.biologicaldiversity.org/species/invertebrates/pdfs/Center-et-al-2021-Petition-to-List-the-American-Bumble-bee.pdf>
- Cervený, L.K., Miller, A., and Gende, S. 2020. Sustainable Cruise Tourism in Marine World Heritage Sites. *Sustainability* 12(2): 24. <https://doi.org/10.3390/su12020611>
- Choate, P.M. 2013. Tiger Beetles of Florida, *Cicindela* spp., *Megacephala* spp. (Insecta: Coleoptera: Carabidae: Cicindelinae). Date: March, 2013. Gainesville, FL: University of Florida. 5 p. <https://edis.ifas.ufl.edu/publication/IN131>
- Clausnitzer, V., Kalkman, V.J., Ram, M., Collen, B., Baillie, J.E.M., Bedjanič, M., Darwall, W.R.T., Dijkstra, K.-D.B., Dow, R., Hawking, J., Karube, H., Malikova, E., Paulson, D., Schütte, K., Suhling, F., Villanueva, R.J., von Ellenrieder, N., and Wilson, K. 2009. Odonata enter the biodiversity crisis debate: The first global assessment of an insect group. *Biological conservation* 142(8): 1864-1869. <https://doi.org/10.1016/j.biocon.2009.03.028>
- Collinge, S.K., Prudic, K.L., and Oliver, J.C. 2003. Effects of Local Habitat Characteristics and Landscape Context on Grassland Butterfly Diversity. *Conservation Biology* 17(1): 178-187. <https://www.jstor.org/stable/3095284>
- Colorado Natural Heritage Program (CNHP). 2024. Colorado Rare Plant Guide: *Asclepias uncialis* (website). Colorado Natural Heritage Program, Last Modified 20241122. <https://cnhp.colostate.edu/rareplant/details/?plantID=23798>
- Colorado State University, C.P. Gillette Museum of Arthropod Diversity. 2024. *Cicindela lepida* (online data) Dejean, 1831. Colorado State University, C.P. Gillette Museum of Arthropod Diversity. Accessed: 2024. Available at: <https://www.gbif.org/occurrence/2432176416>
- Cordero-Rivera, A. 1990. The Inheritance of Female Polymorphism in the Damselfly *Ischnura graellsii* (Rambur) (Odonata: Coenagrionidae). *Heredity* 64: 341-346. <https://doi.org/10.1038/hdy.1990.42>
- CPW, Colorado Parks and Wildlife. 2015. State wildlife action plan: A strategy for conserving wildlife in Colorado. Denver, CO. 865 p. <https://cpw.widencollective.com/assets/share/asset/nbenjdfemj>
- Decker, B.L. and Harmon-Threatt, A.N. 2019. Growing or Dormant Season Burns: The Effects of Burn Season on Bee and Plant Communities. *Biodiversity and Conservation* 28(13): 3621-3631. <https://doi.org/10.1007/s10531-019-01840-6>
- DUPLICATE, N.R.C. 2007. Status of Pollinators in North America. Washington, DC: The National Academies Press. 326 p. <https://doi.org/10.17226/11761>
- Edwards, W.H. 2024. Green Skipper (*Hesperia viridis*) (online data) Nebraska Lepidoptera. Accessed: 2024. Available at: <https://nebraskalepidoptera.com/viridis2/>
- Entomology, U.o.K. 2010. Kentucky Critter Files: Sphinx Moths (website). University of Kentucky, Last Modified February 26, 2010. <https://www.uky.edu/Ag/CritterFiles/casefile/insects/butterflies/sphinx/sphinx.htm>
- Feltwell, J. 1992. American Nature Guides: Butterflies of North America. United States: SMITHMARK Publishers Inc.,.
- Fisher, M.L. 2018a. Biogeography and Natural History of Tiger Moths and Spongillafly of Intermountain North America with Experimental Studies of Host Preference in the Lichen-Feeder *Cisthene angelus* (Insecta: Lepidoptera: Erebiidae: Arctiinae and

- Neurctiinae and Neuroptera: Sisyridae). Master of Science. Department of Biology, Brigham Young University, Provo, UT. 241 p.
<https://scholarsarchive.byu.edu/cgi/viewcontent.cgi?article=8194&context=etd>
- Fisher, M.L. 2018b. Biogeography and natural history of tiger moths and spongillaflies of intermountain North America with experimental studies of host preference in the lichen-feeder *Cisthene angelus* (Insecta: Lepidoptera: Erebiidae: Erebiidae: Arctiinae and Neurctiinae and Neuroptera: Sisyridae). Master of Science. Department of Biology, Brigham Young University, Provo, UT. 241 p. <https://scholarsarchive.byu.edu/cgi/viewcontent.cgi?article=8194&context=etd>
- Florida Natural Areas Inventory. 2023. Eastern Ringtail *Erpetogomphus designatus* (online data) Florida Natural Areas Inventory. Accessed: January, 2023. Available at:
https://www.fnai.org/PDFs/FieldGuides/Erpetogomphus_designatus.pdf
- FWS, U.S. Fish and Wildlife Service. 2024. Endangered and threatened wildlife and plants; 90-day findings for 8 species. In 50 CFR Part 17. Vol. 89. Report Number. 81388-81394 pp.
<https://www.govinfo.gov/content/pkg/FR-2024-10-08/pdf/2024-22914.pdf>
- Garrison, R.W. 1994. A Synopsis of the Genus *Argia* of the United States with Keys and Descriptions of New Species, *Argia sabino*, *A. leonora*, and *A. pima* (Odonata: coenagrionidae). Transactions of the American Entomological Society (1890-) 120(4): 287-368.
<https://www.jstor.org/stable/40785270>
- Ghanzar, M., Malik, M.F., Hussain, M., Iqbal, R., and Younas, M. 2016. Butterflies and their Contribution in Ecosystem: A Review. Journal of Entomology and Zoology Studies 4(2): 115-118. <https://www.entomoljournal.com/archives/2016/vol4issue2/PartB/4-2-36.1.pdf>
- Glassberg, J. 2001. Butterflies Through Binoculars: The West: A field Guide to the Butterflies of Western North America. New York, USA: Oxford University Press.
<http://ebookcentral.proquest.com/lib/wisc/detail.action?docID=5745618>.
- Goulson, D. 2010. Bumblebees: behaviour, ecology, and conservation. 2nd ed. New York, NY: Oxford University Press on Demand.
- Guzman, L.M., Johnson, S.A., Mooers, A.O., and M'Gonigle, L.K. 2021. Using Historical Data to Estimate Bumble Bee Occurrence: Variable Trends Across Species Provide Little Support for Community-Level Declines. Biological Conservation 257: 109-141.
<https://doi.org/10.1016/j.biocon.2021.109141>
- Hall, S., Sorenson, C., Corey, E., Shields, M., Anderson, J., and Howard, T. 2024. Splendid Tiger Beetle (*Cicindela splendida*) (online data). Raleigh, NC: North Carolina Biodiversity Project, North Carolina State Parks. Accessed: 2024. Available at:
<https://auth1.dpr.ncparks.gov/beetles/accounts.php>
- Hanberry, B.B., DeBano, S.J., Kaye, T.N., Rowland, M.M., Hartway, C.R., and Shorrock, D. 2021. Pollinators of the Great Plains: Disturbances, Stressors, Management, and Research Needs. Rangeland Ecology & Management 78: 220-234. <https://doi.org/10.1016/j.rama.2020.08.006>
- Harrold, M.N. and Guralnick, R. 2010. A field guide to the freshwater mollusks of Colorado. Date: August, 2010. Denver, CO: Colorado Division of Wildlife. 1-132 pp. <https://pnwmussels.org/wp-content/uploads/2016/07/FreshwaterMollusks.pdf>
- Hatfield, J., Takle, E., Grotjahn, R., Holden, P., Izaurralde, R.C., Mader, T., Marshall, E., and Liverman, D. 2014. Agriculture. Chapter 6. In Melillo, J.M., Richmond, T. and Yohe, G.W., eds., Climate change impacts in the United States: The third national climate assessment. Washington, DC: U.S. Global Change Research Program (USGCRP). 150-174 pp.
<https://doi.org/10.7930/J02Z13FR>
- Heitzman, R. 1966. The life history of *Atryone arogos* (Hesperiidae). Journal of Lepidopterists' Society 20(3): 177-181. [https://images.peabody.yale.edu/lepsoc/jls/1960s/1966/1966-20\(3\)177-Heitzman.pdf](https://images.peabody.yale.edu/lepsoc/jls/1960s/1966/1966-20(3)177-Heitzman.pdf)
- Hunt, P.D., Blust, M., and Morrison, F. 2010. Lotic odonata of the Connecticut River in New Hampshire and Vermont. Northeastern Naturalist 17(2): 175-188. <https://www.jstor.org/stable/40664872>

- iDigBio. 2024. iDigBio (website). Integrated Digitized Biocollections (iDigBio), the National Resource for Advancing Digitization of Biodiversity Collections (ADBC) funded by the National Science Foundation, Last Modified 2024. <https://www.idigbio.org>
- Integrated Taxonomic Information System (ITIS). 2024a. *Bombus morrisoni*, Cresson, 1879, Taxonomic serial number 714823 (website). (Virtual Dataset). U.S. Department of the Interior, Geological Survey (USGS), Last Modified 2024. https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=714823#null
- Integrated Taxonomic Information System (ITIS). 2024b. Brimstone Clubtail (*Stylurus intricatus*) (online data) Hagen in Selys. 1858. Reston, VA: U.S. Department of the Interior, Geologic Survey (USGS). Accessed: 2024. Available at: <https://www.itis.gov/servlet/SingleRpt/SingleRpt>
- Integrated Taxonomic Information System (ITIS). 2024c. *Cicindela splendida*, Hentz, 1830, Taxonomic serial number 697740 (website). (Virtual Dataset). U.S. Department of the Interior, Geological Survey (USGS), Last Modified 2024. https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=697740#null
- Integrated Taxonomic Information System (ITIS). 2024d. ITIS (online data) ITIS. Accessed: 11/22/2024. Available at: <https://doi.org/10.5066/F7KH0KBK>
- ITIS, Integrated Taxonomic Information System. 2024a. *Amblyscirtes aenus*, W. H. Edwards, 2024, 706565. (Virtual Dataset). Report. Date: 2024. U.S. Department of the Interior, Geological Survey (USGS). https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=706565#null
- ITIS, Integrated Taxonomic Information System. 2024b. *Argia sedula*, Hagen, 2024, 102147 (online data) Report. Virtual Dataset: U.S. Department of the Interior, Geological Survey (USGS). Accessed: 2024. Available at: <https://www.itis.gov/servlet/SingleRpt/SingleRpt#null>
- ITIS, Integrated Taxonomic Information System. 2024c. Eastern Ringtail (*Erpetogomphus designatus*) (online data) Hagen in Selys, 1858, 101726. Reston, VA: U.S. Department of the Interior, Geologic Survey (USGS). Accessed: 2024. Available at: <https://www.itis.gov/servlet/SingleRpt/SingleRpt>
- ITIS, Integrated Taxonomic Information System. 2024d. Ghost Tiger Beetle (*Ellipsoptera lepida*) (online data) Dejean, 1831, 931855. Reston, VA: U.S. Department of the Interior, Geological Survey (USGS). Accessed: 2024. Available at: <https://www.itis.gov/>
- ITIS, Integrated Taxonomic Information System. 2024e. *Pygarcia neomexicana*, Barnes, 1904 (online data) ITIS Taxonomic Serial Number 940089. Virtual Dataset: U.S. Department of the Interior, Geological Survey (USGS). Accessed: April 8, 2024. Available at: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=940089#null
- ITIS, Integrated Taxonomic Information System. 2024f. Rainbow Bluet (*Enallagma antennatum*) (online data) Say, 1839, 102103. Reston, VA: U.S. Department of the Interior, Geologic Survey (USGS). Accessed: 2024. Available at: <https://www.itis.gov/servlet/SingleRpt/SingleRpt>
- IUCN, International Union for Conservation of Nature. 2024. The IUCN red list of threatened species (website). International Union for Conservation of Nature (IUCN), Last Modified 2024. <https://www.iucnredlist.org/>
- Jacobus, L.M., Macadam, C.R., and Sartori, M. 2019. Mayflies (ephemeroptera) and their contributions to ecosystem services. *Insects* 10(6) <https://www.doi.org/10.3390/insects10060170>
- Johnson, C. 1966. Environmental Modification of Habitat Selection in Adult Damselflies. *Ecology* 47(4): 674-676. <https://doi.org/10.2307/1933953>
- Kelso, T., Bower, N., Halteman, P., Tenney, K., and Weaver, S. 2007. Dune communities of SE Colorado: Patterns of rarity, disjunction and succession. Pages 39-48. *In* Barlow-Irick, P., Anderson, J. and McDonald, C., eds. Southwestern rare and endangered plants: Proceedings of the fourth conference; March 22-26, 2004; Las Cruces, NM, Proc. RMRS-P-48CD. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. <https://research.fs.usda.gov/treesearch/29586>

- Knisley, C.B. 2011. Anthropogenic Disturbances and Rare Tiger Beetle Habitats: Benefits, Risks, and Implications for Conservation. *Terrestrial arthropod reviews* 4(1): 41-61.
<https://www.doi.org/10.1163/187498311X555706>
- Koch, J.B.U. and Cane, J.H. 2022. Pollen Columns and a Wax Canopy in a First Nest Description of *Bombus* (*Cullumanobombus*) *morrisoni* (Apidae). *Apidologie* 53(3): 31.
<https://doi.org/10.1007/s13592-022-00943-4>
- Kuhn, B., Nelson, B.E., and Hartman, R.L. 2011. A Floristic Inventory of the Cimarron National Grassland (Kansas) and the Comanche National Grassland (Colorado). *Journal of the Botanical Research Institute of Texas* 5(2): 753-772. <http://www.jstor.org/stable/41972334>
- Locklear, J.H. 2021. The Sandsage prairie ecological system: Biodiversity hotspot for the Great Plains. *Natural areas journal* 41(1): 64-74. <https://doi.org/10.3375/043.041.0109>
- Lotts, K. and Naberhaus, T. 2017. Butterflies and Moths of North America (online data). Available at: <https://www.butterfliesandmoths.org/species/Danaus-plexippus>
- Lotts, K. and Naberhaus, T. 2024. Butterflies and Moths of North America [online database] (online data). Available at: <http://www.butterfliesandmoths.org/>
- Lozier, J.D. and Cameron, S.A. 2009. Comparative Genetic Analyses of Historical and Contemporary Collections Highlight Contrasting Demographic Histories for the Bumble Bees *Bombus pensylvanicus* and *B. impatiens* in Illinois. *Molecular ecology* 18(9): 1875-86.
<https://www.doi.org/10.1111/j.1365-294x.2009.04160.x>
- MacPhail, V.J., Richardson, L.L., and Colla, S.R. 2019. Incorporating citizen science, museum specimens, and field work into the assessment of extinction risk of the American Bumble bee (*Bombus pensylvanicus* De Geer 1773) in Canada. *Journal of insect conservation* 23(3): 597-611.
<https://www.doi.org/10.1007/s10841-019-00152-y>
- Mahato, M. and Kennedy, J. 2008. Field Experimental Approach to Detect Urban Impact on *Erpetogomphus Designatus* Hagen in Selys Larvae (Anisoptera : Gomphidae). *Odonatologica* 37: 13-28. <https://natuurtijdschriften.nl/pub/592612/OJIOS2008037001002.pdf>
- Matthews, R.F. 1994. *Lycium pallidum* (online data) Fire Effects Information System, Online. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory: USDA Forest Service. Available at: <https://www.fs.usda.gov/database/feis/plants/shrub/lycpal/all.html>
- McCafferty, W.P., Durfee, R.S., and Kondratieff, B.C. 1993. Colorado mayflies (Ephemeroptera): An annotated inventory. *The southwestern naturalist* 38(3): 252-274. <https://doi.org/10.2307/3671431>
- McGuire, W.W. 1982. Notes on the Genus *Hesperia* in Texas: Temporal and Spatial Relationships. *Bulletin of the Allyn Museum - McGuire Center for Lepidoptera & Biodiversity* 73
<https://www.floridamuseum.ufl.edu/wp-content/uploads/sites/56/2017/05/McGuire-AME073.pdf>
- McPeck, M.A. 1990. Determination of species composition in the *Enallagma* damselfly assemblages of permanent lakes. *Ecology* 71(1): 83-98. <https://doi.org/10.2307/1940249>
- Minnesota Department of Natural Resources. 2024a. Rare species guide (website). Minnesota Department of Natural Resources, Last Modified 2024. <https://www.dnr.state.mn.us/rsg/index.html>
- Minnesota Department of Natural Resources. 2024b. Splendid tiger beetle (*Cicindela splendida cyanocephalata*) (online data). St. Paul, MN: Minnesota Department of Natural Resources. Accessed: 2024. Available at: <https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=IICOL02321>
- Montana Natural Heritage Program. 2024a. Brimstone Clubtail (*Stylurus intricatus*) (online data). Helena, MT: Montana Natural Heritage Program. Accessed: 2024. Available at: <https://fieldguide.mt.gov/speciesDetail.aspx?elcode=IIODO80020>
- Montana Natural Heritage Program. 2024b. Ghost tiger beetle (*Ellipsoptera lepida*) (online data). Helena, MT: Montana Natural Heritage Program. Accessed: 2024. Available at: <https://fieldguide.mt.gov/speciesDetail.aspx?elcode=IICOL02250>

- Mortensen, L. and Richardson, J.M.L. 2008. Effects of Chemical Cues on Foraging in Damselfly Larvae, *Enallagma Antennatum*. *Journal of insect behavior* 21(4): 285-295.
<https://doi.org/10.1007/s10905-008-9125-4>
- Myrup, A., R. and Baumann, R., W. 2016. The Dragonflies and Damselflies (Odonata) of Utah. *Monographs of the western North American naturalist* 9(1): 1-114.
<https://www.doi.org/10.3398/042.009.0101>
- National Research Council 2007. Status of pollinators in north America. Washington, DC: The National Academies Press. 326 p. <https://doi.org/10.17226/11761>
- NatureServe. 2024. NatureServe Explorer (online data) NatureServe. Accessed: April 17, 2024. Available at: <https://explorer.natureserve.org>
- Neid, S., Decker, K., Handwerk, J., and Panjabi, S.S. 2007. Rare plant surveys on the pinon canyon maneuver site 2006-2007. Fort Collins, CO: Colorado Natural Heritage Program. 50 p.
https://www.cnhp.colostate.edu/download/documents/2007/PCMS_FINAL_122107.pdf
- Nelson, S.M. 2007. Butterflies (Papilionoidea and Hesperioidea) as Potential Ecological Indicators of Riparian Quality in the Semi-Arid Western United States. *Ecological Indicators* 7(2): 469-480.
<https://doi.org/10.1016/j.ecolind.2006.05.004>
- NRCS, USDA Natural Resources Conservation Service 2024. Ecological site R063AY011SD Clayey (website). U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS), Ecosystem Dynamics Interpretive Tool (EDIT), Last Modified June 26, 2024.
<https://edit.jornada.nmsu.edu/catalogs/esd/063A/R063AY011SD>
- Olsen, F.L. 2018. Survey of northwest Iowa prairies for *Atrytone arogos* and *Poanes massasoit* 2018. 30 p. http://www.poweshiekskipper.org/project/Swengel_Arogos_and_Massasoit_Report_2018.pdf
- Osborn, R. 2005. Odonata as Indicators of Habitat Quality at Lakes in Louisiana, United States. *Odonatologica* 34: 259-270. <https://archive.org/details/odonatologica-34-259-270>
- Panzer, R. 2002. Compatibility of Prescribed Burning with the Conservation of Insects in Small, Isolated Prairie Reserves. *Conservation Biology* 16(5): 1296-1307. <https://doi.org/10.1046/j.1523-1739.2002.01077.x>
- Patten, M.A., Bried, J.T., and Smith-Patten, B.D. 2015. Survey data matter: Predicted niche of adult vs breeding Odonata. *Applied Odontology* 34(3): 1114-1122.
<https://www.journals.uchicago.edu/doi/10.1086/682676>
- Paulson, D.R., Dunkle, S.W., and Johnson, J.T. 2024. A checklist of North American Odonata, including English name, etymology, type locality, and distribution. 2024 ed. Vancouver, Washington: Jim T. Johnson. 92 p.
https://www.odonatacentral.org/public/media/uploads/files/NA_Odonata_Checklist_2024.pdf
- Pearson, D.L., Knisley, C.B., and Kazilek, C.J. 2006. A Field Guide to the Tiger Beetles of the United States and Canada : Identification, Natural History, and Distribution of the Cicindelidae. New York, NY: Oxford University Press. 4 p. <https://books.google.com/books?id=7bmggXG6ANcC>
- Pearson, D.L. and Wiesner, J. 2023. The use of tiger beetles (Coleoptera: Cicindelidae) in adapting hotspot conservation to global, regional, and local scales. *Journal of insect conservation* 27(1): 19-48. <https://doi.org/10.1007/s10841-022-00411-5>
- Prather, I. and Prather, B. 2015. The Dragonflies and Damselflies (Odonata) of Colorado: An Updated Annotated Checklist. *Insects of Western North America*. Date: February 10, 2015. Fort Collins, CO: C.P. Gillette Museum of Arthropod Diversity, Colorado State University. 59 p.
<http://hdl.handle.net/10217/88633>
- Pyle, R.M. 2004. National Audubon Society Field Guide to North American Butterflies. Audubon Society Field Guide Series. 17th ed. New York: Alfred A. Knopf.
- Raby, M., Nowierski, M., Perlov, D., Zhao, X., Hao, C., Poirier, D.G., and Sibley, P.K. 2018. Acute toxicity of 6 neonicotinoid insecticides to freshwater invertebrates. *Environmental toxicology and chemistry* 37(5): 1430-1445. <https://doi.org/10.1002/etc.4088>

- Remington, C.L. 1958. On the Autecology of Mega Thymus Yuccae in Florida, with Notes on Food Plant Specificity (Hesperioidea). *The Lepidopterists' News* 12(5-6): 175-185.
[https://images.peabody.yale.edu/lepsoc/jls/1950s/1958/1958-12\(5-6\)175-Remington.pdf](https://images.peabody.yale.edu/lepsoc/jls/1950s/1958/1958-12(5-6)175-Remington.pdf)
- Robinson, J.V., Dickerson, J.E., and Bible, D.R. 1983. The Demographics and Habitat Utilization of Adult *Argia Sedula* (Hagen) as Determined by Mark-Recapture Analysis (Zygoptera: Coenagrionidae). *Odonatologica* 12(2): 167-172.
<https://natuurtijdschriften.nl/pub/591614/OJIOS1983012002006.pdf>
- Roitberg, B.D. and Mangel, M. 2016. Cold snaps, heatwaves, and arthropod growth. *Ecological Entomology* 41: 653-659. <https://doi.org/10.1111/een.12324>
- Rondeau, R., Decker, K., Handwerk, J., Siemers, J., Grunau, L., and Pague, C. 2011. The state of Colorado's biodiversity. Date: 2011. Fort Collins, CO: Colorado Natural Heritage Program. 208 p. https://cnhp.colostate.edu/download/documents/2011/Scorecard_march1_2012_final.pdf
- Schultz, T.D. 1989. Habitat preferences and seasonal abundances of eight sympatric species of tiger beetle, Genus *Cicindela* (Coleoptera: Cicindelidae), in Bastrop State Park, Texas. *The southwestern naturalist* 34(4): 468-477. <https://www.doi.org/10.2307/3671504>
- Scott, J.A. 1986. *The Butterflies of North America: A Natural History and Field Guide*. Stanford, CA: Stanford University Press. 4 p. <https://archive.org/details/butterfliesofnor00jame>
- Scott, J.A. 2020. Butterflies of the Southern Rocky Mountains Area, and Their Natural History and Behavior. *Papilio News Series* 27(March): 392.
<https://api.mountainscholar.org/server/api/core/bitstreams/e85956ea-368c-4023-a79c-1f9e3c281b18/content>
- Scott, J.A. and Epstein, M.E. 1987. Factors Affecting Phenology in a Temperate Insect Community. *The American Midland Naturalist* 117(1): 103-118. <https://doi.org/10.2307/2425712>
- Sibley, F., Paseka, J., and Beckemeyer, R. 2019. *The Dragonflies and Damselflies of Nebraska*. Lincoln, Nebraska: Zea E-Books. 95 p. <https://doi.org/10.32873/unl.dc.zea.1094>
- Sirois-Delisle, C. and Kerr, J.T. 2018. Climate Change-Driven Range Losses among Bumblebee Species are Poised to Accelerate. *Scientific Reports* 8(1): 14464. <https://doi.org/10.1038/s41598-018-32665-y>
- Sirois-Delisle, C. and Kerr, J.T. 2022. Climate Change Aggravates Non-Target Effects of Pesticides on Dragonflies at Macroecological Scales. *Ecological Applications* 32(2): e2494-11.
<https://doi.org/10.1002/eap.2494>
- Smith, B. and Patten, M. 2020. Conservation of Oklahoma Odonata. Chapter 7. *In* Smith, B. and Patten, M., eds., *Dragonflies at a Biogeographical Crossroads: The Odonata of Oklahoma and Complexities Beyond its Borders*. Boca Raton, FL: CRC Press. 8 p.
<https://doi.org/10.1201/9781003007562>
- Smith, J. 2024. Colorado's shortgrass prairies at risk of dying off as extreme droughts become more common. *Colorado Sun*, February 2, 2024 Agriculture, 4 p.
<https://coloradosun.com/2024/02/02/colorados-shortgrass-prairies-dying-off-drought/>
- Smith, J., Rossner, K., and Duran, D. 2021. New opportunities for conservation of a rare tiger beetle on developed barrier island beaches. *Journal of insect conservation* 25: 733-745.
<https://doi.org/10.1007/s10841-021-00339-2>
- Society, T.X. (2023). *Monarch Necture Plants Rocky Mountains* Accessed:
<https://xerces.org/publications/scientific-reports/conservation-status-and-ecology-of-monarch-butterfly-in-us>
- Stewart, S.S. and Vodopich, D.S. 2018. Environmental Effects on Wing Shape And Wing Size of *Argia Sedula* (Odonata: Coenagrionidae). *International Journal of Odonatology* 21(3-4): 189-203.
<https://doi.org/10.1080/13887890.2018.1523752>
- Swengel, A.B. 1996. Effects of Fire and Hay Management on Abundance of Prairie Butterflies. *Biological Conservation* 76(1): 73-85. [https://doi.org/10.1016/0006-3207\(95\)00085-2](https://doi.org/10.1016/0006-3207(95)00085-2)
- Swengel, S.R., Schlicht, D., Olsen, F., and Swengel, A.B. 2010. Declines of prairie butterflies in the midwestern USA. Poster Pages 1-13. 6th International symposium: The 2010 target and beyond

- for Lepidoptera; March 26-28, 2010; Reading, UK Butterfly Conservation.
<https://doi.org/10.13140/2.1.4889.5689>
- Thomas, J.A. 2005. Monitoring Change in the Abundance and Distribution of Insects Using Butterflies and Other Indicator Groups. *Philosophical Transactions of the Royal Society B: Biological Sciences* 360(1454): 339-357. <https://doi.org/10.1098/rstb.2004.1585>
- Trager, M.D., Boyd, B.M., Daniels, J.C., and Pence, J.A. 2009a. Host Plant Selection, Larval Survival, and Reproductive Phenology in *Megathymus Yccae* (Lepidoptera: Hesperidae). *Environmental Entomology* 38(4): 1211-1218. <https://doi.org/10.1603/022.038.0431>
- Trager, M.D., Boyd, B.M., Daniels, J.C., and Pence, J.A. 2009b. Host Plant Selection, Larval Survival, and Reproductive Phenology in *Megathymus yuccae* (Lepidoptera: Hesperidae). *Environmental Entomology* 38(4): 1211-1218. <https://doi.org/10.1603/022.038.0431>
- Tuttle, J.P. 2007. *The Hawk Moths of North America: A Natural History Study of the Sphingidae of the United States and Canada*. Washington, DC: Wedge Entomological Research Foundation. 6 p.
https://books.google.com/books/about/The_Hawk_Moths_of_North_America.html?id=vwQAQAAMAAJ
- University of Nebraska. 2024. *Cicindela splendida hentz, splendid tiger beetle* (website). Department of Entomology, Last Modified 2024. <https://entomology.unl.edu/cicindela-splendida-hentz-splendid-tiger-beetle>
- USDA Forest Service. 2005a. *Cimarron and Comanche National Grassland: Vegetation/Ecology*. Specialist Reports. Date: May 10, 2006. Washington, DC: U.S. Department of Agriculture. 150 p.
- USDA Forest Service. 2005b. *Cimarron and Comanche National Grasslands Land Management Plan: Ecological Sustainability*. Date: October 6, 2005. Washington, DC: U.S. Department of Agriculture. 150 p.
- USDA Forest Service. 2005c. *Cimarron and Comanche National Grasslands: Ecological sustainability*. Date: June 10, 2005. Washington, DC: USDA Forest Service. 115 p.
- USDA Forest Service. 2024a. *Canyonlands. Ecological ecosystem integrity workshop*. Date: 2024. Washington, DC: USDA Forest Service. 6 p.
- USDA Forest Service. 2024b. *Sandsage prairie. Terrestrial ecosystem integrity workshop*. Date: 2024. Washington, DC: USDA Forest Service. 6 p.
- USDA Forest Service. 2024c. *Shortgrass prairie. Terrestrial ecosystem integrity workshop*. Date: 2024. Washington, DC: USDA Forest Service. 9 p.
- USDA Forest Service. 2024d. *Terrestrial condition assessment report for Cimarron-Comanche National Grasslands*. Date: September, 2024. Washington, DC: USDA Forest Service. 22 p.
- USDA Forest Service. 2024e. *Terrestrial ecosystem integrity workshop sandsage prairie - draft*. Date: 2024. Washington, DC: U.S. Department of Agriculture, Forest Service.
- USDA Forest Service. 2024f. *Terrestrial ecosystem integrity workshop shortgrass prairie - draft*. Date: 2024. Washington, DC: U.S. Department of Agriculture, Forest Service. 9 p.
- USDA Forest Service. 2024g. *Worksheet for streams and rivers ecosystems technical reports: Cimarron and Comanche National Grasslands*. Date: 2024. Washington, DC: USDA Forest Service. 19 p.
- Van Scoyoc, M. 2024. *Species Occurrence Data for the Cimarron-Comanche National Grasslands*. (HTML output auto-generated from multiple data sources such as iDigBio, GBIF, and others). Date: April 2024. Denver, CO: USDA Forest Service, Mountain Planning Service Group.
- Vaudo, A.D., Dyer, L.A., and Leonard, A.S. 2024. *Pollen Nutrition Structures Bee and Plant Community Interactions*. *Proceedings of the National Academy Sciences* 121(3): e2317228120.
<https://doi.org/10.1073/pnas.2317228120>
- Vogel, J.A., Debinski, D.M., Koford, R.R., and Miller, J.R. 2007. Butterfly responses to prairie restoration through fire and grazing. *Biological conservation* 140(1): 78-90.
<https://www.doi.org/10.1016/j.biocon.2007.07.027>
- Vogel, J.A., Koford, R.R., and Debinski, D.M. 2010. Direct and indirect responses of tallgrass prairie butterflies to prescribed burning. *Journal of Insect Conservation* 14: 663-677.
<https://link.springer.com/article/10.1007/s10841-010-9295-1>

- Voshell, J.R. 2002. A guide to common freshwater invertebrates of North America. McDonald & Woodward.
- Westfall, M.J. and May, M.L. 2006. Damselflies of North America. Gainesville, FL: Scientific Publishers. 5 p. <https://books.google.com/books?id=U9wQAQAAMAAJ>
- Williams, P.H., Thorp, R.W., Richardson, L.L., and Colla, S.R. 2014. Bumble Bees of North America: An Identification Guide. Princeton, NJ: Princeton University Press. 209 p. <http://www.jstor.org/stable/j.ctt6wpzr9>
- Wisconsin Aquatic and Terrestrial Resources Inventory and Wisconsin Department of Natural Resources. 2024. Wisconsin odonata survey: Eastern ringtail (*Erpetogomphus designatus*) (online data) Hagen in Selys, 1858. Madison, WI: Wisconsin Department of Natural Resources. Accessed: 2024. Available at: <https://wiatri.net/inventory/odonata/speciesaccounts/SpeciesDetail.cfm?TaxaID=178>
- Wright, A.L., Boyd, C.L., Bowers, M.D., and Scott, V.L. 2017. The Bumble Bees of Colorado: A Pictorial Identification and Information Guide. Boulder, Colorado: University of Colorado. 71 p. <https://www.colorado.edu/cumuseum/sites/default/files/attached-files/thebumblebeesofcolorado-2017.pdf>
- Xerces Society for Invertebrate Conservation. 2019. Rangeland Management and Pollinators: A Guide for Producers in the Great Plains. Portland, OR: Xerces Society for Invertebrate Conservation. <https://xerces.org/sites/default/files/publications/20-001.pdf>
- Xerces Society for Invertebrate Conservation, Killingsworth, S., May, E., Hatfield, R., and Jepsen, S. 2023. Petition to List Morrison Bumble Bee *Bombus morrisoni* (Cresson), 1878 as an Endangered Species Under the U.S. Endangered Species Act. Portland, OR: Xerces Society for Invertebrate Conservation. https://xerces.org/sites/default/files/publications/23-026_01_Xerces_Bombus-morrisoni-ESA-Petition.pdf



Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Cimarron and Comanche National Grasslands | Mammal Species Evaluations for Assessment | June 2025

Species Evaluation Report for Mammals on the Cimarron and Comanche National Grasslands

**Prepared by USDA Forest Service, Mountain Planning Service
Group, Lakewood, Colorado**

Prepared for the Cimarron and Comanche National Grasslands



Cover Photo: Rocky Mountain Bighorn Sheep (*Ovis canadensis canadensis*)

This is a working document and the information contained herein may be changed or updated by the USDA Forest Service at any time in the future.

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American Hog-nosed Skunk

(*Conepatus leuconotus* (sp. *figginsi*))

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One individual was observed during the field surveys on 2016-04-24 in Whitby Canyon (Van Scoyoc 2024). Photo taken by Beissel.

Year of Last Known Occurrence: 2016

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Use of agricultural pesticides that contribute to a loss of prey items (Dragoo and Sheffield 2009).
 - b. Habitat: Canyon and woodland habitats on the grasslands have pressures from livestock grazing, recreation and fire.
2. Declining trends in populations or habitat in the plan area:
 - c. Population: Only one observation in the plan area (Van Scoyoc 2024) and no trend data in the plan area is available.
 - d. Habitat: species can use varied habitats; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. *Conepatus leuconotus* has relatively large range extending from the southwestern U.S. to Nicaragua (NatureServe 2024). The population in the plan area maybe a part of disjunct population and at the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: One individual was observed during the field surveys on 2016-04-24 in Whitby Canyon (Van Scoyoc 2024). The one individual observed was at the bottom of gully in juniper habitat (Van Scoyoc 2024).
 - b. Ecological Conditions: species is a habitat generalist and therefore its ecological conditions are not restricted.

Species Status

G4; S1 in Colorado; SNR in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Conepatus leuconotus is valid (Integrated Taxonomic Information System (ITIS) 2024c). Other common names are common hog-nosed skunk, eastern hog-nosed skunk, zorrillo-narigón occidental, white-backed hog-nosed skunk, badger skunk, rooter skunk, Texas skunk (Integrated Taxonomic Information System (ITIS) 2024c). *Conepatus leuconotus figginsi* is valid (Integrated Taxonomic Information System

(ITIS) 2024c). (Dragoo and Sheffield 2009) states: “In the case of *C. l. figginsi* and *C. l. telmalestes*, further genetic research may indicate that these taxa are not valid.”

Species range

Overall species range

Conepatus leuconotus has relatively large range extending from the southwestern U.S. to Nicaragua; apparently has declined drastically in recent decades in the north and is now very rare in Texas. Range Extent: 20,000-2,500,000 square km (about 8000-1,000,000 square miles) (NatureServe 2024). The population in the plan area maybe a part of disjunct population which at present represents a valid subspecies and at the northern edge of the species range (Figure 1, Figure 2, Figure 3).

Description of how the population in the plan area fits within the overall range

Colorado is the extreme north edge of the species range (Figure 1, Figure 2, Figure 3). Population in Colorado and the Oklahoma panhandle may represent a disjunct population by several hundred kilometers from the nearest locality in the Sandia Mountains of New Mexico (USFS 2001).

Distribution, abundance, and trend in the plan area

Population

One individual was observed during the field surveys on April 24, 2016 (Van Scoyoc 2024). No trend data in the plan area is available.

Habitat

The one individual observed in 2016 was at the bottom of gully in juniper habitat in the plan area (Van Scoyoc 2024). In southeast Colorado juniper woodlands have expanded (Colorado Parks and Wildlife 2015), particularly in areas of in rocky, shallow soil types that have little herbaceous cover, but contraction has also occurred in deeper and more finely textured soils (Amme et al. 2020)(see Appendix for more details). In general, this species is a habitat generalist (Dragoo and Sheffield 2009) and there is no discernable trend across its broad range of suitable habitats.

Threats (arising from on or off the plan area)

Population

Population declines may be associated with use of agricultural pesticides that contribute to a loss of prey items (Dragoo et al. 2003).

Habitat

(USDA Forest Service 2001a) states “Canyon and woodland habitats on the grasslands have pressures from livestock grazing, recreation and fire”. (Colorado Parks and Wildlife 2015) states: “Warmer and drier conditions could lead to a shift in the relative abundance of shortgrass prairie species, with the resulting development of novel plant communities. In particular, warmer night-time temperatures are likely to favor cool-season species, both native and exotic”.

Ecological conditions

Ecological condition requirements

This species inhabits wide variety of habitats and occurs in canyons, stream sides, and rocky terrain. It has been collected in a variety of habitats, including open desert-scrub and mesquite-grasslands, tropical areas, mountains, and coastal plains, cornfields surrounded by brushland or adjacent to grassy plains and thickets of bull-horn acacia (*Acacia*); and thorn woodland and riparian forests characterized by live-oaks (*Quercus virginiana*), pecans (*Carya illinoensis*), sycamores (*Platanus occidentalis*), and Texas persimmons (*Diospyros texana*) and an understory of briars, grasses, and weeds. It also has been found in pine-oak forest and in scrub and cacti, mesquite-brushland, pastures, and native grassland, used exclusively for cattle ranching and thorny brush and cactus vegetation (Dragoo and Sheffield 2009). Dens are in rock crevices, hollows in the roots of trees, hollow logs, underground burrows, caves, mine shafts, woodrat nests, abandoned burrows of other animals, or dig its own (Dragoo et al. 2003).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The one individual observed in 2016 was at the bottom of gully in juniper habitat (Van Scoyoc 2024). While juniper woodlands represent a relatively small proportion of the plan area, the species can also occupy native grassland habitat (Dragoo and Sheffield 2009), which is abundant in the plan area.

Critical biological characteristics

This species is adapted for digging and resembles badgers rather than other species of skunks in this respect. The rectangular-shaped scapula, strong forearms, and shape of the humeri of *C. leuconotus* resemble those of badgers. The nostrils are located ventrally and open downward, sense of smell is acute, and the nose is used in locating and capturing buried prey (Dragoo and Sheffield 2009).

C. leuconotus is a capable climber and reported to use climbing as an escape behavior (Brashear et al. 2010). Dens are in rock crevices, hollow logs, underground burrows, caves, mine shafts, woodrat houses, or under buildings (Dragoo and Sheffield 2009).

This species breeds from late February through early March; most adult females are pregnant by the end of March and parturition occurs in April and May. *C. leuconotus* generally is solitary, but females and young commonly are found together until the young disperse in late summer. Only a handful of studies have been conducted on *C. leuconotus* in Texas and Mexico, and there are no radiotelemetry data to describe home ranges, movement, and dispersal of *C. leuconotus* (Dragoo and Sheffield 2009).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The species is nocturnal and feeds primarily on insects especially larval forms, but it is also able to find and eat fruits and small vertebrates (Dragoo and Sheffield 2009).

This species is taken as prey by canids (coyotes [*Canis latrans*], dogs [*C. lupus*], and foxes [*Vulpes vulpes* and *Urocyon cinereoargenteus*]), felids (*Puma concolor* and *Lynx rufus*), badgers (*Taxidea taxus*), and birds of prey such as great horned owls (*Bubo virginianus*) and eagles (*Aquila chrysaetos* and *Haliaeetus leucocephalus*). These predators are nondiscriminatory and opportunistically eat any of the skunk species (Dragoo and Sheffield 2009).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

(Colorado Parks and Wildlife 2015) states: "Grazing by domestic livestock is the primary use of remaining shortgrass prairie. Management for increased livestock production tends to produce a more homogeneous grassland dominated by key forage species (Fuhlendorf and Engle 2001) and requires additional management effort to restore a mosaic of habitat structure suitable for characteristic wildlife species. Thus, there is an ongoing threat of habitat degradation or loss of function for shortgrass prairie".

Maps of Species Range and Known Occurrences in Plan Area

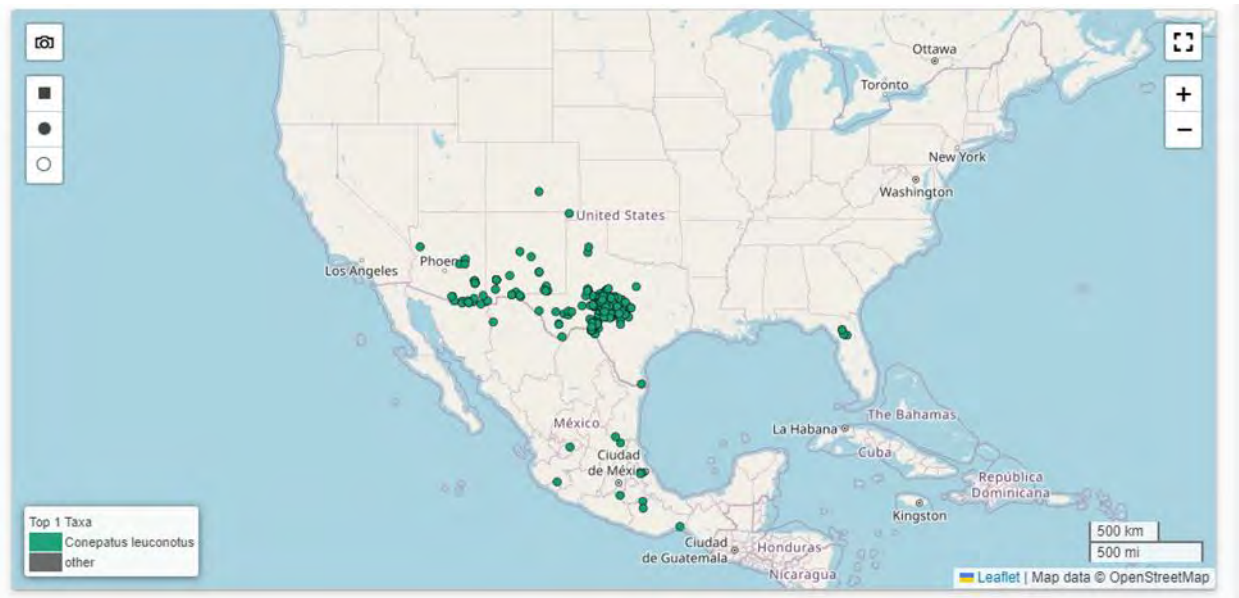


Figure 1. Distribution map of the American hog-nosed skunk (*Conepatus leuconotus*) (iDigBio 2024).

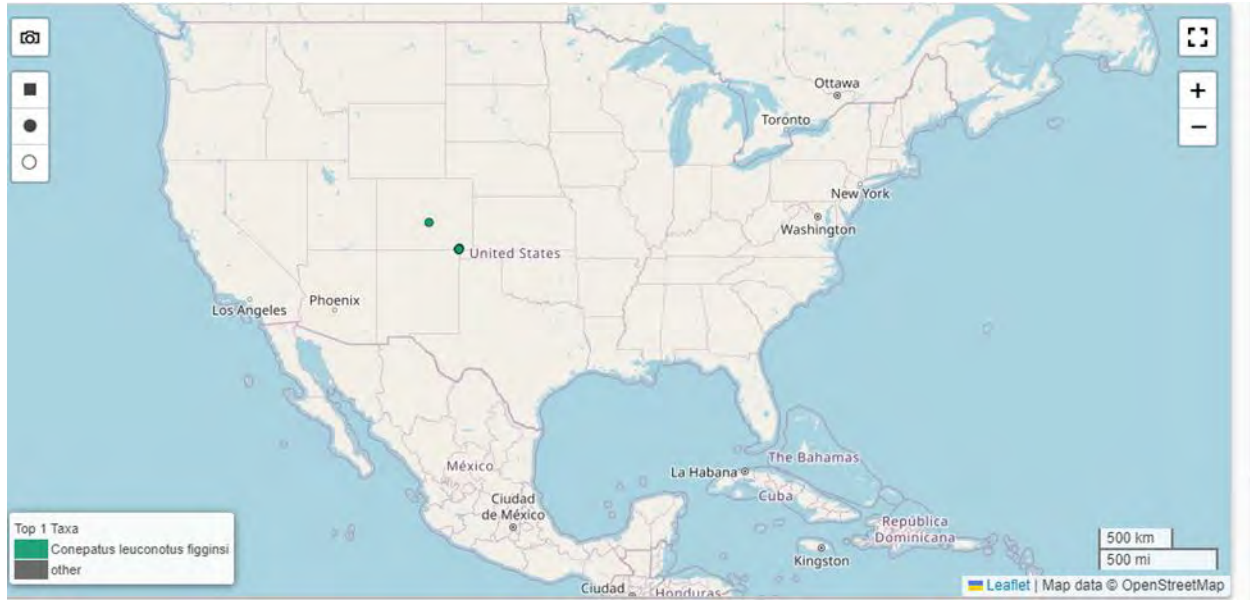


Figure 2. Distribution map of the American Hog-nosed Skunk (*Conepatus leuconotus figginsi*) (iDigBio 2024).

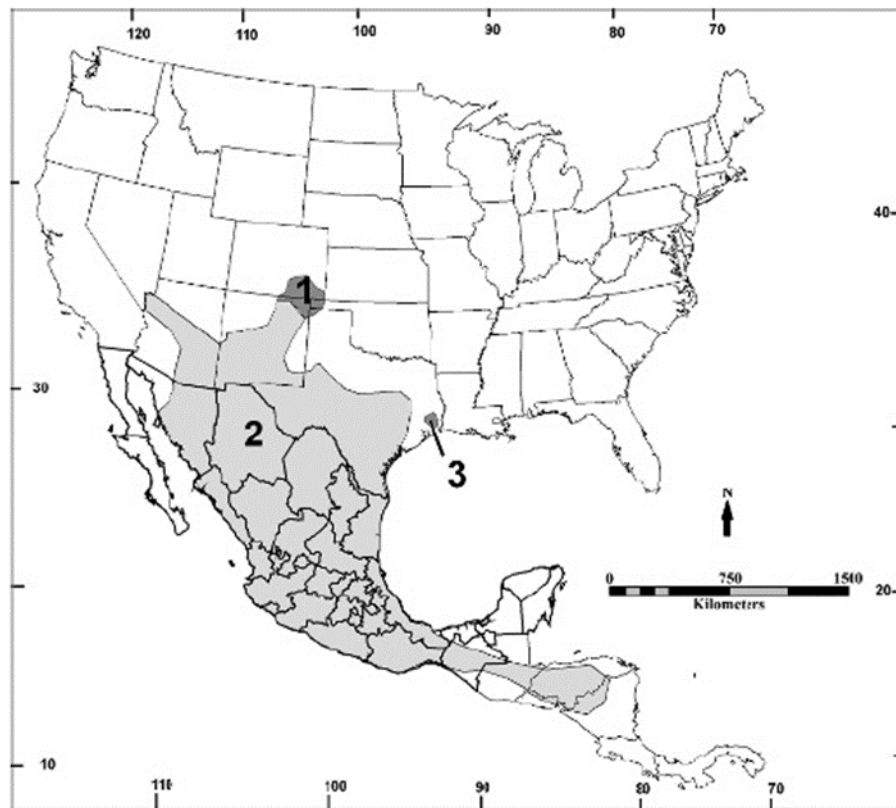


Figure 3. Geographic distribution of *Conepatus leuconotus figginsi*, *C. l. leuconotus*, and *C. l. telmalestes*. Modified from (Dragoo et al. 2003).

Big Free-tailed Bat

(*Nyctinomops macrotis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One female specimen was collected near Rourke Ranch along Purgatoire River in the Comanche NG on 1994-08-17 (Van Scoyoc 2024). Another specimen was collected along Cimarron River in the Cimarron NG on unknown date (iDigBio 2024, Schmidt et al. 2024).

Year of Last Known Occurrence: 1994

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: These bats may be negatively affected by changes to foraging areas or prey populations caused by livestock grazing or riparian management. It is not known to be affected by white-nose syndrome
 - b. Habitat: Disturbance to crevices and cavities, energy development, and forest management are threats albeit at a slight or low severity level. Blasting of cliffs or water impoundments could negatively affected this species but those effects can be mitigated.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trend information is available.
 - b. Habitat: Foraging habitat of riparian area has declined. Roost sites of rocky and canyon area should be stable. Crack Cave on Comanche NG is not known for bat utilization.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the population range (Figure 5) (iDigBio 2024).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size unknown. One female specimen was collected near Rourke Ranch along Purgatoire River in the Comanche NG on 1994-08-17. Another specimen was collected along Cimarron River in the Cimarron NG on unknown date (iDigBio 2024, Schmidt et al. 2024).
 - b. Ecological conditions: Rocky or canyon country where this species roosts are limited to areas along rivers and their tributaries in the plan area. The amount of suitable roosting sites in the plan area is unknown.

Species Status

G5; S1 in Colorado; SNA in Kansas.

Taxonomy

Nyctinomops macrotis is valid and accepted. Other common names include Murciélago-cola suelta mayor (Integrated Taxonomic Information System (ITIS) 2024b), (American Society of Mammalogists 2024).

Species range

Overall species range

The big free-tailed bat occurs mainly in southern California, Arizona, New Mexico, Texas and Mexico. Long thought to be an accidental wanderer in Colorado, recent data show the presence of breeding colonies in Colorado (Colorado Bat Working Group 2024a)).

Description of how the population in the plan area fits within the overall range

The population in the plan area is at the northern edge of the population range (Figure 5) (iDigBio 2024)).

Distribution, abundance, and trend in the plan area

Population

One female specimen was collected near Rourke Ranch along Purgatoire River in Comanche NG on 1994-08-17. Another specimen was collected along Cimarron River in the Cimarron NG on unknown date (iDigBio 2024, Schmidt et al. 2024). No population trend in the plan area is available.

Habitat

Specimens were collected in riparian areas where they were foraging. Riparian habitat has declined in the plan area due to several factors, including the increased abundance of invasive tamarisk. Drawdown of the aquifer has substantially decreased the discharge to most of the rivers in the Carrizo unit of the Comanche and the entire Cimarron National Grassland (USDA Forest Service 2005b). Rocky or canyon country where this species roosts are limited to areas along rivers and their tributaries in the plan area. These habitats are restricted within the plan area, but roost sites of rocky and canyon area should have been stable. Crack Cave on Comanche NG is not known for bat utilization.

Threats (arising from on or off the plan area)

Population

No major threats to this species have been identified (Colorado Bat Working Group 2024a, NatureServe 2024). However, these bats potentially may be negatively affected by changes to foraging areas or prey populations caused by livestock grazing or riparian management. This species is not known to incur significant mortality from turbines at wind energy facilities, and it is not known to be affected by white-nose syndrome (NatureServe 2024)).

Habitat

(Colorado Bat Working Group 2024a)notes that disturbance to crevices and cavities, energy development, and forest management are threats albeit at a slight or low severity level. In arid regions, the bats are possibly limited by the availability of large, obstacle-free drinking sites (Corbett et al. 2008). Such sites are thought to have decreased in number compared to the historical situation, and ongoing climate stressors could result in some water sources becoming unsuitable. However, such losses may be offset by the wide availability of artificial water sources created by damming.

Ecological conditions

Ecological condition requirements

This species of bat frequents rocky or canyon country where it roosts in crevices, but sometimes they are found in buildings, caves, or occasionally tree cavities (Colorado Bat Working Group 2024a, NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Rocky or canyon country where this species roosts are limited to areas along rivers and their tributaries in the plan area. Riparian and wetland habitats, where this species forages, are also relatively limited in the plan area (Hazlett 2004) (see Appendix for further information).

Critical biological characteristics

It is assumed that most bats of this species in the United States spend the winter months in southwestern Texas, Arizona, and southern California (Schmidt et al. 2024). Breeding probably occurs in midwinter while the species is in warmer latitudes. A single young is born in mid-June to early July. Females form small nursery colonies, and the young do not leave the nursery until they are almost full grown (Colorado Bat Working Group 2024a). These bats forage over large areas. In Arizona, individuals were captured an average of 12 kilometers from their roosts and sometimes went as far as 36 kilometers away during foraging flights; one individual had a mean foraging range of 296 square kilometers over a 6-night period (Corbett et al. 2008).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

These bats feed opportunistically on moths, beetles, crickets, longhorned grasshoppers, ichneumon wasps, flying ants, stinkbugs, froghoppers, leafhoppers, and other insects most of which were captured by active, flying bats, because most insects in our samples were of small flying forms (Sparks and Valdez 2003).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Plains streams in eastern Colorado are threatened by drying and fragmentation due to groundwater irrigation depleting underlying aquifers (Colorado Parks and Wildlife 2015).

Maps of Species Range and Known Occurrences in Plan Area

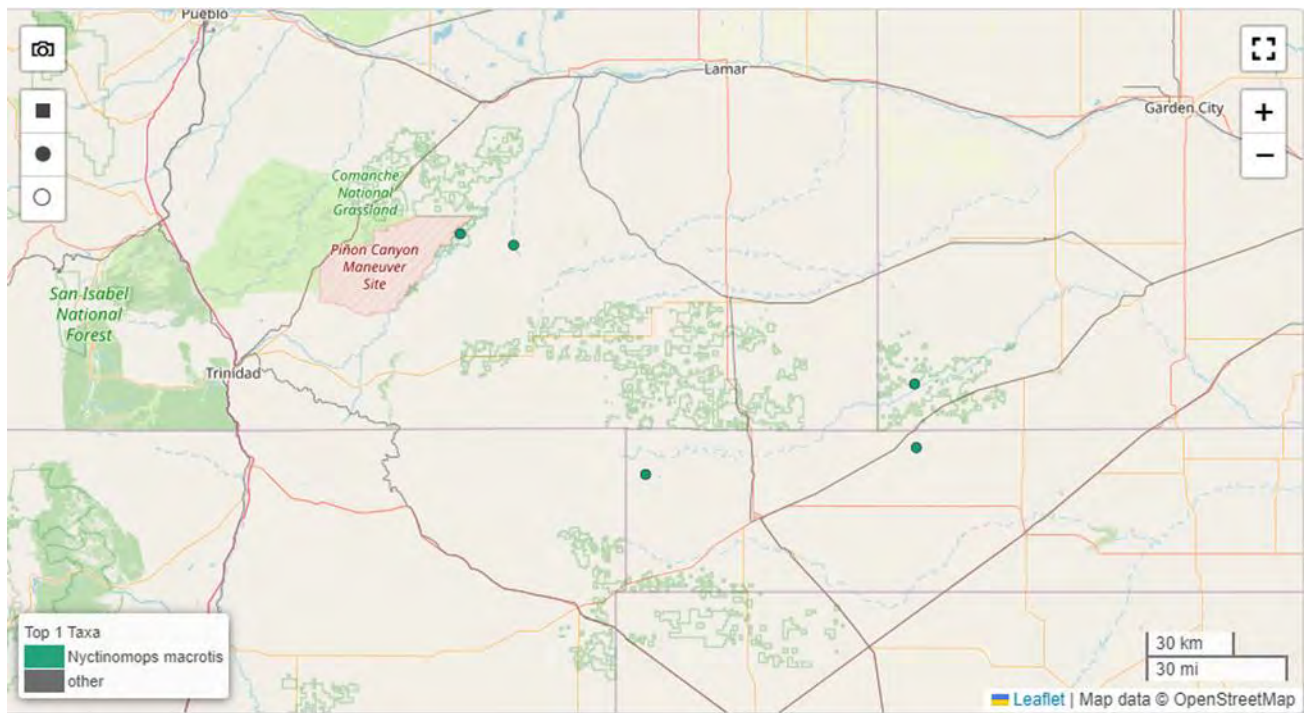


Figure 4. Distribution of big free-tailed bat in the plan vicinity (iDigBio 2024).

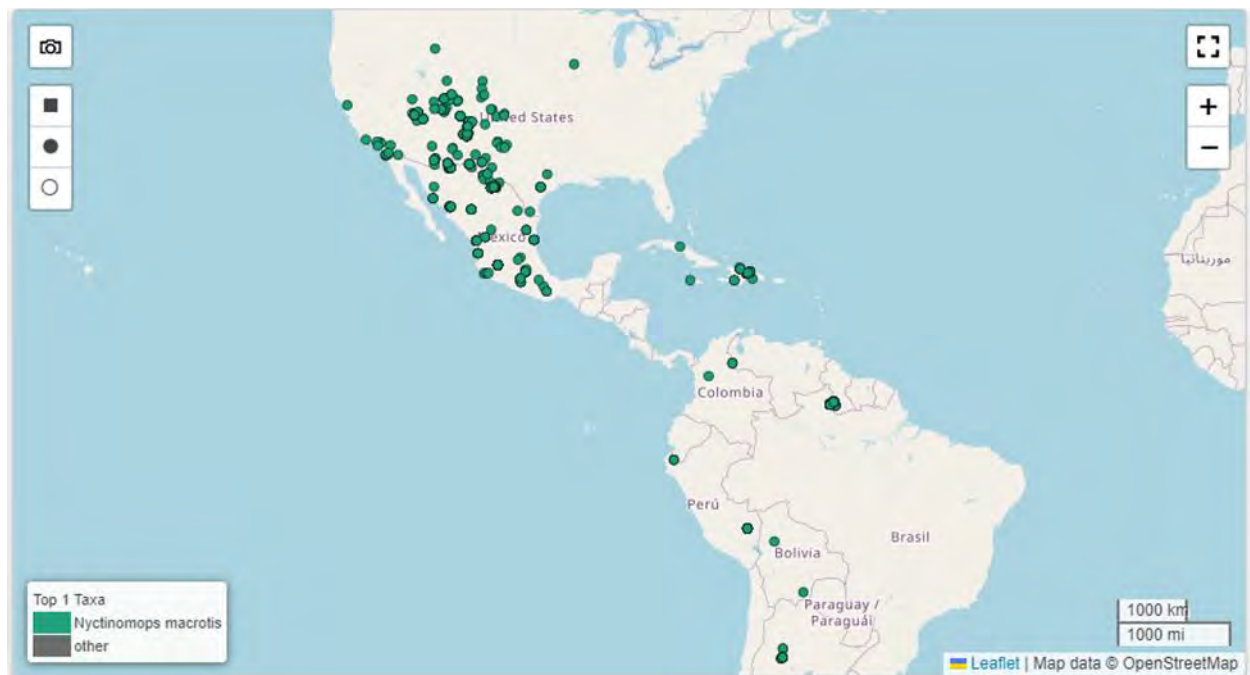


Figure 5. Distribution of big free-tailed bat in the Americas (iDigBio 2024).

Black-tailed Prairie Dog

(*Cynomys ludovicianus*)

Species is Native to, and Known to Occur in, National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: 9 records from Colorado Natural Heritage Program (Van Scoyoc 2024)

Year of Last Known Occurrence: 2012

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - c. Population: Prairie dogs are susceptible to disease, including sylvatic plague. Isolated populations may have problems with inbreeding. Prairie dogs have been the subject of widespread lethal control programs for over a century. Lethal control by poisoning does not occur on the plan area but the prairie-dogs are hunted on the plan area.
 - d. Habitat: Few direct threats to habitat in the plan area. Black-tailed prairie dog depend upon short grass prairie but are not generally limited to any specific sort of narrower habitat preference. Outside of the plan area, millions of acres of potential prairie dog habitat across the western U.S. have been converted into croplands or development, the USGS managed grasslands have largely been excepted from this destruction.
2. Declining trends in populations or habitat in the plan area:
 - e. Population: Several efforts to map prairie dog habitat on the CCNGs. Net decline in active colony acreage with low recolonization following plague after outbreak on Carrizo Unit on the Comanche National Grassland in 2005-2006 and on the Cimarron National Grassland in 1997. It appears new areas are colonized more readily. Areas of active prairie dog colonies fluctuate, but the colonies are stable or at pre-plague outbreak level.
 - f. Habitat: No indication of habitat decline for this species was documented in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - g. This species has a wide range, from the U.S./Mexico border up to the U.S./Canada border, Midwest prairies west into the Rocky Mountains.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - h. Population: Areas of active prairie dog colonies fluctuate, but the colonies are stable or increasing.
 - i. Ecological conditions: Potential prairie dog habitat on the CCNGs is not limiting; colonies can survive on tracts as small as a few acres, the CCNG's have tens of thousands of acres of potential habitat.

Species Status

G4; S3 in Colorado; S3 in Kansas; listed as "Candidate" in Colorado; USFS Region 2 Sensitive Species.

Taxonomy

Cynomys ludovicianus (Ord 1815) is accepted and valid (Integrated Taxonomic Information System (ITIS) 2024e).

Species range

Overall species range

The black-tailed prairie dog occurs throughout the shortgrass prairie communities of the American west. There approximately 650,000 hectare of currently occupied black-tailed prairie dog habitat in the American west (Commission for Environmental Cooperation 2005).

Description of how the population in the plan area fits within the overall range

The Comanche Cimarron sits on the eastern edge of the species' range. There are records from both grasslands.

Distribution, abundance, and trend in the plan area

Population

On the Comanche NG, plague-induced decline in prairie dog colonies has been noted between 2005 and 2006, where 10% of area originally occupied in 1995 was still occupied by prairie dogs in 2006. In 2005 and 2006 respectively, 74 and 83% of the total area of the Comanche complex occurred in locations that were not occupied in 1995, and only 1% of the complex was occupied continuously over a decade. Active prairie dog colony area fluctuated dramatically from 1,579 acres in 1999 to 10,653 acres in 2005, with a net decline in active colony acreage over the 11-year period from 5,401 to 3262 acres. The temporal pattern of occupancy and re-colonization after plague epizootics reflects substantial changes in locations of active black-tailed prairie dog colonies, with few areas that were occupied in 2006 having been occupied 11 years earlier (Augustine et al. 2008). (Cully et al. 2000) noted a black-tailed prairie dog population abruptly declined in May 1997 and by June 1997 due to plague outbreak, prairie dogs were no longer present at the affected colony on the Cimarron National Grassland.

Several efforts have been made to map prairie dog habitat on the CCNGs. Net decline in active colony acreage with low recolonization following plague after outbreak on Carrizo Unit on the Comanche National Grassland in 2005-2006 and on the Comanche National Grassland have been recorded. It appears new areas are colonized more readily. Areas of active prairie dog colonies have been fluctuating, but the colonies appear to be relatively stable or at pre-plague outbreak levels (Augustine et al. 2006, Van Scoyoc 2024, USDA Forest Service 2010a, 2024, No Date). [USDS Forest Service 2024 Comanche](#)

Table 1. Prairie dog population changes from 1989 to 2024.

Year	Cimarron NG Acres	Comanche NG Total Acres	Carrizo Unit (Comanche NG) Acres	Timpas Unit (Comanche NG) Acres
1989	750			
1992	1,082			
1995		6,279	5,724	551
1997	1,246			

Year	Cimarron NG Acres	Comanche NG Total Acres	Carrizo Unit (Comanche NG) Acres	Timpas Unit (Comanche NG) Acres
1998	1,298			
1999	1,697		1,894	
2001	2,439	4,213	3,851	362
2002	3,321	5,702	5,127	575
2003	4,008	6,620	6,064	556
2004	5,634	12,128	11,592	563
2005	5,793	14,894	14,387	508
2006	5,660	6,774	5,786	998
2007	2,710	4,629	3,554	1,075
2008	1,337			
2009	2,154			
2010	3,066	7,186	6,169	1,017
2024	5,151	14,633	10,396	4,237

Habitat

Shortgrass and tall grass prairie. Fine to medium textured soils that hold shape and don't easily collapse. Relatively well drained areas, playas/vernal pools do not make for good prairie dog habitat.

Threats (arising from on or off the plan area)

Population

Black-tailed prairie dog is known to have declining populations in some portions of its range, including Wyoming. The causes of decline are lethal control strategies, loss and fragmentation of habitat, in-breeding and sylvatic plague (NatureServe 2024). The rate of population decline appears to be slower now that it was in the late 1800s through the 1950s (Commission for Environmental Cooperation 2005).

Habitat

Habitat loss due to cropland conversion, urbanization, habitat modification and fragmentation has negatively affected populations of the black-tailed prairie dog on private lands, increasing the importance of habitat refugia present on publicly managed lands (FWS 2004).

Ecological conditions

Ecological condition requirements

Black tailed prairie dogs use prairie and grasslands but have very generalist habitat requirements within those types.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Habitat of potential use to prairie dogs is widespread in and around both Comanche and Cimarron National Grasslands.

Critical biological characteristics

There is no single particular ecological characteristic that is required by this species (other than prairie).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Prairie dogs of all species influence habitat via the construction of colonies. Burrows are dug and can often be reused by other species. Digging can also reduce soil compaction and create habitat for ruderal species. The species reduced plant cover, especially of taller herbaceous species (NatureServe 2024).

Prairie dogs prefer perennial forbs, this reduces the frequency and cover of such species relative to other herbaceous species (NatureServe 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

The species does not well tolerate encroachment by tree species or tall structures upon which raptors can perch. Relatively fine soils are preferred, as that prevents burrows from collapsing.

Maps of Species Range and Known Occurrences in Plan Area



Figure 6. Range map for black-tailed prairie dog.

Eastern Mole

(*Scalopus aquaticus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One specimen was collected from the Cimarron Recreation Area in Cimarron NG on 2020-07-14 (iDigBio 2024), Figure 7). (Schmidt et al. 2024) indicates museum vouchers were collected from Cimarron NG on 2013-04-14 (Figure 8).

Year of Last Known Occurrence: 2020

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No threats to populations have been identified for this species.
 - b. Habitat: No threats have been identified for this species.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No known population trend is available in plan area.
 - b. Habitat: the amount of the habitat with loamy fine sand along Cimarron River is likely stable.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the western edge of the range (iDigBio 2024) (Figure 9).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: One specimen was collected from the Cimarron Recreation Area in the Cimarron NG on 2020-07-14 (iDigBio 2024)) (Figure 7). (Schmidt et al. 2024) indicates museum vouchers were collected from Cimarron NG on 2013-04-14 (Figure 8). Ecological conditions: In Cimarron NG, loamy fine sand is limited to along Cimarron River. In western Kansas, it is found only in valleys where soils are deep and soft (Schmidt et al. 2024).

Species Status

G5; S2 in Colorado; S5 in Kansas.

Taxonomy

Scalopus aquaticus is accepted and valid. Other common names are Topos and Topo occidental (Spanish) (Integrated Taxonomic Information System (ITIS) 2024)).

Species range

Overall species range

This species has the largest range of any North American mole (Yates and Schmidly 1978). Throughout much of eastern U.S. from Massachusetts, southern New York, extreme southwestern Ontario, southern

Minnesota, and Nebraska, south to northern Tamaulipas, northern Coahuila, eastern Texas, and Florida (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

The population in the plan area is at the western edge of the range (Figure 9).

Distribution, abundance, and trend in the plan area

Population

One specimen was collected from Cimarron Recreation Area in the Cimarron NG on 2020-07-14 (iDigBio 2024)) (Figure 7). (Schmidt et al. 2024) indicates museum vouchers were collected from Cimarron NG on 2013-04-14 (Figure 8). No population information available for this species in the plan area.

Habitat

The specimen collected in 2020 was collected from disturbed recreation site with loamy fine sand. In western Kansas, it is found only in valleys where soils are deep and soft (Schmidt et al. 2024).

Threats (arising from on or off the plan area)

Population

No threats to populations have been identified for this species (NatureServe 2024, IUCN 2024).

Habitat

No threats to habitat have been identified for this species (NatureServe 2024, IUCN 2024), but see general habitat threats in the Appendix.

Ecological conditions

Ecological condition requirements

This species most commonly occurs in open areas with moist soils, such as lawns, meadows, and golf courses. Bottomland wooded areas also are used. Soft humid soils are preferred over gravelly, dry soils. Two types of underground passageways: near-surface and deep. Near-surface are commonly seen with their raised ridges. Deep (10-24") provide wintering/breeding areas. Den sites often are located under protection of a surface object (NatureServe 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

In the Cimarron NG, loamy fine sand is limited to along Cimarron River. In western Kansas, it is found only in valleys where soils are deep and soft (Schmidt et al. 2024).

Critical biological characteristics

Active day and night, especially 0200-1600 h and 2300-0400 h. Home range varies from 0.15-1.80 acres home range of male larger than that of female (Harvey 1976). (Schmidt et al. 2024) states; "The nest is placed in well drained soils and constructed of grasses, leaves, and other plant fibers".

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

(Schmidt et al. 2024) states, "The main food of eastern moles is larval insects and earthworms. Like shrews, they also eat snails, adult insects, and other invertebrates found while excavating tunnels. Although very little vegetation is directly consumed, secondary effects such as exposure of roots to air or disturbance from excavation of tunnels may cause death of some plants".

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information suggests that this species influences ecosystem structure or function.

Maps of Species Range and Known Occurrences in Plan Area

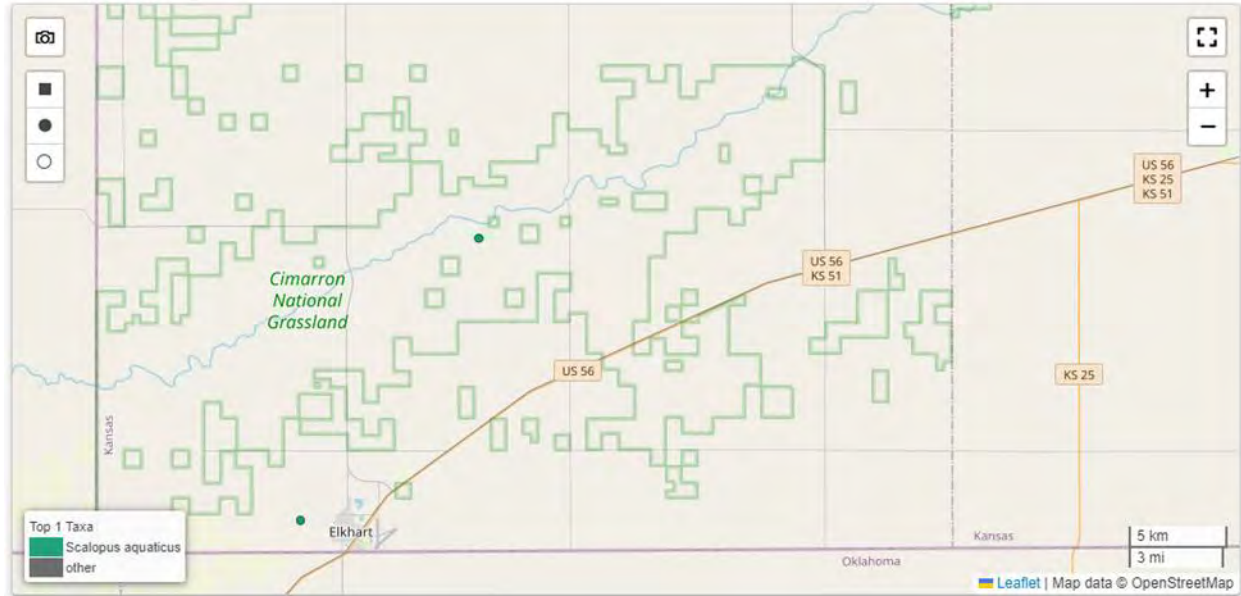


Figure 7. Distribution of Eastern mole in the plan area (iDigBio 2024).

(●, ○ Museum Voucher) (▲, △ Observation) (■, □ Literature Record)
Open icons are questionable records; Click on a marker to view details.

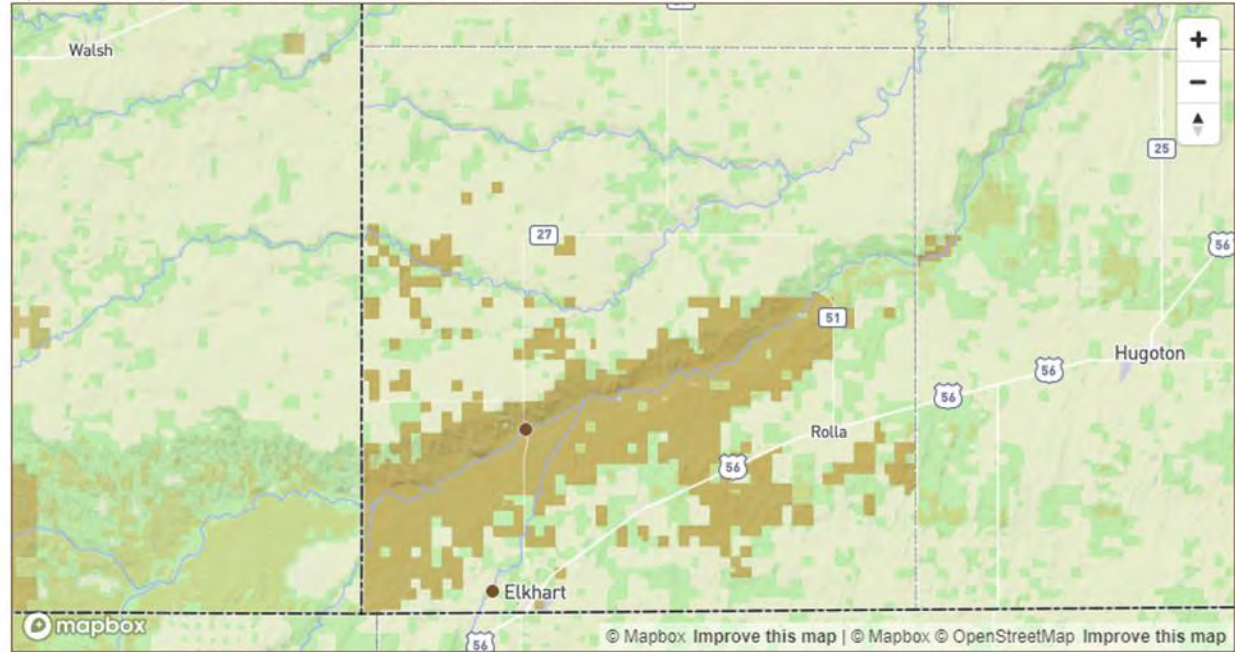


Figure 8. Distribution of Eastern mole in the plan vicinity.

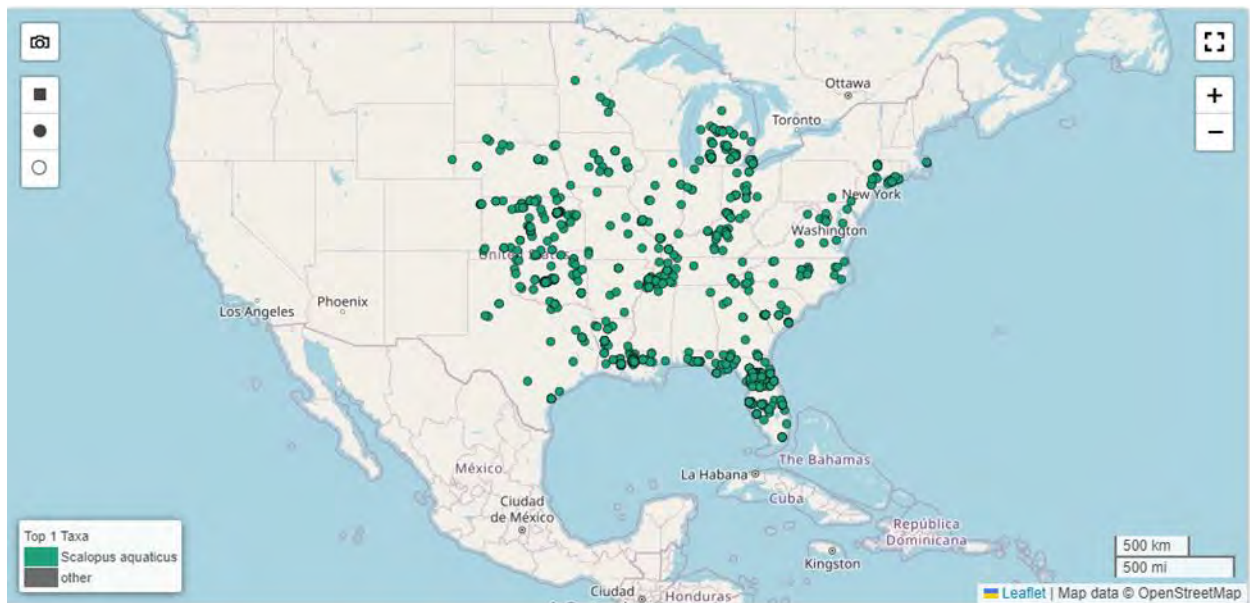


Figure 9. Distribution of Eastern mole in the United States (iDigBio 2024).

Eastern Red Bat

(*Lasiurus borealis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One individual was collected from Picture Canyon Spring on unknown date (Van Scoyoc 2024, Armstrong et al. 1994). One adult female was captured in the Cimarron NG on 2019-05-22. This species was also detected by an acoustic device between 2020-05-18 and 2020-05-21 and on 2021-05-22 and automatically identified by Kaleidoscope Pro Auto ID and manually verified (Van Scoyoc 2024).

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

5. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - b. Population: Wind development (direct effects) is the threat albeit at a substantial, imminent threat level. WNS has been detected in Colorado including Otero and Baca Counties. *Pseudogymnoascus destructans*, a fungus causes white-nose syndrome in bats has been detected from this species, but no diagnostic sign of white-nose syndrome has been documented.
 - c. Habitat: Contaminants, oil and gas development, and wind development (indirect effects) are threats albeit at a slight or low severity level.
6. Declining trends in populations or habitat in the plan area:
 - d. Population: No population trend is available in the plan area.
 - e. Habitat: Riparian habitat on the plan area has declined; however, tamarisk control and cottonwood and willow restoration efforts along the Cimarron and Purgatoire Rivers are ongoing.
7. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - f. Population in the plan area is at the Western edge of the species range.
8. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - g. Population: One specimen, one capture, and acoustic detection records are available in the plan area.
 - h. Ecological conditions: The approximate extent of riparian and wetland habitat is ~1% of the total plan area.

Species Status

G3/G4, S2S3B in Colorado, S5B in Kansas.

Taxonomy

Lasiurus borealis is accepted as valid. Other common names include red bat, chauve-souris rousse and Murciélago-cola peluda rojizo (Integrated Taxonomic Information System (ITIS) 2024f, American Society of Mammalogists 2024). *Lasiurus borealis* recently was split into two species. According to this

classification, *Lasiurus borealis* contains no subspecies and, therefore, is monotypic (Schmidt et al. 2024).

Species range

Overall species range

Range includes the central and eastern United States and adjacent southern Canada and northeastern Mexico, with occasional occurrences on Atlantic/Caribbean islands. Winter range is smaller than summer range and is mainly in the southeastern United States and northeastern Mexico, with the highest concentrations in coastal Atlantic and Gulf of Mexico regions. Individuals in the most northerly portions of the winter range usually are males. Additional records in the southwestern United States extend the distribution farther west than previously recognized (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the western edge of the species range.

Distribution, abundance, and trend in the plan area

Population

One individual was collected from Picture Canyon Spring on unknown date (Van Scoyoc 2024, Armstrong et al. 1994). One adult female was captured in the Cimarron NG on 2019-05-22. This species was also detected by an acoustic device between 2020-05-18 and 2020-05-21 and on 2021-05-22 and automatically identified by Kaleidoscope Pro Auto ID and manually verified (Van Scoyoc 2024).

Habitat

The occurrence record of this species spatially maps within Landfire Existing Vegetation Type layer (EVT) as Western Great Plains Shortgrass Prairie but close to riparian habitat.

Riparian habitat has declined in the plan area due to several factors, including the increased abundance of invasive tamarisk. Drawdown of the aquifer has substantially decreased the discharge to most of the rivers in the Carrizo unit of the Comanche and the entire Cimarron National Grassland (USDA Forest Service 2005a). Tamarisk density, live cottonwood stem density, and the density of cottonwood regeneration are all greater in the western portion of the Cimarron River, while dead cottonwood stem density is greater along the eastern portion of the river channel. Ongoing management efforts in the riparian woodlands are focused on tamarisk control and cottonwood and willow restoration along the Cimarron and Purgatoire Rivers.

Threats (arising from on or off the plan area)

Population

(Colorado Bat Working Group 2024h) notes that wind development (direct effects) is the threat albeit at a substantial, imminent threat level to this species.

P. destructans, a fungus causes white-nose syndrome in bats, was detected for the first time in Colorado in July 2022, during sampling of bats in Baca County. White-nose syndrome was detected in Otero

county in 2022-2023 (USDI Fish and Wildlife Service (FWS) 2024b). *P. destructans* has been detected from this species, but no diagnostic sign of white-nose syndrome has been documented in Eastern red bat (USDI Fish and Wildlife Service (FWS) 2024a).

Habitat

(Colorado Bat Working Group 2024h) notes that contaminants, oil and gas development, and wind development (indirect effects) are threats albeit at a slight or low severity level.

Ecological conditions

Ecological condition requirements

(Colorado Bat Working Group 2024h) states, “The red bat is solitary and roosts by day in deciduous trees, such as cottonwoods or fruit trees. It seems to prefer American elms where it hangs among the leaves. Red bats usually are well hidden and only can be seen from directly below. They usually roost 4-10 feet off the ground unless they have young, in which case they will be found up to 20 feet high in the tree”.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Riparian and wetland habitats are limited in the plan area (Hazlett 2004). Based on National Wetlands Inventory data, the approximate extent of riparian and wetland habitat is ~1% of the total plan area.

Critical biological characteristics

(Colorado Bat Working Group 2024h) states, “Red bats are highly migratory and migrate in groups. Males and females apparently migrate separately, however. Hibernation occurs in the southern states (not in Colorado) where these bats may arouse and forage throughout the winter.”

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

(Colorado Bat Working Group 2024h) states, “More than other bats, red bats seem to take advantage of insects attracted to lights, and they often are found feeding near street lamps where they appear to be territorial. They alight and feed on non-flying insects, including grasshoppers and crickets. They feed near moth-infested areas, which is certainly a benefit to humans. Foraging occurs in early evening when they leave their roosts and fly in high, lazy patterns over the trees and along forest edges. When it is dark, they descend and feed below the treetops to within a few feet of the ground”.

Predators include blue jays, opossums, domestic cats, hawks and owls, and a relatively high incidence of rabies (about 7%) has been found in this species (Schmidt et al. 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Plains streams in eastern Colorado are threatened by drying and fragmentation due to groundwater irrigation depleting underlying aquifers (Colorado Parks and Wildlife 2015).

Maps of Species Range and Known Occurrences in Plan Area

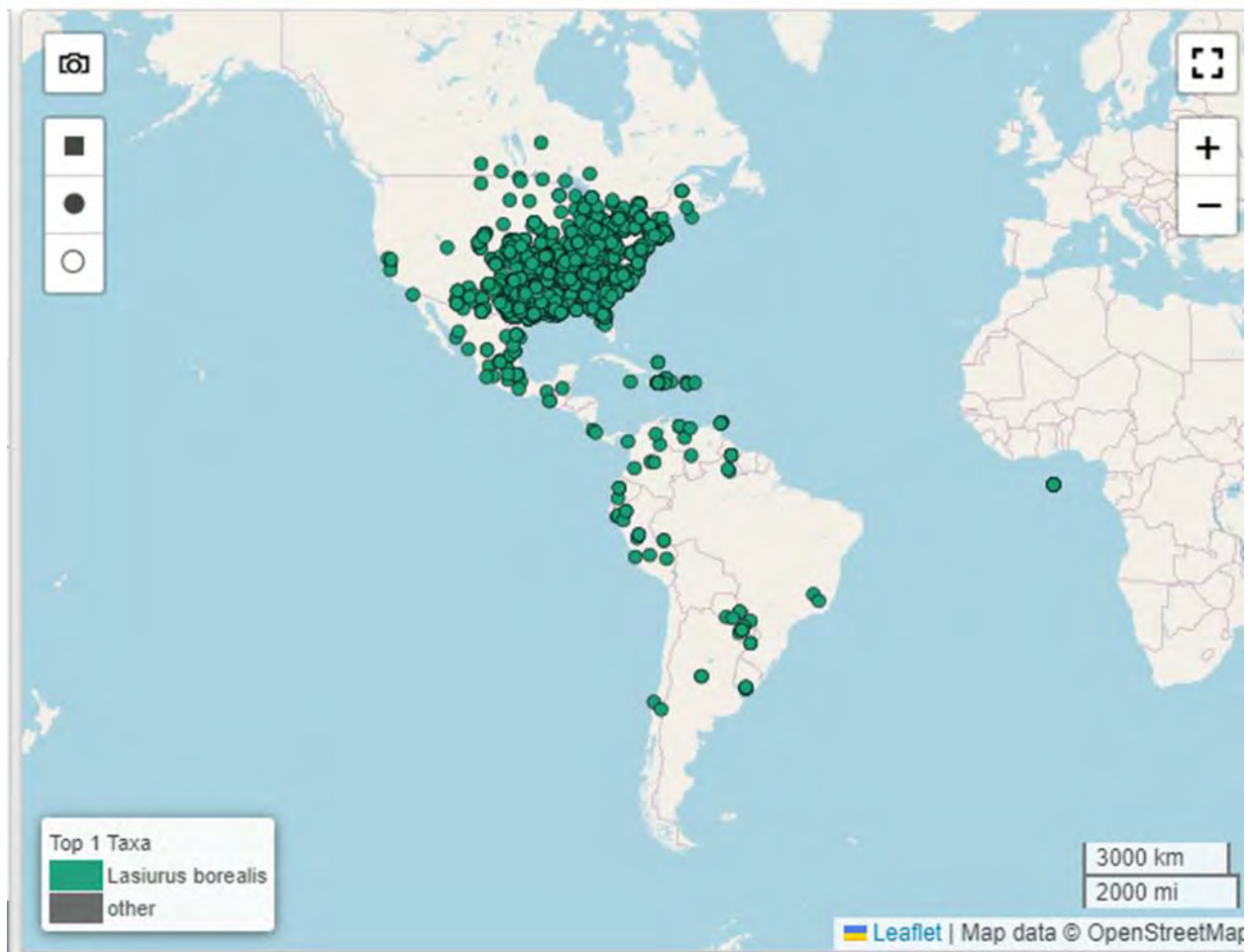


Figure 10. Distribution of the Eastern Red Bat (iDigBio 2024).

Elk

(*Cervus elaphus*)

Species is Native to, and Known to Occur in, National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: Although there are 3 observation records in GBIF from iNaturalist for this species, only one of the records includes photos of the species itself. Another one of the records is a photo of a skull, and the third record is a photo of hoof prints in the snow. All three records are for the subspecies *C. elaphus canadensis*. Historically, in southeast Colorado and across Kansas, it has been the Manitoban subspecies (*C. canadensis manitobensis*) (Kohl et al. 2023), but starting in 1981, the Kansas Department of Wildlife and Parks reintroduced 12 elk from the Maxwell Wildlife Refuge to the Cimarron NG, with subsequent reintroductions occurring in 1982, 1984, 1988 and 1990 (Conard et al. 2006). The introduced subspecies is the Rocky Mountain elk (*C. c. nelsoni*) and is not considered native to the plan area.

Year of Last Known Occurrence: 2023

Species Status

G5; S5 in Colorado; S2 in Kansas.

Maps of Species Range and Known Occurrences

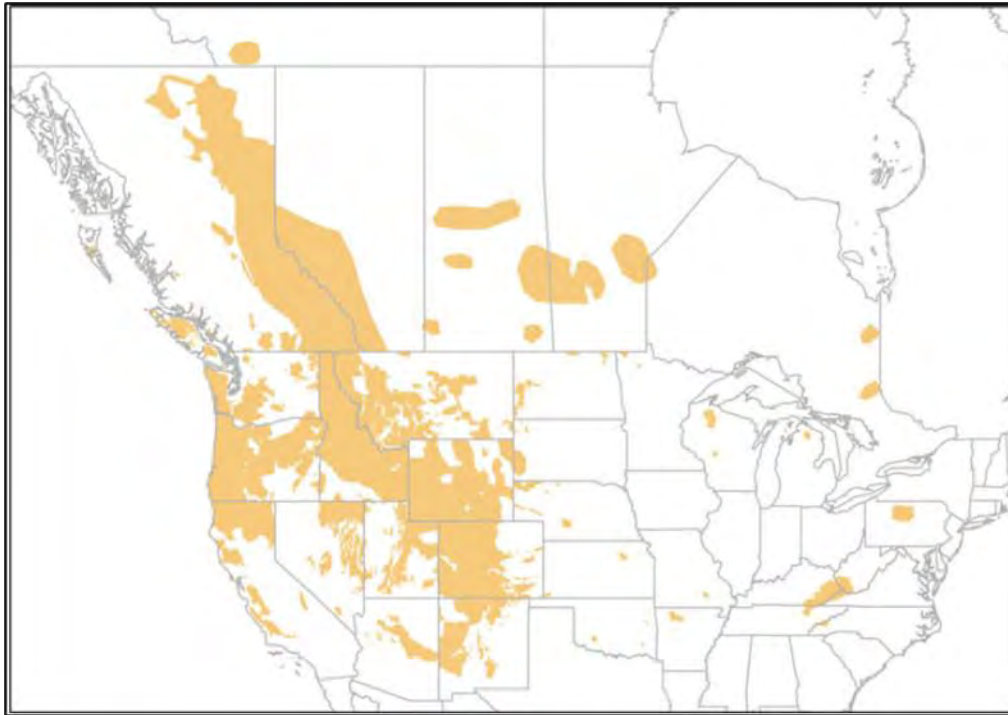


Figure 11. Current distribution of elk in North America. Elk residing in National Parks or within Tribal or First Nations boundaries are not shown (Kohl et al. 2023).

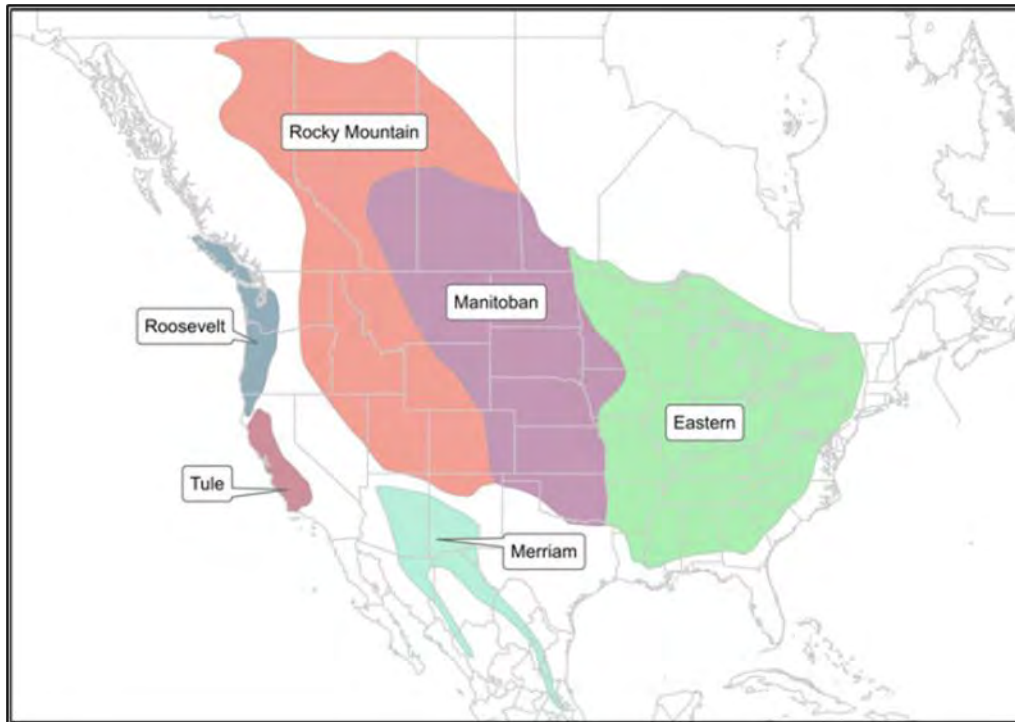


Figure 12. Historical distribution of elk in North America (Kohl et al. 2023).

Fringed Myotis **(*Myotis thysanodes*)**

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: The data from CPW shows a point in Holt Canyon in Baca County, and two specimens were collected on 1977-09-01 (Van Scoyoc 2024). The data indicates that location was digitized from (Armstrong et al. 1994). (Armstrong et al. 1994) indicates that two specimens collected from Skull Canyon Copper mine were examined. The Skull Canyon Copper mine is on private property. Therefore, there is insufficient evidence to demonstrate that this species is known to occur in the plan area.

Year of Last Known Occurrence: N/A

Species Status

G4; S3 in Colorado; Tier 1 in Colorado.

Little Brown Bat

(*Myotis lucifugus*)

Species is Native to, and Known to Occur in, National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One female specimen was collected from the Comanche NG on 1994-06-11. The specimen is identified as *Myotis lucifugus carissimus* (iDigBio 2024). The five previously recognized subspecies of *Myotis lucifugus* (*alascensis*, *carissima*, *lucifugus s.s.*, *pernox*, *relictus*) have been recognized as distinct species by (Morales and Carstens 2018). NatureServe will continue to recognize the broader concept of *M. lucifugus* following the American Society of Mammalogists (American Society of Mammalogists 2024).

Year of Last Known Occurrence: 1994

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: White-nose syndrome has killed over 90% of little brown bats (Cheng et al. 2021).
 - b. Habitat: Cave management (cave access management and cave internal disturbances) and extermination of bats in urban setting are threats albeit at moderate, non-imminent severity levels.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends are available in the plan area.
 - b. Habitat: No plans of operations for locatable mining, abandoned mines or significant caves within the plan area. Some individuals could roosts in rock crevices and hollow trees as roost sites. Crack Cave on Comanche NG is not known for bat utilization. No changes to the possible roost sites of rock crevices and hollow trees. Riparian habitat on the plan area has declined.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is not narrow endemics, disjunct populations, or at the edge of the *Myotis lucifugus* range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Only one female specimen was collected from the Comanche NG on 1994-06-11. Ecological conditions: No obvious hibernacula sites (mines or caves) in the plan area. Some individuals could night roost in rock crevices and hollow trees, which are limited in the plan area.

Species Status

TNR; SNR in Colorado; listed as Tier 1 in Colorado; under review for ESA listing.

Taxonomy

Myotis lucifugus is accepted as valid. Other common names include little brown myotis. Western little brown bat, *Myotis lucifugus carissimus* is accepted as valid. *Myotis lucifugus carissima* is invalid (ITIS 2024).

The five previously recognized subspecies of *Myotis lucifugus* (*alascensis*, *carissima*, *lucifugus* s.s., *pernox*, *relictus*) have been recognized as distinct species by (Morales and Carstens 2018). NatureServe will continue to recognize the broader concept of *M. lucifugus* following the American Society of Mammalogists (American Society of Mammalogists 2024). They "tentatively include *alascensis*, *carissima*, *pernox*, and *relictus* as subspecies/junior synonyms on the recommendation of (Francis and Simmons 2022) given the current lack of conclusive evidence regarding their genetic distinctiveness, contra the previous conclusion of (Morales and Carstens 2018)".

Species range

Overall Species range

M. lucifugus occurs in the wide range includes North America from the Alaska-Canada boreal forest south through most of the contiguous United States, though the species is generally absent from the southern Great Plains region (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

The plan area is not narrow endemics, disjunct populations, or at the edge of the *Myotis lucifugus* range.

Distribution, abundance, and trend in the plan area

Population

One female specimen was collected from the Comanche NG on 1994-06-11 (iDigBio 2024).

Habitat

No plans of operations for locatable mining, abandoned mines or significant caves within the plan area. Some individuals could roost in rock crevices and hollow trees as roost sites. Crack Cave on Comanche NG is not known for bat utilization (USDA Forest Service 2010b).

Threats (arising from on or off the plan area)

Population

In April 2013, USFS Region 2 finalized an Environmental Assessment to analyze options for management of caves and abandoned mines in response to the potential for human introduction and spread of the fungal spores associated with WNS (USDA Forest Service 2013b). The management strategy uses an adaptive management approach to preventing WNS on 11 National Forests in USFS Region 2, including the Cimarron and Comanche National Grasslands (USDA Forest Service 2013a). The fungus, *P. destructans*, was detected for the first time in Colorado in July 2022, during sampling of bats in Baca County. White-nose syndrome was detected in Otero County in 2022-2023 (USDI Fish and Wildlife Service (FWS) 2024b). This species has been identified and confirmed with diagnostic symptoms of white-nose syndrome (USDI Fish and Wildlife Service (FWS) 2024a, b). The spread of WNS in Colorado is a critical concern for the conservation of several cave-dwelling bat species and warrants integration into the local AML closure program in regards to assessing underground bat population prior to (and potentially after) closure work and in relationship to periodic monitoring in collaboration with other partners. White-nose Syndrome has killed over 90% of little brown bats (Cheng et al. 2021).

(NatureServe 2024)) state, “White-nose syndrome (WNS) is the most severe threat faced by this species, although, as of this assessment, declines are generally more severe in the northeast and there remain uncertainties around the rate of spread of WNS and its impacts to western bats. Nevertheless, a high rate of mortality would be expected. Other threats include wind-energy development, human urban/rural expansion and commercial and agricultural development, climate stressors (particularly drought), disturbances of colonies, timber harvest (e.g. pinyon-juniper conversion), pesticide use, pest control, mining, and use of cyanide in gold mining”.

Habitat

(Colorado Bat Working Group 2024d) notes that cave management (cave access management and cave internal disturbances) and extermination of bats in urban setting are threats albeit at moderate, non-imminent severity levels.

Ecological conditions

Ecological condition requirements

Large trees and snags are frequently identified as important features for tree-roosting bats (Kalcounis-Rüppell et al. 2005, Saltus and Britzke 2022, Fabianek et al. 2015), including little brown myotis (Lacki 2018); however, the species will roost in a variety of structures, including human structures (Bachen et al. 2019, Bergeson et al. 2015, Johnson et al. 2019, Bachen et al. 2020). In the summer males roost alone, but females form maternity colonies in buildings or large trees that can include hundreds of individuals (Fenton and Barclay 1980, Olson and Barclay 2013, Bergeson et al. 2015). Little brown myotis show substantial interannual fidelity to maternal colonies (Dixon 2011, Norquay et al. 2013). Increased density of suitable roosting locations is likely to increase the use of an area (Washinger 2021, Jung 2020), as broadly demonstrated for many bat species (Arnett and Hayes 2009, Kalcounis-Rüppell et al. 2005, Fabianek et al. 2015). Little brown myotis exhibit even higher philopatry to hibernacula than summer roosting habitats (Norquay et al. 2013). Some little brown bats hibernate in Colorado, but winter habits are poorly known here and elsewhere in the West. In some parts of the range, the animals may move several hundred kilometers from nursery colonies to hibernacula, but such long-distance movements have not been documented in the West. The animals can move 50 miles a night at speeds up to 19 miles per hour (Colorado Bat Working Group 2024d).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Within the plan area, there are no plans of operations for locatable mining, abandoned mines or significant caves which can be roost site for this species. No obvious hibernacula sites (mines or caves) in the plan area. Some individuals could night roost in rock crevices, hollow trees in riparian habitat, which are limited in the plan area (see Appendix).

Critical biological characteristics

A highly gregarious bat, little brown myotis mate at hibernacula in the fall and winter (Kunz and Reichard 2011)). Females are reproductively mature in their first year of life, but males aren't mature for another year (Kunz and Reichard 2011). Females typically give birth to a single offspring at summer nursery colonies (Fenton and Barclay 1980). In the winter, the species may congregate in hibernacula in the thousands, but overwintering congregations west of the Rocky Mountains tend to be significantly smaller, and in many cases may be limited to an individual or small group occupying small, dispersed hibernacula rather than a single hibernaculum (Jung et al. 2014).

Little brown bats emerge at dusk to feed, often following the same foraging route repeatedly through the night and on successive nights. They forage over water or among trees, 3 to 6 meters above ground. Foraging flight is erratic for a bat of this size. The diet consists largely of aquatic insects, including caddis flies and midges, but also includes moths, mosquitoes and other flies. The prey is knocked from the air with a wingtip, captured in the membrane between the legs and lifted to the mouth. Foraging behavior has to be learned, and adults are much more efficient feeders than are young; adults fill their stomach in as little as 15 minutes (Colorado Bat Working Group 2024d).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The diet consists largely of aquatic insects, including caddis flies and midges, but also includes moths, mosquitoes and other flies. Predators include raccoons, mink, snakes and owls (Colorado Bat Working Group 2024e).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Highly aggregated hibernation in abandoned mines in eastern and central North America suggests closure of mines without adequate survey could have major population impact. Lack of knowledge of hibernation sites (and the degree of population aggregation at these sites) is a key point of vulnerability for this species. Inadequate systematic resolution may affect management decisions (Ellison et al. 2003).

Maps of Species Range and Known Occurrences in Plan Area

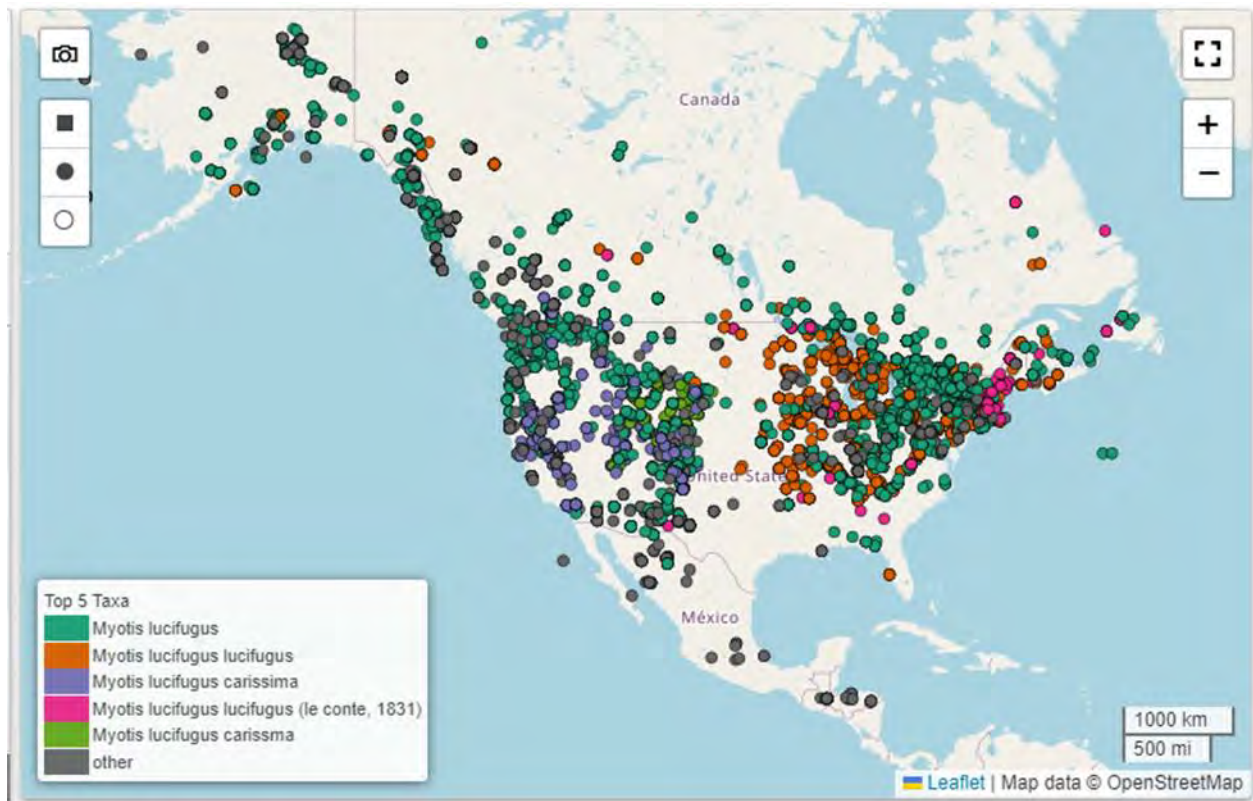


Figure 13. Distribution of little brown bat taxa in North and Central America (iDigBio 2024).

Northern Hoary Bat

(*Lasiurus cinereus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One specimen was collected along Cimarron River in the Cimarron NG on 1967-05-12 (Schmidt et al. 2024), (Figure 14). One specimen was collected from the parcel on the Northwestern side of the Cimarron NG on 1995-09-02 (iDigBio 2024), (Figure 15). One specimen was collected on 09/02 and 2 specimens were collected on 09/03 in 1995 along Cimarron River on the Cimarron NG (Schmidt et al. 2024), (Figure 14).

Year of Last Known Occurrence: 1995

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Threats to population of this species include becoming snagged on barbed wire and directly impacted by wind energy. This species is unlikely to be affected by white-nose syndrome due to its avoidance of caves as roost sites.
 - b. Habitat: Energy development and urban are threats albeit at a slight or low severity levels, and forest management including insect, disease and large-scale disturbances, and timber harvest/forest product are moderate severity.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trend information in the plan area is available.
 - b. Habitat: Pinyon-juniper habitat has both expanded and contracted. Riparian habitat on the plan area has declined.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is not endemic, disjunct or at the edge of their range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: One specimen was collected along Cimarron River in the Cimarron NG on 1967-05-12 (Schmidt et al. 2024), (Figure 14). One specimen was collected from the parcel on the Northwestern side of the Cimarron NG on 1995-09-02 (iDigBio 2024), (Figure 15). One specimen was collected on 09/02 and 2 specimens were collected on 09/03 in 1995 along Cimarron river on the Cimarron NG (Schmidt et al. 2024) (Figure 14).
 - b. Ecological conditions: Both riparian area and pinyon-juniper habitats are relatively limited in the plan area.

Species Status

G3; S3 in Colorado; S4 in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Lasiurus cinereus is valid and accepted (Integrated Taxonomic Information System (ITIS) 2024g). Other common names are hoary bat, Murciélago-cola peluda canoso [Spanish] and chauve-souris cendrée [French] (Integrated Taxonomic Information System (ITIS) 2024g)).

Species range

Overall species range

Range encompasses most of North America, from southeast Alaska, British Columbia, southeastern Mackenzie, Hudson Bay, southern Quebec, Prince Edward Island, and Newfoundland south through Mexico to Guatemala. This species is rare or absent in most of the southeastern United States and in deserts of the U.S. Southwest (NatureServe 2024)).

Description of how the population in the plan area fits within the overall range

The population in the plan area is not endemic, disjunct or at the edge of their range (iDigBio 2024), Figure 16).

Distribution, abundance, and trend in the plan area

Population

One specimen was collected along Cimarron River in the Cimarron NG on 1967-05-12 (Schmidt 2021, Figure 14). One specimen was collected from the parcel on the Northwestern side of the Cimarron NG on 1995-09-02 (iDigBio 2024), Figure 15). One specimen was collected on 09/02 and 2 specimens were collected on 09/03 in 1995 along Cimarron river on the Cimarron NG (Schmidt et al. 2024), (Figure 14). No population trend data are available for this species.

Habitat

Specimens collected from the plan area were from riparian areas along the Cimarron River. In Colorado, this species is known to forage in Pinyon-juniper habitats (Neubaum and Aagaard 2022). Both riparian and pinyon-juniper habitats are relatively limited in the plan area (see Appendix). In southeast Colorado juniper woodlands have expanded (Colorado Parks and Wildlife 2015), particularly in areas of in rocky, shallow soil types that have little herbaceous cover, but contraction has also occurred in deeper and more finely textured soils (Amme et al. 2020). Riparian habitat quality and quantity has declined in the plan area due to several factors, including the increased abundance of invasive tamarisk (see Appendix).

Threats (arising from on or off the plan area)

Population

(Schmidt et al. 2024) states: "This species has the reputation of becoming snagged on barbed wire, possibly because it flies too fast to avoid fences. Finally, this is one of the three species (the others being the eastern red bat and the silver-haired bat) that are killed most often by wind turbines in wind farms". (Colorado Bat Working Group 2024b) notes that wind energy has substantial and imminent direct threats

to this species. This species is unlikely to be affected by white-nose syndrome due to its avoidance of caves as roost sites.

Habitat

(Colorado Bat Working Group 2024b) notes that energy development and urban are threats albeit at a slight or low severity levels, and forest management including insect, disease and large-scale disturbances, and timber harvest/forest product are moderate severity.

Loss of roosting habitat due to timber harvest is likely the biggest threat to this species. Use of pesticides on public forest lands may also be a potential source of mortality to roosting bats and their insect prey. In suburban settings, where jays thrive in association with humans, this bird may pose a major threat to sleeping or hibernating hoary bats (Western Bat Working Group 2024). Hoary bat mortality comprises an estimated 40% of bat fatalities at wind energy facilities. Although the population impact is unknown, the degree of threat is probably increasing. This species is unlikely to be affected by white-nose syndrome due to its avoidance of caves as roost sites (NatureServe 2024)).

Ecological conditions

Ecological condition requirements

This species roosts in either coniferous or deciduous trees and can be expected to live in any habitat with trees (Colorado Bat Working Group 2024c, Schmidt et al. 2024). Known to forage in juniper habitat in Colorado (Neubaum and Aagaard 2022).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species could roost and forage in juniper habitat or riparian habitat in the plan area. Both riparian habitat and pinyon-juniper woodlands are relatively limited in the plan area (see Appendix).

Critical biological characteristics

(Schmidt et al. 2024) states; "Hoary bats are migratory, spending the winter in Mexico. In spring, they return northward in a gender-segregated manner, most males into the western United States and Canada and most females into the eastern United States and Canada. Kansas, located centrally, has both genders but females are said to be about twice as abundant as males. Collection data indicate that the earliest individuals arrive in Kansas in March and the latest individuals leave Kansas in October. Roosts are in either coniferous or deciduous trees, generally from 5 to 7 m above the ground, and visible only from directly below the roost. Hoary bats must fall from the roost to obtain enough airspeed to support flight".

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

(Schmidt et al. 2024) states: "Hoary bats eat more moths than other insects, including beetles, flies, grasshoppers, termites, dragonflies, and wasps. Because of its strong flight, the hoary bat is capable of avoiding predation by all but the fastest raptors. There is one report of predation by an American kestrel. On the other hand, roosting in trees facilitates predation by many predators, including snakes. Moreover,

females with young may be blown from their roosts during storms and face predation by cats and dogs before they can return to the roost”.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Most hoary bat fatalities at wind facilities occur during the species' fall migration and evidence suggests they may be attracted to wind turbines (Arnett et al. 2008)).

Plains streams in eastern Colorado are threatened by drying and fragmentation due to groundwater irrigation depleting underlying aquifers (Colorado Parks and Wildlife 2015)).

Maps of Species Range and Known Occurrences in Plan Area

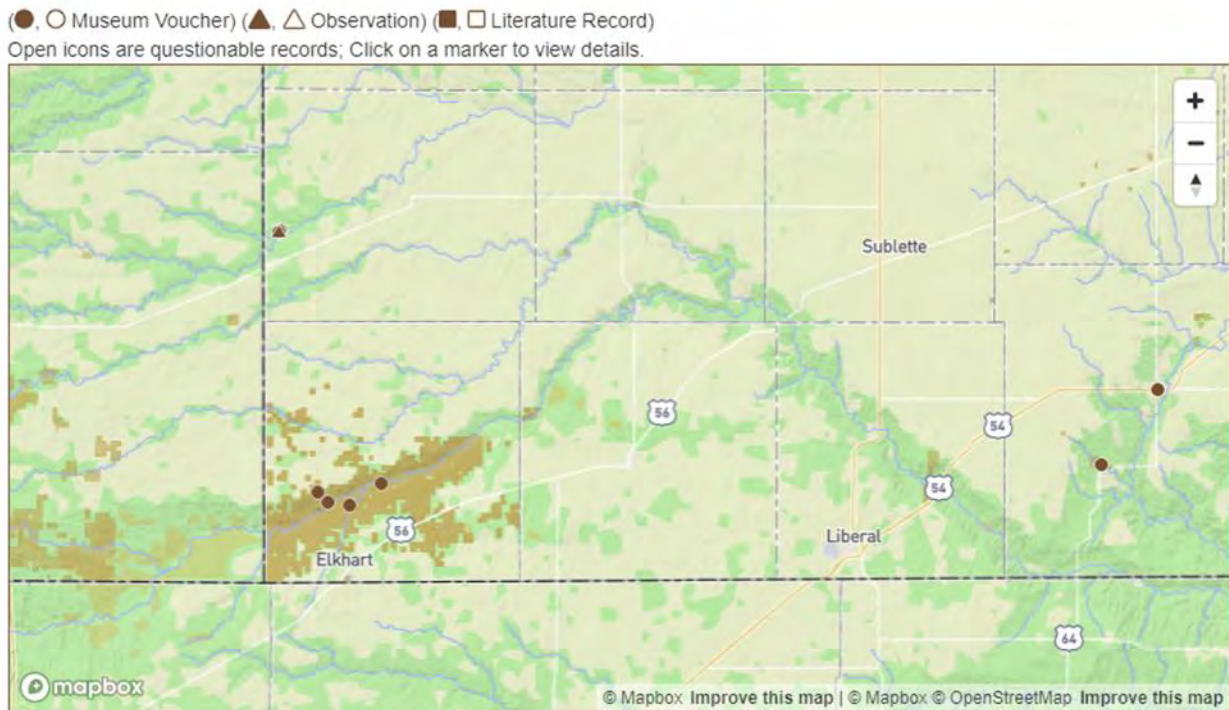


Figure 14. Map of the northern hoary bat occurrences in the Cimarron National Grassland (Schmidt et al. 2024).

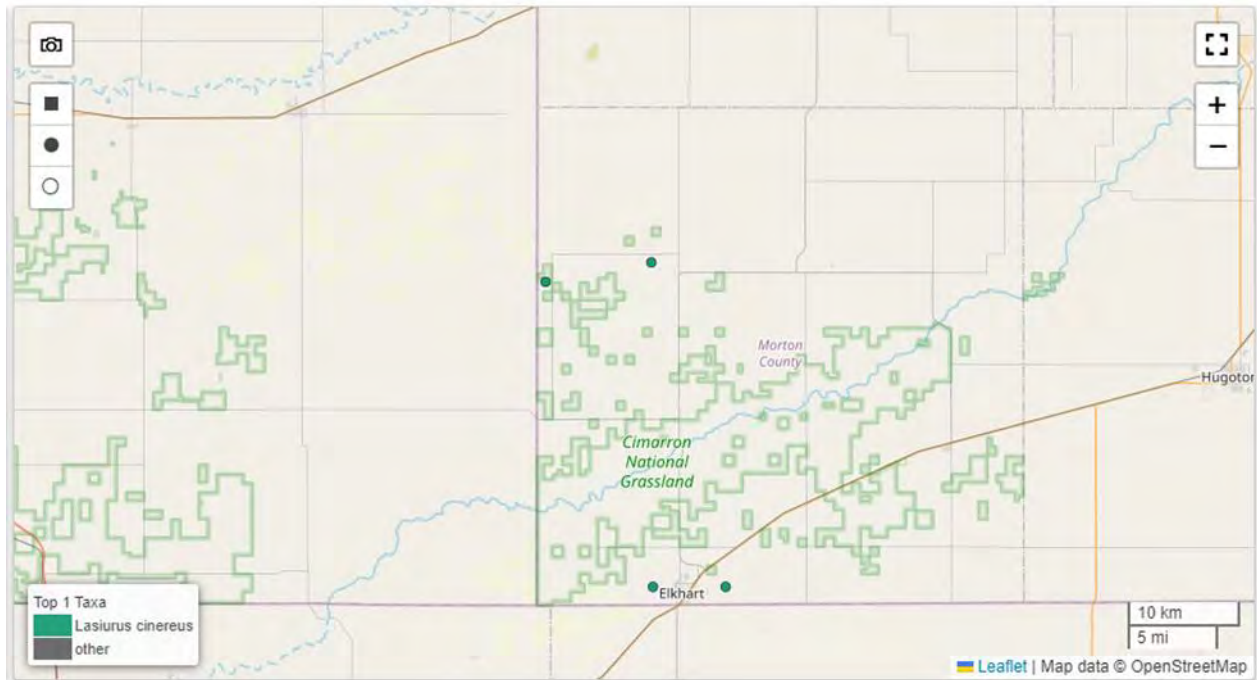


Figure 15. Map of northern hoary bat occurrences in the Cimarron National Grassland (iDigBio 2024).

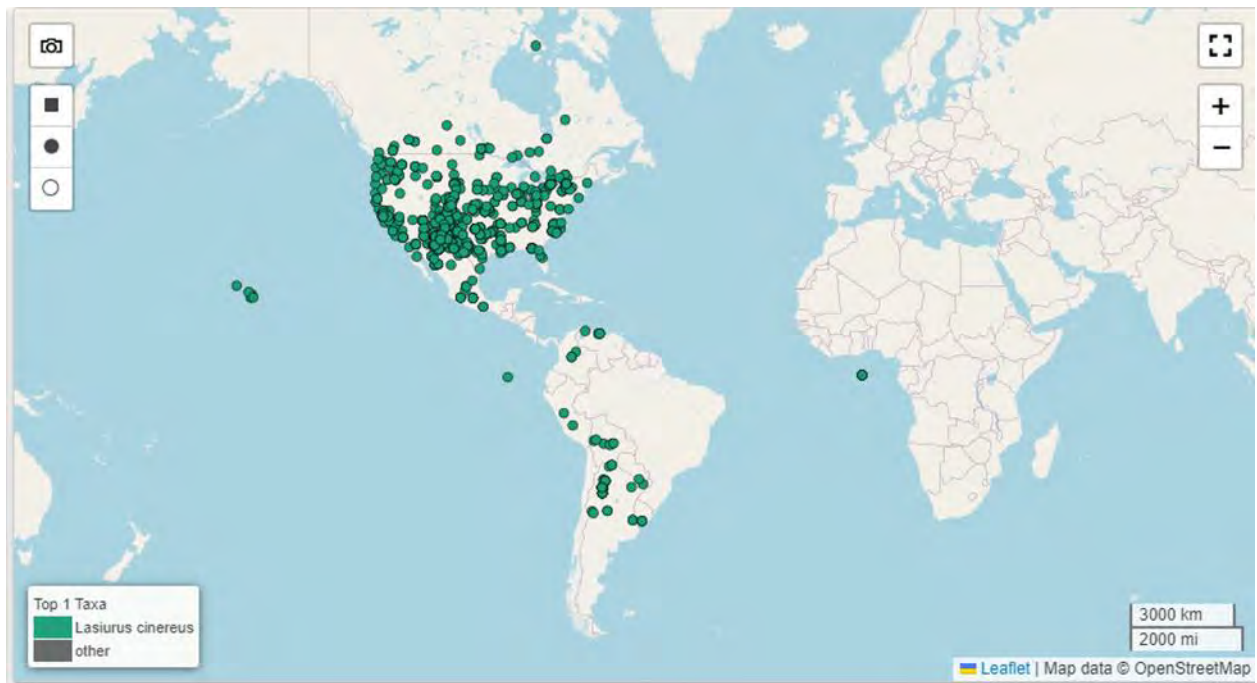


Figure 16. Distribution of the northern hoary bat (iDigBio 2024).

Pallid Bat

(*Antrozous pallidus*)

Species is Native to, and Known to Occur in, National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One specimen was collected on 5/19/1950, a total of 7 specimens were collected between 6/4-8/31 in 1977, and one specimen was collected on 8/17/1978 (GBIF 2024). CPW (2024) reports 9 specimens collected between 6/4-9/1 in 1977.

Year of Last Known Occurrence: 1978

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: On a range-wide basis, no major threats are known. This species is not known to be affected by white-nose syndrome.
 - b. Habitat: Locally, some maternity colonies and hibernacula are susceptible to disturbance, and they may be negatively affected or destroyed as a result of vandalism, mine closures or reactivation, or other activities. Some populations undoubtedly have been negatively affected by loss or extensive modification of primary foraging habitat caused by agricultural expansion (including orchards and vineyards), cheatgrass invasion, fire, urban development, excessive livestock grazing, and pesticide use, but the degree of impact of these threats on the affected populations is not well known.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends are available in the plan area.
 - b. Habitat: No changes to the possible roost sites of rock crevices.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: One specimen was collected on 5/19/1950, a total of 7 specimens were collected between 6/4-8/31 in 1977, and 1 specimen was collected on 8/17/1978 (GBIF 2024). (CPW 2024) reports 9 specimens collected between 6/4-9/1 in 1977.
 - b. Ecological conditions: Individuals are likely to be foraging on shortgrass Prairie habitat in/near canyons or near water sources in the plan area. Roost sites of rock crevices could be a limited microhabitat, but the amount of suitable roosting sites in the plan area is unknown.

Species Status

G4; S4 in Colorado; S1 in Kansas; listed as "Candidate" in Kansas.

Taxonomy

Antrozous pallidus is accepted as valid (Integrated Taxonomic Information System (ITIS) 2024a).

Species range

Overall species range

Range includes western North America from south-central British Columbia, south through the western United States to southern Baja California, central Mexico, southern Kansas, and southern Texas; also Cuba. Elevational range in Texas is 600-2,000 meters (NatureServe 2024).

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the eastern edge of the species range.

Distribution, abundance, and trend in the plan area

Population

In Colorado, this bat inhabits lower elevations of the Western Slope, broken rocky areas of the southeastern part of the state and along the foothills to Colorado Springs. A report of an isolated colony at Torrington, on the plains of eastern Wyoming, suggests that the pallid bat could be found in rocky habitats on the plains of eastern Colorado (Colorado Bat Working Group 2024g).

Habitat

Pallid bats roost in rock crevices, tree hollows, mines and caves (Ellison et al. 2003). Rocky outcrops in the plan area are limited to areas along rivers and their tributaries. No changes to the possible roost sites of rock crevices. Specimens have been collected from Western Shortgrass Prairie habitat in/near canyons or near water sources.

Threats (arising from on or off the plan area)

Population

On a range-wide basis, no major threats are known (NatureServe 2024). This species was not known to be affected by white-nose syndrome (USDI Fish and Wildlife Service (FWS) 2024a).

Habitat

Locally, some maternity colonies and hibernacula are susceptible to disturbance, and they may be negatively affected or destroyed as a result of vandalism, mine closures or reactivation, or other activities. Some populations undoubtedly have been negatively affected by loss or extensive modification of primary foraging habitat caused by agricultural expansion (including orchards and vineyards), cheatgrass invasion, fire, urban development, excessive livestock grazing, and pesticide use, but the degree of impact of these threats on the affected populations is not well known (NatureServe 2024).

Ecological conditions

Ecological condition requirements

This is a species of deserts and grasslands near rocky outcrops. The pallid bat's habit of using structures built by humans may allow it to extend beyond what would otherwise be its natural range. In Colorado, the pallid bat occupies semidesert scrub and piñon-juniper woodlands to about 7,000 feet. Pallid bats are gregarious, although males may separate from breeding females in summer. Elsewhere, this species is not migratory and makes only short movements to hibernation sites. Pallid bats probably hibernate in Colorado from mid-October to April, although there is no direct evidence of their winter habits here. Pallid bats form small colonies and may use rock crevices as day roosts. These roosts are selected for suitable temperature and protection from predators. Night roosts are also selected on the basis of a temperature that minimizes energy loss. Night roosts, such as crevices, shallow caves, overhangs, and man-made structures, are usually near day roosts. Both day and night roosts change seasonally as their thermal characteristics change (Colorado Bat Working Group 2024g).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Within the plan area, there are no plans of operations for locatable mining, abandoned mines or significant caves which can be roost site for this species. Some individuals could roost in rock crevices and hollow trees (Ellison et al. 2003). Rocky outcrops in the plan area are limited to areas along rivers and their tributaries. These habitats are restricted within the plan area. Specimens have been collected from western shortgrass prairie habitat in/near canyons or near water sources. Shortgrass prairie is abundant in the plan area, but proximity to water is more limited.

Critical biological characteristics

Social behavior of pallid bats is quite interesting. There is a strong bond between mother and offspring, and the association may continue year after year. There is also strong group cohesion and roost site attachment. Young are provided preferential positions in roosts, pregnant females are attentive to other females in labor and females actually signal mothers whose young are in distress. Mortality is highest when young bats are first beginning to fly. Their habit of foraging on the ground makes pallid bats susceptible to injury and predation (Colorado Bat Working Group 2024g). The bats are relatively inactive during the winter. They are not known to migrate and are believed to hibernate as solitary individuals or in small numbers. Occasional winter activity has been reported in southern portions of its range (Ellison et al. 2003).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Predators include hawks, kestrels, owls, and snakes. The pallid bat feeds principally on flightless ground-dwelling arthropods, such as crickets, grasshoppers, beetles, scorpions and spiders. Their presence is revealed by audible clicks as they forage after full dark and again before sunrise. Other foods include large moths, lizards, small bats and small rodents (Colorado Bat Working Group 2024g).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

This species' use of mines places them in jeopardy regarding mine closure projects (Ellison et al. 2003).

Maps of Species Range and Known Occurrences in Plan Area

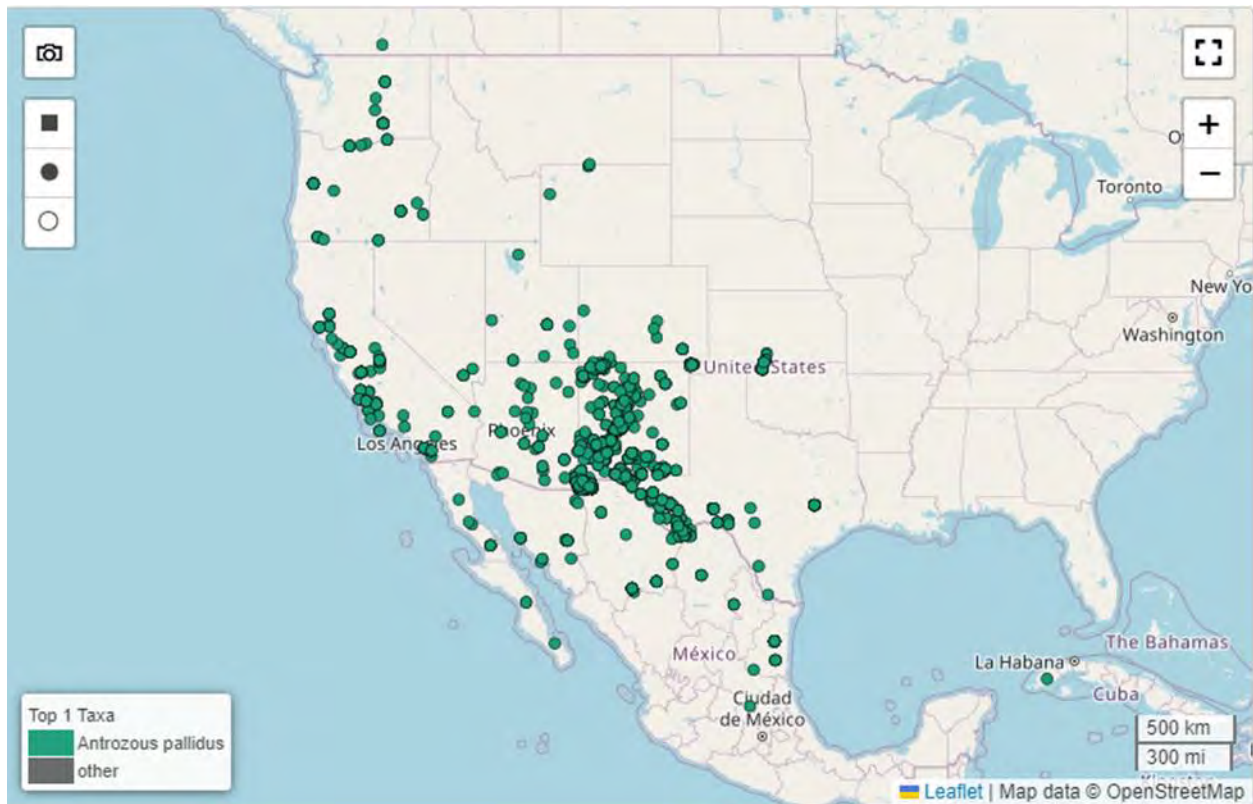


Figure 17. Distribution of the pallid bat (iDigBio 2024).

Rocky Mountain Bighorn Sheep

(*Ovis canadensis canadensis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: **yes**

Rationale/Evidence of Occurrence: This species is native to the Comanche National Grassland (NG) and surrounding area and have occupied suitable mountainous habitat since pre-settlement times. There is a petrograph of bighorn sheep in a canyon near the Comanche NG. The Purgatoire Canyon herd located partially on the Comanche NG is the largest herd in Colorado and contains 400 individuals or more. The Carrizo Canyon herd located partially on the Comanche NG contains approximately 75 individuals, and the animals are known to move between the Carrizo Canyon and the Dry Cimarron Unit of New Mexico.

Year of Last Known Occurrence: 2024

Summary of indicators of conservation concern

5. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - c. Population: Epizootics disease, herd size and loss of genetic diversity and competition with domestic and wild ungulates. Domestic sheep grazing occurs on private lands in proximity to CCNGs.
 - d. Habitat: Human disturbances, development, and habitat fragmentation are not considered a primary limiting factor for any bighorn sheep herd on the Comanche National Grassland. Fragmentation on non-federal lands and the presence and continued risk of transmitted diseases are primary factors limiting the restoration of large, interconnected herds on Forest and between adjacent public land management units.
6. Declining trends in populations or habitat in the plan area:
 - e. Population: Since translocation of the bighorn sheep, populations have been fluctuating but have been generally increasing.
 - f. Habitat: Habitat condition is stable.
7. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - g. Population in the plan area is at the Western edge of the species range.
8. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - h. Population: The Purgatoire Canyon herd partially on the Comanche NG is the largest herd in Colorado and contains 400 individuals or more. The Carrizo Canyon herd partially on the Comanche NG contains approximately 75 individuals, and the animals are known to move between the Carrizo Canyon and the Dry Cimarron Unit of New Mexico.
 - i. Ecological conditions: Ecological condition is limited to the Canyonlands and is limited in the plan area.

Species Status

G4; S4 in Colorado; SGCN, Tier 2 in Colorado, USFS Region 2 Sensitive Species.

Taxonomy

Ovis canadensis canadensis is accepted as valid (ITIS 2024).

Species range

Overall species range

Rocky Mountain bighorn sheep are widespread in western North America from central British Columbia and Alberta south to Colorado (Figure 19).

Bighorn sheep (*Ovis canadensis*) have experienced range contractions across their historical distribution since the late 1800s. Translocations and reintroductions of these mountain ungulates are key aspects of restoration and often are used to reestablish populations in historical habitat or to supplement declining herds (Figure 19) (Whiting et al. 2023).

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the western edge of the species range.

Distribution, abundance, and trend in the plan area

Population

Although the bighorn sheep populations on the Comanche NG have undergone periodic fluctuations, the long-term population trend has followed that of herds elsewhere in Colorado. Many bighorn herds as they exist today are small remnants that have persisted in the most productive or isolated portions of their ranges.

The Purgatoire Canyon herd partially on the Comanche NG is the largest herd in Colorado and contains 400 individuals or more. This herd was initiated in 1982 with the translocation of 17 bighorns from the Never Summer Range in Rocky Mountain National Park into the Purgatoire River Canyon. A subsequent translocation was made in 1986 using 20 sheep from the Collegiate North Herd, which were released into Chacuaco Canyon, a major tributary canyon of the Purgatoire (Figure 20, Figure 21). The herd increased to an estimated 240 individuals by 1996 (Beecham et al. 2007). Recent post hunt population estimates show 400-525 individuals between 2017 and 2023 (Figure 18) (Colorado Parks and Wildlife 2019, 2020, 2023).

Several authorities consider 100 individuals to be a minimal size for viability (Smith et al. 1991 (Smith et al. 1991, Singer et al. 2001). The Carrizo Canyon herd contains approximately 75 individuals which is lower than the minimal size for validity; however, animals are known to move between the Carrizo Canyon and the Dry Cimarron Unit of New Mexico. Recent post hunt population estimates show increase in numbers, 50 individuals in 2017 to 75 individuals in 2023 (Figure 18) (CPW 2019, 2020, 2023).

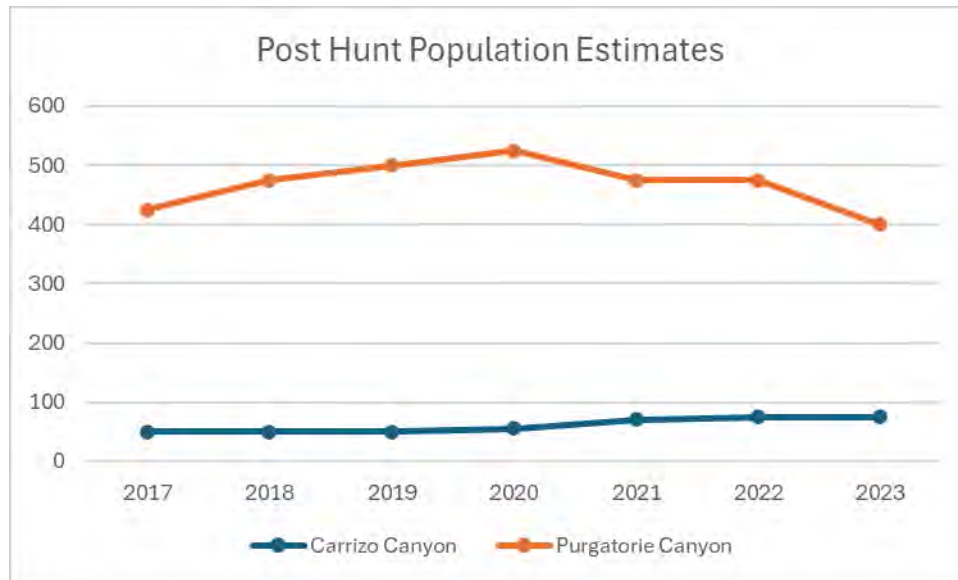


Figure 18. Post hunt population estimates of bighorn sheep (Colorado Parks and Wildlife 2019, Boulder County Parks and Open Space 2012, Colorado Parks and Wildlife 2020, 2023).

Habitat

The habitat of bighorn sheep is mesic to xeric grasslands associated with mountain, foothill, or major river canyons, ranging from high alpine areas to deserts (Shackleton 1985). There are two Rocky Mountain bighorn sheep Management Units with occupied range that occur partially on the Comanche National Grassland. The Canyonlands in the plan area is a distinctive feature of the Comanche due to contrasting relief and the abundance of juniper that flourishes in the Ecological Area. Soils vary with the topography (USDA Forest Service 2005a).

This system in the plan area includes cliffs and outcrops throughout. Substrate can range from sandstone and limestone, which can often form bands in the examples of this system. Trend in Canyonland systems (Cliff, Canyon rock outcrop habitat) is not well established. While there may be disturbances in localized conditions due to threats, such as mining or wind energy, that could alter the system structurally and community wise that could lead to a declining trend in localized situations but for the overall habitat type it is most likely stable due to condition of cliff and canyon habitats is typically good (Colorado Parks and Wildlife 2015).

Threats (arising from on or off the plan area)

Population

Disease Epizootics: In Colorado, the susceptibility of bighorn sheep to pathogens introduced by domestic sheep is regarded as the primary factor limiting bighorn sheep populations (George et al. 2009).

Mycoplasma ovipneumoniae, which is the key pathogen behind pneumonia outbreaks and is acquired through contact with domestic sheep or already-infected bighorn sheep. The Comanche NG does not have sheep grazing allotments, but domestic sheep are on privately owned lands. No recent pneumonia die-off has been documented in the plan area. Other respiratory pathogens documented in bighorn sheep include parainfluenza-3 (PI-3) and bovine respiratory syncytial virus (BRSV).

Herd Size and Loss of Genetic Diversity: In pre-settlement times, it is likely that most of Colorado's bighorn populations existed as large metapopulations that interacted over large areas and maintained high genetic diversity. Currently, large-scale movements and herd interactions have been greatly

restricted because most extant populations occur as small, isolated herds separated by landscape habitat fragmentation factors such as roads, towns, urban home-sites, and other human developments on private lands in the broader landscape. The recent open canopy conditions due to the spruce beetle outbreak may temporarily facilitate greater movements across the landscape, which may be a positive factor for greater genetic exchange but perhaps a negative factor for disease transmission.

Competition: Competition with domestic and wild ungulates can potentially influence bighorn sheep. From a forage perspective, bighorn sheep have the most dietary overlap with domestic sheep, cattle, and elk and less overlap with species such as mule deer (George et al. 2009). A study in Trickle Mountain did not include domestic sheep, which had been removed at the time but are known to have the highest dietary overlap and utilize many of the same habitats as bighorn sheep (McCollough et al. 1980). In regards to livestock, the study found that although bighorns and cattle have a high dietary overlap, the impact of cattle was limited to only about 5% of the critical bighorn sheep range because cattle primarily remained close to water and used areas with less slope (George et al. 2009). However, other researchers have reported that cattle were serious dietary competitors with bighorn where their habitats overlapped, and also compete through spatial displacement (several authors in (Beecham et al. 2007). The impact on bighorns due to an apparent social intolerance of cattle (except in extreme cases, such as the 2007/2008 winter conditions that resulted in the S-70 Fossil Ridge herd mixing with cattle on private land eating hay) has resulted in displacement from traditional range areas and disruption of the lamb-rearing season (Beecham et al. 2007, McKinney et al. 2001). On the Comanche National Grassland, however, there is little range overlap between cattle and bighorn sheep, and there are no sheep grazing allotments on the plan area.

Habitat

Human Disturbance, Development and Habitat Fragmentation: Human disturbances, development, and habitat fragmentation are not considered a primary limiting factor for any bighorn sheep herd on the Comanche National Grassland. In some areas, recreation or other potential human disturbances warrant further site-specific evaluations for possible influences on local bighorn herds. However, development off National Forest Systems land combined with highways, roads, and other human infrastructure is a concern in some areas, particularly where bighorn highways intersect core herd home range or disrupt movements to resource needs such as water. Fragmentation on non-federal lands and the presence and continued risk of transmitted diseases are primary factors limiting the restoration of large, interconnected herds on Forest and between adjacent public land management units.

Ecological conditions

Ecological condition requirements

Climate, elevation, and latitude influence the vegetative structure and composition in bighorn sheep habitat. Within individual home ranges, different habitats meet the specific requirements of wild sheep, including foraging, resting, mating, lambing, thermal cover, and predator avoidance (Risenhoover and Bailey 1985). Seasonal use of different slopes and aspects results in a mosaic of plant communities and phenological patterns which provide foraging and security opportunities for bighorn sheep (Valdez and Krausman 1999).

Warm temperatures on south-facing slopes result in earlier green-up, marking the transition from winter range to spring range. During the spring green-up, mineral licks appear to be an important component of bighorn sheep habitats where soils are derived from granitic materials. As temperatures continue to rise during late spring and early summer, bighorn sheep make greater use of north, east, and west-facing slopes at higher elevations for foraging. Alpine meadows and high elevation plateaus are important summer foraging areas for many Rocky Mountain sheep populations. The elevation and aspect preferred by bighorn sheep varies according to forage succulence and ambient temperature (Beecham et al. 2007).

While bighorns feed in open areas, they are rarely found more than 0.25 miles (400 m) from escape cover, where they have an advantage over most predators (Krausman and Leopold 1986, Krausman and Bowyer 2003). Bighorn sheep rely on keen vision to detect predators, and on rapid mobility on steep terrain as the principal means of avoiding predators (Geist 1971). Thus, open, steep terrain is the defining component of bighorn sheep habitat. Talus slopes, rock outcrops, and cliffs provide habitat for resting, lambing, and escape cover. Adult male sheep are known to move farther away from security cover than females. Young rams in particular have a propensity to wander great distances from escape cover, particularly during the breeding season (Schommer and Woolever 2001).

Escape terrain is critical for ewes during lambing, even to the extent that they will sacrifice access to high quality forage for security (Cook 1990, Bleich et al. 1997). Both ewes and lambs are vulnerable to predation immediately prior to and for one to two days after parturition. Adult female bighorns exhibit strong fidelity to parturition sites and often use the same lambing grounds year after year. In the Rocky Mountains, lambing areas are usually on or very close to wintering areas (Geist 1971).

Key elements of winter ranges for bighorn sheep include low snow depth and wind-swept areas with sufficient forage and adjacent escape terrain for eluding predators (Krausman and Bowyer 2003 (Krausman and Bowyer 2003)). Wind, cold temperatures, and heavy snow accumulation are likely limiting factors for Rocky Mountain bighorn sheep in some areas. (Stelfox 1976) suggested that the critical snow depth for Rocky Mountain bighorn lambs was 12-17 inches (30 to 44 cm), 13-19 inches (32 to 48 cm) for yearlings and adult females, and 14-21 inches (36 to 54 cm) for adult males. Consequently, most bighorn winter ranges occur on steep south, southwest, or southeast-facing slopes where maximum heat gain reduces cold stress and snow cover, and increases the availability of forage (Geist 1971, Krausman and Bowyer 2003). In some areas, bighorn sheep may remain at or move to high elevation, wind-swept ridges to avoid heavy snow depths at lower elevations (Geist 1971). Snow quality and the proximity of security cover are other factors influencing sheep use of winter ranges.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The Purgatoire Canyon herd inhabits mainly the Purgatoire River Canyon portion of the plan area (Figure 20).

The Carrizo Canyon herd inhabits Little Black Mesa, Whitby Canyon, Bushy Canyon and Carrizo Canyon areas of the plan area (Figure 20). This herd is known to move between the Carrizo Canyon and the Dry Cimarron Unit of New Mexico.

The modeled suitable habitat map (Figure 19) shows suitable habitat area between the Purgatoire Canyon and the Carrizo Canyon herds.

Critical biological characteristics

Although it is difficult to estimate how many bighorn sheep occurred on the grasslands historically. By the late 1800's, the number of bighorns decreased drastically in association with human settlement. Historical statewide estimates of 7,230 bighorn sheep in 1915, 3,200 in 1958 and 2,200 in 1970 reflect this trend; there were an estimated 6,045 bighorns in Colorado in 1988, and in 2007 there were an estimated 7,040 bighorn sheep statewide in Colorado (George et al. 2009).

Rocky Mountain bighorn sheep are characterized by low reproductive rates, long life spans, and populations adapted to live near carrying capacity in relatively stable environments (Geist 1971).

Bighorn sheep are a sexually dimorphic species with ewes that may weigh 190 pounds and rams may weigh greater than 300 pounds. Large-horned, older rams do much of the breeding, though younger rams will breed opportunistically (Hogg and Forbes 1997). Rams may breed several ewes; however, they are not territorial, nor do they form harems, but rather are serial polygynists. Ewes generally first breed at 2.5

years and give birth to one lamb after a gestation period of 180 days. Although twins have been documented in both wild and captive bighorn sheep, it occurs infrequently (Eccles and Shackleton 1986).

In the southern Rocky Mountains, bighorn sheep generally breed from late October through late December with the peak breeding season occurring from about mid-November to mid-December (Beecham et al. 2007). Most lambs are born from late April through early June, with few lambs born after mid-June. Bighorn sheep generally have a life span of 10-14 years, although exceptions as old as 18 years have been reported (Geist 1971). Mortality tends to be high the first two years, low from ages 3-5, after which mortality rates dramatically diverged. Stable, unhunted bighorn populations that were nutritionally limited tended to exhibit slowly increasing mortality rates and long life expectancy. On the other hand, rapidly increasing and hunted populations on excellent ranges tended to show rapidly increasing male mortality rates with shorter life expectancies (Beecham et al. 2007).

Bighorn sheep are social animals that live in groups most of the year. Ewe groups (comprised of adult ewes, yearling ewes, lambs, and young rams) generally are larger than ram groups especially during late spring and early summer when nursery bands may contain 25-100 animals (Lange 1978). Mature rams generally remain solitary or in bachelor groups except during the pre-rut and rut periods (November-January), when rams and ewes gather on the same range.

Bighorn sheep eat a wide variety of plants with diets that vary seasonally and throughout their geographic range (Beecham et al. 2007). Succulent vegetation in summer and snow and ice in winter help bighorns to survive for long periods without freestanding water. Forbs generally dominate the diet, followed by grasses, and lastly browse (Beecham et al. 2007). However, some low-elevation Rocky Mountain bighorn sheep populations have diets dominated by the leaves of browse species, particularly true mountain-mahogany (Rominger et al. 1988). Bighorn sheep also use mineral licks, especially during summer when green, potassium-rich forage is consumed.

Unlike other ungulates in which young disperse to new areas, bighorn sheep pass knowledge of home ranges and migration routes from one generation to the next. Therefore, bighorn sheep do not typically re-colonize ranges where they have been extirpated. Translocations are generally required to establish new populations (Singer and Gudorf 1999).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Competition with domestic and wild ungulates can potentially influence bighorn sheep. From a forage perspective, bighorn sheep have the most dietary overlap with domestic sheep, cattle, and elk and less overlap with species such as mule deer.

Maps of Species Range and Known Occurrences in Plan Area

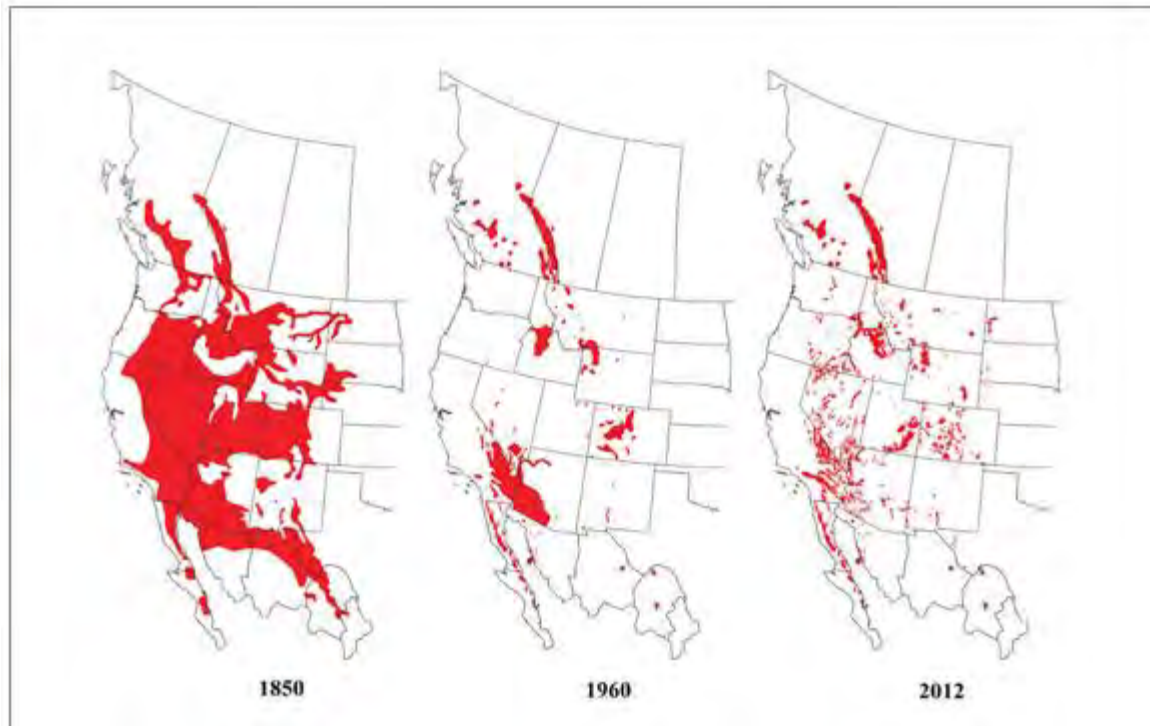
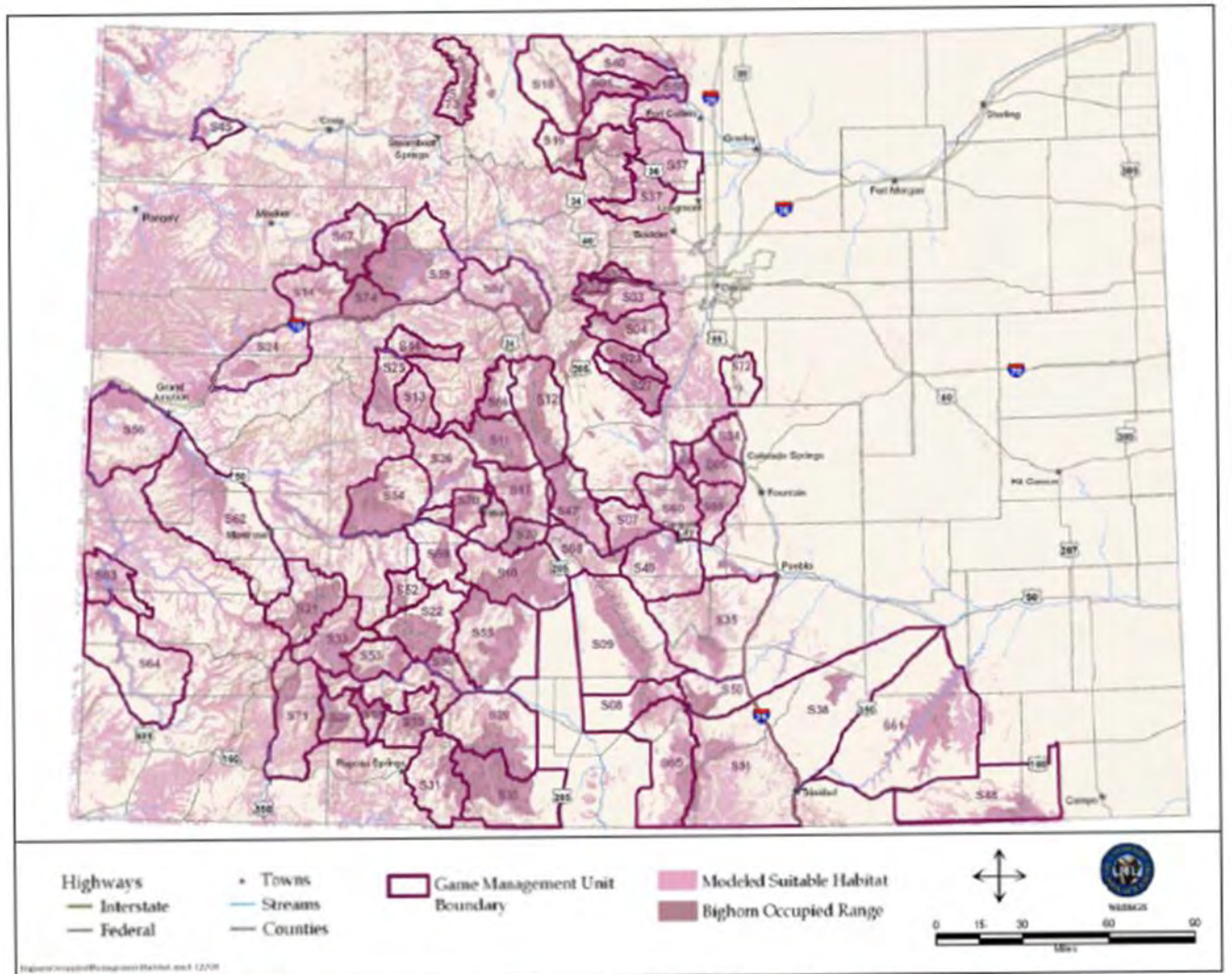


Figure 19. Bighorn sheep distribution: historical (1850), probable lowest distribution (1960), and more recent distribution (2012) (Wild Sheep Foundation and WAFWA Wild Sheep Working Group, 2012) (Whiting et al. 2023 (Whiting et al. 2023)).



APPENDIX II. Bighorn sheep game management units, occupied bighorn sheep range, and modeled potentially suitable bighorn sheep habitat (based primarily on slope) in Colorado, 2008.

Figure 20. Occupied and potential bighorn sheep habitat in Colorado 2008 (Gero et al. 2009).

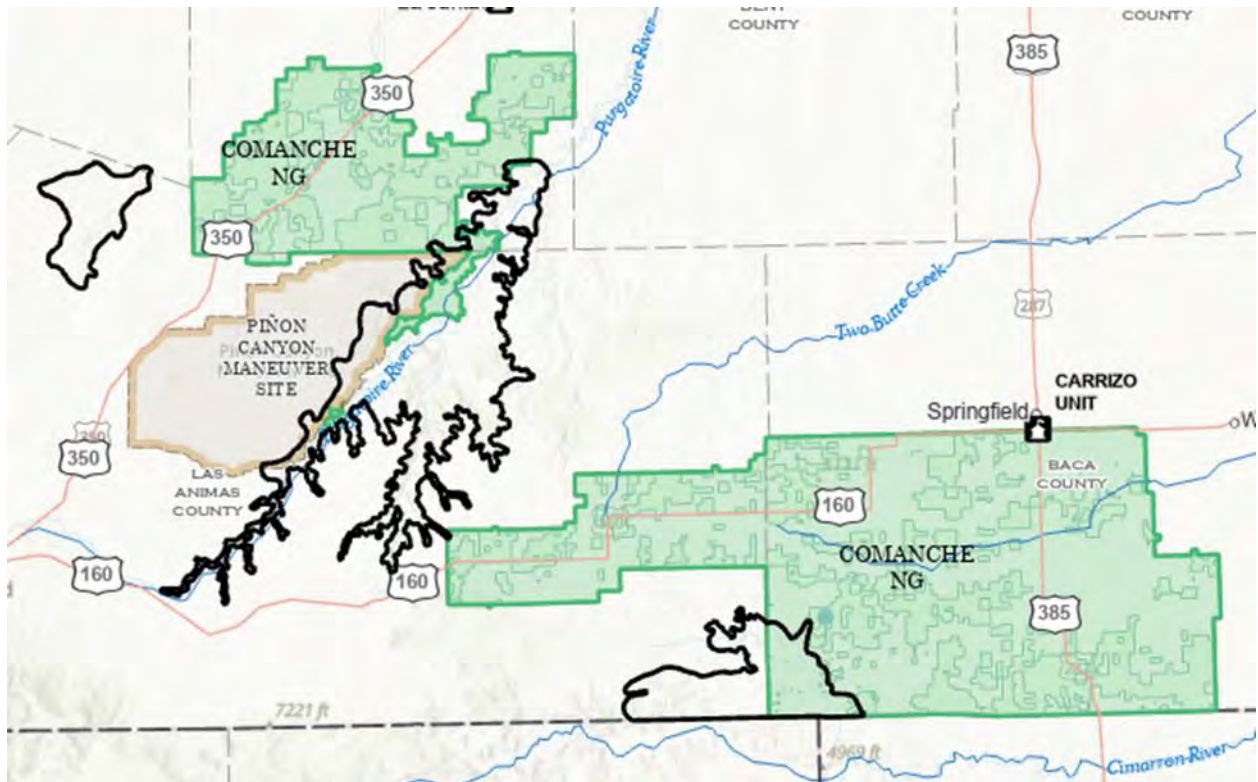


Figure 21. Bighorn sheep occupied range (2014) over the plan area.

Silver-haired Bat

(*Lasionycteris noctivagans*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: One specimen was collected from 4 miles SW of Timpas on 1951-04-28 (GBIF 2024). Because this species is mainly dependent on forested habitat for roosts, this specimen could likely be captured during spring migration. The species has been documented throughout Kansas, albeit more commonly in western counties. Most specimens have been taken in the months of May and September, suggesting that this bat migrates twice annually across the state (Schmidt et al. 2024).

Year of Last Known Occurrence: 1951

Species Status

G3; S3 in Colorado; SNA in Kansas.

Maps of Species Range and Known Occurrences in Plan Area

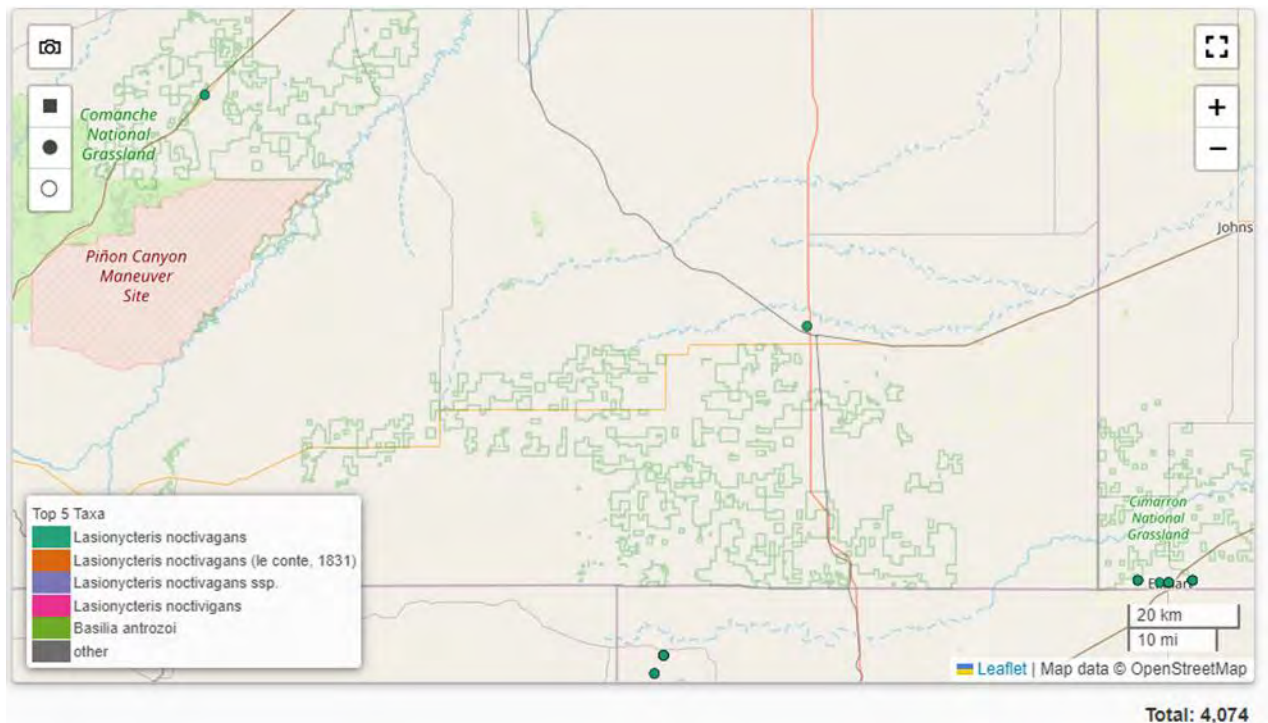


Figure 22. Occurrence records in and near the plan area (iDigBio 2024).

(●, ○ Museum Voucher) (▲, △ Observation) (■, □ Literature Record)
Open icons are questionable records; Click on a marker to view details.

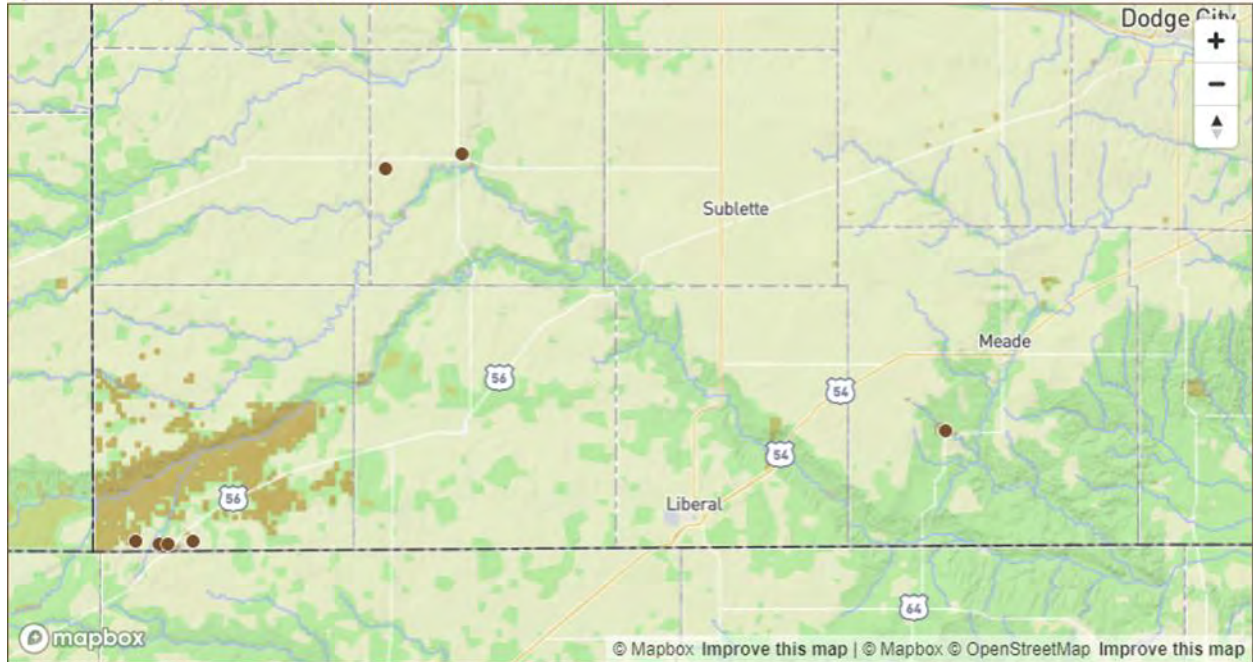


Figure 23. Occurrence records near the Cimarron NG (Schmidt et al. 2024).

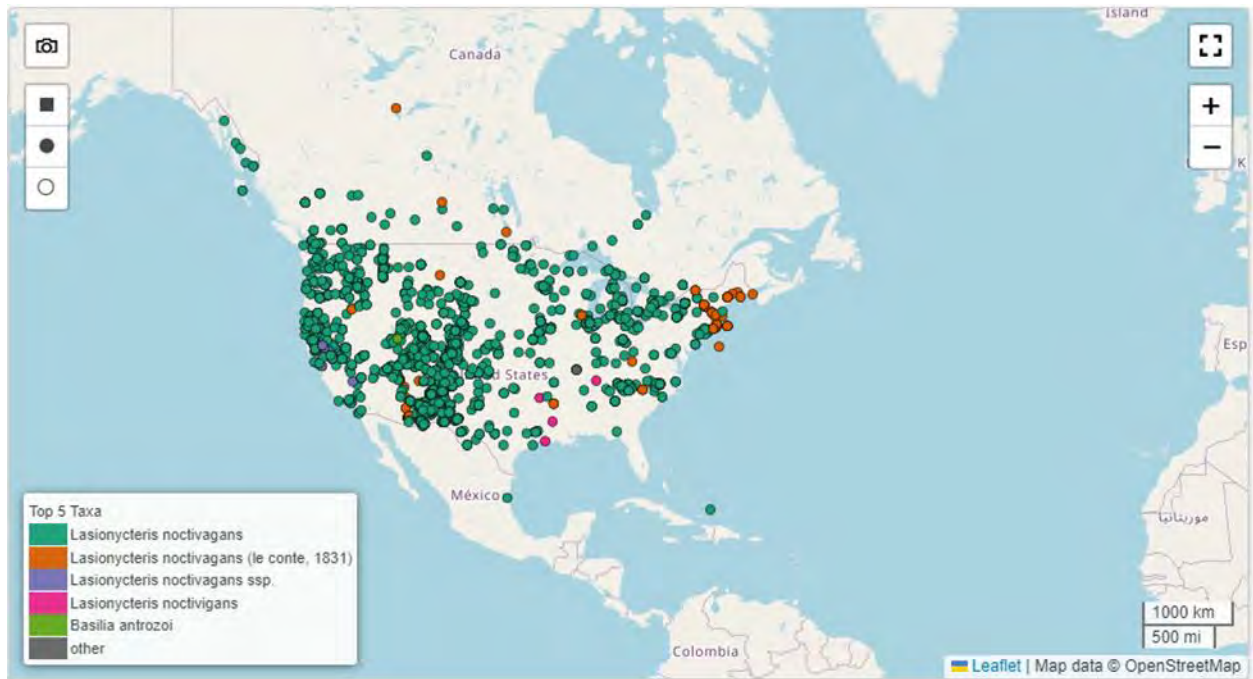


Figure 24. Distribution of the silver-haired bat (iDigBio 2024).

Swift Fox

(*Vulpes velox*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: A total of three individuals have been observed and one roadkill was found between 7/10/2020 and 6/13/2023 in the Comanche NG, in addition to 11 occurrences in the Comanche NG between 9/18/1994 and 8/27/2009 (Van Scoyoc 2024). Six active dens were reported on the Carrizo Unit, Comanche NG in 2006 (Van Scoyoc 2024). One specimen was collected from Cimarron NG on 4/7/1955 (Figure 25) (Schmidt et al. 2021a).

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Habitat loss and degradation, interspecific competition with red fox and coyote, vehicle collisions, and poisoning.
 - b. Habitat: Loss of habitat to agriculture and possibly urbanization, but information is scarce. (Colorado Parks and Wildlife 2015) lists urban, suburban, and ex-urban development, habitat fragmentation by roads and railroads as threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends are not available in the plan area, but populations are stable in Colorado and Kansas.
 - b. Habitat: Shortgrass prairie in the plan area is generally stable.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the western edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Unknown; 14 occurrence records and 6 active dens.
 - b. Ecological conditions: Shortgrass prairie which is abundant in the plan area.

Species Status

G3; S3 in Colorado; S3 in Kansas; listed as "Candidate" in Colorado; USFS Region 2 Sensitive Species.

Taxonomy

Vulpes velox is accepted as valid. Another common name for this species is Zorra desértica (in Spanish) (Integrated Taxonomic Information System (ITIS) 2024k). (Mercure et al. 1993) examined mtDNA variability in 10 areas throughout most of the range of the kit and swift foxes; they concluded that kit and swift foxes hybridize over a limited geographic area and should be recognized as separate species (Figure 26).

Species range

Overall species range

The historic range of the swift fox includes all or portions of Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming, and the southern prairie region of Alberta, Manitoba, and Saskatchewan. Some historical range descriptions include swift fox in Minnesota and Iowa; however, there are no verifiable records of swift fox occurrence in either State (Sovada et al. 2009) (USDI Fish and Wildlife Service (FWS) 2001).

Evaluations have demonstrated nearly continuous distribution of swift fox populations from Wyoming south throughout eastern Colorado, western Kansas, the Oklahoma Panhandle, eastern New Mexico, and in two or three counties in the extreme northern panhandle of Texas. Scattered populations can also be found in Montana, South Dakota, North Dakota and Nebraska. In Canada, there are populations of swift fox in southern Alberta and Saskatchewan (Peek et al. 2024, Sovada et al. 2009) (USDI Fish and Wildlife Service (FWS) 2001).

Swift fox distribution was estimated about 44% of their historical range based on the data collected between 2001 and 2006 (Sovada et al. 2009). Overall swift fox distribution has increase to 49% of their historic range based on the county-level presence -absence data collected for the 5-year period of 2014-2018 in the U.S., which included Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming (Peek et al. 2024) (Figure 27).

Description of how the population in the plan area fits within the overall range

Population in the plan area is at the western edge of the species range.

Distribution, abundance, and trend in the plan area

Population

No population trend data is available in the plan area. However, CPW has been conducting statewide surveys since 1997, and occupancy rates have been remained relatively stable in eastern Colorado (Dowd Stukel 2017, Stratman et al. 2022, Stratman 2017). Between 80-85% of surveyed prairies in Colorado are considered to be occupied by swift foxes and in good condition to support more (Peek et al. 2024). Harvested swift foxes have been pelt tagged since 1994 in Kansas (Figure 1, (Peek 2023)). No decreases in distribution of swift fox have been detected since 1982 when regulated harvest of this species was started (Dowd Stukel 2011).

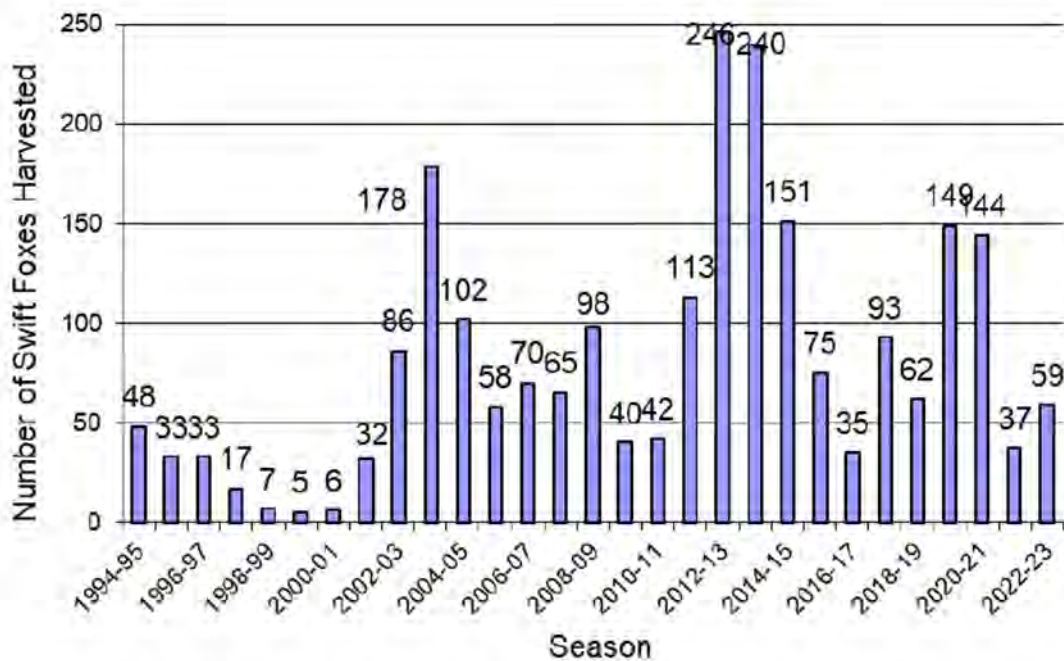


Figure 25. Number of swift foxes pelt tagged annually by KDWP since a tagging program was initiated in 1994 (Peek 2023). Regulated harvest has not impacted populations of swift foxes based on the data (Stephens and Anderson 2005, Peek et al. 2024).

Habitat

Most of the occurrence records of this species spatially map within Landfire Existing Vegetation Type layer (EVT) as Western Great Plains Shortgrass Prairie. Other habitats include but not limited to Central Mixedgrass Prairie Grassland, Inter-Mountain Basins Mixed Salt Desert Scrub, Inter-Mountain Basins Shale Badland, Northern & Central Plains Ruderal & Planted Grassland, Western Cool Temperate Urban Herbaceous, Western Cool Temperate Urban Shrubland, Western Great Plains Cliff and Outcrop, Western Great Plains Foothill and Piedmont Grassland and developed roads. Shortgrass prairie exhibits many departures from historic conditions, but the current condition in the plan area is believed to be relatively stable (see Appendix).

Threats (arising from on or off the plan area)

Population

Threats to the population include habitat loss and degradation, interspecific competition with red fox and coyote, vehicle collisions, and poisoning (Stephens and Anderson 2005). Regulated harvest has not impacted populations of swift foxes based on the data (Stephens and Anderson 2005, Peek et al. 2024).

Habitat

Threats to habitat includes loss of habitat to agriculture and possibly urbanization, but information is scarce (Stephens and Anderson 2005). (Colorado Parks and Wildlife 2015)) lists urban, suburban, and ex-urban development, habitat fragmentation by roads and railroads as threats. Swift foxes are reported to avoid CRP (conservation Reserve Program) lands due to tall vegetation height of tall grass species (Werdel et al. 2023).

Ecological conditions

Ecological condition requirements

The swift fox inhabits the shortgrass and midgrass prairie ecosystem of the Great Plains and seems to prefer heavily grazed, early successional stages of grassland communities. Studies in Kansas and Colorado demonstrate that the swift fox has been able to adapt to a mixed prairie agricultural landscape. Adaptability to various habitat types was further demonstrated in Wyoming and Colorado where the swift fox was found to occupy sagebrush-grassland and sagebrush greasewood habitat types with topography ranging from flat to badland-like terrain (Thompson et al. 2008, USDI Fish and Wildlife Service (FWS) 1995, Kahn et al. 1997).

Swift foxes were more likely to occur in grassland-dominated landscapes and on loamy tableland soils, and less likely to occur in landscapes with greater proportions of CRP landcover and greater landcover heterogeneity in Western Kansas (Werdell et al. 2023).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Shortgrass prairie habitat is abundant in the plan area (see Appendix). Therefore, ecological conditions are not considered restricted for this species in the plan area.

Critical biological characteristics

The swift fox is bred in December to February depending on latitude. Average litter sizes of 3 – 5 pups, with a range of 1-8. Den sites are possibly changed multiple time during the pup-rearing period (Stephens and Anderson 2005). Dens are in burrows. A fox may dig a burrow or use a burrow made by another mammal (e.g. prairie dog), usually in sandy soil on high ground in open prairies, along fencerows, occasionally in plowed field. An individual may use several different dens throughout the year. Young are born in an underground den about 1 meter below the surface. The den usually has multiple entrances and a complex network of tunnels (Egoscue 1979).

Pup-dispersal begins in September and October (Kahn et al. 1997).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Predation and interspecific competition with coyotes and expanding red fox populations may be the two most serious limiting factors to swift fox recolonization of potential habitat within the historic range. Competition with coyote and red fox confer a likely ecological barrier for settling into new areas. Coyote killing of swift foxes appears to have significantly affected the experimental reintroduction of swift foxes in Canada (Sovada et al. 2009) in (Allen et al. 1995).

Diet includes mammals (mainly Lagomorphs), birds, lizards, invertebrates, and vegetable matter (grasses and berries). Mammals (often especially *Sylvilagus*) and insects comprise the bulk of the diet (Egoscue 1979).

Swift fox dens, particularly the larger complex, regularly occupied systems provide a place of refuge for numerous kinds of invertebrates and vertebrates. Some examples are centipedes, several species of coleoptera, numerous spiders, pulicid fleas, and a Great Plains toad from occupied burrows. Burrowing

owls commonly live in abandoned dens, and others include several invertebrates not found in occupied dens, prairie rattlesnake, deer mice and striped skunks (Egoscue 1979).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Prescribed fire and a combination of prescribed burning and mechanical treatment to reduce woody vegetation and density and heights of grass species have positive effects on swift fox habitats. Sparse short vegetation compositions decrease predation risk from coyotes (Peek et al. 2024).

Maps of Species Range and Known Occurrences in Plan Area

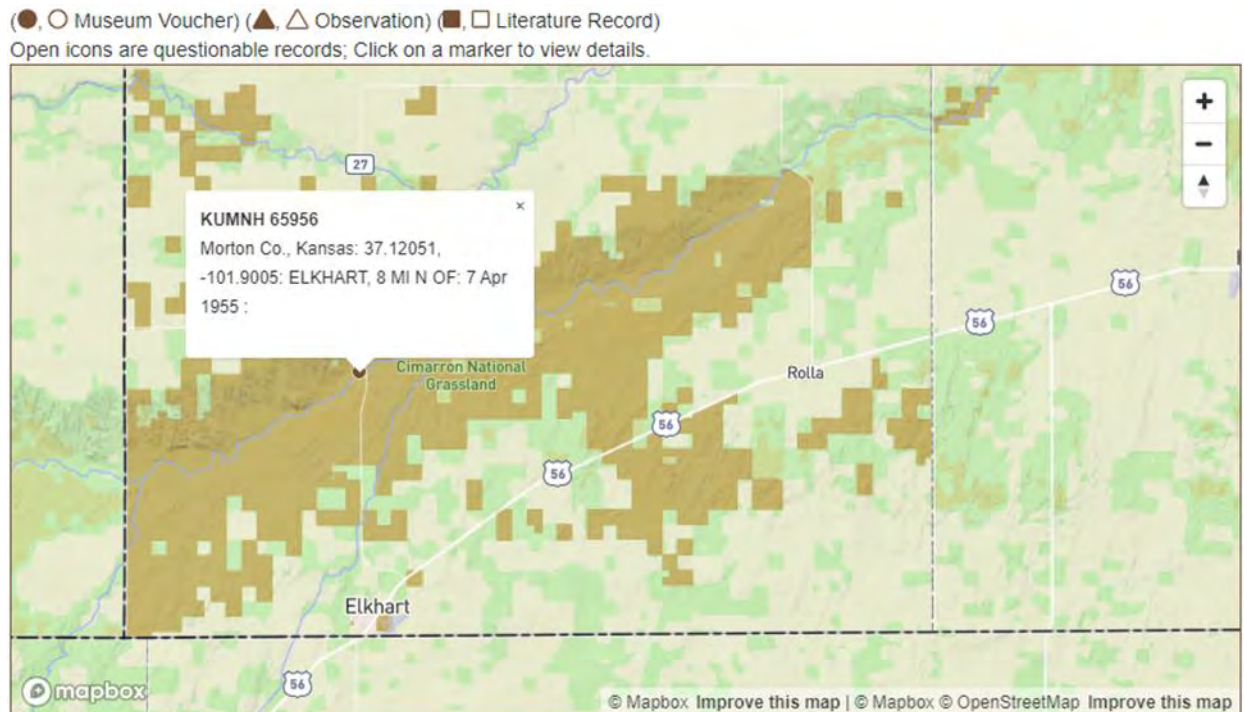


Figure 26. Specimen record on the Cimarron NG from April 7, 1955 (Schmidt et al. 2021a).

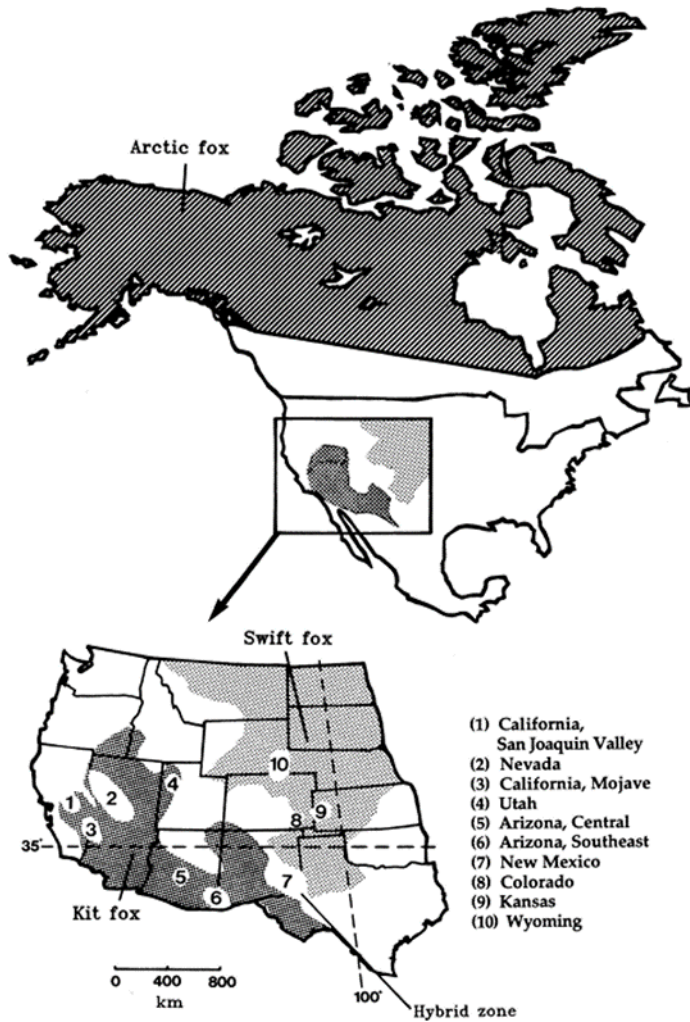


Figure 27. Variability in mtDNA in 10 areas throughout most of the range of the kit and swift foxes have been examined. Kit and swift foxes hybridize over a limited geographic area and should be recognized as separate species (Mercure et al. 1993).



Figure 28. Distribution of the swift fox in North America based on surveys in Canada during 2014-2015 and county-level data in the U.S. during 2014-2018 (Peek et al. 2024).

Townsend's Big-eared Bat

(*Corynorhinus townsendii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One male specimen was collected from the Comanche NG on 1952-09-28 (Van Scoyoc 2024). Specimens were collected about 2 miles outside of the plan area in 1997 and in 2000 (iDigBio 2024). Based on the 1952 occurrence record, the species is known to occur in the plan area.

Year of Last Known Occurrence: 1952

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: WNS has been detected in Colorado including Otero and Baca Counties. *Pseudogymnoascus destructans*, a fungus that causes white-nose syndrome in bats has been detected in this species, but no diagnostic sign of white-nose syndrome has been documented.
 - b. Habitat: Disturbance to cave surface, crevices and cavities, energy development, forest management and urban contaminants are threats albeit at a slight or low severity level. Disturbances to internal of caves and cave accesses, renewed uranium mining and uninformed closure of abandoned mines are substantial or moderate threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trend data is available in the plan area.
 - b. Habitat: No known changes to the possible roost sites of rock crevices and hollow trees. Crack Cave on Comanche NG is not known for bat utilization.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan areas are at the eastern edge of the population range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Only one male specimen was collected from the Comanche NG on 1952-09-28, other specimens were collected about 2 miles outside of the plan area in 1997 and in 2000 (iDigBio 2024). Ecological conditions: No obvious roosts sites (mines or caves) in the plan area, but some individuals could roost in rock crevices and hollow trees, which are limited in the plan area. Mines outside of the plan area are used for roosts sites and individuals are likely to be foraging on the plan area.

Species Status

T3; S2 in Colorado; SNR in Kansas; listed as Tier 1, "Candidate" in Colorado; listed as "Candidate" in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Corynorhinus townsendii is accepted as valid at both the species and subspecies levels (Integrated Taxonomic Information System (ITIS) 2024d). Other common names for *Corynorhinus townsendii* include; mule-eared bat, western big-eared bat, western long-eared bat, western lump-nosed bat, Pacific Townsend's big-eared bat. Other common names for *Corynorhinus townsendii pallescens* include pale lump-nosed bat.

Species range

Overall species range

Corynorhinus townsendii occurs throughout the West and is distributed from the southern portion of British Columbia south along the Pacific coast to central Mexico and east into the Great Plains, with isolated populations occurring in the central and eastern United States (Piaggio and Sherwin 2005). The species can be found throughout Colorado except on the eastern plains, however the species is present in the CCNG. Distribution is strongly correlated with the availability of caves and cave-like roosting habitat, with population centers occurring in areas dominated by exposed, cavity forming rock and/or historic mining districts (Colorado Parks and Wildlife 2015, Ellison et al. 2003).

Description of how the population in the plan area fits within the overall range

The population in the plan areas are at the eastern edge of the population range (iDigBio 2024) (Figure 30, Figure 31).

Distribution, abundance, and trend in the plan area

Population

No population trend data is available in the plan area. Although only one male specimen was collected from the Comanche NG on 1952-09-28, other specimens were collected about 2 miles outside of the plan area in 1997 and in 2000 (iDigBio 2024). This suggests that the species may be more widely present on the plan area than is documented, and at a minimum probably makes hunting forays onto the plan area even if there are no maternity or hibernacula colonies present.

Nearly one third of bat species in the United States are experiencing population declines (Hammerson et al. 2017), but population trends for most bat species are unknown (Frick et al. 2020). Throughout the species range, colony counts have remained stable or demonstrated slight increases (Bachen et al. 2020), particularly when populations are not subject to human disturbance (Weller et al. 2014). Moreover, recent survey efforts have increased the number of known occupied hibernacula for the species across the species' range, further suggesting that populations are stable (Weller et al. 2018).

Habitat

The specimen collected on 1952-09-28 was likely captured over a stock pond. No plans of operations for locatable mining, abandoned mines or significant caves within the plan area. Some individuals could roost in rock crevices and hollow trees, especially in piñon-juniper habitat (Ellison et al. 2003)). Crack Cave on Comanche NG is not known for bat utilization.

Threats (arising from on or off the plan area)

Population

In April 2013, USFS Region 2 finalized an Environmental Assessment to analyze options for management of caves and abandoned mines in response to the potential for human introduction and spread of the fungal spores associated with WNS (USDA Forest Service 2013b). The management strategy uses an adaptive management approach to preventing WNS on 11 National Forests in USFS Region 2, including the Cimarron and Comanche National Grasslands (USDA Forest Service 2013a). The fungus, *P. destructans*, was detected for the first time in Colorado in July 2022, during sampling of bats in Baca County. White-nose syndrome was detected in Otero County in 2022-2023 (USDI Fish and Wildlife Service (FWS) 2024b). *P. destructans*, a fungus causes white-nose syndrome in bats has been detected from this species, but no diagnostic sign of white-nose syndrome has been documented (USDI Fish and Wildlife Service (FWS) 2024a). The spread of WNS in Colorado is a critical concern for the conservation of several cave-dwelling bat species and warrants integration into the local AML closure program in regard to assessing underground bat population prior to (and potentially after) closure work and in relationship to periodic monitoring in collaboration with other partners.

Habitat

Threats of habitat of this species include loss, modification, and disturbance of roosting habitat resulting from uninformed closure of abandoned mines, recreation and renewed mining at historical sites and loss, modification, and disturbance of foraging habitat resulting from elimination of forest canopy, elimination or alteration of wetland habitat conversion of native shrub and grasslands to urban or agricultural uses (Gruver and Keinath 2006). (Colorado Bat Working Group 2024i) notes that disturbance to cave surface, crevices and cavities, energy development, forest management and urban contaminants are threats albeit at a slight or low severity level. Disturbances to internal of caves and cave accesses, renewed uranium mining and uninformed closure of abandoned mines are substantial or moderate threats.

Ecological conditions

Ecological condition requirements

In Colorado, *C. townsendii* is reported to occur across all four of the state's ecoregions (i.e., Wyoming Basin, Colorado Plateau, Southern Rocky Mountains, Central Shortgrass Prairie) and in at least five community types (i.e., Saxicoline brush, sagebrush, semi-desert scrub, pinyon-juniper woodland, ponderosa pine woodland) (Ellison et al. 2003)cited in (Gruver and Keinath 2006).

Townsend's big-eared bat requires spacious cavern-like structures for roosting during all stages of its life cycle, most notably for maternity and winter roosting. Typically, they use caves and mines (Pierson et al. 1999) cited in (Gruver and Keinath 2006), but has also been reported to utilize buildings, bridges, rock crevices and hollow trees as roost sites (Ellison et al. 2003). Size of roost opening may influence the accessibility of predators to roosts and tends to regulate and maintain temperature and humidity profiles (Gruver and Keinath 2006).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Within the plan area, there are no plans of operations for locatable mining, abandoned mines or significant caves which can be roost site for this species. Some individuals could roost in rock crevices and hollow trees (Ellison et al. 2003). Specimens have been collected from the Skull Canyon Copper

Mine in southwestern Baca County on private land (iDigBio 2024). Individuals probably makes hunting forays onto the plan area even if there are no maternity or hibernacula colonies present.

Critical biological characteristics

Mating generally occurs between October and February in both migratory sites and hibernacula. Maternity colonies form between March and June (based on local climactic factors), with a single pup produced between May and July. Males remain solitary during the maternity period. Winter hibernating colonies are composed of mixed-sexed groups that can range in size from a single individual to colonies of several hundred animals in the western U.S. (Ellison et al. 2003). The species has been documented foraging in edge habitats along streams, adjacent to and within a variety of wooded habitats (see above). It often travels large distances while foraging, including movements of over 10 miles during a single evening. Seasonal movement patterns are not well understood, although there is some indication of local migration, perhaps along an altitudinal gradient (Ellison et al. 2003).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

(Schmidt et al. 2021b) states: "Townsend's big-eared bats feed primarily by capturing insects near, or by gleaned insects from foliage. They feed largely on small moths, although small beetles, leafhoppers, and flies also are taken. Often this species lands to feed, with the result that night roosts used frequently by this species are littered with moth wings. Raccoons and snakes that hunt in caves and, to a lesser extent owls, evidently are the principal predators on Townsend's big-eared bat".

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

(USDA Forest Service 2001b) states "Both the quantity and quality of suitable roosting habitat is declining within R2, largely due to human activity. Since *C. townsendii* roosts on open cave roofs (not in crevices) it is very sensitive to disturbance at roosting sites. Even if no direct interaction with the bats occurs, repeated recreational and scientific visitation of roost caves has been shown to drastically reduce or extirpate *C. townsendii* populations in those caves. Further, the last decade has witnessed extensive closure of underground mineral and coal mines in the western United States with no regard to bat use, effectively eliminating potential roosting habitat".

Maps of Species Range and Known Occurrences in Plan Area

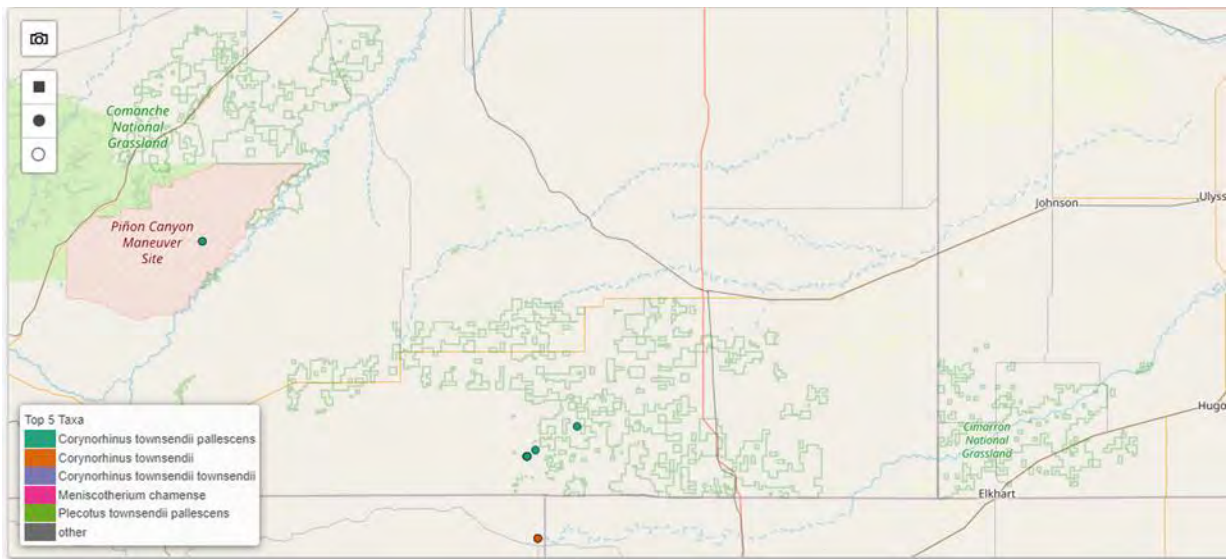


Figure 29. Map of Townsend's big-eared bat occurrences in the Comanche National Grassland (iDigBio 2024).



Figure 30. Distribution of the Townsend's big-eared bat (iDigBio 2024).

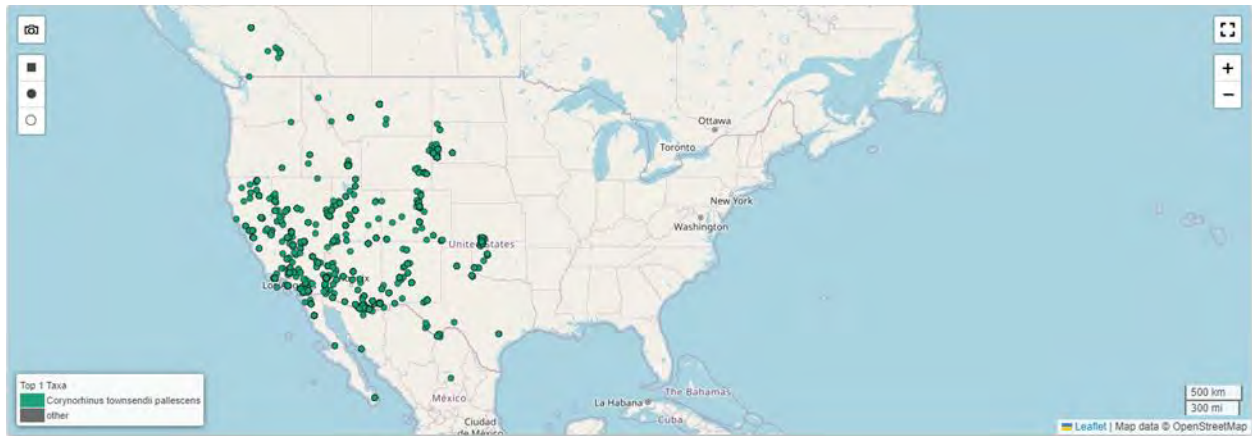


Figure 31. Distribution of the pale lump-nosed bat (iDigBio 2024).

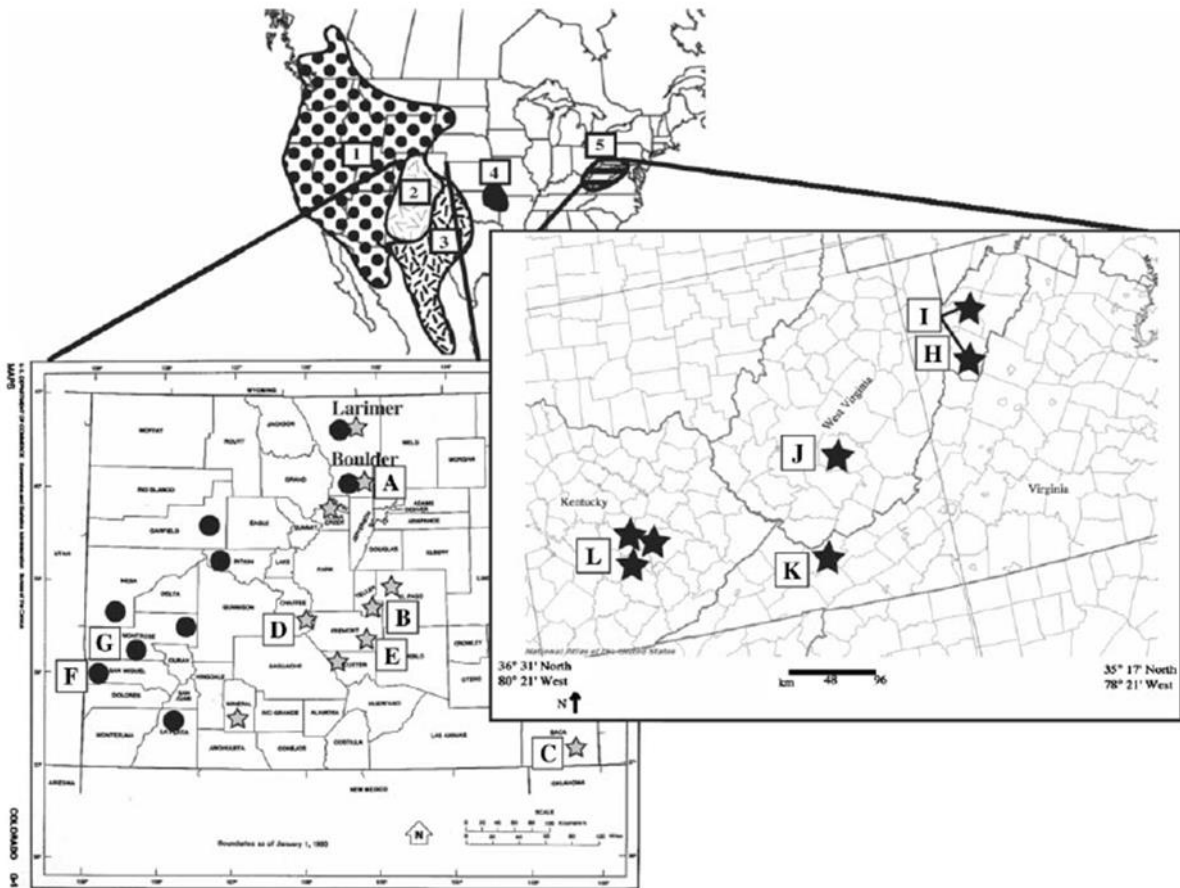


Figure 32. Distribution of *C. townsendii* with ranges of subspecies. Subspecies are labeled as follows: (1) *C. t. townsendii*, (2) *C. t. pallescens*, (3) *C. t. australis*, (4) *C. t. ingens*, (5) *C. t. virginianus* (Piaggio and Perkins 2005). Areas of microgeographic examinations are shown in detail with areas sampled (black circles = *C. t. townsendii*, gray stars = *C. t. pallescens*, and black stars = *C. t. virginianus*) marked and populations labeled. Populations correspond to *C. t. pallescens* (a-e), *C. t. townsendii* (f, g), and *C. t. virginianus* (h-l). Black lines from population I signify that this population is made up of individuals from caves in both Pendleton County and Grant County. Population H is a single cave also found in Pendleton County, West Virginia. However, all individuals in population I are 32.2 km away from population H. (Map from University

of Texas, Austin, Perry Castaneda Library Map Collection on-line <http://www.lib.utexas.edu/maps/>)
(Piaggio et al. 2009).

Western Small-footed Bat

(*Myotis ciliolabrum*)

Species is Native to, and Known to Occur in, National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One female specimen was collected from the Comanche NG on 1977-08-31 (iDigBio 2024, Van Scoyoc 2024).

Year of Last Known Occurrence: 1977

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Overall, no major threats are known. *Pseudogymnoascus destructans*, a fungus causes white-nose syndrome in bats has been detected from this species, but no diagnostic sign of white-nose syndrome has been documented.
 - b. Habitat: Human disturbance of hibernacula, the closure of abandoned mines without adequate surveys, and by recreational caving. Loss or degradation of shrub-steppe for agriculture, grazing, and other uses has reduced the amount of foraging habitat and likely altered prey availability.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends are available in the plan area.
 - b. Habitat: No plans of operations for locatable mining, abandoned mines or significant caves within the plan area. Some individuals could roost in rock crevices and hollow trees as roost sites. Crack Cave on Comanche NG is not known for bat utilization. No changes to the possible roost sites of rock crevices and hollow trees.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is at the eastern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Only one female specimen was collected from the Comanche NG on 1977-08-31. Ecological conditions: No obvious hibernacula sites (mines or caves) in the plan area. Some individuals could night roost in rock crevices and hollow trees, which are limited in the plan area.

Species Status

G5; S4 in Colorado; S2B in Kansas.

Taxonomy

Myotis ciliolabrum is accepted as valid. Other common names include Western Small-footed Myotis and Small-footed Myotis (Integrated Taxonomic Information System (ITIS) 2024h).

Species range

Overall species range

Range includes western North America from southern Saskatchewan, southern Alberta, and southern British Columbia south through the western United States (not including coastal areas north of southern California, east to the Dakotas, Nebraska, Kansas, Oklahoma, and Texas) and into central Mexico. Winter range is the same as the summer range in at least some regions, but winter status is unknown in some areas. Elevational range extends to at least 2,743 meters in Colorado to 3,300 meters in some areas (NatureServe 2024 (NatureServe 2024)).

Description of how the population in the plan area fits within the overall range

In Colorado it occurs statewide in suitable habitat. It seems to be most common in the canyon country of the Western Slope and in rocky areas of northeastern and southeastern Colorado (Colorado Bat Working Group 2024f). Population in the plan area is at the eastern edge of the species range.

Distribution, abundance, and trend in the plan area

Population

One female specimen was collected from the Comanche NG on 1977-08-31 (iDigBio 2024, Van Scoyoc 2024). No population trends in the plan area are available for this species.

Habitat

No plans of operations for locatable mining, abandoned mines or significant caves within the plan area. Some individuals could roost in rock crevices and hollow trees as roost sites.

Threats (arising from on or off the plan area)

Population

Overall, no major threats are known. Populations tend to be widely dispersed in small groups among many sites and so are not vulnerable to significant declines from localized events (NatureServe 2024). *Pseudogymnoascus destructans*, a fungus causes white-nose syndrome in bats has been detected from this species, but no diagnostic sign of white-nose syndrome has been documented (USDI Fish and Wildlife Service (FWS) 2024a).

Habitat

Locally, threats include wanton killing and human disturbance of hibernacula. This species may be affected by the closure of abandoned mines without adequate surveys, and by recreational caving. Loss or degradation of shrub-steppe for agriculture, grazing, and other uses has reduced the amount of foraging habitat and likely altered prey availability (NatureServe 2024).

Ecological conditions

Ecological condition requirements

Despite its wide occurrence, little is known of habitat preferences of this species, although it is known to inhabit rocky areas and is more common at lower elevations. Summer roosts are highly variable and include buildings, mines, under bark on trees, beneath stones and a variety of other sites. The small-footed myotis is a year-round resident of Colorado. It hibernates in caves and mines alone or in small groups. Despite its small size, it is known to hibernate in open tunnels at low temperatures and low humidity, a situation one would assume is stressful. It sometimes hibernates near other bats, including Townsend's big-eared bat, at elevations to 9,500 feet (Colorado Bat Working Group 2024f).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Within the plan area, there are no plans of operations for locatable mining, abandoned mines or significant caves which can be roost site for this species. No obvious hibernacula sites (mines or caves) in the plan area. Some individuals could night roost in rock crevices and hollow trees which are limited in the plan area.

Critical biological characteristics

Little is known about the reproduction of small-footed myotis. Small nursery colonies of 10 to 15 are found occasionally in caves, mines or buildings. One young per year is usual. Young are born in mid-June following a gestation of about two months (Colorado Bat Working Group 2024f).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The western small-footed myotis feeds early in the evening on small flying insects such as flies, small beetles and winged ants. This species is highly maneuverable in flight, often foraging among boulders, along cliffs or shrubs and trees (Colorado Bat Working Group 2024f).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

May be affected by closure of abandoned mines without adequate surveys and by recreational caving. No information known on use and acceptance of bat gates (Ellison et al. 2003).

Maps of Species Range and Known Occurrences in Plan Area

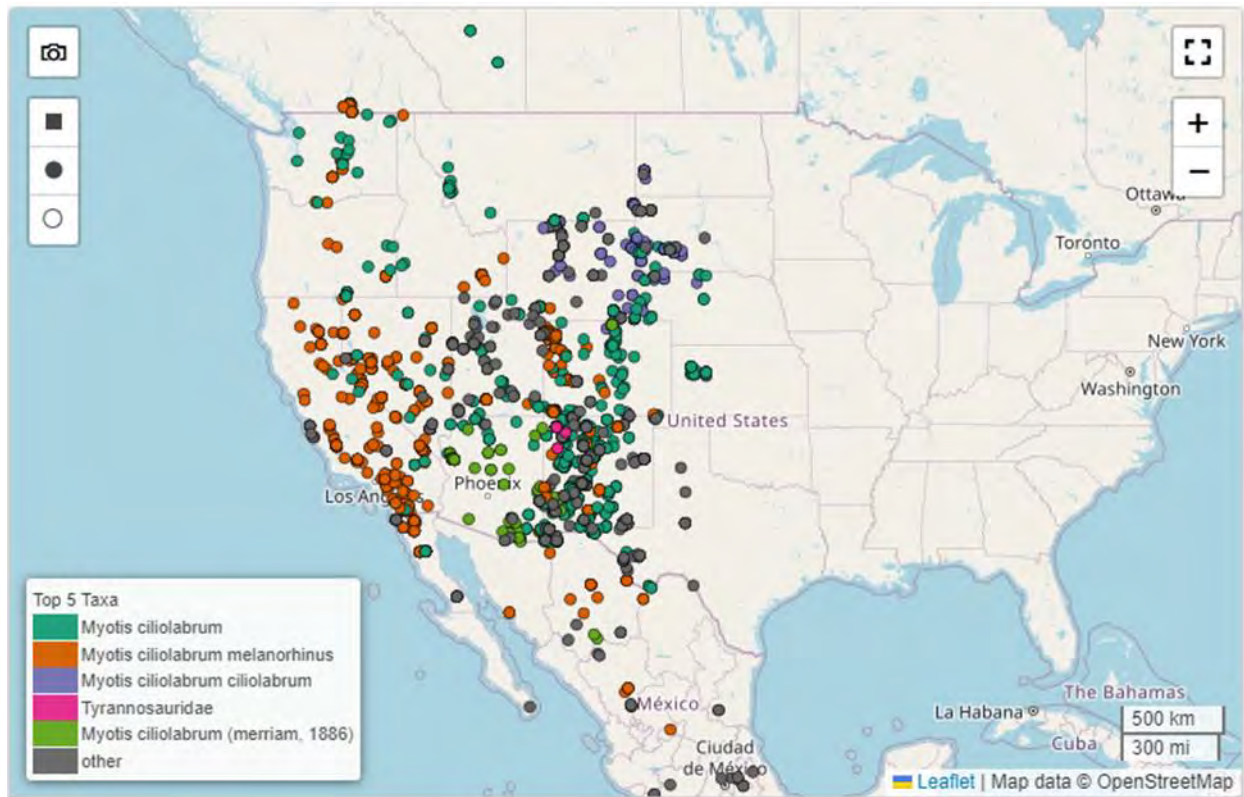


Figure 33. Distribution of western small-footed bat taxa in North and Central America (iDigBio 2024).

White-toothed Woodrat

(*Neotoma leucodon*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One specimen was collected from Purgatoire Canyon, Mesa North of Rourke Ranch in the Comanche NG on 1994-08-16 (iDigBio 2024). The species has not been documented in the Cimarron NG (iDigBio 2024, NatureServe 2024).

Year of Last Known Occurrence: 1994

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Hybridization with *N. micropus* could be a threat to this species.
 - b. Habitat: Threats to pinyon-juniper woodlands include livestock grazing and energy developments. This type of habitat is moderately vulnerable to climate stressors (Colorado Parks and Wildlife 2015).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No known population trend in plan area.
 - b. Habitat: Species uses a variety of habitat types; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: One specimen was collected from Purgatoire Canyon, Mesa North of Rourke Ranch in the Comanche NG on 1994-08-16 (iDigBio 2024).
 - b. Ecological conditions: Juniper woodland and savanna is relatively limited in the plan area. Rocky and cliff areas where this species was observed in the Comanche NG are limited to areas along rivers and their tributaries.

Species Status

G5; S2 in Colorado.

Taxonomy

Genus/Species *Neotoma leucodon* is accepted as valid by all consulted sources (Integrated Taxonomic Information System (ITIS) 2024i). Other common names include Eastern white-throated woodrat (NatureServe 2024)).

Species range

Overall species range

Southeastern Colorado and eastern New Mexico (east of the Rio Grande), south through western Oklahoma, Texas, and eastern Chihuahua (east of the Rio Conchos) to Hidalgo and Michoacan.

Description of how the population in the plan area fits within the overall range

The Comanche NG portion of the plan area is the extreme northern edge of the species' range.

Distribution, abundance, and trend in the plan area

Population

One specimen was collected from Purgatoire Canyon, Mesa North of Rourke Ranch in the Comanche NG on 1994-08-16 (iDigBio 2024). No population trend information in the plan area are available for this species.

Habitat

One specimen was collected from rocks and cliffs in juniper woodland in the plan area (iDigBio 2024)). *N. leucodon* is known from a variety of habitat types including scrublands, rocky areas, cactus stands (especially cholla and prickly pear), as well as pinyon-juniper forests (IUCN 2024). In southeast Colorado juniper woodlands have expanded (CPW 2015), particularly in areas of in rocky, shallow soil types that have little herbaceous cover, but contraction has also occurred in deeper and more finely textured soils (Amme et al. 2020) (see Appendix for more information).

Threats (arising from on or off the plan area)

Population

Hybridizes with *N. micropus* in southeastern Colorado, western Oklahoma, northern Texas, Chihuahua, and possibly Coahuila has been known to occur (NatureServe 2024).

Habitat

Threats to Pinyon-Juniper woodlands include livestock grazing and energy developments. This type of habitat is moderately vulnerable to climate stressors (Colorado Parks and Wildlife 2015).

Ecological conditions

Ecological condition requirements

N. leucodon is known from a variety of habitat types including scrublands, rocky areas, cactus stands (especially cholla and prickly pear), as well as pinyon-juniper forests (IUCN 2024). Well adapted to these arid regions, the White-toothed Woodrat is able to obtain much of its food and water needs from cacti. Like other woodrats, *N. leucodon* often builds elaborate dens of sticks and vegetation, which offer protection from predators and extreme temperatures (IUCN 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Pinyon-juniper habitat is relatively limited in the plan area (see Appendix). Rocky and cliff areas where this species was observed in the Comanche National Grassland are limited to areas along rivers and their tributaries. These habitats are restricted within the plan area.

Critical biological characteristics

This species previously was considered part of *Neotoma albigula*, but a phylogenetic analysis of mtDNA sequences by (Edwards et al. 2001) show that the populations west of the Rio Grande and north of the Rio Conchos are distinct from those to the east and south. The western populations, in fact, form a sister clade to *N. floridana*, and the eastern populations are a sister species to *N. micropus*. The western populations retain the name *N. albigula*; the eastern and southern populations became *N. leucodon*. (Edwards et al. 2001). (Baker et al. 2003) recognized *albigula* and *leucodon* as distinct species.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Hybridizes with *N. micropus* in southeastern Colorado, western Oklahoma, northern Texas, Chihuahua, and possibly Coahuila (NatureServe 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information suggests that this species influences ecosystem structure or function.

Maps of Species Range and Known Occurrences in Plan Area

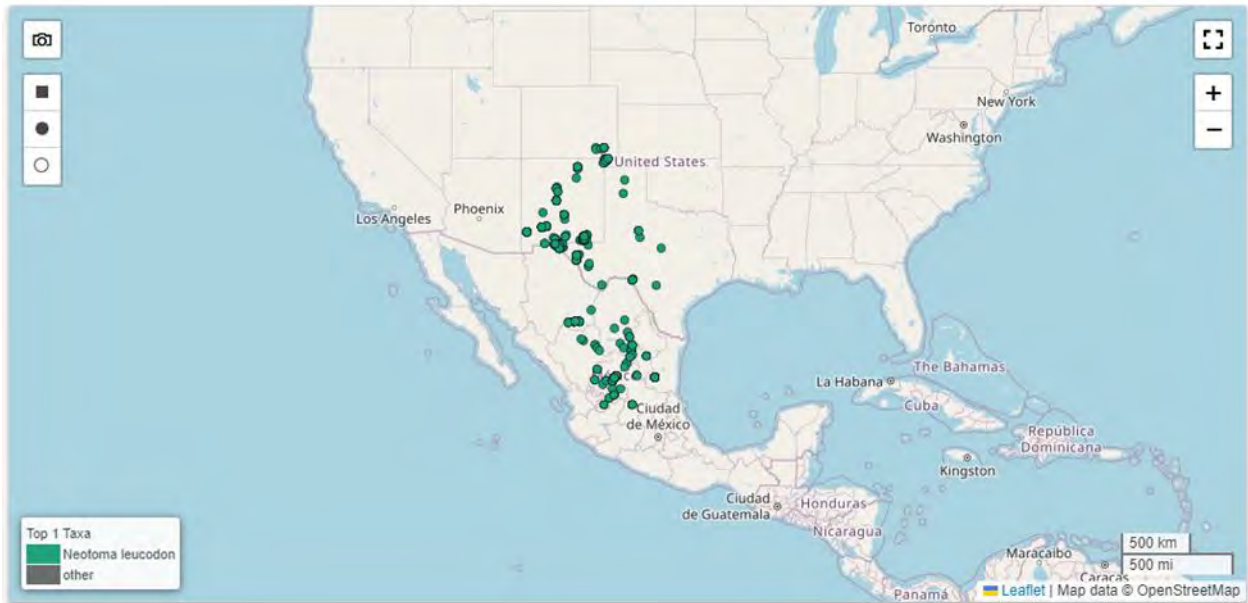


Figure 34. Distribution of white-toothed woodrat in North and Central America (iDigBio 2024).

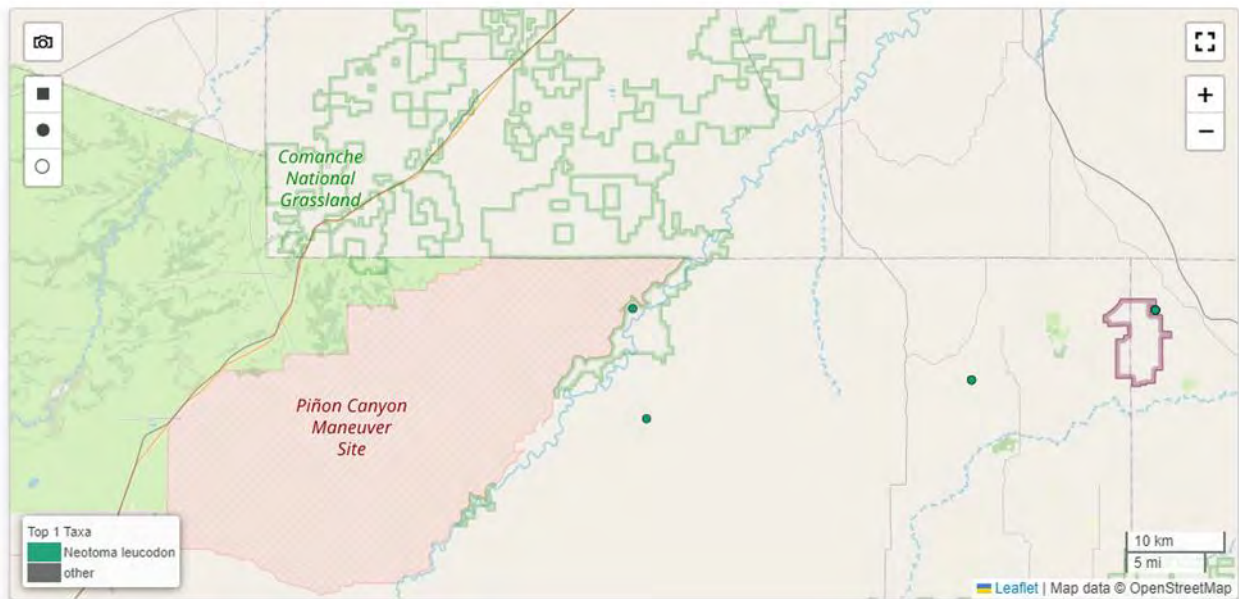


Figure 35. Occurrence of white-toothed woodrat in the plan area and vicinity (iDigBio 2024).

Consolidated Literature Cited

- Allen, S.H., Whitaker, J., and Dowd Stukel, E. 1995. Report of the Swift Fox Conservation Team. Bismarck, ND: North Dakota Game and Fish Department. 165 p.
<https://cpw.catalog.aspeninfo.com/Files/1199/ViewPDF>
- American Society of Mammalogists. 2024. Mammalian Species (online data) American Society of Mammalogists. Date Published: 2024. Date Accessed: 2024. Available at:
<https://mammalsociety.org/publications/mammalian-species>
- Amme, N., Pague, C.A., and Redmond, M.D. 2020. Change in piñon-juniper woodland cover since Euro-American settlement: Expansion versus contraction associated with soil properties. *Rangeland ecology & management* 73(6): 847-855. <https://doi.org/10.1016/j.rama.2020.07.001>
- Armstrong, D., Adams, R., and Freeman, J. 1994. Distribution and Ecology of Bats of Colorado. *National History Inventory of Colorado* 15: 1-83.
https://www.researchgate.net/publication/238769879_Distribution_and_ecology_of_bats_of_Colorado#full-text
- Arnett, E.B., Brown, W.K., Erickson, W.P., Fiedler, J.K., Hamilton, B.L., Henry, T.H., Jain, A., Johnson, G.D., Kerns, J., Koford, R.R., Nicholson, C.P., O'Connell, T.J., Piorkowski, M.D., and Tankersley, R.D. 2008. Patterns of bat fatalities at wind energy facilities in North America. *The Journal of Wildlife Management* 72(1): 61-78. <https://doi.org/10.2193/2007-221>
- Arnett, E.B. and Hayes, J.P. 2009. Use of conifer snags as roosts by female bats in western Oregon. *Journal of Wildlife Management* 73(2): 214-224. <https://doi.org/10.2193/2007-532>
- Augustine, D., Mason, G., and Chappell, A. 2006. 2006 annual report: Summary of black-tailed prairie dog distribution on the cimarron and comanche national grasslands. Date: October, 2006. Washington, DC: USDA Forest Service. 5 p.
- Augustine, D.J., Matchett, M.R., Toombs, T.P., Cully Jr, J.F., Johnson, T.L., and Sidle, J.G. 2008. Spatiotemporal dynamics of black-tailed prairie dog colonies affected by plague. *Landscape ecology* 23(3): 255-267. <https://pubs.usgs.gov/publication/70031943>
- Bachen, D., McEwan, A.L., Skone, B., Harris, H., and Hanauska-Brown, L. 2020. Hibernaculum potential of rock outcrops and associated features in eastern Montana. Helena, MT: Montana Natural Heritage Program. 44 p.
- Bachen, D.A., McEwan, A.L., Burkholder, B.O., Blum, S.A., and Maxell, B.A. 2019. Features used as Roosts by Bats in Montana. Helena, MT: Montana Natural Heritage Program. 37 p.
http://mntnhp.org/Reports/ZOO_Bat_Roost_Features_Bachen_2019.pdf
- Baker, R.J., Bradley, L.C., Bradley, R.D., Dragoo, J.W., Engstrom, M.D., Hoffmann, R.S., Jones, C.A., Reid, F., Rice, D.W., and Jones, C. 2003. Revised checklist of North American mammals north of Mexico, 2003. Revised checklist of North American mammals north of Mexico, 2003 229: 1-23.
<https://www.biodiversitylibrary.org/item/263397#page/1/mode/1up>
- Beecham, J.J., Collins, C.P., and Reynolds, T.D. 2007. Rocky Mountain bighorn sheep (*Ovis canadensis*): A technical conservation assessment. Rigby, ID: USDA Forest Service, Rocky Mountain Region, Specied Conservation Project. 1-106 pp.
<http://www.fs.fed.us/r2/projects/scp/assessments/rockymountainbighornsheep.pdf>
- Bergeson, S.M., Carter, T.C., and Whitby, M.D. 2015. Adaptive roosting gives little brown bats an advantage over endangered Indiana bats. *The American Midland Naturalist* 174(2): 321-330.
<https://doi.org/10.1674/0003-0031-174.2.321>
- Bleich, V.C., Bowyer, R.T., and Wehausen, J.D. 1997. Sexual segregation in mountain sheep: Resources or predation? *Wildlife Monographs* 134: 3-50. <http://www.jstor.org/stable/3830743>
- Boulder County Parks and Open Space. 2012. Prairie dog habitat element of the grassland and shrubland management policy. Longmont, CO: Boulder County Parks and Open Space. 86 p.

- Brashear, W.A., Dowler, R.C., and Ceballos, G. 2010. Climbing as an escape behavior in the American hog-nosed skunk, *Conepatus leuconotus*. *Western North American naturalist* 70(2): 258-260, 3. <https://doi.org/10.3398/064.070.0217>
- Cheng, T.L., Reichard, J.D., Coleman, J.T.H., Weller, T.J., Thogmartin, W.E., Reichert, B.E., Bennett, A.B., Broders, H.G., Campbell, J., Etchison, K., Feller, D.J., Geboy, R., Hemberger, T., Herzog, C., Hicks, A.C., Houghton, S., Humber, J., Kath, J.A., King, R.A., Loeb, S.C., Massé, A., Morris, K.M., Niederriter, H., Nordquist, G., Perry, R.W., Reynolds, R.J., Sasse, D.B., Scafani, M.R., Stark, R.C., Stihler, C.W., Thomas, S.C., Turner, G.G., Webb, S., Westrich, B.J., and Frick, W.F. 2021. The scope and severity of white-nose syndrome on hibernating bats in North America. *Conservation biology* 35(5): 1586-1597. <https://doi.org/10.1111/cobi.13739>
- Colorado Bat Working Group. 2024a. Big Free-Tailed Bat (*Nyctinomops macrotis*) (online data) Colorado Bat Working Group. Date Published: 2024. Date Accessed: 2024. Available at: <https://cnhp.colostate.edu/cbwg/bat-list/speciesprofile/?speciesID=18>
- Colorado Bat Working Group. 2024b. Hoary Bat (*Lasiurus cinereus*) (online data) Species threat matrix. Fort Collins, CO: Colorado Bat Working Group. Date Published: 2024. Date Accessed: 2024. Available at: <https://cnhp.colostate.edu/cbwg/batmatrix/search/speciesmatrix/?speciesID=3>
- Colorado Bat Working Group. 2024c. Hoary Bat (*Lasiurus cinereus*). Species profile (online data). Fort Collins, CO: Colorado Bat Working Group. Date Published: 2024. Date Accessed: 2024. Available at: <https://cnhp.colostate.edu/cbwg/bat-list/speciesprofile/?speciesID=3>
- Colorado Bat Working Group. 2024d. Little brown bat (*Myotis lucifugus*). Species Profile. Colorado State University. <https://cnhp.colostate.edu/cbwg/bat-list/speciesprofile/?speciesID=6>
- Colorado Bat Working Group. 2024e. Little brown bat (*Myotis lucifugus*). Species threat matrix. Colorado State University. <https://cnhp.colostate.edu/cbwg/batmatrix/search/speciesmatrix/?speciesID=6>
- Colorado Bat Working Group. 2024f. *Myotis ciliolabrum*, western small-footed myotis (website). Colorado Bat Working Group. Date Accessed: August 2, 2024. <https://cnhp.colostate.edu/cbwg/bat-list/speciesprofile/?speciesID=9>
- Colorado Bat Working Group. 2024g. Pallid bat, *Antrozous pallidus* (website). Colorado Bat Working Group, Last Modified: 2024. Date Accessed: August 2, 2024. <https://cnhp.colostate.edu/cbwg/batmatrix/search/speciesmatrix/?speciesID=17>
- Colorado Bat Working Group. 2024h. Red Bat (*Lasiurus borealis*) (online data). Fort Collins, CO: Colorado Bat Working Group. Date Published: 2024. Date Accessed: 2024. Available at: <https://cnhp.colostate.edu/cbwg/bat-list/speciesprofile/?speciesID=10>
- Colorado Bat Working Group. 2024i. Townsend's Big-Eared Bat (*Corynorhinus townsendii*) (online data) Species threat matrix. Fort Collins, CO: Colorado Bat Working Group. Date Published: 2024. Date Accessed: 2024. Available at: <https://cnhp.colostate.edu/cbwg/batmatrix/search/speciesmatrix/?speciesID=1>
- Colorado Parks and Wildlife. 2015. State Wildlife Action Plan: A Strategy for Conserving Wildlife in Colorado. Date: 2015. Colorado Springs, CO. 865 p.
- Colorado Parks and Wildlife. 2019. Colorado Rocky Mountain Bighorn Sheep 2019 posthunt population estimates. (Draft) Dated: December 27, 2019. 2 p.
- Colorado Parks and Wildlife. 2020. Colorado Rocky Mountain Bighorn Sheep 2020 posthunt population estimates. (Draft) Dated: December 9, 2020. 2 p.
- Colorado Parks and Wildlife. 2023. Colorado Rocky Mountain bighorn sheep 2023 post hunt population estimates (Version Final) Colorado Parks and Wildlife. Originally Released: January 10, 2024.
- Commission for Environmental Cooperation. 2005. North American Conservation Action Plan: Black tailed prairie dog (*Cynomys ludovicianus*). Montreal, QC: Commission for Environmental Cooperation. 55 p. https://www.govinfo.gov/content/pkg/GOVPUB-Y3_EN8-PURL-LPS106504/pdf/GOVPUB-Y3_EN8-PURL-LPS106504.pdf
- Conard, J., Gipson, P., and Peek, M. 2006. Historical and current status of elk in Kansas. Pages 307-312. *In* Springer, J.T. and Springer, E.C., eds. *Prairie invaders: Proceedings of the 20th North*

- American prairie conference; July 23-26, 2006; Kearney, NE. Kearney, NE: University of Nebraska-Kearney. <https://digitalcommons.unl.edu/usgsstaffpub/194>
- Cook, J.G. 1990. Habitat, nutrition, and population ecology of two transplanted bighorn sheep populations in southcentral Wyoming. Ph.D. in Zoology and Physiology Dissertation, University of Wyoming, Laramie, WY. 24 p. <https://www.proquest.com/openview/3f44062ab2eccc2579aebd87d9c59f29/1?pq-origsite=gscholar&cbl=18750&diss=y>
- Corbett, R.J.M., Chambers, C.L., and Herder, M.J. 2008. Roosts and activity areas of *Nyctinomops macrotis* in Northern Arizona. *Acta chiropterologica* 10: 323-329. <https://doi.org/10.3161/150811008X414890>
- Cully, J.F., Jr., Carter, L.G., and Gage, K.L. 2000. New records of sylvatic plague in Kansas. *Journal of wildlife diseases* 36(2): 389-392. <https://pubs.usgs.gov/publication/70022860>
- Dixon, M.D. 2011. Population genetic structure and natal philopatry in the widespread North American bat *Myotis lucifugus*. *Journal of Mammalogy* 92(6): 1343-1351. <https://doi.org/10.1644/10-mamm-a-426.1>
- Dowd Stukel, E. 2011. Conservation Assessment and Conservation Strategy for Swift Fox in the United States – 2011 Update. Date: 2011. Pierre, SD: South Dakota Department of Game, Fish and Parks. 98 p.
- Dowd Stukel, E. 2017. Swift Fox Conservation Team: Report for 2015–2016. Date: July, 2017. Wildlife Division Report No. 2017-04. Pierre, SD: Department of Game, Fish and Parks. 86 p.
- Dragoo, J.W., Honeycutt, R.L., and Schmidly, D.J. 2003. Taxonomic Status of White-Backed Hog-Nosed Skunks, Genus *Conepatus* (Carnivora: Mephitidae). *Journal of Mammalogy* 84(1): 159-176. <https://academic.oup.com/jmammal/article/84/1/159/2372970?searchresult=1>
- Dragoo, J.W. and Sheffield, S.R. 2009. *Conepatus leuconotus* (Carnivora: Mephitidae). *Mammalian Species*(827): 1-8. <https://academic.oup.com/mspecies/article/doi/10.1644/827.1/2600869>
- Eccles, T.R. and Shackleton, D.M. 1986. Correlates and consequences of social status in female bighorn sheep. *Animal behaviour* 34(5): 1392-1401. [https://doi.org/10.1016/S0003-3472\(86\)80210-X](https://doi.org/10.1016/S0003-3472(86)80210-X)
- Edwards, C.W., Fulhorst, C.F., and Bradley, R.D. 2001. Molecular phylogenetics of the *Neotoma albigula* species group: Further evidence of a paraphyletic assemblage. *Journal of mammalogy* 82(2): 267-279. [https://doi.org/10.1644/1545-1542\(2001\)082<0267:MPOTNA>2.0.CO;2](https://doi.org/10.1644/1545-1542(2001)082<0267:MPOTNA>2.0.CO;2)
- Egoscue, H.J. 1979. *Vulpes velox*. *Mammalian species*(122): 1-5. <https://doi.org/10.2307/3503814>
- Ellison, L.E., Wunder, M.B., Jones, C.A., Mosch, C., Navo, K.W., Peckham, K., Burghardt, J.E., Annear, J., West, R., Siemers, J., Adams, R.A., and Brekke, E. 2003. Colorado bat conservation plan. Fort Collins, CO: Colorado Committee of the Western Bat Working Group. 107 p. <http://www.wbwg.org/colorado/colorado.htm>
- Fabianek, F., Simard, M.A., and Desrochers, A. 2015. Exploring Regional Variation in Roost Selection by Bats: Evidence from a Meta-Analysis. *PLoS One* 10(9): e0139126.
- Fenton, M.B. and Barclay, M.R. 1980. *Myotis lucifugus*. *Mammalian Species*(142): 1-8.
- Francis, C.M. and Simmons, N.B., on behalf of the Global Bat Taxonomy Working Group of the IUCN SSC Bat Specialist Group. 2022. On the taxonomy of *Myotis lucifugus*. Switzerland: Zenodo. 4 p. <https://doi.org/10.5281/zenodo.7338575>
- Frick, W.F., Kingston, T., and Flanders, J. 2020. A review of the major threats and challenges to global bat conservation. *Annals Of The New York Academy Of Sciences* 1469(1): 5-25.
- Fuhlendorf, S.D. and Engle, D.M. 2001. Restoring heterogeneity on rangelands: Ecosystem management based on evolutionary grazing patterns. *BioScience* 51(8): 625-632. [https://doi.org/10.1641/0006-3568\(2001\)051\[0625:RHOREM\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2001)051[0625:RHOREM]2.0.CO;2)
- FWS, U.S. Fish and Wildlife Service,. 2004. Endangered and threatened wildlife and plants; finding for the resubmitted petition to list the blacktailed prairie dog as threatened. In 50 CFR Part 17. Report Number. 51217-51226 pp. <https://www.govinfo.gov/content/pkg/FR-2004-08-18/pdf/FR-2004-08-18.pdf>

- Geist, V. 1971. Mountain sheep. A study in behavior and evolution. edited by Schaller, G.B. Chicago, IL: University of Chicago Press.
- George, J.L., Kahn, R., Miller, M.W., and Watkins, B. 2009. Colorado bighorn sheep management plan: 2009-2019. Spec. Rep. No. 81. Denver, CO: Colorado Division of Wildlife. 88 p.
https://bighorndiseaseinfo.altervista.org/Bighorn_Disease_Documents/Colorado_Bighorn_Sheep_Management_Plan_CDOW_2009.pdf
- Gruver, J.C. and Keinath, D.A. 2006. Townsend's big-eared bat (*Corynorhinus townsendii*): A technical conservation assessment. Edited by U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Date: October 25, 2006. 93 p.
<https://www.fs.fed.us/r2/projects/scp/assessments/townsendsbigearedbat.pdf>
- Hammerson, G.A., Kling, M., Harkness, M., Ormes, M., and Young, B.E. 2017. Strong geographic and temporal patterns in conservation status of North American bats. Biological Conservation 212: 144-152. <https://doi.org/10.1016/j.biocon.2017.05.025>
- Harvey, M.J. 1976. Home range, movements, and diel activity of the eastern mole, *Scalopus aquaticus*. The American midland naturalist 95(2): 436-445. <http://www.jstor.org/stable/2424406>
- Hazlett, D.L. 2004. Vascular Plant Species of the Comanche National Grassland in Southeastern Colorado. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 36 p.
<https://doi.org/10.2737/rmrs-gtr-130>
- Hogg, J.T. and Forbes, S.H. 1997. Mating in bighorn sheep: Frequent male reproduction via a high-risk "unconventional" tactic. Behavioral ecology and sociobiology 41(1): 33-48.
<https://doi.org/10.1007/s002650050361>
- iDigBio. 2024. iDigBio (website). Integrated Digitized Biocollections (iDigBio), the National Resource for Advancing Digitization of Biodiversity Collections (ADBC) funded by the National Science Foundation, Last Modified: 2024 <https://www.idigbio.org>
- Integrated Taxonomic Information System (ITIS). 2024a. *Antrozous pallidus*, (LeConte, 1856), Taxonomic serial number 180006 (website). (Virtual Dataset). United States Department of Interior, Geological Survey (USGS), Last Modified: 2024. Date Accessed: August 2, 2024.
https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=180006#null
- Integrated Taxonomic Information System (ITIS). 2024b. Big Free-Tailed Bat (*Nyctinomops macrotis*) (online data) Gray, 1840, 180086. Reston, VA: United States Department of Interior, Geological Survey (USGS). Date Published: 2024. Date Accessed: 2024. Available at:
<https://www.itis.gov/servlet/SingleRpt/SingleRpt>
- Integrated Taxonomic Information System (ITIS). 2024c. *Conepatus leuconotus figginsi*, F. W. Miller, 2024, 727369 (online data) Report. Virtual Dataset: United States Department of Interior, Geological Survey (USGS). Date Published: April 2, 2024. Date Accessed: April 2, 2024. Available at:
https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=933396#null
- Integrated Taxonomic Information System (ITIS). 2024d. *Corynorhinus townsendii pallescens*, Miller, 1897 (online data) Taxonomic Serial Number 203458. Virtual Dataset: United States Department of Interior, Geological Survey (USGS). Date Published: April 18, 2024. Date Accessed: April 18, 2024. Available at: <https://www.itis.gov/servlet/SingleRpt/SingleRpt#null>
- Integrated Taxonomic Information System (ITIS). 2024e. *Cynomys ludovicianus*, (Ord, 1815), Taxonomic serial number 180186 (website). (Virtual Dataset). United States Department of Interior, Geological Survey (USGS), Last Modified: 2024. Date Accessed: August 21, 2024.
https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=180186#null
- Integrated Taxonomic Information System (ITIS). 2024f. *Lasiurus borealis*, (Müller, 1776) (online data) Taxonomic Serial Number 180016. Virtual Dataset: United States Department of Interior, Geological Survey (USGS). Date Published: May 16, 2024. Date Accessed: May 16, 2024. Available at:
https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=180016#null

- Integrated Taxonomic Information System (ITIS). 2024g. *Lasiurus cinereus*, (Palisot de Beauvois, 1796) (online data) Taxonomic Serial Number 180017. Virtual Dataset: United States Department of Interior, Geological Survey (USGS). Date Published: April 5, 2024. Date Accessed: April 5, 2024. Available at: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=180017#null
- Integrated Taxonomic Information System (ITIS). 2024h. *Myotis ciliolabrum*, (Merriam, 1886), Taxonomic serial number, 179994 (website). (Virtual Dataset). United States Department of Interior, Geological Survey (USGS), Last Modified: 2024. Date Accessed: August 2, 2024. https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=179994
- Integrated Taxonomic Information System (ITIS). 2024i. *Neotoma leucodon*, Merriam, 1824, 970628 (online data) Report. Virtual Dataset: United States Department of Interior, Geological Survey. Date Published: April 2, 2024. Date Accessed: April 2, 2024. Available at: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=970628#null
- Integrated Taxonomic Information System (ITIS). 2024j. *Topos (Scalopus aquaticus)* (online data) Linnaeus, 1758, 179979. Reston, VA: United States Department of Interior, Geological Survey (USGS). Date Published: 2024. Date Accessed: 2024. Available at: <https://www.itis.gov/servlet/SingleRpt/SingleRpt>
- Integrated Taxonomic Information System (ITIS). 2024k. *Vulpes velox*, (Say, 1823) (online data) Taxonomic Serial Number 180607. Virtual Dataset: United States Department of Interior, Geological Survey (USGS). Date Published: June 20, 2024. Date Accessed: June 20, 2024. Available at: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=180607#null
- ITIS, Integrated Taxonomic Information System. 2024. *Myotis lucifugus* (Virtual Dataset).
- IUCN, International Union for Conservation of Nature. 2024. The IUCN red list of threatened species (website). International Union for Conservation of Nature (IUCN), Last Modified: 2024. Date Accessed: October 31, 2024. <https://www.iucnredlist.org/>
- Johnson, J.S., Treanor, J.J., Slusher, A.C., and Lacki, M.J. 2019. Buildings provide vital habitat for little brown myotis (*Myotis lucifugus*) in a high-elevation landscape. *Ecosphere* 10(11) <https://doi.org/10.1002/ecs2.2925>
- Jung, T.S. 2020. Bats in the changing boreal forest: response to a megafire by endangered little brown bats (*Myotis lucifugus*). *Écoscience* 27(1): 59-70. <https://doi.org/10.1080/11956860.2019.1687084>
- Jung, T.S., Blejwas, K.M., Lausen, C.L., Wilson, J.M., and Olson, L.E. 2014. Concluding Remarks: What Do We Need To Know About Bats in Northwestern North America? *Northwestern Naturalist* 95(3): 318-330. <https://doi.org/10.1898/95-3.1>
- Kahn, R., Fox, L., Horner, P., Giddings, B., and Roy, C. 1997. Conservation Assessment and Conservation Strategy for Swift Fox in the United States. Date: September, 1997. Grand Junction, CO: Colorado Parks And Wildlife. 34 p.
- Kalcounis-Rüppell, M.C., Psyllakis, J.M., and Brigham, R.M. 2005. Tree roost selection by bats: an empirical synthesis using meta-analysis. *Wildlife Society Bulletin* 33(3): 1123-1132. [https://doi.org/10.2193/0091-7648\(2005\)33\[1123:Trsbba\]2.0.Co;2](https://doi.org/10.2193/0091-7648(2005)33[1123:Trsbba]2.0.Co;2)
- Kohl, M.T., Cleveland, S.M., Ellis, C.C., Halseth, A.N., Merkle, J.A., Proffitt, K.M., Rowland, M.M., and Wisdom, M.J. 2023. Elk and rangelands. Chapter 20. *In* McNew, L.B., Dahlgren, D.K. and Beck, J.L., eds., *Rangeland Wildlife Ecology and Conservation*. Cham, CH: Springer International Publishing. 703-733 pp. https://doi.org/10.1007/978-3-031-34037-6_20
- Krausman, P.R. and Bowyer, R. 2003. Mountain sheep (*Ovis canadensis* and *O. dalli*). Chapter 51. *In* *Wild mammals of North America: Biology, management, and conservation*. Baltimore, MD: The Johns Hopkins University Press. 1095-1115 pp. https://www.researchgate.net/publication/263579768_Mountain_sheep_Ovis_canadensis_and_O_dalli

- Krausman, P.R. and Leopold, B.D. 1986. The Importance of Small Populations of Desert Bighorn Sheep. In TRANSACTIONS of the Fifty-First North American Wildlife and Natural Resources Conference. Reno, Nevada. Wildlife Management Institute. 52-61 pp.
- Kunz, T.H. and Reichard, J.D. 2011. Status review of the little brown myotis (*Myotis lucifugus*) and determination that immediate listing under the Endangered Species Act is scientifically and legally warranted. Boston, MA: Boston University's Center for Ecology and Conservation Biology. 30 p.
- Lacki, M. 2018. Restoration of legacy trees as roosting habitat for myotis bats in eastern North American forests. *Diversity* 10(29): 1-17. <https://doi.org/10.3390/d10020029>
- McCullough, S.A., Cooperrider, A.Y., and Bailey, J.A. 1980. Impact of cattle grazing on bighorn sheep habitat at trickle mountain, Colorado. 18 p.
- McKinney, T., Smith, T.W., and Hanna, J.D. 2001. Precipitation and desert bighorn sheep in the Mazatzal Mountains, Arizona. *The Southwestern naturalist* 46(3): 345-353. <https://doi.org/10.2307/3672431>
- Mercure, A., Ralls, K., Koepfli, K.P., and Wayne, R.K. 1993. Genetic Subdivisions Among Small Canids: Mitochondrial DNA Differentiation of Swift, Kit, and Arctic Foxes. *Evolution* 47(5): 1313-1328. <https://doi.org/10.1111/j.1558-5646.1993.tb02157.x>
- Morales, A.E. and Carstens, B.C. 2018. Evidence that *Myotis lucifugus* "subspecies" are five nonsister species, despite gene flow. *Systematic biology* 67(5): 756-769. <https://doi.org/10.1093/sysbio/syy010>
- NatureServe. 2024. NatureServe Explorer (online data) NatureServe. Date Published: April 17, 2024. Date Accessed: April 17, 2024. Available at: <https://explorer.natureserve.org>
- Neubaum, D.J. and Aagaard, K. 2022. Use of Predictive Distribution Models to Describe Habitat Selection by Bats in Colorado, USA. *The Journal of Wildlife Management* 86(2): 20. <https://doi.org/10.1002/jwmg.22178>
- Norquay, K.J.O., Martinez-Nuñez, F., Dubois, J.E., Monson, K.M., and Willis, C.K.R. 2013. Long-distance movements of little brown bats (*Myotis lucifugus*). *Journal of Mammalogy* 94(2): 506-515. <https://doi.org/10.1644/12-mamm-a-065.1>
- Olson, C.R. and Barclay, R.M.R. 2013. Concurrent changes in group size and roost use by reproductive female little brown bats (*Myotis lucifugus*). *Canadian Journal of Zoology* 91(3): 149-155. <https://doi.org/10.1139/cjz-2012-0267>
- Peek, M. 2023. 2022-23 Swift Fox Pelt Tagging Report. Edited by Kansas Department of Wildlife and Parks. Date: July, 2023. Grant W-39-R-29. Pratt, KS: Kansas Department of Wildlife and Parks. 3 p. <https://ksoutdoors.com/Services/Research-Publications/Wildlife-Research-Surveys/Furbearers/2022-23-Swift-Fox-Pelt-Tagging-Report>
- Peek, M.S., Dowd Stukel, E., and Schwalm, D.L. 2024. Chapter 34: Swift Fox. Chapter 34. In Hiller, T.L., Applegate, R.D., Bluett, R.D., Frey, S.N., Gese, E.M. and Organ, J.F., eds., *Wild Furbearer Management and Conservation in North America*. Helena, MT: Wildlife Ecology Institute. 34 p. <https://doi.org/10.59438/SRWF4476>
- Piaggio, A.J. and Sherwin, R. 2005. Western bat working group species account (*Corynorhinus townsendii*) Townsend's big-eared bat (website). Western Bat Working Group <http://wbwg.org/western-bat-species/>
- Pierson, E.D., Wackenhut, M.C., Altenbach, J.S., Bradley, P., Call, P., Genter, D.L., Harris, C.E., Keller, B.L., Lengus, B., Lewis, L., Luce, B., Navo, K.W., Perkins, J.M., Smith, S., and Welch, L. 1999. Species conservation assessment and conservation strategy for Townsend's big-eared bat. Boise, Idaho: Idaho Department of Fish and Game, Idaho Conservation Effort. 73 p. https://cnhp.colostate.edu/wp-content/uploads/cbwg/pdfs/Townsend_Big-Eared_Bat.pdf
- Risenhoover, K.L. and Bailey, J.A. 1985. Foraging ecology of mountain sheep: implications for habitat management. *Journal of Wildlife Management* 49(3): 797-804.

- Rominger, E.M., Dale, A.R., and Bailey, J.A. 1988. Shrubs in the summer diet of Rocky Mountain bighorn sheep. *The journal of wildlife management* 52(1): 47-50.
<https://doi.org/10.2307/3801056>
- Saltus, C.L. and Britzke, E.R. 2022. Literature review: macrohabitat metrics to identify presence of chiroptera on the landscape in the United States. Vicksburg, MS: U.S. Army Corps of Engineers, Research and Development Center, Ecosystem Management and Restoration Research Program. 38 p.
- Schmidt, C.J., Peek, G.A., Kaufman, D.W., Kaufman, E.J., Finck, L., Patrick, A., and Hope, R. 2024. Kansas Mammal Atlas: An On-line Reference (website). (Electronic dataset). Sternberg Museum of Natural History, Fort Hays State University. Date Accessed: 20241112.
<https://webapps.fhsu.edu/ksmammal>
- Schmidt, C.J., Peek, M., Kaufman, G.A., Kaufman, D.W., Finck, E.J., Patrick, L., Hope, A., and Timm, R. 2021a. Kansas Mammal Atlas: Swift Fox, *Vulpes velox* (online data) (Say, 1923). Hays, KS: Sternberg Museum of Natural History, Fort Hays State University. Date Published: November 11, 2019. Date Accessed: November 11, 2019. Available at:
<https://webapps.fhsu.edu/ksmammal/account.aspx?o=31&t=151>
- Schmidt, C.J., Peek, M., Kaufman, G.A., Kaufman, D.W., Finck, E.J., Patrick, L., Hope, A., and Timm, R. 2021b. Kansas Mammal Atlas: Townsend's Big-Eared Bat, *Corynorhinus townsendii* (online data) (Copper, 1837). Hays, KS: Sternberg Museum of Natural History, Fort Hays State University. Date Published: July 17, 2017. Date Accessed: July 17, 2017. Available at:
<https://webapps.fhsu.edu/ksmammal/account.aspx?o=32&t=170>
- Schommer, T. and Woolever, M. 2001. A process for finding management solutions to the incompatibility between domestic and bighorn sheep. Edited by U.S. Department of Agriculture, Forest Service.
- Shackleton, D.M. 1985. *Ovis canadensis*. *Mammalian species*(230): 1-9. <https://doi.org/10.2307/3504034>
- Singer, F.J. and Gudorf, M.A. 1999. Restoration of bighorn sheep metapopulations in and near 15 national parks: Conservation of a severely fragmented species; Volume I, Planning, problem definition, findings, and restoration. Vol. 1. Open File Report 99-102. Reston, VA: United States Department of Interior, Geologic Survey (USGS). 109 p. <https://doi.org/10.3133/ofr99102>
- Singer, F.J., Zeigenfuss, L.C., and Spicer, L. 2001. Role of patch size, disease, and movement in rapid extinction of bighorn sheep. *Conservation Biology* 15(5): 1347-1354.
<https://doi.org/10.1111/j.1523-1739.2001.99488.x>
- Smith, T.S., Flinders, J.T., and Winn, D.S. 1991. A habitat evaluation procedure for Rocky Mountain bighorn sheep in the intermountain west. *The Great Basin Naturalist* 51(3): 205-225.
- Sovada, M., Woodward, R., and Igl, L. 2009. Historical Range, Current Distribution, and Conservation Status of the Swift Fox, *Vulpes velox* , in North America. *Canadian Field Naturalist* 123: 346-367. <https://doi.org/10.22621/cfn.v123i4.1004>
- Sparks, D.W. and Valdez, E.W. 2003. Food habits of *Nyctinomops macrotis* at a maternity roost in New Mexico, as indicated by analysis of guano. *The Southwestern naturalist* 48(1): 132-135.
[https://doi.org/10.1894/0038-4909\(2003\)048<0132:FHONMA>2.0.CO;2](https://doi.org/10.1894/0038-4909(2003)048<0132:FHONMA>2.0.CO;2)
- Stelfox, J.G. 1976. Range ecology of big mountain horn sheep. Rep. Ser. No. 39. Ottawa, CA: Canadian Wildlife Service. 53 p. https://publications.gc.ca/collections/collection_2018/eccc/cw65-8/CW65-8-39-eng.pdf
- Stephens, R.M. and Anderson, S.H. 2005. Swift Fox (*Vulpes velox*): A Technical Conservation Assessment. Date: January 21, 2005. Laramie, WY: University of Wyoming. 46 p.
https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5181934.pdf
- Stratman, M. 2017. Status of Swift Fox in Eastern Colorado. Date: October, 2017. Brush, CO: Colorado Parks and Wildlife. 19 p.
- Stratman, M., Runge, J., and Vieira, M. 2022. Status of Swift Fox in Eastern Colorado. Date: October, 2022. Fort Collins, CO: Colorado Parks and Wildlife. 20 p.

- Thompson, C.M., Augustine, D.J., and Mayers, D.M. 2008. Swift Fox Response to Prescribed Fire in Shortgrass Steppe. *Western North American Naturalist* 68(2): 251-256.
<http://www.jstor.org/stable/41717681>
- USDA Forest Service. 2001a. Region 2 Sensitive Species Evaluation Form: Common Hog-Nosed Skunk. (Form) Dated: October 29, 2001. USDA Forest Service. 3 p. Available at:
https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5316054.pdf
- USDA Forest Service. 2001b. Region 2 Sensitive Species Evaluation Form: Townsend's Big-Eared Bat (*Corynorhinus townsendii*). Date: May 30, 2001. Washington, DC: USDA Forest Service. 6 p.
https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5316128.pdf
- USDA Forest Service. 2005a. Cimarron and Comanche National Grasslands Land Management Plan: Ecological Sustainability. Date: October 6, 2005. Washington, DC: US Department of Agriculture. 150 p.
- USDA Forest Service. 2005b. Cimarron and Comanche National Grasslands: Ecological sustainability. Date: June 10, 2005. Washington, DC: USDA Forest Service. 115 p.
- USDA Forest Service. 2010a. BTPD Acres 2010 Worksheet (online data)
- USDA Forest Service. 2010b. Comanche National Grassland closing Crack Cave Fall Equinox tour to prevent potential spread of white-nose syndrome in bat species. USDA Forest Service, Rocky Mountain Region, July 26.
- USDA Forest Service. 2013a. Decision Notice and Finding of No Significant Impact Cave and Abandoned Mine Management for White Nose Syndrome. Date: March 27, 2013. Washington, DC: USDA Forest Service. 7 p.
- USDA Forest Service. 2013b. Environmental Assessment for Cave and Abandoned Mine Management for White-Nose Syndrome. Date: April, 2013. Lakewood, CO: USDA Forest Service, Rocky Mountain Region. 24 p.
https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5414178.pdf
- USDA Forest Service. 2024. Cimarron Prairie Dog Towns (online data). Date Published: 2024. Date Accessed: 2024.
- USDA Forest Service. No Date. Praire Dog Acres (online data) Cimarron Comanche National Grasslands.
- USDI Fish and Wildlife Service (FWS). 1995. Endangered and Threatened Wildlife and Plants; 12-Month Finding for a Petition To List the Swift Fox as Endangered. In *Federal Register*. Vol. 60. Report Number. 31633-31636 pp. <https://www.govinfo.gov/content/pkg/FR-1995-06-16/pdf/95-14730.pdf>
- USDI Fish and Wildlife Service (FWS). 2001. Endangered and Threatened Wildlife and Plants; Annual Notice of Findings on Recycled Petitions. In *Federal Register*. Vol. 66. Report Number. 1295-1300 pp. <https://www.govinfo.gov/content/pkg/FR-2001-01-08/pdf/01-440.pdf>
- USDI Fish and Wildlife Service (FWS), White-Nose Syndrome Response Team. 2024a. Bats Affected by White-Nose Syndrome (website). United States Department of Interior, Fish and Wildlife Service (FWS), Last Modified: June, 2024. Date Accessed: April 8, 2024.
<https://www.whitenosesyndrome.org/static-page/bats-affected-by-wns>
- USDI Fish and Wildlife Service (FWS), White-Nose Syndrome Response Team. 2024b. Where is WNS Now? (online data) United States Department of Interior, Fish and Wildlife Service (FWS). Date Published: June, 2024. Date Accessed: June, 2024. Available at:
<https://www.whitenosesyndrome.org/where-is-wns>
- Valdez, R. and Krausman, P.R., (eds.) 1999. *Mountain Sheep of North America*. Tucson, AZ: The University of Arizona Press. 353 p.
- Van Scoyoc, M. 2024. Species Occurrence Data for the Cimarron-Comanche National Grasslands (HTML output auto-generated from multiple data sources such as iDigBio, GBIF, and others). Date: April 2024. Denver, CO: USDA Forest Service, Mountain Planning Service Group.
- Washingier, D.P. 2021. Influence of forest disturbances on summer foraging activity of boreal bats at three spatial scales. Master of Science Master's thesis. Boreal Ecosystems and Agricultural Sciences Program, Memorial University of Newfoundland, Newfoundland, Canada. 139 p.

- Weller, T.J., Rodhouse, T.J., Neubaum, D.J., Ormsbee, P.C., Dixon, R.D., Popp, D.L., Williams, J.A., Osborn, S.D., Rogers, B.W., Beard, L.O., McIntire, A.M., Hersey, K.A., Tobin, A., Bjornlie, N.L., Foote, J., Bachen, D.A., Maxell, B.A., Morrison, M.L., Thomas, S.C., Oliver, G.V., and Navo, K.W. 2018. A review of bat hibernacula across the western United States: Implications for white-nose syndrome surveillance and management. *PLoS One* 13(10): 1-20.
- Weller, T.J., Thomas, S.C., and Baldwin, J.A. 2014. Use of Long-Term Opportunistic Surveys to Estimate Trends in Abundance of Hibernating Townsend's Big-Eared Bats. *Journal of Fish and Wildlife Management* 5(1): 59-69. <https://doi.org/10.3996/022014-jfwm-012>
- Werdell, T.J., Piper, C.W., Ricketts, A.M., Peek, M.S., Sullins, D.S., and Ahlers, A.A. 2023. Strategic Grassland Conservation for Swift Foxes in Multi-Use Landscapes. *Biological Conservation* 277: 109864. <https://doi.org/10.1016/j.biocon.2022.109864>
- Western Bat Working Group. 2024. Hoary Bat, *Lasiurus cinereus* (Version 2024). Rapid City, SD: Western Bat Working Group. Originally Released: 2024. <https://wbwg.org/species-accounts/>
- Whiting, J.C., Bleich, V.C., Bowyer, R.T., and Epps, C.W. 2023. Restoration of bighorn sheep: History, successes, and remaining conservation issues. *Frontiers in ecology and evolution* 11: 17. <https://doi.org/10.3389/fevo.2023.1083350>
- Yates, T.L. and Schmidly, D.J. 1978. *Scalopus aquaticus*. *Mammalian Species*(105): 1-4. <https://doi.org/10.2307/0.105.1>



Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Cimarron and Comanche National Grasslands | Plant Species Evaluations for Assessment | June 2025

Species Evaluation Report for Plants on the Cimarron and Comanche National Grasslands

**Prepared by USDA Forest Service, Mountain Planning Service
Group, Lakewood, Colorado**

Prepared for the Cimarron and Comanche National Grasslands



Cover Photo: Fire-wheel blanket-flower (*Gaillardia pulchella*) is documented within arid shortgrass prairie communities of the Cimmaron and Comanche National Grasslands. [NPS Photo \(public domain\) from the Lake Meredith National Recreation Area](#)

This is a working document and the information contained herein may be changed or updated by the USDA Forest Service at any time in the future.

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American sea-blite

(*Suaeda calceoliformis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: There is one occurrence record from 1961 that overlaps with the Cimarron National Grasslands (Van Scoyoc 2024). The spatial uncertainty of this record is 6.2 miles (10,037 m). The locality description of this record states “Elkhart, 9 Mi N, 4 Mi E.” Therefore, there is insufficient spatial precision to demonstrate that this species occurs in the plan area.

Year of Last Known Occurrence: N/A

Species Status

G5; SNR in Colorado; S2 in Kansas.

Annual skeleton-weed

(*Shinnersoseris rostrata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are five occurrence records on the Cimarron National Grassland (NG) from 1972 through 2003 (Van Scoyoc 2024). These records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2003

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: dune stabilization.
 - b. Habitat: Threats common for sandsage prairie (see Threats and Trends Appendix) including dune stabilization.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Unknown.
 - b. Habitat: The distribution of open, less vegetated sand dunes in the plan area is naturally constantly shifting, with no discernable trends identified.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is on the southwestern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Size not known; five occurrence records; described as locally common.
 - b. Ecological conditions: Open, unstable sand dunes are restricted in the plan area.

Species Status

G5; SNR in Colorado; S2 in Kansas.

Taxonomy

Shinnersoseris rostrata is accepted as valid (Ackerfield 2022). *Lygodesmia rostrata* is a taxonomic synonym and another common name is beaked skeletonweed.

Species range

Overall Species range:

Annual skeleton-weed is distributed in the prairies and Great Plains region of North America from Iowa and Minnesota, west to Wyoming and Colorado, and south to Texas (NatureServe 2025) (Figure 1, Figure 2).

Description of how the population in the plan area fits within the overall range:

The population in the plan area is on the southwestern edge of the species range (Figure 1, Figure 2).

Distribution, abundance, and trend in the plan area

Population:

The population size and trend is unknown in the plan area. The two occurrence records from 1988 state “locally common” on the north side of the Cimarron River and “scattered to locally common in loose sand.” Another record from 1972 describes the species as “common” in the West Artesian Pasture of the Cimarron National Grassland. Annual skeleton-weed is not considered rare in Morton County, KS (Figure 2). Populations of rare annual plants can fluctuate between years confounding statements about population dynamics (Elzinga et al. 1998).

Habitat

Annual skeleton-weed grows in the sandy soils of stream banks, dunes, and sand hills in prairies at elevations from 980-4,800 ft (Van Scoyoc 2024). It seems to prefer active to semi-stabilized dune blowouts (Robson 1997). Smith (2021) states “the plants survive only in unstabilized blowouts where the sand is constantly shifting and there is little, if any, competing vegetation.” Within the plan area, it has been found in the western portion of the Cimarron National Grassland. This species primarily uses less stable sand habitat without competing vegetation. The distribution of open, less vegetated sand dunes in the plan area is naturally constantly shifting, with no discernable trends identified (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

This species is believed to be threatened by dune stabilization (Robson 1997).

Habitat

Habitat for this species is believed to be threatened by dune stabilization (Robson 1997) and other threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Annual skeleton-weed requires sandy soils and sunny, dry conditions (Smith and McDonough 2001, Hazlett 2004) and freedom from dune stabilization (Robson 1997). Seed germination requires scarification in the form of physical abrasion, presumably the seed tumbling over the sand, or possibly by the sand blowing over the seed (Smith and McDonough 2001).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Any type of active dune complex or blowout is potential habitat for this species (Robson 1997). Open, unstable sand dunes are restricted in the plan area. Dune habitat in the plan area occurs within the sandsage prairie ecological system, which is stabilized by sand sagebrush (*Artemisia filifolia*). Unstable dunes and blowouts are very patchily distributed and generally small.

Critical biological characteristics

Annual skeleton-weed is a composite in the Aster family that is insect-pollinated with wind-dispersed seed (Robson 1997). The seeds require scarification to germinate (Smith et al. 2001).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species is a pollinator plant for insects (Robson 1997).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Smith (2001) advises that "Maintaining open conditions must be the primary goal of habitat management. The use of prescribed fire may be helpful in reaching this goal, but it will probably need to be augmented by brush cutting or, in extreme cases, the judicious removal of herbaceous plants. This must be done with great care and planning. It is erroneous to assume that allowing an area of overgrown dunes to be used by off-road vehicles or grazed by domestic animals to open up the dunes will create suitable habitat."

Maps of Species Range

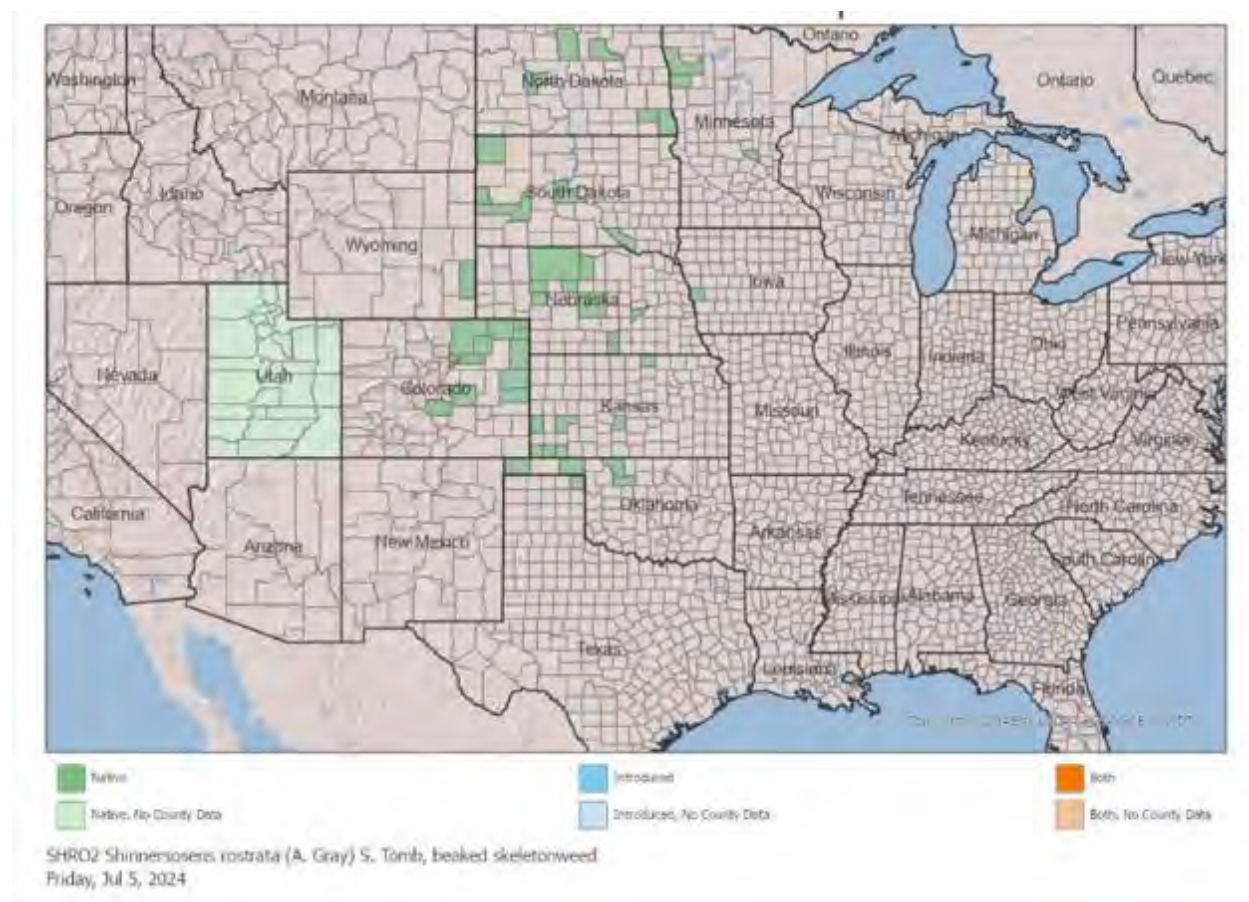


Figure 1. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

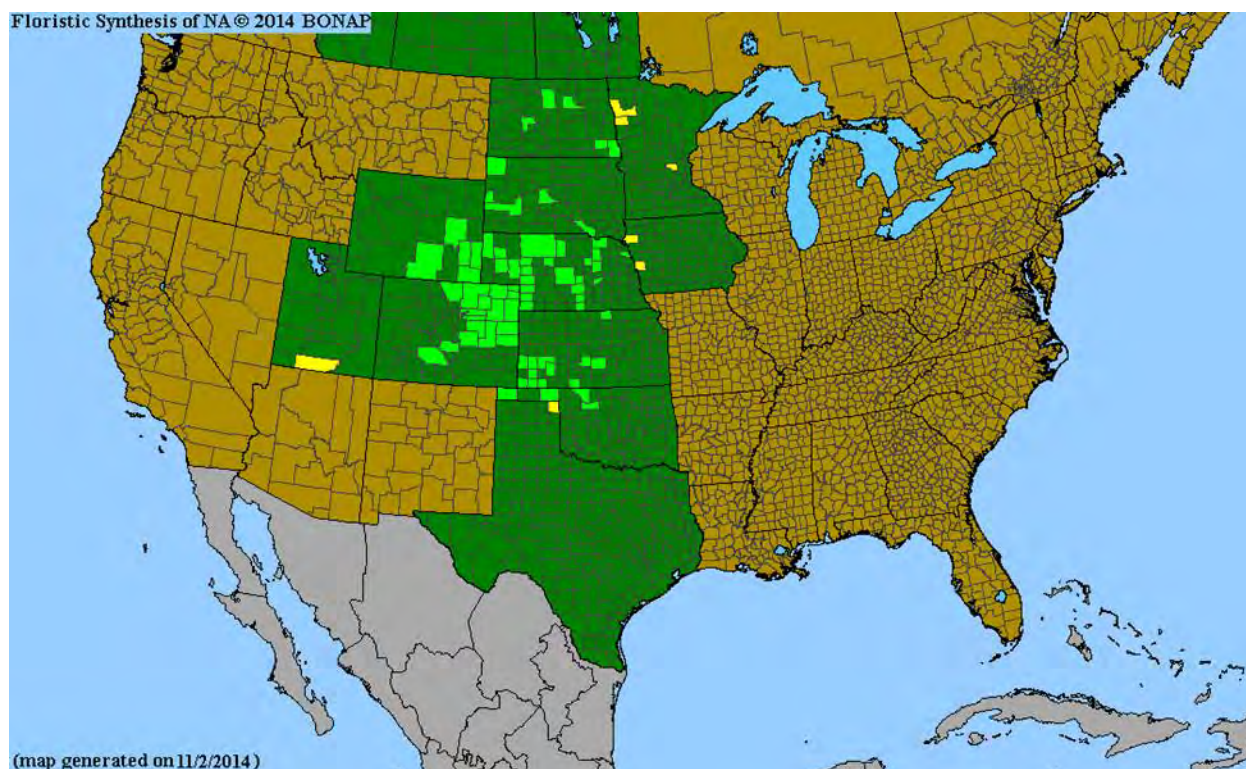


Figure 2. County occurrence data from Biota of North America Program (BONAP 2025). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Arkansas Valley evening-primrose (*Oenothera harringtonii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are 12 documented occurrences from 1995 to 2010 on the Comanche National Grassland (NG) (Van Scoyoc 2024). Five from 1936 through 2009 in iDigBio (Van Scoyoc 2024), four from 1936 to 2007 in GBIF (Van Scoyoc 2024), and 11 from 1936 to 2009 in SEINet (Van Scoyoc 2024).

Year of Last Known Occurrence: 2010

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Weed invasion, roadside maintenance activities, and development.
 - b. Habitat: Residential development, habitat loss, road development and road maintenance activities (herbicide use), and resource extraction activities, invasion of habitat by non-native plant species
Threats common in the habitat type (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: There are insufficient data in the literature, associated with herbarium specimens, or at the Heritage Programs to accurately determine population trends.
 - b. Habitat: There does not appear to be compelling evidence of downward trends in habitat. Trends common in the habitat type (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the southern eastern edge of the species' range (Figure 3, Figure 4).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population numbers are unknown. There are 12 known occurrences in the plan area.
 - b. Ecological conditions: Appears to be limited to specific soil types, derived from shale and limestone formations, in a relatively small geographic area.

Species Status

G3; S3 in Colorado.

Taxonomy

Oenothera harringtonii is accepted as valid (NRCS 2025).

Species range

Overall Species range

Arkansas Valley evening-primrose is endemic to Colorado and occurs in El Paso, Fremont, Huerfano, Las Animas, Otero, and Pueblo Counties, and probably occurs in adjacent New Mexico (NatureServe 2025). In 2010, NatureServe estimated the range to be approximately 26,288 square kilometers (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are at the southeastern edge of the species' range (Figure 3, Figure 4).

Distribution, abundance, and trend in the plan area

Population

Many of the occurrence records are spatially mapped on the edge of Shale Hills, some near Packers Gap. All occur within the Timpas Unit of the Comanche NG in the shortgrass prairie ecosystem (USFS 2005a). There are over 60 documented occurrences in Colorado, 20 or more occurrences are known to be of good viability (NatureServe 2025).

There is insufficient data in the literature, associated with herbarium specimens, or at the Heritage Programs to accurately determine population trends (Ladyman 2005).

Habitat

Arkansas Valley evening-primrose habitat is typically flat or gentle slopes in open shortgrass or saltbush communities. Plants are often found on compacted, silty clay soil, but may also grow on rocky, sandy, and silty loam soils. Substrates are often derived from shale and limestone formations, including the Niobrara formation, Carlile shale, Greenhorn limestone, Graneros shale, and Pierre shale formations. This species is known from an elevation range of about 4,600-6,100 feet. (NatureServe 2025). Ackerfield (2022) describes the habitat as dry grasslands, clay, rocky, or sandy soil, 4700 – 6100 ft in elevation. Hazlett (2004) describes its primary habitat as rocky, exposed limestone/shale barrens.

Almost all occurrence records occur within the Limestone Breaks Ecological Site and within the Western Great Plains Shortgrass Prairie in the plan area (Landfire 2024). The Western Great Plains Shortgrass Prairie dominates the plan area. Trends common in the shortgrass prairie habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Many occurrences are threatened by weed invasion, roadside maintenance activities, or residential or commercial development (NatureServe 2025).

Arkansas Valley evening-primrose is a local endemic plant with relatively few known individuals, and the most reliable habitat availability and management is on the Comanche. To prevent listing under the Endangered Species Act, efforts should be made to maintain current populations by avoiding certain

ground disturbing activities at known sites, ensuring appropriate habitat is maintained for this species. (USFS 2005a).

Habitat

Management actions that may affect this species include livestock grazing, prescribed fire, roads, trails, weed management, and unregulated recreation, but may be over-ridden by local weather conditions. Efforts should be made to maintain current populations by avoiding ground disturbance at known sites to protect established plants. Any herbicide use in the vicinity of these populations should be closely monitored to prevent damage to this species (USFS 2006).

Residential development is the primary threat to the species. Habitat loss due to urbanization, road development projects, and resource extraction activities, especially quarrying and surface mining, is a substantial threat to Arkansas Valley evening-primrose (NatureServe 2025). Since several known occurrences are near highways, roadside maintenance activities, such as herbicide use, may impact the several known occurrences that are near highways (Ladyman 2005).

This species is non-competitive and therefore threatened by invasion of habitat by non-native plant species (NatureServe 2025). Occurrence records from the plan area have documented exotic species (cheatgrass, *Bromus tectorum*) in this species' occupied habitat in the Comanche National Grassland (EO ID 14188). This species is also significantly threatened by livestock grazing, especially during flowering and fruiting periods, which likely reduces its reproductive output (NatureServe 2025). Most occurrence records for the species in the plan area describe evidence of cattle grazing, although the shale hills are not as heavily grazed as other areas (EO IDs 7879, 14188, 16858, 16857, 16610).

Natural catastrophes and environmental stochasticity appear to represent less imminent threats, given the habitat requirements and geographic location of this species. It is unclear how changing climatic conditions may affect this species (Ladyman 2005). Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

This species is rare and appears to be limited to specific soil types in a relatively small geographic area (Ladyman 2005). The substrates this species occurs on are often derived from shale and limestone formations.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The small geographic range of this species makes it vulnerable to large-scale natural and human-induced disturbances. An additional aspect to its vulnerability is that it is not evenly distributed within its narrow range. Thus, a relatively large proportion of its total population may be susceptible to relatively localized disturbances (Ladyman 2005).

Critical biological characteristics

This species is a self-incompatible annual that relies on insect pollination for its reproductive success (Skogen et al. 2016). Its primary hawkmoth pollinator is abundant in North America, and declines are not suspected anywhere in its range (Skogen et al. 2016). Arkansas Valley evening-primrose has been found to be resilient to low-to-moderate land-use change, likely because this species is disturbance-adapted, and hawkmoths seem robust to the negative impacts of land-use change (Skogen et al. 2016).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Observations indicate that the white-lined sphinx moth (*Hyles lineata*) is a significant pollinator species. Bees also appear to be important pollinators of this species (Ladyman 2005).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

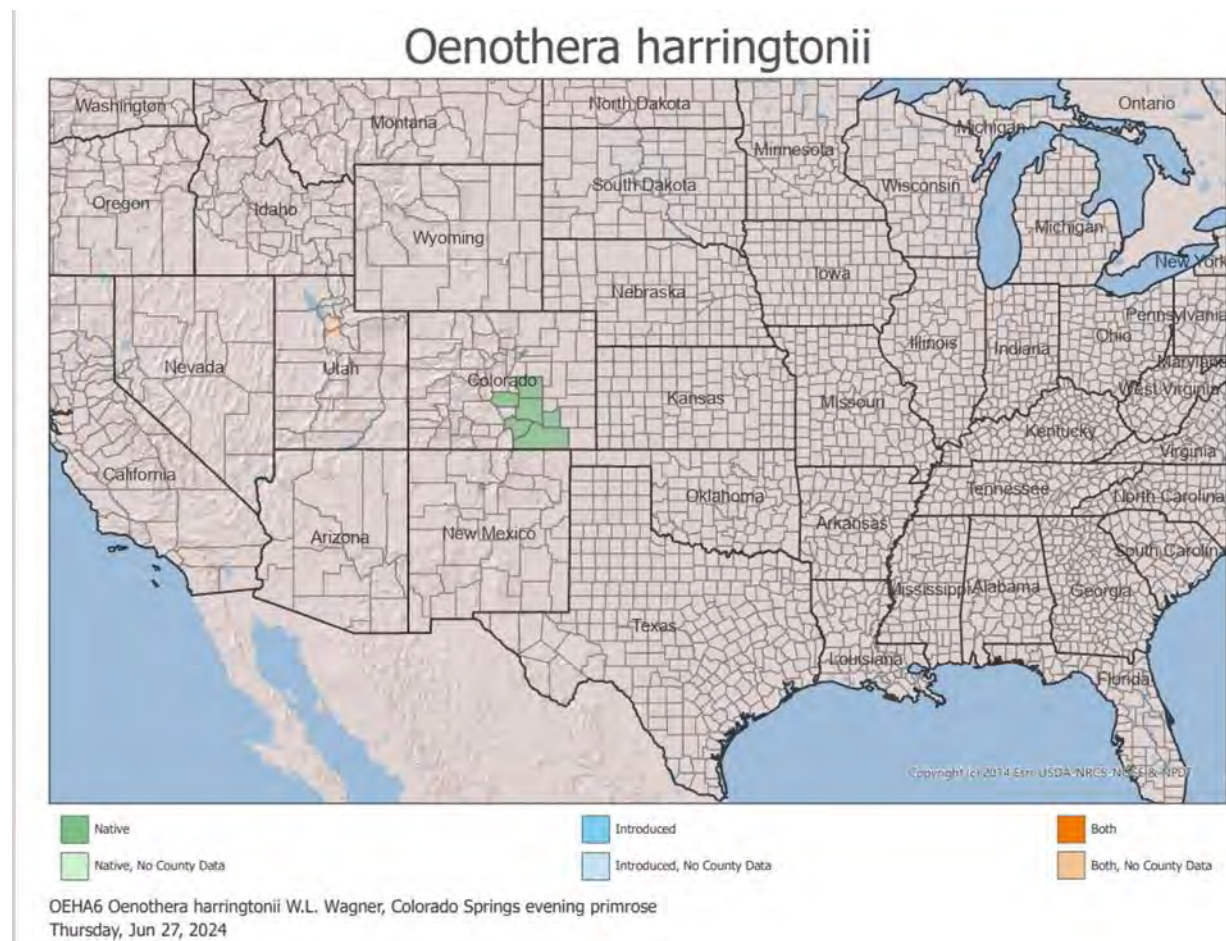


Figure 3. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

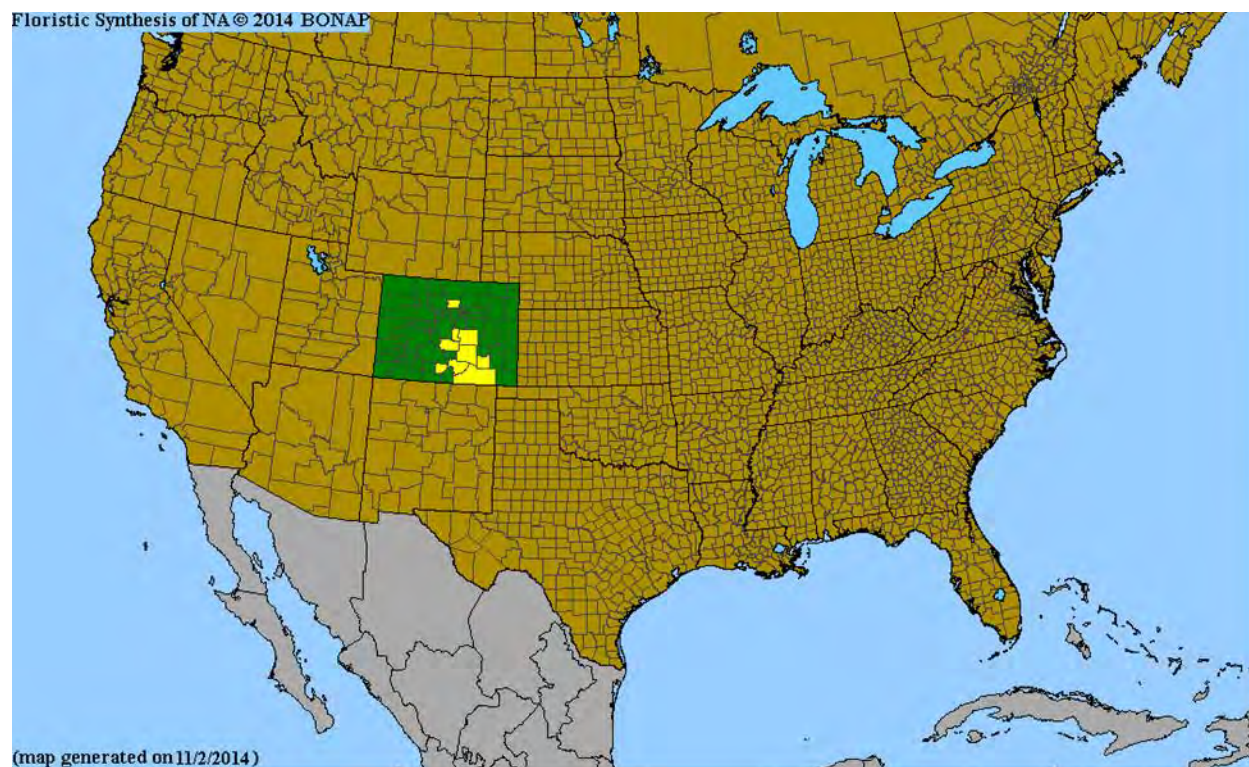


Figure 4. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Atlantic goldenrod (*Solidago arguta* var. *caroliniana*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: There is one occurrence record (Van Scoyoc 2024) from 1962 within the plan area. This species is not known to occur in Kansas or Colorado and is not in Ackerfield (2022) or Haddock (2024b) and was not included in Hazlett (2004) or Kuhn (2011) floristic inventory. This observation is believed to have been misidentified.

Year of Last Known Occurrence: 1962

Species Status

T4; S1 in Kansas.

Bailey's rabbitbrush **(*Chrysothamnus baileyi*)**

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: There is one occurrence record in GBIF at the edge of the plan area from 1961 that overlaps with the Comanche National Grassland (Van Scoyoc 2024), which has insufficient spatial precision (± 4.5 miles) to determine if it occurred in the plan area. CNHP has one occurrence polygon from 1949 that partially overlaps the plan area, but this record also does not have sufficient spatial precision to determine if it occurred in the plan area (CNHP 2024). Therefore, the species is not known to occur in the plan area and is not analyzed further.

Year of Last Known Occurrence: N/A

Species Status

G4; S1 in Colorado; S1 in Kansas.

Beach wormwood

(*Artemisia campestris* ssp. *caudata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are two occurrence records of the subspecies *Artemisia campestris* ssp. *caudata* (Van Scoyoc 2024) in the plan area. The parent species was not identified in the spatial records for the plan area, but *Artemisia campestris* ssp. *caudata* was. This overview is for *Artemisia campestris* ssp. *caudata*.

Year of Last Known Occurrence: 1997

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Unknown.
 - b. Habitat: Housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, drought, renewable energy, and fire and fire suppression. Threats common in the habitat type (see Threats and Trends Appendix).
 - c. NatureServe describes threats as not being widely documented, this taxon is potentially threatened by development, recreational activities, erosion, deer browsing, invasive species, and other threats in some places (NatureServe 2025).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Little is known about trends, but with a large range extent, large number of occurrences, abundant habitat, and no obvious intrinsic vulnerabilities.
 - b. Habitat: Species uses varied habitats, no discernable trend (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is not at the edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size is not known. There are two occurrence record within the plan area.
 - b. Ecological conditions: Uses varied habitats, some of which have restricted ecological conditions.

Species Status

T5; SNR in Colorado; S2 in Kansas.

Taxonomy

The parent species, *Artemisia campestris* was not identified in the spatial records for the plan area and is ranked as S4 in Colorado and no ranking in Kansas. *Artemisia campestris* ssp. *caudata* is documented in the plan area and matches the ranking in the spreadsheet for the listed parent species. This overview is for *Artemisia campestris* ssp. *caudata*. *Artemisia campestris* ssp. *caudata* is accepted as valid

(NatureServe 2025, ITIS 2024, NRCS 2025). Synonyms for *Artemisia campestris* ssp. *caudata* include *Artemisia caudata*, *Artemisia forwoodii*, *Oligosporus campestris* ssp. *Caudatus*, *Artemisia campestris* var. *caudata*, *Artemisia caudata* var. *calvens*, and *Oligosporus caudatus* (ITIS 2024, NRCS 2025).

Species range

Overall Species range

Beach wormwood occurs in 34 states including Alabama, Arizona, Colorado, Connecticut, Florida, Iowa, Illinois, Indiana, Kansas, Massachusetts, Maine, Michigan, Minnesota, Missouri, Mississippi, Montana, North Carolina, North Dakota, Nebraska, New Hampshire, New Jersey, New Mexico, New York, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Texas, Vermont, Washington, Wisconsin, and Wyoming (NatureServe 2025). Also occurs in six Canadian provinces. Range extent is eastern and central North America from New Brunswick west to Saskatchewan in Canada south to Florida, Texas, and New Mexico in the United States and northeastern Mexico (NatureServe 2025). Range extent was estimated to be almost 10.5 million square kilometers using herbarium specimens, photo-based observations, and NatureServe Network occurrence data documented between 1983 and 2024 (NatureServe 2025, Van Scoyoc 2024).

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are not at the edge of the species' range (Figure 5, Figure 6).

Distribution, abundance, and trend in the plan area

Population

Little is known about trends, but with a large range extent, large number of occurrences, abundant habitat, and no obvious intrinsic vulnerabilities, this taxon is considered secure (NatureServe 2025).

There are two occurrence records on the Carrizo Unit of the Comanche NG within the sandsage ecosystem (USFS 2005b). Hazlett (2004) indicates this species is known from Baca County, and could also occur in Otero, western Las Animas, and eastern Las Animas County. Kuhn et al. (2011) found this species in Otero County during a floristic inventory.

Habitat

Beach Wormwood grows in "open meadows, usually moist soils, sometimes sandy or rocky habitats," including "sandy woodlands, beaches and dunes, gravelly and rocky shores; also, adventive in sandy fields, on roadsides, in railroad ballast, and other disturbed areas" (NatureServe 2025). Hazlett (2004) describes it as sandy. Kuhn et al. (2011) describes habitat as pinyon juniper woodlands in the floristic inventory of the Cimarron and Comanche National Grasslands.

There were two herbarium records found in the Carrizo Unit of the Comanche NG. One was in a pasture adjacent to a road and the other was above Picture Canyon, fields and roadsides.

The occurrence record is spatially mapped within the sandsage ecosystem (USFS 2005b) and LandFire existing vegetation types: Western Great Plains Shortgrass Prairie and Developed Roads (Landfire 2024).

Species uses varied habitats. Trends common in the habitat types (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (NatureServe 2025).

Habitat

Common threats include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (Grunau et al. 2011, Rohweder 2022). Threats common in the habitat type (see Threats and Trends Appendix).

NatureServe describes threats as not being widely documented, this taxon is potentially threatened by development, recreational activities, erosion, deer browsing, invasive species, and other threats in some places (NatureServe 2025).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are two herbarium records found on the Carrizo Unit. One was in a pasture adjacent to a road and the other was above Picture Canyon, fields and roadsides.

The occurrence record is spatially mapped within the Sandsage ecosystem (USFS 2005b) and LandFire lists the existing vegetation types as Western Great Plains Shortgrass Prairie and Developed Roads (Landfire 2024).

Critical biological characteristics

Beach Wormwood is a short-lived biennial or perennial plant that flowers June through August and requires full sun (NatureServe 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Plants provide nesting material and structure for native bees (NPIN 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

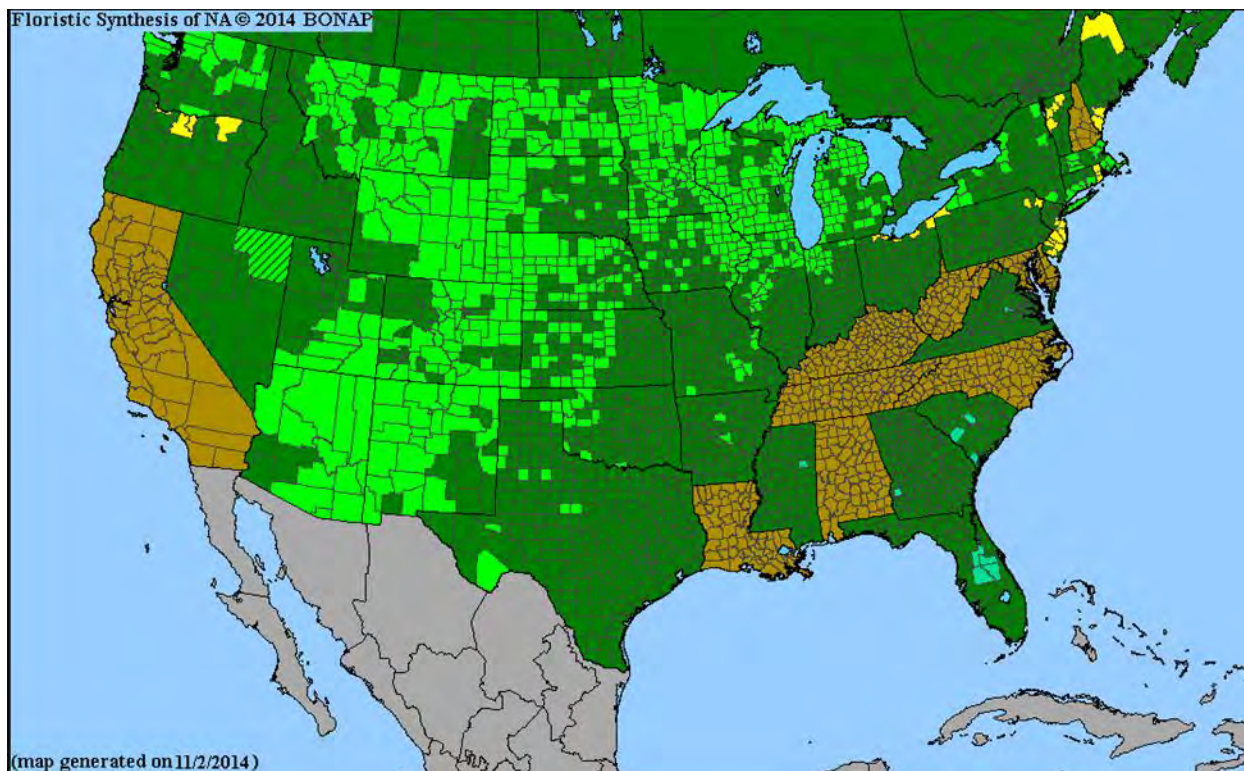
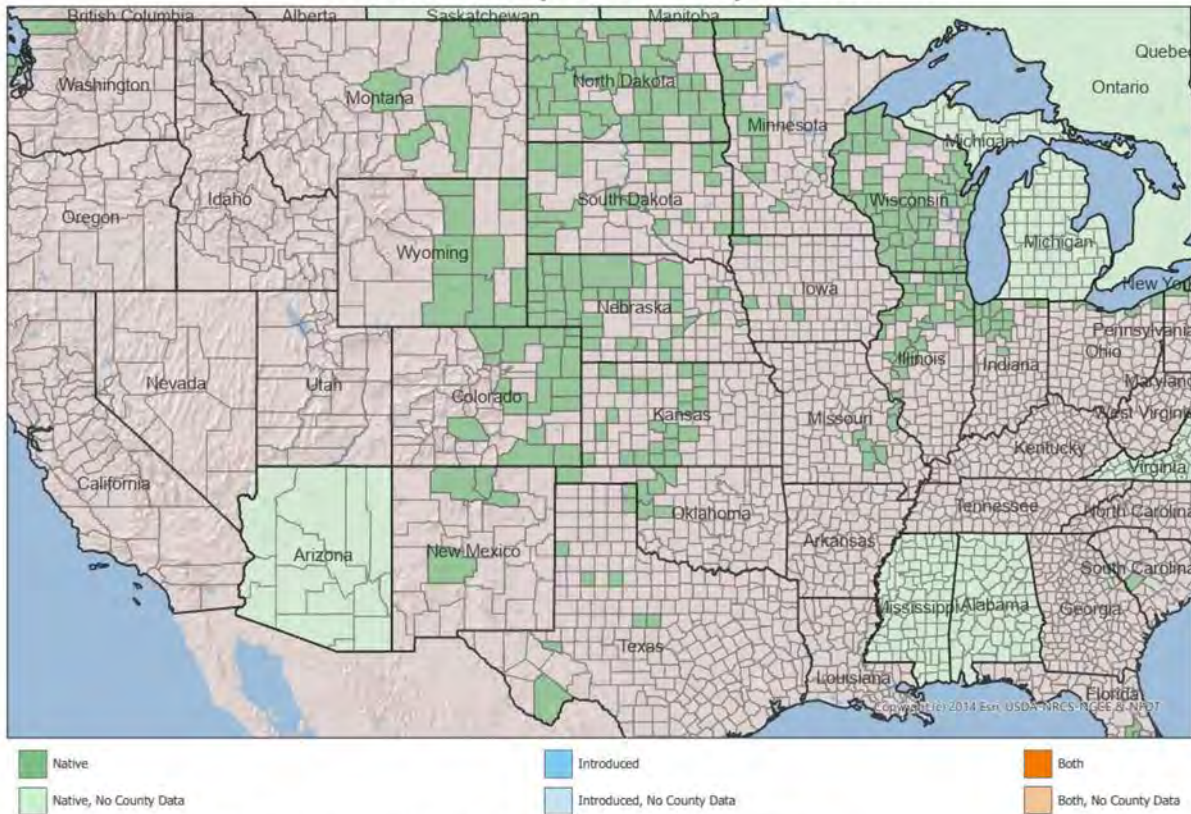


Figure 5. County occurrence data from Biota of North America Program (BONAP) for the parent species (BONAP, 2025). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Artemisia campestris ssp. Caudata



ARCAAC *Artemisia campestris* L. ssp. *caudata* (Michx.) H.M. Hall & Clem., field sagewort
Tuesday, Aug 6, 2024

Figure 6. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Beaked spikerush

(*Eleocharis rostellata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has one occurrence record from 1961 (Van Scoyoc 2024), which has insufficient precision (± 6.2 miles) to determine if this record was from the plan area. KNHP has one occurrence polygon, which was most recently surveyed in 2007 (Van Scoyoc 2024). The 2007 record indicates that plants were observed at an established recreation area in the Cimarron National Grassland.

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: climate stressors, drought, and groundwater depletion.
 - a. Habitat: climate stressors, drought, and groundwater depletion. Threats common in the habitat type (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - b. Population: no population trends in plan area are available.
 - c. Habitat: The single occurrence in the plan area is along the Cimarron River which has declined in spatial extent and quality of habitat due to groundwater depletion moving the system from perennial to ephemeral flow. Trends common in the habitat type (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is on the western edge of the Great Plains distribution.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; one occurrence polygon in the plan area; species is considered rare in Morton County, Kansas, which is the only county in the plan area where this species is known to occur.
 - b. Ecological conditions: aquatic/riparian/wetland habitat is generally restricted in the plan area, particularly in the Cimarron National Grassland, which is the only part of the plan area where this species occurs. This species prefers saline or calcareous soils.

Species Status

G5; SNR in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Eleocharis rostellata* as valid; taxonomic synonyms include *Eleocharis rostellata* var. *congregonii*, *Eleocharis rostellata* var. *occidentalis*, and *Scirpus rostellatus* (NRCS 2025).

Species range

Overall Species range:

Beaked spikerush is distributed across much of the United States, although sometimes rarely, northern Mexico, Puerto Rico, Andean South America in British Columbia and eastern Canada, (NatureServe 2025) (Figure 7, Figure 8).

Description of how the population in the plan area fits within the overall range:

The population in the plan area is on the western edge of the Great Plains distribution (Figure 7, Figure 8).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. It is considered rare in Morton County, Kansas, the only county in the plan area where this species is known to occur (Figure 8). The most recent occurrence record from 2007 does not provide the number of individuals observed.

Freeman (1989) states: "Attempts to relocate this occurrence in 1988 were unsuccessful. Searches of other appropriate habitats in 1988 and 1989 were similarly unproductive." However, this same area was surveyed by Kuhn in 2007, and an unknown number of plants were observed in sandy soil in cottonwood gallery forest along the Cimarron River with large stands of tamarisk (*Tamarix* spp.). Freeman (1989) noted "Should populations be rediscovered on the Grassland, it is recommended that they be protected if possible."

Habitat

Across its range, beaked spikerush occurs in a variety of mesic to wet-mesic habitats coastal salt marshes, and inland in saline, alkaline or strongly calcareous habitats (e.g., around hot springs, or very wet calcareous or brackish fens) (Freeman 1989, NatureServe 2025, Van Scoyoc 2024). Within the plan area, it has been associated with wetland and riparian habitat, including cottonwood gallery forest (Freeman 1989, Hazlett 2004, Kuhn et al. 2011). The only known extant population in the plan area is around the ponds in the vicinity of the George Atwood Recreation Area on the Cimarron National Grassland in sandy soil in cottonwood gallery forest along the Cimarron River with large stands of tamarisk (*Tamarix*) (Freeman 1989). Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

The habitat-mediated threats identified below can also affect populations.

Habitat

Drought and groundwater depletion are considered threats to this species' habitat because it depends on the presence of mesic soil and is intolerant of drought (NRCS 2025). Alteration of fens is an additional

threat to habitat (Schwegman 1991). Threats common in aquatic habitat types (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

USDA NRCS considers beaked spikerush an Obligate wetland species across its range, including the Great Plains; this means that this species almost always occurs in wetlands (NRCS 2025). It is adapted to all soil textures, has high fire tolerance, no drought tolerance, and high moisture use (NRCS 2025). It is intolerant of shade (NRCS 2025). It can use a broad range of wet habitats, including fens (Seischab et al. 1985). It prefers saline or calcareous soils (Van Scoyoc 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Freeman (1989) states: "The species may occur in a variety of mesic to wet-mesic habitats in and along the Cimarron River on the Cimarron National Grassland...Considerable potential habitat remains on the Cimarron National Grassland."

Although Freeman notes considerable potential habitat, riparian/wetland habitats are proportionally limited in the plan area (Hazlett 2004), particularly on the Cimarron National Grassland that is the only part of the plan area where this species is native and known to occur (Figure 7, Figure 8). The plan area has some playa lakes, wetlands, and constructed ponds, but these features are typically small and relatively restricted (see Threats and Trends Appendix). While the invasion of salt cedar in the plan area could potentially create favorable saline soil conditions for this species, the Cimarron River within the plan area has lost perennial flow due to groundwater depletion and is now an ephemeral system. The unit has also experienced prolonged drought conditions for the last two decades, and this species is very drought intolerant (NRCS 2025).

Critical biological characteristics

Beaked spikerush is a perennial graminoid (NRCS 2025). It can propagate by seed and by rhizomes (NRCS 2025). This species is highly competitive and often forms large monospecific colonies (Van Scoyoc 2024).

Important ecological and biological interactions

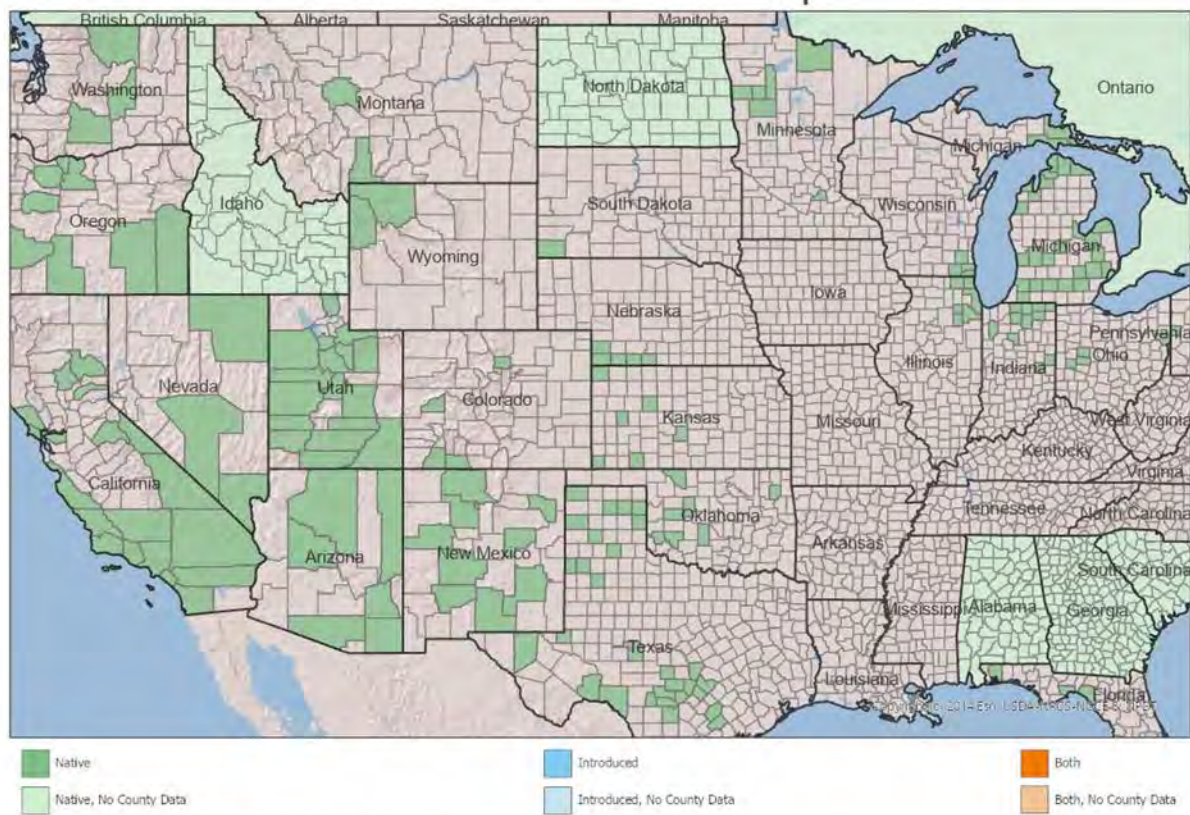
How (or if) this species influences other species or ecosystem diversity or integrity

This species can be an early colonizer of harsh environments such as marl beds and is further described as a stress-tolerant competitor (Seischab et al. 1985).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

A study in Illinois found that alteration of a fen resulted in apparent loss of this species from the graminoid fen community (Schwegman 1991).

Maps of Species Range



ELRO2 *Eleocharis rostellata* (Torr.) Torr., beaked spikerush
Monday, Jul 15, 2024

Figure 7. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

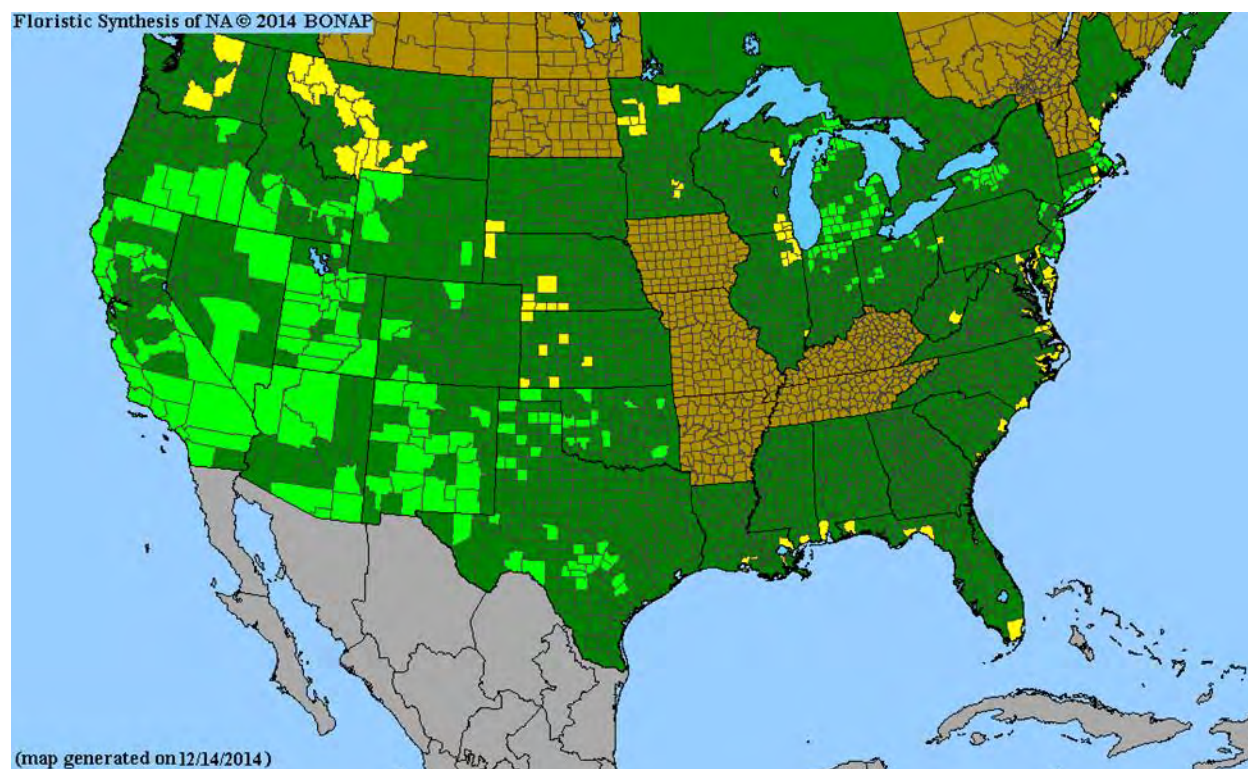


Figure 8. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Bigelow's bluegrass

(*Poa bigelovii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one occurrence on the Carrizo Unit of the Comanche National Grassland (NG) from 1997 (Van Scoyoc 2024). The locality for the herbarium specimen is documented as Picket Wire Canyonlands near an intermittent drainage at the base of the South Black Hills (Van Scoyoc 2024).

Year of Last Known Occurrence: 1997

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Grazing intensity.
 - b. Habitat: Grazing intensity and threats associated with shortgrass prairie habitat (see Threats and Trends Appendix) including oil and gas development, invasive species, climate stressors, and the knock-on effects of fire suppression.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: While the spatial extent of the shortgrass prairie is stable in the plan area the quality of that habitat has a declining trend (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the northeastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There is one documented occurrence in the plan area. Population numbers for this occurrence are unknown.
 - b. Ecological conditions: habitat is described as dry areas with an aspect of disturbance which are not restricted in the plan area.

Species Status

G5; S2 in Colorado.

Taxonomy

Poa bigelovii Vasey & Scribn. is accepted as valid (Ackerfield 2022, NatureServe 2025, NRCS 2025, Weber et al. 2012). No other synonyms or common names were found in the consulted sources.

Species range

Overall Species range

In North America, occurs in the southwestern U.S. including Arizona, California, Colorado, Nevada, New Mexico, Oklahoma, Texas, and Utah (NatureServe 2025). The species also occurs in northern Mexico (Flora of North America 1993, NatureServe 2025).

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are at the northeastern edge of the species range (Figure 9).

Distribution, abundance, and trend in the plan area

Population

Unknown. No information about distribution, abundance, or trend could be found from the consulted sources. The herbarium record from the 1997 collection includes four distinct plants on the specimen sheet (Van Scoyoc 2024).

Habitat

Bigelow's bluegrass grows in arid upland regions, in particular on shady and rocky slopes (Flora of North America 1993). In Colorado, plants occur on dry slopes from 4000 to 6000 ft. (Ackerfield 2022). Hazlett (2004) lists habitat for Bigelow's bluegrass as disturbed, often in roadside soils and likely to occur in eastern Las Animas County on the Comanche NG.

The herbarium specimen, collected from Las Animas County, lists the plants as growing near an intermittent drainage with *Atriplex canescens*, *Cylindropuntia imbricata*, *Pascopyrum smithii*, and *Elymus elymoides* at approximately 4900 feet (Van Scoyoc 2024).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Unknown, but likely affected by grazing intensity.

Habitat

Threats associated with the shortgrass prairie habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Unknown.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Unknown.

Critical biological characteristics

Annual to short-lived perennial bunchgrass that is not rhizomatous (Ackerfield 2022, Flora of North America 1993).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

In the past, Bigelow's bluegrass was considered to have significant grazing and forage value on the grasslands (Marsh 1952).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

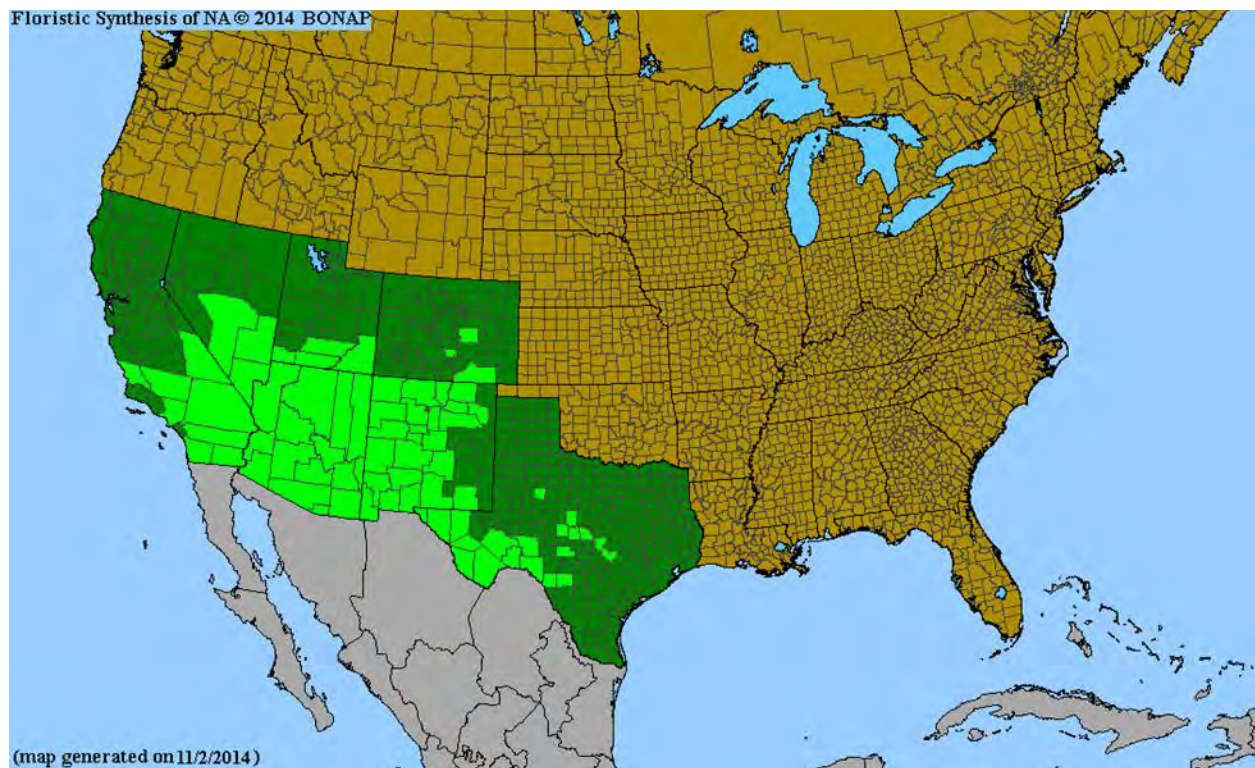


Figure 9. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in

state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Black grama

(*Bouteloua eriopoda*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are 15 documented occurrences on the Cimarron and Comanche National Grasslands (CCNGs) including one on the Cimarron NG in 2014, ten occurrences from 1947 through 2021 in GBIF, six from 1948 to 2021, and 15 from 1947 to 2021 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Grazing intensity and extreme fire.
 - b. Habitat: Physical disturbance, land conversion to agriculture, energy development, and woody encroachment. Threats common in the habitat type (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Trends consistent with shortgrass prairie (quality of habitat is declining) and canyonlands (woody encroachment from fire suppression resulting in decline in perennial grass (i.e., this species) habitats. Trends common in the habitat type (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are 15 occurrences in the plan area. Population numbers for these occurrences are unknown.
 - b. Ecological conditions: Unknown.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

Bouteloua eriopoda (Torr.) Torr. is accepted as valid (Ackerfield 2022, NRCS 2025). Synonyms include *Chondrosum eriopodum* (Ackerfield 2022, Flora of North America 1993) and *Bouteloua brevifolia* (Van Scoyoc 2024, ITIS 2024). Other common names include woolyfoot grama and hairyfoot grama (Simonin 2000).

Species range

Overall Species range

In North America, occurs in Arizona, California, Colorado, Kansas, Nevada, New Mexico, Oklahoma, Texas, Utah, and Wyoming (NatureServe 2025) as well as throughout Mexico (Figure 10). Black grama is restricted to southwestern Kansas and cited as one of the rare plants of the Cimarron NG (Freeman 1989).

Description of how the population in the plan area fits within the overall range

Species is at the northern edge of its range in the plan area (Figure 10).

Distribution, abundance, and trend in the plan area

Population

There are 15 documented occurrences in the plan area (Figure 10). Abundance and trend in the plan area are unknown.

Habitat

Black grama can be found growing on dry plains, foothills, and open forested slopes, often in shrubby habitats, and on waste ground (Flora of North America 1993). It occurs on dry open ground with well-drained sandy or gravelly soils (Simonin 2000). In Colorado, habitat includes sandstone mesas, rocky slopes, canyons and prairie (Ackerfield 2022). Black grama grows in the shortgrass prairie and canyonlands of the CCNGs.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Black grama provides a good source of food for livestock and wildlife, however plants do not tolerate overgrazing (iNaturalist 2025). Under heavy grazing conditions, the high palatability of the grass can lead to decreased size in population (Texas A&M AgriLife Extension 2024). Thus, an issue impacting populations and ecosystem biodiversity on the grasslands may be a lack of proper grazing management (Rohweder 2022).

Black grama is sensitive to fire and often top burned, however the stolons may survive (Simonin 2000). Populations recover slowly after fire, especially during periods of drought (Simonin 2000). Additive effects, such as drought and grazing pressure lengthen species recovery times following a fire.

Habitat

Physical disturbance and habitat fragmentation is a concern for species on the grasslands. Development is a threat outside of the plan area on privately-owned land where habitat is being converted for other uses including cropland or single-family housing (Rohweder 2022). Other threats to the habitat include

energy development and production, woody encroachment primarily from one-seed juniper, and invasive species. Threats common in the habitat type (see Threats and Trends Appendix).

Fire may be a particular threat to the species habitat due to improper prescribed fire frequency and management which create an altered fire regime in the ecosystems where this species occurs (Simonin 2000).

Ecological conditions

Ecological condition requirements

short grass prairie and canyonlands ecosystems – species is sensitive to livestock grazing, fire, and light-competition so needs freedom from those factors.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Trends common in the habitat type (see Threats and Trends Appendix).

Critical biological characteristics

This perennial warm season bunch grass primarily disperses through vegetative spread by stolons, tillers, and layering (Simonin 2000). In general, the species does not reproduce well by seed due to the high rate of sterile seeds compared to fertile seeds (Simonin 2000). Plants grow up to two feet in height (Texas A&M AgriLife Extension 2024) and are tolerant of short droughts once they become established (Simonin 2000).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The long-lived native perennial grass (Simonin 2000) provides a good source of food and Vitamin A for browsers and grazers during winter months (Texas A&M AgriLife Extension 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Black grama is intolerant of shade (NRCS 2025) and may face competition from woody species such as one-seed juniper on the grasslands.

The species is highly palatable for both browsing and grazing animals (NRCS 2025) however it is not tolerant of overgrazing (iNaturalist 2025). Black grama was once a dominant species in much of its range, however under heavy grazing pressure it is typically only found where it is protected from grazing by shrubs or cacti (Flora of North America 1993, Van Scoyoc 2024).

Maps of Species Range

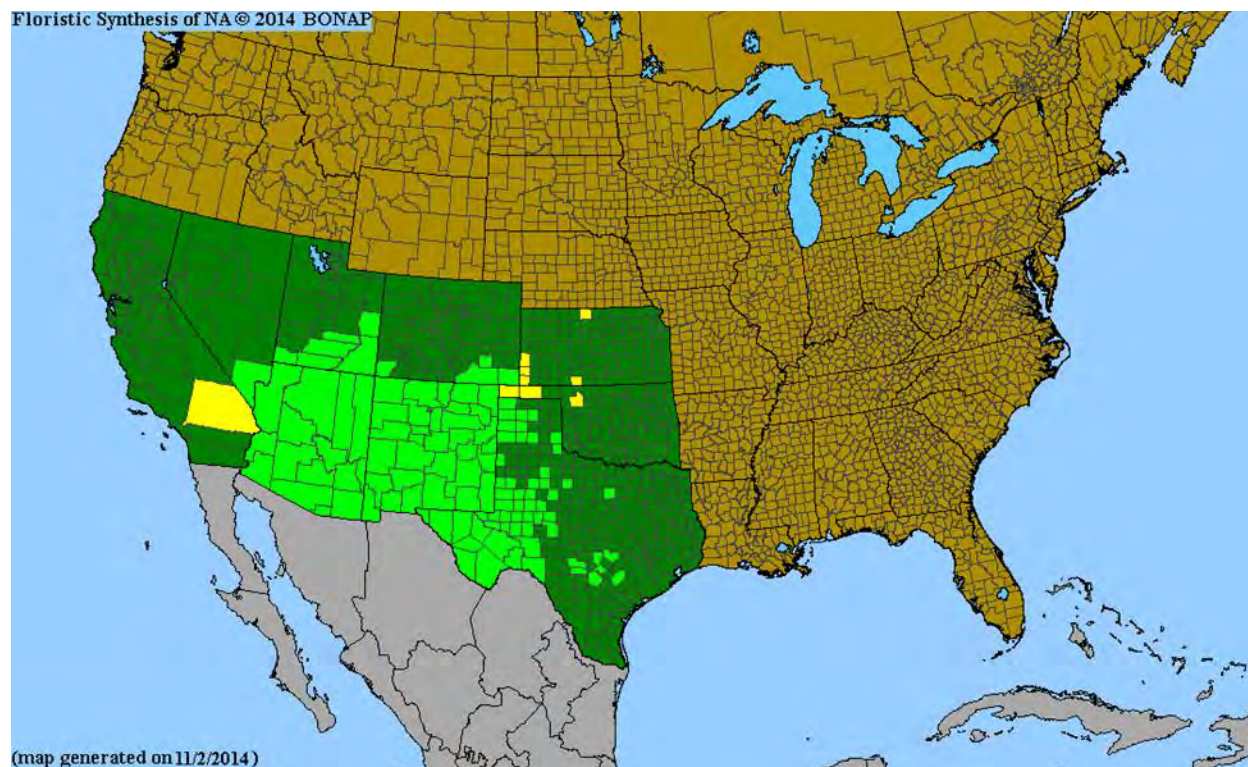


Figure 10. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Black willow

(*Salix nigra*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are four documented occurrences in the plan area. CNHP has one occurrence polygon in the plan area that was most recently surveyed in 2002 (CNHP 2024). GBIF has four occurrence records from 1991-2021, and SEINet has four occurrence records from 1991-2007 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: high-severity fire, drought, groundwater depletion, river management, insects and disease
 - b. Habitat: high-severity fire, drought, groundwater depletion, river management, insects and disease Threats common in the habitat type (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Trends consistent with wetland habitat in the plan area (declining trend from groundwater depletion). Trends common in the habitat type (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the western edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: four occurrences in the plan area. Population numbers for these occurrences are unknown.
 - b. Ecological conditions: Wetland habitat is restricted in the plan area.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

USDA NRCS recognizes *Salix nigra* as valid, with fifteen taxonomic synonyms (NRCS 2025). While *Salix nigra* is accepted as valid and as a distinct taxa (Flora of North America 1993) it does readily hybridize with other willow species sometimes complicating database searches which impose synonymy over the element occurrences and lump *Salix nigra* with other species. This overview is for *Salix nigra* in the strict sense since that is what the Colorado S1 ranking is based upon.

Species range

Overall Species range:

Black willow is widely distributed and found throughout the eastern United States, adjacent parts of Canada, and Mexico; its range extends west from southern New Brunswick and central Maine to Quebec, southern Ontario, central Michigan, southeastern Minnesota, and eastern North Dakota (Tesky 1992) (Figure 11).

Description of how the population in the plan area fits within the overall range:

The plan area is at the western edge of the species' range (Figure 11). In Colorado, it is known only from Baca County (Lemly and Culver 2013).

Distribution, abundance, and trend in the plan area

Population:

Population size and trend in the plan area is not known. Occurrence records give no indication of the number of individuals. The species has been documented in approximately 93 acres of habitat within the Comanche NG. There are several occurrence records along the Cimarron River in the Cimarron NG. Black willow is considered rare in Baca County, Colorado, but not Morton County, Kansas (Figure 11).

Habitat

Across its range, black willow occurs in floodplains, edges of ponds and lakes, swamps, marshes, white cedar bogs, wet meadows, open fields, roadside ditches, mixed upland deciduous woods along streams at elevations from 30 to 4600 ft (Van Scoyoc 2024). It is most common on river margins where it occupies the lower, wetter, and often less sandy sites (Tesky 1992).

Within the plan area, black willow has been documented in Picture Canyon, Vogel Canyon, and Tobe Creek within the Comanche NG (Van Scoyoc 2024) (EO ID 17102). It has also been documented in several locations along the Cimarron River in the Cimarron NG. Riparian and wetland habitat has declined in the plan area due to the dropping groundwater table and the presence of nonnative invasive plant species such as tamarisk (Cable et al. 1996).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

High-severity fire represents a threat to populations because black willow is very susceptible to fire damage, and high-severity fires can kill entire stands (Tesky 1992). Low-severity fires can scorch the bark and wound trees, leaving them more susceptible to insects and disease; black willow is susceptible to several insects and diseases, including forest tent caterpillar (*Malacosoma disstria*), the gypsy moth (*Lymantria dispar*), the cottonwood leaf beetle (*Chrysomila scripta*), the willow sawfly (*Nematodes ventralis*), the willow leaf beetle (*Plagiodera versicolora*), cottonwood borer (*Plectrodera scalator*), leaf rust, fungus scab, and black canker (Tesky 1992). Groundwater depletion and drought also represent probable threats to populations because seed viability is greatly reduced by dry conditions (Tesky 1992). Populations are

threatened by river management activities, such as channelization, impoundments, and gravel extraction, which can reduce the species' regeneration potential (Guilloy et al. 2011).

Habitat

Threats to habitat include many of the same threats to populations including high-severity fire, drought, groundwater depletion, insects and disease, degradation and loss of wetlands (Tesky 1992). Its habitat is threatened by river management activities, such as channelization, impoundments, and gravel extraction, which can reduce the species' regeneration potential (Guilloy et al. 2011). Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Black willow is an Obligate wetland species across most its range, except the Great Plains where it is a Facultative Wetland species (Lichvar et al. 2016). Thus, in the Great Plains it usually occurs in wetlands, but may occur in non-wetlands. However, the habitat descriptions of the occurrences in and around the plan area make it clear that black willow in southeastern Colorado and southwestern Kansas occurs in situations with flowing water (washes, floodplains, arroyos, etc.) and is thus riparian particularly because seedlings require slow drops in the water table to successfully establish rather than abrupt water table drops (Guilloy et al. 2011). It requires freedom from high-severity fire and severe insect and disease outbreaks (Tesky 1992).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Riparian and wetland habitats are limited in the plan area (Hazlett 2004) (see Threats and Trends Appendix). Despite the limited amount of wetland/riparian habitat, this species is documented across both the Cimmaron and Comanche, and has been documented in a variety of habitats including dry, rocky sandstone hills, open juniper woodland, sandbars, springs, ponds, etc. (Van Scoyoc 2024).

Critical biological characteristics

Black willow is a pioneer tree species whose lifecycle greatly depends upon natural hydro-geomorphic disturbances (Guilloy et al. 2011). Guilloy et al. (2011) describe its life cycle as follows: "sexual regeneration of (black willow) occurs through the massive annual production of water- and wind-dispersed, short-lived seeds that do not form seed banks." Their release is typically timed to follow the spring flood along river systems (Karrenberg et al. 2002). These seeds have high germination rates and seedlings will rapidly colonize damp and bare sediments that are deposited on floodplains during flood events and exposed following gradual recession of floodwaters (Cooper 2003). Thus typically, a large number of first-year seedlings germinate widely across the floodplain each year. The majority of these seedlings do not survive the first growing season." Early seedling establishment is a demographic bottleneck for the sexual regeneration of black willow; seedling roots must track receding water tables to avoid desiccation (Guilloy et al. 2011).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Tesky (1992) states: "birds eat the buds and flowering catkins of black willow; deer eat the twigs and leaves; and rodents eat the bark and buds. The yellow-bellied sapsucker feeds on the sap... Black willow/cottonwood stands are also commonly used as nesting habitat by some small nongame bird species."

Willows are also an important component of riparian ecosystems and help stabilize streambanks, provide stream shading, and contribute to input of organic matter (Lemly and Culver 2013, Culver and Lemly 2013).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Although black willow has higher drought tolerance than some willow species, summer drought may reduce seedling survival and therefore populations' sexual regeneration (Guilloy et al. 2011). Basara et al. (2013) state growing concern that projected climatic conditions may enhance future drought conditions in the Great Plains, although the confidence in this prediction is low. To mitigate impacts to black willow, Guilloy et al. (2011) recommend that in managed river systems, "controlled floods must be followed by water table levels that avoid abrupt drops, progressively as a function of seedling age (i.e., avoid drops greater than 10 cm day⁻¹ during the first month following establishment and greater than 40 cm day⁻¹ subsequently). As recruitment is an episodic phenomenon, these prescriptions do not necessarily need to be undertaken annually, but rather at frequent enough intervals to ensure that some sexual regeneration of the floodplain forest occurs at least at a decadal scale."

Maps of Species Range

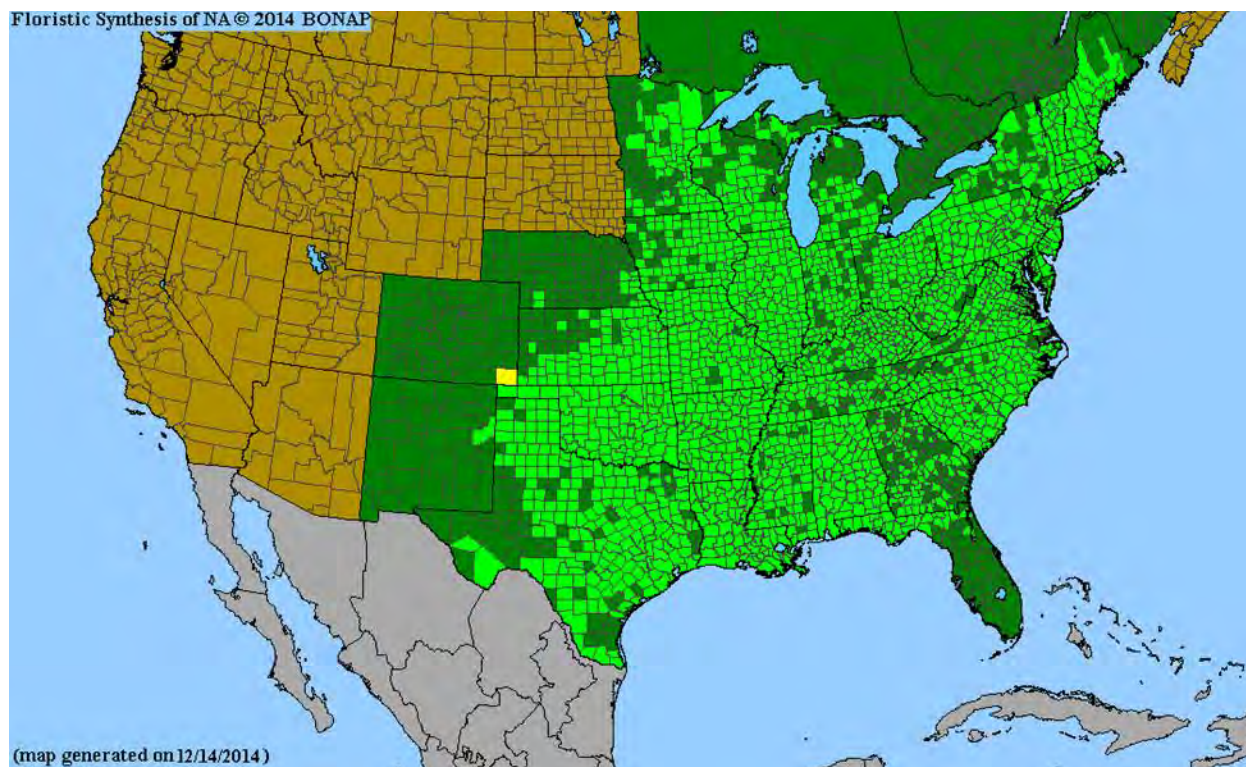


Figure 11. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Black-stem spleenwort

(*Asplenium resiliens*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are three documented occurrences on the Cimarron Comanche National Grasslands (CCNGs) from 1948 to 2007 (Van Scoyoc 2024). The 1948 duplicate record is also listed in GBIF and iDigBio (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Prolonged drought, extreme temperatures, over-collecting, and physical disturbance such as trampling.
 - b. Habitat: Rock quarrying and mining. Threats common in the habitat type (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend in the plan area is unknown.
 - b. Habitat: Habitat trend in the plan area is unknown. Trends common in the habitat type (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Three occurrences have been documented in the plan area. Population numbers are unknown.
 - b. Ecological conditions: the species is associated with a restricted ecological condition (e.g., shaded rocky crevices and ravines).

Species Status

G5; S1 in Colorado; S2 in Kansas.

Taxonomy

Asplenium resiliens Kunze is accepted as valid (Ackerfield 2022, NRCS 2025, Weber et al. 2012). Hill (2009) lists *Asplenium parvulum* (illegitimate name), *Chamaefilix resiliens*, and *Asplenium lealii* as synonyms for this species. Other common names include blackstem spleenwort (NRCS 2025) and little ebony spleenwort (iNaturalist 2025).

Species range

Overall Species range

In North America, occurs in 26 states including Alabama, Arizona, Arkansas, Colorado, Delaware, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Maryland, Mississippi, Missouri, Nevada, New Mexico, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, and West Virginia (NatureServe 2025). The species is listed as Imperiled or Critically Imperiled in 13 of these states including Colorado and Kansas and presumed extirpated in Louisiana (NatureServe 2025). The species also occurs in Mexico and South America (Van Scoyoc 2024). Hill (2003) acknowledges that the distribution of this species in the U.S. is widespread and excludes only the westernmost and northernmost states.

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are at the northern edge of the species range (Figure 12).

Distribution, abundance, and trend in the plan area

Population

Three occurrence records were identified in the plan area (Figure 12) which may reflect low population numbers and limited abundance. Precise location accuracy is considered low for one of these collections from 1948 based on the georeferenced remarks in the specimen record (Van Scoyoc 2024) leaving the possibility of only two known occurrences in the plan area.

Habitat

Known to occur in rock crevices, cracks, caprocks (Ackerfield 2022), shaded rocky canyons and ravines (Hazlett 2004), and sandstone cliffs (Weber et al. 2012). Plants can be found growing in cliffs and sinkholes, on limestone, dolomite (Hill 2003), or other alkaline rocks (Van Scoyoc 2024). Suitable habitat for black-stem spleenwort is often near streams or drainages where the air is humid, and airflow is still (Hill 2003). While this habitat type is restricted in the plan area, the habitat is may be stable since the species grows in shaded rock crevices and is somewhat protected in the grassland ecosystem, although this is unknown from the consulted sources.

Black-stem spleenwort is spatially mapped in the rough stony land soil map unit (Soil Survey Staff 2024). In the plan area, the rough stony land map unit occurs only in the south end of Baca County, Colorado. The herbarium collection from 1948 lists the habitat as basalt caprock and the location at the confluence of Sand and Gallinas Canyons, tributary to the Cimarron River in the vicinity of Wilson Ranch (Van Scoyoc 2024).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Threats to populations are largely unknown but likely include fragmentation and habitat loss due to development. This is a particular concern in the shortgrass prairie landscape such as the plan area where land ownership is highly fragmented. Populations are typically isolated due to infrequent availability of

suitable habitat (Hill 2003). Other threats to the species include physical damage by trampling and over-collecting of plants in the wild (Hill 2003).

In addition, climate stressors could push the climate envelope, including precipitation and temperature extremes, beyond the species ability to survive. Prolonged drought may cause populations to decline or disappear (Hill 2003).

Habitat

Marble and limestone quarrying present a minor threat to this species (NatureServe 2025). The degree of current and historic quarrying is unknown both on and off the plan area.

Grazing and extreme fire are general threats to shortgrass prairie ecosystems, however the microhabitat for this species is somewhat protected from these threats since it requires rocky surfaces which limit livestock grazing and fire impacts.

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Black-stem spleenwort relies on moist shaded locations in rock crevices and ledges where soil is typically thin or composed only of organic matter (Hill 2003). The species is adapted to dry environmental conditions during summer months when plants may lose some of their leaves or wilt (Hill 2003).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Little is known of the status and trend of ecological conditions in the plan area although they are expected to be restricted with little connectivity. In general, populations are isolated and there is little new suitable habitat available across the species range (Hill 2003). The species occurs on the rough stony land soil map unit (Soil Survey Staff 2024).

Critical biological characteristics

Black-stem spleenwort is a small evergreen perennial fern that relies on cool shaded environments. The fern produces spores without requiring fertilization which results in genetically identical plants in local populations (Hill 2003).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown from the reviewed literature and sources, but the species likely provides diversity and physical cover in a largely barren habitat (e.g., rock crevices).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Ecosystem structure and function are likely to affect black-stem spleenwort due to its habitat preferences. In addition, the limited ability of this species to disperse coupled with changing climatic factors in the shortgrass prairie ecosystem could compound species survival and migration.

Maps of Species Range

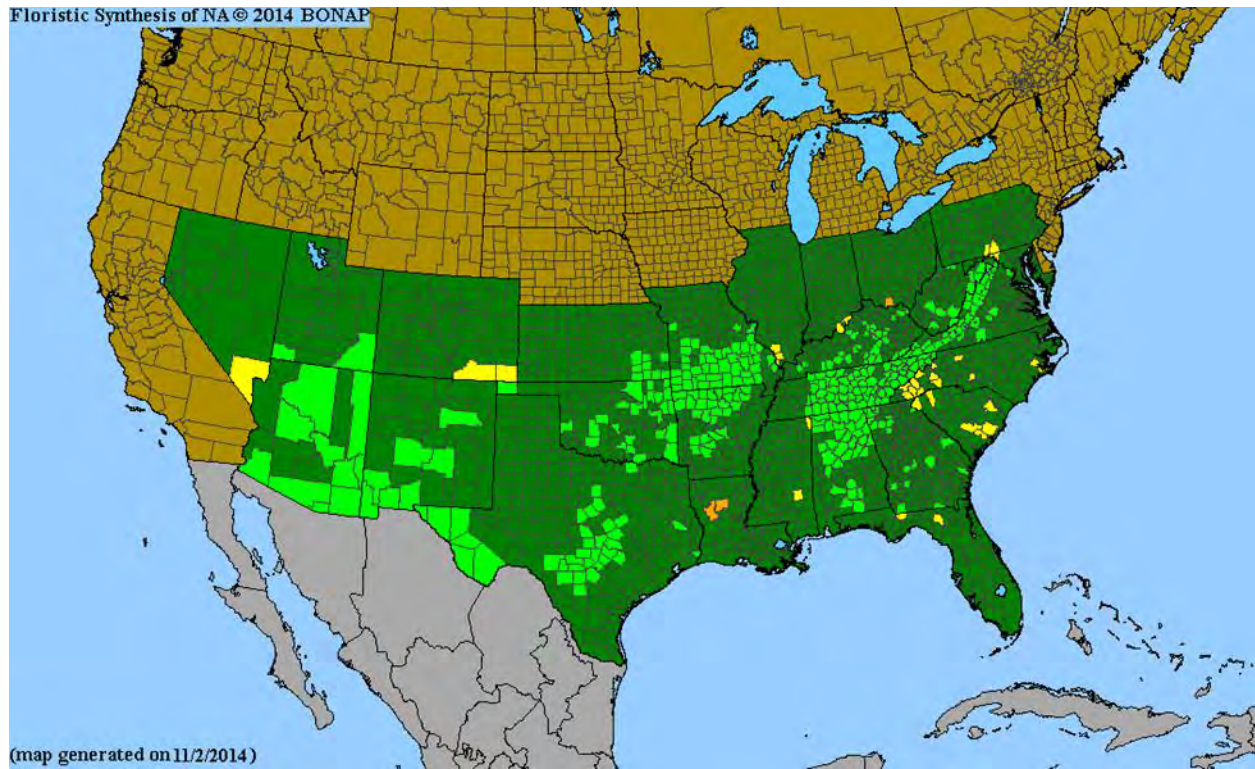


Figure 12. County occurrence data from Biota of North America Program (BONAP 2025). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Blue three-awn grass

(*Aristida purpurea* var. *nealleyi*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: **Yes**

Rationale/Evidence of Occurrence: There is one occurrence record (Van Scoyoc 2024).

Year of Last Known Occurrence: 2008

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Unknown.
 - b. Habitat: General threats include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, recreation, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022). Threats common in the habitat type (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Trends common to the variety of habitat types used by this species, particularly as it relates to woody encroachment into this species micro habitat (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northeastern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size is not known. There is one known occurrence in the plan area.
 - b. Ecological conditions: The variety has been associated with a variety of habitats in the plan area. Given this breadth of habitat associations, its ecological conditions are not considered restricted

Species Status

T4: S2 in Colorado; SNR in Kansas

Taxonomy

Aristida purpurea var. *nealleyi* is accepted as valid; synonyms are *Aristida glauca*, *Aristida nealleyi*, *Aristida purpurea* var. *glauca*, *Aristida reverchonii*, and *Aristida stricta* var. *nealleyi* (NRCS 2025). This is an accepted variety for the parent species *Aristida purpurea* in ITIS (ITIS 2024, NRCS 2025).

Species range

Overall Species range

Blue three-awn grass occurs in Arizona, California, Colorado, Illinois, Kansas, New Mexico, Nevada, Oklahoma, Texas, and Utah (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is at the northeastern edge of the species' range (Figure 13).

Distribution, abundance, and trend in the plan area

Population

There is one occurrence record that occurs in the Timpas Unit of the Comanche NG within the canyonland ecosystem (USFS 2005c).

Population and population trends for this variety in the plan area are unknown.

Habitat

This species grows on dry (rocky or sandy) slopes and plains at lower elevations than the other varieties, frequently in desert grassland vegetation (Flora of North America 1993). Hazlett (2004) does not mention this variety in his report. Kuhn et al. (2011) describes habitat as pinyon juniper woodlands, rocky upland prairie, and shortgrass prairie, in a floristic inventory of the Cimarron and Comanche National Grasslands.

The herbarium record is located within the canyonlands ecosystem (USFS 2005a). The occurrence record is spatially mapped within landfire existing vegetation type Western Great Plains Shortgrass Prairie (Landfire 2024).

The locality of the observation is 1000 feet from Withers Canyon Trailhead and 300 feet from a road (not maintained for passenger vehicles). Habitat description of the occurrence record is shortgrass prairie by *Elymus*, *Stipa*, and scattered *Juniperus monosperma* (Van Scoyoc 2024).

Species uses varied habitats and would be associated with trends common in the shortgrass prairie habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified any unique threats to this variety. The locality of the observation is 1000 ft from Withers Canyon Trailhead and 300 ft from a road (not maintained for passenger vehicles).

Habitat

General threats to habitat include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, recreation, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022).

Threats common in the shortgrass prairie habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

The variety has been associated with a variety of habitats in the plan area. Given this breadth of habitat associations, its ecological conditions are not considered restricted.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Because this species can use such varied habitats, its ecological conditions are not restricted in the plan area. There is a minimum of one occurrence record. Herbarium record is within the Canyonlands Ecosystem (USFS 2005a). The occurrence record is spatially mapped within Landfire existing vegetation types; Western Great Plains Shortgrass Prairie, (Landfire 2024). The locality of the observation is 1000 ft from Withers Canyon Trailhead and 300 ft from a road (not maintained for passenger vehicles). Habitat description of the occurrence record is shortgrass prairie by *Elymus*, *Stipa*, and scattered *Juniperus monosperma* (Van Scoyoc 2024).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this variety. This variety flowers March through September and is perennial (Van Scoyoc 2024, Flora of North America 1993). Information was found relating to the parent species. Purple three-awn is adapted to dry, recently disturbed sites. It is also capable of thriving in areas that have been heavily grazed. It is seral on most sites. It is a warm-season, native perennial bunchgrass. Purple three-awn is highly competitive during droughts lasting only a few years. It tends to decrease during periods of extended drought (Howard 2007). This species is generally unpalatable due to its spike-like awns and tends to increase with grazing and maintains a persistent seedbed (Howard 2007).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown at the variety level. Information at the parent level include forage value of purple three-awn is only poor to fair (Howard 2007). Black-tailed prairie dog graze purple three awn lightly but don't prefer it. Purple three-awn is often one of the few grasses remaining in areas severely disturbed by prairie dogs (Howard 2007). Purple three-awn tends to increase with grazing. (Howard 2007).

Wildlife use- Seldom grazed. The seeds are food for some songbirds, like the Junco. The plants provide nesting materials or habitat for some fur and game animal (NPIN 2025).

Attracts butterflies, larval host for skippers and Satyrs, highly deer resistant (NPIN 2025).

Provides Nesting Materials/Structure for Native Bees (A plant that native bees nest beneath, within, or harvest parts from to construct their nests.) (NPIN 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown at the variety level

Purple three-awn is seral on most sites but is a component of stable plant communities on some sites. It is one of the first grasses to establish on abandoned fields and other disturbed sites (Howard 2007).

Maps of Species Range



Figure 13. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Buckley's beardtongue

(*Penstemon buckleyi*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one occurrence record on the Cimarron and Comanche National Grasslands (CCNGs) from 2007 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025).
 - b. Habitat: Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression Threats common in the habitat type (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend for this species in the plan area is unknown.
 - b. Habitat: The habitat at the single known occurrence in the plan area has a declining trend from user created trails, dispersed camping sites and facility development from 1988 to present. Trends common in the habitat type (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is on the western edge of the species range
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known. There was one occurrence record within the plan area.
 - b. Ecological conditions: No sources consulted identified ecological requirements needed for this species aside from general habitat needs.

Species Status

G4; S2 in Colorado; S3 in Kansas.

Taxonomy

Penstemon buckleyi is accepted as valid (Ackerfield 2022, NRCS 2025, Weber et al. 2012).

Species range

Overall Species range

Buckley's beardtongue occurs in Colorado, Kansas, Nebraska, New Mexico, Oklahoma, and Texas. Range extent North-central and southwest Kansas west to extreme southeast Colorado, south to central Texas and New Mexico (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is not at the edge of the species' range (Figure 14, Figure 15).

Distribution, abundance, and trend in the plan area

Population

There is one occurrence record that occur in the Carrizo Unit within the Canyonland ecosystem (USFS 2005a). Hazlett (2004) indicates this species is not known to occur in the plan area but could occur in Otero County. Kuhn et al. (2011) describes the habitat as midgrass prairie.

Population abundance and trend for this species in the plan area is unknown.

Habitat

Buckley's beardtongue is a perennial forb species found in shortgrass prairie, 3500-4800 ft in elevation. NatureServe describes habitat as sandy soil, particularly dunes (NatureServe 2025). Flora of North America describe habitat as sandy soils, sandsage, or mixed grass prairies. It frequently is found on aeolian sands of dune fields associated with the major streams of the southern Great Plains; it also occurs on alluvial sands and sandstone-derived soils (Flora of North America 1993). Hazlett (2004) describes it as rocky: exposed limestone/shale barrens. Kuhn et al. (2011) describes habitat as midgrass prairie in the floristic inventory of Cimarron National Grassland and Comanche National Grassland.

In Colorado, Weber (2012) found the species is restricted to grasslands in southeasternmost counties. In the plan area, one herbarium record was found in Picture Canyon, Baca County within the Carrizo unit. The habitat was described as lush canyon with *Salix* dominated wet draw. Canyon rim is dominated by *juniperus*. Found in the shortgrass prairie.

The occurrence record is spatially mapped within the Canyonland ecosystem (USFS 2005a) and the Western Great Plains Shortgrass Prairie (Landfire 2024). The occurrence is adjacent to a well-developed dirt road. It is approximately 47 feet from the Picture Canyon picnic site where an examination of satellite imagery shows a proliferation of user-created trails, dispersed camping sites, and developed facilities between 1988 and present which represents a declining trend in habitat.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025). The one occurrence record is close to a road and a picnic site in Picture Canyon therefore there is potential for trampling from human activity in the area.

Habitat

Common threats to the habitat include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There was one occurrence record located within Western Great Plains Shortgrass Prairie (Landfire 2024). The occurrence record is within the Canyonland ecosystem on the Carrizo Unit (USFS 2005a).

Critical biological characteristics

Plants flower from May through June (Ackerfield 2022).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Buckley's beardtongue likely has special value to bumble bees (NPIN 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

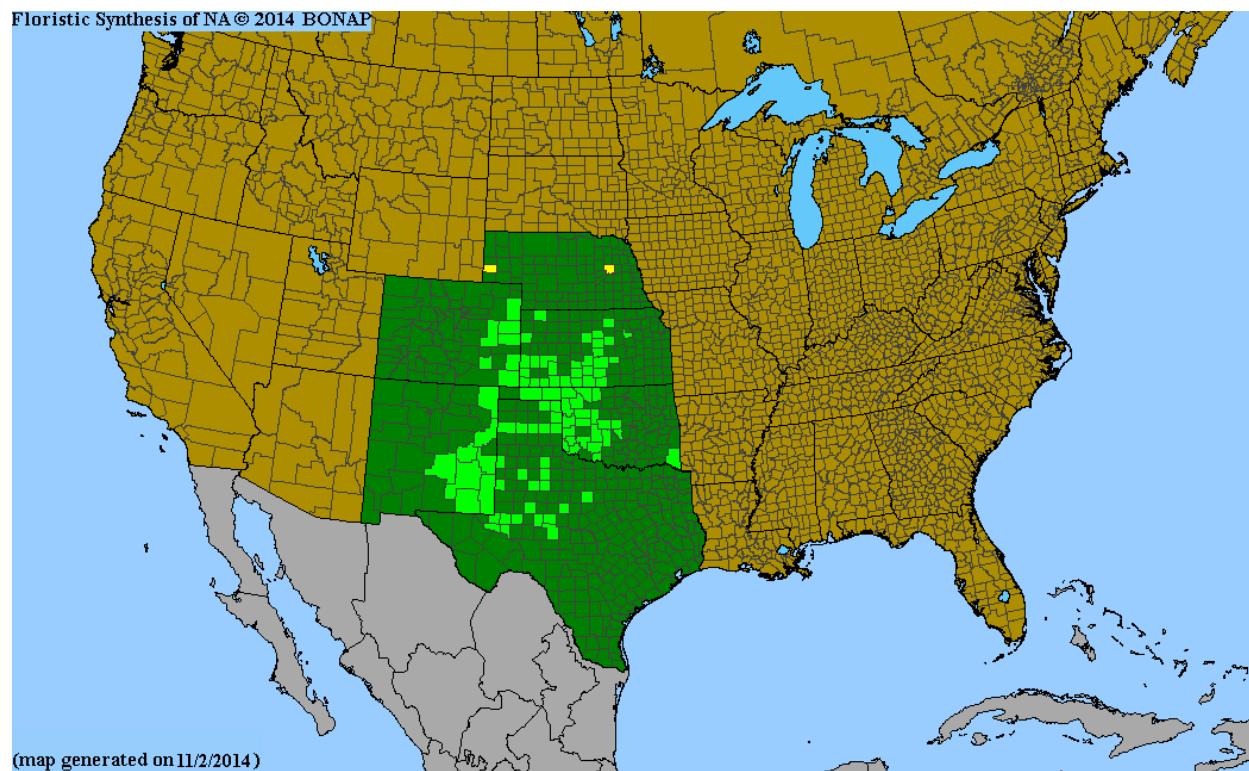


Figure 14. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

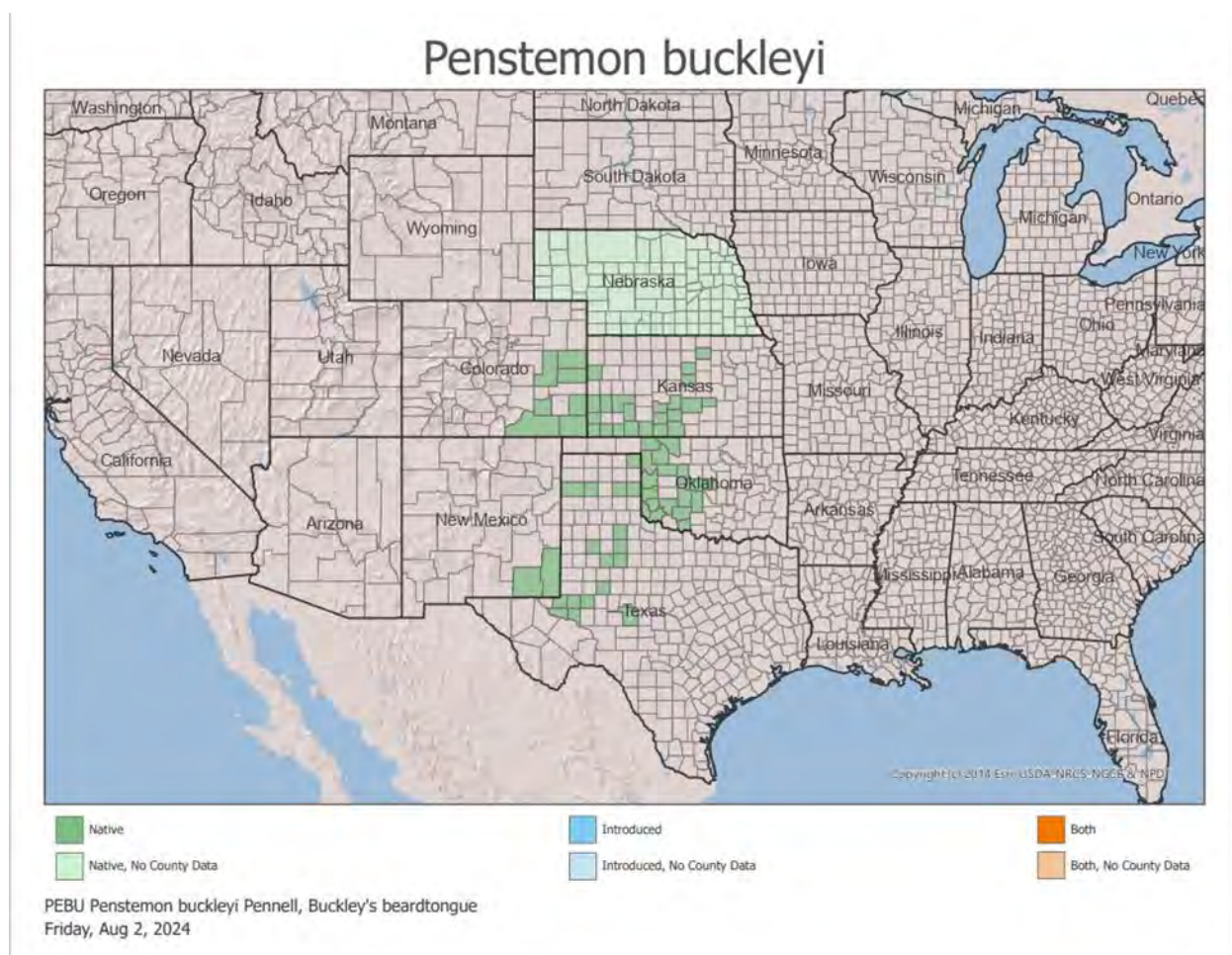


Figure 15. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

California amaranth

(*Amaranthus californicus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one documented occurrence on the Cimarron National Grassland (NG) from 1982 (Van Scoyoc 2024).

Year of Last Known Occurrence: 1982

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Livestock grazing and drought.
 - b. Habitat: Drought. Threats common in the habitat type (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trend in the plan area is unknown.
 - b. Habitat: Trends common in the playa habitat type (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There is one documented occurrence on the Cimarron NG. Population numbers are unknown.
 - b. Ecological conditions: Playas are restricted in the plan area total of 326 acres in plan area

Species Status

G4; S1 in Kansas.

Taxonomy

Amaranthus californicus (Moquin) S. Watson is accepted as valid (Flora of North America 1993, ITIS 2024, NRCS 2025, Weber et al. 2012). Synonyms include *Amaranthus albomarginatus* and *Amaranthus microphyllus* (NRCS 2025). Other common names associated with this species include Californian amaranth (Flora of North America 1993) and California pigweed (iNaturalist 2025, ITIS 2024).

Species range

Overall Species range

In North America, occurs in most western states including California, Idaho, Kansas, Montana, Nebraska, Nevada, Oregon, Texas, Utah, Washington, Wyoming, and two Canadian provinces (NatureServe 2025). The species has also been observed in Arizona, Colorado, New Mexico, and South Dakota (Van Scoyoc

2024). Weber (2012) report that California amaranth is “abundant on disturbed ground in the urbanized areas of the plains in eastern Larimar and Weld Counties.”

Description of how the population in the plan area fits within the overall range

The documented occurrence in the plan area is at the eastern edge of the species range (Figure 16).

Distribution, abundance, and trend in the plan area

Population

Very little is known about the population in the plan area on the Cimarron NG. Only one occurrence from 1982 was identified in the consulted sources from the plan area (Figure 16). The occurrence record gives no indication of the number of individuals. Plants may be under collected due to the annual lifecycle of California amaranth.

Habitat

Plants can be found in seasonally moist flats or near bodies of water (Flora of North America 1993). In addition, the Flora of North America (1993) and Weber (2012) report that California amaranth grows in waste places and on other disturbed ground.

The species has been documented only within the Cimarron NG portion of the plan area in Morton County, Kansas (Van Scoyoc 2024). The herbarium specimen notes that the plants were located on the edge of a dried pool (Van Scoyoc 2024). Riparian and wetland habitat is limited on the Cimarron NG (see Threats and Trends Appendix), although this species may not depend on riparian areas and rather grow in early successional environments with water availability. Disturbed areas in the plan area include roadside environments that are not subject to livestock grazing and stock ponds (Kuhn et al. 2011).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

California amaranth has a low tolerance for drought (NRCS 2025) and projected climatic conditions are likely to increase periods of drought.

Habitat

Climate stressors are likely to negatively influence the persistence and abundance of riparian wetland areas. Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

California amaranth is listed on the National Wetland Plant List as a Facultative Wetland species (Lichvar et al. 2016) that usually occurs in riparian wetland habitat (CalFlora 2024). The species is intolerant of shade (NRCS 2025) and shows an opportunistic ability to inhabit open disturbed areas.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Riparian and wetland habitat is limited in the semi-arid grasslands (Kuhn et al. 2011) and limited in the plan area (Hazlett 2004).

Critical biological characteristics

California amaranth is a prostrate annual plant in the pigweed family (Amaranth). As annuals, the plants produce an abundance of seeds and reproduce only by seed (NRCS 2025). Plants grow 4 to 20 inches in size (iNaturalist 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown from the consulted sources. As an annual plant, this species may show an ability to colonize early seral environments providing cover and diversity.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Species is vulnerable to drought and wildfire and has moderate palatability for grazing animals (NRCS 2025).

Maps of Species Range

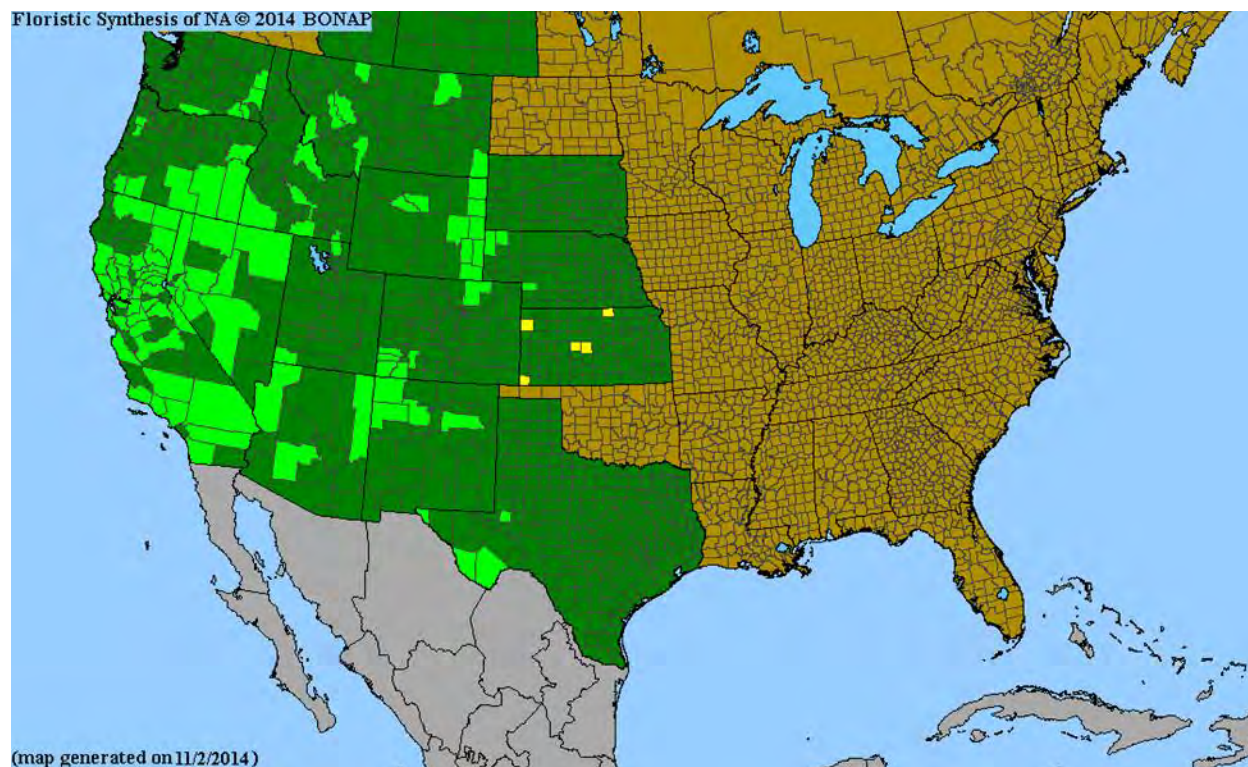


Figure 16. County occurrence data from Biota of North America Program (2014). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

California crabgrass

(Digitaria californica)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: SEINet contains one occurrence record in the plan area from 2003 (Van Scoyoc 2024). The locality description states, "Comanche National Grassland: at and ca 0.5 mi S of Picture Canyon Picnic Area, ca 10.5 mi SW of Campo and ca 1 mi N of Oklahoma."

Year of Last Known Occurrence: 2003

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Competition with non-native grasses.
 - b. Habitat: Threats common in the varied habitat types (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trend in the plan area is unknown.
 - b. Habitat: Species uses varied, well-draining habitats; no discernable trend. Trends common in the habitat type (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There is one documented occurrence on the Comanche NG. Population numbers are unknown.
 - b. Ecological conditions: Unshaded, well-draining habitats are abundant and well-distributed across in the plan area.

Species Status

G5; S2 in Colorado.

Taxonomy

Digitaria californica is accepted as valid (Ackerfield 2022, NRCS 2025, Weber et al. 2012). A taxonomic synonym is *Trichachne californica* and another common name is Arizona cottontop (NRCS 2025).

Species range

Overall Species range

California crabgrass is distributed in southern California, west through all of Arizona, New Mexico, southern Colorado, Texas, and southern Oklahoma; south through Mexico to south America (Van Scoyoc

2024). Weber (2012) cite this grass as a Chihuahuan species at the northern edge of its range in southeastern Colorado.

Description of how the population in the plan area fits within the overall range

The occurrence in the plan area is at the northern edge of the species' range (Figure 17, Figure 18).

Distribution, abundance, and trend in the plan area

Population

Within the plan area, the population size and trend in the plan area is not known. The occurrence record from the Comanche National Grassland gives no indication of the number of individuals.

Habitat

Across its range, California crabgrass grows in open, well-drained soils, often on steep, rocky slopes, at elevations from 1,000-6,000 feet (Van Scoyoc 2024). It is a component of the mixed grass prairie (Kuhn et al. 2011). Hazlett (2004) classifies its primary habitat as wetland and riparian, but it can occupy a broader range of well-drained habitats, including hillsides, rocky slopes, arroyos, canyons and dry mesas (Thomas 2021).

In Colorado, the grass can be found growing on mesa tops and dry, rocky ridges from 4000 to 6000 feet in elevation (Ackerfield 2022). The species has been documented only within the Comanche National Grassland portion of the plan area in Colorado (Figure 17, Figure 18). The occurrence record from 2003 describes its habitat as "Sandstone bluffs, cliffs, and riparian; sandy soil." It grows on a variety of soils from clay loam to sandy loam but grows best on gravelly and sandy loam soils (Thomas 2021).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

California crabgrass may be outcompeted by invasive species. Populations of California crabgrass have declined concomitant with the spread of introduced, non-native Lehmann lovegrass (*Eragrostis lehmanniana*) in Arizona (Cox et al. 1992). There is speculation that California crabgrass is more palatable than Lehmann lovegrass, and preferential livestock grazing has caused the replacement of California crabgrass with Lehmann lovegrass but there is no data to support this hypothesis (Cox et al. 1992). California crabgrass is highly palatable to grazing animals (NRCS 2025), but the species is generally tolerant to heavy grazing over long periods of time (Thomas 2021).

Habitat

Consulted sources did not identify any specific threats to habitat (Cox et al. 1992, Thomas 2021, NRCS 2025, Van Scoyoc 2024). Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

This species is adapted to low rainfall and high temperature environments and requires well-draining soils (Thomas 2021). It uses coarse- and medium-textured soils (Thomas 2021). It is intolerant of shade, low moisture use, and high drought tolerance (Thomas 2021). It can regrow during wet years after periods of drought and after fire (Thomas 2021).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Unshaded, open habitats with well-drained soils are abundant and well-distributed across the plan area.

Critical biological characteristics

California crabgrass is a long-lived perennial warm-season bunchgrass (Thomas 2021).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

California crabgrass is highly palatable to grazing animals (NRCS 2025). It is grazed by cattle and horses, black-tailed jackrabbits, and other wildlife species including the javelina, scaled quail, mule deer, pronghorn antelope and desert cottontail (Thomas 2021). Since it is nearly evergreen, it works good as ground cover to prevent soil erosion (Thomas 2021).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Species has high drought tolerance and medium fire tolerance (NRCS 2025).

Maps of Species Range

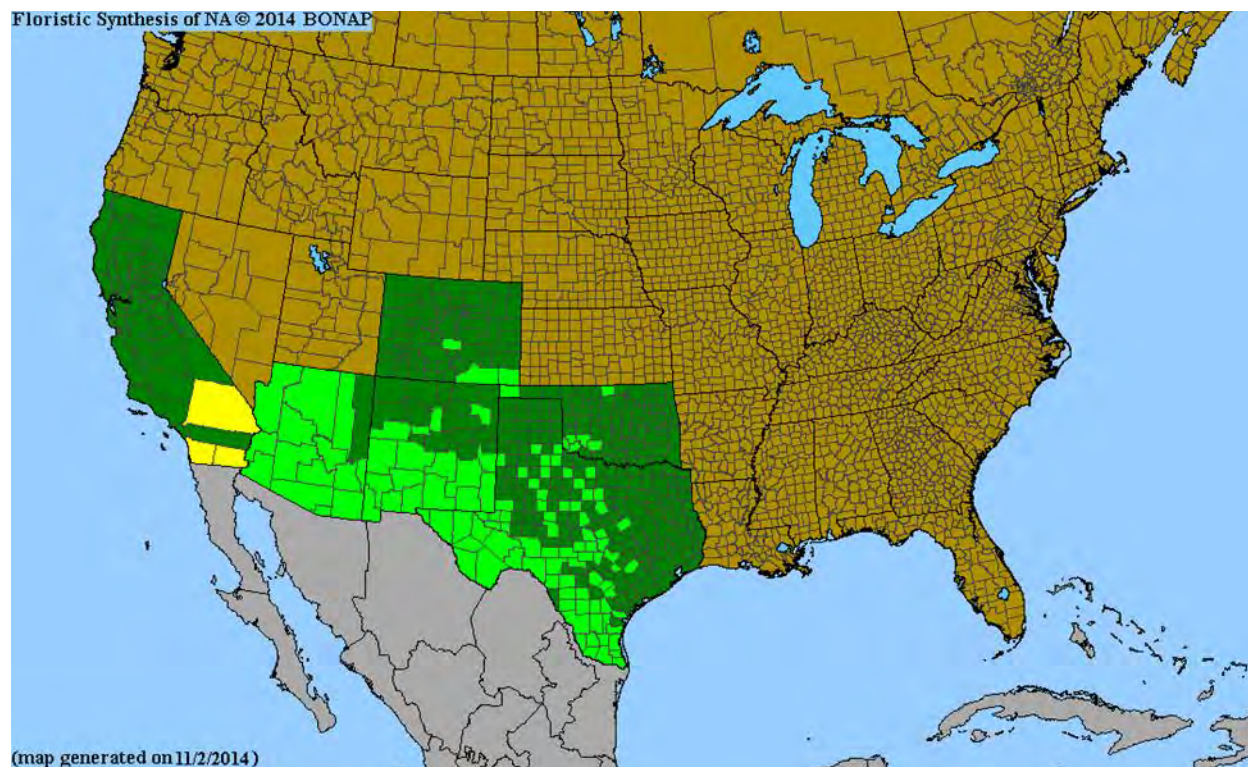
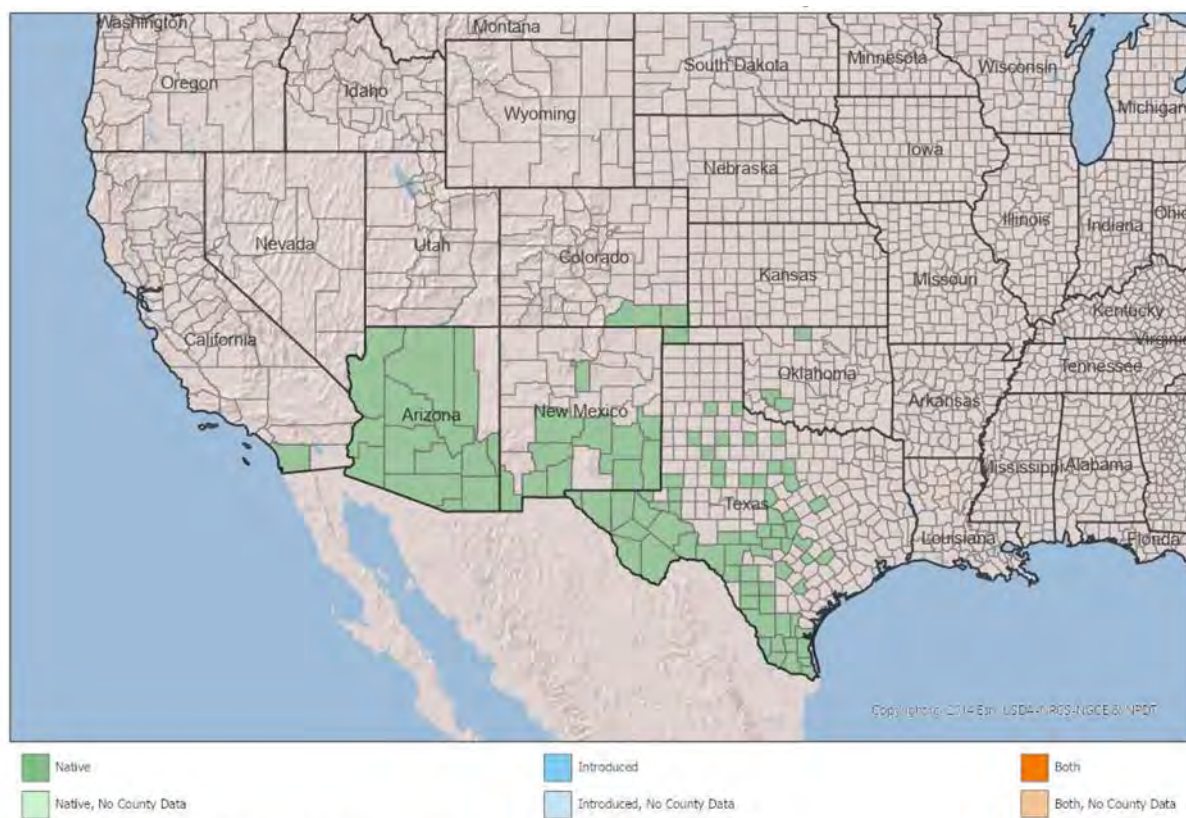


Figure 17. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.



DICA8 *Digitaria californica* (Benth.) Henr. Arizona cottontop
Monday, Sep 9, 2024

Figure 18. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Camphorweed goldenaster

(*Heterotheca subaxillaris*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has seven occurrence records in the plan area from 1951 to 2010 on the Cimarron and Comanche National Grasslands (Van Scoyoc 2024).

Year of Last Known Occurrence: 2010

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trends are unknown in the plan area.
 - b. Habitat: Varied dry, sandy habitats; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is not at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size is not known; one of the most abundant species in the sandsage prairie.
 - b. Ecological conditions: Uses varied dry habitats with sandy soils, including disturbed habitat, which are not restricted in the plan area.

Species Status

G5; S2 in Colorado; S5 in Kansas.

Taxonomy

USDA NRCS recognizes *Heterotheca subaxillaris* as valid with 11 taxonomic synonyms (NRCS 2025). NatureServe states: "*Heterotheca subaxillaris* is treated by Kartesz 1999 at the species level without recognition of infraspecific taxa; four varieties are sometimes recognized," (NatureServe 2025).

Species range

Overall Species range:

Camphorweed goldenaster is distributed from the southern half of the US, from California and Nevada, east to New York; south to central Mexico (Van Scoyoc 2024) (Figure 19, Figure 20).

Description of how the population in the plan area fits within the overall range:

The plan area is not at the edge of the species' range, endemic, or disjunct (Figure 19, Figure 20).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. It is considered rare in Baca County, Colorado, but not in Morton County, Kansas (Figure 20). Two records from the Cimarron National Grassland both describes species as “abundant”—one from 1972 and one from 2010. Rangeland analysis shows that this is one of the most abundant species in the sandsage prairie (in total cover) within the Cimarron Comanche National Grasslands (CCNG Rangeland Analysis Platform Trends 2024).

Habitat

Across its range, camphorweed goldenaster occurs in streams, ditches, fence-rows, and in disturbed soils at elevations from 1,000-5,500 ft (Van Scoyoc 2024). Within the plan area, it has been associated with midgrass prairie (Kuhn et al. 2011) and sandy soils (Hazlett 2004). Occurrence records have been distributed across the Carrizo Unit of the Comanche and the Cimarron. Records in and adjacent to the plan area have noted habitat including pasture and roadside habitat.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Olsen 1997, Johnson and Lincoln 2000, Hazlett 2004, Kuhn et al. 2011, Van Scoyoc 2024, NatureServe 2025).

Habitat

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Camphorweed goldenaster can use a variety of sandy habitat types (midgrass prairie, streams, ditches, fence-rows, roadsides, etc.) (Hazlett 2004, Kuhn et al. 2011, Van Scoyoc 2024). Camphorweed goldenaster is pollinated by both generalist and specialist pollinators and has no dependence on a specific type of pollinator (Olsen 1997).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Because this species can use varied dry habitats with sandy soils, including disturbed habitat (Hazlett 2004, Van Scoyoc 2024, Olsen 1997), its ecological conditions are not restricted in the plan area.

Critical biological characteristics

Camphorweed goldenaster is a taprooted, annual/biennial herb in the aster family (Asteraceae) (Johnson and Lincoln 2000, Van Scoyoc 2024). It is self-incompatible (Olsen 1997).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Camphorweed goldenaster is a minor food source for terrestrial birds (NRCS 2025). It is pollinated by both generalist foragers and specialist bees (Olsen 1997). It is considered a “weedy” species that is able to colonize recently disturbed or exposed habitats (Olsen 1997).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Greenhouse gas production elevates atmospheric carbon dioxide levels, which directly influences plants’ photosynthetic activity; Johnson and Lincoln (2000) found camphorweed goldenaster transitioned to earlier flowering and produced significantly more flower biomass under elevated carbon dioxide levels. They suggest that carbon dioxide enrichment has a positive effect on reproductive output of this species (Johnson and Lincoln 2000).

Maps of Species Range

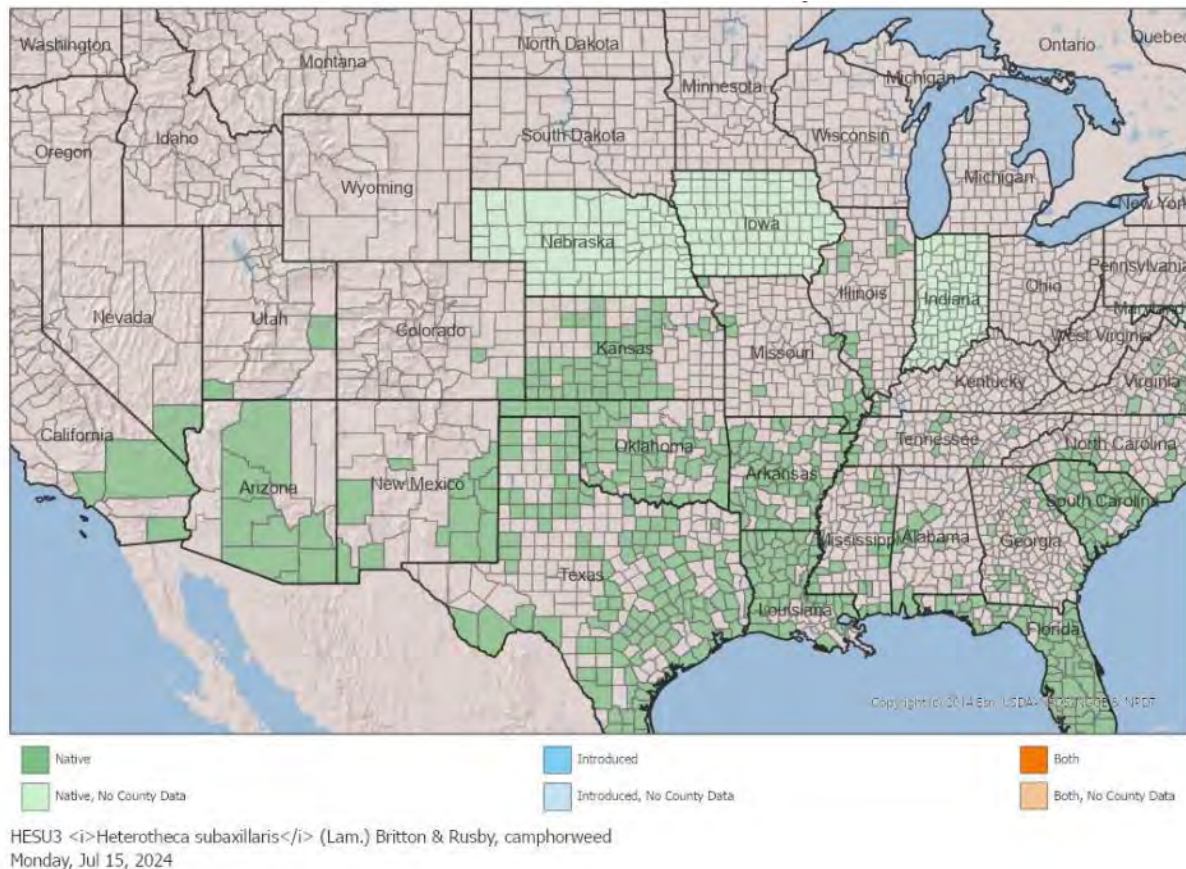


Figure 19. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

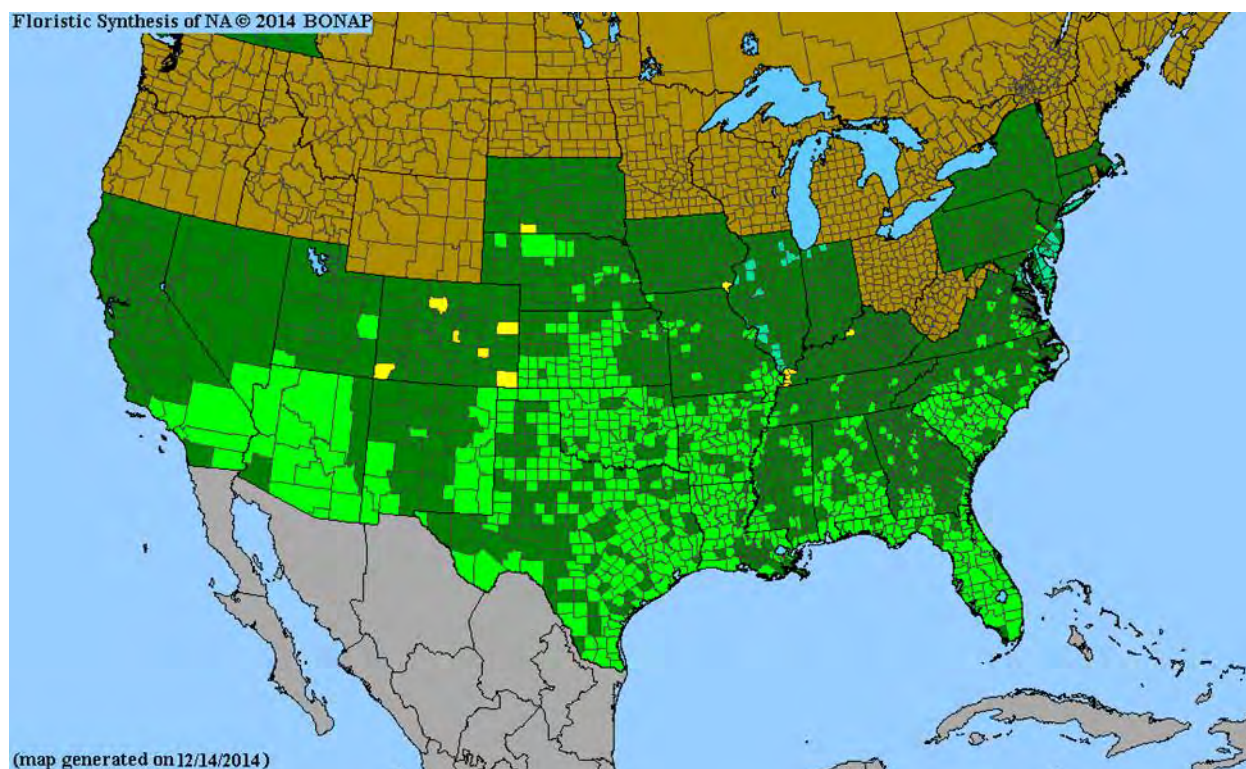


Figure 20. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Capulin goldenrod

(*Solidago capulinensis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: CNHP contains one occurrence polygon from 1949 that partially overlaps with the plan area (CNHP 2024, Van Scoyoc 2024). The Level 1 Occurrence Report (EO ID 17183) describes the locality as “Breaks of East Carrizo Creek, 5 mi SW of Kirkwell.” The Estimated Representation Accuracy is classified as Low, and the polygon overlaps NFS and private lands. There is not sufficient spatial precision with this record to determine that the species occurs in the plan area. Therefore, this species is not known to occur in the plan area.

Year of Last Known Occurrence: N/A

Species Status

G2; S1 in Colorado.

Taxonomy

USDA NRCS does not recognize *Solidago capulinensis* as valid, but no alternate taxonomy nor taxonomic synonyms could be found (NRCS 2025). This rare endemic plant is considered *Solidago capulinensis* by Colorado Natural Heritage Program (Grunau et al. 2011).

Cardinal-flower

(*Lobelia cardinalis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has six occurrence records in the plan area from 1961-2023 (Van Scoyoc 2024). Additionally, CNHP has one occurrence polygon from 2011 (CNHP 2024, Van Scoyoc 2024). Some of these records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: climate stressors, drought, and groundwater depletion.
 - b. Habitat: climate stressors, drought, and groundwater depletion.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: riparian/wetland habitat in the plan area has declined.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is on the northern edge of the species range
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are seven occurrence records in the plan area. Population numbers are unknown.
 - b. Ecological conditions: riparian/wetland habitat is restricted in the plan area.

Species Status

G5; S2 in Colorado; S5 in Kansas.

Taxonomy

USDA NRCS recognizes *Lobelia cardinalis* as valid with nine taxonomic synonyms (NRCS 2025). NatureServe notes: "Several subspecies or varieties sometimes recognized (e.g., (Kartesz, 1994) checklist); in Kartesz 1999 floristic synthesis, no infrataxa recognized at all in this widespread, variable species," (NatureServe 2025).

Species range

Overall Species range:

Cardinal-flower is distributed from California east to Quebec and Florida; south to Panama (Van Scoyoc 2024) (Figure 21, Figure 22).

Description of how the population in the plan area fits within the overall range:

Occurrences in the plan area are at the northern edge of the species range (Figure 21, Figure 22).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. One record from the Comanche National Grassland in 2023 describes species as “Estimated frequency within viewshed: Frequent (11-100).” Other occurrence records do not give an indication of the number of individuals. It is considered rare in Baca and Las Animas Counties, Colorado, but not in Morton County, Kansas (Figure 22). Lemly and Culver (2013, 2013) characterize it as “uncommon” in wet meadows, floodplains and seeps on the Eastern Slope of Colorado.

Habitat

Across its range, cardinal-flower occurs in moist soils, especially along streams at elevations from 3,000-7,000 ft (Van Scoyoc 2024). Within the plan area, it has been associated with wetland/riparian habitats (Hazlett 2004, Kuhn et al. 2011). Occurrence records have been distributed across the Carrizo Unit of the Comanche and the Cimarron. Records in the plan area have noted habitat including a permanent spring-fed creek in Picture Canyon and in sandy loam soil along Carrizo Creek.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Climate stressors, drought, and groundwater depletion are considered threats to this species because xeric conditions reduce its fitness (Caruso et al. 2006).

Habitat

Drought and groundwater depletion are considered threats to this species’ habitat because it depends on presence of wet soil (Caruso et al. 2006).

Threats common in aquatic habitat types (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Cardinal-flower is a Facultative Wetland species that usually occurs in wetlands but may also occur in non-wetlands in the Great Plains region (Lichvar et al. 2016). It is adapted to medium-textured soils of medium fertility (NRCS 2025). It has medium drought tolerance, low fire tolerance, and is tolerant of shade (NRCS 2025). It can occur in varied habitats with wet soil, including ditches, on the borders of lakes and ponds, and woodlands (Van Scoyoc 2024). Pollinators are required for seed production, especially hummingbirds (Bartkowska and Johnston 2012).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Cardinal-flower exhibits relatively low ecological breadth, as it depends on habitats with high soil moisture, with a preference for standing water (Caruso et al. 2006). This species depends on riparian/wetland habitat, which are limited in the plan area (Hazlett 2004). Although the plan area has some playa lakes, wetlands, and constructed ponds, these features are typically small and rare (see Threats and Trends Appendix). Riparian habitat is relatively limited in the plan area (see Threats and Trends Appendix); therefore, habitat is considered restricted for this species.

Critical biological characteristics

Cardinal-flower is a short-lived herbaceous perennial plant (Bartkowska and Johnston 2012, Van Scoyoc 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Cardinal-flower is moderately palatable to both browsing and grazing animals and is considered a minor food source for terrestrial birds and is normally pollinated by hummingbirds (NRCS 2025). It is consumed by several insects including weevil larvae, caterpillars, and slugs (Bartkowska and Johnston 2012).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Cardinal-flower is highly dependent on soil water availability and its fitness greatly declines under drought (Caruso et al. 2006).

Maps of Species Range

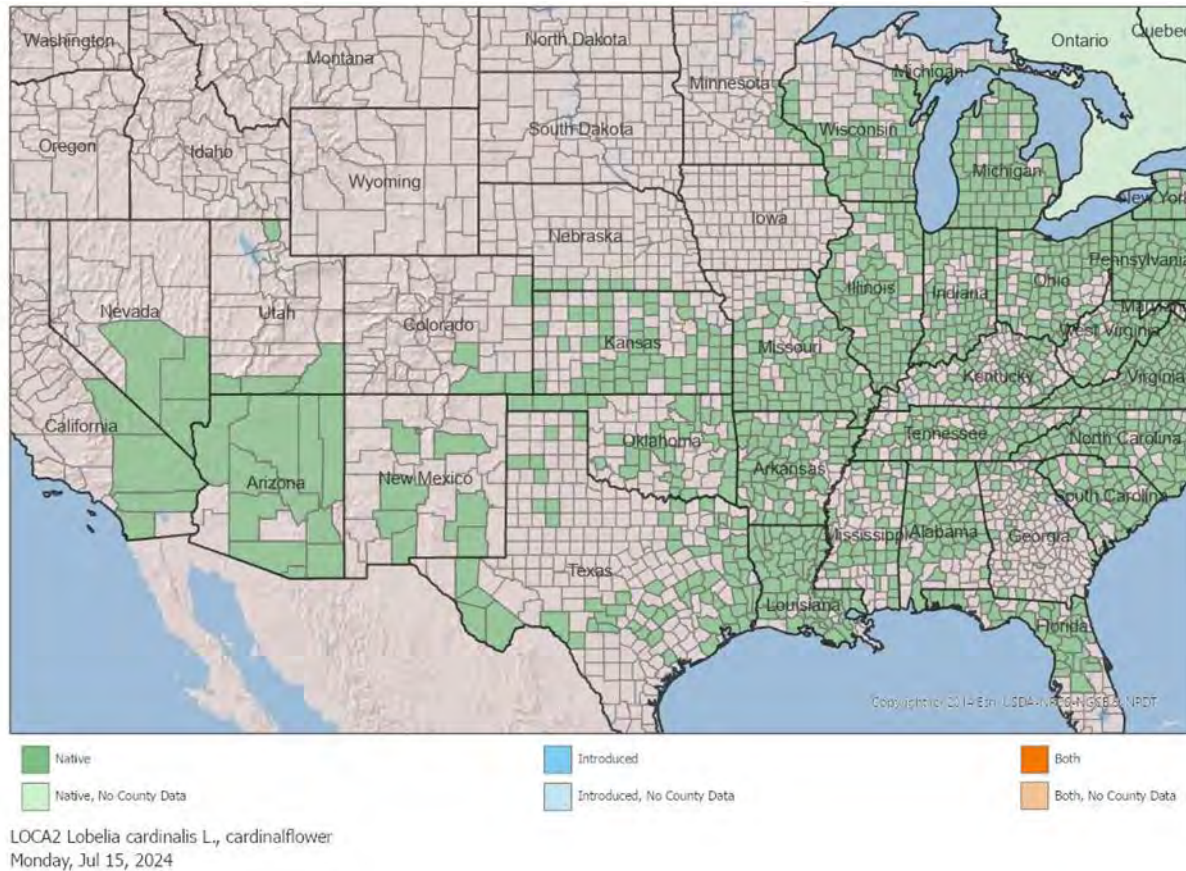


Figure 21. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

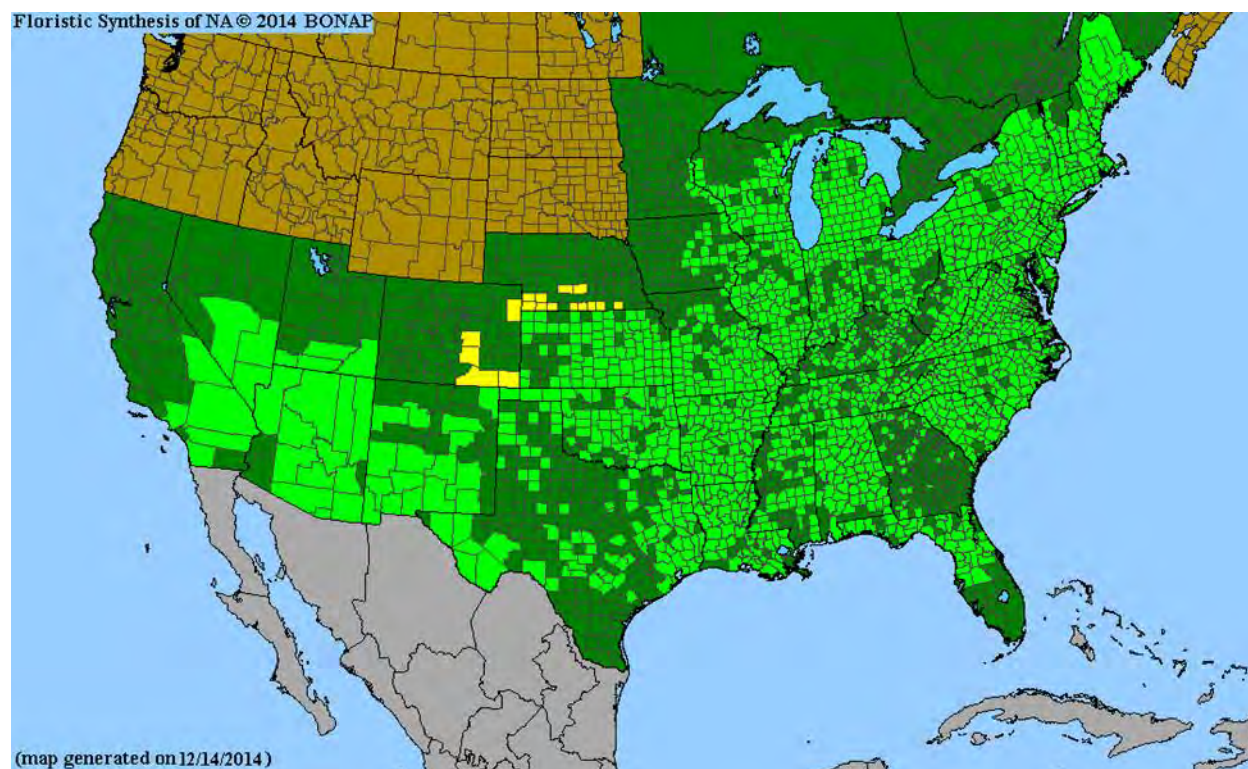


Figure 22. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Chickasaw plum (*Prunus angustifolia*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has four occurrence records in the plan area from 1991 - 2008 (Van Scoyoc 2024). Additionally, CNHP has three occurrence polygons from 2008 (CNHP 2024, Van Scoyoc 2024). Some of these records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2008

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: management of road rights-of-way could be a potential threat.
 - b. Habitat: management of road rights-of-way could be a potential threat.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: varied habitats; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the western edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; seven occurrence records, one of which describes species as common.
 - b. Ecological conditions: uses varied habitat types with dry, sandy soils (roadsides, rocky upland prairie, shortgrass prairie, sand-sage prairie), which collectively are not restricted in the plan area.

Species Status

G5; S1 in Colorado; S5 in Kansas.

Taxonomy

USDA NRCS recognizes *Prunus angustifolia* as valid (NRCS 2025).

Species range

Overall Species range:

Chickasaw plum is distributed chiefly from Virginia to Florida, west to Kansas and Texas, but also irregularly to southern New Jersey, southern Oklahoma, Indiana, Illinois, and Nebraska (Van Scoyoc 2024).

Description of how the population in the plan area fits within the overall range:

The plan area is at the western edge of the species' range (Figure 23, Figure 24).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. CNHP records give no indication of the number of individuals observed (CNHP 2024). One record from the Cimarron National Grassland from 2006 describes species as "common, thicket-forming shrub." Other occurrence records do not give an indication of the number of individuals, but just describe thickets of the species along roadsides, etc. It is considered rare in all three counties that overlap the Comanche portion of the plan area, but is not rare in Morton County, Kansas that overlaps the Cimarron National Grassland (Figure 24).

Habitat

Across its range, chickasaw plum occurs in sandy or sterile soil, open woods, thickets, and fence-rows (Van Scoyoc 2024). Within the plan area, it has been associated with roadside habitat, rocky upland prairie, shortgrass prairie, sand-sage prairie (Kuhn et al. 2011), and shaded rocky canyons and ravines (Hazlett 2004). Occurrence records have been distributed across the Carrizo Unit of the Comanche and the Cimarron. One record from 2008 in the Comanche National Grassland notes it occurred in roadside ditches and *Robinia* thicket.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

One occurrence record from 2008 noted: "Evidence of threats and disturbance: site is flanking road. Predominant land use: road right of way." Management of road rights-of-way could be a potential threat to this species' habitat and its population.

Habitat

One occurrence record from 2008 noted: "Evidence of threats and disturbance: site is flanking road. Predominant land use: road right of way." Management of road rights-of-way could be a potential threat to this species' habitat and its population.

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Chickasaw plum can use a variety of habitat types—ranging from roadside ditches to sand-sage prairie (Kuhn et al. 2011). Observation records suggest a preference for dry, sandy soils. Chickasaw plum has medium moisture use, medium fire tolerance, and medium fertility requirements (NRCS 2025). It is intolerant of shade and salinity and is adapted to medium- and coarse-textured soils (NRCS 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Because this species can use such varied habitats, its ecological conditions are not restricted in the plan area.

Critical biological characteristics

Chickasaw plum is a long-lived thorny shrub or small tree (NRCS 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Chickasaw plum has some, low food value for large and small mammals; medium palatability to browsers; and low palatability to grazers (NRCS 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

The effects of changing climatic conditions on plant phenology have been documented across a wide range of taxa, including a related species *Prunus spinosa* (Cosmulescu et al. 2022).

Maps of Species Range

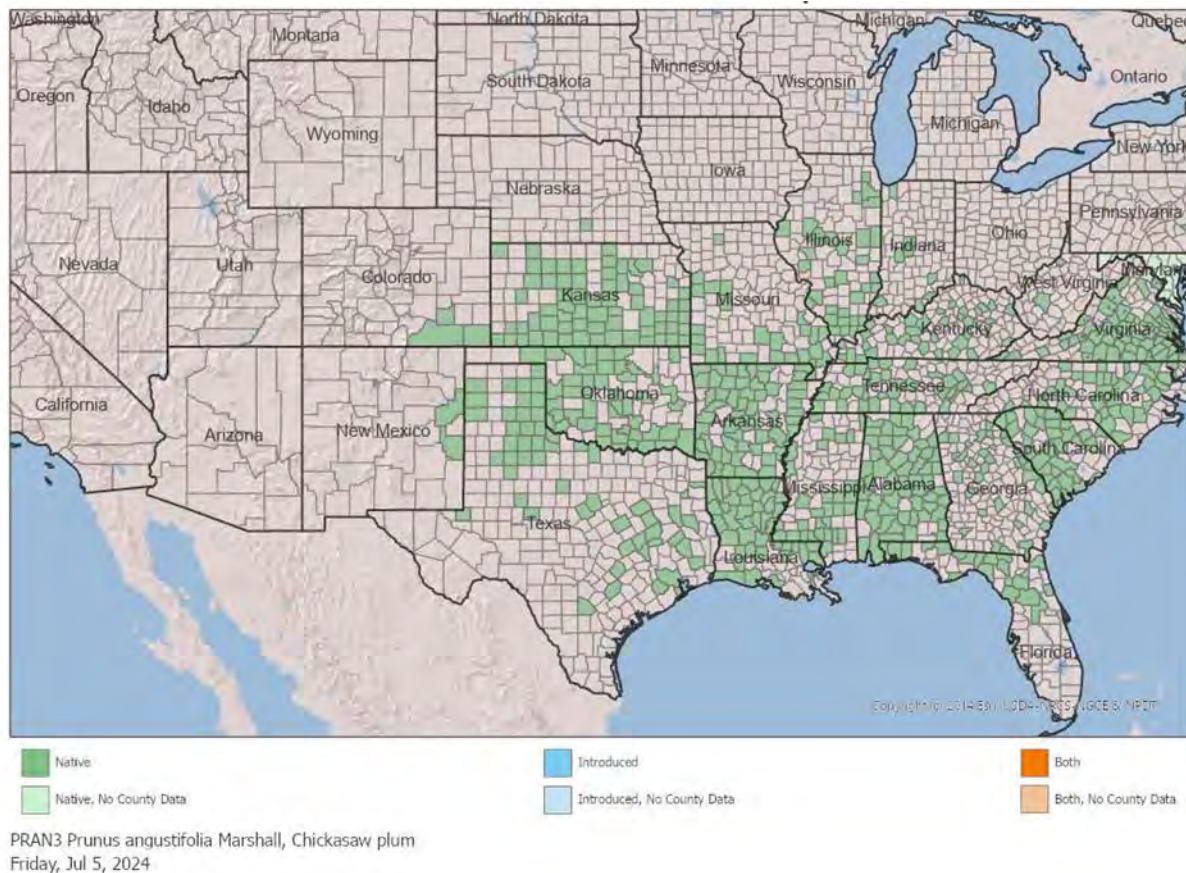


Figure 23. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

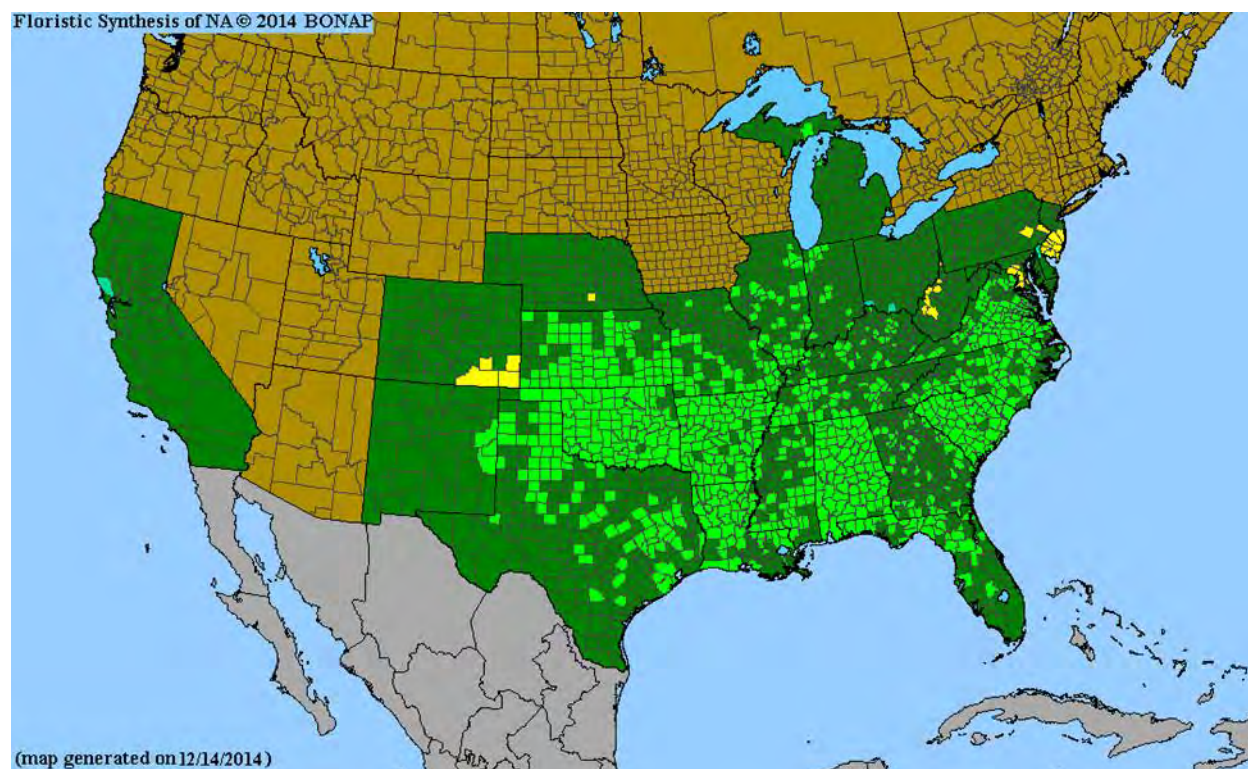


Figure 24. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Claspingleaf Venus'-looking-glass (*Triodanis perfoliata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are four documented occurrences on the Cimarron Comanche National Grasslands (CCNGs) from 2007 (Van Scoyoc 2024). Three collections were made on the Carrizo unit of the Comanche NG in Baca County, Colorado and one collection was made in on the Cimarron NG in Morton County, Kansas (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Unknown, grazing was documented in one occurrence record.
 - b. Habitat: Threats common in riparian habitats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trends in the plan area are unknown.
 - b. Habitat: Trends associated with riparian habitats (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The species' range is not restricted.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are four documented occurrences in the plan area. Population numbers are unknown.
 - b. Ecological conditions: Unknown, but likely to be restricted if plants in the plan area are dependent on wet seeps and riparian areas, as indicated in the collection records.

Species Status

G5; S2 in Colorado; S5 in Kansas.

Taxonomy

Triodanis perfoliata (L.) Nieuwl. is accepted as valid (Ackerfield 2022, NRCS 2025, Weber et al. 2012). Synonyms include *Legousia perfolioata*, *Specularia perfoliata*, *Triodanis perfoliata* var. *perfoliata* (NRCS 2025). Other common names include Venus's looking-glass (Weber et al. 2012).

Species range

Overall Species range

In North America, occurs in nearly every mainland state extending into Canada and Mexico (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The species' range is not restricted (Figure 25).

Distribution, abundance, and trend in the plan area

Population

There are four documented occurrences in the plan area (Van Scoyoc 2024) (Figure 25). The occurrence records give no indication of the number of individuals. Distribution, abundance and trend of populations in the plan area is unknown.

Habitat

Ackerfield (2022) lists habitat in Colorado as sandy or rocky soil of open places, often in disturbed or burned areas. Weber (2012) identify the species as "infrequent on the outwash mesas of the front range."

The collection on the Cimarron National Grassland in Morton County was along the Cimarron River and Turkey Trail. The habitat was listed as "mature open cottonwood forest with *Elymus* understory on sand and silt" (Van Scoyoc 2024).

Three collections were made in Baca County on the Comanche National Grassland (Van Scoyoc 2024). Two collections were made in Picture Canyon: 1) in a wet seep near the parking lot; and 2) "along salix-dominated wet seep. Shortgrass prairie with *Yucca* sp., *Opuntia* sp., and *Buchloe dactyloides*, grazed." The third collection was made in a side canyon of Holt Canyon with habitat described as a "narrow canyon with small riparian area."

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Livestock grazing may be a threat to populations.

Habitat

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

In the Great Plains, claspingleaf Venus'-looking-glass is listed as a Facultative species on the National Wetland Plant List (Lichvar et al. 2016).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Unknown.

Critical biological characteristics

Small annual herbaceous plant with purple flowers. Plants produce cleistogamous flowers with the ability to self-fertilize, even though the plants are still actively growing (Weber et al. 2012).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

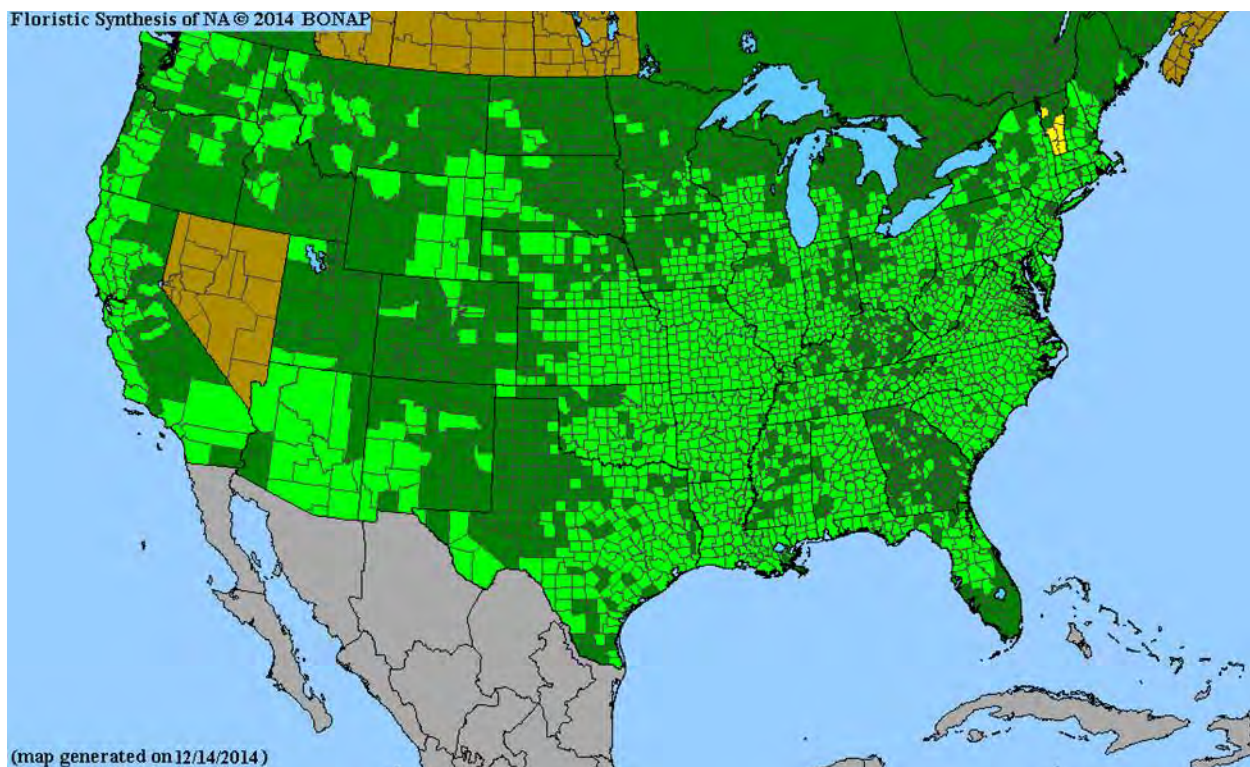


Figure 25. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Clustered broomrape (*Orobanche fasciculata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one documented occurrence on the Carrizo Unit of the Comanche National Grassland (NG) in 2007 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species.
 - b. Habitat: housing development in urban areas, altered native vegetation, habitat shifting and alteration, recreational activities, military exercises, livestock farming and ranching, oil and gas drilling, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend is unknown.
 - b. Habitat: Analysis of aerial imagery at the single known occurrence in the plan area shows that the P-J woodland where this collection was made remains stable.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is on the eastern edge of the species range
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known. There is one occurrence record within the plan area.
 - b. Ecological conditions: Pinyon juniper woodlands are spatially restricted in the plan area

Species Status

G4; SNR in Colorado; S1 in Kansas.

Taxonomy

Orobanche fasciculata is accepted as valid (NRCS 2025, ITIS 2024, NatureServe 2025). Ackerfield (2022) does recognize *Orobanche fasciculata* and refers to the species as *Aphyllon fasciculatum*. Synonyms include *Anoplangium fasciculatus*, *Aphyllon fasciculatum*, *Thalesia fasciculata*, *Thalesia lutea* *Orobanche fasciculata* var. *franciscana*, *Orobanche fasciculata* var. *lutea*, *Orobanche fasciculata* var. *subulate*, and *Orobanche fasciculata* var. *typica* (ITIS 2024).

Species range

Overall Species range

Clustered Broomrape occurs in 24 states including Alaska, Arizona, California, Colorado, Iowa, Idaho, Illinois, Indiana, Kansas, Michigan, Minnesota, Montana, North Dakota, Nebraska, New Mexico, Nevada, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wisconsin, and Wyoming, and six Canadian provinces (NatureServe 2025). Its range extent is widespread from Alaska to the Great Lakes region south to Texas and California. It is scattered throughout the western United States and southwestern Canada and is rare at the northwest and eastern edges of its range (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The population in the plan area is on the eastern edge of the species range (Figure 26, Figure 27).

Distribution, abundance, and trend in the plan area

Population

There is one occurrence record within the Carrizo Unit within the Shortgrass Prairie ecosystem (USFS 2005a). Hazlett (2004) indicates this species is known to occur in Otero County and could occur in eastern Las Animas County. Kuhn et al. (2011) has identified this species as occurring in Las Animas County.

Population and trend for this species in the plan area is unknown.

Habitat

Clustered Broomrape is an annual herb that occurs in sandy soils, prairies, and plains from 3400-9500 feet in elevation (Ackerfield 2022, Van Scoyoc 2024). Flora of North America (1993) describes habitat as sagebrush, chaparral, upland prairies, dunes, desert scrub, rocky slopes, hardwood and coniferous woodlands and forests, thickets, alpine meadows, roadsides, gardens. Hazlett (2004) describes the habitat as open steppe. Kuhn et al. (2011) describes habitat as pinyon juniper woodlands in the floristic inventory of Cimarron National Grassland and Comanche National Grassland.

There was one herbarium record found on the Carrizo Unit within the plan area. The locality is Las Animas County, Comanche National Grasslands. The occurrence record habitat is Pinyon-juniper with oak thickets and openings (Van Scoyoc 2024). The occurrence record is spatially mapped within the Southern Rocky Mountain Pinyon-Juniper Woodland.

Piñon-juniper is relatively limited in the plan area (see Threats and Trends Appendix). Juniper woodlands are restricted to the southwestern portion of the Comanche National Grassland (Kuhn et al. 2011), where there are extensive pinyon pine forests in Picketwire Canyon and the Kim area in Las Animas County.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025, Van Scoyoc 2024, Flora of North America 1993).

Habitat

Common threats include housing and urban areas, altered native vegetation, habitat shifting and alteration, recreational activities, military exercises, livestock farming and ranching, oil and gas drilling, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025, Flora of North America 1993). Species is an annual herb, usually parasitic forb that flowers May through August (Ackerfield 2022). Most references suggest that this species uses a broad range of hosts. However, there are four main genera of host plants: *Artemisia* (Asteraceae), *Phacelia* (Hydrophyllaceae), *Eriodictyon* (Namaceae), and *Eriogonum* (Polygonaceae) (Flora of North America 1993).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There is one herbarium record found in the Carrizo Unit within the plan area. The locality is Las Animas County, Comanche National Grasslands. The occurrence record habitat is Pinyon-juniper with oak thickets and openings (Van Scoyoc 2024). The occurrence record is spatially mapped within the Southern Rocky Mountain Pinyon-Juniper Woodland (Landfire 2024).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (NatureServe 2025, Ackerfield 2022). The plants are parasitic. Most references suggest that this species uses a broad range of hosts. However, there are four main genera of host plants: *Artemisia* (Asteraceae), *Phacelia* (Hydrophyllaceae), *Eriodictyon* (Namaceae), and *Eriogonum* (Polygonaceae) (Flora of North America 1993).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Plants are parasitic (Ackerfield 2022) and most references suggest that this species uses a broad range of hosts. However, there are four main genera of host plants: *Artemisia* (Asteraceae), *Phacelia*

(Hydrophyllaceae), *Eriodictyon* (Namaceae), and *Eriogonum* (Polygonaceae) (Flora of North America 1993).

Clustered broomrape is the host plant for the Variable Checkerspot Butterfly (Van Scoyoc 2024).

Ethnobotany: Roots eaten as a lung medicine, used for wounds, when on sweet sage (*Artemisia annua*-) it is used for cancer, it is poisonous to livestock, used to wash sores, used for sores as a poultice, as a life medicine, for birth injuries, hemorrhoids, the entire plant can be eaten, even roasted and eaten like a baked potato, raw or boiled (Van Scoyoc 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

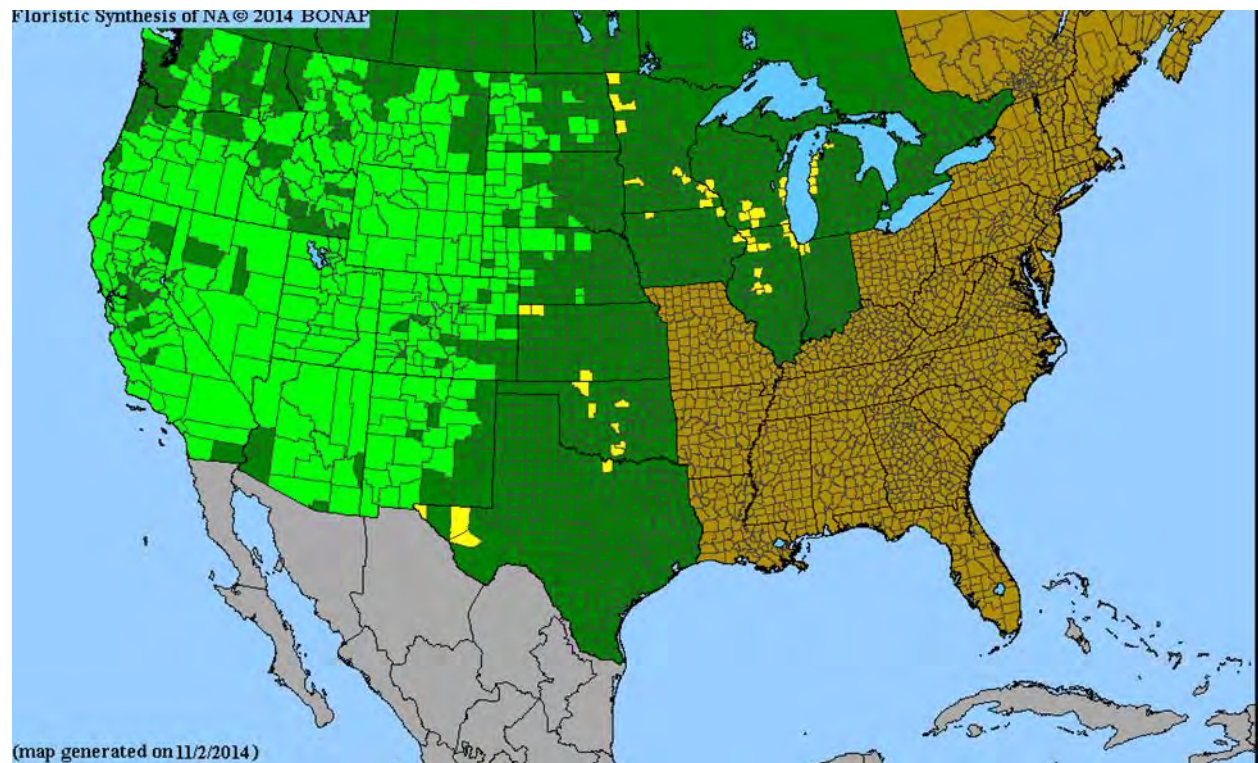


Figure 26. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

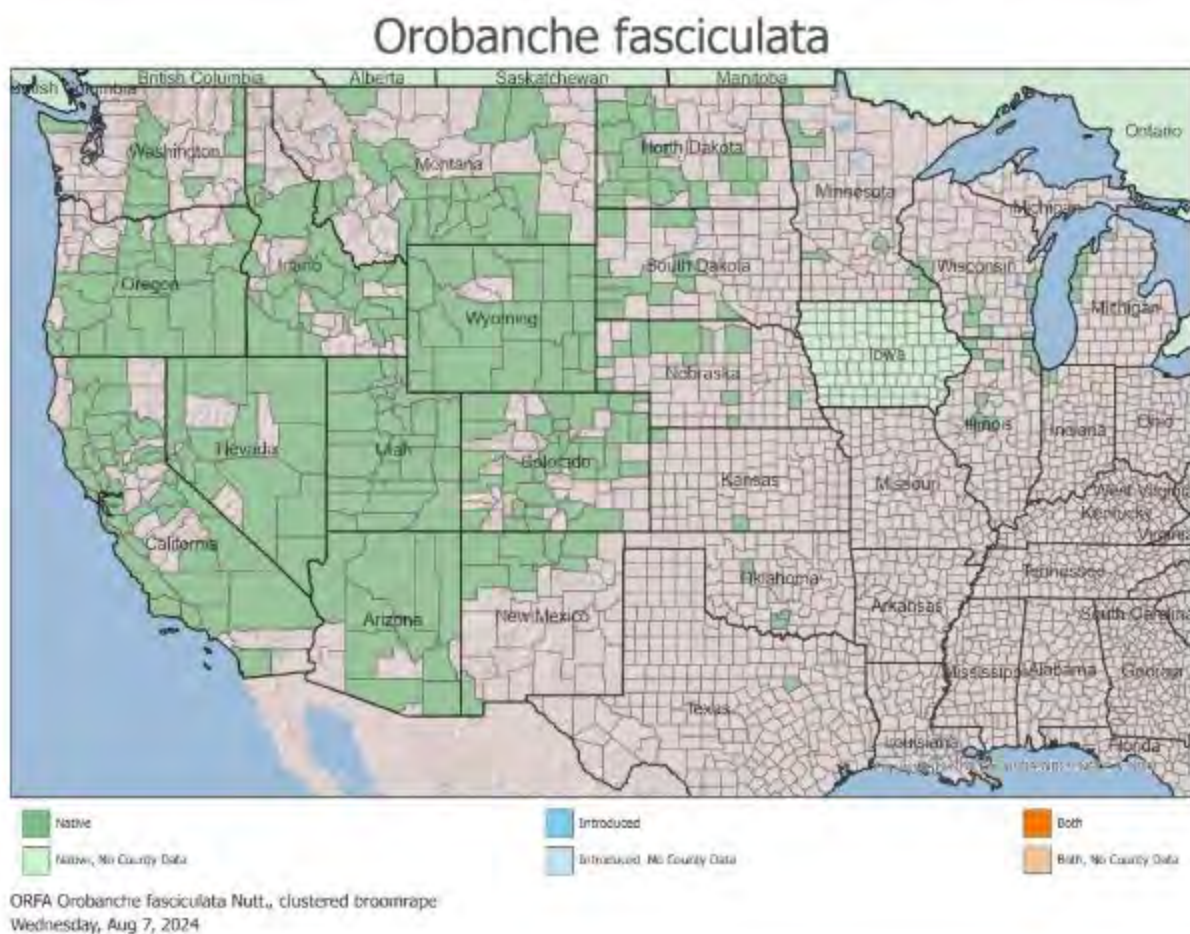


Figure 27. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Coastal sandbur (*Cenchrus spinifex*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: GBIF has one occurrence record from the Comanche National Grasslands in Picket Wire Canyonlands from 2021 (Van Scoyoc 2024). The species is an S1 in Kansas but is not shown as native to any of the plan area counties in USDA (Figure 28). It is native to North America, but outside of its native range is an invasive species that has spread widely in South America, Europe, Asia, Australia, and other regions (Cao et al. 2021). The species is easily spread by human activities and the single, recent occurrence in the plan area is in the Timpas Unit of the Comanche National Grassland in Colorado, where the species has no state ranking. Within the plan area, it was documented occurring on both sides of the Purgatorie River near Dinosaur track. Dinosaur tracks is a popular developed trail system where the species, a bur, could be easily introduced. There is considerable uncertainty whether this species is native to the plan area and Weber (2012) note that it is “alien” in Colorado. As a result, this species is determined to not meet the definition of native to the plan area and is not forward in analysis.

Year of Last Known Occurrence: 2021

Species Status

GNR; SNR in Colorado; S1 in Kansas.

Maps of Species Range

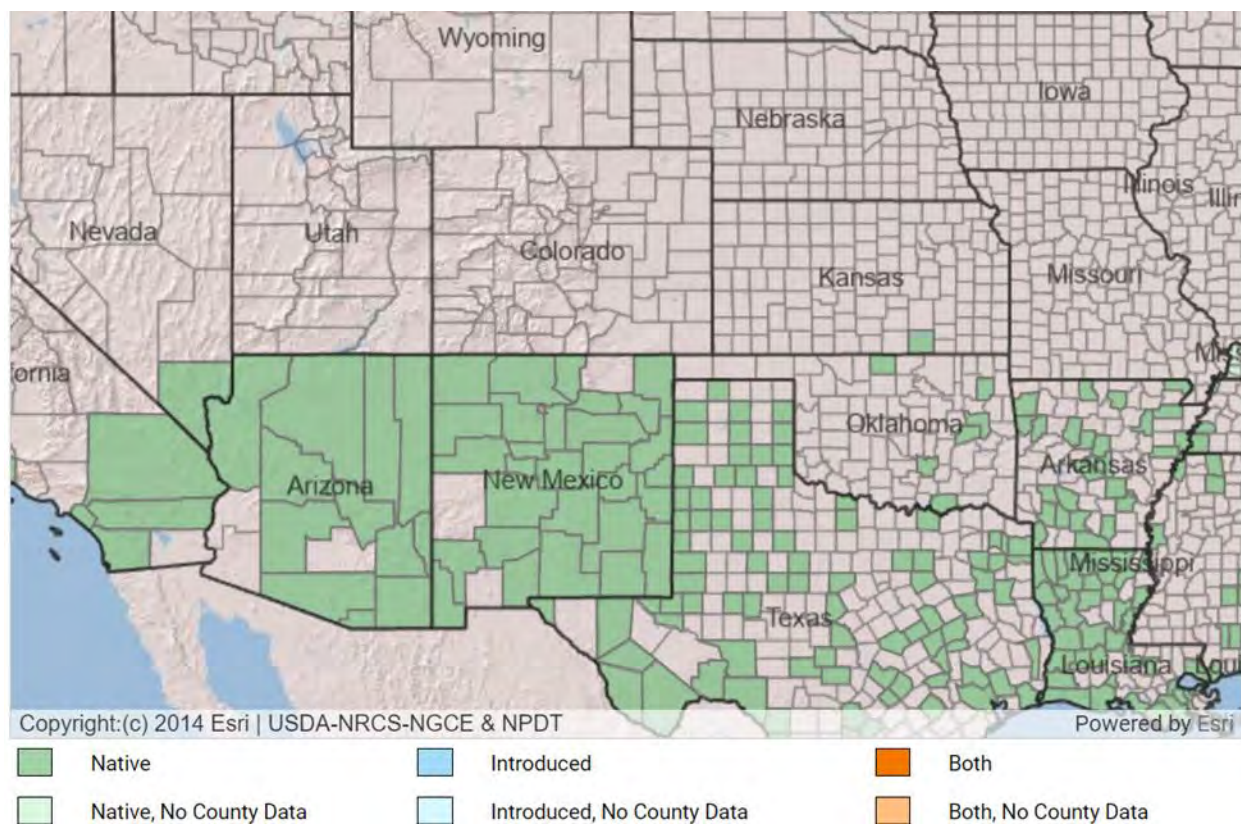


Figure 28. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Cobaea beardtongue

(*Penstemon cobaea*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one occurrence record on the Cimarron National Grassland (Van Scoyoc 2024). The spatial uncertainty of this location is 1,115 meters. This occurrence records is ~3 meters from the edge of the plan area. The herbarium record has the locality as Kansas, Morton, Elkhart; Cimarron National Grasslands. The habitat is described as grazed, upland, sandsage prairie; fairly level; sandy to sandy-silt soil.

Year of Last Known Occurrence: 1989

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species
 - b. Habitat: Current threats within the Cimarron unit include livestock grazing and oil and gas exploration that can influence vegetation patterns and species composition across the Grasslands (USFS 2005a).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: unknown
 - b. Habitat: The record in the plan area occurs in sandsage prairie which is declining in quality in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the western edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known. There is only one occurrence record in the plan area.
 - b. Ecological conditions: Ecological conditions do not appear restricted in the plan area.

Species Status

G4; S1 in Colorado; SNR in Kansas.

Taxonomy

Penstemon cobaea is accepted as valid (NRCS 2025, Ackerfield 2022).

Species range

Overall Species range

In North America, this species occurs in Arkansas, Arizona, Colorado, Iowa, Illinois, Kansas, Missouri, Nebraska, New Mexico, Ohio, Oklahoma, and Texas (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is at the western edge of the species' range (Figure 29, Figure 30).

Distribution, abundance, and trend in the plan area

Population

The one occurrence record is located on the Cimarron NG within the sandsage prairie ecosystem (USFS 2005a).

Distribution, abundance, and trend for this species in the plan area is unknown.

Habitat

Habitat is described as grasslands, prairie, perhaps not persisting, 4200-4500 ft elevation (Ackerfield 2022). Landry bird Johnson Wildflower Center describes it as sandy or rocky, open hillsides; limestone outcrops (NPIN 2025). The soil description is Calcareous or sandy loam. Rocky, Sandy, Limestone-based, Sandy Loam, Medium Loam, Clay Loam Clay.

The habitat described in the herbarium record is grazed, upland, sandsage prairie; fairly level; sandy to sandy-silt soil (USFS 2005a). The occurrence is spatially mapped within the Great Plains Comanchian Ruderal Grassland (Landfire 2024).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025).

Habitat

Current threats within the Cimarron unit include livestock grazing and oil and gas exploration that can influence vegetation patterns and species composition across the Grasslands (USFS 2005a).

The dominant spatially mapped ecological site is Sandy 16-22 PZ.

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Cobaea beardtongue performs best when grown in full or partial sun. Poor quality soils are no problem for this species; so long as the site is well-drained. Prolonged periods of drought in the heat of summer can signal this species to enter an early dormancy (Prairie Moon Nursery 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species is only known from one occurrence record in the Cimmaron Unit within the sandsage prairie ecosystem (USFS 2005a). The sandsage prairie ecosystem in the plan area has declined in habitat quality.

It was found within the Great Plains Comanchian Ruderal Grassland (Landfire 2024). The habitat conditions needed for this species can be found in other dominant vegetation types in the plan area. This species can persist in poor soil conditions (Prairie Moon Nursery 2024).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (Ackerfield 2022, NatureServe 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This penstemon attracts a variety of moths. Butterflies and hummingbirds. It is a larval host for the Dotted Checkerspot butterfly and has special value to native bees (recognized by pollination ecologists as attracting large numbers of native bees) (NPIN 2025).

Livestock, particularly sheep, readily consume new growth. The plant may be 2-3 yrs. old before producing blossoms (Haddock 2024b).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

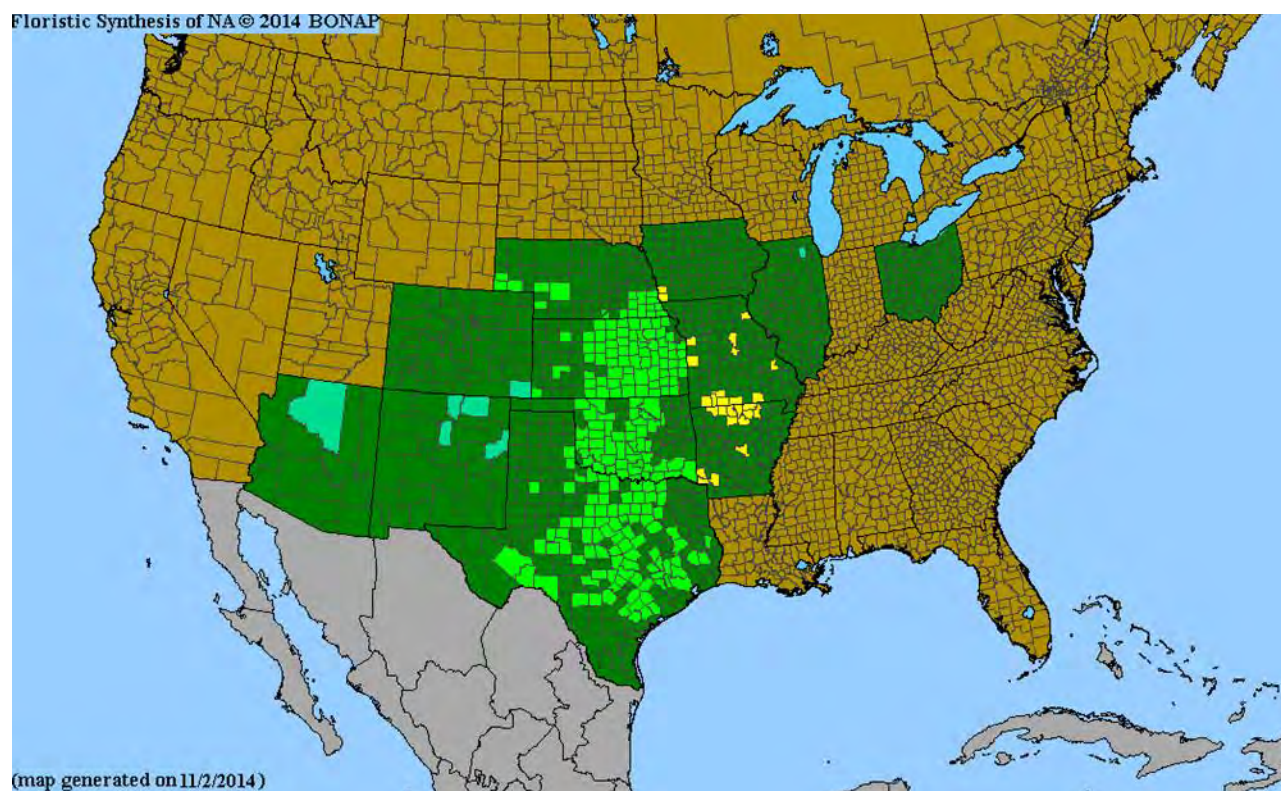


Figure 29. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

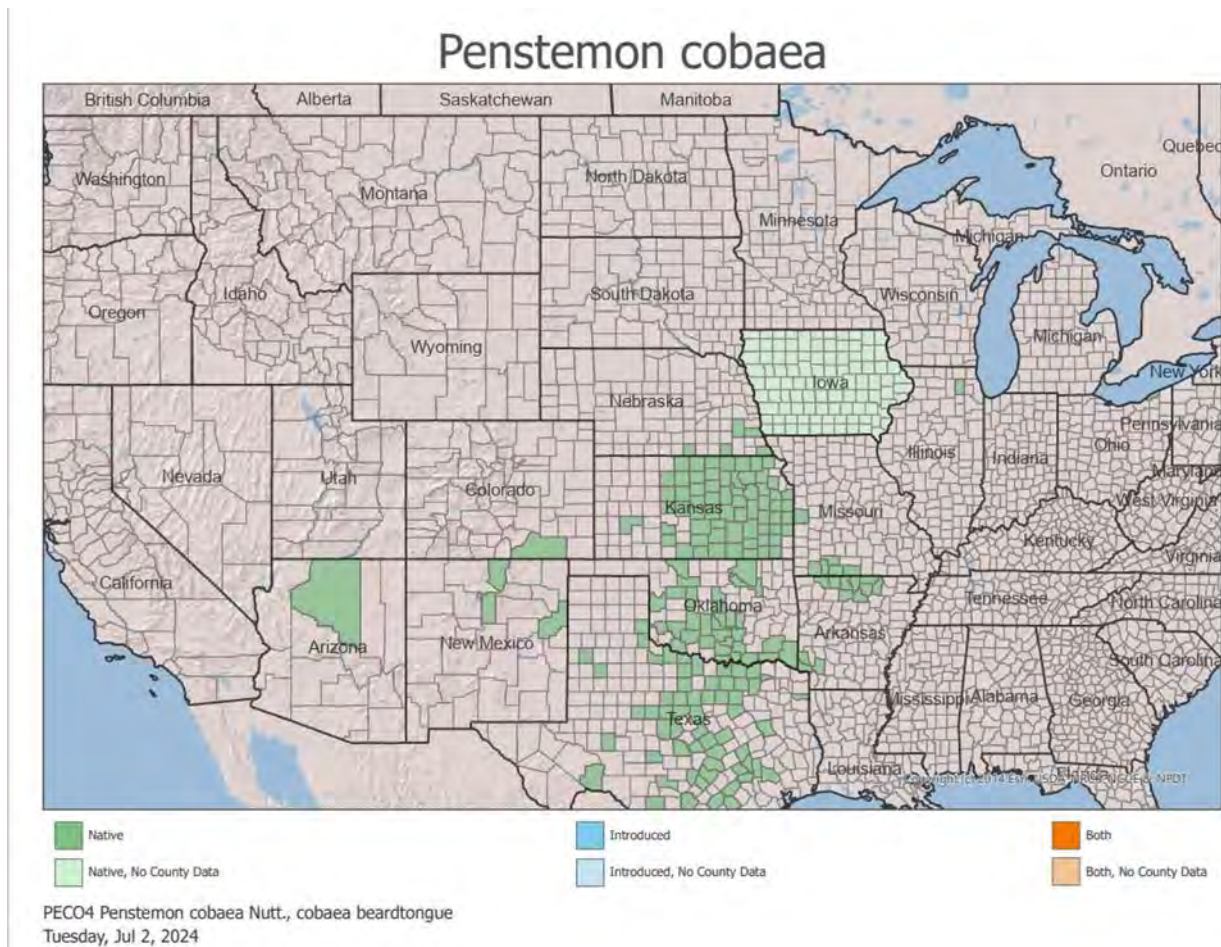


Figure 30. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Colorado gentian (*Frasera coloradensis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are approximately 15 occurrence records within the plan area (USFS 2005a).

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Livestock grazing duration and timing (NatureServe 2025).
 - b. Habitat: Habitat loss through road maintenance, herbicide application, and energy development (NatureServe 2025). Moderately threatened by agricultural and road management practices.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population is probably stable with some moderate historical declines related to agricultural practices
 - b. Habitat: Surface outcrop habitat trend is Likely relatively unchanged (USFS 2018) but the shortgrass prairie in the plan area has a declining trend in quality of habitat in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Colorado gentian is endemic to southeastern Colorado and restricted to a total range of 25 x 75 miles.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known. There are 15 occurrences in the plan area
 - b. Ecological conditions: This species probably has the most limited distribution of any plant endemic to the Great Plains (a floristic region comprised mostly of plants with wide distributions). It associated with surface outcrops or shallow-to-bedrock occurrences of Cretaceous rock formations, including Greenhorn limestone, Graneros shale, and Dakota sandstone. It is naturally rare because of limited habitat availability within its narrow geographic range (USFS 2018).

Species Status

G2; S2 in Colorado.

Taxonomy

Frasera coloradensis is accepted as valid (NRCS 2025, Ackerfield 2022). Synonyms for this species include *Swertia coloradensis* (NRCS 2025).

Species range

Overall Species range

Colorado Gentian is endemic to southeastern Colorado (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

Colorado Gentian is endemic to southeastern Colorado (Figure 31, Figure 32).

Distribution, abundance, and trend in the plan area

Population

There are ~15 occurrence records in the Carrizo Unit within the shortgrass prairie ecosystem (USFS 2005a).

Population is probably stable (USFS 2018).

Habitat

NatureServe identifies habitat as “low sandy/sandstone breaks in grasslands, northerly aspects in between rocks or just below them; shallow slopes. Associated with surface outcrops or shallow-to-bedrock occurrences of Cretaceous rock formations, including Greenhorn limestone, Graneros shale and Dakota sandstone. Plant community generally shortgrass prairie, mixed prairie breaks, or open pinyon-juniper woodlands. Substrate is the best indicator for locations of this species” (NatureServe 2025).

NatureServe notes “documented habitat less than 300 acres; potential undocumented habitat is estimated at about 1,000 acres. Total range is about 25 miles x 75 miles (estimated by the Colorado Natural Heritage Program in 2008). This species is known from four counties: Baca, Bent, Prowers, and Las Animas” (NatureServe 2025).

Habitat trend is likely relatively unchanged (USFS 2018). However, other analyses of the shortgrass prairie indicate a decline in the quality of habitat in the plan area.

Threats (arising from on or off the plan area)

Population

“Population is probably stable with some moderate historical declines related to agricultural practices (declines from agriculture are considered insignificant because...habitat is not ideally suited for agriculture)” (NatureServe 2025).

Habitat

NatureServe states “Nearly all the occurrences are on private or public land that is utilized for livestock grazing. Impacts from grazing vary by site, depending on timing and duration. There are some reports of inflorescences being browsed thus reducing reproduction, but others report the plants seem to tolerate grazing. Naumann 1991 reports that grazing probably doesn't frequently kill established plants except in cases of overgrazing. Road maintenance practices such as herbicide application, grading and ditching

cause direct damage to at least 20% of the occurrences. Additional habitat loss may occur from wind energy development (pers. comm. Don Hazlett 2014)” (NatureServe 2025).

Kuhn (2011) observed that livestock avoid *Frasera* when other forage is available but graze it before seed set if other forage becomes depleted.

Threats common for the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

This species probably has the most limited distribution of any plant endemic to the Great Plains (a floristic region comprised mostly of plants with wide distributions). It is associated with surface outcrops or shallow-to-bedrock occurrences of Cretaceous rock formations, including Greenhorn limestone, Graneros shale, and Dakota sandstone. It is naturally rare because of limited habitat availability within its narrow geographic range (USFS 2018).

“Substrate is the best indicator for locations of this species” (NatureServe 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Colorado gentian occurs on calcareous, rocky outcrops in 11 or so locations in Baca, Las Animas, Bent, Prowers, and Lincoln counties (Hazlett 2004). In the plan area, this species occurs in the Carrizo Unit of the Comanche NG.

Habitat trend is likely relatively unchanged (USFS 2018).

Critical biological characteristics

Ready colonization of roadcuts where appropriate substrate has been exposed suggests that habitat, rather than reproductive or dispersal capabilities, is a significant limiting factor (USFS 2018).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

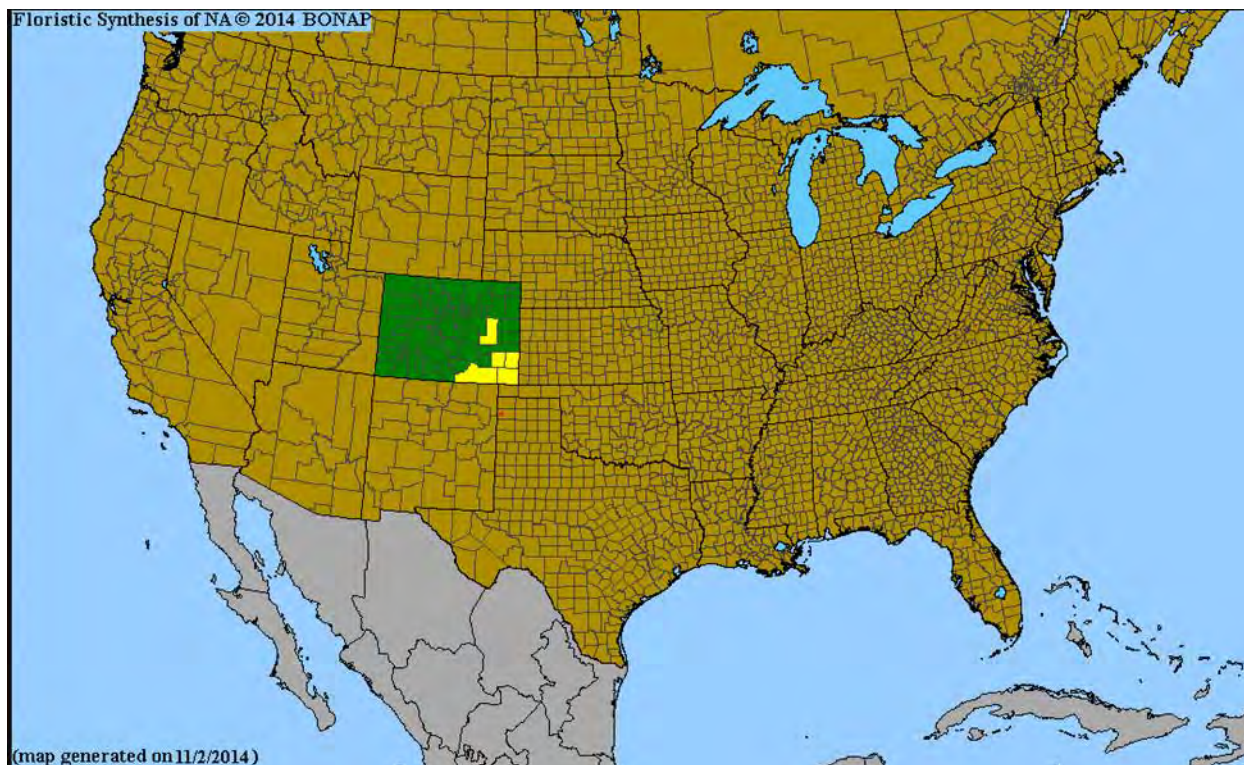
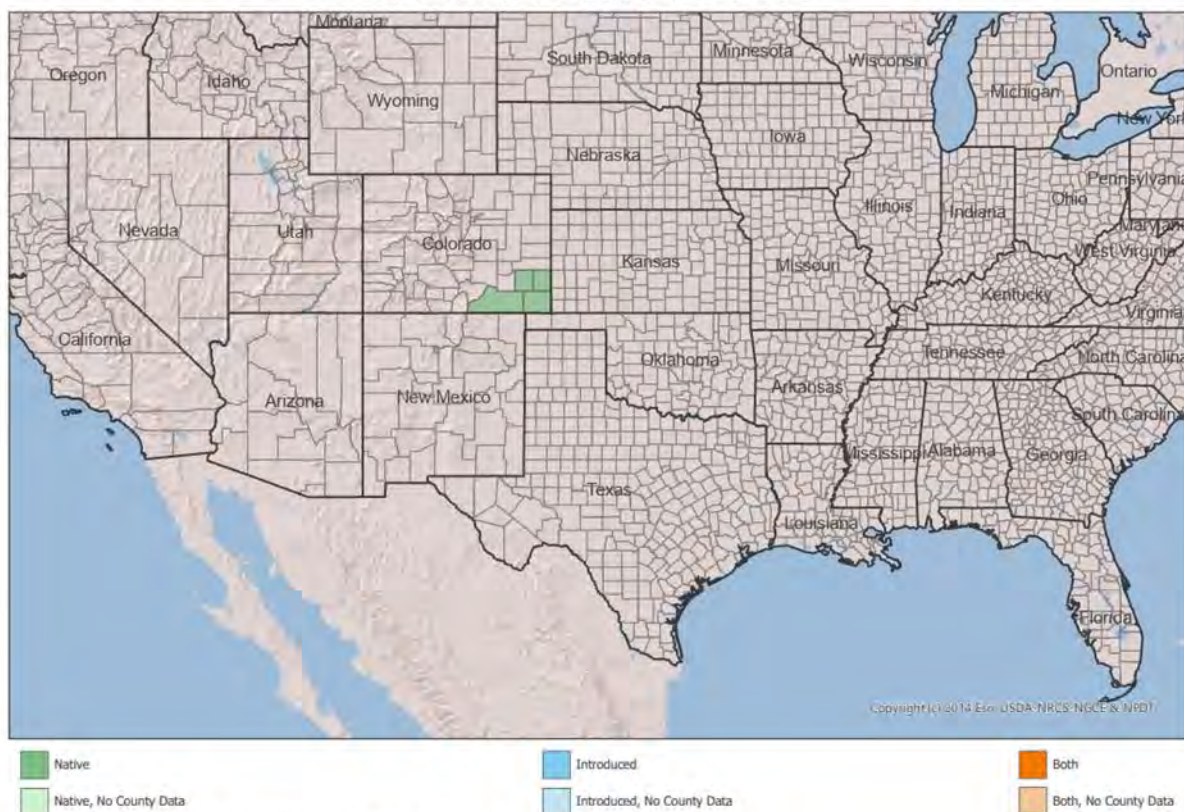


Figure 31. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Frasera coloradensis



FRC07 *Frasera coloradensis* (C.M. Rogers) D.M. Post, Colorado fraseria
Monday, Jul 8, 2024

Figure 32. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Comb-like evening-primrose (*Oenothera coronopifolia*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one occurrence record in the plan area (Van Scoyoc 2024). The other occurrence record has poor spatial precision and is not a reliable record of the species presence in the plan area.

Year of Last Known Occurrence: 2008

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025). The one occurrence record is close to a road, therefore there is potential for trampling or being driven over from human activity in the area.
 - b. Habitat: Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Unknown.
 - b. Habitat: Species uses habitat described in the plan area as shortgrass prairie, sandsage prairie, and juniper woodlands. Shortgrass prairie has a declining trend in quality in the plan area, sandsage prairie is declining in quality in the plan area, while juniper woodlands have increased in some parts of the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the eastern edge of the species range
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known. There was one spatial occurrence record within the plan area.
 - b. Ecological conditions: No sources consulted identified any ecological requirements needed for this species aside from general habitat needs which is not restricted in the plan area. It can persist in many different habitat types and can occur in disturbed locations.

Species Status

G5; SNR in Colorado; S2 in Kansas.

Taxonomy

Oenothera coronopifolia is accepted as valid (NRCS 2025, Ackerfield 2022, NatureServe 2025). Recognized synonym is *Anogra coronopifolia* (NRCS 2025).

Species range

Overall Species range

Comb-like Evening-primrose distribution is Arizona, Colorado, Kansas, Nebraska, New Mexico, South Dakota, Utah, and Wyoming (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is at the eastern edge of the species' range (Figure 33, Figure 34).

Distribution, abundance, and trend in the plan area

Population

There is one spatial occurrence record that occurs in Las Animas County in the Carrizo Unit within the Sandsage ecosystem (USFS 2005a). Hazlett (2004) indicates this species is known to occur in Baca County. Kuhn (2011) describes it occurring in Otero County.

Global abundance for this species is frequent to locally common (NatureServe 2025).

Population trend for this species in the plan area is unknown.

Habitat

Comb-like Evening-primrose is a perennial forb species found on dry slopes, sandy soil, disturbed areas, shortgrass prairie, 3500 - 9700 ft in elevation. Flowers May through August (Ackerfield 2022).

NatureServe describes habitat as sagebrush, mountain brush, pinyon-juniper, Douglas pine, ponderosa pine, lodgepole pine, and aspen communities at 2135-2810 m., sandy to rocky prairies, open woodlands (NatureServe 2025). Hazlett describes habitat as rocky, exposed limestone/shale barens, and sandy soils. Kuhn (2011) describes habitat as juniper woodland and shortgrass prairie in his floristic inventory of Cimarron National Grassland and Comanche National Grassland. Observation was in Otero County.

There is one herbarium record found in in the Comanche National Grassland in Las Animas County. It was located in shortgrass prairie.

The occurrence record is spatially mapped within the Sandsage ecosystem (USFS 2005a) and the Western Great Plains Shortgrass Prairie (Landfire 2024). The occurrence is adjacent to a road.

The shortgrass prairie ecosystem has a present declining trend in the quality of that habitat in the plan area, the sandsage prairie has a declining trend in the quality of the habitat in the plan area, and the juniper woodland habitat in the plan area is increasing in spatial extent in some areas of the plan area. Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025). The one occurrence record is close to a road, therefore there is potential for trampling or being driven over from human activity in the area.

Habitat

Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022). Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025). Species is apparently having both self-incompatible and self-compatible populations (Flora of North America 1993). Species can live in a variety of habitat types.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There was one spatial occurrence record located within Western Great Plains Shortgrass Prairie (Landfire 2024). The occurrence record occurs in the Carrizo Unit within the sandsage ecosystem (USFS 2005a).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (Ackerfield 2022, NatureServe 2025). This species can persist in many habitat types and disturbed locations.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Special Value to Native Bees (Recognized by pollination ecologists as attracting large numbers of native bees.) (NPIN 2025).

Species is used by the Navajo to improve the taste of tobacco; a poultice of the plant or root was used for swellings; a cold infusion of the leaves was used to treat stomachaches (Van Scoyoc 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

None known at this time.

Maps of Species Range

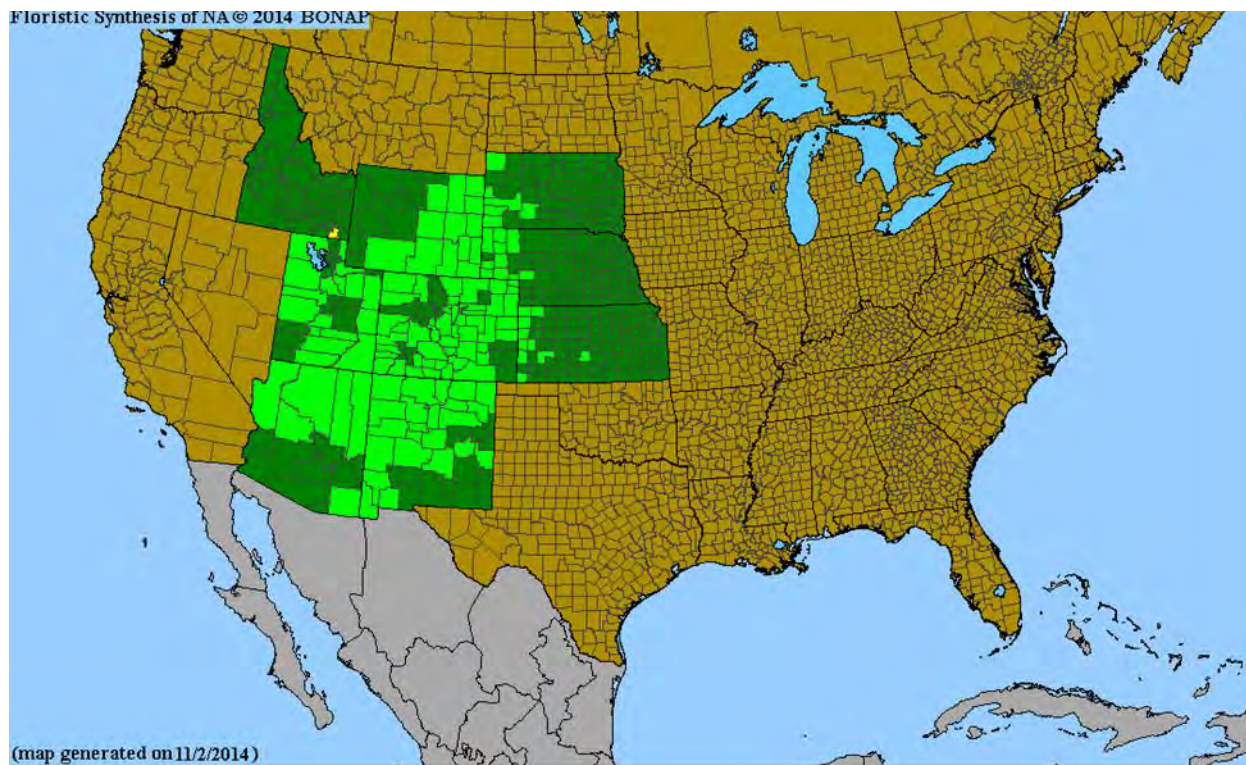


Figure 33. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

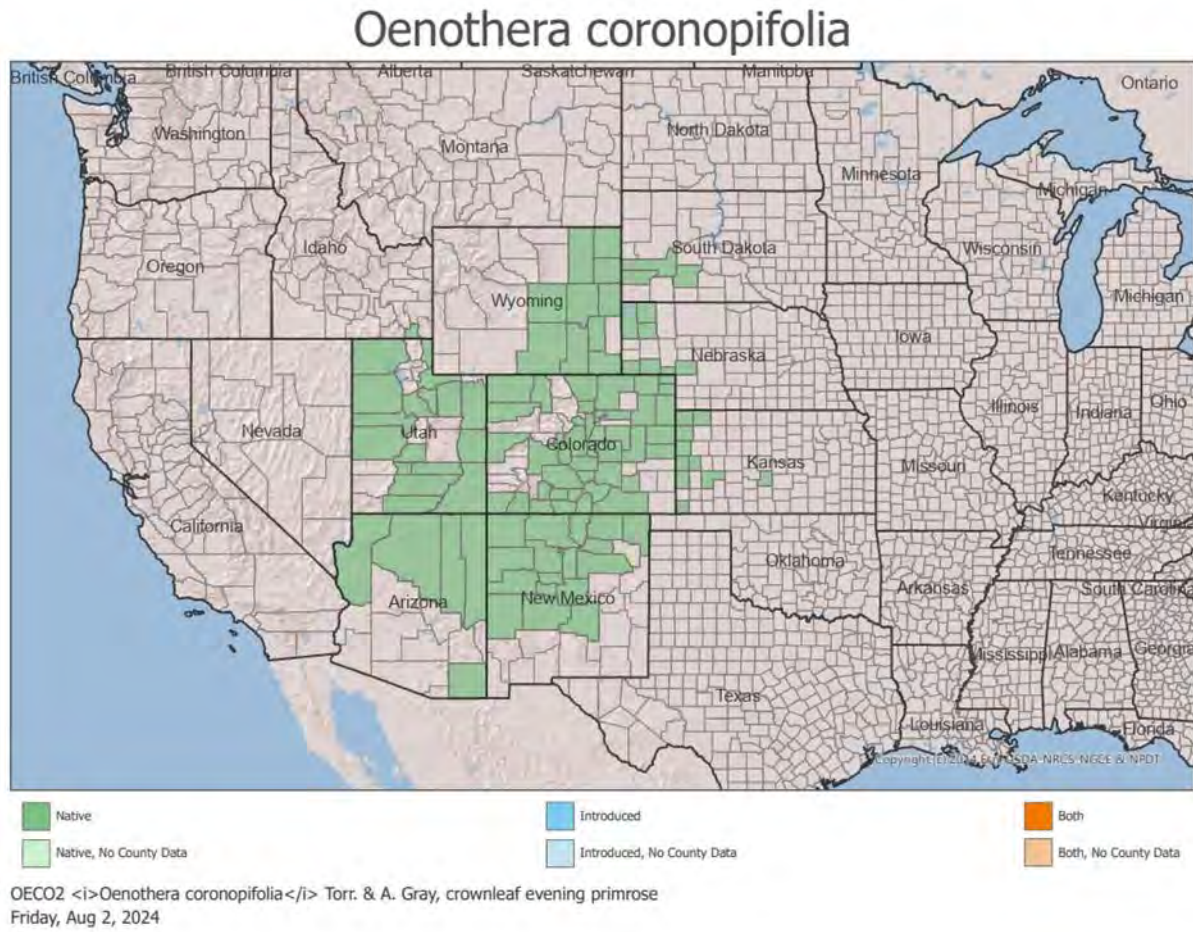


Figure 34. USDA Plants database distribution data (NRCS 2025).

Common evening-primrose (*Oenothera biennis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: There is one documented occurrence record (Van Scoyoc 2024) on the CCNG. Possible to be a misidentification. According to Ackerfield (2022) she states: "this species is included in the key but is unlikely to occur in Colorado. All specimens of *O. biennis* that I have seen from Colorado are misidentification of *O. villosa*.". Haddock (2024b) states: "*O. biennis* occurs in the east ¼ of Kansas". While Hazlett (2004) does list the species occurring in Otero Co. it most likely is the same occurrence record that was in GBIF that is no longer spatially identified as being present. There is not enough supporting information to indicate that this species occurs in the plan area.

Year of Last Known Occurrence: 2017

Species Status

G5; SNR in Colorado; S2 in Kansas.

Taxonomy

Mirabilis rotundifolia is accepted as valid (NRCS 2025).

Cooley's mimosa (*Desmanthus cooleyi*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: KNHP has two occurrence polygons that partially overlap the Cimarron National Grassland from 1961, and additionally, GIBF has 13 occurrence records in the Comanche National Grassland from 1947-2022 (Van Scoyoc 2024). Some of these records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: possibly grazing and roadside impacts since most extant occurrences are associated with roads.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: The species is considered extirpated from Morton County, so the species has declined in at least a portion of the plan area.
 - b. Habitat: species can use varied habitat types, including sandy, shortgrass prairie hillsides, ravines, washes, roadsides, and disturbed habitat; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northeastern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; extirpated from Cimarron National Grassland, 13 occurrence records from Comanche National Grassland.
 - b. Ecological conditions: uses varied habitats (shortgrass prairie hillsides, sandsage prairie, roadsides, etc.).

Species Status

G5; S2 in Colorado; S1 in Kansas.

Taxonomy

USDA NRCS recognizes *Desmanthus cooleyi* as valid; another common name is cooley's bundleflower (NRCS 2025).

Species range

Overall Species range:

Cooley's mimosa is distributed across extreme southwestern Kansas and southeastern Colorado, south through the Oklahoma and Texas panhandles, into the mountainous areas of the Trans-Pecos of Texas and adjacent Mexico, west through New Mexico and into Arizona (Freeman 1989) (Figure 35, Figure 36).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northeastern edge of the species' range (Figure 35, Figure 36).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. The species is considered extirpated from Morton County (Figure 57), so the species has declined in at least a portion of the plan area. A record from the Comanche National Grassland from 2022 states "Estimated frequency within viewshed: Frequent (11-100)."

Habitat

Cooley's mimosa is found on dry slopes and open steppe at elevations from 3,500-7,500 ft (Hazlett 2004, Van Scoyoc 2024). Within the plan area, it has been documented in Sand Canyon, Holt Canyon, and Burrows Draw in the southern side of the Carrizo Unit of the Comanche National Grassland. It was documented in the Cimarron National Grassland near Elkhart in 1961, but the species is now considered extirpated from Morton County, Kansas (Figure 36). Most record on the Comanche National Grassland have been associated with roadside habitat. Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Freeman (1989) suggests grazing may possibly be a threat. A congener, Illinois bundleflower (*Desmanthus illinoensis*), is highly palatable to livestock, but it is unknown if cooley's mimosa is readily consumed by livestock (Freeman 1989). If so, grazing may contribute to the rarity of this species (Freeman 1989).

Habitat

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

This species occupies dry, rocky to sandy, shortgrass prairie hillsides, sandsage prairie, ravines, washes, roadsides, and disturbed sites (Freeman 1989, Kuhn et al. 2011).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Given this species' use of varied, dry habitat types, including shortgrass prairie, sandsage prairie, and roadsides (Freeman 1989, Hazlett 2004, Kuhn et al. 2011), its ecological condition requirements are not considered restricted in the plan area.

Critical biological characteristics

Cooley's mimosa is a perennial subshrub in the pea family (Fabaceae) (Van Scoyoc 2024). Flowering occurs from June through September, with fruiting from July through October (Freeman 1989).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found for this species. Legumes can provide valuable forage plants for bees in honey production, and numerous species are browsed by livestock and serve as important browse plants for wildlife (Freeman 1989, Lueders et al. 2006). Legumes host bacteria which are capable of fixing atmospheric nitrogen. However, native grassland legumes likely contribute only a small amount of Nitrogen enrichment to soils, having evolved in low nutrient sites such as the Great Plains grasslands (VanRiper et al. 2010).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

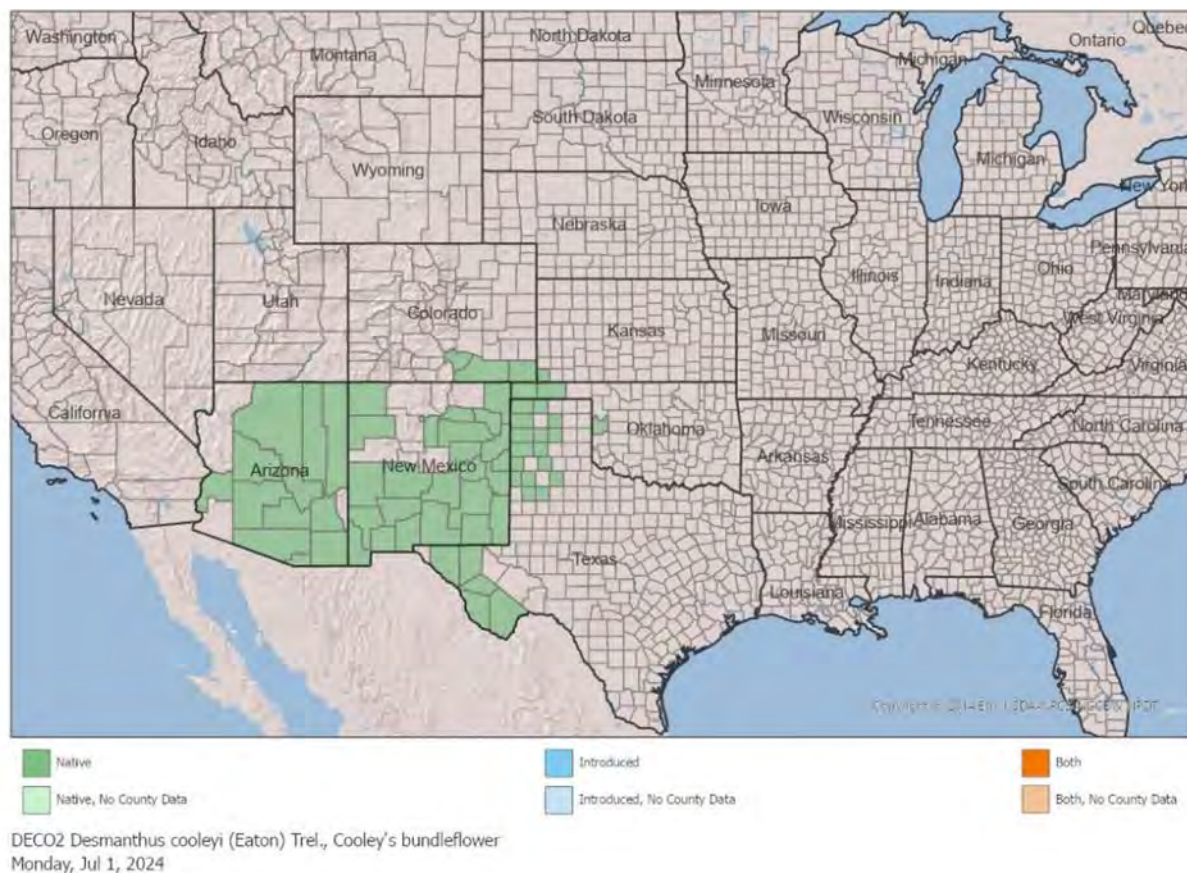


Figure 35. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

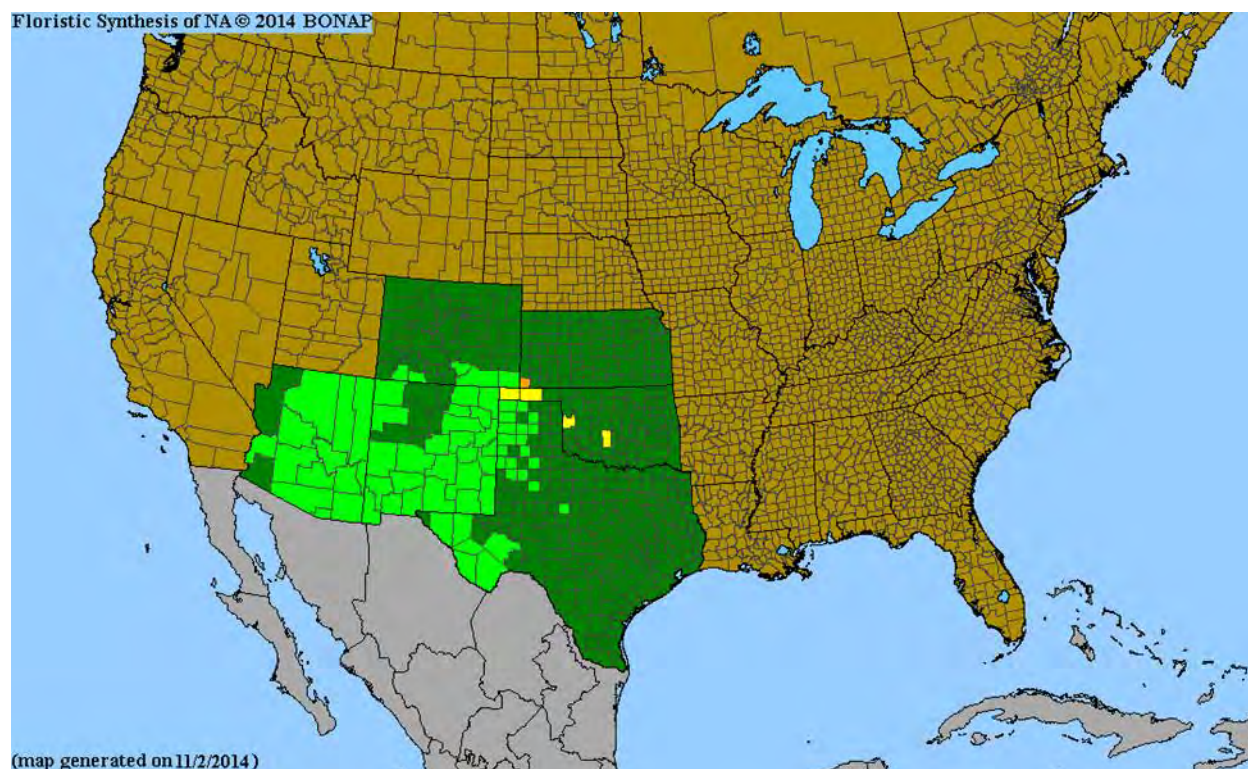


Figure 36. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county; orange indicates species extirpated (historic) in the county.

Cottonflower

(Guilleminea densa)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: CNHP has one level 2 occurrence polygon on the Comanche National Grassland from 1991 (CNHP 2024, Van Scoyoc 2024). The land status in the Element Occurrence report (EO ID 17002) is shown as private. Therefore, the species is not known to occur in the plan area.

Year of Last Known Occurrence: N/A

Species Status

G5; S1 in Colorado.

Creek plum **(*Prunus rivularis*)**

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: GBIF has two occurrence records from 1991 (Van Scoyoc 2024). The occurrence records are at the edge of the plan area and the spatial uncertainty of these records is 3.1 miles (5,000 m). Therefore, this species is not known to occur in the plan area.

Year of Last Known Occurrence: N/A

Species Status

G4; S1 in Colorado; S1 in Kansas.

Cutleaf cyclanthera (*Cyclanthera dissecta*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: iDigBio has four occurrence records in the Comanche National Grasslands portion of the plan area, spanning 1965 to 1997 (Van Scoyoc 2024). These records are classified under *Cyclanthera dissecta* but see taxonomy discussion of this species below. Although some of these points have high uncertainty (1000 to 2400 m), locality descriptions of the herbarium records demonstrate that this species is known to occur in the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 1997

Summary of indicators of substantial concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No known threats from the consulted sources.
 - b. Habitat: Climate stressors including drought.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: Wetland/riparian habitat has declined in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the western edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: not known; four occurrence records.
 - b. Ecological conditions: riparian/wetland habitat is restricted in the plan area (<1% of plan area).

Species Status

G4; S2 in Colorado; S2 in Kansas.

Taxonomy

Occurrence records in the plan area are listed as *Cyclanthera dissecta*. USDA NRCS recognizes *Cyclanthera dissecta* as valid, but only shows the species occurring in Texas (NRCS 2025). Nesom (2014) presented a revised taxonomy that while all *Cyclanthera* in the United States were traditionally identified as *C. dissecta*, there are actually four “morphogeographic entities.” *Cyclanthera dissecta* is a rarely collected species endemic to the coastal plain of southeastern Texas (Nesom 2014, NRCS 2025). Plants of central Texas and south-central United States previously known as *C. dissecta* are now identified as *C. naudiniana* (Nesom 2014, NRCS 2025). The records from the plan area named as *Cyclanthera dissecta* are now considered *C. naudiniana* under revised taxonomy for this species (Figure 37).

Species range

Overall Species range:

Cutleaf cyclanthera is distributed in central Texas and the south-central United States (Nesom 2014) (Figure 37, Figure 38).

Description of how the population in the plan area fits within the overall range:

The plan area is at the western edge of the species' range (Figure 37, Figure 38).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. Occurrence records give no indication of the number of individuals. The species has been documented in one creek in the plan area. It is not considered rare in Baca or Las Animas County (Figure 38).

Habitat

Across its range, cutleaf cyclanthera can occur in canyons, rocky slopes, stream sides, riparian woods of elm-hackberry, sycamore, willow-cottonwood, juniper, oak-juniper, pinyon-oak-juniper, live oak, and roadsides (Nesom 2014). In the plan area, it has only been found in riparian habitats (Hazlett 2004). Likewise, in Nebraska it has only been found in riparian areas (Hastings and Rothenberger 2013).

Cutleaf cyclanthera has been documented in two locations in the plan area, both along Carrizo Creek in the Comanche National Grasslands. Riparian and wetland habitat has declined in the plan area due to the dropping groundwater table and the presence of nonnative invasive plant species such as tamarisk (Caleb et al. 1996). Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No known threats (Hazlett 2004, Van Scoyoc 2024, NatureServe 2025).

Habitat

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Limited information could be found concerning this species' ecological condition requirements (Hazlett 2004, Hastings and Rothenberger 2013, Nesom 2014, Van Scoyoc 2024, NatureServe 2025). Across its range, cutleaf cyclanthera can evidently use varied habitat types (Nesom 2014), but in the portion of its range that encompasses the plan area it seems to depend on riparian/wetland habitat (Hazlett 2004).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species seems to depend on riparian/wetland habitat in the plan area (Hazlett 2004). Riparian and wetland habitats are limited in the plan area (Hazlett 2004). Based on National Wetlands Inventory data, the approximate extent of riparian and wetland habitat is ~1% of the total plan area. This species has also only been documented in one creek in the plan area. Therefore, its ecological conditions are considered restricted.

Critical biological characteristics

Cutleaf cyclanthera is an annual vine (NRCS 2025). Flowering occurs from May through October (Nesom 2014).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

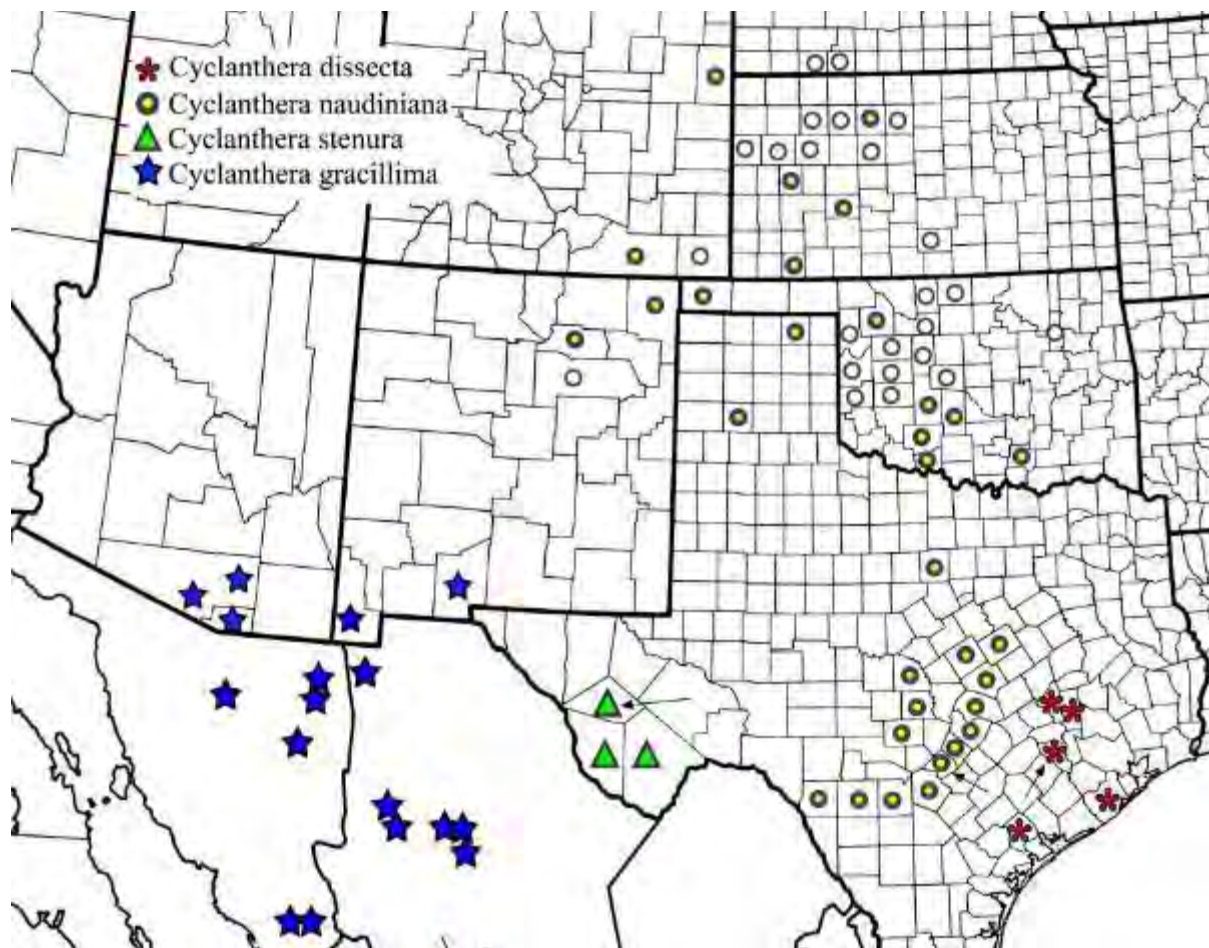


Figure 37. Distribution of *Cyclanthera* species native to the USA from Nesom (2014). Uncolored symbols are from literature. Note that *Cyclanthera naudiniana* is the only species that could occur in the plan area, even though it is called *Cyclanthera dissecta* on state rank lists.

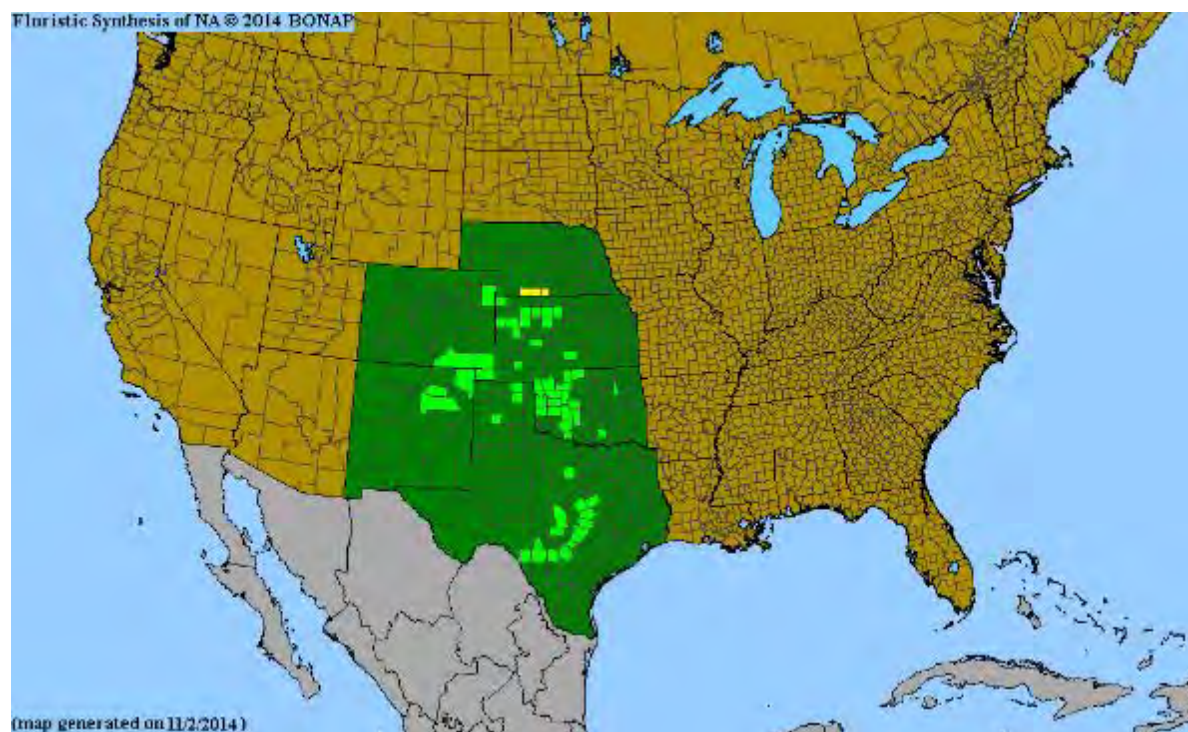


Figure 38. County occurrence data from Biota of North America Program (BONAP) for *Cyclanthera naudiniana*. Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Cutleaf germander

(*Teucrium laciniatum*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: KNHP has five occurrence polygons in the Cimarron National Grasslands from 1961-2012 and GBIF has 16 records from 1936-2022 (Van Scoyoc 2024); therefore, the species is known to occur in the plan area.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: grazing and habitat conversion.
 - b. Habitat: grazing and habitat conversion.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: the species seems to have declined or possibly been extirpated from the Cimarron National Grassland, indicating a declining trend in the plan area.
 - b. Habitat: no discernable trend; species uses varied habitat types.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; extremely rare or possibly extirpated from the Cimarron National Grassland, but more common on the Timpas Unit of the Comanche National Grassland with between 5 and 16 occurrences in the plan area.
 - b. Ecological conditions: uses varied habitats (shortgrass prairie, roadsides, floodplains).

Species Status

G4; SNR in Colorado; S1 in Kansas.

Taxonomy

USDA NRCS recognizes *Teucrium laciniatum* as valid; another common name is lacy germander (NRCS 2025)

Species range

Overall Species range:

Cutleaf germander is distributed in west Kansas and southeast Colorado, south to central Texas, Oklahoma, and New Mexico (NatureServe 2025) (Figure 39, Figure 40).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure 39, Figure 40).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size in the plan area is not known. The species is considered critically imperiled in Kansas due to extreme rarity. The species was documented on the Cimarron National Grassland in 1961. Freeman (1989) conducted an exhaustive search for the species on the Cimarron National Grassland in 1988 and 1989 and found no plants were found despite abundant suitable habitat. It is possible the species is extirpated from the Cimarron National Grassland, or small, isolated populations may still persist (Freeman 1989). Recent occurrence records of the species have been concentrated on the Timpas Unit of the Comanche National Grassland, and there are many occurrence records adjacent to the Timpas Unit as well. One record of the species from 2022 in the Timpas Unit states "Estimated frequency within viewshed: Common (101-500)." It is considered rare in Morton County, Kansas, but none of the counties that overlap the Comanche portion of the plan area in Colorado (Figure 40).

Habitat

Cutleaf germander is found in sandy soil in prairies, along flood plains and roadsides, less often gypsiferous or limestone soils or gravelly hillsides or upland prairies, at elevations from 4,000-6,500 ft (NatureServe 2025, Van Scoyoc 2024). Within the plan area, it has been associated with open steppe and disturbed, often roadside soils (Hazlett 2004).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

NatureServe (NatureServe 2025) and SEINet (2024) identify no threats to populations. Freeman (1989) states "Grazing and habitat conversion are probably only minor threats to the species."

Habitat

Freeman (1989) notes to protect this species, "Damage to significant outcrops of the Ogallala Formation should be avoided, especially in the area of Point of Rocks and also says "Grazing and habitat conversion are probably only minor threats to the species".

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

This species can use varied habitat types, including shortgrass prairie, sandy roadsides, and floodplains (Freeman 1989). It frequently occurs on gypsiferous or calcareous soils (Freeman 1989). It is an early successional species (Hazlett 2004).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Given this species' use of varied, sandy habitat types, including shortgrass prairie and roadsides (Freeman 1989, Hazlett 2004), its ecological condition requirements are not considered restricted in the plan area.

Critical biological characteristics

This species is a low, mat-forming perennial herb (Freeman 1989). It is a pioneer species that colonizes disturbed sites and can establish in large roadside patches or in fallow ground (Hazlett 2004). Flowering occurs from June through August, sometimes as later as September, with fruiting from July to October (Freeman 1989).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This is a pioneer species that helps stabilize disturbed soils (Hazlett 2004).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Freeman (1989) notes to protect this species, "Damage to significant outcrops of the Ogallala Formation should be avoided, especially in the area of Point of Rocks."

Maps of Species Range

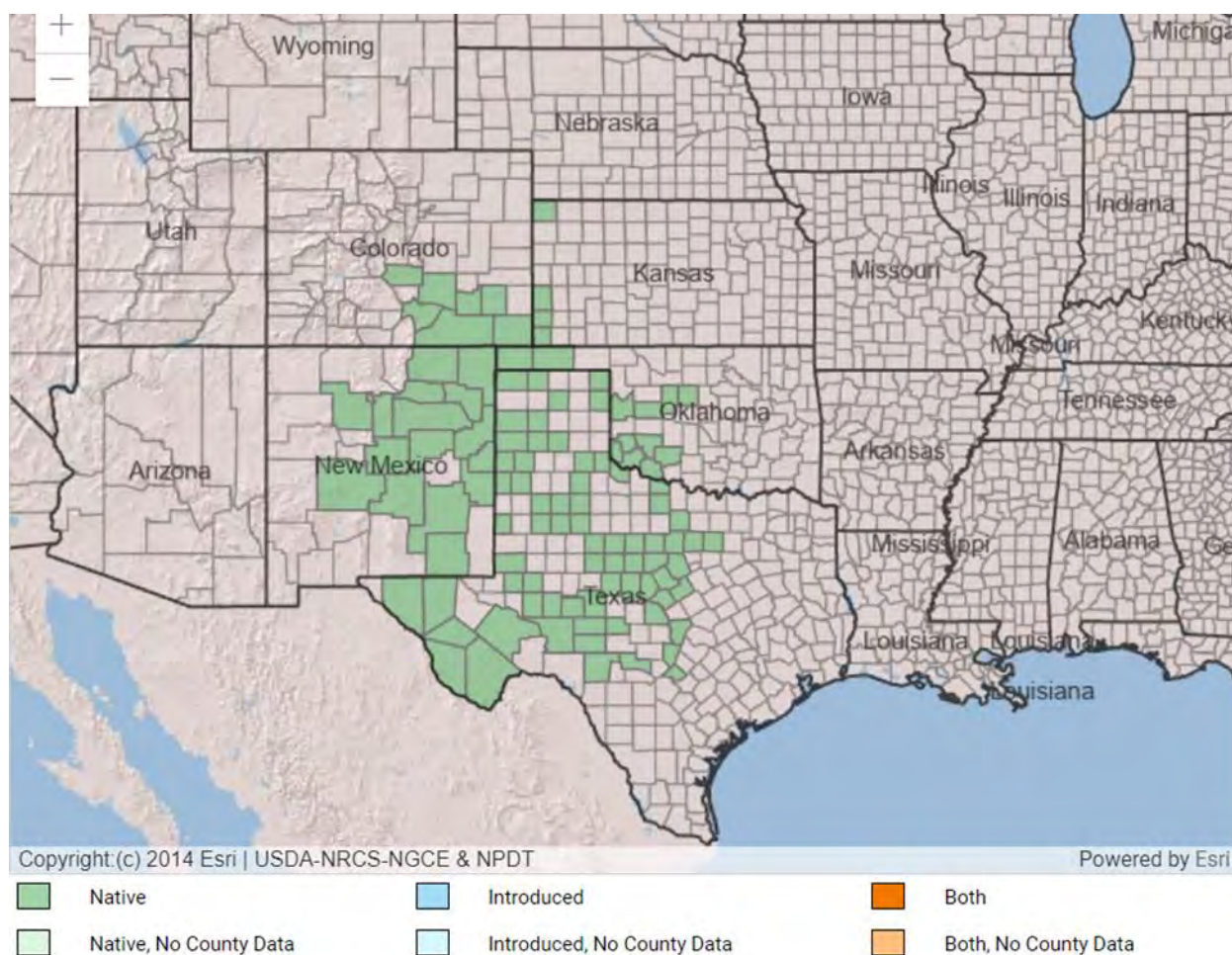


Figure 39. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

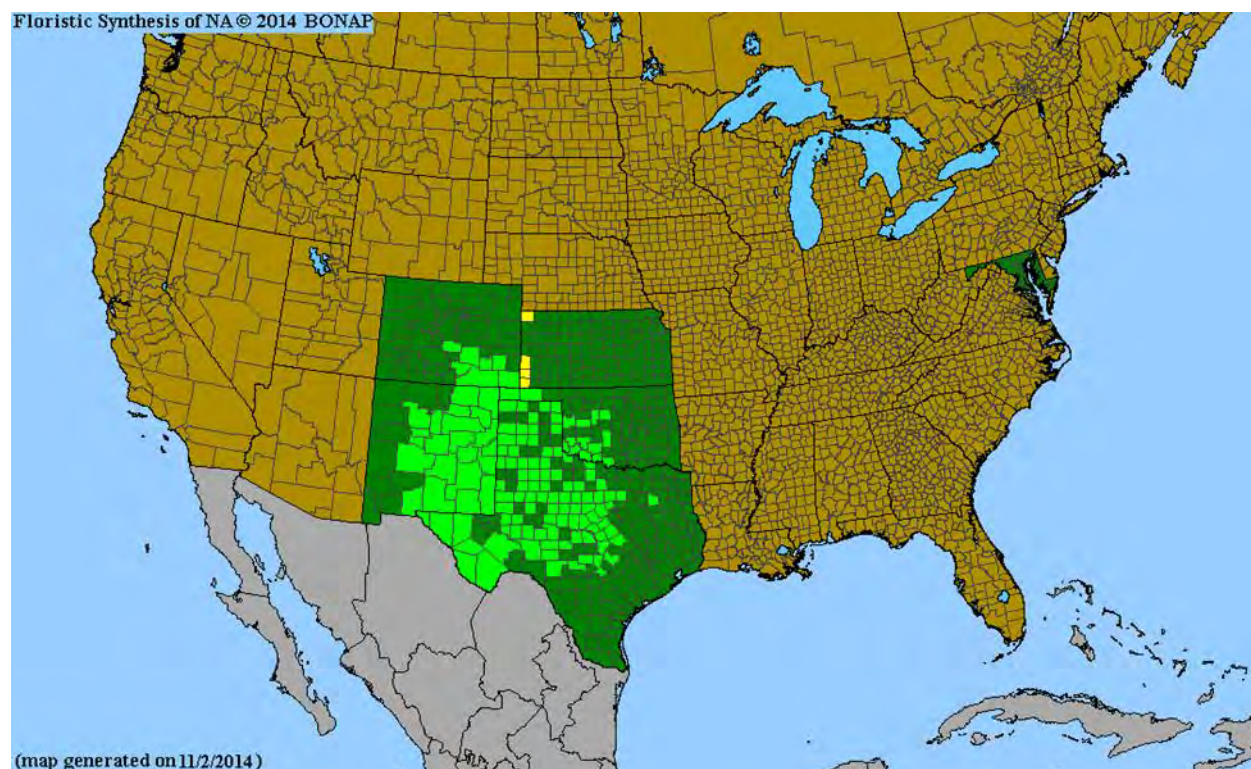


Figure 40. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Desert portulaca

(*Portulaca halimoides*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has two occurrence records in the Comanche National Grasslands, both from 2021, with sufficient precision to demonstrate the species is known to occur in the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: species occupies dry, disturbed habitats such as roadsides, which are considered stable in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northeast edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: not known; two occurrence records.
 - b. Ecological conditions: dry and disturbed soils are not restricted in the plan area.

Species Status

G5; S1 in Colorado.

Taxonomy

USDA NRCS recognizes *Portulaca halimoides* as valid; a taxonomic synonym is *Portulaca parvula*. Another common name is silkcotton purslane (NRCS 2025).

Species range

Overall Species range:

Desert portulaca has a wide range within the United States, as well as the West Indies, Central America, and South America (NatureServe 2025, Van Scoyoc 2024) (Figure 41, Figure 42).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northeast edge of the species' range (Figure 41, Figure 42).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. Occurrence records give no indication of the number of individuals observed. It is not considered rare in any of the counties that overlap the plan area (Figure 41).

Habitat

Across its range, desert portulaca can be found in dry soil, sand dunes, and arroyos (Van Scoyoc 2024). In the counties near the plan area, it has been associated with disturbed, often roadside soils (Hazlett 2004). Within the plan area, it has only been documented in roadside habitat near Vogel Canyon (Van Scoyoc 2024). Roadside habitat is considered stable in the plan area.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (NatureServe 2025, Van Scoyoc 2024).

Habitat

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Desert portulaca requires dry, sandy or gravelly soils, often in disturbed areas (Van Scoyoc 2024). Species in the purslane genus (*Portulaca*) can generally tolerate moderate to high soil salt concentrations (Borsai et al. 2020).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Dry and disturbed habitats are not restricted in the plan area.

Critical biological characteristics

Desert portulaca is a succulent annual herb with slender, fibrous roots (Van Scoyoc 2024). Flowering occurs from March through November (Van Scoyoc 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found for this species.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Purslanes are generally adaptable in different soil conditions and can grow in harsh climatic conditions (Srivastava et al. 2023).

Maps of Species Range

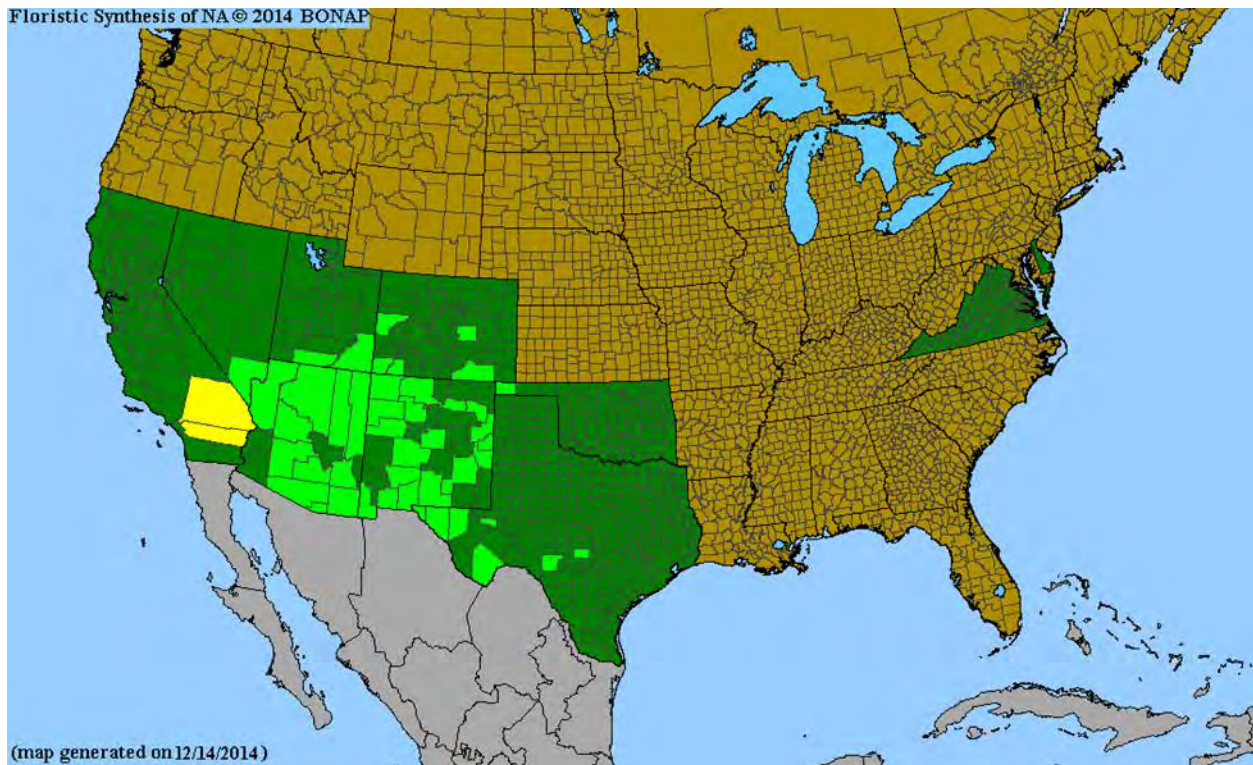


Figure 41. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

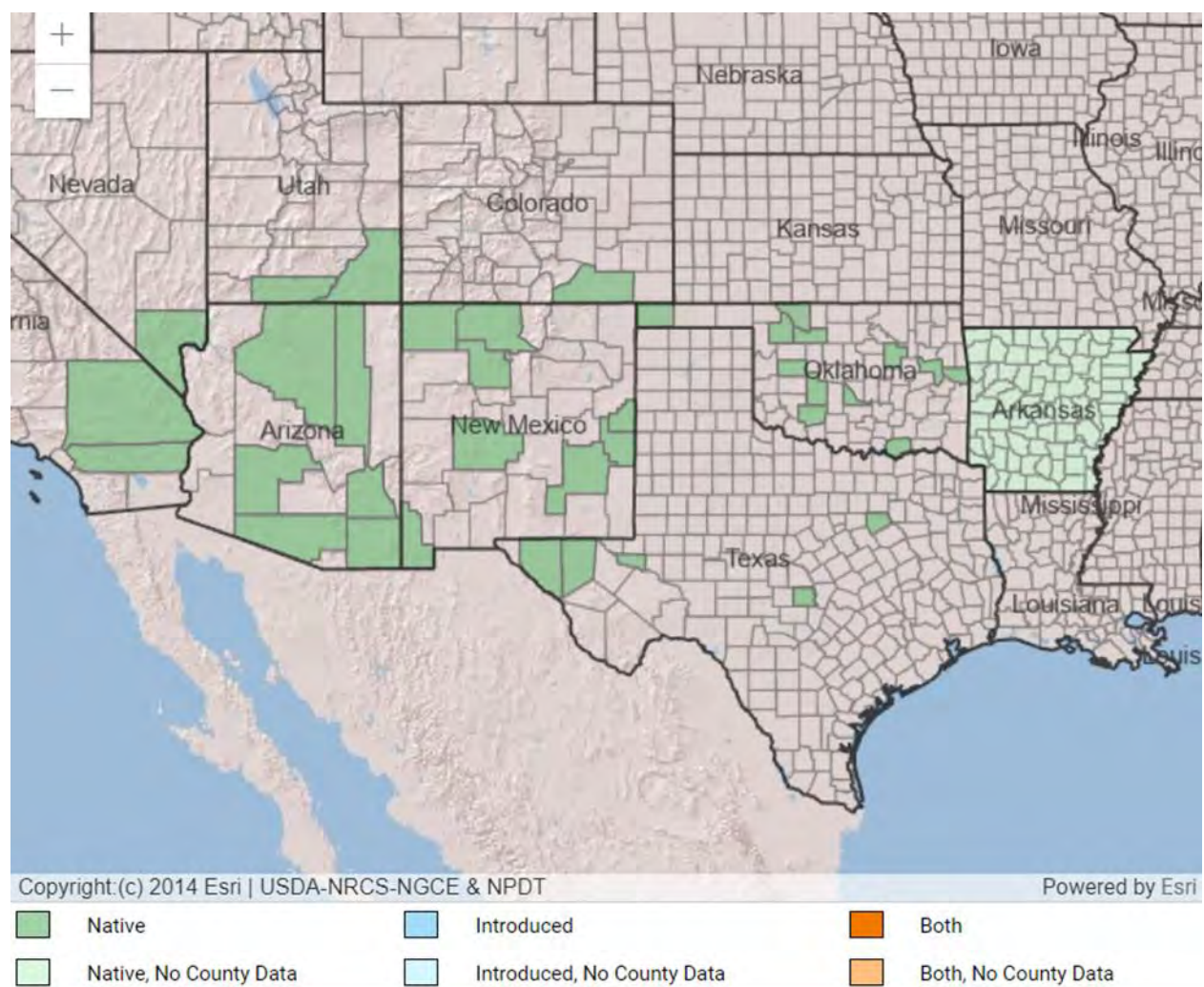


Figure 42. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Douglas ragwort

(*Senecio flaccidus* var. *flaccidus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: there is one occurrence record within the plan area for *Senecio douglasii longilobus* and five records for *Senecio flaccidus* var. *flaccidus* (Van Scoyoc 2024).

Year of Last Known Occurrence: 2003

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025). Two occurrence records are adjacent to a road and three of the occurrences are within the Cimmaron Unit that has active oil and gas well activity, therefore there is potential for trampling from human activity in the area
 - b. Habitat: Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (Grunau et al. 2011, Rohweder 2022) (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend for this species in the plan area is unknown.
 - b. Habitat: Species uses varied habitats, but there are trend statements that can be made for some of the habitats – shortgrass prairie has a declining trend in quality of the habitat, while the juniper woodland has expanded in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is on the northeastern edge of the species range
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known. There are five occurrence record within the plan area.
 - b. Ecological conditions: No sources consulted identified any ecological requirements needed for this species aside from general habitat needs

Species Status

T5; SNR in Colorado; S2 in Kansas.

Taxonomy

Senecio flaccidus var. *flaccidus* is accepted as valid (NRCS 2025, Ackerfield 2022, ITIS 2024, Flora of North America 1993, NatureServe 2025). ITIS recognizing these as synonyms for this species *Senecio*

filifolius, *Senecio longilobus*, *Senecio douglasii* ssp. *longilobus*, *Senecio douglasii* var. *jamesii*., and *Senecio douglasii* var. *longilobus* (ITIS 2024, NRCS 2025).

Species range

Overall Species range

Douglas Ragwort distribution is AZ, CO, KS, NM, OK, TX, and UT; This variety is also native to central and northern Mexico (NatureServe 2025, Van Scoyoc 2024).

Description of how the population in the plan area fits within the overall range

The population in the plan area is on the northeastern edge of the species range. (Figure 43, Figure 44).

Distribution, abundance, and trend in the plan area

Population

There is one occurrence record that occur in the Timpas, one in the Carizo and three in the Cimmaron Unit. Five of the occurrences are within the shortgrass prairie ecosystem and one in the within the Canyonland ecosystem (USFS 2005b). Hazlett (2004) indicates this species is known to occur in Otero western Las Animas, eastern Las animas, and Baca County. Kuhn (2011) found this species in Baca, Las Animas, Otero and Morton County during a floristic inventory.

Population trend for this species in the plan area is unknown.

Habitat

Douglas Ragwort is a perennial forb species found in dry open places in sandy or rocky soil, streambeds, and canyons 3500-6500 ft in elevation (Ackerfield 2022, Van Scoyoc 2024, Flora of North America 1993). Hazlett (2004) describes it as open steppe. Kuhn (2011) describes habitat as juniper woodland, midgrass prairie, pinyon juniper woodland, rocky upland prairie, and shortgrass prairie in his floristic inventory of Cimarron National Grassland and Comanche National Grassland.

There is one occurrence record that occur in the Timpas, one in the Carizo and three in the Cimmaron Unit. Five of the occurrences are within the shortgrass prairie ecosystem and one in the within the Canyonland ecosystem (USFS 2005b). The habitat in the herbarium records is described as, upland shortgrass prairie; rocky, calcareous outcrops of Ogallala Formation at edge of shorgrass prairie; sandy prairie hillside.

The occurrence record is spatially mapped within the Western Great Plains Shortgrass Prairie (Landfire 2024). Two of the occurrences are adjacent to a well-developed dirt road.

Species uses varied habitats. Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025). Two occurrence records are adjacent to a road and three of the occurrences are within the Cimmaron Unit that

has active oil and gas well activity, therefore there is potential for trampling from human activity in the area.

Habitat

Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022). Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There is one occurrence record that occur in the Timpas, one in the Carizo and three in the Cimmaron Unit. Five of the occurrences are within the Shortgrass prairie ecosystem and one in the within the Canyonland ecosystem (USFS 2005b). Three occurrence records are spatially mapped within the Western Great Plains Shortgrass Prairie and two are within the Western Great Plains Cliff and Outcrop (Landfire 2024). Two of the occurrences are adjacent to a well-developed road and three are near oil and gas well activities.

Critical biological characteristics

This species is perennial forb, subshrub. Flowers May through October (Ackerfield 2022).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

None known at this time.

Maps of Species Range

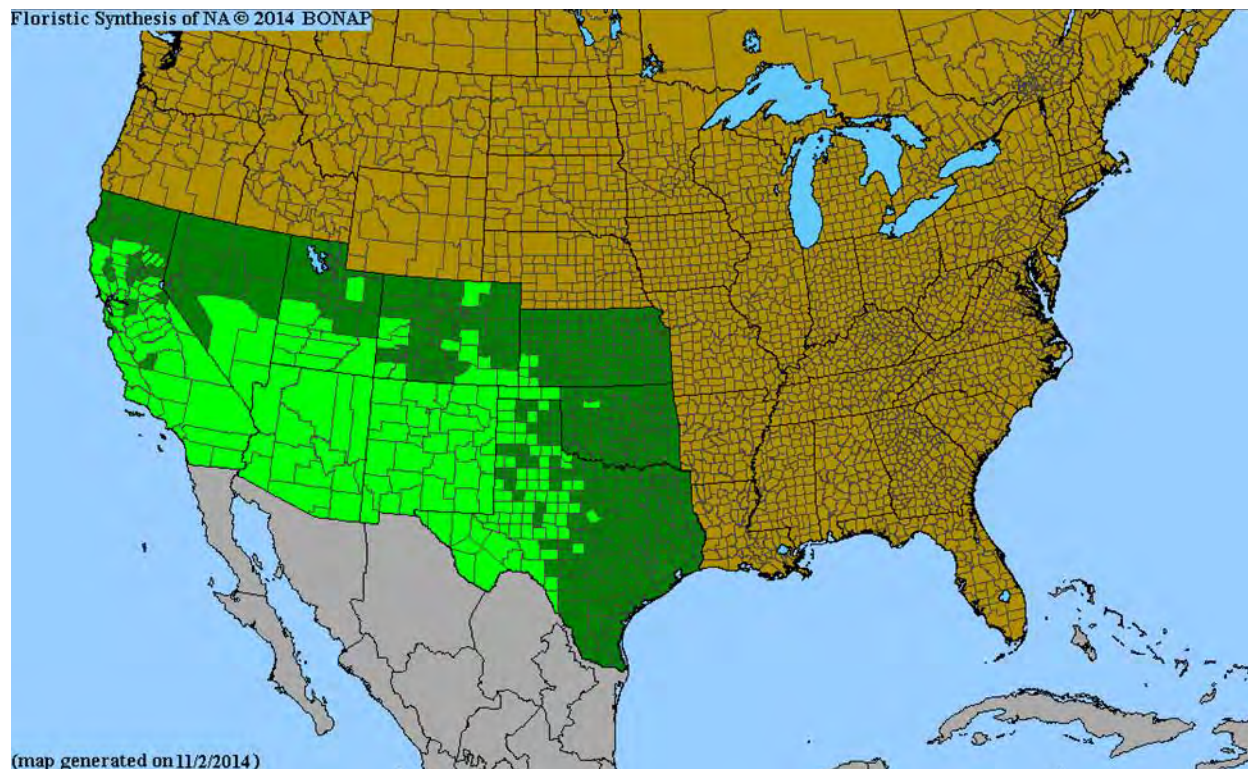
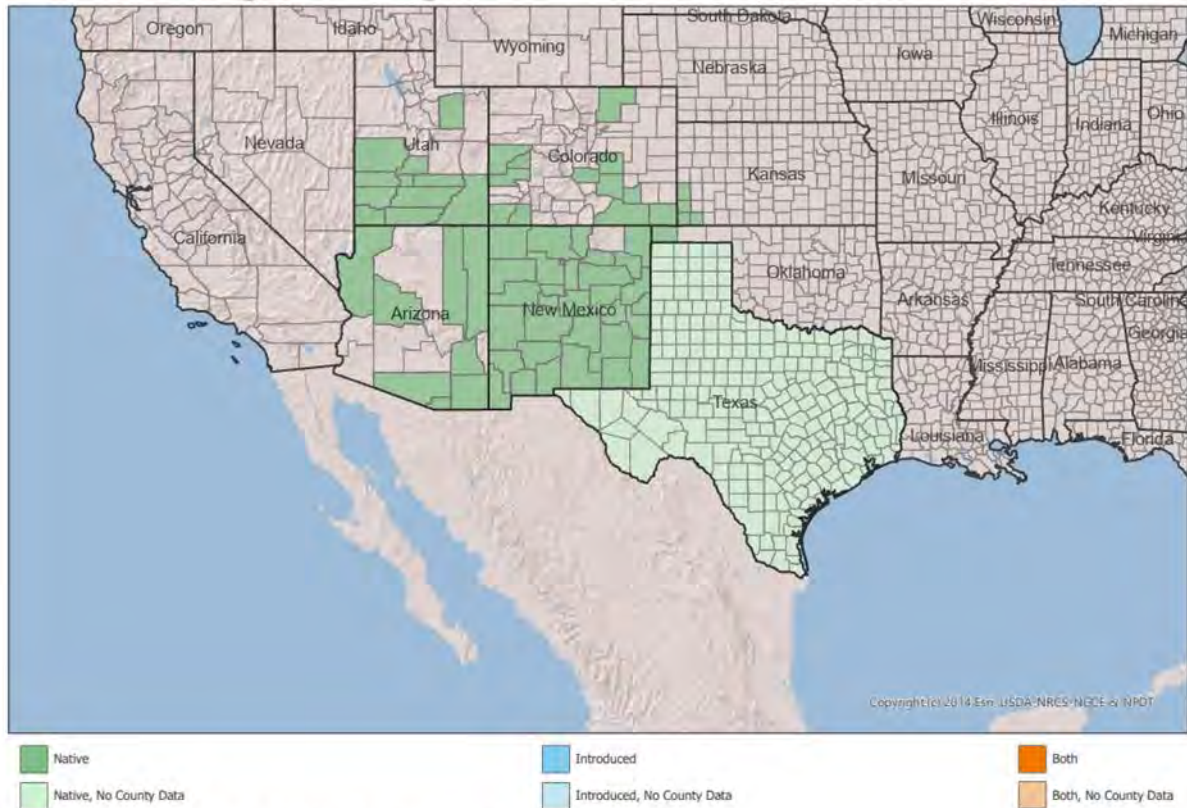


Figure 43. County occurrence data from Biota of North America Program (BONAP) for the parent species *Senecio flaccidus*. Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Senecio douglasii longilobus *Senecio flaccidus* var. *flaccidus*



SEFLF *Senecio flaccidus* Less. var. *flaccidus*, threadleaf ragwort
 Tuesday, Aug 6, 2024

Figure 44. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Dwarf dalea

(*Dalea nana* var. *nana*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has five occurrence records in the plan area, spanning 1972-2007 (Van Scoyoc 2024). Some of these have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Unknown.
 - b. Habitat: Unknown.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: varied sandy habitats; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is not endemic, disjunct, or at the edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; 5 occurrence records.
 - b. Ecological conditions: sandy soils are widely distributed across the plan area.

Species Status

G5; S2 in Colorado; SNR in Kansas.

Taxonomy

USDA NRCS recognizes *Dalea nana* var. *nana* as valid; a taxonomic synonym is *Parosela nana* (NRCS 2025).

Species range

Overall Species range:

Dwarf dalea is distributed in southeast Colorado, southwest Kansas, Arizona, southern New Mexico, Texas, and south into northern Mexico (Figure 45, Figure 46).

Description of how the population in the plan area fits within the overall range:

The population in the plan area is not endemic, disjunct, or at the edge of the species range (Figure 45, Figure 46).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. The species is not considered rare in any counties that overlap the plan area (Figure 45). One record from 1988 from the Cimarron National Grassland describes species as “Scarce. Few scattered plants observed.” Otherwise, occurrence records give minimal indication regarding the number of individuals observed.

Habitat

Across its range, dwarf dalea occurs in dry soils in woodlands, grasslands and scrub from 3,500-5,500 ft (Van Scoyoc 2024). Within the plan area, it is associated with rocky soils (Hazlett 2004). The species has been documented across the Carrizo Unit of the Comanche National Grassland and the Cimarron National Grassland (Van Scoyoc 2024). One record from the Comanche National Grassland in 2007 describes the species’ habitat as “sandy soil, shortgrass prairie with Yucca and cholla.”

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to this species’ populations (Hazlett 2004, NatureServe 2025, Van Scoyoc 2024).

Habitat

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

The species requires on dry, sandy soil (Hazlett 2004, Van Scoyoc 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

It occurs in a variety of habitat types—woodlands, shortgrass prairie and scrub—so long as they have dry, sandy substrate (Hazlett 2004, Van Scoyoc 2024). Sandy soil is not restricted in the plan area.

Critical biological characteristics

Dwarf dalea is a perennial forb with a taproot and pealike, pale-yellow flowers (Van Scoyoc 2024). Flowering occurs May-September (Van Scoyoc 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The Xerces Society for Invertebrate Conservation identifies dwarf dalea as having special value to native bees, bumble bees, and honeybees (Flora of North America 1993). Legumes can provide valuable forage plants for bees in honey production, and numerous species are browsed by livestock and serve as important browse plants for wildlife (Freeman 1989, Johnson 2006a). Legumes are known to be atmospheric nitrogen fixers through symbiotic relationships with soil bacteria. However, native grassland legumes likely contribute only a small amount of Nitrogen enrichment to soils, having evolved in low nutrient sites such as the Great Plains grasslands (VanRiper et al. 2010).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found specifically for this species.

Maps of Species Range

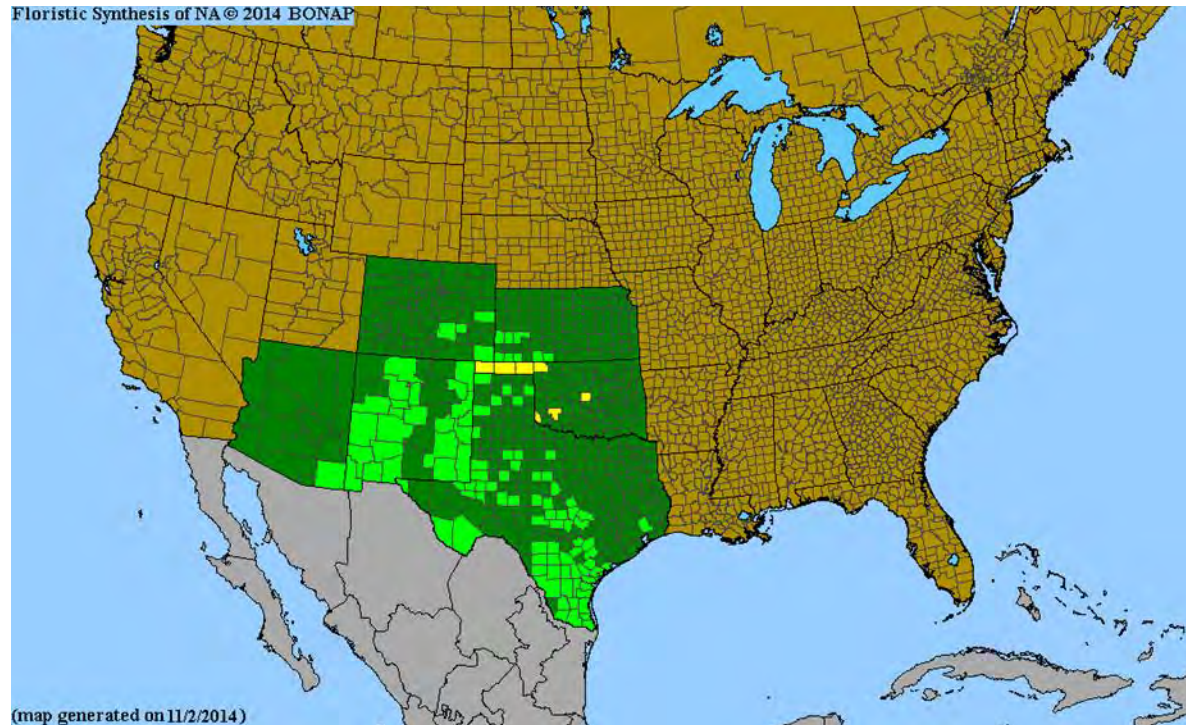
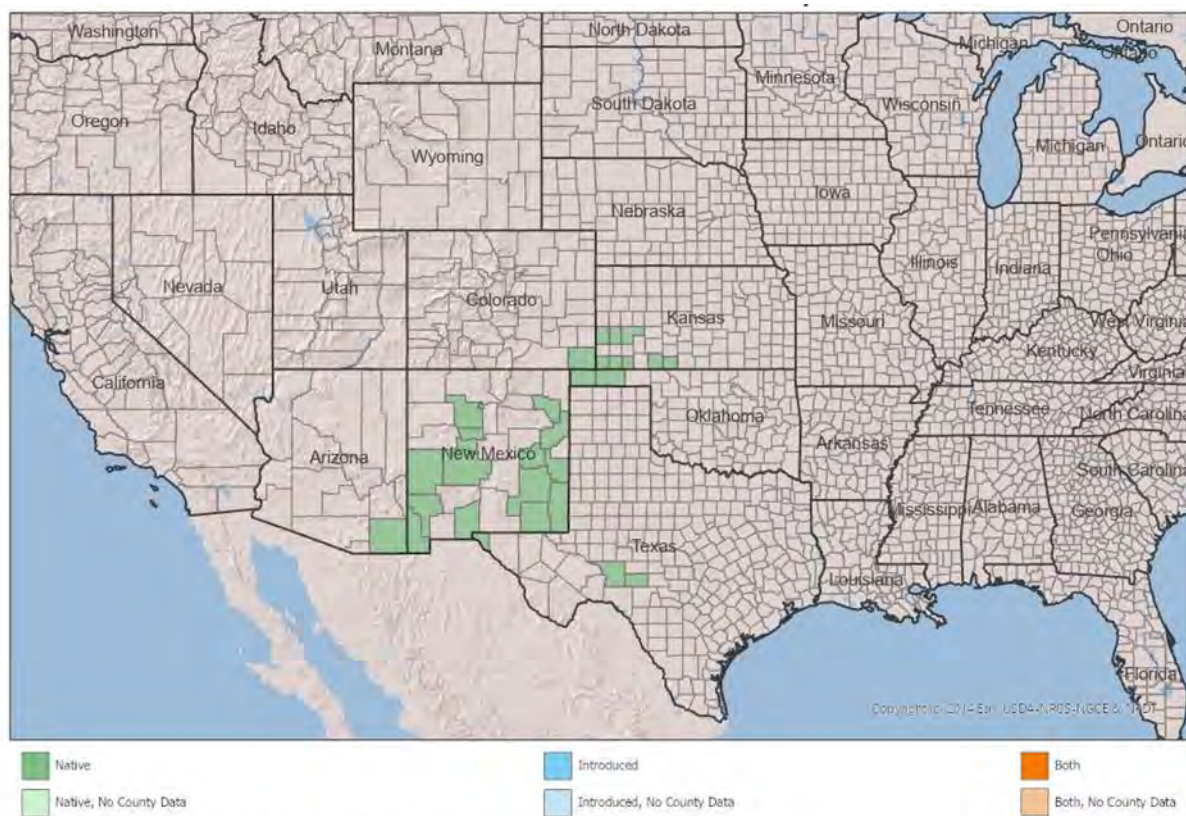


Figure 45. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county. Note that this map is for the species, not the variety.



DANAN *Dalea nana* Torr. ex A. Gray var. *nana*, dwarf prairie clover
Wednesday, Aug 7, 2024

Figure 46. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Dwarf milkweed

(*Asclepias involucrata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Data from iDigBio and CNHP contain two records of species occurrences combined within the USFS portions of the planning unit both on the Comanche NG in the South Fork Sand Arroyo and the Mesa de Maya region of the Comanche NG (Van Scoyoc 2024). EOID 16766 was new in 2007 and contains 5 genets (aboveground “plants” arising from the same root structure). EOID 16767 was observed in 1948 and re-discovered in 2007 and consisted of 3 genets in 2007.

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Individuals threatened by livestock grazing and invasive species.
 - b. Habitat: Habitat is moderately vulnerable to negative impacts from projected climatic conditions. Heavy continuous livestock grazing, military training, invasive non-native species, altered fire regime (fire suppression).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trend is not known at this time.
 - b. Habitat: Shortgrass prairie is stable in Kansas but has deviated in eastern Colorado. Juniper woodlands have increased in distribution and abundance in the plan area in some ecosystems (canyonlands of the Comanche).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. This species is at the northeastern edge of its range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: known from a total of 8 genets at 2 locations in the plan area.
 - b. Ecological conditions: Shortgrass prairie is not restricted within the plan area. Juniper woodlands are restricted to the southwestern portion of the Comanche National Grassland where there are extensive pine forests in Picketwire Canyon and the Kim area in Las Animas County.

Species Status

G5; S1 in Colorado; SH in Kansas.

Taxonomy

Asclepias involucrata Engelm. Ex Torr. is accepted as valid (Ackerfield 2022, NRCS 2025, Weber et al. 2012). One synonym exists for this species: *Asclepias macrosperma* (NRCS 2025). Related ITIS name: *Asclepias involucrata* Engelm. ex Torr. (TSN 30275) (ITIS 2024, NatureServe 2025). Other common names for this species include White rim milkweed (Nabhan et al. 2015).

Species range

Overall Species range

Dwarf milkweed is native to the south-central and southwestern United States, but is considered to be rare in Texas, Oklahoma, and Colorado (Coxe 2023). Its historic distribution includes Arizona, Utah, and east through Colorado and New Mexico to Kansas, Oklahoma, and Texas (Van Scoyoc 2024). Outside of the US, it is native to northern Mexico (Coxe 2023).

Description of how the population in the plan area fits within the overall range

The population in the plan area is on the northeastern edge of the species range (Figure 47).

Distribution, abundance, and trend in the plan area

Population

Dwarf milkweed documented occurrences vary depending on the data source. According to iDigBio, there is one preserved specimen associated with a record of species occurrence in Colorado on the Comanche National Grasslands back in 1948 according to the University of Colorado Museum of Natural History Herbarium Vascular Plant Collection (Van Scoyoc 2024). The collection remarks describe the observed population as scattered and flowering at the time of collection. The record notes indicate the general location was within the Las Animas County, Mesa de Maya region, in a field eight miles northeast of Kim, CO.

According to CNHP, the Plan Area plus a 1km buffer includes two separate documented species occurrences with the last recorded observations from 2007 (CNHP 2024, Van Scoyoc 2024).

According to Hazlett (2004), dwarf milkweed could occur within the Comanche National Grassland in eastern Las Animas and Baca counties in rocky (exposed limestone/shale barrens) or sandy soils because it's been known to occur in a nearby area.

E OID 16766 lists a total of 5 genets in 2007, 16767 (collection from 1948) lists 3 genets in 2007.

According to CNHP, there are 2 occurrences in the Plan Area (E OID 16766 and 16767 from 1948) (CNHP 2024, Van Scoyoc 2024).

Habitat

This species grows in prairies with gravelly/sandy soil, chaparral, and arroyos. It can also occur in desert shrub, sagebrush, and pinyon-juniper communities (Coxe 2023).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

E OID 16767 lists "Evidence of threats and disturbance: cattle grazing is dominant land use here. Predominant land uses: cattle grazing. Exotic species: *Bromus tectorum*, *Cirsium arvense*, *Convolvulus arvensis*".

Habitat

Habitat loss drivers include land development, agricultural intensification, and the widespread adoption of herbicide resistant crops (Brower et al. 2012, Pleasants and Oberhauser 2013).

Where milkweeds already occur, in remnant natural areas or non-cropped areas such as field borders, roadsides, and ditch banks, conservation practices that involve the management of existing habitat can serve to protect the plants as a resource for monarch caterpillars, pollinators, and other beneficial insects (Nabhan et al. 2015).

Threats associated with the shortgrass prairie habitat type (see Threats and Trends Appendix). Habitat is moderately vulnerable to negative impacts from projected climatic conditions. Heavy continuous livestock grazing, military training, invasive non-native species, altered fire regime (fire suppression), conversion to agriculture, fragmentation from roads and development such as exurban and urban development, and more recently oil and gas exploration and extraction stress the shortgrass prairie ecosystem.

Pinyon-juniper (P-J) woodland habitat shifting and alteration due to climate-induced changes is a threat to pinyon-juniper communities (CPW 2015).

Livestock grazing can alter the understory composition of juniper woodlands and most of the plan area is actively grazed. Fire suppression has contributed to mature, dense stands of oneseed juniper in the plan area, putting them at greater risk from disease and catastrophic fire (USFS 2008).

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Ackerfield (2022) describes the habitat as “sandy and rocky soils” the two EOs from the plan area describe the habitat as “shortgrass prairie in small draw (EOID 16766) and “shortgrass prairie with prairie dog town, dry, gentle slope (EOID 16767).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Sandy and rocky soil is certainly not rare in the plan area. The occurrences in the plan area are associated with the short grass prairie EVT. For the shortgrass prairie vegetation type in Kansas, it is considered good with a stable trend (Rohweder 2022), but in eastern Colorado there is a widespread deviation regarding changes in the composition (lower species diversity, lower abundance of highly palatable grasses, increase in weedy species, and an increase in bare ground (see Threat and Trends Appendix).

Juniper woodlands are restricted to the southwestern portion of the Comanche National Grassland (Kuhn et al. 2011), where there are extensive pinyon pine forests in Picketwire Canyon and the Kim area in Las Animas County. Juniper has increased in distribution and abundance in some ecosystems within the plan area, particularly the canyonlands of the Comanche National Grassland (USFS 2005a). The current ecosystem condition is likely well outside the historic range (USFS 2005a), but the overall trend is unknown.

Critical biological characteristics

Most milkweeds are strongly clonal where many aboveground individuals may belong to a single genetic individual, this can throw off population counts. Many or most parts of the plant are poisonous to many

animals but serve as nectar and forage for insects. Milkweed is a perennial that often bears blossoms and fruit at the same time (USDA Agricultural Research Service 2018). It is a low herbaceous spreading plant. It flowers throughout the spring and early summer from March to July (Nabhan et al. 2015). The plant may be 19-39 inches high (USDA Agricultural Research Service 2018). Leaves may be narrow or broad, and the leaves or other above-ground parts of the plant are poisonous (USDA Agricultural Research Service 2018).

Important ecological and biological interactions

This species is a host for the monarch butterfly (*Danaus plexippus*) and queen butterfly (*Danaus gilippus*) (Coxe 2023).

How (or if) this species influences other species or ecosystem diversity or integrity

It is said to be favored by jackrabbits (Van Scoyoc 2024, Coxe 2023). Dwarf milkweed is also known to be used for medicinal uses including an infusion of the plant used as a stomach medicine, poultice of heated roots is applied for toothaches, and dry powdered roots are mixed with saliva and used for unspecified illnesses (Van Scoyoc 2024, Coxe 2023). The nectar of milkweed flowers is attractive to dozens of insects including bees, wasps, butterflies, moths, and hummingbirds (Nabhan et al. 2015). The bees that milkweed flowers attract to agricultural landscapes are important for pollinating a wide variety of vegetable forage and fruit crops (Nabhan et al. 2015).

It is ideal to leave milkweeds undisturbed throughout the growing season, especially when they are flowering. Milkweeds can potentially host monarch caterpillars whenever the plants have foliage (Nabhan et al. 2015). If maintenance activities such as mowing, spraying, or burning must be conducted during the growing season, treat only a subset of the total area occupied by milkweed (Nabhan et al. 2015).

Milkweeds are bitter-flavored and unpalatable, and range animals will generally avoid eating them if sufficient forage is available (Nabhan et al. 2015). Forero (2011) noted that depression and diarrhea are the main signs of milkweed poisoning. Most milkweed poisoning results from hungry animals being concentrated in areas where milkweed is abundant (USDA Agricultural Research Service 2018).

The leaves and other above-ground parts of all milkweed species are poisonous due to containing several glucosidic substances called cardenolides that are toxic (USDA Agricultural Research Service 2018). Milkweeds may cause losses at any time, but it is most dangerous during the active growing season.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Subject to the same influences as the ecosystems in which it grows.

Maps of Species Range

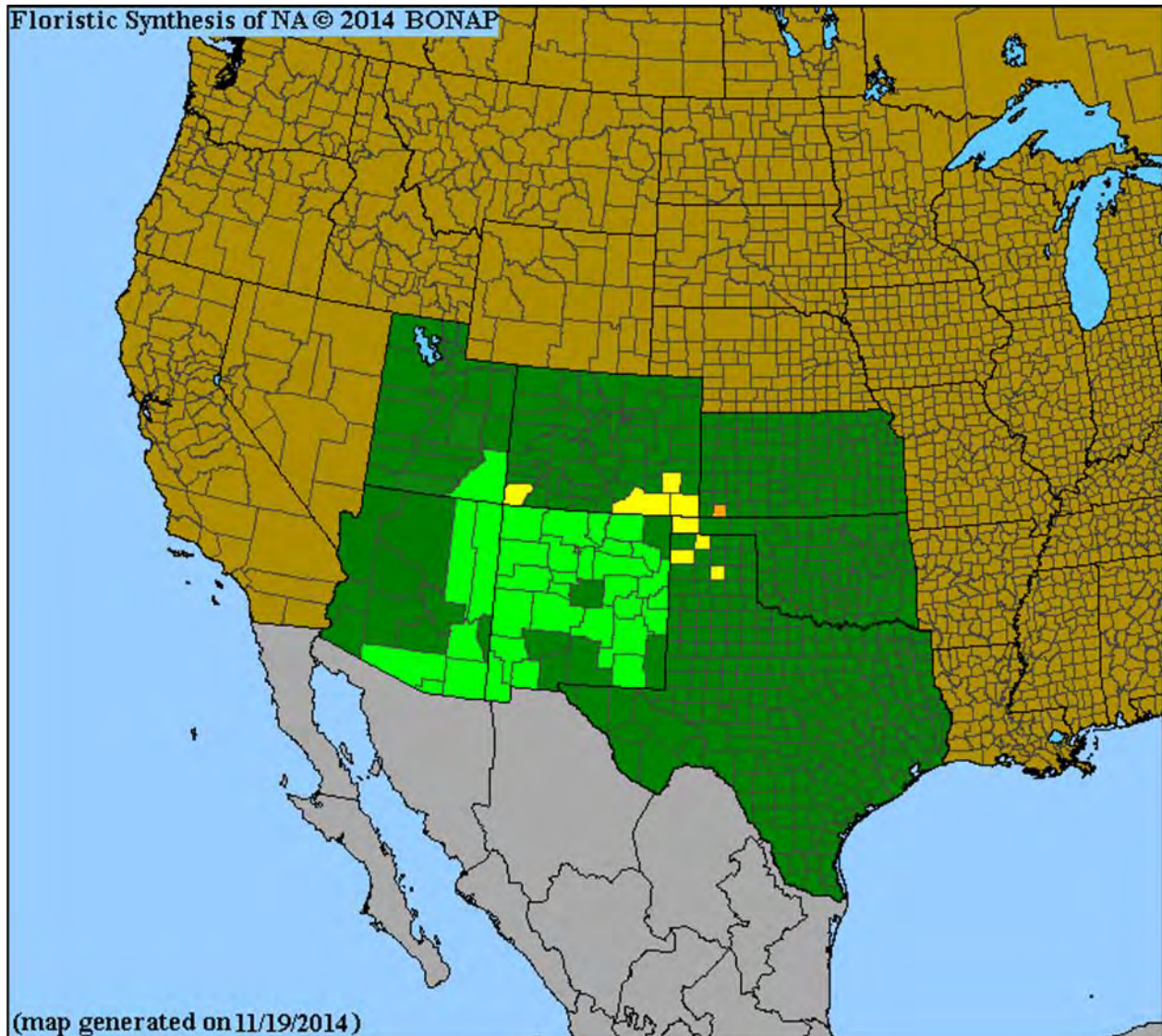


Figure 47. County-level species range map of dwarf milkweed from The Biota of North America Program (BONAP). Dark green is present in the state and native; Brown is species not present in the state; Lime green is species present and not rare; Yellow is species present and rare; Orange is species extirpated (historic).

Ear muhly

(*Muhlenbergia arenacea*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: According to iDigBio and GBIF, there have been two records of occurrences since 2007 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No significant threats are known. This species is drought-tolerant and can survive in hot temperatures.
 - b. Habitat: Desert grasslands are threatened by drought, livestock grazing, wildfire, and woody plant and invasive species encroachment (University of Arizona 2024).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Unknown.
 - b. Habitat: Desert grasslands are declining. Sandsage habitat is declining in quality of habitat.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Species is at the northern edge of the species' range and is disconnected from the rest of its range to the south.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: population numbers are unknown, 2 known occurrences in the plan area.
 - b. Ecological Conditions: Not restricted within the plan area.

Species Status

G5; S2 in Colorado.

Taxonomy

Muhlenbergia arenacea (Buckley) Hitchc. is the currently accepted valid scientific name for this species (NRCS 2025). Other synonyms include *Sporobolus arenaceus* Buckley, *Sporobolus auriculatus* Vasey, and *Sporobolus asperifolius* var. *brevifolius* Vasey (TSN 41895) (ITIS 2024).

Common names for this species include ear muhly and eared muhly (ITIS 2024).

Species range

Overall Species range

The species range extends from the southwestern United States into northern Mexico (Peterson 2021). In the U.S., its range includes Colorado, Arizona, New Mexico and Texas.

Description of how the population in the plan area fits within the overall range

Part of the plan area is within the overall known species range; however, it is at the northern edge of the species' range and is disconnected from the rest of its range to the south.

Distribution, abundance, and trend in the plan area

Population

The NatureServe Explorer database had no available data of the documented species distribution (NatureServe 2025) but there are two known occurrence records for the plan area.

Habitat

It grows in sandy flats, plains, alluvial fans, washes, depressions, and alkaline mesas in open grasslands, at elevations of 3280 – 7218 ft. (1000-2200 m.) (Peterson 2021). This species prefers alkaline soils that are well-draining, calcareous sand, loam, clay, or limestone (NPIN 2025). Muhly species are also drought-tolerant and can survive in hot temperatures.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No known threats at this time. This species is drought-tolerant and can survive in hot temperatures.

Habitat

Desert grasslands in general are threatened by drought, livestock grazing, wildfire, and woody plant and invasive species encroachment (University of Arizona 2024).

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Sandy, dry alkaline soils.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The plan area has an abundance of sandy flats and plains with open grasslands. The trend of these conditions are primarily in a decline for each of the grassland prairie vegetation types within the plan area. The shortgrass prairie habitat type is the dominant habitat type across the plan area. It is considered good with a stable condition in Kansas (Rohweder 2022) but has deviated from historical conditions regarding composition in eastern Colorado (see Threats and Trends Appendix).

The sandsage prairie habitat type is the second-most widespread vegetation type in the plan area, and the most abundant type for the Cimarron National Grassland, specifically (USFS 2005a). In Kansas, the sandsage prairie habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of the historic sandsage habitat has been lost or converted for agricultural uses (CPW 2015). The remaining tracts have good landscape connectivity, but the species composition is highly altered (CPW 2015).

Critical biological characteristics

No critical biological characteristics known at this time.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Leaf litter can be used by other species for nest construction (NPIN 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

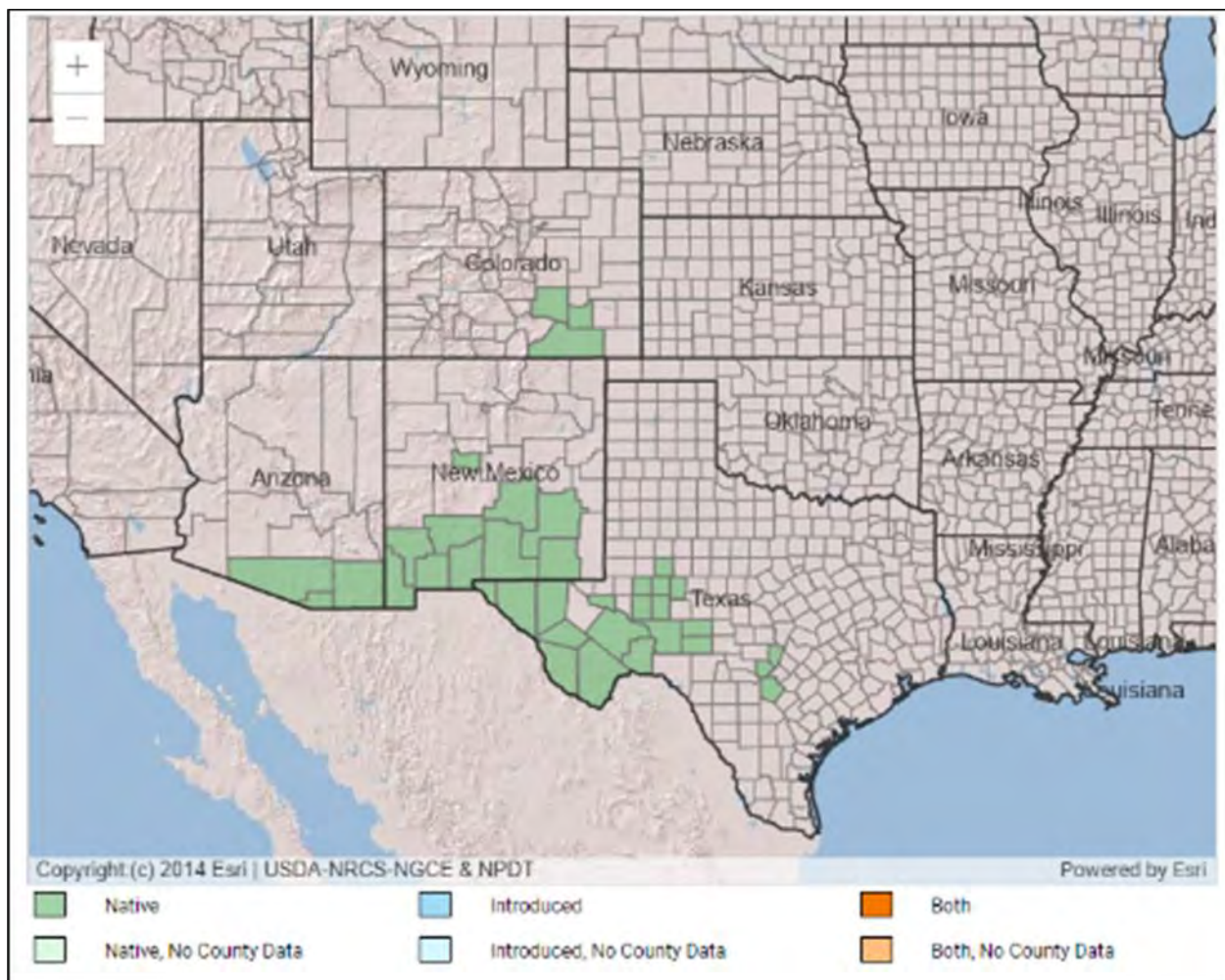


Figure 48. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Ebony spleenwort

(*Asplenium platyneuron*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are eight occurrences on CCNG from 1972 to 2008; GBIF contains four records from 1948 to 2020 on CCNG; iDigBio contains three records from 1948 to 2012; and SEINet contains three records from 1948 to 2007 (Van Scoyoc 2024). Three of the herbarium collections were documented in the southeastern Carrizo Unit of the Comanche National Grassland in Baca County (Van Scoyoc 2024).

Year of Last Known Occurrence: 2020

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Fragmentation, habitat loss, development, and drought.
 - b. Habitat: Development and climate stressors.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Habitat trends in the plan area are unknown.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is disjunct from the main body of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: eight known occurrences in the plan area. Population information is unknown.
 - b. Ecological Conditions: Likely restricted because the species is associated with a restricted ecological condition (e.g., seeps and shaded places on cliff faces).

Species Status

G5; S1 in Colorado; S4 in Kansas.

Taxonomy

Asplenium platyneuron (L.) Britton, Sterns & Poggenberg is accepted as valid (Ackerfield 2022, Weber et al. 2012, Flora of North America 1993, NRCS 2025). A synonym for this species is *Asplenium ebeneum* (iNaturalist 2025). Four varieties have been described however they are currently not recognized including *Asplenium platyneuron* var. *bacculum-rubrum*, var. *incism*, var. *platyneuron*, and var. *proliferum* (ITIS 2024). Other common names associated with this species include brownstem spleenwort (iNaturalist 2025) and doradille ébène (Flora of North America 1993, ITIS 2024). *Asplenium platyneuron* hybridizes with *A. rhizophyllum*, *A. trichomanes* (producing *A. × virginicum* Maxon), *A. pinnatifidum*, *A. ruta-muraria* (producing *A. × morganii* W. H. Wagner & F. S. Wagner), *A. bradleyi*, and *A. montanum* (producing sterile *A. bradleyi*) (Flora of North America 1993).

Species range

Overall Species range

In North America, ebony spleenwort occurs in 35 states including Alaska, Arkansas, Arizona, Colorado, Connecticut, Washington DC, Delaware, Florida, Georgia, Iowa, Illinois, Indiana, Kansas, Louisiana, Maine, Michigan, Minnesota, Missouri, Mississippi, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Virginia, Vermont, Wisconsin, and West Virginia (NatureServe 2025). The species is also known to occur in New Brunswick, Ontario, and Quebec (NatureServe 2025). This fern is unique in that disjunct occurrences have also been documented in South Africa and Slovakia (NatureServe 2025). The range extent was estimated to be 32 million square kilometers with greater than 5000 occurrences across its range (NatureServe 2025). There are estimated to be more than 40 occurrences that are protected and managed on conservation lands in the United States, Canada, and South Africa (NatureServe 2025). In Colorado, ebony spleenwort is known to occur in Baca and Las Animas Counties.

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area appear to be disjunct from the main body of the species range (Figure 49).

Distribution, abundance, and trend in the plan area

Population

There are eight documented occurrences in the plan area (Figure 49), none of the records contain population information. Of these collections, the most recent was in 2020. One collection in 2012 cited the plant at Picture Canyon “found in shaded recesses and the cracks in rocks associated with the cliffs near the horse and soldier petroglyphs” (Van Scoyoc 2024). The location data for another herbarium collection of ebony spleenwort made in 1972 was plotted in Holt Canyon, ten miles west and seven miles south of Campo. One of the specimen collections made by Wilbur A. Weber in 1948 was later determined to be a related species, black-stem spleenwort, which is also found on sandstone cliffs in Colorado (Van Scoyoc 2024).

Habitat

Ebony spleenwort can be found growing on the forest floor and on rocks (Flora of North America 1993). Plants are associated with seeps or shaded areas of cliff faces, which is not a common habitat type in the plan area.

Herbarium collections indicate Ebony spleenwort may be associated with sandstone in the plan area. One collection in Holt Canyon on the Comanche NG lists the habitat as cracks in sandstone above a spring in a small cave (Van Scoyoc 2024). Another collection near Picture Canyon lists habitat as sandstone bluffs, cliffs, and riparian areas; in sandy soil.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Threats to ebony spleenwort include fragmentation and habitat loss due to development. This is a particular concern in a landscape such as the plan area where land ownership is highly fragmented. However, these threats appear to have a low impact on the species distribution overall (NatureServe 2025). Projected climatic conditions could push the climate envelope, including minimum and maximum daily temperatures, beyond the species' ability to survive.

Habitat

Future climate may alter temperature and precipitation regimes that could influence water availability at the seeps where this plant occurs.

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Ebony spleenwort is a fern described as an ecological generalist that is particularly characteristic of disturbed woodlands (Flora of North America 1993), but in Colorado is associated with cliff faces.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Cliff faces and seeps where ebony spleenwort occurs in the plan area are limited.

Critical biological characteristics

Ebony spleenwort is a small herbaceous perennial fern. Proliferous buds on the lowest pinnae allow the formation of clumps with stems at several layers in the litter (Flora of North America 1993). In Colorado, the spore-producing period begins in May and extends through September (CNHP 2024).

Habitat in North America for ebony spleenwort includes cliffs, bare rocks/talus/scree, old fields, and forest/woodland (NatureServe 2025), forest floor or on rocks, disturbed woodlands, old fields, and on outcrops, especially of calcareous rocks and in masonry crevices, from 0 to 1300 meters in elevation (Flora of North America 1993). Habitat in Colorado is documented to be shaded seeps at the base of cliffs, sandy soil at elevations of 4300-5000 ft. (CNHP 2024) on sandstone cliffs and rimrock (Weber et al. 2012), and "rare on sandstone cliffs" (Ackerfield 2022).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown from the reviewed literature and sources, but the species likely provides diversity and physical cover in a largely barren habitat (i.e., cliff faces).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Due to its habitat preferences in cool moist areas, the species is likely to be threatened by altered climatic conditions. Research indicates that the species is moving northern in its range (NatureServe 2025) to higher elevations and altitudes. While this fern species may have the ability to disperse, there would need to be suitable unoccupied habitat areas available for migration. Essentially, changing climatic factors could limit favorable habitat and force the species into new areas that may not be protected or appropriately managed for conservation. The species also likely relies on seeps and the factors that create cliff face habitat.

Maps of Species Range

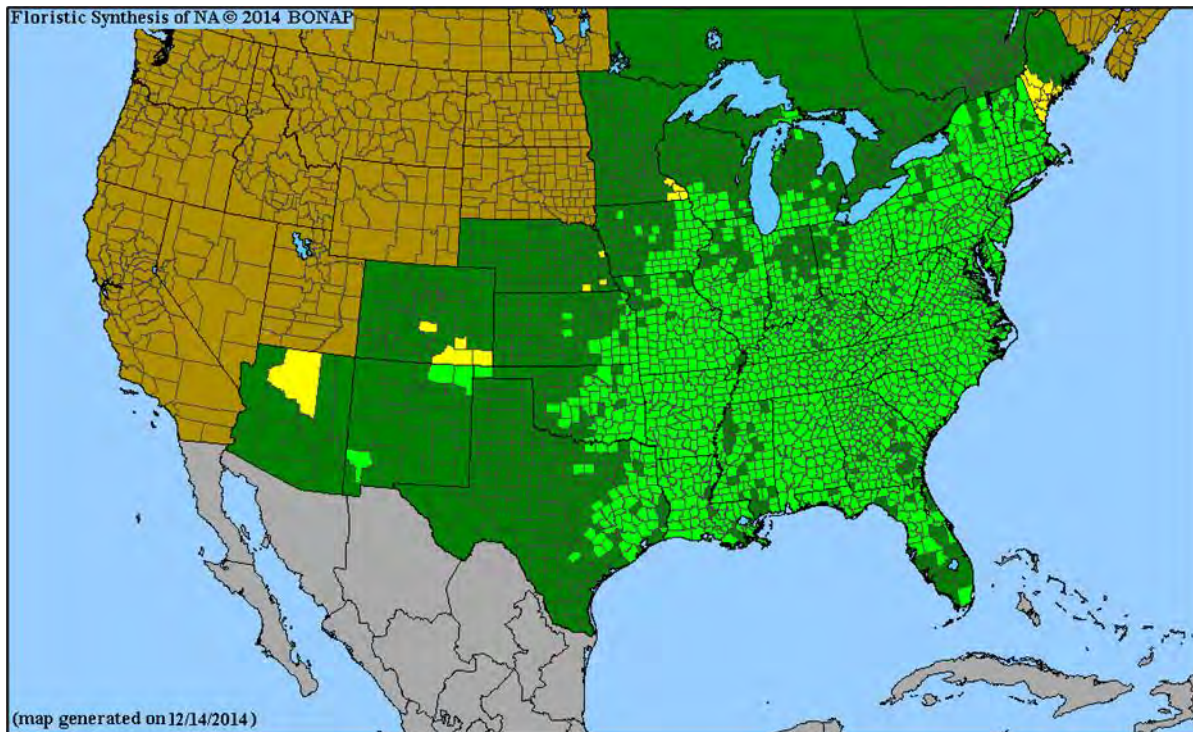


Figure 49. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Engelmann evening-primrose

(Oenothera engelmannii)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are between seven and thirteen occurrence records from 1957 to 2010 on the Cimarron National Grassland (NG) (Van Scoyoc 2024).

Year of Last Known Occurrence: 2010

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Unknown.
 - b. Habitat: Disturbance appears to be an important factor for habitat maintenance for the species, and it appears to tolerate grazing. Primary threats appear to be fire suppression and conversion to cropland (Warren and Redders 2001).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: There does not appear to be any compelling evidence of downward trends for populations.
 - b. Habitat: Most occurrence records are within the Western Great Plains Shortgrass Prairie (Landfire 2024) which have a declining trend in quality of habitat in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Large numbers of individuals occur in populations in the Cimarron NG (Warren and Redders 2001).
 - b. Ecological conditions: Ecological conditions do not appear restricted in the plan area.

Species Status

G4; S1 in Colorado; S2 in Kansas.

Taxonomy

Oenothera engelmannii is accepted as valid (NRCS 2025).

Species range

Overall Species range

It has a relatively narrow distribution in sandy areas of eastern New Mexico and western Texas, extending to southeastern Colorado, western Oklahoma, and southwestern Kansas. Widely dispersed

and locally common over the higher prairies (Flora of North America 1993). Plants occur in Colorado, Kansas, New Mexico, Oklahoma, and Texas (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range (Figure 50).

Distribution, abundance, and trend in the plan area

Population

Known occurrence records in the plan area are within the sandsage prairie ecosystem (USFS 2005a).

Large numbers of individuals occur in populations on the Cimarron NG (Warren and Redders 2001).

Noted in 2001 that there does not appear to be any compelling evidence of downward trends in habitat or population on NFS lands (Warren and Redders 2001).

Habitat

Sand dunes and open sandy flats, disturbed areas, and roadsides (NatureServe 2025, Flora of North America 1993). Ackerfield (2022) describes habitat as sandy soil, prairie 4200 to 4500 feet in elevation.

This species is associated with sand dunes and loose sand in sandsage prairie habitat. It is at the limit of its range in R2, occurring only on the Cimarron NG. Large numbers of individuals occur in populations in the Cimarron NG (Warren and Redders 2001).

Most occurrence records occur within the Western Great Plains Shortgrass Prairie (Landfire 2024). There did not appear to be any compelling evidence of downward trends in habitat or population on NFS lands, as of 2001 (Warren and Redders 2001). However, more recent analyses of habitat trend in the plan area have indicated that there is a declining trend in the quality of the shortgrass prairie in the plan area.

Trends common in the shortgrass prairie habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025, Warren and Redders 2001, Flora of North America 1993).

Habitat

There are many occurrence records in the Western Great Plains Shortgrass prairie (Landfire 2024). Common stressors and threats for this type include fragmentation, altered fire regime, overgrazing by livestock, and invasive species (in the less xeric regions). Fire suppression and certain grazing patterns such as continuous heavy grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. The short grasses that dominate this system are extremely drought- and grazing-tolerant although continuous heavy grazing and extended drought (3-4 years) will reduce cover of dominant species. (NatureServe 2025).

Disturbance appears to be an important factor information and maintenance of habitat for the species, and it appears to tolerate grazing. Primary threats appear to be fire suppression and conversion to cropland (Warren and Redders 2001).

Threats common in the shortgrass prairie habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025, Flora of North America 1993).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Shortgrass prairie habitat is not limited within the plan area. Ecological conditions in the plan area are within the Western Great Plains Shortgrass Prairie (Landfire 2024). The distribution of the species occurrence records is limited to the Cimarron NG in the plan area.

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (Ackerfield 2022, NatureServe 2025, Flora of North America 1993, Warren and Redders 2001).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Engelmann evening-primrose has value to native bees and is recognized by pollination ecologists as attracting large numbers of native bees (NPIN 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

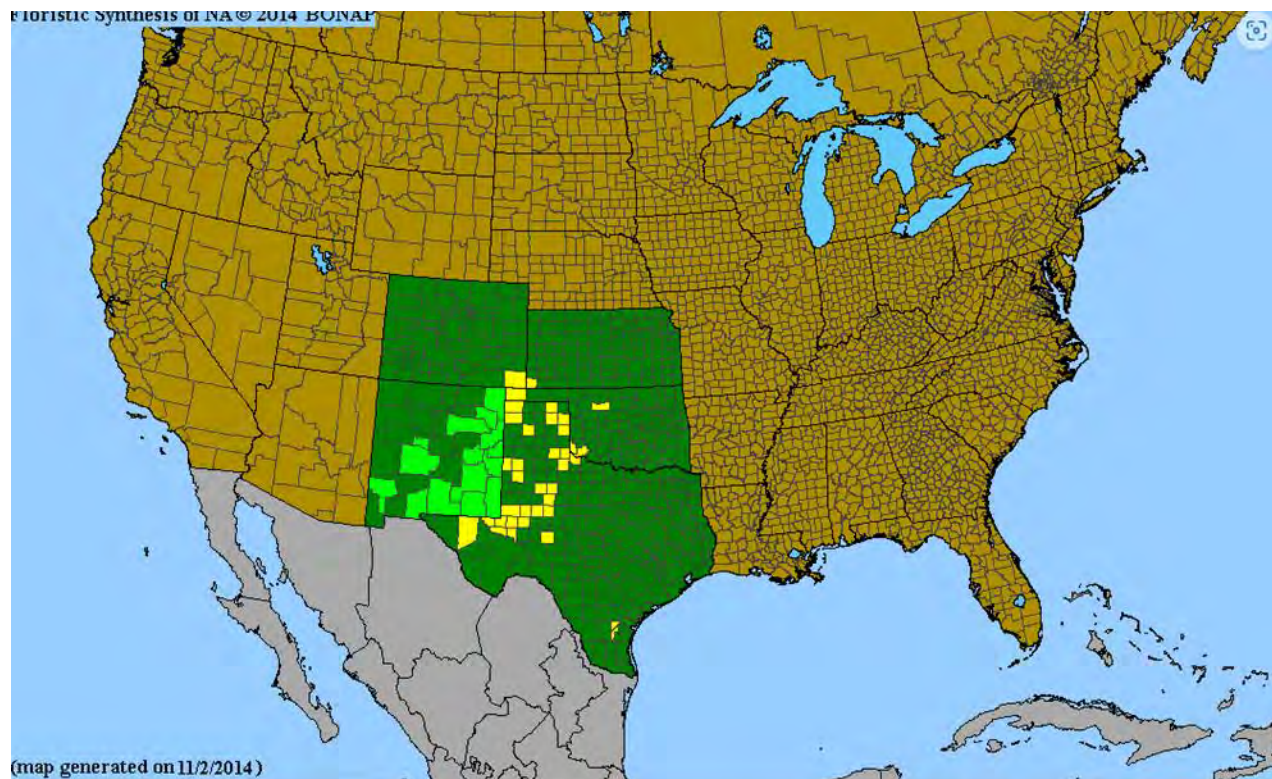


Figure 50. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Engelmann's goldenweed

(*Oönosis engelmannii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are two documented occurrences on the Carrizo Unit of the Comanche National Grassland (NG) in 1990 (Van Scoyoc 2024). One of these is also listed in CNHP data from 2024 (CNHP 2024).

Year of Last Known Occurrence: 1990

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Unknown.
 - b. Habitat: Threats common in the shortgrass prairie and canyonlands (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Trends associated with the shortgrass prairie and canyonlands (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the southern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are two documented occurrences in the plan area. Population numbers are unknown.
 - b. Ecological conditions: Unknown, but the species utilizes a number of varied habitat types that may be present in the plan area.

Species Status

G3; S3 in Colorado; S1 in Kansas.

Taxonomy

Oönosis engelmannii (A. Gray) Greene is accepted as valid (Flora of North America 1993, NRCS 2025, Weber et al. 2012). Synonyms include *Haplopappus engelmannii* (ITIS 2024, NRCS 2025) and *Bigelowia engelmannii* (Flora of North America 1993). Hybridization has been documented between *O. engelmannii* and *O. foliosa* var. *foliosa* (Flora of North America 1993).

Species range

Overall Species range

In North America, occurs only in Colorado and Kansas (NatureServe 2025) (Figure 51). Engelmann's goldenweed is endemic to the Arkansas River watershed in southeastern Colorado and westernmost Kansas (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are at the southern edge of the species range. The overall range of this species is limited.

Distribution, abundance, and trend in the plan area

Population

Population trend and abundance in the plan area are unknown.

Habitat

This endemic species is considered more widely distributed across Central Grasslands. Locklear (2017) lists occurrences also in rock outcrop habitat in the Raton Tablelands.

Weber (2012) cited plants as scattered on the plains except in the northern Colorado counties. Habitat includes "barrens, limestone and clay outcrops and ridges, sandy or gravelly slopes, shaley slopes (often with *Frasera coloradensis*), cactus-scrub, dry powdery clay, gypsiferous shale, ditches, pastures, fencelines, drying shorelines, usually in sites within shortgrass prairie" (Flora of North America 1993). NatureServe lists plants to be "somewhat restricted to particular substrates but locally abundant, with about 20 discrete populations and over a million individuals estimated," (NatureServe 2025).

Plants may occur in moderately disturbed habitat in shortgrass prairie rangeland (NatureServe 2025). Buffalo wallows may have provided pre-European settlement habitat; the plants are now often found near fencelines, roadsides, railroad rights-of-way, and other disturbed places and are closely associated with the Greenhorn limestone/Graneros shale complex, the Pierre shale, and a few other substrates (NatureServe 2025).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No threats to populations were identified in the literature. NatureServe comments that most occurrences are on private land, but not particularly threatened (NatureServe 2025).

Habitat

Threats common in the shortgrass prairie and canyonlands (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Plants are frequent in some disturbed areas such as fence lines, roadside ditches, unimproved roads, and railroad rights-of-way (NatureServe 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Connectivity of ecological conditions may be limited in the plan area. NatureServe notes that the greatest distance between known occurrences is about 165 miles (NatureServe 2025).

Critical biological characteristics

In the genus, plants without ray flowers are frequent (Weber et al. 2012).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Plants in the genus are known to accumulate selenium (Weber et al. 2012).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

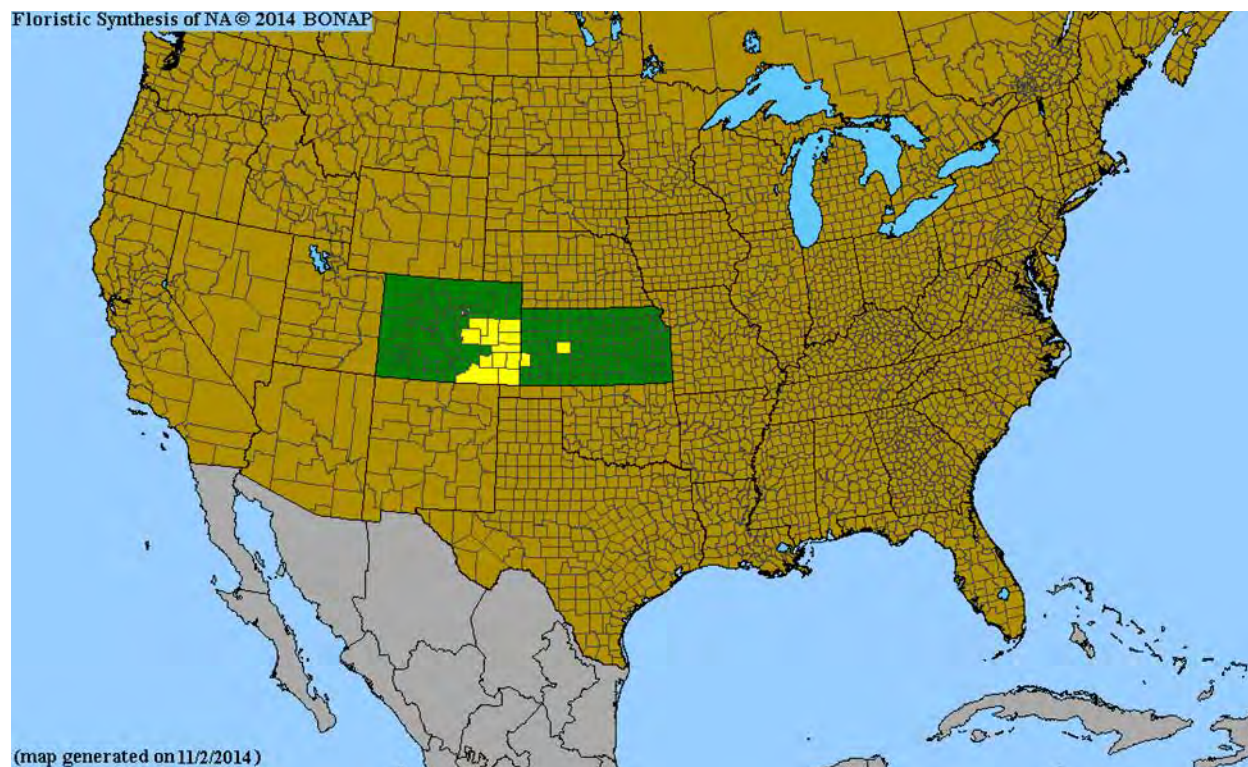


Figure 51. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Erect knotweed

(*Polygonum erectum*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has two occurrence records within the Cimarron National Grassland, both from 1962 (Van Scoyoc 2024). The specimen records for the occurrences describe the locality as “Grassland area on Cimarron River, soil sandy, flower white” with a decimal degree precision of seven decimals. This provides sufficient locational precision to determine the species occurs in the plan area. Aerial imagery of the location shows intact grassland habitat (Figure 52). Therefore, this species is known to occur in the plan area.

Year of Last Known Occurrence: 1962

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: dry, disturbed soils are considered stable in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Plan area is within the central portion of species’ range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: unknown; two occurrence records in the plan area.
 - b. Ecological conditions: dry, disturbed habitats are not restricted in the plan area.

Species Status

G5; S2 in Kansas.

Taxonomy

Polygonum erectum is accepted as valid (NRCS 2025). There is domesticated subspecies of erect knotweed, *Polygonum erectum* ssp. *watsoniae* (Mueller 2018).

Species range

Overall Species range:

In North America, erect knotweed is widely distributed across most of the United States and much of Canada but is largely absent from the southwestern United States (Figure 53, Figure 54).

Description of how the population in the plan area fits within the overall range:

The plan area is within the central portion of the species' range (Figure 53, Figure 54).

Distribution, abundance, and trend in the plan area

Population:

There are two occurrence records in the plan area, which has not been observed since 1962 (Van Scoyoc 2024) (Figure 52). Population size in the plan area is not known.

Erect knotweed populations have declined occurred across New England (Native Plant Trust 2024). Population trend in the plan area is not known.

Habitat

Erect knotweed is "typically found in in dry disturbed soils of farm lots and fields, as well as in woodlands and shaded floodplains" (Thomas et al. 2006). SEINet also indicates an association with anthropogenically-influenced habitats and notes it can use rich soil or hard, clay soil (Van Scoyoc 2024).

The species has only been documented within the Cimarron National Grassland portion of the plan area (Van Scoyoc 2024). Both occurrence records were located off the South River Road (FSR # 700.3). Since this species benefits from disturbed and anthropogenically influenced habitat, its habitat is considered stable in the plan area.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

None of the sources consulted identified threats to populations (Hobbs and Huenneke 1992, NatureServe 2025, Van Scoyoc 2024, McLauchlan 2003, Thomas et al. 2006, Native Plant Trust 2024).

Habitat

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Erect knotweed occupies disturbed habitats, but it can be uncommon even in disturbed habitats which indicates that certain other ecological conditions are necessary for them to thrive (McLauchlan 2003). Beyond disturbance, these conditions are not well characterized for erect knotweed (McLauchlan 2003). Its erect growth habit makes this species intolerant of mowing (Hobbs and Huenneke 1992).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species depends on dry, disturbed habitats (Thomas et al. 2006, Van Scoyoc 2024). The occurrence records within the plan area intersect with the LANDFIRE Existing Vegetation Type of “developed roads” (Landfire 2024). While our current understanding of its full ecological condition requirements may be incomplete (McLauchlan 2003), dry, disturbed habitats are not restricted in the plan area.

Critical biological characteristics

Erect knotweed is an annual forb in the buckweed family (Mueller 2018). It flowers in May-October (Van Scoyoc 2024). Wild erect knotweed produces two achene morphs: tubercled morphs with a thicker, more durable coat and greater capacity for dormancy, and smooth morphs that have a thinner, more permeable fruit coat and germinate more readily (Mueller 2018).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Erect knotweed has been cultivated for its edible seeds (Mueller 2018). Mueller (2018) states “it may have been harvested as a seed crop as early as 1500 BC and is abundant and ubiquitous at many archaeological sites...”. The domesticated subspecies has been described as *Polygonum erectum* ssp. *watsoniae* (Mueller 2018).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found specifically for this species.

Maps of Species Range and Known Occurrences in Plan Area



Figure 52. Aerial imagery showing the mapped location of the two occurrence records (yellow pin), which show intact grassland habitat where the occurrence record (1962) described collecting the herbarium specimens.

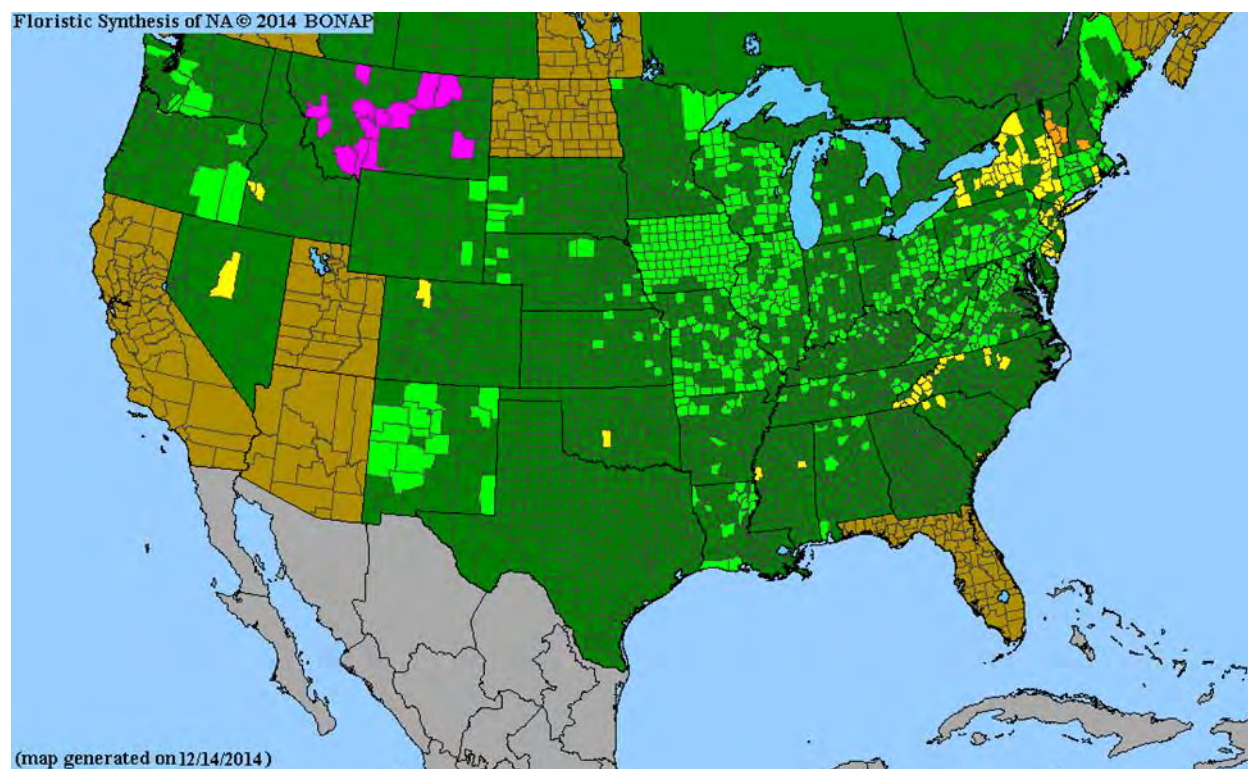


Figure 53. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

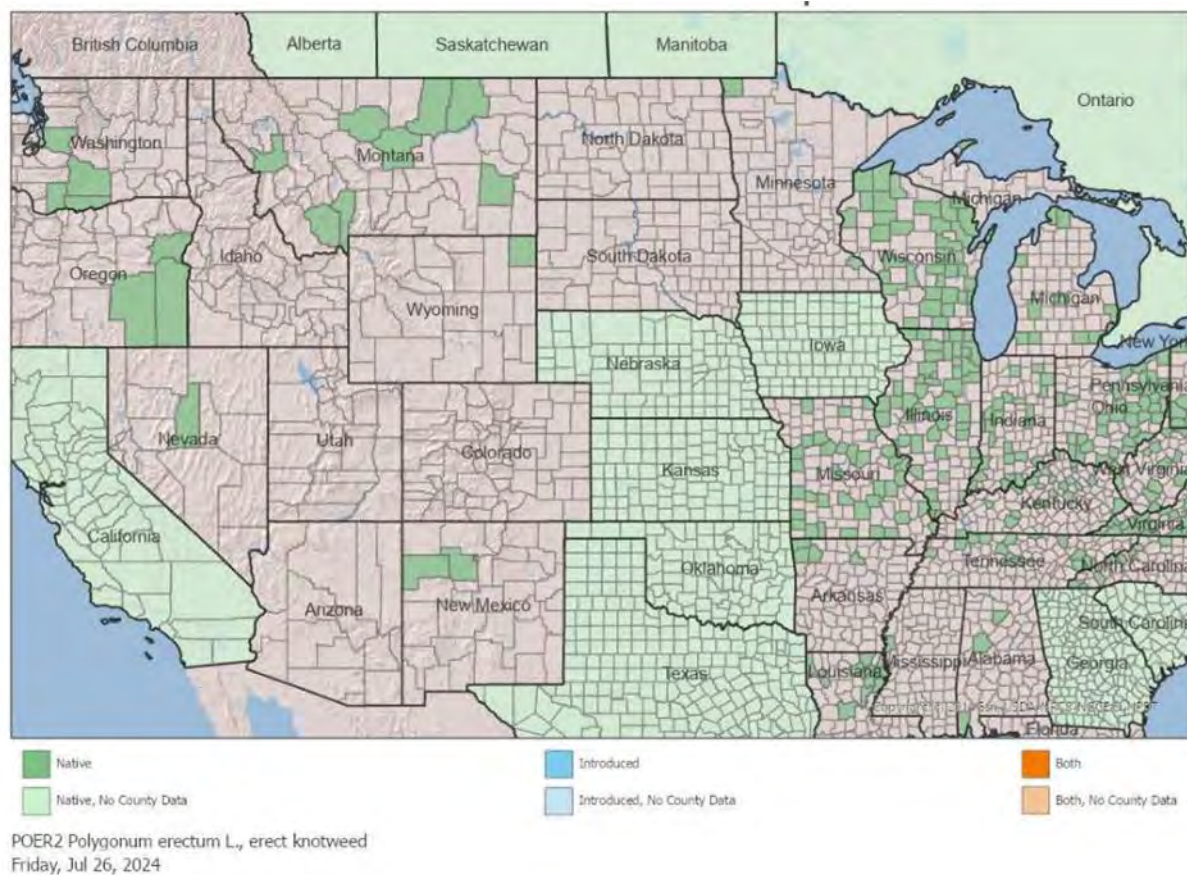


Figure 54. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

False golden-weed

(*Grindelia ciliata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are 5 occurrence records from GBIF and SEINet in the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: The five known occurrences are found near abandoned and active oil and gas well activity sites. This species can persist in disturbed conditions, but human activity associated with oil and gas well can impact individuals by driving over them or trampling and potentially uprooting the plant.
 - b. Habitat: General habitat threats include grazing, oil and gas development, roads, fire suppression, and invasive species. Most of these threat to the habitat will not impact the False Golden-weed.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend is unknown.
 - b. Habitat: Habitat trend is unknown
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the North Central edge of the species' range (Figure 55).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known, but occurrence records indicate there are five observation locations in the Cimmaron Unit.
 - b. Ecological conditions: Ecological conditions: Ecological conditions do not appear restricted in the plan area.

Species Status

G4; S1 in Colorado; S5 in Kansas.

Taxonomy

Grindelia ciliata is accepted as valid (Ackerfield 2022, ITIS 2024). USDA NRCS has *Grindelia ciliata* as a synonym for *Grindelia papposa* (NRCS 2025) and ITIS list *Prionopsis ciliata* and *Haplopappus ciliatus* as additional synonyms (ITIS 2024).

Species range

Overall Species range

False golden-weed distribution includes Arkansas, Arizona, California, Colorado, Iowa, Illinois, Kansas, Louisiana, Michigan, Missouri, New Mexico, Oklahoma, and Texas (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is at the North Central edge of the species' range (Figure 55).

Distribution, abundance, and trend in the plan area

Population

There are five occurrence records that all occur in the Cimarron Unit. Two are spatially mapped within the shortgrass prairie ecosystem and three are in Riparian woodlands and aquatic habitats (USFS 2005a).

Two herbarium record were found east of an oil well, south side of Cimarron River, tamarisk flats along floodplains.

Population trend is unknown.

Habitat

Open sandy or rocky places along the Cimarron River, 3800-4300 ft elevation (Ackerfield 2022). Haddock (2024b) describes this species as occurring nearly statewide. Open prairies, pastures, roadsides, waste ground; dry, sandy or rocky soils.

All five occurrence records occur in different LandFire (2024) existing vegetation types: Central Mixedgrass Prairie Grassland, Western Cool Temperate Pasture and Hayland, Western Great Plains Floodplain Herbaceous, Western Great Plains Sand Prairie, and Western Great Plains Shortgrass Prairie.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

The five known occurrences are found near abandoned and active oil and gas well activity sites (Van Scoyoc 2024). This species can persist in disturbed conditions, but human activity associated with oil and gas well can impact individuals by driving over them or trampling and potentially uprooting the plant.

Habitat

General habitat threats include grazing, oil and gas development, roads, fire suppression, and invasive species. Most of these threat to the habitat will not impact the false golden-weed. Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are five occurrence records occurrence records that all occur in the Cimarron Unit. Two are spatially mapped within the shortgrass prairie ecosystem and three are in riparian woodlands and aquatic habitats (USFS 2005a).

All five occurrence records occur in different LandFire (2024) existing vegetation types; Central Mixedgrass Prairie Grassland, Western Cool Temperate Pasture and Hayland, Western Great Plains Floodplain Herbaceous, Western Great Plains Sand Prairie, and Western Great Plains Shortgrass Prairie.

There are no required ecological conditions required for this species. This species can persist in disturbed areas such as roadsides.

Critical biological characteristics

No sources consulted identified critical biological characteristics for this species (Ackerfield 2022, NatureServe 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

False golden-weed is avoided by grazing livestock (Haddock 2024b).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

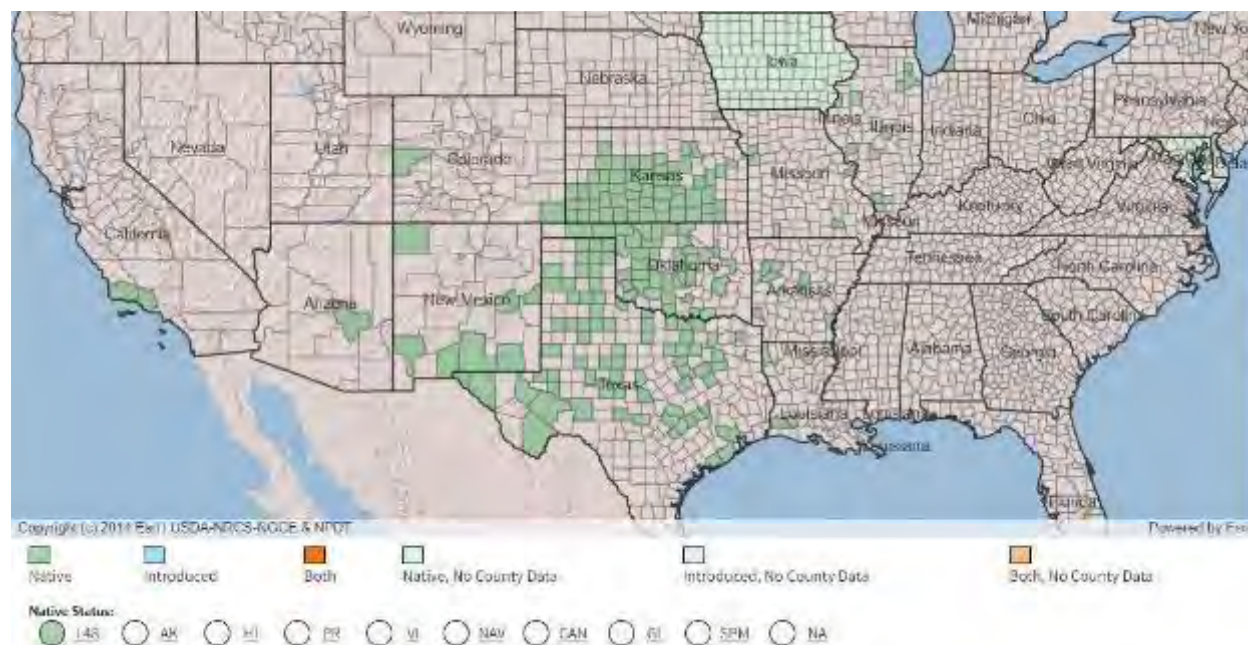


Figure 55. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Fanleaf vervain

(*Verbena plicata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one occurrence record in the plan area (Van Scoyoc 2024). Two observation records in GBIF are not known to occur in the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025).
 - b. Habitat: Common threats include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend for this species in the plan area is unknown.
 - b. Habitat: Species uses varied habitats, no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northern edge of the species range
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known. There is one occurrence record within the plan area.
 - b. Ecological conditions: No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025). Species is herbaceous annual to short-lived perennial, flowers, May through August (Ackerfield 2022, Van Scoyoc 2024).

Species Status

G5; S1 in Colorado.

Taxonomy

Verbena plicata is accepted as valid (NRCS 2025, NatureServe 2025, Ackerfield 2022). Synonyms for this species include *Verbena plicata* var. *degeneri* and *Verbena plicata* var. *plicata* (ITIS 2024).

Species range

Overall Species range

Fanleaf vervain occurs in Arizona, Colorado, New Mexico, Oklahoma, and Texas (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range (Figure 56, Figure 57).

Distribution, abundance, and trend in the plan area

Population

There is one occurrence record within the Carizo Unit in the Canyonlands ecosystem (USFS 2005a). Hazlett (2004) indicates this species is not known to occur in the plan area but could occur in eastern Las Animas and Baca County. Kuhn (2011) did not identify this in the Floristic Inventory of Cimarron National Grassland and Comanche National Grassland.

Population and population trend for this species in the plan area is unknown.

Habitat

Fanleaf vervain is a perennial herb that occurs in sandy prairie, canyon bottoms, pinyon-juniper woodlands, 4200-6200 ft in elevation. Flowers May through August (Ackerfield 2022). SEINet indicates it is found in sandy or gravelly prairies, flats, ravines, hillsides, roadsides (Van Scoyoc 2024). Hazlett (2004) describes it as rocky: exposed limestone/shale barrens. Kuhn (2011) did not identify this species in the Floristic Inventory of Cimarron National Grassland and Comanche National Grassland.

The observation record in the plan area locality is Holt Canyon, in Baca County, Comanche National Grassland. The habitat it was found was scattered Juniperus monosperma; canyon walls with Selaginella and Cheilanthes (Van Scoyoc 2024). The occurrence record is spatially mapped within the Western Great Plains Shortgrass Prairie (Landfire 2024).

Species uses varied habitats. Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025).

Habitat

Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022). Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025). Species is herbaceous annual to short-lived perennial, flowers, May through August (Ackerfield 2022, Van Scoyoc 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There is one occurrence record within the Carizo Unit in the Canyonlands ecosystem (USFS 2005a). The observation record in the plan area locality is Holt Canyon, in Baca County, Commanche National Grassland. The habitat it was found was scattered Juniperus monosperma; canyon walls with Selaginella and Cheilanthes (Van Scoyoc 2024). The occurrence record is spatially mapped within the Western Great Plains Shortgrass Prairie (Landfire 2024).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (NatureServe 2025, Ackerfield 2022). Species is herbaceous annual to short-lived perennial, flowers, May through August (Ackerfield 2022, Van Scoyoc 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

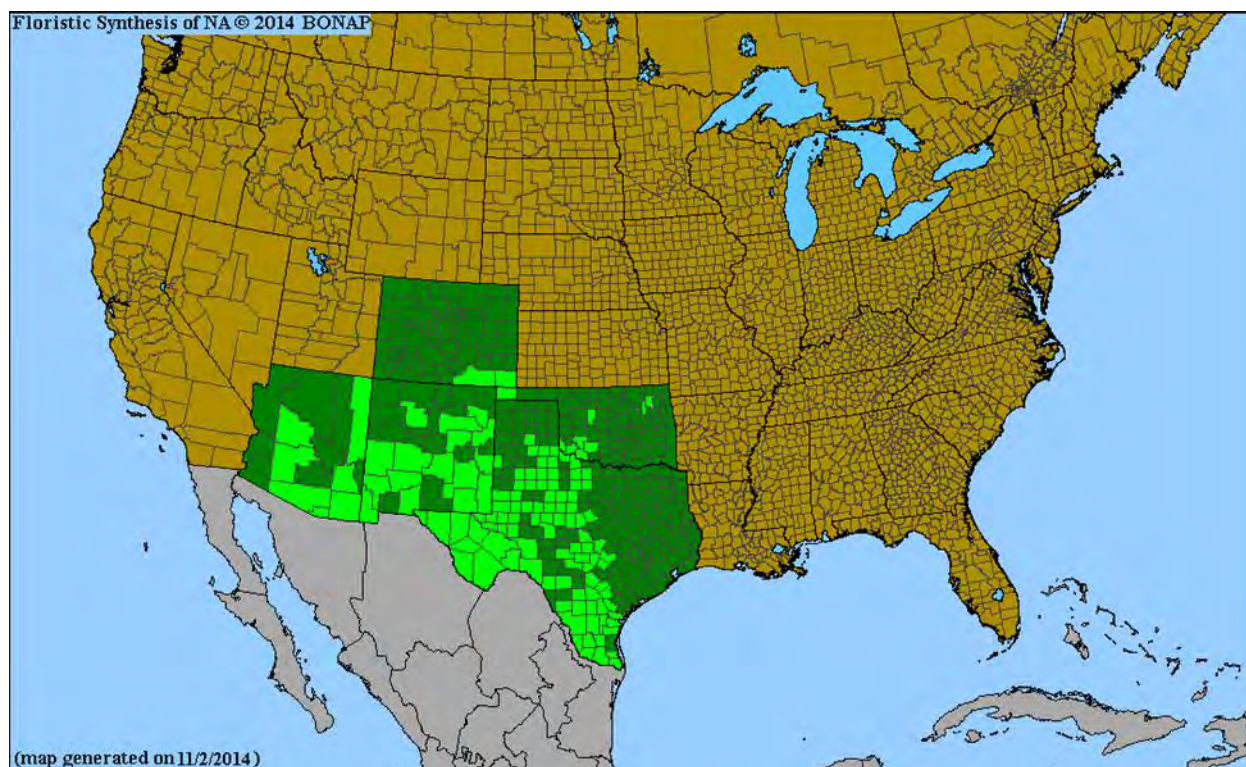


Figure 56. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

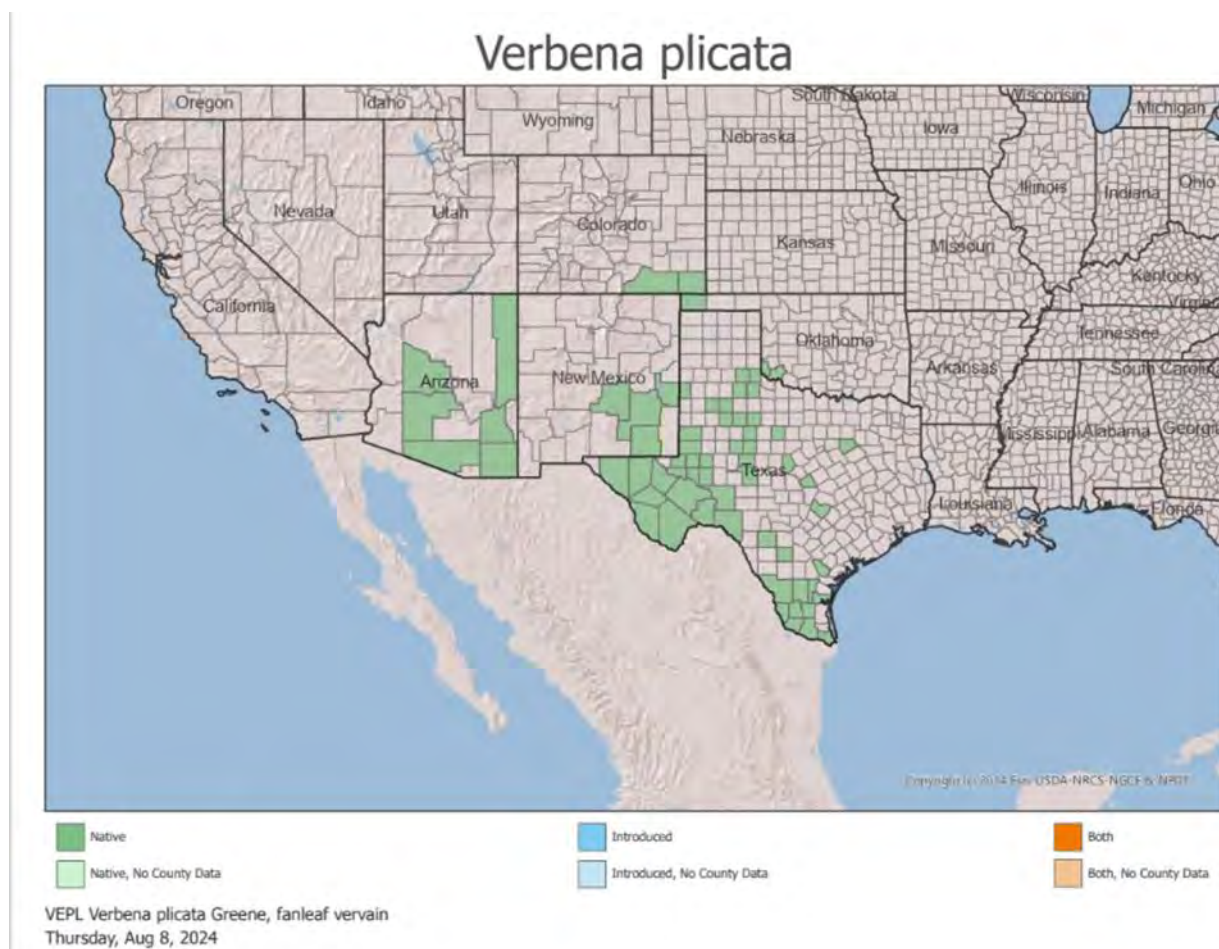


Figure 57. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Feather-plume dalea

(*Dalea formosa*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has 11 occurrence records in the plan area, spanning from 1947 to 2022 (Van Scoyoc 2024). Some of these have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: none known.
 - b. Habitat: none known.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: none specifically known; canyonlands are considered stable.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; 11 occurrence records (six from 1947- 1954 and five from 2009-2022).
 - b. Ecological conditions: rocky canyons, ravines, and juniper woodlands are not restricted in the plan area.

Species Status

G5; S2 in Colorado.

Taxonomy

USDA NRCS recognizes *Dalea formosa* as valid; a taxonomic synonym is *Parosela formosa* (NRCS 2025).

Species range

Overall Species range:

Feather-plume dalea is distributed in the southwest United States in Arizona, Colorado, New Mexico, Oklahoma and Texas, and in northern and north-eastern Mexico (Figure 58).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure 58).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. Occurrence records give no indication of the number of individuals. The species is not considered rare in Baca County, Colorado (Figure 58).

Habitat

Across its range, feather-plume dalea occurs in gravelly or rocky, dry slopes at elevations from 2,000 – 6,500 ft (Van Scoyoc 2024). Within the plan area, it has only been documented at the southern edge of the Carrizo Unit of the Comanche National Grassland near Sand and Holt Canyons. Near Holt Canyon, the species was observed in sandstone pavement at top of west-facing slope of the canyon.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No consulted sources listed threats to populations (NatureServe 2025, Van Scoyoc 2024, Kuhn et al. 2011, Hazlett 2004).

Habitat

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

This species requires shaded rocky canyons and ravines (Hazlett 2004). Kuhn (2011) indicates it can also use juniper-woodlands. It prefers well drained slopes and Permian red clay coils or limestone brakes (Blossingame 1968).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Within the plan area, this species has been observed in the canyonland ecosystem of the Comanche National Grassland. Its ecological conditions are not considered restricted in the plan area because of the prevalence of canyonlands.

Critical biological characteristics

Legumes can provide valuable forage plants for bees in honey production, and numerous species are browsed by livestock and serve as important browse plants for wildlife (Freeman 1989, Johnson 2006a).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species is a host plant for a completely parasitic plant called a stemsucker (*Pilostyles covillei*); the distribution of this parasite seems to depend on the distribution of feather-plume dalea as the two species exhibit a close host-parasite relationship (Blossingame 1968). Legumes are known to host nitrogen fixing bacteria. However, native grassland legumes likely contribute only a small amount of Nitrogen enrichment to soils, having evolved in low nutrient sites such as the Great Plains grasslands (VanRiper et al. 2010).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

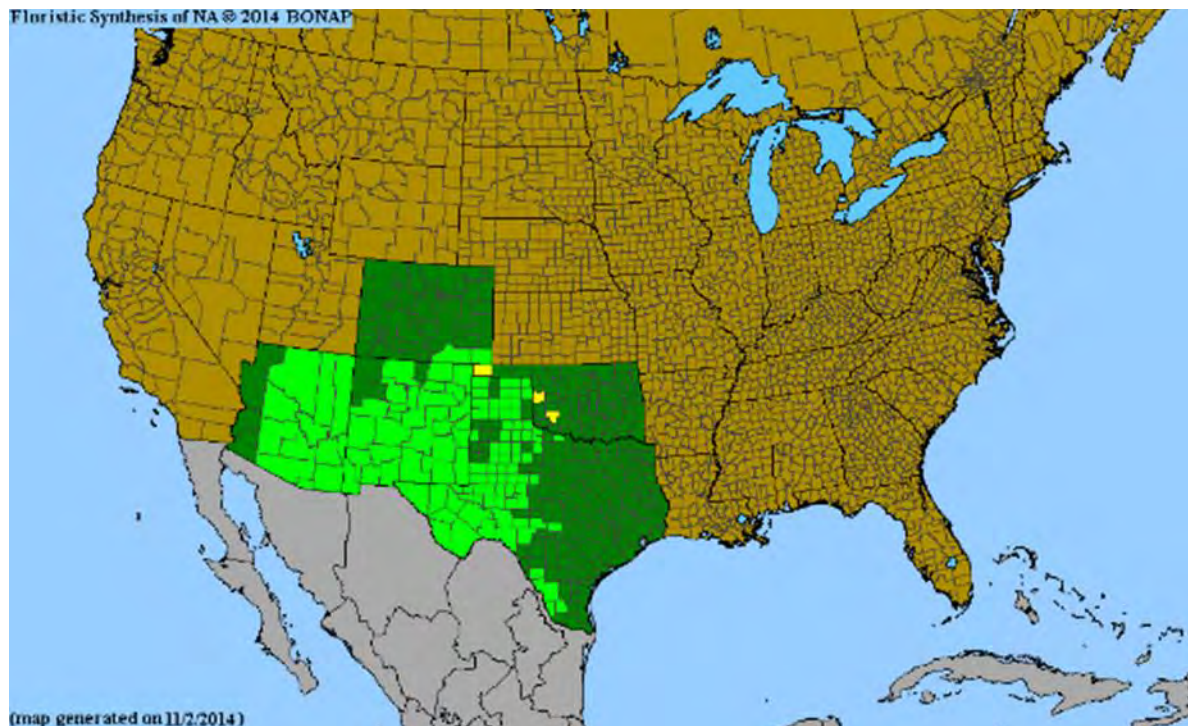


Figure 58. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Fendler's false cloak fern (*Argyrochosma fendleri*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: One occurrence on CCNG in 1985 (Van Scoyoc 2024). This record has a spatial uncertainty of $\pm 8,200$ ft (2,500 m); the locality description is "Ca. 8 Mi. N Of The New Mexico-Oklahoma Corner. Base Of Cliff, North-facing Wall Of Side-canyon To East Carrizo Creek," which could be on or off the plan area. This record does not have sufficient spatial precision to demonstrate that the species is known to occur in the plan area. No other consulted databases (CNHP and KNHP) contain occurrence records. Hazlett (2004) did not find occurrence data for this species on the Comanche NG however did identify western Las Animas and Baca Counties as areas where the species could occur, known from a nearby area. Therefore, the species is not known to occur in the plan area and is not analyzed further.

Year of Last Known Occurrence: N/A

Species Status

G3; S3 in Colorado.

Taxonomy

Argyrochosma fendleri (Kunze) Windham is accepted as valid (Ackerfield 2022, NRCS 2025). Synonyms include *Cheilanthes cancellata*, *Notholaena fendleri*, and *Pellaea fendleri* (NRCS 2025).

Fendler's three-awn grass (*Aristida purpurea* var. *fendleriana*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: **Yes**

Rationale/Evidence of Occurrence: GBIF and SEINet show nine occurrence records within the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this variety.
 - b. Habitat: General threats include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, recreation, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022). Threats common in the habitat type (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Trends common in the various habitat types (see Threats and Trends Appendix) particularly for shortgrass prairie, sandsage, and the tree-free portion of the canyonlands and juniper woodlands where woody encroachment is resulting in a declining trend in this species particular ecological conditions.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the eastern edge of the varieties' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are nine known occurrences in the plan area. Size is unknown.
 - b. Ecological conditions: The variety has been associated with a variety of habitats in the plan area, including disturbed, often roadside, sand open steppe, juniper woodlands, rocky upland prairie, shortgrass prairie, and sandsage prairie. Given this breadth of habitat associations, its ecological conditions are not considered restricted

Species Status

TNR: SNR in Colorado; S2 in Kansas

Taxonomy

Aristida purpurea var. *fendleriana* is accepted as valid and synonym is *Aristida fendleriana* (NatureServe 2025, NRCS 2025). These are all accepted varieties for the parent species *Aristida purpurea* in ITIS (ITIS 2024). This variety is often confused with var. *longiseta* (Flora of North America 1993).

Species range

Overall Species range

Fendler's three-awn grass occurs in Arizona, California, Colorado, Kansas, Montana, North Dakota, Nebraska, New Mexico, Nevada, Oklahoma, South Dakota, Texas, Utah, and Wyoming (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is at the eastern edge of the varieties' range (Figure 59, Figure 60).

Distribution, abundance, and trend in the plan area

Population

There are 9 occurrence records that occur in the Timpas (6) and Carrizo (1) Units of the Comanche NG and Cimarron NG (2) within the Shortgrass, Sandsage, Canyonlands and Riparian woodlands and aquatic habitat ecosystems (USFS 2005a). Hazlett (2004) indicates this species is known from Baca and Otero County and could potentially occur in western Las Animas, and eastern Las Animas County. Kuhn (2011) found this species in Otero, Las Animas, and Morton County in his floristic inventory.

Population abundance and trends for this variety in the plan area are unknown.

Habitat

This variety is found on open slopes, flats, and dry plains from 5,000-7,000 ft (Van Scoyoc 2024, Flora of North America 1993). Hazlett (2004) describes habitat for this variety as disturbed, often roadside sand open steppe. Kuhn (2011) describes habitat as juniper woodlands, rocky upland prairie, shortgrass prairie, and Sandsage prairie in the floristic inventory of Cimarron National Grassland and Comanche National Grassland.

Herbarium records are within the Shortgrass, Sandsage, Canyonlands and Riparian woodlands and aquatic habitat Ecosystem (USFS 2005a). The occurrence records are spatially mapped within landfire existing vegetation types; Western Cool Temperate Urban Shrubland, Developed-Roads, and Western Great Plains Shortgrass Prairie (Landfire 2024).

Habitat descriptions for occurrence records include, sandhills, rolling sandsage prairies, open pastures, along river on rocky upland slope with scattered juniper, weedy canyon sides, rocky upland, and

Species uses varied habitats. Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified any unique threats to this variety. Two of the known locations are near oil and gas well activities and all are near roads (most being roads not maintained for passenger vehicles).

Habitat

General threats to this varieties habitat on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, recreation, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022). Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

The variety has been associated with a variety of habitats in the plan area, including disturbed, often roadside, sand open steppe, juniper woodlands, rocky upland prairie, shortgrass prairie, and sandsage prairie. Given this breadth of habitat associations, its ecological conditions are not considered restricted

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Because this species can use such varied habitats, its ecological conditions are not restricted in the plan area. There are 9 occurrence records. Two observations are on the Cimmaron NG, one in the Carrizo Unit and six in the Timpas Unit of the Comanche NG. Herbarium records are within the Shortgrass, Sandsage, Canyonlands and Riparian woodlands and aquatic habitat ecosystems (USFS 2005a). The occurrence records are spatially mapped within landfire existing vegetation types; Western Cool Temperate Urban Shrubland, Developed-Roads, and Western Great Plains Shortgrass Prairie (Landfire 2024).

Habitat descriptions for occurrence records include, sandhills, rolling sandsage prairies, open pastures, along river on rocky upland slope with scattered juniper, weedy canyon sides, rocky upland, and disturbed soil (Van Scoyoc 2024).

Critical biological characteristics

The variety flowers May through September and is perennial (Van Scoyoc 2024, Flora of North America 1993).

Information was found relating to the parent species. Purple three-awn grass is adapted to dry, recently disturbed sites. It is also capable of thriving in areas that have been heavily grazed. It is seral on most sites. It is a warm-season, native perennial bunchgrass. Purple three-awn grass is highly competitive during droughts lasting only a few years. It tends to decrease during periods of extended drought (Howard 1997). This species is generally unpalatable due to its spike-like awns and tends to increase with grazing and maintains a persistent seedbed (Howard 1997).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown at the variety level.

Information at the parent level include forage value of purple three-awn grass is only poor to fair (Howard 1997). Black-tailed prairie dog graze purple three awn lightly but don't prefer it. Purple three-awn is often

one of the few grasses remaining in areas severely disturbed by prairie dogs (Howard 1997). Purple three-awn grass tends to increase with grazing (Howard 1997).

Wildlife use- Seldom grazed. The seeds are food for some songbirds, like the Junco. The plants provide nesting materials or habitat for some fur and game animal (NPIN 2025).

Attracts butterflies, larval host for skippers and Satyrs, highly deer resistant (NPIN 2025).

Provides Nesting Materials/Structure for Native Bees (A plant that native bees nest beneath, within, or harvest parts from to construct their nests.) (NPIN 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown at the variety level. Purple three-awn grass is seral on most sites but is a component of stable plant communities on some sites. It is one of the first grasses to establish on abandoned fields and other disturbed sites (Howard 1997).

Maps of Species Range

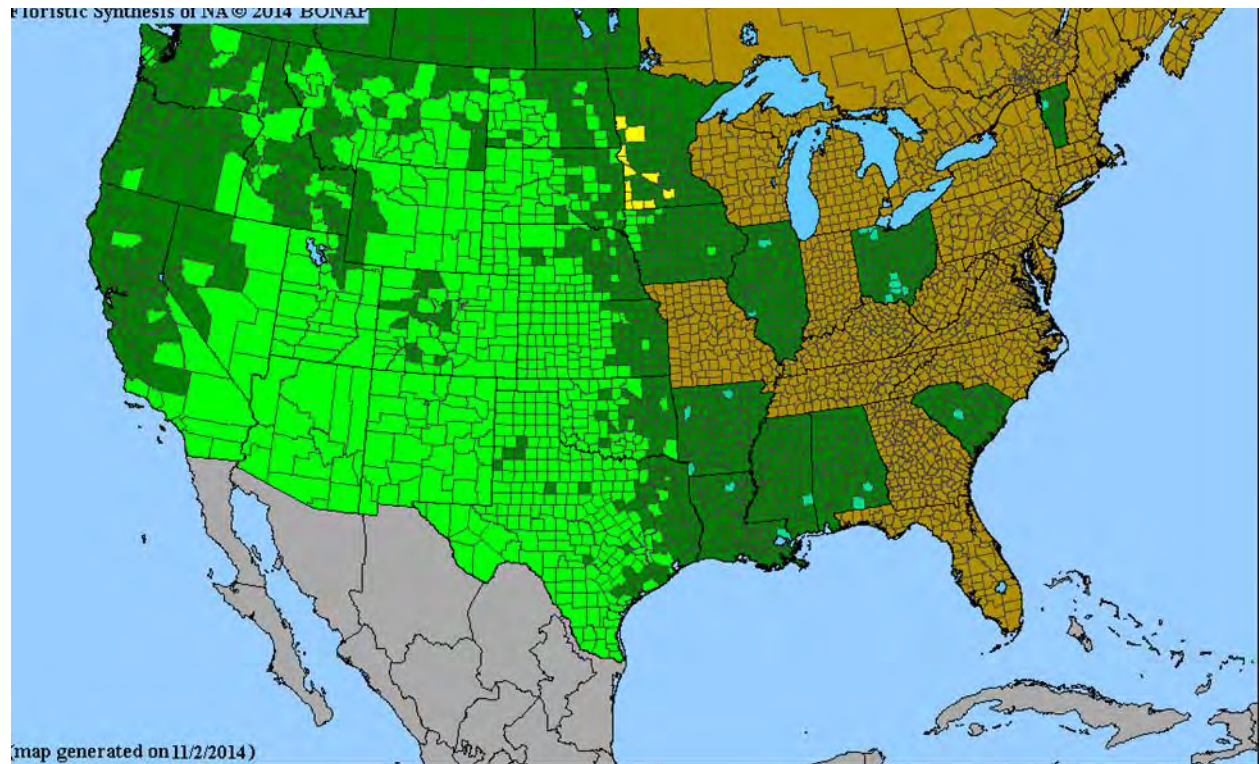


Figure 59. County occurrence data from Biota of North America Program (BONAP) for the parent species *Aristida purpurea*. Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

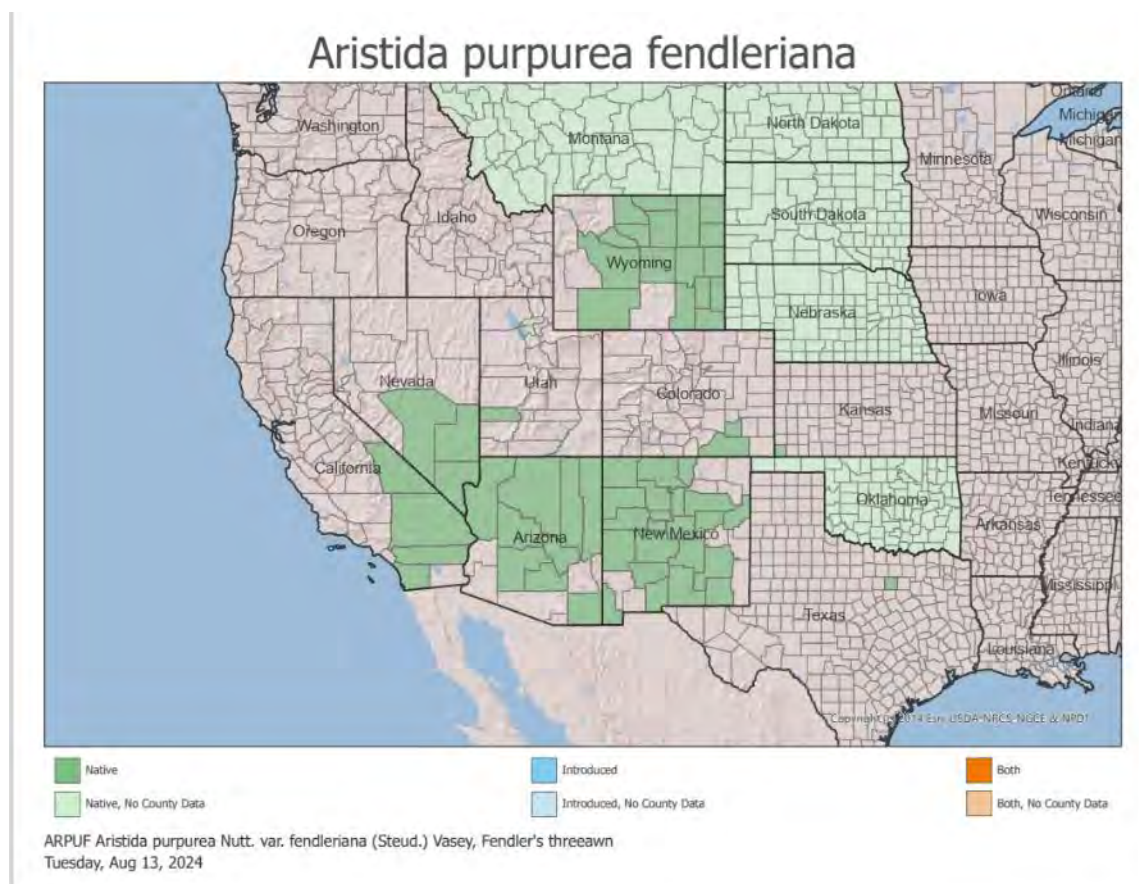


Figure 60. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

References

Fire-wheel blanket-flower

(*Gaillardia pulchella*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are 21 documented occurrences on the Cimarron and Comanche National Grasslands (CCNGs) from 1947 through 2007 (Van Scoyoc 2024). GBIF lists 16 occurrences and iDigBio lists 11 occurrences on the CCNGs (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Unknown.
 - b. Habitat: Consistent with threats for arid shortgrass prairie.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Consistent with trends for arid shortgrass prairie.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are not restricted in range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - b. Population: There are 21 documented occurrences in the plan area. Population numbers are unknown from the consulted sources.
 - c. Ecological conditions: Unknown, but not likely to be restricted.

Species Status

G4; S2 in Colorado; SNR in Kansas.

Taxonomy

Gaillardia pulchella Foug. is accepted as valid (Ackerfield 2022, NRCS 2025). Other common names include blanketflower (Weber et al. 2012), Indian blanket (NRCS 2025), and Indian blanketflower (Ackerfield 2022).

Species range

Overall Species range

In North America, occurs in at least 35 states and is not limited in its distribution (NatureServe 2025). In some of these states, the species is considered introduced or exotic (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are in the middle of the range for this species (Figure 61).

Distribution, abundance, and trend in the plan area

Population

Collection remarks from a collection in 1958 indicate that the plants are “common” in the area. The number of documented occurrences may serve as a proxy of distribution, abundance and trend in the plan area. Collections have been made on both the Cimarron and Comanche National Grasslands (Figure 61).

Habitat

In Colorado, plants occur on dry, open prairie, and are known from southeastern counties in Colorado from 3300-4600 feet in elevation (Ackerfield 2022). Weber (2012) state that plants are found in sandy places on the southwestern plains.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Unknown.

Habitat

Threats common in the shortgrass habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Unknown.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Unknown.

Critical biological characteristics

Annual or short-lived perennial plant (Ackerfield 2022) in the Aster family (Asteraceae).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Flowers provide food for pollinators.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

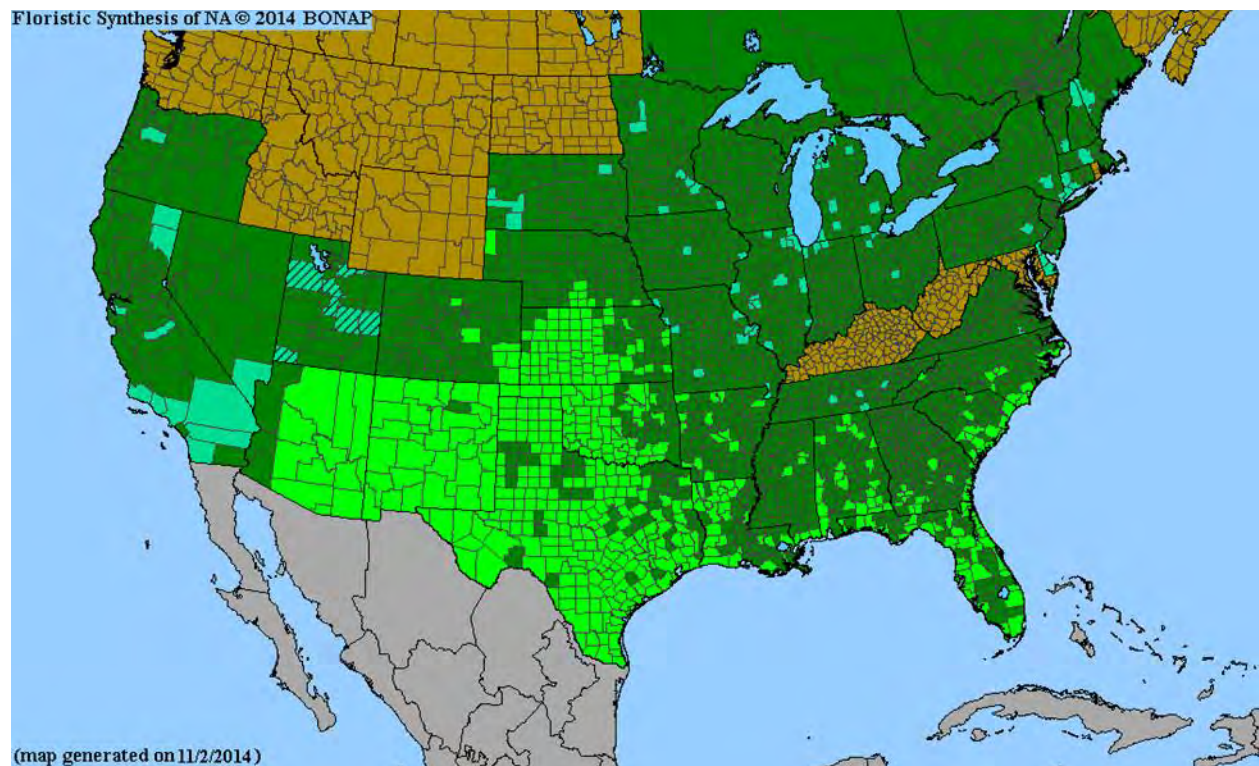


Figure 61. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Flat-globe dodder (*Cuscuta umbellata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has four occurrence records in the plan area from 1957-2021 (Van Scoyoc 2024). Some of these records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Unknown.
 - b. Habitat: Unknown.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: varied habitats; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is not at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; four occurrence records; rare in all counties that overlap the plan area.
 - b. Ecological conditions: uses many herbaceous host species and occurs in several habitat types (juniper woodland, riparian, and disturbed areas including roadsides).

Species Status

G5; S2 in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Cuscuta umbellata* as valid; *Cuscuta umbellata* var. *reflexa* and *Grammica umbellata* (NRCS 2025).

Species range

Overall Species range:

Flat-globe dodder is distributed across the southern United States, West Indies, Mexico, and northern South America (NatureServe 2025) (Figure 62, Figure 63).

Description of how the population in the plan area fits within the overall range:

The plan area is not at the edge of the species' range (Figure 62, Figure 63).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. One record in the Comanche National Grasslands from 2021 describes species as "abundant in adjacent field." It is considered rare in all counties that overlap the plan area (Figure 63).

Habitat

Across its range, flat-globe dodder can occur on a variety of herbaceous plant hosts, including those in the following genera: *Polygonum*, *Atriplex*, *Suaeda*, *Alternanthera*, *Amaranthus*, *Boerhaavia*, *Trianthema*, *Sesuvium*, *Kallstroemia*, *Tribulus*, and *Euphorbia* (NatureServe 2025). Within the plan area, it has been associated with juniper woodland, riparian, and disturbed habitat including roadsides (Hazlett 2004, Kuhn et al. 2011). Occurrence records have been distributed across both units of the Comanche and the Cimarron. One record notes species growing on the genus *Salsola* in disturbed road habitat in silty/sandy soil in the Purgatorie River floodplain.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Hazlett 2004, Press and Phoenix 2005, Kuhn et al. 2011, Van Scoyoc 2024, NatureServe 2025).

Habitat

Many of the genera which flat-globe dodder parasitizes are weedy or ruderal of which there are many and likely increasing in the plan area. Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

This species is a parasitic vine that depends entirely on a host plant for its life cycle. Dodders, including flatglobe dodder, can use a broad range of host plants—often hundreds of hosts (Press and Phoenix 2005, NatureServe 2025). This species is known to use varied habitat types in the plan area, including juniper woodland, riparian, and disturbed habitat including roadsides (Hazlett 2004, Kuhn et al. 2011).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species can use many different host plants in several different habitat types, including disturbed habitats such as roadsides (Press and Phoenix 2005, Hazlett 2004, Kuhn et al. 2011). It has been documented in all units of the plan area.

Critical biological characteristics

Flatglobe dodder is an annual parasitic vine (Van Scoyoc 2024). Dodder vines in the *Cuscuta* genus are shoot parasites (Press and Phoenix 2005).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Parasitic plants are considered keystone species in their ecosystems, since they impact host growth, community structure, vegetation zonation, and population dynamics (Press and Phoenix 2005). Dodder vines in the *Cuscuta* genus may form thousands of connections with many host species, resulting in considerable impacts on the plant community even when representing a low percentage of the vegetation biomass (Press and Phoenix 2005).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Greater abundance and/or performance of preferred or good hosts will enhance the performance of the parasitic plant; *Cuscuta* shows greater biomass and reproduction within patches of good hosts (Press and Phoenix 2005).

Maps of Species Range

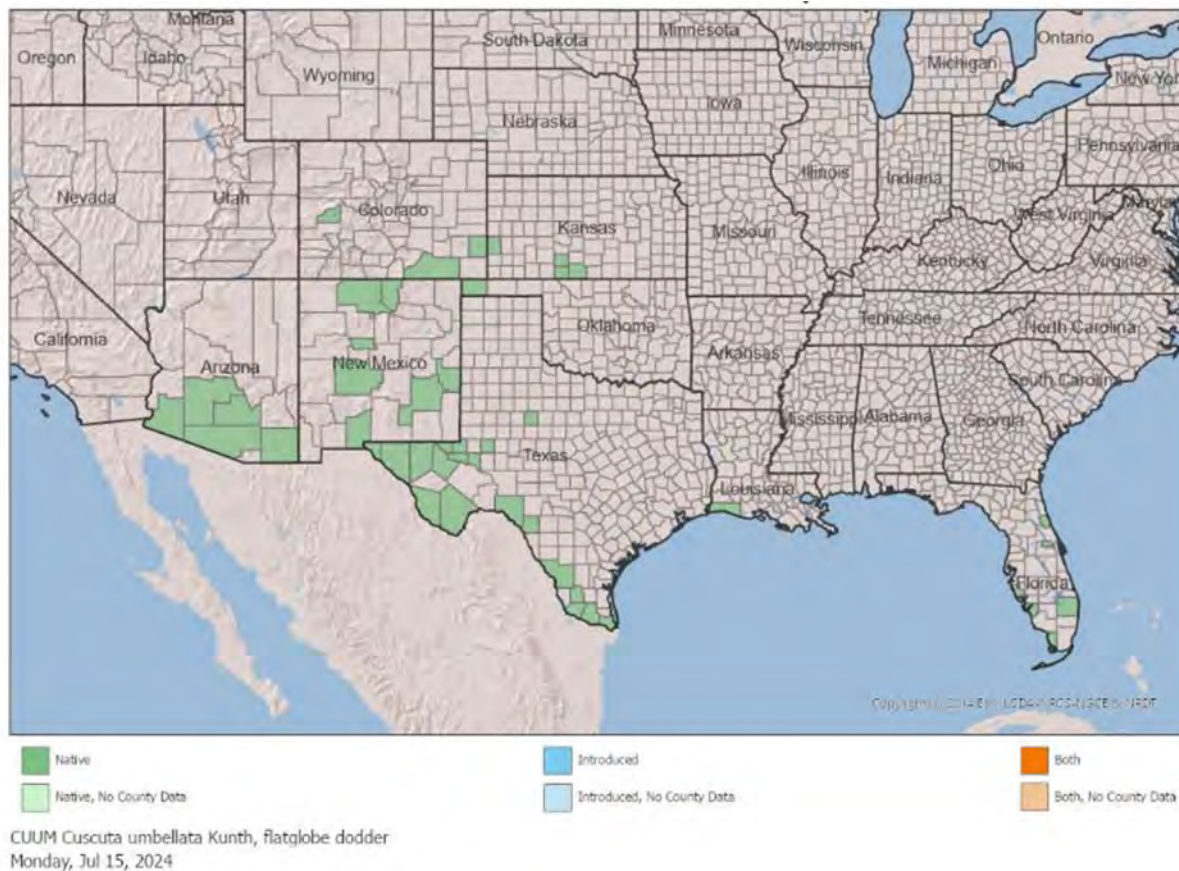


Figure 62. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

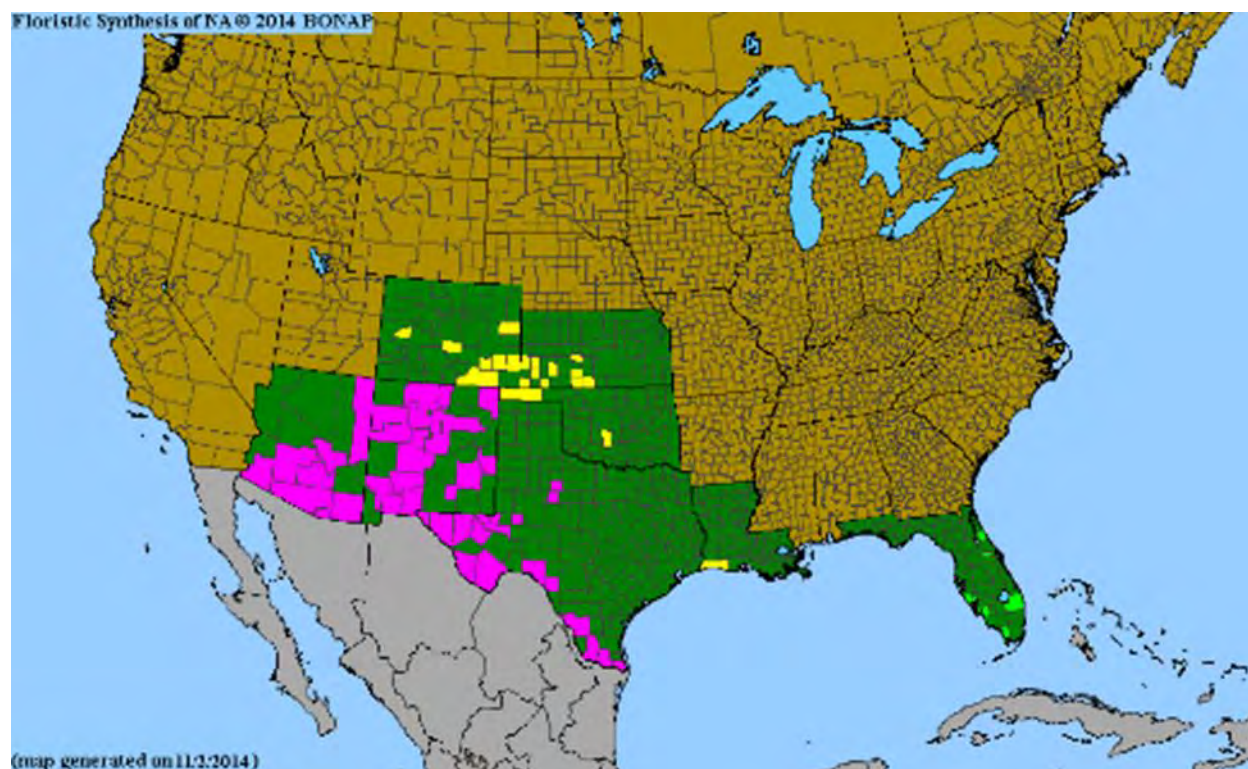


Figure 63. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Flax-leaf stenosiphon (*Stenosiphon linifolius*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one occurrence record (Van Scoyoc 2024) within the plan area. The herbarium record location is within the Cimarron National Grassland south of the Cimarron River.

Year of Last Known Occurrence: 1989

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025).
 - b. Habitat: Species uses varied habitat including sandsage prairie and shortgrass prairie. Common threats on and/or off the plan area can include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, habitat shifting and alteration due to invasive species, drought, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022) Threats common in the habitat type (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend for this species in the plan area is unknown.
 - b. Habitat: In the plan area sandsage prairie has a declining trend quality of the habitat. In the plan area shortgrass prairie has a declining trend in the quality of the habitat
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is on the western edge of the species range (Figure 64, Figure 65).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known. There was one occurrence record within the plan area.
 - b. Ecological conditions: While this species is found in various habitats it is said to prefer calcareous soils and limestone (Haddock 2024b) which do not represent a restricted ecological condition in the plan area owing to their spatial extent.

Species Status

G5; S1 in Colorado; S5 in Kansas.

Taxonomy

NatureServe recognizes this species as *Stenosiphon linifolius* and the synonym *Oenothera glaucifolia*. *Oenothera glaucifolia* is accepted as valid (NatureServe 2025, ITIS 2024, Ackerfield 2022, Haddock

2024b, Flora of North America 1993). ITIS recognized synonyms are *Stenosiphon linifolius* and *Stenosiphon virgatus* (ITIS 2024). USDA plants database recognizes this species as *Stenosiphon linifolius* and the synonym *Stenosiphon virgatus* (NRCS 2025).

Species range

Overall Species range

Flax-leaf stenosisiphon occurs in Arkansas, Colorado, Indiana, Kansas, Missouri, Nebraska, New Mexico, Oklahoma, South Dakota, and Texas (Figure 64, Figure 65).

Description of how the population in the plan area fits within the overall range

The population in the plan area is on the western edge of the species range (Figure 64, Figure 65).

Distribution, abundance, and trend in the plan area

Population

There is one spatial occurrence record in Morton County in the Cimarron Unit within the sandsage ecosystem (USFS 2005a). Hazlett (2004) indicates this species is not known or collected in the plans area, but this species could occur in western Las Animas County. Habitat is described as Rocky: exposed limestone/shale barrens. Kuhn (2011) does not include this species in the floristic inventory.

Population trend for this species in the plan area is unknown.

Habitat

Flax-leaf stenosisiphon is a biennial forb species found on sandy soil, at 4500 – 5500 ft in elevation. Flowers July through September (Ackerfield 2022). NatureServe describes habitat Rocky limestone glades bald knobs, rocky prairie hillsides and cliffs, stream valleys, and roadsides. (NatureServe 2025). FNA describes it as rocky prairie slopes and outcrops or bluffs, along streams, roadsides, usually on limestone 700 – 4300 ft in elevation (Flora of North America 1993). Hazlett describes habitat as rocky, exposed limestone/shale barrens. Haddock (2024b) describes it as prairie hillsides, roadsides, stream valleys; dry, rocky, calcareous soils.

There is one herbarium record found in in the Cimarron National Grassland in Morton County. It was located south of the Cimarron River. The habitat was described as grazed, upland, rolling sandsage prairie; soil mostly sandy with scattered patches of exposed sand., additional comments were “scattered, mostly in shallow depression between low dunes” (Van Scoyoc 2024). The occurrence record is spatially mapped within the Sandsage ecosystem (USFS 2005a) and LandFire existing vegetation type, Western Great Plains Shortgrass Prairie (Landfire 2024). The occurrence is approximately ¼ mile from existing oil and gas activity and road systems.

Species uses varied habitats. Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025, Haddock 2024b).

Habitat

Species uses varied habitat including sandsage prairie and shortgrass prairie. Common threats on and/or off the plan area can include; housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, habitat shifting and alteration due to invasive species, drought, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022). Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025, Flora of North America 1993). Grows in sunny condition and soil moisture is dry. Species is self-incompatible, the flowers diurnal, pollinated primarily by wasps as well as bees, flies, butterflies, and occasionally beetles (Flora of North America 1993).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There was one spatial occurrence record located within Landfire existing vegetation type Western Great Plains Sandhill Prairie (Landfire 2024). The occurrence record is located within the Cimmaron Unit within the sandsage ecosystem (USFS 2005a).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (Ackerfield 2022, NatureServe 2025, Flora of North America 1993). While this species is found in various habitats it is said to prefer calcareous soils and limestone (Haddock 2024b).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Species is pollinated primarily by wasps as well as bees, flies, butterflies, hummingbirds and occasionally beetles (Flora of North America 1993).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

None known at this time.

Maps of Species Range

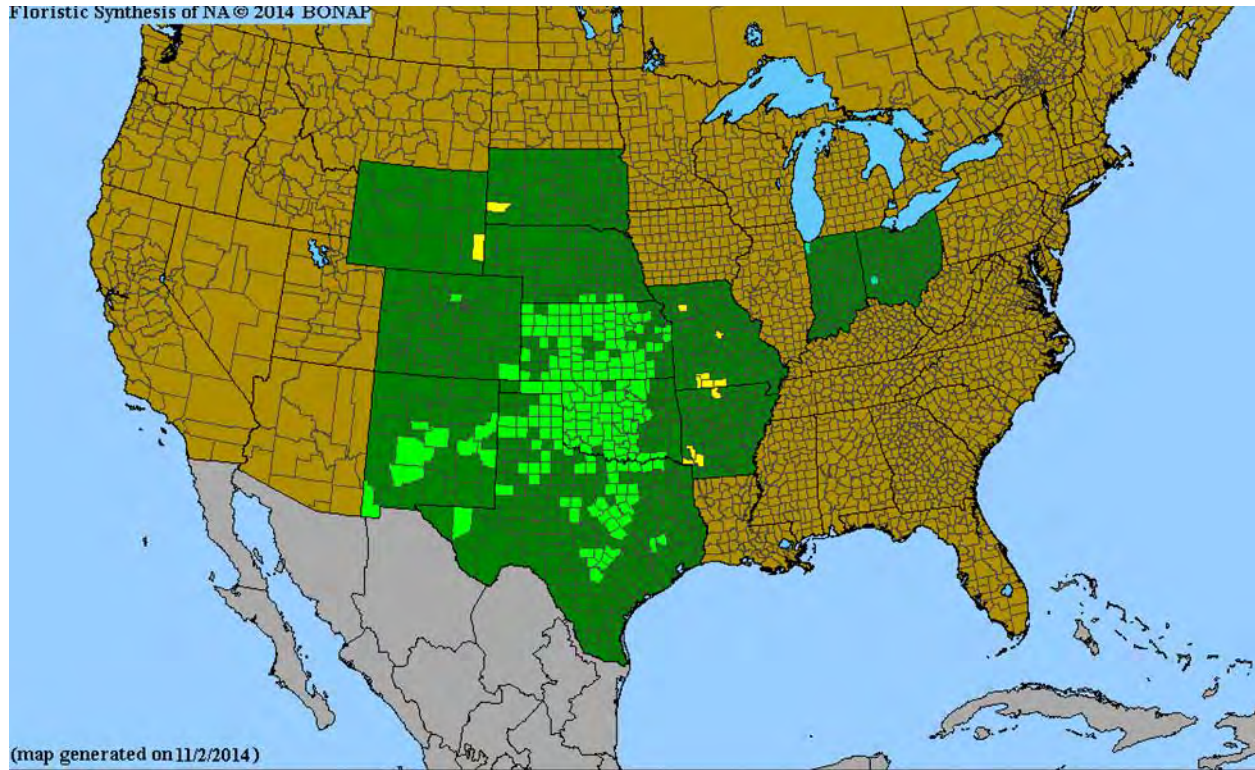


Figure 64. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

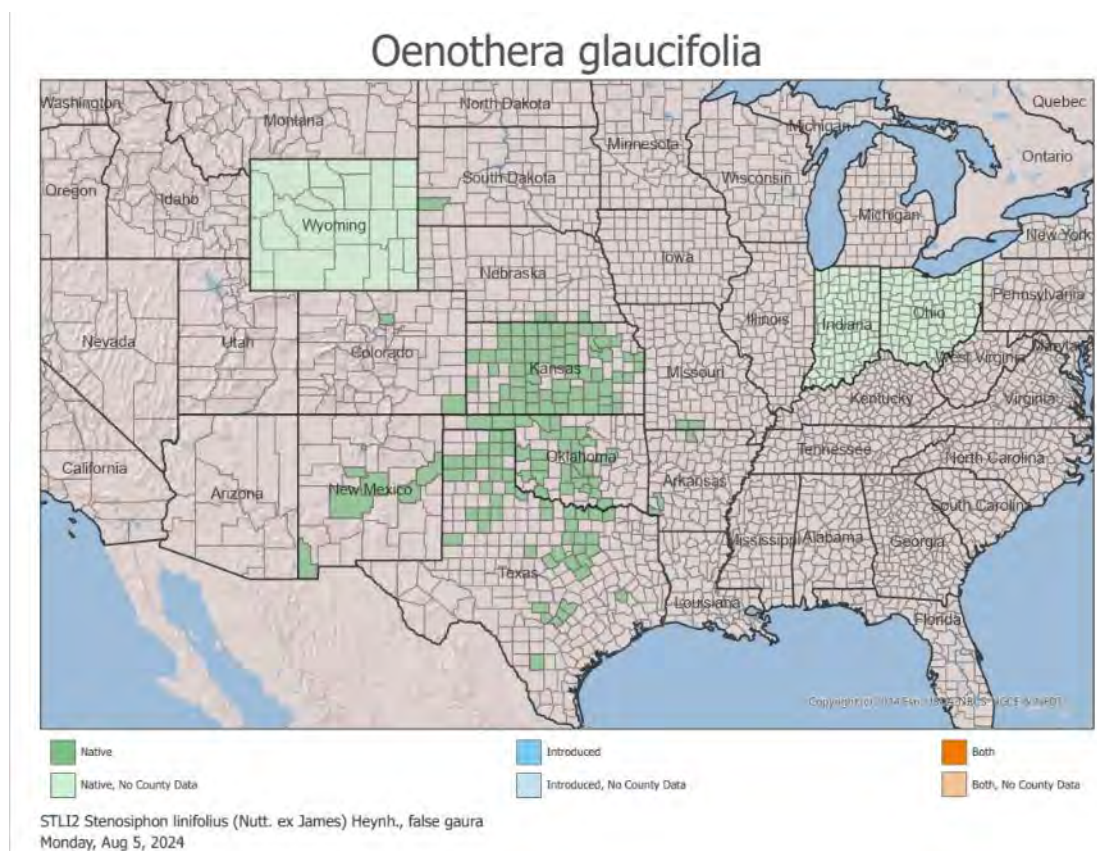


Figure 65. NRCS PLANTS database map showing native status and distribution.

Fragrant indigobush

(*Amorpha nana*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Two specimens were collected from the Comanche National Grassland (NG) in 1989 and 1991 (Van Scoyoc 2024). One Element Occurrence (EO) is reported from 2013 during a USFS Survey on Comanche NG (Olson and Burnett 2013). Of the sources identified, no records were found, and the species is not known to occur on the Cimmaron NG (Delisle 2024, Freeman 1989, Van Scoyoc 2024, Kuhn et al. 2011).

Year of Last Known Occurrence: 2013

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Livestock grazing and climate stressors.
 - b. Habitat: Land use including dispersed recreation and livestock grazing and the presence of invasive cheatgrass.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Pinyon-juniper habitat has expanded into neighboring communities, at both higher and lower elevations. Rocky slope habitat is limited to areas along rivers and their tributaries.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the southern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Three observations in the plan area, noted to be locally common where it occurs, but few occurrences in the plan area overall.
 - b. Ecological conditions: Rocky slope habitat is limited to areas along rivers and their tributaries.

Species Status

G5; S2 in Colorado; S1 in Kansas.

Taxonomy

Amorpha nana Nutt. is accepted as valid (Weber et al. 2012, NRCS 2025). Other common names associated with this species include fragrant false indigo, dwarf wild indigo, dwarf indigo, dwarf indigobush (ITIS 2024), dwarf leadplant (Hazlett 2004), and dwarf false indigo (NRCS 2025).

Species range

Overall Species range

In North America, fragrant indigobush occurs in nine states including Colorado, Iowa, Kansas, Minnesota, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, and also in the Canadian province Manitoba (Van Scoyoc 2024, NatureServe 2025). The range extent was estimated to be 2,500,000 million square kilometers (NatureServe 2025). Widespread throughout much of the Midwest from Canada to Colorado and New Mexico, particularly in the northern Great Plains region.

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are at the southern edge of the species range (Figure 66).

Distribution, abundance, and trend in the plan area

Population

There are two documented herbarium records and one EO in the plan area. The specimen collected in 1989 was noted “locally common on gentle slope”. The other specimen collected in 1991 does not contain population information (Van Scoyoc 2024). The 1989 specimen was collected from Purgatoire River Drainage, South Rim of Taylor Arroyo, Fort Carson. The 1991 specimen was collected from Breaks of Picture Canyon. One EO is reported from 2013 during a USFS survey on Comanche NG (Olson and Burnett 2013). The EO was plotted in Minnie Canyon, Northwest of Pinyon Canyon Maneuver Site. No population information is provided in the description (Olsen 2013). No trend information is available for populations in the plan area. Hazlett (2004) lists fragrant indigobush as rare in Baca, Las Animas, and Otero Counties in Colorado and identifies the species as needing additional survey work in order to assess presence and abundance on the Comanche NG.

No records were found, and the species is not known to occur on Cimmaron NG (Delisle 2024, Freeman 1989, Van Scoyoc 2024, Kuhn et al. 2011).

Habitat

Juniper woodland edge in sandstone breaks area. Near base of rocky slope. Dominant plant community is blue grama, oneseed juniper, and twistspine pricklypear. Toe slope in sandstone breaks (Olson and Burnett 2013). Pinyon-juniper woodlands have expanded into neighboring communities, at both higher and lower elevations (CPW 2015). Rocky slope habitat is limited to areas along rivers and their tributaries but should be stable.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No known threats are reported in the literature; however, the EO report indicated evidence of threats and disturbance from livestock grazing (Olson and Burnett 2013). Plants are usually more abundant where grazing is light or moderate (USGS 2024).

Habitat

Predominant land use in the plan area was dispersed recreation, livestock grazing, and the presence of invasive cheatgrass (Olson and Burnett 2013). Any of these factors could threaten the species habitat. Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Fragrant indigobush inhabits dry prairies, hillsides, plains, buttes, mesas, and rocky hillsides (NatureServe 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Rocky hillsides where fragrant indigobush occurs in Comanche NG are limited to areas along rivers and their tributaries. These habitats are restricted within the plan area. In general, this species is also known to occupy dry prairies and plains which are common in the plan area.

Critical biological characteristics

Fragrant indigobush is a perennial broadleaf deciduous shrub (Oregon State University 2024) in the Pea family and blooms in May, June and July (NPIN 2025). The species is hermaphroditic with irregular perfect flowers. Self-sterility is rare in the Pea family; however, four flower mechanisms exist that promote cross-pollination in this species (NatureServe 2025). This species is commercially available as container stock.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown from the reviewed literature and sources, but the species likely provides diversity and physical cover in a barren habitat (i.e., dry prairies, hillsides, plains, buttes, mesas, and rocky hillsides). Members of the Pea family are known to harbor nitrogen-fixing bacteria in their roots which increases soil fertility in the immediate area.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information was found suggesting influences of ecosystem structure or function on this species aside from the general forces that structure prairie plant communities.

Maps of Species Range

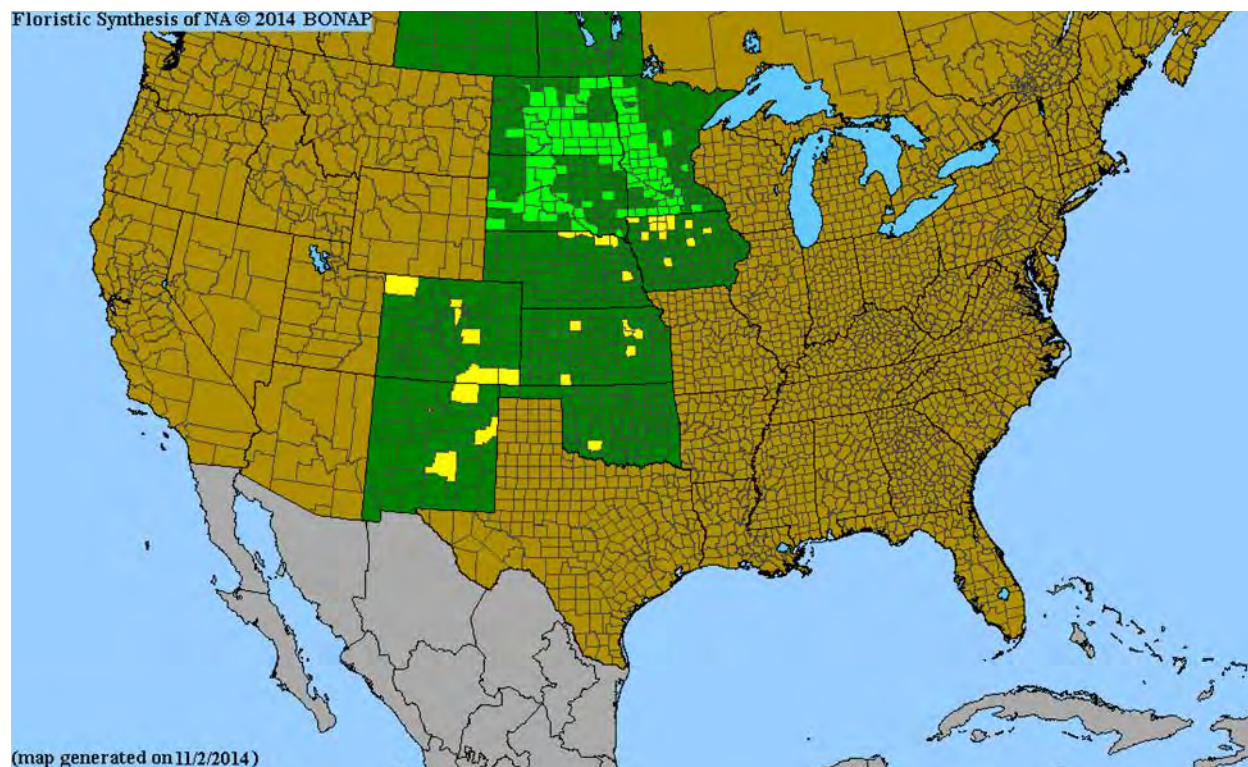


Figure 66. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Fremont's goosefoot

(*Chenopodium fremontii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has two occurrence records in the Timpas Unit of Comanche National Grassland from 1998 and 2007 (Van Scoyoc 2024). Both these records have high uncertainty (>3,000 feet), but the locality description of both records state this species was documented in the Comanche National Grassland. Therefore, the species is known to occur in the plan area.

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: juniper woodland has expanded in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the eastern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; two occurrence records.
 - b. Ecological conditions: uses varied habitats (desert, cliffs, talus, and moist shaded areas), but benefits from microhabitat conditions provided by juniper. Juniper is not restricted in the plan area.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

USDA NRCS recognizes *Chenopodium fremontii* as valid; there are two recognized subspecies (NRCS 2025).

Species range

Overall Species range:

Freemont's goosefoot is widely distributed throughout the intermountain western United States, into the plains, north to Canada and south to Mexico (Van Scoyoc 2024) (Figure 67, Figure 68).

Description of how the population in the plan area fits within the overall range:

The plan area is at the eastern edge of the species' range (Figure 67, Figure 68).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. The two occurrence records in the plan area give no indication of the number of individuals, describing the species as "scattered; most abundant in shade of junipers." It is not considered rare in any counties that overlap the plan area (Figure 68).

Habitat

Freemont's goosefoot is found in a wide variety of habitats from desert, cliffs, talus, and moist shaded areas under aspen, junipers, or pinyons, often in riparian habitats at elevations from 2,500-9,000 ft (Van Scoyoc 2024). Within the plan area, it has been associated with juniper woodland and pinyon-juniper woodland (Kuhn et al. 2011). It has been documented in Vogel Canyon and the Purgatoire River Valley, co-occurring with juniper in both areas (Van Scoyoc 2024). Juniper woodlands in southeast Colorado have expanded due to fire suppression and drought (CPW 2015). Juniper has also increased in distribution and abundance in some ecosystems within the plan area, such as the canyonlands (USFS 2005a).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (NatureServe 2025, Van Scoyoc 2024).

Habitat

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Within the plan area, this species associated with juniper woodland and pinyon-juniper woodland (Kuhn et al. 2011). It seems to benefit from at least partial shade (Van Scoyoc 2024). USDA NRCS considers freemont's goosefoot a "facultative upland" species in the Great Plains region (NRCS 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Freemont's goosefoot is found in a wide variety of habitats, but observations in the plan area have been associated with shade provided by juniper (Kuhn et al. 2011, Van Scoyoc 2024). The canyonland ecosystem of the plan area encompass approximately 40,960 acres (USFS 2008). It is characterized by an abundance of oneseed juniper (*Juniperus monosperma*) along canyons' slopes and walls (USFS 2008). Therefore, ecological conditions are not considered restricted for this species.

Critical biological characteristics

This species is an annual herb in the amaranth family (Amaranthaceae); fruiting occurs late summer-fall. (Van Scoyoc 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

The genus *Chenopodium* has a worldwide distribution and includes both domesticated species and several species of invasive weeds (Jellen et al. 2011). The genus inhabits niches that include some of the harshest environments on earth for plant survival (Jellen et al. 2011).

Maps of Species Range

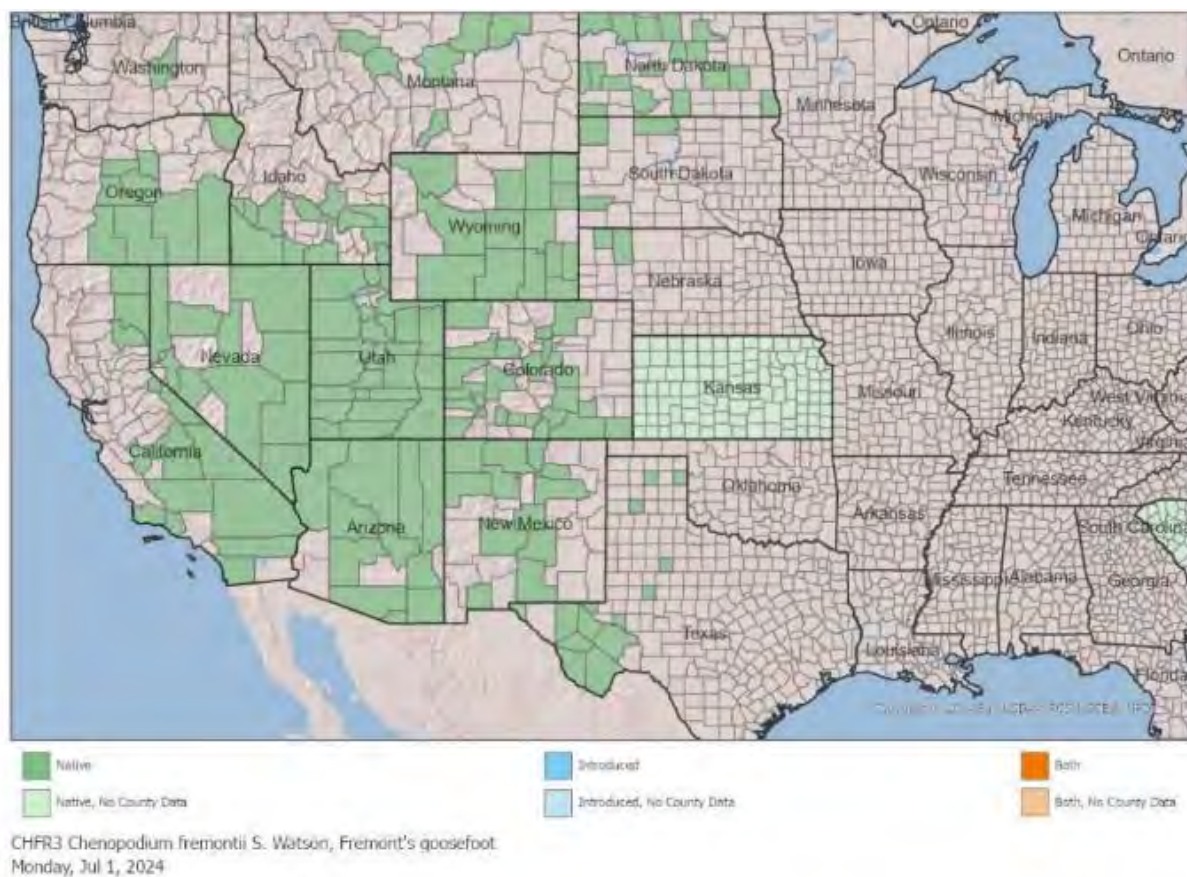


Figure 67. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

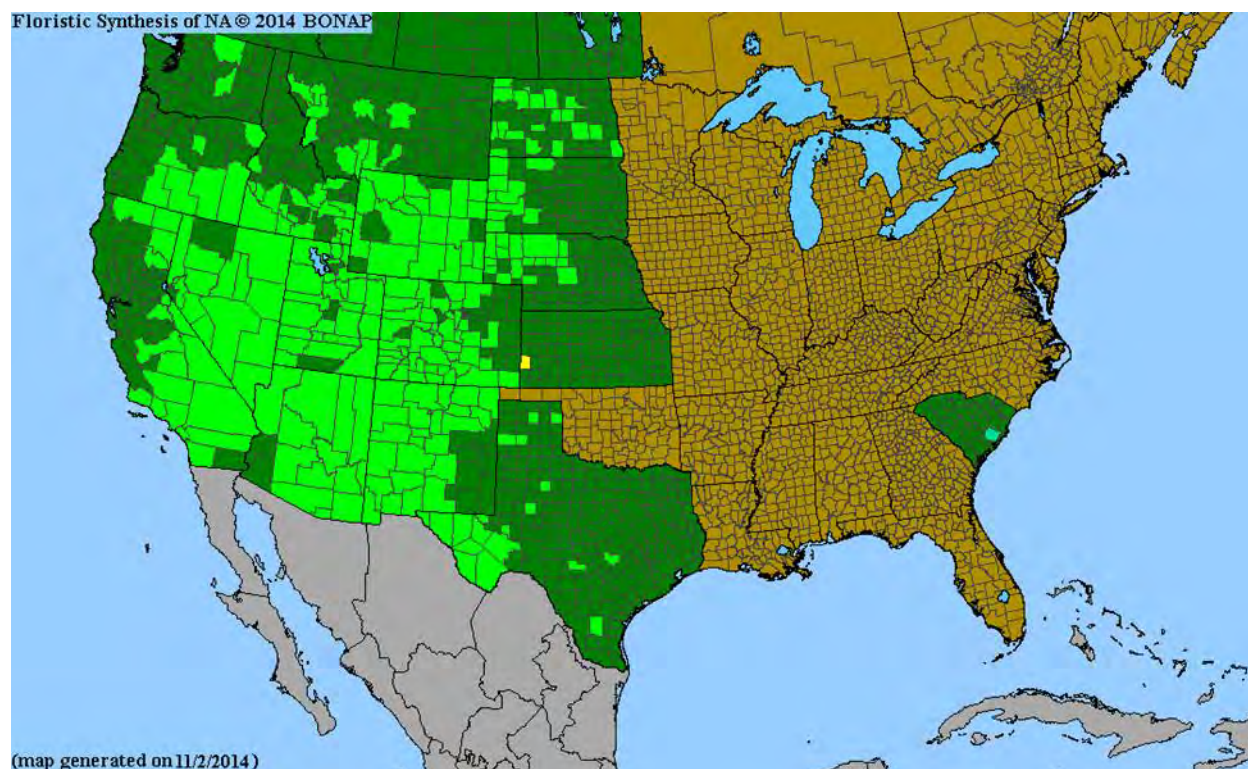


Figure 68. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Giant dropseed

(*Sporobolus giganteus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Kansas NHP has 8 occurrence records from 1961 to 2018; GBIF has 7 occurrence records from 1965 to 1996; and iDigBio has 7 occurrence records from 1965 to 1996 (Van Scoyoc 2024). Some of these records have sufficient spatial precision to demonstrate this species is known to occur in the plan area.

Year of Last Known Occurrence: 2018

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No significant threats known.
 - b. Habitat: It is adapted to withstand dry conditions and disturbed areas. General threats include grazing, fire and energy development.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trends are unknown at this time.
 - b. Habitat: Sandsage prairie has declined in habitat quality
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Species is at the northeastern edge of its range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: between 7 and 15 occurrences in the plan area
 - b. Ecological Conditions: Ecological conditions are not restricted. Although sandsage prairie is declining this species is adapted to persist in disturbed, dry conditions of which there is no shortage in the plan area.

Species Status

G5; S2 in Colorado; S1 in Kansas.

Taxonomy

The currently accepted valid name is *Sporobolus giganteus* Nash (NRCS 2025). Other synonyms include *Sporobolus cryptandrus* var. *giganteus* (Nash) E.K. Jones and *Sporobolus cryptandrus* var. *robustus* Vasey (TSN 42138) (ITIS 2024). There are no other known common names for this species.

Species range

Overall Species range

It's known to occur in Arizona, Colorado, Kansas, New Mexico, Oklahoma, Texas and Utah (NatureServe 2025). It's range also extends into northern Mexico (Van Scoyoc 2024).

Description of how the population in the plan area fits within the overall range

The plan area is considered at the northeastern edge of the species range.

Distribution, abundance, and trend in the plan area

Population

Kansas NHP has 8 occurrence records from 1961 to 2018; GBIF has 7 occurrence records from 1965 to 1996; iDigBio has 7 occurrence records from 1965 to 1996; and SEINet shows there are 7 occurrence records within the plan area (Van Scoyoc 2024). There is no information for population abundance, distribution or trend.

Habitat

Giant dropseed grows in sand dunes and sandy areas along rivers and roadsides, at elevations from 100-1830 m (328-6000 ft.) (Van Scoyoc 2024). The sandsage prairie habitat type is the second-most widespread vegetation type in the plan area, and the most abundant type for the Cimarron National Grassland, specifically (USFS 2005a). In Kansas, the sandsage prairie habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of the historic sandsage habitat has been lost or converted for agricultural uses (CPW 2015). The remaining tracts have good landscape connectivity, but the species composition is highly altered (CPW 2015).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

None known at this time.

Habitat

At a broad scale, the primary threats to sandsage prairie are loss and fragmentation of habitat and degradation of ecological integrity (e.g., conversion to agriculture, expanding exurban development, construction of roads, energy development, encroachment of woody plants, and targeted eradication of sandsage with herbicide) (Locklear 2021, CPW 2015, Rohweder 2022). Weather/climate, fire and grazing constitute the most important processes impacting this system, and these processes are also interactive (Locklear 2019). While sandsage prairie is fairly resilient to the effects of drought in the Great Plains, there are biological limits to the ability of this vegetation to tolerate prolonged episodes of severe drought and may be at the limits of its drought tolerance in southeastern Colorado (Rondeau et al. 2018, Locklear 2019).

At the unit level, grazing occurs over most of the plan area across both states. Long-term continuous grazing of domestic livestock has considerably altered these shrubland habitats from their pre-settlement condition (CNHP 2024, Rohweder 2022). Generally, domestic livestock grazing tends to favor the increase of sandsage over associated native grasses therefore decreasing herbaceous cover (CNHP 2024). Fire is an important disturbance process for sandsage prairie, and fire suppression has caused encroachment of woody species such as eastern redcedar (Locklear 2019) and less mosaiced successional conditions (USFS 2008). Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimarron National Grassland.

While habitat loss and deleterious management practices are recognized as threats to sandsage prairie vegetation, the significance of these losses to the larger Great Plains ecoregion has not been examined (Locklear 2021).

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Best suited for riparian areas and disturbed areas and can tolerate dry conditions (Utah State University 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species is adapted to a wide range in elevation and disturbances. Sandy areas along rivers and roadsides are well distributed across the plan area, but there is a declining trend in sandsage prairie habitat in the plan area.

Critical biological characteristics

None known at this time.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Can be a good management tool for erosion control and is drought resilient (Utah State University 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

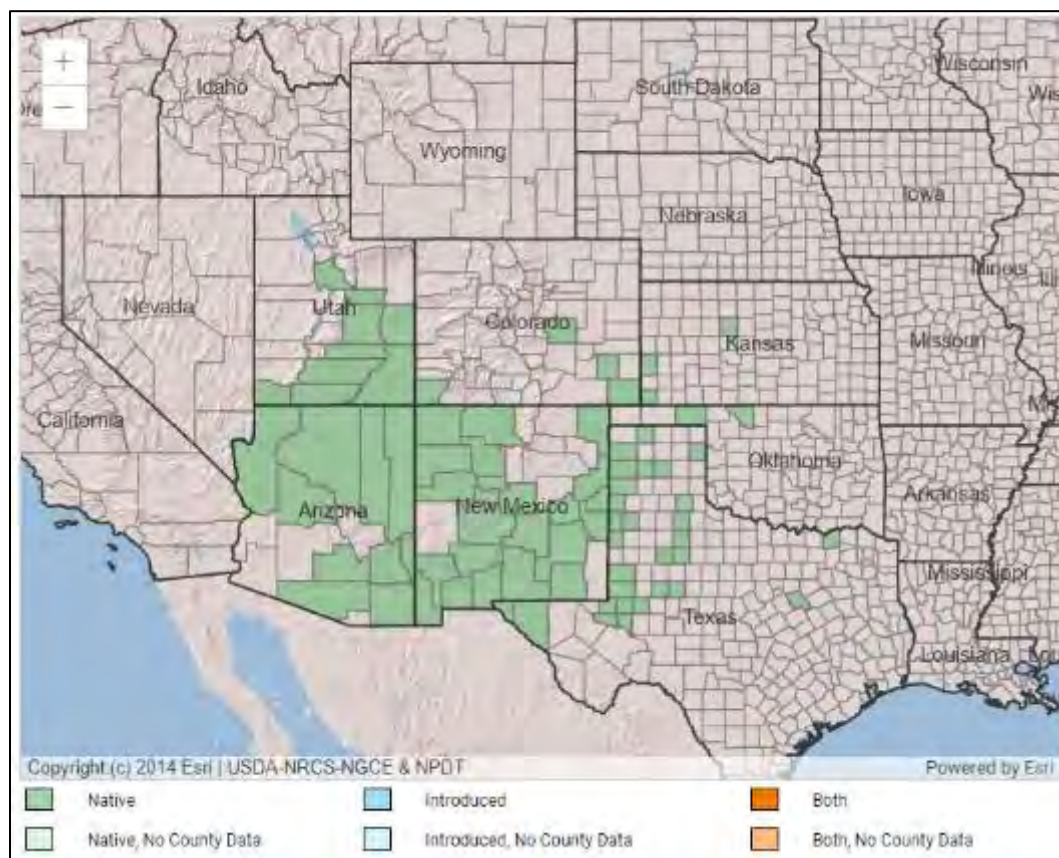


Figure 69. Species distribution for giant dropseed (NRCS 2025).

Great Plains flatsedge

(*Cyperus lupulinus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Three documented occurrences on the Timpas unit of the Comanche National Grassland (NG) from 1947 to 2021; one in iDigBio in 2021; and two in SEINet in 1947 and 2021 (Van Scoyoc 2024). Locality information for the 2021 collection lists Picture Canyon and the 1947 collection lists Sand Creek Canyon (Van Scoyoc 2024).

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Drought.
 - b. Habitat: Threats associated with the shortgrass prairie.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Short grass prairie is declining in quality.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the western edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are three documented occurrences in the plan area. Population numbers are not known.
 - b. Ecological conditions: Unknown, but not likely to be restricted due to the broad habitat preferences of Great Plains flatsedge documented in the literature.

Species Status

G5; S2 in Colorado; SNR in Kansas.

Taxonomy

Cyperus lupulinus (Spreng.) Marcks is accepted as valid (Ackerfield 2022, NRCS 2025). Two subspecies are recognized including *C. lupulinus* ssp. *lupulinus* and *C. lupulinus* ssp. *macilentus* (Flora of North America 1993, ITIS 2024). The two subspecies ranges somewhat overlap with ssp. *lupulinus* generally found in the Great Plains and ssp. *macilentus* in the northeast (Flora of North America 1993). Synonyms include *Scirpus lupulinus* (Flora of North America 1993).

Species range

Overall Species range

In North America, the species occurs in 40 states including most midwestern and eastern states, as well as many of the western states including Colorado and Kansas (NatureServe 2025). The species also occurs further north in four Canadian provinces. The species range for Great Plains flatsedge is considered widespread and estimated to encompass over 5.8 million square kilometers (NatureServe 2025), however this range estimate includes both subspecies mentioned above.

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area, particularly in Colorado, are at the western edge of the species range (Figure 70).

Distribution, abundance, and trend in the plan area

Population

Limited occurrences were identified from the consulted sources. There are three documented occurrences on the Timpas unit of the Comanche NG (Figure 70). Distribution, abundance, and trend for the populations is unknown.

Habitat

Plants grow in well-drained, open roadsides, fields, and prairies (Flora of North America 1993). In Colorado, plants can be found growing in grasslands, canyons, and rocky slopes from 4000 to 6000 feet in elevation (Ackerfield 2022).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Although threats are not widely documented, this species is threatened by development, road maintenance, invasive species, and other threats in some places, though there is insufficient data, including anecdotal accounts, to understand scope and severity of threats for this species. However, their overall impact is likely negligible given species' broad range, large number of occurrences, tolerance of light disturbance, and affinity for typically abundant habitats, as well as no obvious intrinsic vulnerabilities" (NatureServe 2025).

Habitat

Great Plains flatsedge occurs in a variety of shortgrass prairie habitats and threats to habitat would likely be specific to a given area.

In the plan area, the habitat for an herbarium collection was listed as along a willow (*Salix*) dominated wet seep in shortgrass prairie with Yucca (*Yucca*) sp., prickly pear cactus (*Opuntia*) sp., and Buffalograss (*Buchloe dactyloides*) (Van Scoyoc 2024). The habitat was identified as "grazed" (Van Scoyoc 2024).

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

In the Great Plains, Great Plains flatsedge is listed as a Facultative Upland species on the National Wetland Plant List (Lichvar et al. 2016). Plants grow in open, sun-lit locations.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The species is documented as having a broad habitat preference in the shortgrass prairie.

Critical biological characteristics

Perennial sedge that spreads by underground rhizomes and forms loose dense clumps.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

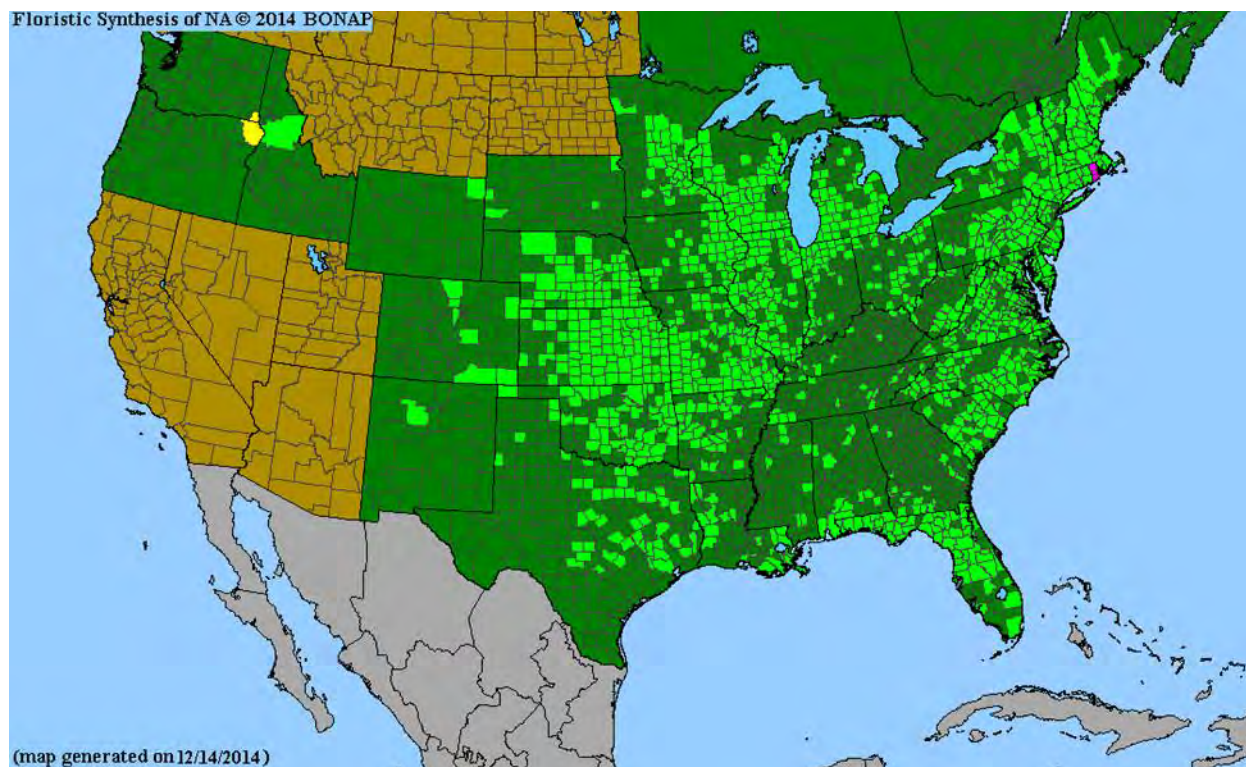


Figure 70. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Green needlegrass

(*Nassella viridula*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has two occurrence records in the Comanche National Grasslands, both from 1998, and SEINet has several occurrence records in the Comanche National Grassland that demonstrate this species is known to occur in the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2008

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: overgrazing.
 - b. Habitat: overgrazing.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available
 - b. Habitat: varied, no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: unknown.
 - b. Ecological conditions: The species has been associated with a variety of habitats in the plan area, including roadsides, rocky shortgrass prairie, pinyon-juniper woodland, and stockponds. Given this breadth of habitat associations, its ecological conditions are not considered restricted.

Species Status

G5; SNR in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Nassella viridula* as valid; a taxonomic synonym is *Stipa viridula* (NRCS 2025). Another common name is green tussock grass (Van Scoyoc 2024).

Species range

Overall Species range:

This species is widely distributed across the western plains of the United States and Canada, where it can be a dominant component of prairies (Figure 71, Figure 72).

Description of how the population in the plan area fits within the overall range:

The plan area is at the eastern edge of the species' range (Figure 71, Figure 72).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. Occurrence records do not give an indication of the number of individuals observed. The species is considered rare in Morton County, Kansas, but not in any counties in Colorado that overlap the plan area (Figure 71).

Habitat

Green needlegrass grows in dry plains, prairies, and open woods, frequently on sandy soils (Hazlett 2004, Van Scoyoc 2024). Within the plan area, it has been observed along roadsides, rocky shortgrass prairie, in pinyon-juniper woodland, and along a stockpond (Van Scoyoc 2024). Occurrence records have been distributed across the northern portion of the Carrizo Unit and southern portion of the Timpas Unit of the Comanche (Van Scoyoc 2024).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Overgrazing is considered a threat to populations since green needlegrass is palatable to livestock and often decreases when subjected to overgrazing (Uresk and Mergen 2014). Cooper and Jean (2001) say it "can be reduced to trace amounts and even extirpated by intensive grazing." It is also threatened by competitive exclusion from non-native, invasive grasses such as Kentucky bluegrass (*Poa pratensis*) (Dennhardt 2016).

Habitat

Overgrazing is considered a threat to habitat since green needlegrass is palatable to livestock and often decreases when subjected to overgrazing (Uresk and Mergen 2014). Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Green needlegrass requires fine- to medium-textured soils in full sun (NRCS 2025). It is intolerant of shade, highly tolerant of drought, and moderately tolerant of fire (NRCS 2025). It often occurs on protected exposures on favorable microsites where it receives extra moisture from runoff moisture or water-receiving positions in the landscape (Cooper and Jean 2001). It requires freedom from intensive grazing (Cooper and Jean 2001) and competition with invasive grasses (Dennhardt 2016).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The species has been associated with a variety of habitats in the plan area, including roadsides, rocky shortgrass prairie, pinyon-juniper woodland, and stockponds. Given this breadth of habitat associations, its ecological conditions are not considered restricted.

Critical biological characteristics

Green needlegrass is a cool season perennial bunchgrass that exhibits rapid growth rate and slow seed spread rate (NRCS 2025). It tends to be more dominant at late seral stages (Uresk and Mergen 2014).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Green needlegrass is moderately palatable to grazers and browsers (NRCS 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

This species competes poorly against Kentucky bluegrass (*Poa pratensis*) (Dennhardt 2016) and is vulnerable to intensive grazing (Uresk and Mergen 2014, Cooper and Jean 2001).

Maps of Species Range

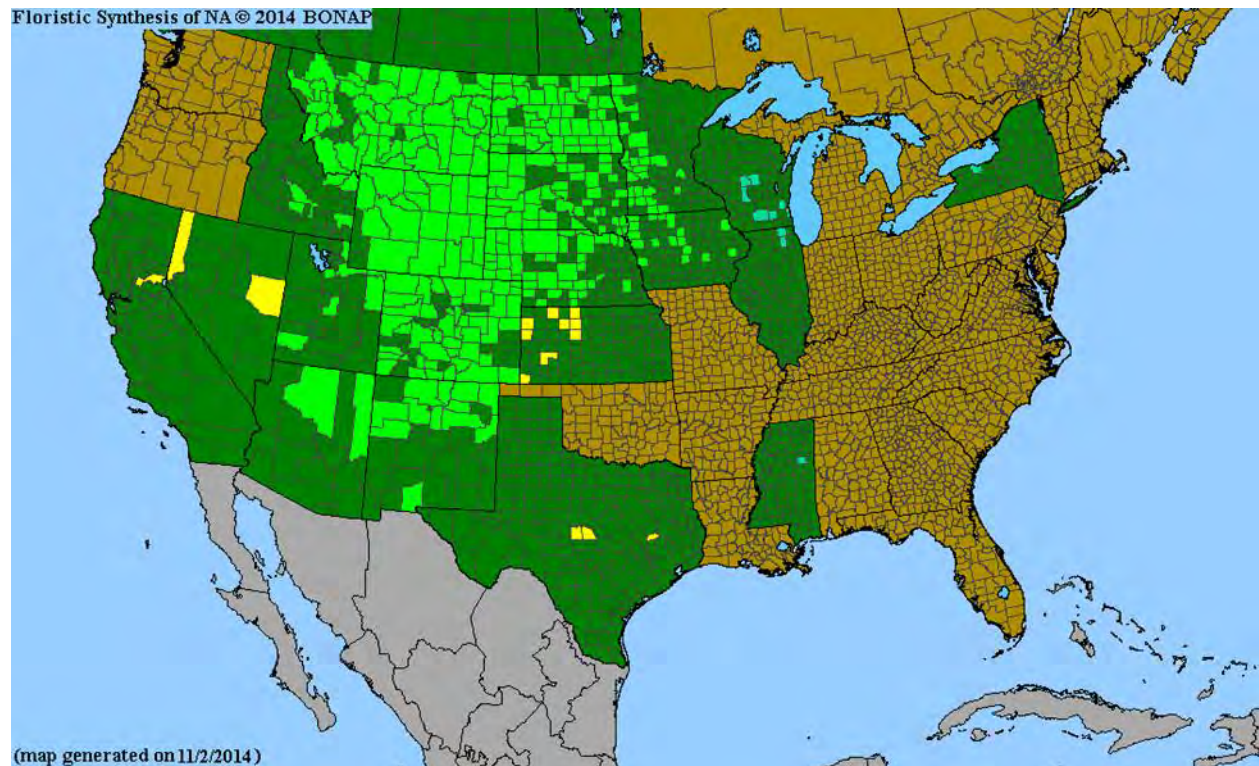


Figure 71. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county; teal indicates species native but adventive in state.

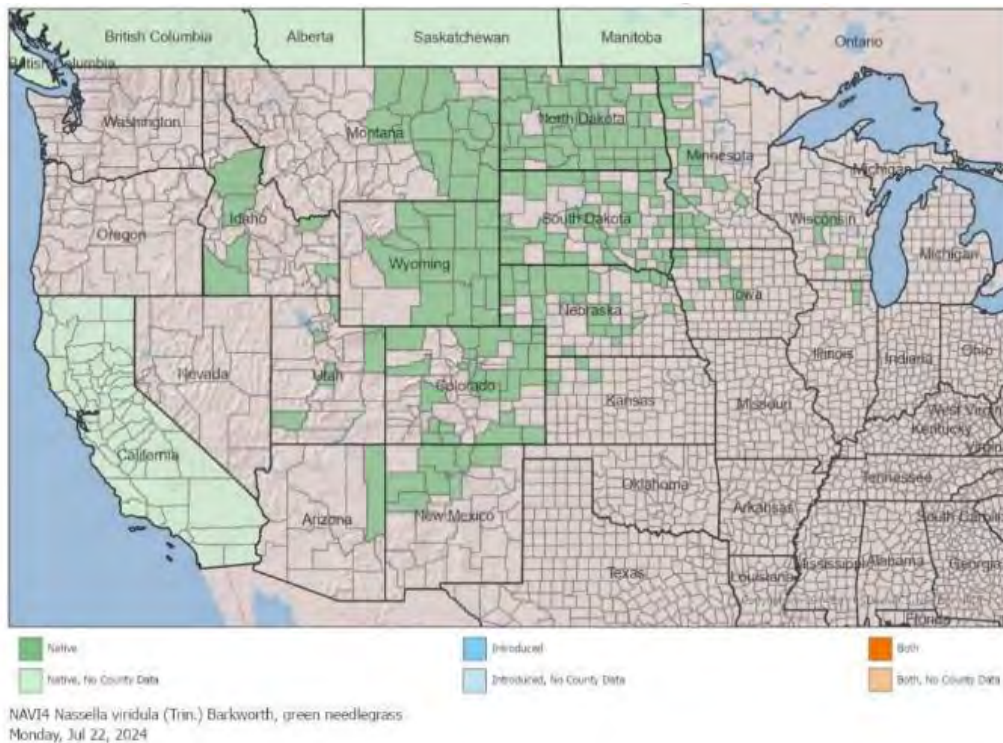


Figure 72. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Green spleenwort (*Asplenium viride*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One documented occurrence on the Comanche National Grassland (NG) from 2011 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2011

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Fragmentation, habitat loss, and drought.
 - b. Habitat: Climate stressors and development.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Habitat trends in the plan area are unknown.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the southern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: One documented occurrence in the plan area. Population numbers are unknown.
 - b. Ecological conditions: Unknown, but likely to be restricted because the species is associated with a restricted ecological condition (e.g., moist, limestone cliffs).

Species Status

G5; S1 in Colorado.

Taxonomy

Asplenium viride Huds. is accepted as valid in most floristic literature (Ackerfield 2022, Weber et al. 2012) while the species is listed in other sources as *Asplenium trichomanes-ramosum* with the synonym *Asplenium viride* (Flora of North America 1993, ITIS 2024, NRCS 2025). There is some disagreement on taxonomy with the other sources listing *Asplenium trichomanes-ramosum* as a synonym (Ackerfield 2022, Weber et al. 2012). Other common names include brightgreen spleenwort (ITIS 2024, NRCS 2025). It is worth noting that there is a valid taxon named *Asplenium trichomanes*, maidenhair spleenwort, which is distinct from *Asplenium trichomanes-ramosum*. Hybridization between *Asplenium trichomanes-ramosum* and *A. trichomanes* produces the fertile *A. adulterinum*, which occurs only on Vancouver Island (Flora of North America 1993).

Species range

Overall Species range

In North America, occurs in Alaska, California, Colorado, Idaho, Maine, Michigan, Montana, Nevada, New York, Oregon, South Dakota, Utah, Vermont, Washington, Wisconsin, Wyoming and many of the Canadian provinces (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The documented occurrence in the plan area is at the southern edge of the species range (Figure 73).

Distribution, abundance, and trend in the plan area

Population

Information about the distribution, abundance, and trend for the population in the plan area is unknown (Figure 73).

Habitat

Plants inhabit limestone cliffs and rocky crevices from 6,000 to 12,00 feet (Ackerfield 2022) which is not a common habitat type in the plan area. In western Colorado, Weber (2012) cite that plants occur on limestone cliffs near the timberline.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Threats to populations are largely unknown (NatureServe 2025), but likely include fragmentation and habitat loss due to development. The population in the plan area appears to be at the edge of its range where climate stressors could push the climate envelope, including minimum and maximum daily temperatures, beyond the species ability to survive or colonize outside of its current locations.

Habitat

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Green spleenwort is a lithophyte that grows in the crevices of shaded limestone and calcareous rocks on talus slopes (NatureServe 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Limestone cliffs where green spleenwort occurs in the plan area are limited.

Critical biological characteristics

Green spleenwort is a small perennial fern that grows in shaded moist calcareous rocks indicating a preference for cool shaded environments and a tolerance for lime. The species may be sensitive to drying and scorching from direct sunlight (Michigan State University 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Green spleenwort shows a high tolerance to heavy metals and has the potential to colonize heavy metal polluted sites (Woch et al. 2022). The species likely provides diversity and physical cover in a largely barren habitat.

Due to its habitat preferences, the species is likely to be threatened by warmer temperatures, altered precipitation patterns, and drought. While this fern species may have the ability to disperse, there would need to be suitable unoccupied habitat areas available for colonization. Essentially, changing climatic factors could limit favorable habitat and force the species into new areas that may not be protected or appropriately managed for conservation.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Little information can be found in the literature documenting the influence of ecosystem structure and function on this species. However, the species relies on specific ecological conditions for growth and survival and would likely suffer if these rocky humid conditions no longer existed.

Maps of Species Range

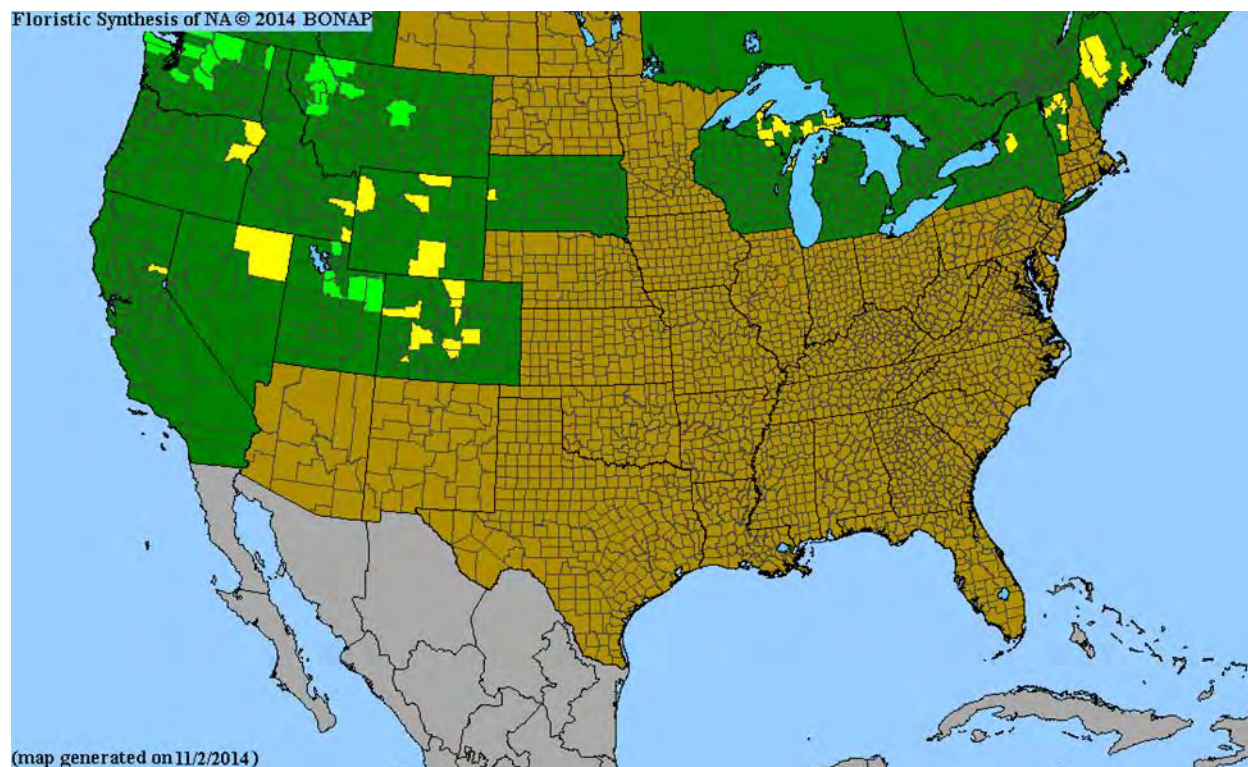


Figure 73. County occurrence data for *Asplenium viride* from Biota of North America Program (BONAP). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Greene milkweed

(*Asclepias uncialis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence There are five Element Occurrence records (EOID 1686, 4466, 7345, 12581, 16583) from CNHP that definitively show the species is known to occur in the plan area (CNHP 2024, Van Scoyoc 2024).

Year of Last Known Occurrence: 2012

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat):
 - a. Population: Because of their isolation, gene flow between populations is unlikely and could lead to a decline in the species viability over time, in addition to their extremely low rates of sexual reproduction. Specific threats to extant occurrences include recreational use, agricultural use, and military tank traffic.
 - b. Habitat: This species has experienced historical declines due to the conversion of lands for agriculture and residential development. More recent declines in habitat quality and population sizes are due to incompatible land uses, like heavy grazing, invasive species, and off-road vehicle use.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Most of the known populations are small, discrete, and isolated with large areas of apparently suitable habitat being unoccupied.
 - b. Habitat: Shortgrass prairie habitat in Kansas is declining and in Colorado there's a widespread deviation when it comes to composition due to grazing. Sandsage prairie has a declining trend in habitat quality because the species composition is highly altered.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. This species is considered at the northeastern edge of its range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population The five EOs from CNHP in the plan area total 9 individuals, three of the occurrences listed single individuals, one listed two, and one listed four individuals (CNHP 2024).
 - b. Ecological Conditions: Ecological conditions are not currently restricted within the plan area.

Species Status

G2; S2 in Colorado; USFS Region 2 Sensitive Species.

Taxonomy

USDA NRCS recognizes the name *Asclepias uncialis* Greene ssp. *uncialis* (NRCS 2025). Other synonyms include *Asclepias uncialis* ssp. *uncialis*, and *Asclepias uncialis* without reference to the subspecies (CNHP 2024). Synonyms for this species includes *Asclepias uncialis* ssp. *uncialis*

(NatureServe 2025). Related ITIS names include: *Asclepias uncialis* Greene (TSN 30318), *Asclepias uncialis* ssp. *uncialis* Greene (TSN 524890) (ITIS 2024, NatureServe 2025).

Other common names for this species include dwarf milkweed (CPW 2015), wheel milkweed (NRCS 2025), and white rim milkweed (Nabhan et al. 2015).

Species range

Overall Species range

Greene milkweed occurs in the southwestern United States and adjacent Mexico (NatureServe 2025). It is found in Arizona, Colorado, New Mexico, Oklahoma, and Texas (NatureServe 2025). There are less than 60 occurrences that occur sporadically in desert grasslands or shortgrass prairies across the species range (NatureServe 2025). The largest population size documented is around 150 plants (NatureServe 2025). Surveys are needed to identify new populations in potential habitat and to document that status of threats, trends, and abundance of plants range wide (NatureServe 2025).

Greene milkweed is currently known from ten eastern Colorado, USA, counties (Baca, Bent, Cheyenne, El Paso, Huerfano, Las Animas, Otero, Prowers, Pueblo, and Weld), and historically known from at least four additional counties (Arapaho, Fremont, Kit Carson, and Washington) (CNHP 2024). Occurrences are primarily in southeastern Colorado. Estimated range extent in Colorado of 71,096 square kilometers was calculated in GeoCAT using occurrence data provided by the Colorado Natural Heritage Program (2023) (CNHP 2024). Range wide, historically, this species appears to have been known from two or three disjunct geographical areas: 1) the western Great Plains of eastern Colorado, northeastern New Mexico, and the adjacent Oklahoma panhandle; 2) central to southwestern New Mexico and scattered locations in Arizona; and 3) Sweetwater County in southwestern Wyoming (CNHP 2024). Some botanists consider the location of the Wyoming collection (C.C. Parry #246) to be an error in labeling and speculate that it may have come from northeastern Colorado (CNHP 2024, Fertig and Markow 2000). Recent observations (i.e., those less than 20 years old) are confined to the first two areas mentioned plus a few observations in central New Mexico (CNHP 2024). Based on collection location and frequency, the range of the species appears to have contracted in northeastern Colorado since the mid to late 1800's (CNHP 2024). This species can be found in Arizona, Nevada, New Mexico, Oklahoma, Texas, Utah, and Wyoming, USA (CNHP 2024).

Description of how the population in the plan area fits within the overall range

Greene milkweed records of occurrences vary depending on the data source. According to (iDigBio 2024), there is one preserved specimen associated with a record of species occurrence just outside the Comanche National Grassland boundary but would be within a 1km buffer of the boundary. That record is from 1948 in Otero County, "several miles south of La Junta", in a shaley outcrop (iDigBio 2024).

According to CNHP, the plan area plus a 1km buffer includes five separate documented species occurrences (CNHP 2024). The last year of observation for each on spans from 1947 to 2012 depending on the population; however, 4 out of the 5 documented populations are from 2007 to 2012.

In Region 2, the species has been documented from 33 occurrences in eastern Colorado, 13 of which are considered historical and probably extirpated (Decker 2006). Of the 20 occurrences believed to be extant, two are located on National Forest System land on the Comanche National Grassland (Decker 2006).

Distribution, abundance, and trend in the plan area

Population

The trend of this species within the plan area is unknown.

Across the whole species range, both the long- and short-term trend for Greene milkweed is a decline of 10-30% according to NatureServe (NatureServe 2025). The long-term trend is based on collection locations and frequency and appears to show that the range of the species has contracted in northeastern Colorado since the mid to late 1800s (NatureServe 2025). Few botanists in this region today have seen Greene milkweed, and many have been unable to locate the species, even with considerable effort (NatureServe 2025). It is also likely that this species has declined over the past 100 years because its habitat, shortgrass prairie, has been extensively modified for human uses such as agriculture, livestock operations, and residential development (NatureServe 2025). The short-term trend is based on the fact that there are significant threats to many of the occurrences, and a decline in the quality of habitat and the number of plants that have been observed at some occurrences. In addition, plants have been difficult to relocate at numerous sites (NatureServe Network Data as of 2021) (NatureServe 2025).

Habitat

Found in grasslands on sandy to rocky soil from 5000-7000 ft (1524-2134 m) (SEINet 2024).

The shortgrass prairie and sandsage prairie are the two more widespread vegetation types in the plan area, respectively (USFS 2005a). Habitat has been extensively modified for human uses such as agriculture, livestock operations, and residential development (NatureServe 2025).

Threats (arising from on or off the plan area)

Population

Specific threats to extant occurrences include recreational use, agricultural use, and military tank traffic (CNHP 2024). Other threats are population limitation by unknown biological requirements, altered disturbance regime, habitat loss, spread of exotic species, and climate stressors (CNHP 2024). A lack of understanding of population trends and habitat conditions for Greene milkweed, and the lack of knowledge about its life cycle, population extent, and demographics also contribute to the possibility that one or more of these factors will threaten the long-term persistence of the species (CNHP 2024, Decker 2006).

Researcher Locklear identified several patterns exhibited by Greene milkweed that are of concern: 1) it is often not found at historical sites that retain native vegetation (CNHP 2024). In these cases, absence of Greene milkweed may be due to causes peculiar to the biology of Greene milkweed, instead of habitat degradation, 2) Most of the known populations are small, discrete, and isolated from each other (CNHP 2024). Large areas of intervening, apparently suitable habitat are not occupied (CNHP 2024). Gene flow between these isolated populations is unlikely and may lead to a decline in species viability over time, and 3) Greene milkweed exhibits extremely low rates of sexual reproduction, perhaps even lower than is characteristic of the genus (CNHP 2024).

Although known populations are exposed to grazing, potential recreational use and development, and military training maneuvers, the degree of threat from these disturbances is not known (CNHP 2024). This species is considered to be vulnerable to climate stressors (CNHP 2024).

Habitat

The primary threat at this time is considered to be agricultural development (CNHP 2024). In general, Greene milkweed habitat, shortgrass prairie, is threatened by extensive human alterations for agricultural, residential, and recreational uses (CNHP 2024).

This species has experienced historical declines due to the conversion of lands for agriculture and residential development (NatureServe 2025). More recent declines in habitat quality and population sizes are due to incompatible land uses, like heavy grazing, invasive species, and off-road vehicle use (NatureServe 2025).

Ecological conditions

Ecological condition requirements

Typical habitat for Greene milkweed is level-to-gently sloping terrain without notable micro-topographic features (CNHP 2024). Although plants are often found at the base of escarpments or mesas, the species does not occur on rock ledges or outcroppings and is absent from highly disturbed habitats such as sand dunes, erosion channels, wash slopes, and badlands (CNHP 2024). Soils in the range of Greene milkweed belong to orders characterized by dry, warm soils (Mollisols, Entisols, Aridisols, and Alfisols) (CNHP 2024). Greene milkweed does not appear to have highly specific microsite requirements, and there is no evidence that Greene milkweed is restricted to a particular soil type (CNHP 2024). Occurrences are known from soils derived from a variety of substrates, including sandstone, limestone, and shale, but are most often found in sandy loam soils (CNHP 2024). It does not occur in pure sand. Greene milkweed is primarily associated with species typical of shortgrass prairie (CNHP 2024).

Associated vegetation is comprised mostly of grasses, with forbs, shrubs, and trees typically comprising less than 15% of the total vegetation cover (CNHP 2024). Plants are typically found growing in open spaces between bunchgrasses (CNHP 2024). Associated forbs are variable throughout the range, since many species found with Greene milkweed in southeastern Colorado (e.g., *Melampodium leucanthum*) are near the northern edge of their distribution in that area (CNHP 2024). Although Greene milkweed is often associated with Juniper Woodland and Savanna ecological systems, it is always found in the prairie or grassland components of these systems (CNHP 2024). The elevational range for this subspecies is 3,722 – 7,729 feet (1,135 – 2,356 meters) (CNHP 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The current condition of the shortgrass prairie habitat in Kansas is considered good with a stable trend (Rohweder 2022). The majority of Colorado's shortgrass prairie is privately owned with most being in agricultural production. While almost half of the native prairie has been converted, vast expanses of native prairie in good condition still exist (CNHP 2010). In Colorado, shortgrass prairie habitat is the largest loss of any of Colorado's habitats (CPW 2015). Remaining tracts have often been managed for domination of blue grama and exclusion of other grasses, with a consequent loss of native forb diversity (CPW 2015). In eastern Colorado and other parts of the state, a widespread deviation for shortgrass plains grasslands is associated with changes in composition due to grazing by livestock. In eastern Colorado and other parts of the state, a widespread deviation for shortgrass plains grasslands is associated with changes in species composition due to grazing by livestock and fire suppression (CPW 2015). These changes include lower native species diversity, especially of native forbs; lower abundance of highly palatable grasses; greater abundance of relatively unpalatable species; increase in weedy species, especially the invasive non-native species; and bare soil. Management for increased livestock production tends to produce a more homogeneous grassland dominated by key forage species (Fuhlendorf and Engle 2001).

In Kansas, the sandsage shrubland habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of historic sandsage habitat has been lost, and habitat conversion to row crop production continues (CPW 2015). The remaining sandsage tracts generally have good landscape connectivity, but species composition is highly altered; understory grasses have been converted to short grass or annual species, and mixed and tall grass components are lacking (CPW 2015). Conversion is not presently happening at the same scale but roads, pipelines, encroachment of woody plants continue to fragment habitat. While habitat loss is recognized the significance are not greatly understood (Locklear 2021).

Critical biological characteristics

Greene milkweed is a small, herbaceous perennial with several to many stems 1 to 2.5 inches high with a milky sap (CNHP 2024). Greene milkweed is the earliest blooming milkweed in the Great Plains flowering May-June (SEINet 2024), although its flowering period can potentially overlap those of a few other species in its range (e.g., *A. asperula*, *A. speciosa*, and *A. involucrata*) (CNHP 2024). In Colorado, flowering begins in late April and extends to the end of May (CNHP 2024). The small population in Weld County, Colorado, that did not flower in the dry spring of 2006 was observed flowering in early August of the same year after some substantial summer rains (CNHP 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Greene milkweed is likely to be pollinated by generalist species since the sparse occurrences and their scattered distribution do not constitute a predictable floral resource (Decker 2006). Ants, crab spiders, and hesperiid butterflies are the only insects that have been observed in association with Greene milkweed, and only the last are likely pollinators (Decker 2006). Observers have reported that this species of milkweed has a strong fragrance described as “an aroma suggesting rose fragrance or that of citrus blossoms, which may serve as an attractant for pollinators (Decker 2006).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

None known at this time.

Maps of Species Range

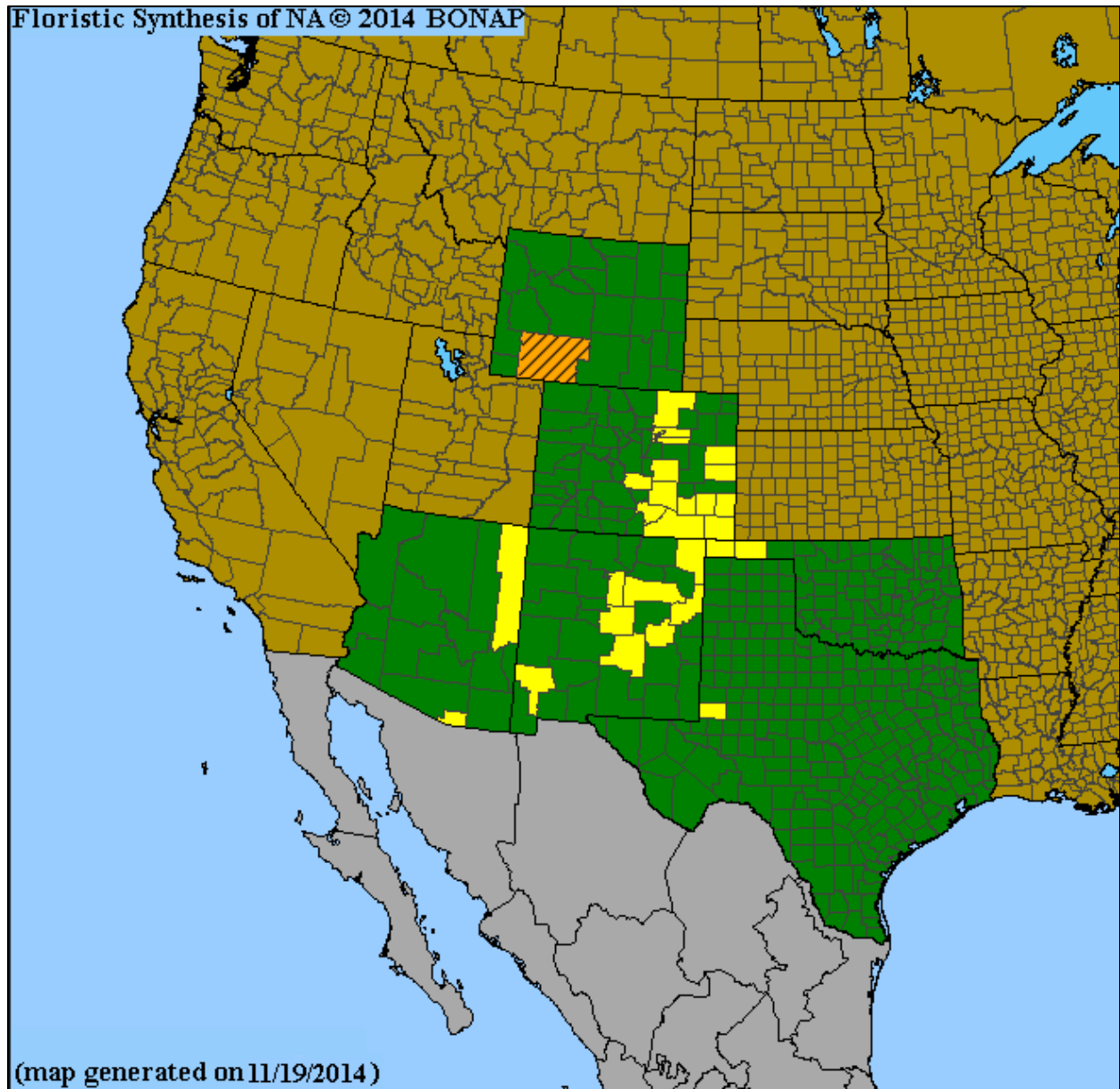


Figure 74. County-level species range map for Greene milkweed from The Biota of North America Program (2024). Dark green is present in the state and native; Brown is species not present in the state; Yellow is species present and rare; Orange with cross-hatch is species extirpated (historic) but questionable presence.

Gummy lovegrass

(*Eragrostis curtipedicellata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has six occurrence records in the Comanche National Grasslands from 1947-2007 (Van Scoyoc 2024). The record from 2007 has sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: grazing with high stocking density can reduce standing biomass.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: shortgrass prairie and riparian (cottonwood gallery) in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; one occurrence record.
 - b. Ecological conditions: uses varied habitats (shortgrass prairie, midgrass prairie, cottonwood gallery forest, disturbed sites).

Species Status

G5; S1 in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Eragrostis curtipedicellata* as valid (NRCS 2025).

Species range

Overall Species range:

Gummy lovegrass is distributed from southern Colorado, Kansas, and Missouri to northeastern Mexico (Van Scoyoc 2024) (Figure 75, Figure 76).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure 75, Figure 76).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. There has only been one occurrence record in the plan area since 1957. This record, from 2007, gives no indication of the number of individuals observed. It is not considered rare in any counties that overlap the plan area (Figure 76).

Habitat

Gummy lovegrass is found near fields, along roadsides, and in the margins of woods at elevations from 3200-5,000 ft (Van Scoyoc 2024). Within the plan area, it has been documented in Holt Canyon in shortgrass prairie above sandstone ledges and pavement (Van Scoyoc 2024).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Grazing with high stocking density in a confined paddock has been shown to reduce standing biomass of this species – either through consumption or trampling (Fritzler 2020).

Habitat

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

This species can use varied habitat types, including shortgrass prairie, midgrass prairie, and cottonwood gallery forest (Kuhn et al. 2011).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Given this species' use of varied habitat types, including shortgrass prairie (Kuhn et al. 2011), its ecological condition requirements are not considered restricted in the plan area.

Critical biological characteristics

Gummy lovegrass is a warm season perennial grass in the family Poaceae (Fritzler 2020, Van Scoyoc 2024). Most species of *Eragrostis* occupy open habitats with poor soils and many occur in disturbed localities (Peterson and Valdés-Reyna 2005).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Not known – it is generally considered an unpalatable plant, though livestock may potentially “learn” to consume it under certain management regimes (Fritzler 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Gummy lovegrass is considered an unpalatable plant, but a study by Fritzler (2020) showed it had lower standing biomass in paddocks with high stocking density that were moved daily compared to a continuous grazing treatment despite similar standing biomass at the beginning of the study. Fritzler (2020) suggests this indicates some form of mechanical removal of the species by livestock, whether from consumption or trampling.

Maps of Species Range

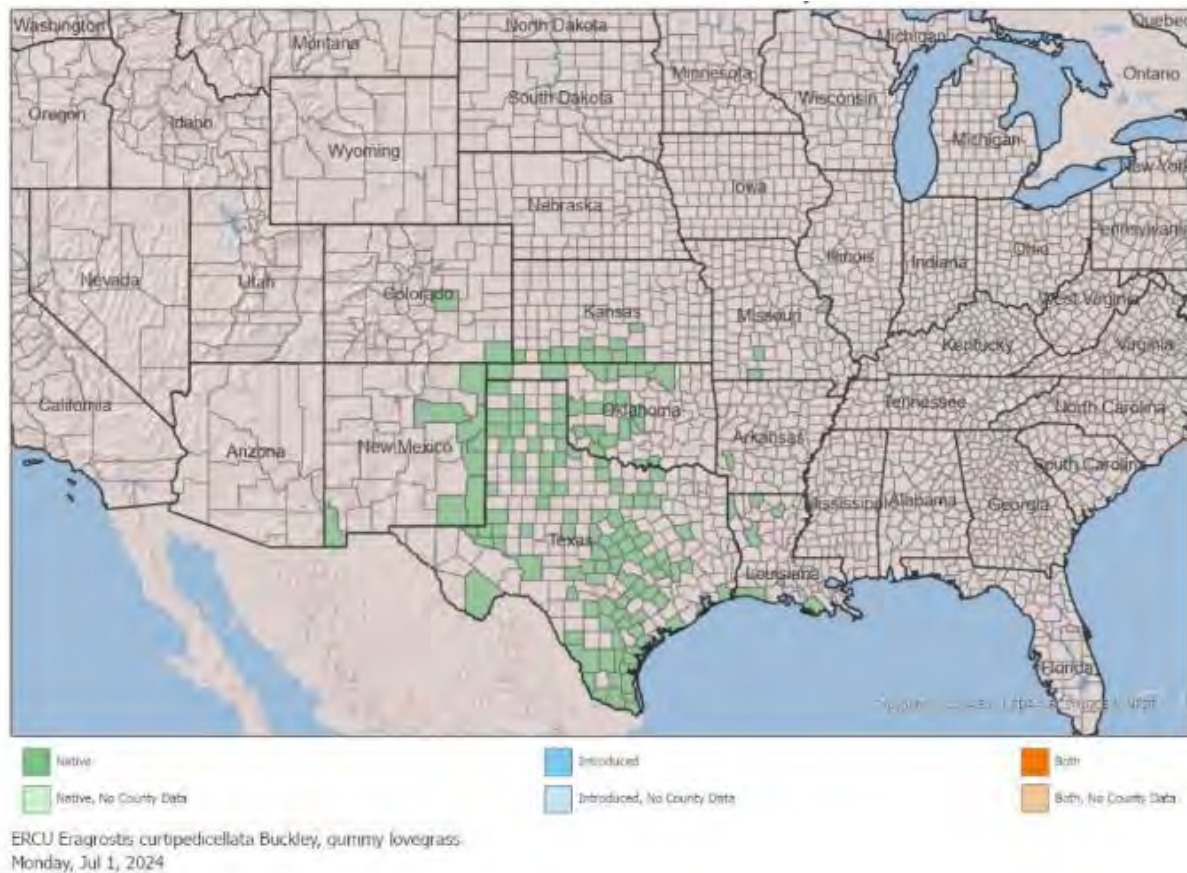


Figure 75. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

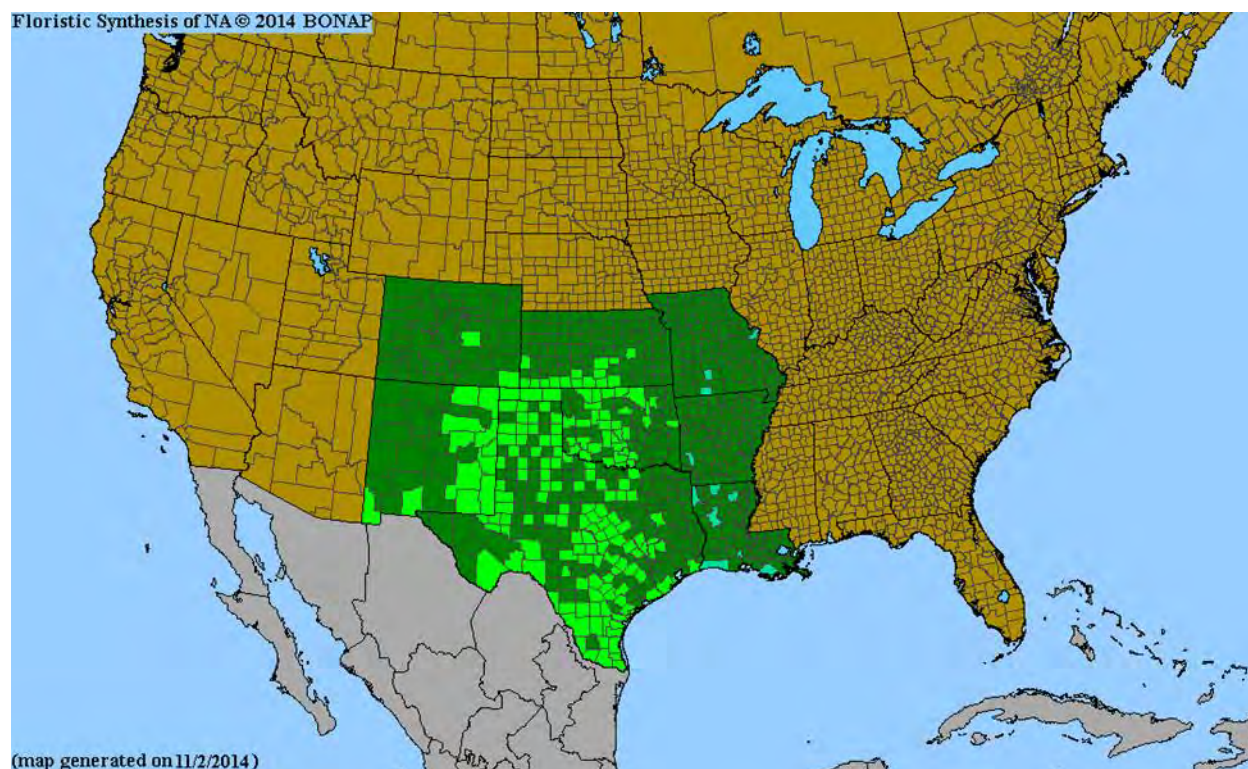


Figure 76. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Hairy four-o'clock

(*Mirabilis hirsuta*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: This variety has one occurrence record within the plan area with unknown spatial precision (Van Scoyoc 2024). One SEINet observation was from 1968 and is not in the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Little information was found about this specie. No information was found in regard to threats to the species.
 - b. Habitat: Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend is unknown.
 - b. Habitat: Trend in habitat is unknown
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is not endemic, disjunct, or at the edge of species range
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There is 1 occurrence records that occur in the Carrizo Unit. The observation is where spatially mapped on edge of Western shortgrass prairie and the Central Mixedgrass Prairie Shrubland (Landfire 2024).
 - b. Ecological conditions: No sources consulted identified any ecological requirements needed for this species aside from general habitat needs

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

Mirabilis hirsuta is accepted as valid (ITIS 2024, NatureServe 2025, NRCS 2025). The USDA Plants Database lists *Allionia hirsuta* and *Oxybaphus hirsutus* as synonyms (NRCS 2025).

Species range

Overall Species range

Hairy four o'clock occurs in 25 states including AR, AZ, CO, CT, IA, IL, IN, KS, MA, ME, MI, MN, MO, MT, ND, NE, NJ, NM, NY, OH, OK, SD, TX, WI, WY. In Canada, it occurs in Alberta, British Columbia, Manitoba, Ontario, and Saskatchewan (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is not at the edge of species range (Figure 77).

Distribution, abundance, and trend in the plan area

Population

There is one documented occurrence record on the Carrizo Unit of the Comanche NG. It is spatially mapped in the Canyonland ecosystem. The species location is on edge of Western shortgrass prairie and the Central Mixedgrass Prairie Shrubland (Landfire 2024).

Hazlett (2004) indicates this species is not known to occur in the plan area but could occur in western Las Animas County. Kuhn (2011) does not include this species in the floristic inventory.

The population and trend for this species in the plan area is unknown.

Habitat

Ackerfield (2022) describes habitat as open forest, meadows, sandy soil 3900-9200 ft. SEINet describes habitat as dry prairies, hills, and barrens (Van Scoyoc 2024). Hazlett (2004) describes it as open steep, sandy soils. Hazlett indicates this species is not known to occur in the plan area but could occur in western Las Animas County. Kuhn (2011) does not include this species in the floristic inventory.

There is 1 occurrence record that occurs in the Carrizo Unit. It is spatially mapped in the Canyonland ecosystem. The species location is on edge of Western shortgrass prairie and the Central Mixedgrass Prairie Shrubland (Landfire 2024).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Little information was found about this species. No information was found in regard to threats to the species (NatureServe 2025, Ackerfield 2022, Hazlett 2004).

Habitat

Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022).

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025, NRCS 2025, iNaturalist 2025). Species is perennial, blooms in June, July, August and September (Ackerfield 2022).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There is 1 occurrence record that occurs in the Carizo Unit. Location is spatially mapped within the canyonland ecosystem (USFS 2005a). The species location is on edge of Western shortgrass prairie and the Central Mixedgrass Prairie Shrubland (Landfire 2024).

No sources consulted identified any critical biological characteristics for the specie (Ackerfield 2022, NatureServe 2025, Hazlett 2004).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

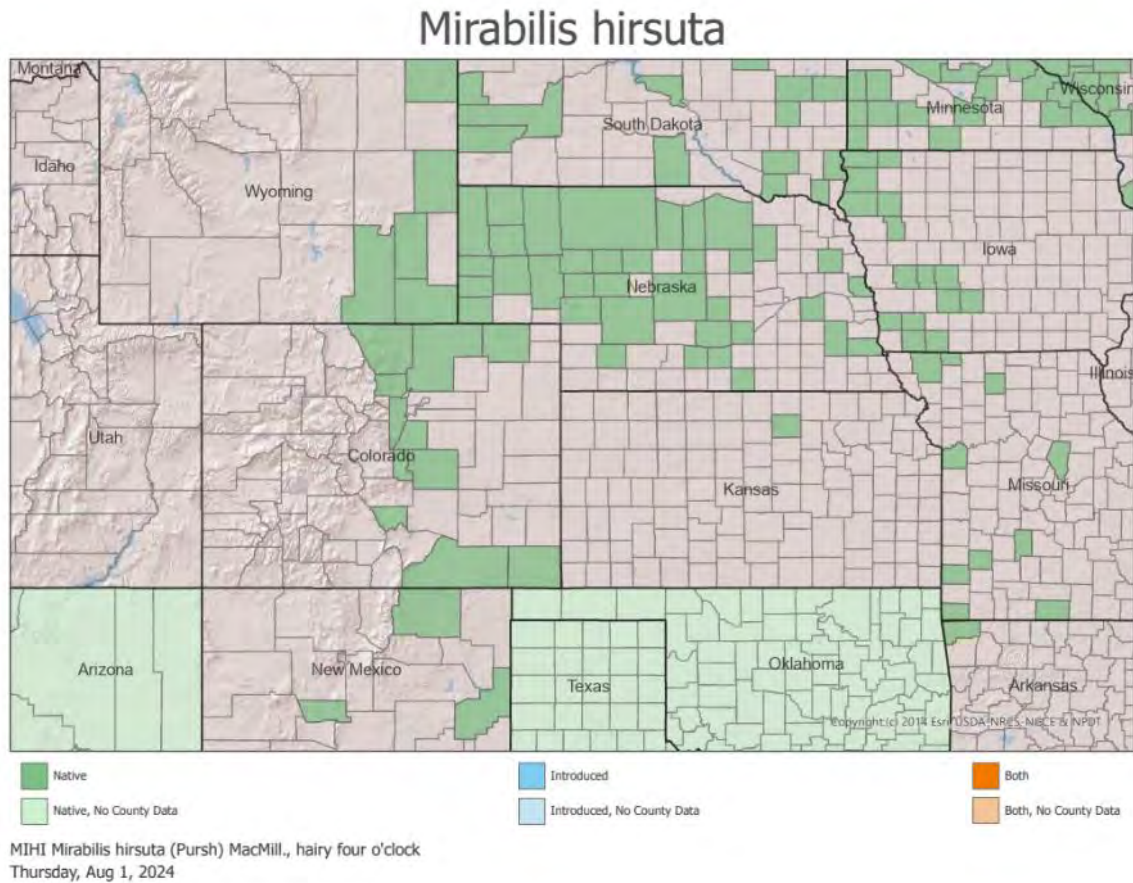


Figure 77. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Hall's milkweed (*Asclepias hallii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: One occurrence record from 2012 was identified in the plan area from SEINet (Van Scoyoc 2024). The locality information for the herbarium specimen lists Las Animas County, Colorado, Comanche National Park, David's Canyon West. Upon closer inspection, the herbarium specimen appears to be incorrectly identified as *Asclepias hallii*, and is actually *A. viridiflora*, green comet milkweed (Figure 1). In addition, the collection was made at approximately 4,596 feet which is outside of the elevational range for *Asclepias hallii* of 7,400 to 10,000 feet (Ackerfield 2022). The species is not currently known to occur in the plan area (Figure 2) and is not analyzed further.

Year of Last Known Occurrence: N/A

Species Status

G3; S3 in Colorado.

Hall's panicgrass

(*Panicum hallii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one occurrence record in the plan area (Van Scoyoc 2024). The herbarium record location is within the Comanche National Grassland in Holt Canyon.

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025).
 - b. Habitat: Species uses varied habitat including shortgrass prairie, canyons, sandy, gravelly areas. Common threats on and/or off the plan area can include housing and urban areas, livestock farming and ranching, recreation, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, habitat shifting and alteration, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022). See Threats and Trends Appendix.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend for this species in the plan area is unknown.
 - b. Habitat: Species uses varied habitats, no discernable trend. The single herbarium collection for the plan area is from juniper woodland
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northern edge of the species' range (Figure 78, Figure 79).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known. There was one spatial occurrence record within the plan area.
 - b. Ecological conditions: No sources consulted identified any ecological requirements needed for this species aside from general habitat needs.

Species Status

G5; S2 in Colorado.

Taxonomy

Panicum hallii is accepted as valid (ITIS 2024, NRCS 2025). The USDA PLANTS Database and NatureServe includes 2 subspecies *Panicum hallii* var. *hallii* and *Panicum hallii* var. *filipes* (NatureServe 2025, NRCS 2025). Ackerfield (2022) recognizes *Panicum hallii* var. *hallii* in her field guide and not the parent species.

Species range

Overall Species range

Hall's panicgrass occurs in Arizona, Colorado, Louisiana, New Mexico, Oklahoma, Texas, and Utah. Its range extends from the southwestern United States to southern Mexico (Flora of North America 1993).

Description of how the population in the plan area fits within the overall range

The plan area is at the northerly edge of the species' range (Figure 78, Figure 79).

Distribution, abundance, and trend in the plan area

Population

There is one spatial occurrence record that occurs in Baca County in the Carrizo Unit. The location is within Holt Canyon in the Canyonlands ecosystem (USFS 2005a). Hazlett (2004) indicates this species is not known to occur in the plan area but could occur in eastern Las Animas County. Kuhn (2011) found this species in Baca County in the floristic inventory of the Cimarron national grassland and the Comanche national grassland.

Population trend for this species in the plan area is unknown.

Habitat

This species is found on sandy plains and rocky slopes, from 2,500-7,500 ft (Van Scoyoc 2024). FNA also describes this species growing on sandy, gravelly, or rocky land, including roadsides, pastures, rangeland, oak and pine savannahs, chaparral, and moist areas in deserts and on mesas (Flora of North America 1993). Kuhn (2011) describe habitat as juniper woodland. Ackerfield (2022) describes the habitat for the variety *hallii* as canyons and shortgrass prairies.

There is one herbarium record found in the Commanche National Grassland in Baca County. It was in Holt Canyon. The habitat is described as scattered *Juniperus monosperma*; canyon walls with *Selaginella* and *Cheilanthes* (Van Scoyoc 2024). The occurrence record is spatially mapped within the Canyonlands ecosystem (USFS 2005a) and LandFire existing vegetation type Western Great Plains Shortgrass Prairie (Landfire 2024).

Species uses varied habitats. Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025, Flora of North America 1993).

Habitat

Species uses varied habitat including shortgrass prairie, canyons, sandy, gravelly areas. Common threats on and/or off the plan area can include; housing and urban areas, livestock farming and ranching,

recreation, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, habitat shifting and alteration, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022). Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (NatureServe 2025, Flora of North America 1993). The species is a perennial graminoid. It is a short-lived bunchgrass (NRCS 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There is one herbarium record found in Holt Canyon in the Carizo Unit. The habitat was described as scattered *Juniperus monosperma*; canyon walls with *Selaginella* and *Cheilanthes*. The occurrence record is spatially mapped within the Canyonlands ecosystem (USFS 2005a) and LandFire existing vegetation type, Western Great Plains Shortgrass Prairie (Landfire 2024).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (Ackerfield 2022, NatureServe 2025, Flora of North America 1993).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species is a good seed producer and can provide a source of food for birds and other wildlife (NRCS 2025).

Ethnobotany: Seeds were ground and used for food, the plant was used as fodder, and the stalks were tied together to make small brooms. (Van Scoyoc 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

None known at this time.

Maps of Species Range

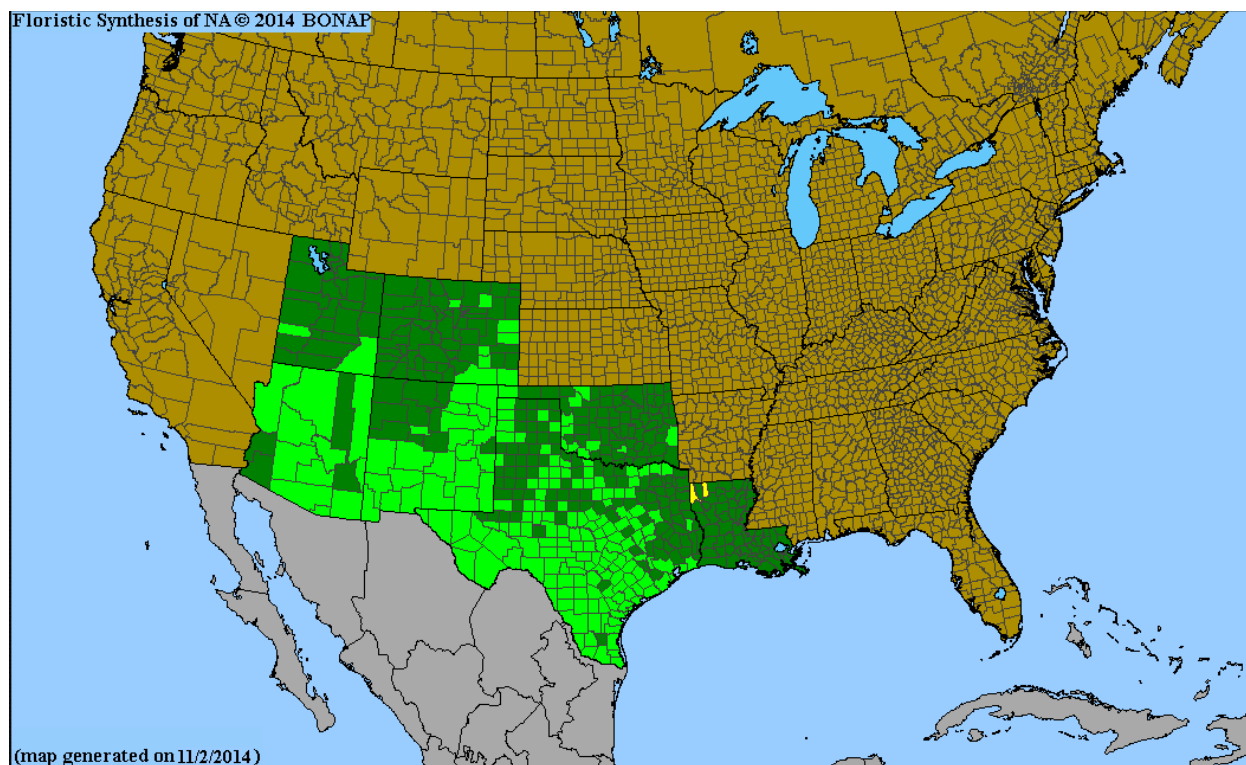


Figure 78. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

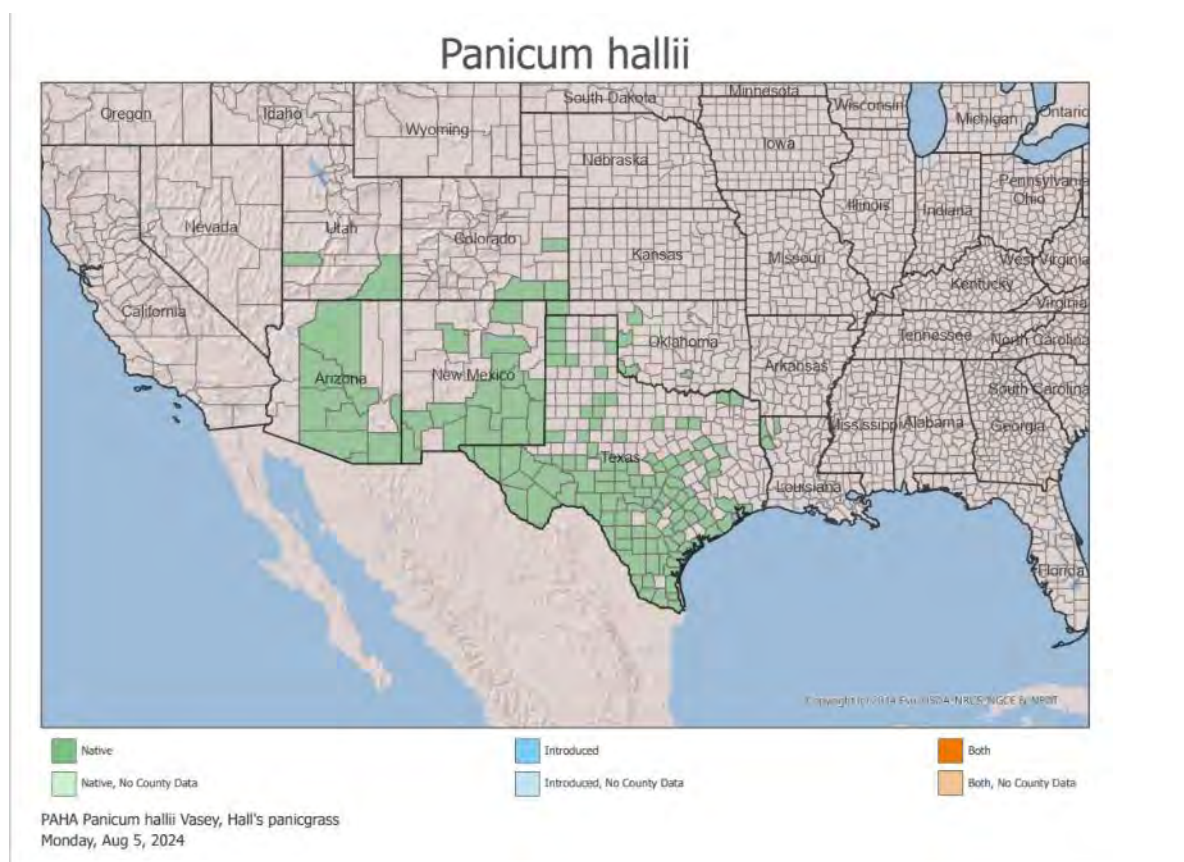


Figure 79. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Hartweg's sundrops (*Calylophus hartwegii* ssp. *pubescens*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: KNHP contains one occurrence polygon squarely within the Cimarron National Grassland from 1989 (Van Scoyoc 2024). The location is described as “Cimarron NG Site...N of Cimarron R. from bluffs N of jct Forest Rds 620 & 627, W paralleling river to near jct Forest Rds 663 & 787, 2 mi E of Colorado line.” Therefore, this species is known to occur in the plan area.

Year of Last Known Occurrence: 1989

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: drought
 - b. Habitat: drought
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: species' known habitat within the plan area shows no evidence of disturbance and therefore is considered stable but short grass prairie in the plan area has a declining trend in habitat quality.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of its range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Single occurrence in the plan area with thousands of individuals.
 - b. Ecological conditions: rocky/gravel outcrops are not limited in the plan area.

Species Status

G4; S2 in Colorado; SNR in Kansas.

Taxonomy

Calylophus hartwegii ssp. *pubescens* is accepted as valid; taxonomic synonyms include *Calylophus hartwegii* var. *pubescens*, *Galpinsia camporum*, *Galpinsia interior*, *Oenothera greggii*, *Oenothera greggii* var. *lampasana*, *Oenothera greggii* var. *pubescens* (NRCS 2025). Towner (1977) states that “Introgression of *C. hartwegii* subsp. *hartwegii* with other taxa appears to occur widely, especially with subsp. *pubescens* and *maccartii*. Intermediates between subsp. *pubescens* and *hartwegii* exist in southern West Texas, southeastern Arizona, and probably in northern Chihuahua and Coahuila.”

Species range

Overall Species range:

This subspecies occurs in the southern Great Plains of the southwestern United States, including Texas, New Mexico, Arizona, Oklahoma, and Colorado (Towner 1977, NatureServe 2025) (Figure 80).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the subspecies' range (Figure 80).

Distribution, abundance, and trend in the plan area

Population:

Towner (1977) states "Most abundant of the races of this species, *Calylophus hartwegii* subsp. *pubescens* occurs widely in Texas and neighboring states." NatureServe considers it an apparently secure subspecies across its range (NatureServe 2025).

The singular element occurrence report in the plan area (EO ID 135) states "observed 1000s of plants while mapping boundaries of EO; boundaries above conform to those of *Dalea jamesii* and *Eriogonum lachnogynum* but probably slightly less extensive for this element" (Van Scoyoc 2024).

Habitat

Hartweg's sundrops (*Calylophus hartwegii*) is found in deserts, plains, and foothills, from 3,500-7,000 ft (1067-2134 m) (Van Scoyoc 2024). The subspecies *pubescens* grows in sandy and limestone soil (Van Scoyoc 2024).

The subspecies *pubescens* has only been documented in one location within the Cimarron National Grassland portion of the plan area (Van Scoyoc 2024). It was found on "Dry, gravelly, limestone breaks and infrequently gravelly to sandy alluvium N of the Cimarron River" within shortgrass prairie (KNHP EO ID 135). Habitat within the occurrence polygon appears stable with no roads, trails, oil and gas, or other land-disturbing activities. Shortgrass prairie in the plan area has a declining trend in habitat quality.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

This species and its habitat are threatened by drought (Clinebell et al. 2004).

Habitat

This species and its habitat are threatened by drought (Clinebell et al. 2004). Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

The subspecies requires sandy or limestone soil (Van Scoyoc 2024). A few species within the *Calylophus* genus are endemic to gypsum outcrops, but Hartweg's sundrops is not one of them (Cooper et al. 2023). It depends on the presence of pollinating insects, predominantly hawkmoths (Clinebell et al. 2004, Cooper et al. 2023).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The occurrence polygon within the plan area intersects with the Western Great Plains Shortgrass prairie (Landfire 2024). Within that vegetation type, Hartweg's sundrops requires rocky/gravel outcrops (Hazlett et al. 2009). Its mapped habitat within the plan area is considered stable due to lack of disturbances in that area north of the Cimarron River.

Sparse records of hawkmoths occur in the plan area, including White-lined sphinx, *Hyles lineata*, Doll's sphinx, *Sphinx dolli*, and Juanita Sphinx Moth, *Proserpinus juanita* (Van Scoyoc 2024). It is possible that this species' pollinators may be limited in the plan area, but there is insufficient information to make that determination.

Hartweg's sundrops can use either sandy or limestone soil (SEINet 2024) because of its use of varied soil types, its ecological conditions are not considered restricted in the plan area.

Critical biological characteristics

Hartweg's sundrops is a perennial forb in the evening primrose family (Onagraceae) (SEINet 2024). The different subspecies of *Calylophus hartwegii* each occupies a slightly different ecological zone within the plains of the southwestern U.S. (Towner 1977). Towner (1977) states: "*Calylophus hartwegii* subsp. *pubescens* is one of the most variable taxa in *Calylophus*, much of this perhaps stemming from the influence of introgression. The size of the flowers and of leaves and other vegetative parts all vary widely.". It is self-incompatible and relies on insect pollination for reproduction, especially hawkmoths (Jogesh et al. 2016). No information could be found on the flowering time of the subspecies, but the species generally flowers May to September (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Species of *Calylophus* are primarily pollinated by hawkmoths (e.g., White-lined sphinx, *Hyles lineata*, Five-spotted hawk moth, *Manduca quinquemaculata*, Doll's sphinx, *Sphinx dolli*), but can also be pollinated by both halictid and bumble bees (Towner 1977). The flowers of Hartweg's sundrops may not always be open early enough for significant afternoon visitation by bees (Towner 1977).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Clinebell et al. (2004) studied the pollination ecology of Hartweg's sundrops (*Calylophus hartwegii*) in western Texas. They found that "this species seems to be particularly negatively impacted by drought; at

site 9 it bloomed abundantly in 2001 but was not even observed in the drought years of 1999 and 2000. At site 2 in the drought year of 2000, it did bloom, but the first flowers did not open until 8:00 P.M., at least a half an hour later than the same plants in the mesic year of 2001.” They further describe that Hartweg’s sundrops may be less affected by the presence of non-native honeybees than other species that depend upon insect pollination, since sphingid moths and honeybees do not seem compete for resources (Clinebell et al. 2004).

Maps of Species Range

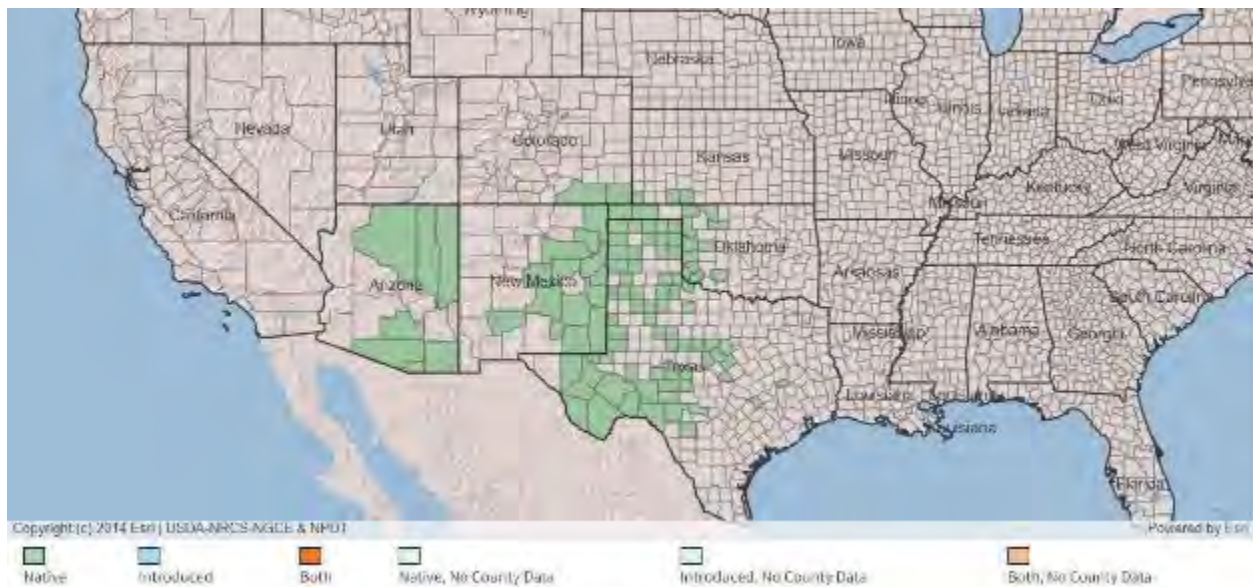


Figure 80. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Havard's three-awn grass

(*Aristida havardii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are 11 occurrences in the plan area from 1948 to 1998, and two observations from 1987 and 1988 are also documented by KNHP (Van Scoyoc 2024). Three observations on the Cimarron National Grassland (NG) were in the vicinity of the Cimarron River and three on the Comanche NG were in the vicinity of Picture Canyon and Sand Canyon (Van Scoyoc 2024).

Year of Last Known Occurrence: 1998

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Unknown.
 - b. Habitat: General threats to shortgrass prairie.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends are unknown.
 - b. Habitat: Trends common in the shortgrass and sandsage prairies (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are 11 documented occurrences in the plan area. Population numbers in the plan area are unknown.
 - b. Ecological conditions: Not likely restricted because shortgrass prairie accounts for approximately 445,000 acres of the plan area.

Species Status

G5; S1 in Colorado; S1 in Kansas.

Taxonomy

Aristida havardii Vasey is recognized as valid (Ackerfield 2022, Weber et al. 2012, NRCS 2025, NatureServe 2025). Synonyms include *Aristida barbata* (Flora of North America 1993, NRCS 2025). Other common names include Havard's three-awn grass (NatureServe 2025).

Species range

Overall Species range

In North America, occurs in Arizona, Colorado, Kansas, New Mexico, Oklahoma, and Texas (NatureServe 2025). The species is considered Critically Imperiled in both Colorado and Kansas. Other sources report that this species also occurs throughout Mexico (Figure 81) (Van Scoyoc 2024).

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are the northern most extent of the species range (Figure 81).

Distribution, abundance, and trend in the plan area

Population

A few of the collections note abundance for populations. Freeman (1989) notes that Havard's three-awn was locally abundant in 1988 with an estimated 150-200 clumps on eroding dunes on the bank of the Cimarron River while a collection in 1987 at the same location noted only four clumps (Freeman 1989).

Habitat

Havard's three-awn is described on dry slopes and sandy soils from 4000 to 4500 ft. by Ackerfield (2022) and dry hills and plains in desert grassland to pinyon-juniper zones, and in sandy to rocky ground from the southwestern United States to northern Mexico by the Flora of North America (1993). The collections in the plan area note the habitat as sandy roadsides, valley floors, sand sage prairie. The occurrences in the plan area are associated with Western Great Plains Shortgrass Prairie (Milchunas et al. 2020). Hazlett (2004) lists Havard's three-awn as being associated with the "Planted" habitat category, something that is not apparent from NAIP aerial imagery of the collections nor the descriptions of the habitat from the various collections in the plan area.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No known threats to populations from the consulted sources.

Habitat

Threats to habitat are those common to the shortgrass prairie including heavy continuous livestock grazing, military training, invasive non-native species, altered fire regime (fire suppression), conversion to agriculture, fragmentation from roads and development, and more recently gas and oil exploration and extraction stress the shortgrass prairie ecosystem.

Moderately vulnerable to negative impacts under projected climatic conditions. Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No specific ecological conditions noted aside from general association with sandy areas.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Dry open sandy areas are widely dispersed across the plan area.

Critical biological characteristics

Havard's three-awn is a cespitose (mat forming, clumped) perennial grass (Flora of North America 1993).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown, aside from the factors that structure the shortgrass prairie.

Maps of Species Range

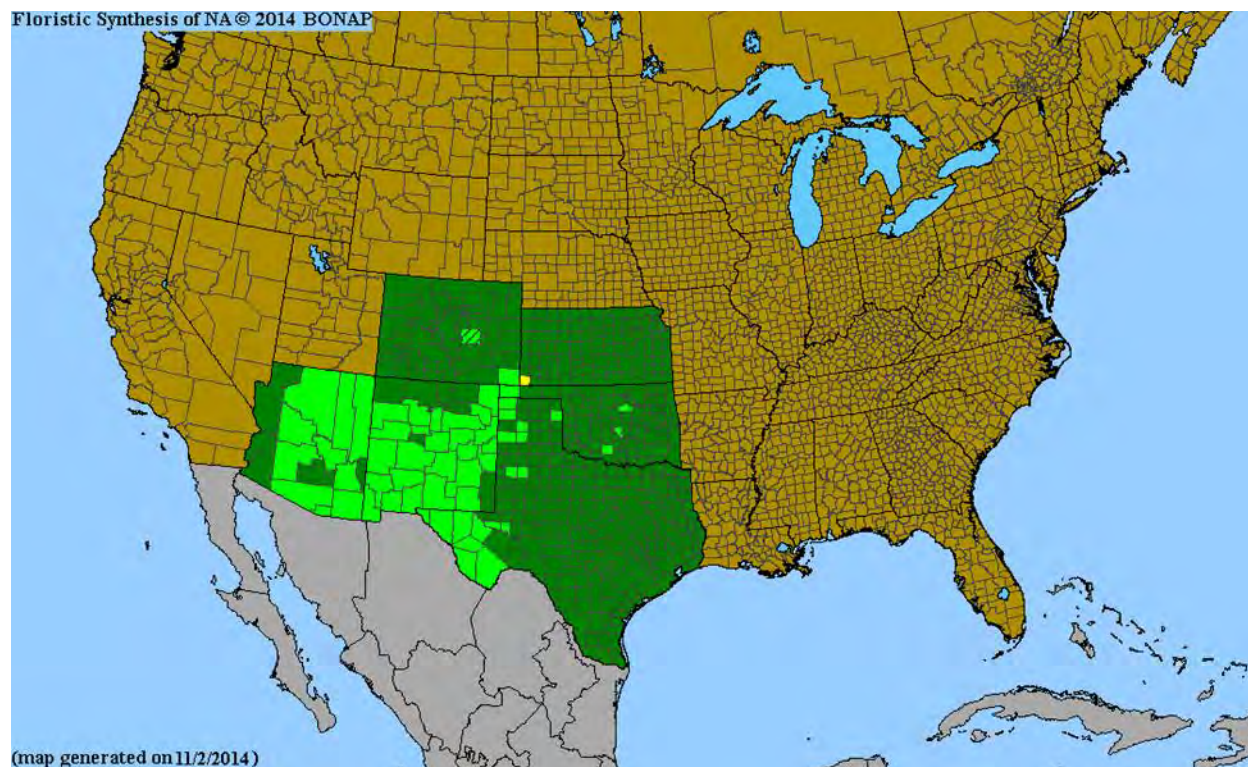


Figure 81. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Hoary broomspurge

(*Euphorbia lata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are 27 occurrence records on the Cimarron and Comanche National Grasslands from 1929 through 2022 (Van Scoyoc 2024). Some of these records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: species can use varied habitat types; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are 27 occurrence records. Population numbers in the plan area are unknown.
 - b. Ecological conditions: uses varied habitats (rocky, exposed limestone/shale barrens, roadside habitat shortgrass prairie, sandsage prairie, etc.).

Species Status

G5; SNR in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Chamaesyce lata* as valid (NRCS 2025); *Euphorbia lata* is a taxonomic synonym recognized as valid by NatureServe (NatureServe 2025). Another common name is hoary sandmat (NRCS 2025) or broad-leaved spurge (Hazlett 2004). SEINet states: "This species belongs to the *Chamaesyce* subgenus of *Euphorbia*. Some treatments, even recent ones, continue to treat *Chamaesyce* as separate genus even though molecular evidence places it within *Euphorbia*," (SEINet 2024). NatureServe uses *Euphorbia lata*, noting that "The Flora of North America (vol. 12 2016) transfers *Chamaesyce lata* to *Euphorbia lata*; these represent the same concept for the element," (NatureServe 2025).

Species range

Overall Species range:

Hoary broomspurge is distributed in Colorado, Kansas, New Mexico, Oklahoma, and Texas, and south to northwest Mexico (SEINet 2024) (Figure 82, Figure 83).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure 82, Figure 83).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. An occurrence record from 1997 states the species is "occasional on rimrock edges" of the Shale Hills of the Comanche National Grassland. An occurrence record from 1995 states the species is "frequent" in a shale outwash area on the Comanche National Grassland near David Canyon Road. Another from 2021 in arid bluffs in the Timpas Unit characterizes the species as "Estimated Frequency within viewshed: Occasional (6-10)." It is not considered rare in any counties that overlap the plan area (Figure 83).

Habitat

Hoary broomspurge is found on mountain slopes, in canyons, basins, rocky prairies, roadsides, and disturbed sites, at elevations from 2,000-7,500 ft (NatureServe 2025, SEINet 2024). Within the plan area, it is predominantly associated with rocky, exposed limestone/shale barrens (Hazlett 2004) but has also been observed in other habitats including juniper woodland, midgrass prairie, roadside habitat, pinyon-juniper woodland, shortgrass prairie, and sandsage prairie (Kuhn et al. 2011). It has been documented in the Timpas Unit of the Comanche and in the Cimarron, but not in the Carrizo Unit of the Comanche (Van Scoyoc 2024).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Hazlett 2004, Kuhn et al. 2011, NatureServe 2025, SEINet 2024).

Habitat

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

This species can use varied habitat types, including juniper woodland, midgrass prairie, roadside habitat, pinyon-juniper woodland, shortgrass prairie, and sandsage prairie (Kuhn et al. 2011). It prefers calcareous soils but can also occur in igneous-derived, sandy or rocky soils (Hazlett 2004, SEINet 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Given this species' use of varied, sandy habitat types, including shortgrass prairie and roadsides (Hazlett 2004, Kuhn et al. 2011), its ecological condition requirements are not considered restricted in the plan area. Although this species prefers calcareous soils such as limestone, it can also grow in other soil types (Hazlett 2004, SEINet 2024).

Critical biological characteristics

Hoary sandmat is a perennial herb that flowers from April through September (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found for this species.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found for this species.

Maps of Species Range

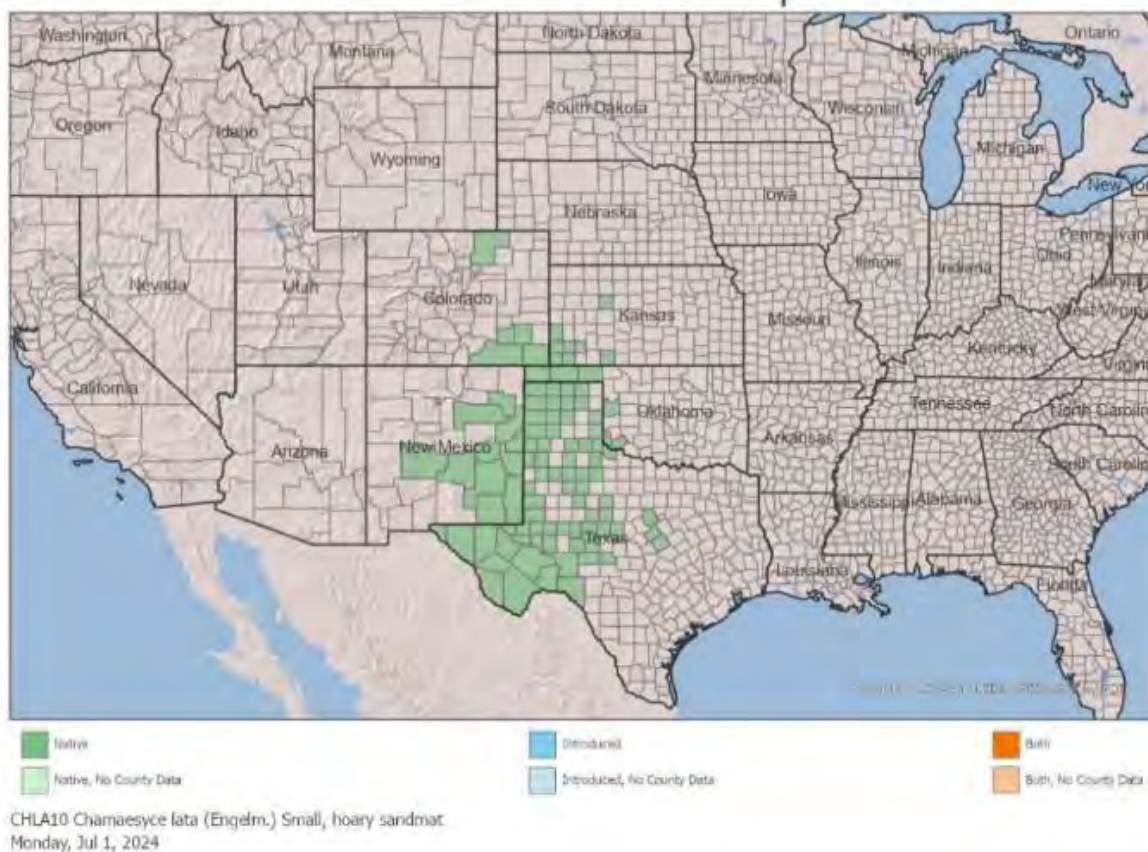


Figure 82. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

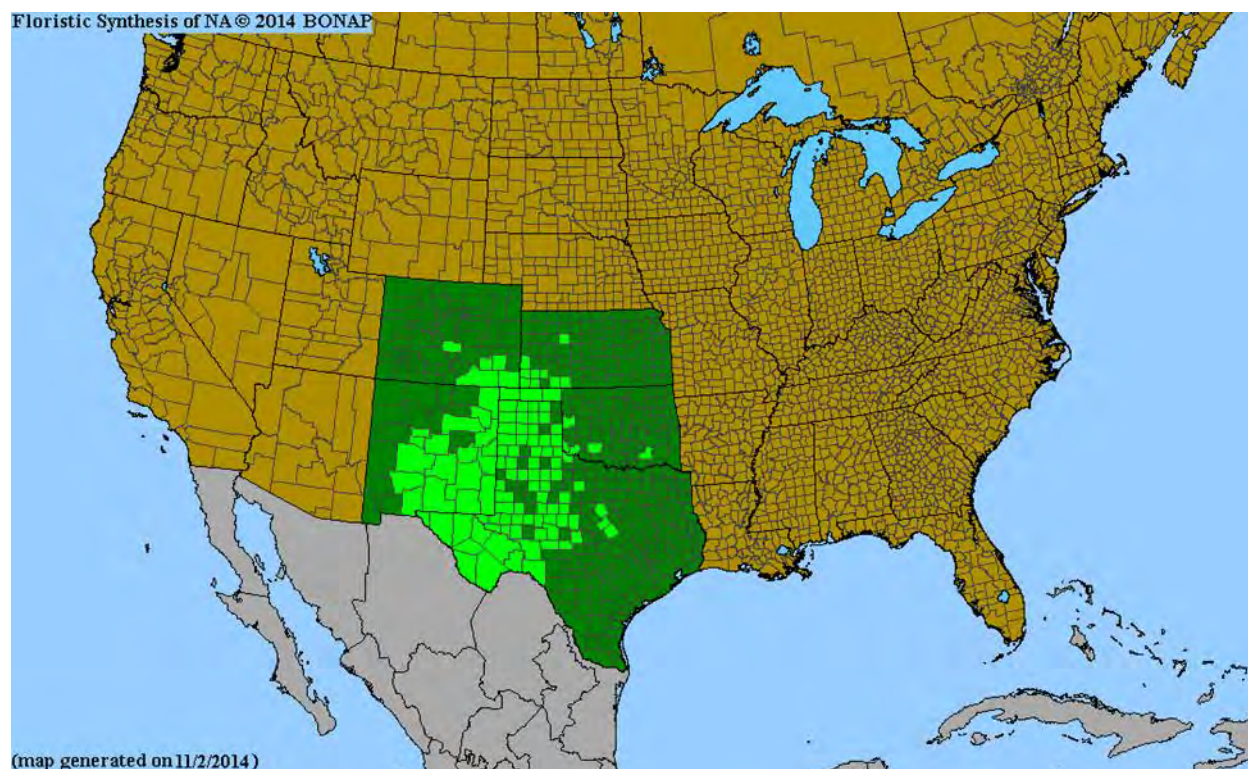


Figure 83. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Hoary fleabane

(*Erigeron canus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has three occurrence records in the Comanche National Grasslands portion of the plan area, spanning 1936-1997 (Van Scoyoc 2024). Although some of these points have high uncertainty (1000 – 2400 m), Hazlett (2004) characterizes it as a species that is known to occur in the Comanche National Grassland. Hazlett is also the collector of two of the records. Therefore, the species is known to occur in the plan area.

Year of Last Known Occurrence: 1997

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats
 - b. Habitat: no known threats
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: Rock outcrop habitat in the plan area appears stable.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are three occurrence records in the plan area. Population numbers in the plan area are unknown.
 - b. Ecological conditions: rocky exposed limestone/shale barrens are not restricted in the plan area.

Species Status

G4; SNR in Colorado; S1 in Kansas.

Taxonomy

USDA NRCS recognizes *Erigeron canus* as valid (NRCS 2025). Another common name is hoary daisy fleabane (Hazlett 2004).

Species range

Overall Species range:

Hoary fleabane is distributed across Arizona, Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Utah, Wyoming, and Mexico (SEINet 2024).

Description of how the population in the plan area fits within the overall range:

The plan area is at the eastern edge of the species range (Figure 84).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. Occurrence records give no indication of the number of individuals, but the species is restricted to two occurrence records in ~15 acres within the plan area. Hoary fleabane is not considered rare in Las Animas County (Figure 84).

Habitat

Across its range, hoary fleabane occurs in dry hills, grasslands, often in gravelly or shaley soil, sagebrush, pinyon-juniper, pine-oak, oak at elevations from 5500 – 8800 ft (1700 –2700 m) (SEINet 2024).

Within the plan area, hoary fleabane has been documented in a caliche outcropping and in limestone breaks at the northern edge of the Carrizo Unit of the Comanche National Grassland (Van Scoyoc 2024). One record from 1997 notes the species co-occurs with Colorado fraseria (*Frasera coloradensis*). Aerial imagery shows no evidence of habitat disturbance in the vicinity of these records. The species also uses rock outcrops that are generally stable features on the landscape.

An additional record from 1936 from the southern edge of the Timpas Unit of the Comanche at Cedar Mesas, but there is considerable locational uncertainty associated with this record (Van Scoyoc 2024).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (SEINet 2024, NatureServe 2025, NPIN 2025, Hazlett 2004).

Habitat

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Hazlett (2004) characterizes the species' habitat as rocky exposed limestone/shale barrens.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species requires rocky exposed limestone/shale barrens (Hazlett 2004).

Critical biological characteristics

Hoary fleabane is a perennial daisy in the Aster family (Asteraceae) that flowers May-July (SEINet 2024). It has a taproot, and its fruit is a cypsela (NPIN 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found for this species (SEINet 2024, NatureServe 2025, NPIN 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found for this species (SEINet 2024, NatureServe 2025, NPIN 2025).

Maps of Species Range

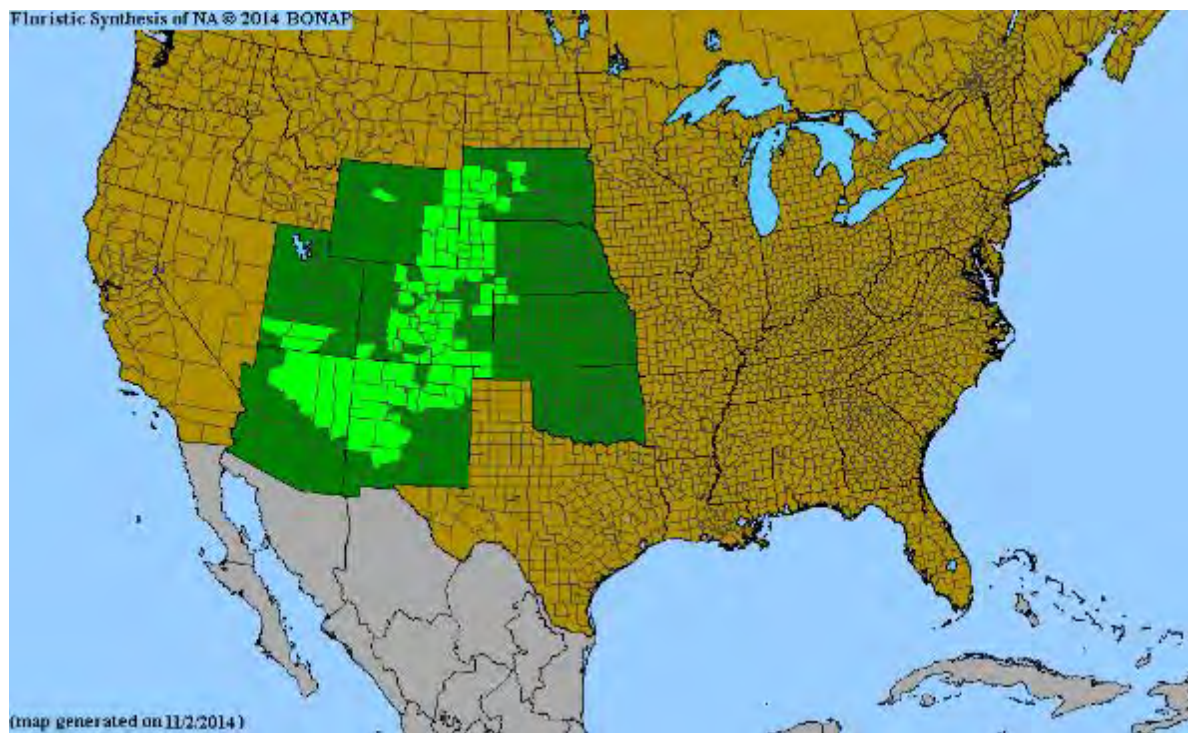


Figure 84. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Hoary tansy-aster

(*Dieteria canescens* var. *glabra*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are three documented occurrence records from 1972 to 1996 on the Cimarron National Grassland (NG) in Morton County, Kansas (Van Scoyoc 2024). The herbarium specimen records list the collections within the Cimarron National Grassland in the “West Artesian Pasture”, a prairie roadside right of way, and on the road shoulder and bar ditch sides of KS 27.

Year of Last Known Occurrence: 1996

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Unknown, but likely synonymous with threats to habitat.
 - b. Habitat: Disturbance by oil and gas drilling, altered native vegetation, livestock farming and ranching, recreational activities, and fire suppression.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends are unknown.
 - b. Habitat: Sandsage habitat is generally declining in quality in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are three occurrence records in the plan area. Little information is available on population sizes due to the limited collections. Consecutive collections in 1972 and 1973 in the same location indicate past persistence in the plan area.
 - b. Ecological conditions: No sources consulted identified restricted ecological requirements needed for this species except the general habitat needs of shortgrass prairie.

Species Status

T4; SNR in Colorado; S1 in Kansas.

Taxonomy

Dieteria canescens (Pursh) Nutt. is accepted as valid (Ackerfield 2022, Weber et al. 2012). The variety listed on the herbarium collections in the plan area, *D. canescens* var. *glabra*, is accepted as valid (Flora of North America 1993, ITIS 2024), and (NatureServe 2025). There are ten varieties of *D. canescens* listed in NatureServe (NatureServe 2025). USDA NRCS recognizes this species as *Machaeranthera canescens*, a name that is listed as a synonym by other sources (NRCS 2025). Other synonyms include *Aster canescens* var. *viridis* and *M. linearis* (Flora of North America 1993).

Species range

Overall Species range

In North America, hoary tansy-aster (*D. canescens*) occurs in nearly all western states where it is either secure, apparently secure, or has no status rank (NatureServe 2025). The species also occurs in three Canadian provinces. The variety of hoary tansy-aster listed in the plan area (*D. canescens* var. *glabra*) occurs in six states including Arizona, Colorado, Kansas, New Mexico, Texas, and Wyoming (NatureServe 2025). The species appears to be widespread throughout its range with the exception of Kansas where it occurs only in eastern Kansas and is listed as critically imperiled by NatureServe (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are at the eastern edge of the species range (Figure 85, Figure 86).

Distribution, abundance, and trend in the plan area

Population

There are three documented occurrence records on the Cimmaron NG in Morton County. Population trend in the plan area is unknown. The three herbarium collection notes indicate plants are “common”, “few”, and “a dozen or more”, respectively (SEINet 2024). Hazlett (2004) and Kuhn (2011) did not include information on this species in the floristic inventory. This species may be likely to be under collected and more common than records indicate.

Habitat

Gucker (2018) indicate the species habitat is common and broadly distributed throughout western North America, ranging from southern British Columbia, south to Baja California and east to North Dakota, Texas, and Chihuahua Mexico. Flora of North America (1993) describes the habitat as grasslands, creosote bush scrublands, pinyon-juniper woodlands, and pine forests.

In Colorado, habitat includes roadsides and meadows from 4400 to 12000 feet (Ackerfield 2022).

The herbarium records list the habitat as: 1) loose, sandy soils; 2) prairie roadside right of way, loose sandy soil; and 3) sand dunes and sandy prairie (SEINet 2024). The occurrences are spatially mapped within the sandsage ecosystem habitat of the Western Great Plains Shortgrass Prairie (Milchunas et al. 2020). Sandsage habitat is generally declining in both quality and quantity in Kansas (Rohweder 2022). Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Potential threats to this species are thought to be synonymous with threats to the habitat including oil and gas development and fire suppression. The spatial locations of the observations are in close proximity to active oil and gas well development sites.

Habitat

Threats common in the sandsage habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Hoary tansy-aster grows in disturbed areas, such as roadsides and grazed pastures, and is identified as an early colonizer. Weber (2012) state the species is an “abundant roadside weed with many poorly defined local races, subject to being moved around through road construction.” Sources also indicate that hoary tansy-aster appears soon after fire, as well as heavy use by elk and pronghorn, and is able to withstand heavy grazing pressure with no significant difference in vegetative cover between ungrazed and highly grazed pastures (Gucker and Shaw 2018).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are three documented occurrences on the Cimarron NG, however consulted sources did not identify information about the distribution, connectivity, status, and trend of ecological conditions in the plan area. This species appears to be a generalist and is likely able to persist in many different habitat types within the plan area.

Critical biological characteristics

The life cycle of hoary tansy-aster can be annual, biennial, or short-lived perennial depending on the growing conditions (Flora of North America 1993). The species is in the Aster family (Asteraceae) and flowers from July through October in Colorado (Ackerfield 2022).

Differences between the various varieties appear to be phenological and Gucker (2018) suggest that integration amongst them is common where the distribution of hoary tansy-aster varieties overlap.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Plants in the Asteraceae family are generally attractive to bees, butterflies, and birds. Hoary tansy-aster flowers attract a diversity of native insects that are important during various life stages of greater sage grouse and other birds (Gucker and Shaw 2018). Plants are grazed on by elk and pronghorn, small mammals, and livestock.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Sources largely did not indicate influences of structure and function on this species. It is worth noting that hoary tansy-aster does not seem to be directly affected by livestock grazing and may prefer disturbed areas.

Maps of Species Range

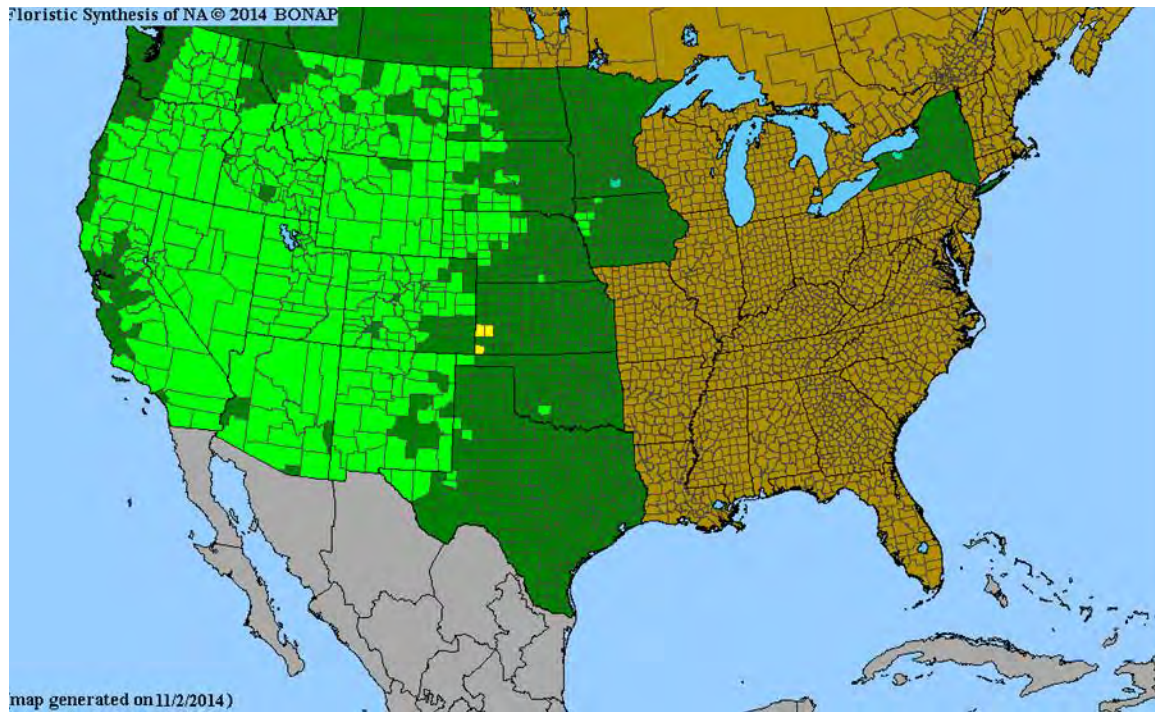
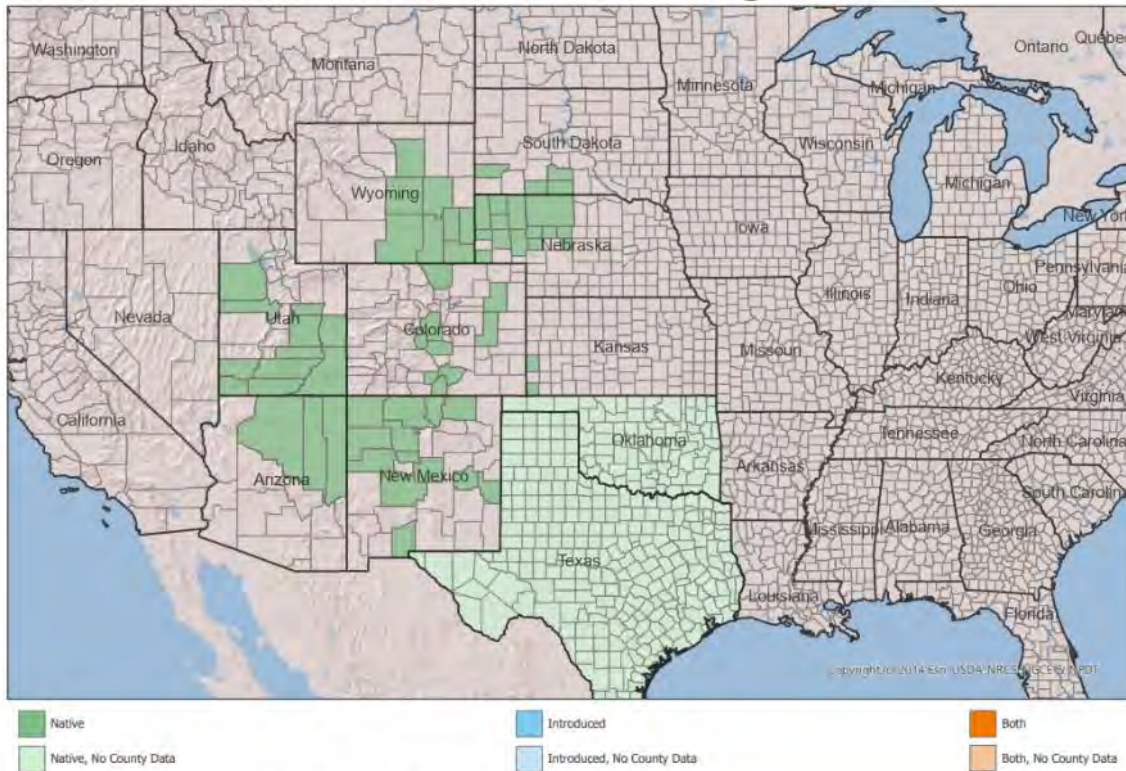


Figure 85. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Dieteria canescens var. glabra



MACAG Machaeranthera canescens (Pursh) A. Gray ssp. glabra (A. Gray) B.L. Turner, hoary tansyaster
Wednesday, Jul 31, 2024

Figure 86. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Holzinger's Venus' looking-glass (*Triodanis holzingeri*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: One documented occurrence on the Comanche National Grassland in 1947 (Van Scoyoc 2024). The occurrence record lists the habitat as a rocky slope along Sand Creek Canyon 25 miles S of Pritchett however the record contains no uncertainty or precision data. No other consulted databases (CNHP, iDigBio, KNHP) contain occurrence records. Due to the limited observation with insufficient spatial precision, the species is not currently known to occur in the plan area and is not analyzed further.

Year of Last Known Occurrence: N/A

Species Status

G4; S1 in Colorado; S3 in Kansas.

Taxonomy

Triodanis holzingeri McVaugh is accepted as valid (Ackerfield 2022, NRCS 2025). Synonyms include *Specularia holzingeri* (NRCS 2025).

Maps of Species Range

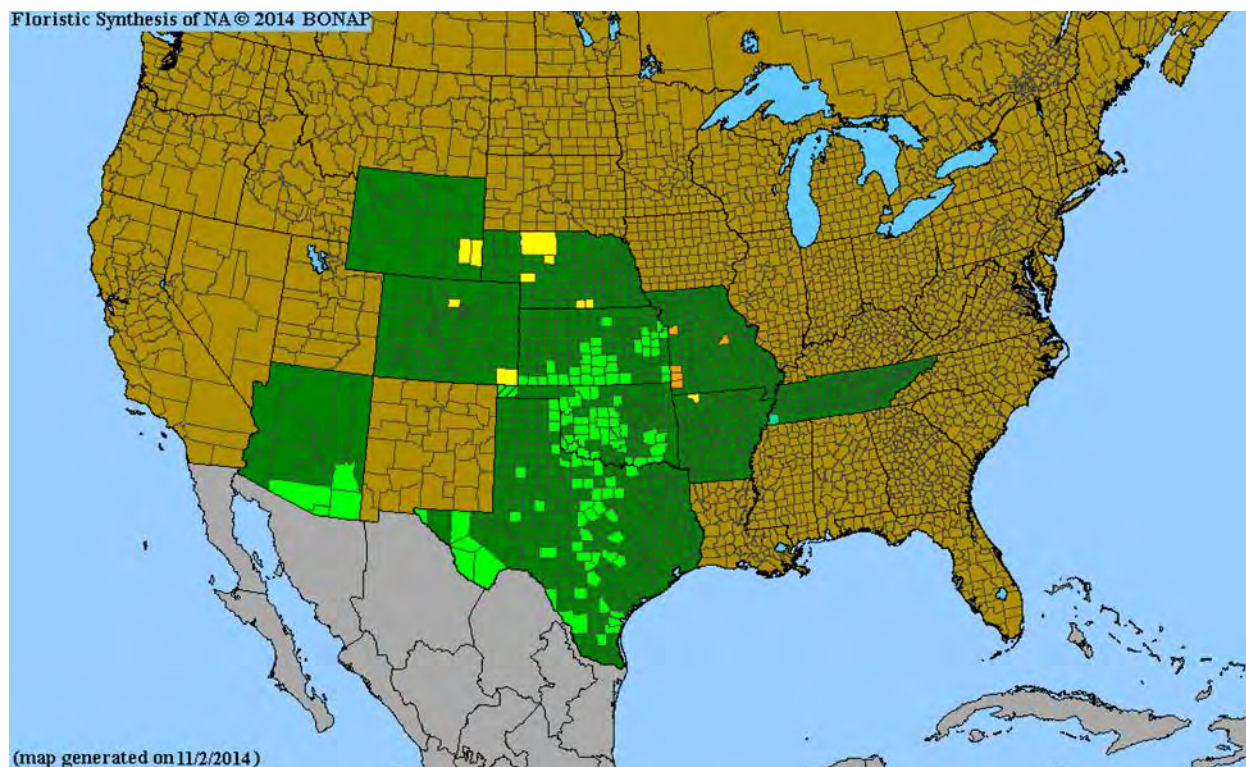


Figure 87. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Honey mesquite

(Prosopis glandulosa var. *glandulosa*; *Prosopis glandulosa*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: The Kansas Natural Heritage Program (KNHP) has one occurrence polygon 1978; this occurrence polygon partially overlaps the plan area, but the locality description characterizes it as "Cimarron National Grassland site" (Van Scoyoc 2024). Therefore, the variety is known to occur in the plan area. Colorado NHP also has one species occurrence record from 1997 to 2002 for the parent species (*Prosopis glandulosa*) (Van Scoyoc 2024).

Year of Last Known Occurrence: 1978 and 2002, respectively.

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Warming temperatures and drier conditions are impacting riparian areas that this species may reside in, but the species is adapted to dry, sandy soils.
 - b. Habitat: Drought, and those stressed conditions exacerbating encroachment of non-native invasives (e.g., tamarisk). Sandsage prairie is threatened by grazing, fire suppression resulting in woody encroachment, and energy development.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Not known at this time.
 - b. Habitat: Riparian areas are declining in the plan area, but sandy, dry soils are stable. Sandsage prairie community is declining.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Species is at the northern edge of its range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Numbers are unknown; 2 known occurrences.
 - b. Ecological conditions: Riparian areas are restricted in the plan area, but this species is adapted to riparian systems of the Mojave and Sonoran deserts, which contain very sandy, dry soils, which are also readily available in the plan area.

Species Status

Parent status: G5; S1 in Colorado; SNR in Kansas.

Variety Status: SNR; SNR in Colorado; S2 in Kansas.

Taxonomy

The currently accepted valid name for this species is *Prosopis glandulosa* var. *glandulosa* (NRCS 2025). Known synonyms include *Prosopis juliflora* auct. non (Sw.) DC.; *Prosopis chilensis* var. *glandulosa* (Torr.) Standl., and *Prosopis juliflora* var. *glandulosa* (Torr.) Cockerell (ITIS 2024). The only common name is honey mesquite.

Any species that has a subtaxa must automatically have at least 2 subtaxa - the parent ssp or var and then the one (or more) that departs from the parent. In this case, *Prosopis glandulosa* has 3 subspecies - the parent taxa is *P. glandulosa* ssp *glandulosa* since there are the other 2 subspecies. Colorado only has the parent taxa in the state and have not provided different information for the subspecies, whereas Kansas refers to this species by the subspecies name: *Prosopis glandulosa* ssp. *glandulosa*.

Species range

Overall Species range

The overall range includes Colorado, Kansas, Louisiana, New Mexico, Oklahoma and Texas (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The population in the Plan Area is on the northern edge of the expected range for the species and based on herbarium data from the University of Kansas (UK) Ronald L. McGregor Herbarium, are just outside of the Plan Area (Van Scoyoc 2024). These two occurrence records are catalog #7844 and #7850 in the UK herbarium.

Distribution, abundance, and trend in the plan area

Population

According to SEINet occurrence data, there are records of the species just outside of the Plan Area at the far NE corner of the Plan Area in Kansas (Van Scoyoc 2024). These two occurrences appear disjunct from any other populations. The Kansas Natural Heritage Program (KNHP) has one occurrence polygon 1978; this occurrence polygon partially overlaps the plan area, but the locality description characterizes it as “Cimarron National Grassland site” (Van Scoyoc 2024). Colorado Natural Heritage Program (CNHP) also has one species occurrence record from 1997 to 2002 for the parent species (*Prosopis glandulosa*) (CNHP 2024, Van Scoyoc 2024).

In general, this species’ geographic range has probably not changed much in the past 300 – 500 years; however, the abundance of the species within this range has increased (Steinberg 2001). Some researchers state that range fires were very important in controlling honey mesquite before the introduction of cattle, while others believe that honey mesquite was rare on grasslands because of limited seed dispersal (Steinberg 2001).

Habitat

Honey mesquite communities are primarily found in drainages in the Mojave and Sonoran deserts, which do not occur in the Plan Area (Steinberg 2001). In riparian habitats, honey mesquite often occurs either in pure stands or mixed with other species (Steinberg 2001).

Brief habitat descriptions were provided with the two herbarium records from UK (Van Scoyoc 2024). Catalog #7850 was collected in 1978, and the habitat was described as several small bushes scattered along a low ridge just north of the Cimarron River in sandy soil. Catalog #7844 was collected in 1972, and the habitat was described as a prairie roadside along the Cimarron River in sandy soil, with an additional note that this is rare.

The sandsage prairie community type is found in association with dune fields and other areas of sandy habitat throughout a large area of the western Great Plains, from South Dakota and Wyoming south into Texas and New Mexico (Hulett et al. 1988). It is the second-most widespread vegetation type in the plan area and the most abundant type for the Cimarron National Grassland (USFS 2005a). In Kansas, the sandsage prairie habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of the historic sandsage habitat has been lost or converted for agricultural uses (CPW 2015). The remaining tracts have good landscape connectivity, but the species composition is highly altered (CPW 2015).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Loss of appropriate ecological conditions to support the species.

Habitat

Warming temperatures and drought are impacting riparian ecosystems, which is where this species is known to occur within its range outside of the plan area. These stressed conditions also create an environment that is more susceptible to non-native invasive species, such as tamarisk, encroaching and outcompeting the native vegetation.

For sandsage prairie at a broad scale, the primary threats to sandsage prairie are loss and fragmentation of habitat and degradation of ecological integrity (e.g., conversion to agriculture, expanding exurban development, construction of roads, energy development, encroachment of woody plants, and targeted eradication of sandsage with herbicide) (Locklear 2021, CPW 2015, Rohweder 2022). Weather, fire, and grazing constitute the most important processes impacting this system, and these processes are also interactive (Locklear 2019). While sandsage prairie is fairly resilient to the effects of drought in the Great Plains, there are biological limits to the ability of this vegetation to tolerate prolonged episodes of severe drought and may be at the limits of its drought tolerance in southeastern Colorado (Rondeau et al. 2018, Locklear 2019).

At the unit level, grazing occurs over most of the plan area across both states. Long-term continuous grazing of domestic livestock has considerably altered these shrubland habitats from their pre-settlement condition (CPW 2015, Rohweder 2022). Generally, domestic livestock grazing tends to favor the increase of sandsage over associated native grasses therefore decreasing herbaceous cover (CPW 2015). Fire is an important disturbance process for sandsage prairie, and fire suppression has caused encroachment of woody species such as eastern redcedar (Locklear 2019) and less mosaiced successional conditions (USFS 2008). Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimarron National Grassland.

While habitat loss and deleterious management practices are recognized as threats to sandsage prairie vegetation, the significance of these losses to the larger Great Plains ecoregion has not been examined (Locklear 2019).

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Species has adapted to most soil types, and this species' root system is well adapted to dry climates receiving less than 6 inches of precipitation annually (Steinberg 2001).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species is found in drainages and riparian areas, which are restricted and limited in their distribution in the plan area. Warming climate trends will continue to influence the availability of these ecological conditions; however, this species is adapted to dry, sandy soils which are readily available throughout the plan area although the sandhills prairie vegetation community is showing a declining trend.

Critical biological characteristics

No critical biological characteristics known at this time.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The fruit of honey mesquite is valuable forage for livestock and wildlife. Cattle, horses, domestic sheep and goats, mules, and burros eat large quantities of the ripe fruit during summer and fall (Steinberg 2001). Livestock often remove the fruit as high on the tree as they can reach and eat fallen pods from the ground (Steinberg 2001). Though seeds are high in protein little is digested and many pass-through livestock digestive tracts intact and viable (Steinberg 2001). Livestock do not consume the foliage to any great extent (Steinberg 2001). Foliage consumption is high only during drought years, especially in the early spring when other forage is sparse (Steinberg 2001). Most livestock consume mesquite (*Prosopis* spp.) flowers when available (Steinberg 2001). In some areas of Mexico, mesquite beans are collected, ground, and fed to cattle (Steinberg 2001).

The fruit crop of honey mesquite is quite predictable, annually providing an abundant and nutritious food source for numerous wildlife species upon ripening in July and August (Steinberg 2001). Honey mesquite seeds form an important part of the diet of mice, kangaroo rats, woodrats, chipmunks, ground squirrels, rock squirrels, cottontail, skunks, quail, doves, ravens, the black-tailed prairie dog, black-tailed jackrabbit, porcupine, raccoon, coyote, collared peccary, white-tailed deer, mule deer, wild turkey, and mallard (Steinberg 2001). Many species of small rodents derive a large portion of their diet from mesquite seeds (Steinberg 2001).

Mesquite browse is generally not a very important wildlife food source (Steinberg 2001). Wild turkeys, round-tailed ground squirrels, cottontails, and woodrats consume some leaves (Steinberg 2001). Jackrabbits consume large amounts of honey mesquite (Steinberg 2001). In southwestern Texas, honey mesquite (primarily leaves) comprised 11% and 19.9% of black-tailed jackrabbit diet during winter and spring (Steinberg 2001).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Where mesquite has dominated former grasslands, it was probably originally present but stunted by repeated fire (Steinberg 2001). Fire effects research supports this theory, demonstrating that honey mesquite is very fire tolerant when only 3 years old (Steinberg 2001). Plants may be top-killed by fire, but most resprout (Steinberg 2001). Thus prior to grazing by livestock, repeated grassland fires probably only killed mesquite seedlings and a few other individuals but kept most plants low in stature and prevented many from producing seed (Steinberg 2001).

Maps of Species Range

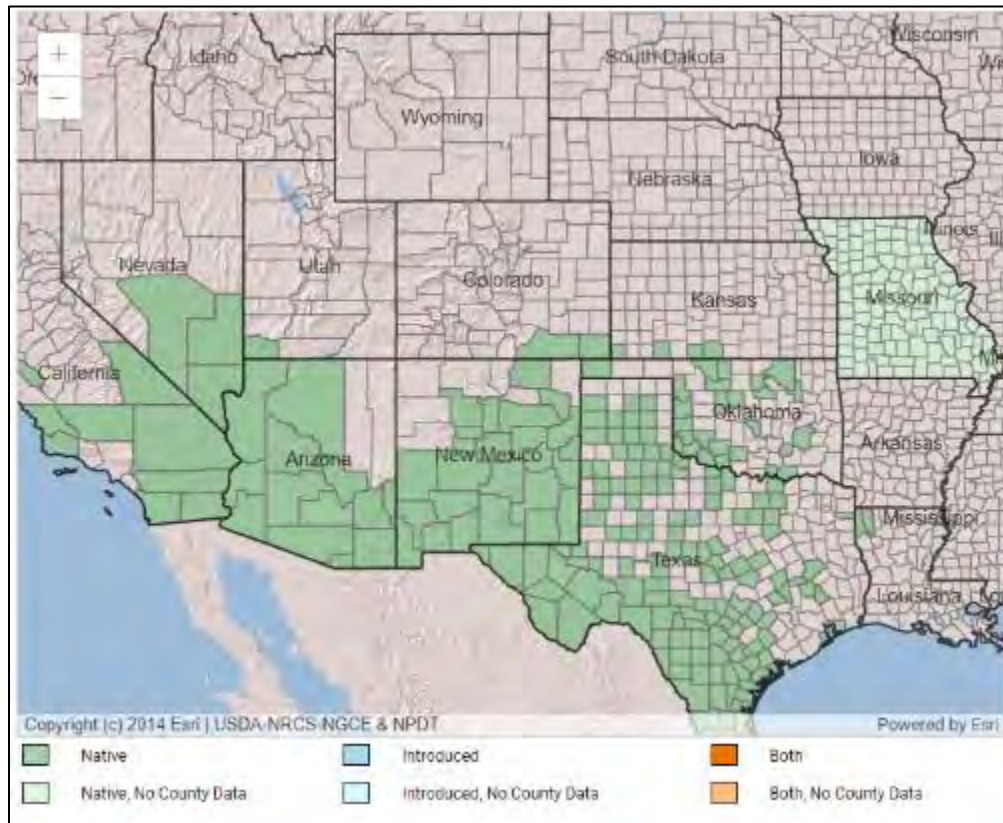


Figure 88. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Howard's evening-primrose

(*Oenothera howardii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one occurrence record in the plan area on the Comanche National Grassland (Van Scoyoc 2024).

Year of Last Known Occurrence: 2008

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025).

Habitat: Species uses varied habitat including shortgrass prairie, cliffs and outcrops. Common threats on and/or off the plan area can include; housing and urban areas, livestock farming and ranching, recreation, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, habitat shifting and alteration, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022). See the Threats and Trends Appendix.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend for this species in the plan area is unknown.
 - b. Habitat: Species uses varied habitats, no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the eastern edge of the species' range (Figure 89, Figure 90).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known. There was one spatial occurrence record within the plan area.

Ecological conditions: No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025, Flora of North America 1993). The species likes full sun has very low water requirements and the soil type is loam rocky, sandy which is not restricted in the plan area.

Species Status

G3; S3 in Colorado; S1 in Kansas.

Taxonomy

Oenothera howardii is accepted as valid (ITIS 2024, Ackerfield 2022, Flora of North America 1993, NRCS 2025, NatureServe 2025). Synonym for this species is *Lavauxia howardii* (NRCS 2025, ITIS 2024).

Species range

Overall Species range

Howard's Evening-primrose occurs in Colorado, Kansas, Nevada, Utah, and Wyoming. Range is limited, the extent is Hamilton, County (KS), four counties in CO, also in UT (widespread) and WY (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is at the eastern edge of the species' range (Figure 89, Figure 90).

Distribution, abundance, and trend in the plan area

Population

There is one spatial occurrence record that occurs in Otero County at Sierra Vista Scenic Overlook in the Timpas Unit within the Shortgrass Prairie ecosystem (USFS 2005a). The occurrence record is approximately 400 ft from this recreation site which is on the edge of the planning area. Hazlett (2004) does include this species in his report. Kuhn (2011) found this species in Otero County in a floristic inventory of the Cimarron and Comanche National Grasslands.

Population trend for this species in the plan area is unknown.

Habitat

Howard's Evening-primrose is a perennial forb species found on dry hillsides, sandy soil, grasslands at 4700 – 6500 ft in elevation. Flowers May through July (Ackerfield 2022). NatureServe describes habitat dry, rocky, prairie hillsides and bluffs (NatureServe 2025). FNA describes it as open or rocky areas, in shale, fine-textured sandstones, clays, gypsum, or limestone from High Plains grasslands, open sites in pinyon-juniper woodlands, ponderosa pine-Douglas fir forests at 4900 – 7500 ft in elevation (Flora of North America 1993). Kuhn (2011) describe habitat is as rocky upland prairie.

There is one herbarium record found in in the Commanche National Grassland in Otero County at Sierra Vista scenic overlook. The habitat was described as ungrazed prairie with shale outcrops (SEINet 2024). The occurrence record is spatially mapped within the Shortgrass ecosystem (USFS 2005a) and LandFire (2024) existing vegetation type Western Great Plains Cliffs and Outcrop. The spatial occurrence record is approximately 400 ft from the Sierra Vista Recreation Site. This location is on the edge of the plan area.

Species uses varied habitats. Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025, Flora of North America 1993).

Habitat

Species uses varied habitat including shortgrass prairie, cliffs and outcrops. Common threats on and/or off the plan area can include; housing and urban areas, livestock farming and ranching, recreation, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, habitat shifting and alteration, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022).

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025, Flora of North America 1993). The species likes full sun and has very low water requirements and the soil type is loam rocky, sandy.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There is one herbarium record found in the Commanche National Grassland in Otero County at Sierra Vista scenic overlook in the Timpas Unit. The habitat was described as ungrazed prairie with shale outcrops (SEINet 2024). The occurrence record is spatially mapped within the Shortgrass ecosystem (USFS 2005a) and LandFire (2024) existing vegetation type Western Great Plains Cliffs and Outcrop.

Oenothera howardii is known from three disjunct areas: three collections on the High Plains (Baca and Otero counties, Colorado, and Hamilton County, Kansas); open yucca-juniper grassland, rocky slopes or disturbed areas on shale substrates along the Colorado counties of Boulder, Denver, Jefferson, and Larimer, and just over the state line in Wyoming; and, common to scattered, mostly on rocky slopes but also in shaded canyon sites on fine-textured red sandstones, clays, gypsum, chalky white degraded limestone or limestone in pinyon-juniper woodland to ponderosa pine-Douglas fir forest in southern Utah and eastern Nevada (Flora of North America 1993).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (Ackerfield 2022, NatureServe 2025, Flora of North America 1993).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Wildlife including Grassland Birds, Hummingbirds, Large Mammals, Pollinators/ Invertebrates, Shrubland Birds, Small Mammals, Woodland Birds use this species.

This is an important adult food host for many of our native invertebrates.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

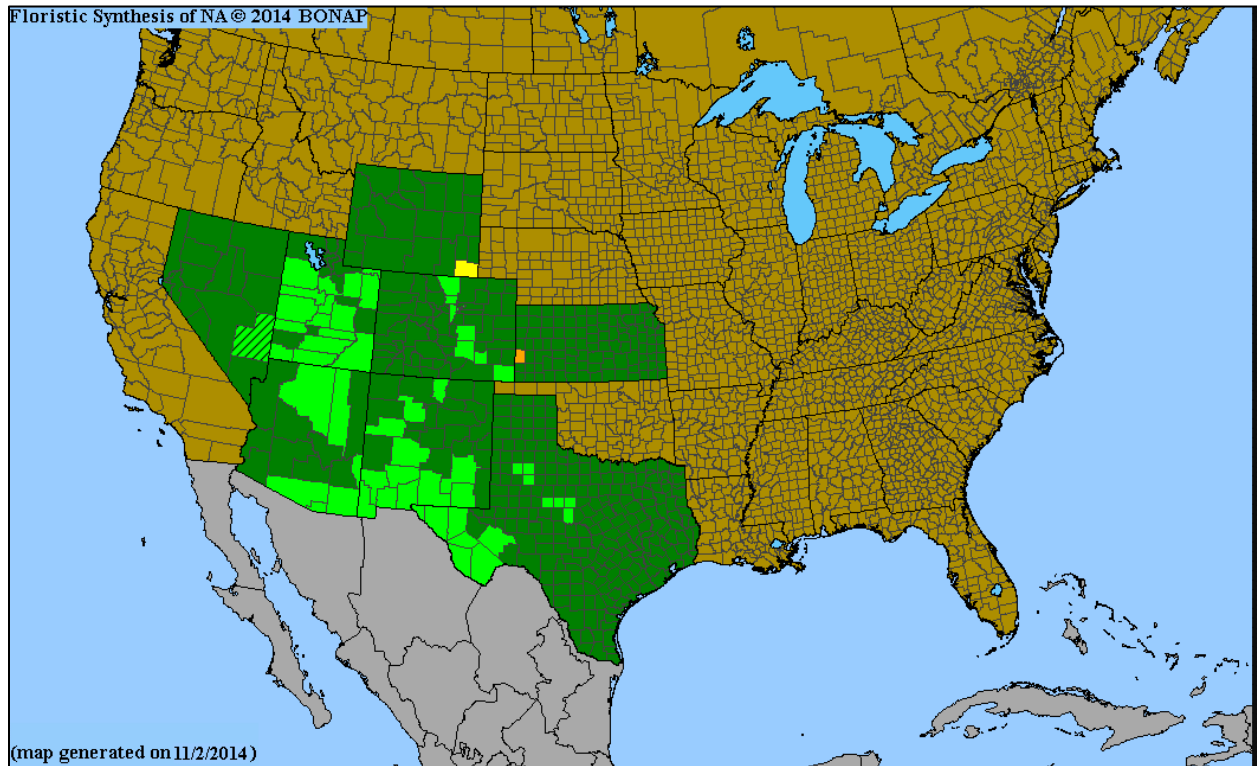


Figure 89. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

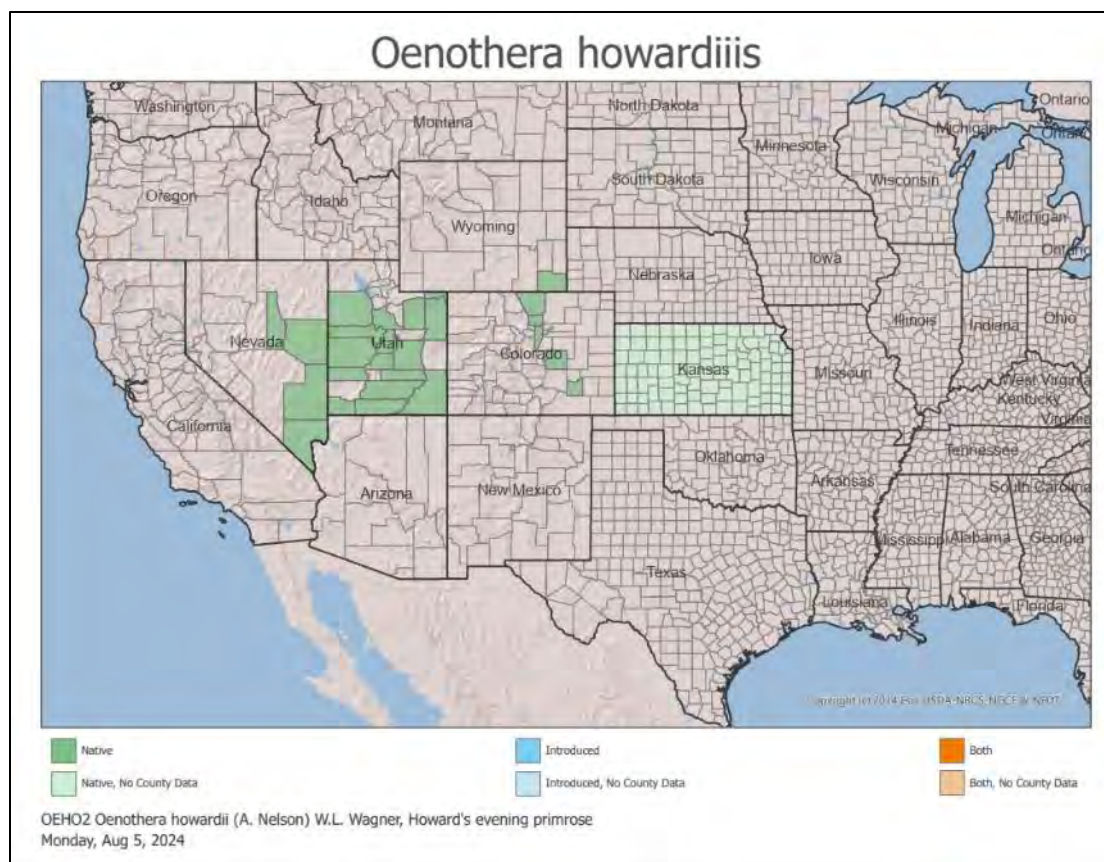


Figure 90. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Indian mountain-ricegrass (*Achnatherum hymenoides*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are 39 known occurrences in the plan area (Van Scoyoc 2024). Cimarron National Grassland (NG) (n=4) and Comanche NG (n=35) (Van Scoyoc 2024). Described as part of many of the plan communities in both NGs

Year of Last Known Occurrence: 2006

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Indian mountain-ricegrass is palatable to native wildlife and introduced ungulates.
 - b. Habitat: Moderate and High vulnerability to changing climatic conditions, other threats common to shortgrass and sand prairies.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Indian mountain-ricegrass is a colonizer and is an early/mid seral species the trend of which is not declining in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is on the southeastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Known from 39 collections in the plan area. Indian mountain-ricegrass is likely to occur in most of the ecosystem types in the plan area
 - b. Ecological conditions: dry well drained soils are very well distributed across the plan area and this species is associated with most ecosystems present in plan area, ecological conditions are not restricted

Species Status

G3; SNR in Colorado.

Taxonomy

Achnatherum hymenoides (Roem. & Schult.) Barkworth is accepted as valid (Ackerfield 2022, Flora of North America 1993, NRCS 2025, Weber et al. 2012). Synonyms include *Eriocoma cuspidata*, *Oryzopsis hymenoides*, and *Stipa hymenoides* (NRCS 2025).

Species range

Overall Species range

In North America, Indian mountain-ricegrass is known to occur in all Western States and Canadian provinces (Figure 91).

Description of how the population in the plan area fits within the overall range

The population in the plan area is on the southeastern edge of the species range (Figure 91).

Distribution, abundance, and trend in the plan area

Population

There are four records of Indian rice grass from the Cimmaron NG and two from the Comanche NG in (Van Scoyoc 2024). One collection on the Cimmaron NG notes that Indian mountain-ricegrass is rare and scattered while the others note that it grows along roads and in the prairies and another notes that the species is present on the banks of the north side of the Cimarron River for at least mile. The lack of collections on the Comanche NG is more likely to represent a lack of collecting of what is perceived as a common species than the lack of presence of the species itself.

Habitat

Indian mountain-ricegrass inhabits both the shortgrass prairie ecosystem and the sandsage ecosystem. Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Indian mountain-ricegrass is highly palatable to both domestic and wild ungulates.

Habitat

Western Great Plains Shortgrass Prairie (Landfire 2024). Threats include heavy continuous livestock grazing, military training, invasive non-native species, altered fire regime (fire suppression), conversion to agriculture, fragmentation from roads and development such as exurban and urban development, and more recently gas and oil exploration and extraction stress the shortgrass prairie ecosystem). Moderate vulnerability to negative impacts from climate stressors.

Sandsage prairie - Overgrazing, fire and trampling; High vulnerability to climate stressors.

Threats common in these habitat types (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Appears to have a broad ecological amplitude is generally described as a colonizer and grows in dry well-drained soils (NatureServe 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Dry well-drained soils are very well distributed across the CCNG plan area. The 2005 vegetation ecology report shows that early and mid-seral conditions (the kind suitable for a colonizing species like Indian mountain-ricegrass) are well represented across the habitat types of the CCNG. Kuhn (2011) lists Indian mountain-ricegrass as being associated with 7 different vegetation types. Hazlett (2004) lists Indian mountain-ricegrass as being associated with the “open steppe” which is the most common habitat on the Comanche NG.

Critical biological characteristics

Very palatable to domestic ungulates and native wildlife, used by Native Americans as a food source. Sometimes included in seed mixes.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown from the reviewed literature and sources, but the species likely provides a food source for wildlife.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Subject to the same influences as the ecosystems in which it grows and appears capable of colonizing after natural and artificial disturbances.

Maps of Species Range

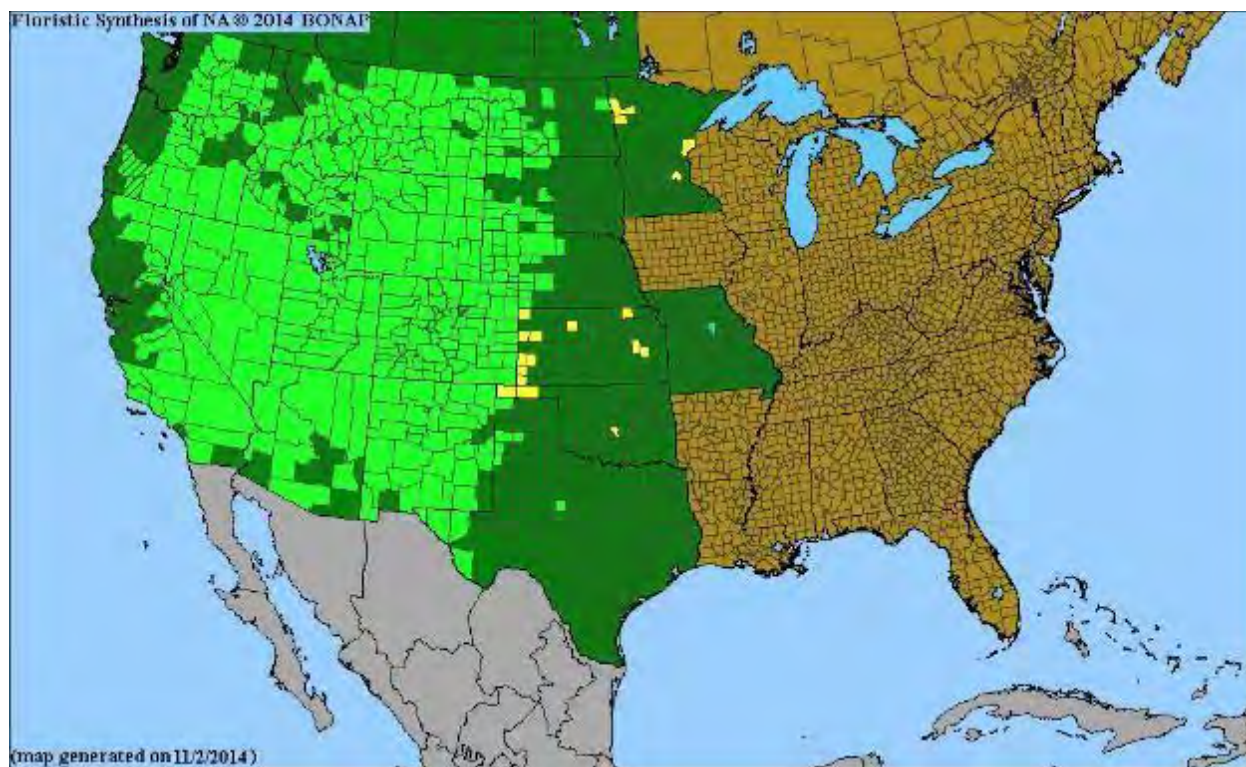


Figure 91. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Iron standing-cypress (*Ipomopsis laxiflora*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: there are ~ 20 occurrence records with varying degree of spatial precision (Van Scoyoc 2024) within the plan area.

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025, Hazlett 2004, Kuhn et al. 2011).
 - b. Habitat: Common stressors and threats for Western Great Plains Shortgrass Prairie include fragmentation, altered fire regime, overgrazing by livestock, and invasive species (in the less xeric regions). Fire suppression and certain grazing patterns such as continuous heavy grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. The short grasses that dominate this system are extremely drought- and grazing-tolerant although continuous heavy grazing and extended drought (3-4 years) will reduce cover of dominant species (NatureServe 2025).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend is unknown.
 - b. Habitat: Trends common in the shortgrass prairie habitat type (see Threats and Trends Appendix)
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the eastern edge of the species' range (Figure 92, Figure 93).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known, but occurrence records indicate there are 20 occurrence records occurrence records that occur in the Timpas, Carrizo and Cimarron Unit (only one occurrence record was within the Cimarron Unit).
 - b. Ecological conditions: Ecological conditions do not appear restricted in the plan area.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

Ipomopsis laxiflora is accepted as valid (Ackerfield 2022, NRCS 2025, ITIS 2024). Synonym for Iron standing-cypress is *Gilia laxiflora* (NRCS 2025).

Species range

Overall Species range

Iron Standing-cypress occurs in Arizona, Colorado, Kansas, New Mexico, Oklahoma, and Texas (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is at the eastern edge of the species' range (Figure 92, Figure 93).

Distribution, abundance, and trend in the plan area

Population

There are 20 occurrence records on the Timpas, Carrizo and Cimarron Unit (only one occurrence record was within the Cimarron Unit). Approximately 12 are spatially mapped within the canyonlands ecosystem and eight within the within the shortgrass prairie ecosystem (USFS 2005a).

Herbarium records are from varied locations. A few found in weedy locations, in prairies with rocky uplands, rimrock to flats along river, Pinon-juniper woodland along breaks of tributary to the Purgatorie River, rolling grasslands with stockponds

Population trend for this species in the plan area is unknown.

Habitat

Dry sandy soil of stream beds and sand hills, rocky soil (NatureServe 2025). Ackerfield (2022) describes the habitat as shortgrass prairie, sandy soil, often with sagebrush, 3600-7000 ft elevation. Hazlett (2004) describes habitat as open steppe. Kuhn (2011) has found this species within Juniper woodland, midgrass prairie, rocky upland prairie, and the shortgrass prairie vegetation types.

Herbarium records are from varied locations. A few found in weedy locations, in prairies with rocky uplands, rimrock to flats along river, Pinon-juniper woodland along breaks of tributary to the Purgatorie River, rolling grasslands with stockponds. Nineteen of the locations were spatially mapped within the Western Great Plains Shortgrass Prairie and one was within Western Great Plains Riparian Herbaceous (Landfire 2024).

Threats common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025, Hazlett 2004, Kuhn et al. 2011).

Habitat

Common stressors and threats for Western Great Plains Shortgrass Prairie include fragmentation, altered fire regime, overgrazing by livestock, and invasive species (in the less xeric regions). Fire suppression

and certain grazing patterns such as continuous heavy grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. The short grasses that dominate this system are extremely drought- and grazing-tolerant although continuous heavy grazing and extended drought (3-4 years) will reduce cover of dominant species (NatureServe 2025)

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025, Hazlett 2004, Kuhn et al. 2011).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are ~20 occurrence records that occur in the Timpas, Carrizo and Cimarron Unit (only one occurrence record was within the Cimarron Unit). Approximately 12 are spatially mapped within the canyonlands ecosystem and eight within the shortgrass prairie ecosystem (USFS 2005a). Nineteen of the locations were spatially mapped within the Western Great Plains Shortgrass Prairie and one was within Western Great Plains Riparian Herbaceous (Landfire 2024).

This species can use varied habitat types, including Juniper woodland, midgrass prairie, rocky upland prairie, and the shortgrass prairie (Kuhn et al. 2011).

There are no required ecological conditions required for this species.

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (Ackerfield 2022, NatureServe 2025, Hazlett 2004, Kuhn et al. 2011).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range and Known Occurrences in Plan Area

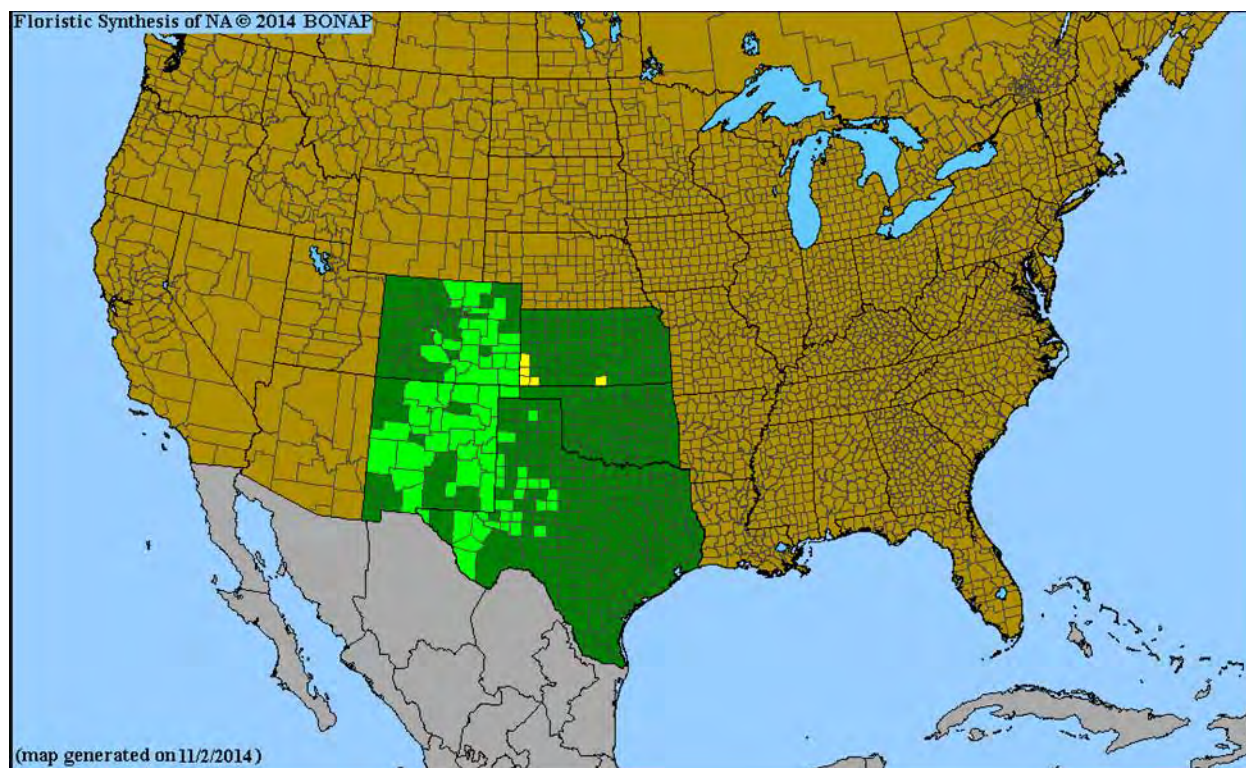


Figure 92. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

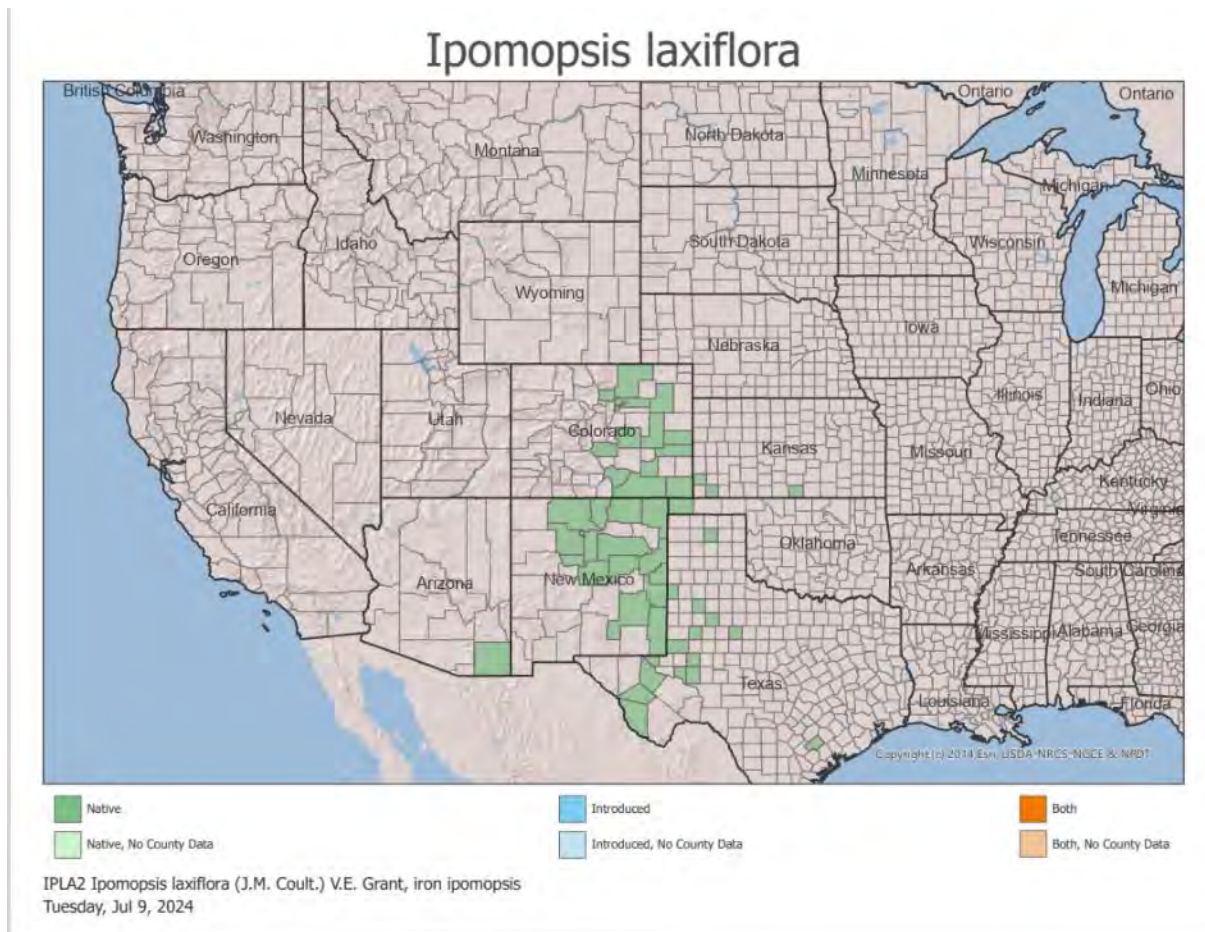


Figure 93. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

James' beardtongue

(*Penstemon jamesii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: there are 7 occurrence records in the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2018

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025, Heil and Bleakly 2006).
 - b. Habitat: Potential threats throughout its range include prescribed fire and wildfire, road building and maintenance, livestock grazing, interspecific plant species competition, and climate stressors (Heil and Bleakly 2006).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: unknown
 - b. Habitat: There was no information suggesting the habitat trend is declining. Species appears to be a habitat generalist
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the Northern edge of the species' range (Figure 94, Figure 95).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known, but occurrence records indicate there are 7 observation locations. At one point it was believed this species was extirpated from the state of Kansas (Churchill et al. 1988).
 - b. Ecological conditions: Ecological conditions do not appear restricted in the plan area.

Species Status

G4; S1 in Colorado; SH in Kansas.

Taxonomy

Penstemon jamesii is accepted as valid (NRCS 2025, Ackerfield 2022). Synonyms for this species include *Penstemon brevibarbatulus* and *Penstemon jamesii* ssp. *typicus* (NRCS 2025).

Species range

Overall Species range

James' beardtongue occurs in Colorado, Kansas, New Mexico, and Texas (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range (Figure 94, Figure 95).

Distribution, abundance, and trend in the plan area

Population

Three of the occurrence records occur in the Cimarron Unit and the others are within the Carrizo Unit of the Comanche NG. All occur within the shortgrass prairie ecosystem (USFS 2005a). At one point it was believed this species was extirpated from the state of Kansas (Churchill et al. 1988). Hazlett (2004) does not recognize this species being present in the plan area.

Population trend for this species in the plan area is unknown.

Habitat

James' beardtongue is a perennial forb that occurs in a range of habitats and appears to be a generalist. It grows primarily in grasslands and shrubby grasslands, on generally flat to hilly terrain; it is not typically found on steep or rocky slopes (Heil and Bleakly 2006, Ackerfield 2022).

There is no recognizable correlation of plant occurrence with any single soil type or geological formation; this species may be found on loamy, rocky, sandy, or calcareous soils (Heil and Bleakly 2006).

The majority of the occurrence records were located within Western Great Plains Shortgrass Prairie (Landfire 2024). Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025, Heil and Bleakly 2006). No specific information was identified limiting population growth (Heil and Bleakly 2006).

Habitat

Potential threats throughout its range include prescribed fire and wildfire, road building and maintenance, livestock grazing, interspecific plant species competition, and climate stressors (Heil and Bleakly 2006).

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025). This species occurs across a broad range of habitats, elevations, and soil types. No specific information was identified limiting population growth (Heil and Bleakly 2006).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Majority of the occurrence records were located within Western Great Plains Shortgrass Prairie (Landfire 2024).

James' beardtongue is a perennial forb species that occurs in a range of habitats and appears to be a generalist (Heil and Bleakly 2006). Three of the occurrence records occur in the Cimarron Unit and the others are within the Carrizo Unit. All occur within the shortgrass prairie ecosystem (USFS 2005a).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (Ackerfield 2022, NatureServe 2025, Heil and Bleakly 2006).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species is most likely insect pollinated.

Ethnobotany: This species is used as an analgesic, emetic, and throat aid (SEINet 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

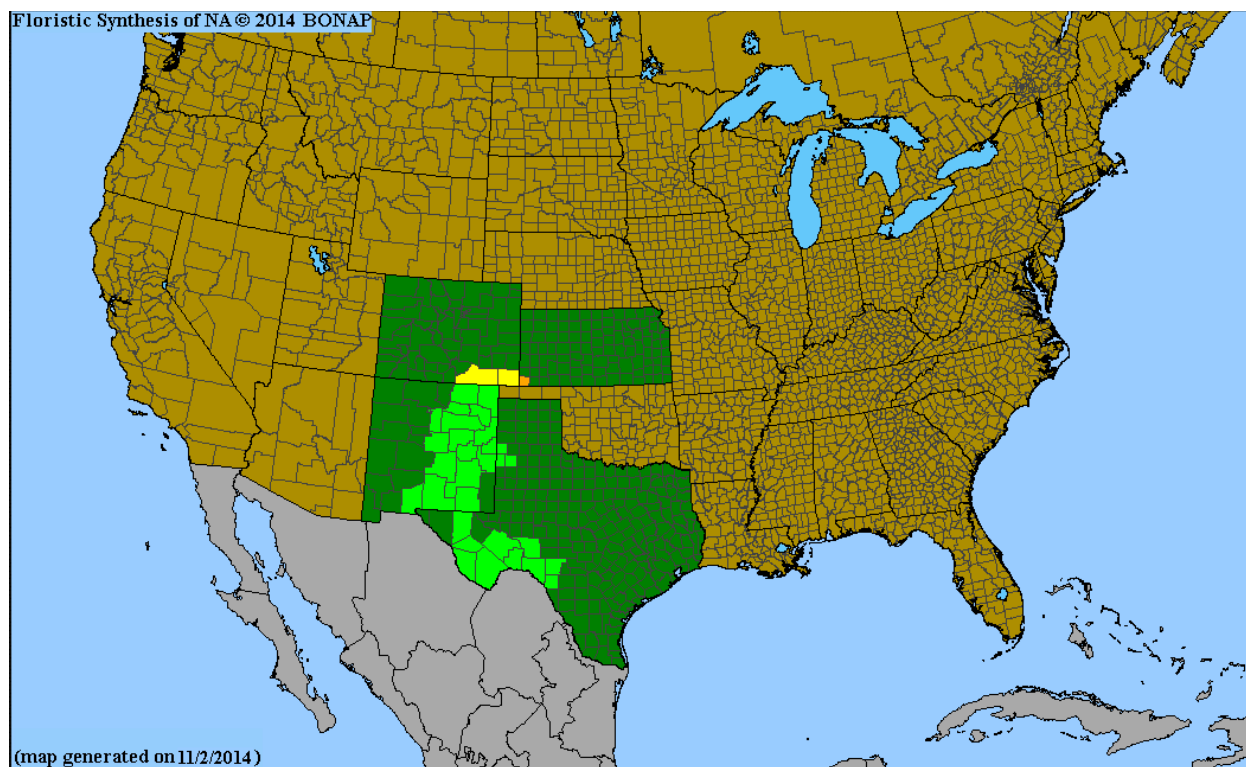


Figure 94. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

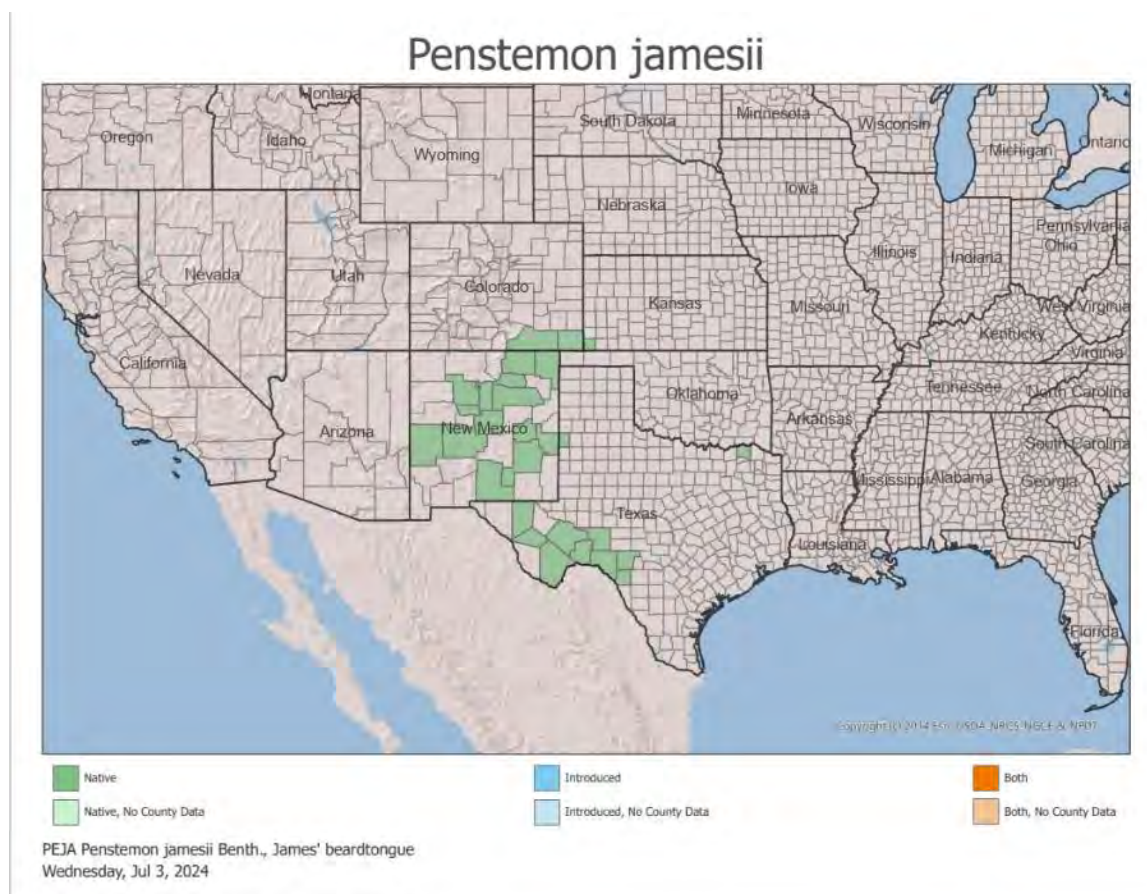


Figure 95. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

James' dalea

(*Dalea jamesii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: KNHP has three occurrence polygons in the Cimarron National Grasslands portion of the plan area, spanning between years 1895-2018 (Van Scoyoc 2024). Some of these have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2018

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: conversion of shortgrass prairie to agricultural use, oil and gas development, road development, and recreation.
 - b. Habitat: conversion of shortgrass prairie to agricultural use, oil and gas development, road development, and recreation.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available, but species is considered relatively secure on the Cimarron based on size and density of populations.
 - b. Habitat: declining due to oil and development and access roads that have fragmented and degraded this species' habitat in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northeastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: thousands of individuals documented in the plan area.
 - b. Ecological conditions: associated with diverse habitat types including juniper woodland, midgrass prairie, pinyon juniper woodland, rocky upland prairie, and shortgrass prairie.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

USDA NRCS recognizes *Dalea jamesii* as valid (NRCS 2025).

Species range

Overall Species range:

James' dalea is distributed in extreme southwestern Kansas and southeastern Colorado from the Arkansas River valley, south into eastern Chihuahua, Mexico; west to southeastern Arizona (Freeman 1989) (Figure 96).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northeastern edge of the species' range (Figure 96).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. Freeman (Freeman 1989) characterizes it as rare on the Cimarron National Grassland.

Two of the occurrence records give an indication of the number of individuals: "Freeman observed four small, isolated groups of plants, each w/ few individuals" (EO ID 132 in 1988); "2018-09-07: Three fruiting plants observed in sec 31 by Steve Olson. 2007-06-18: B. Kuhn recorded plants at Point of Rocks and along Santa Fe Trail and vicinity above Cimarron River. 1988, 1989: Freeman observed thousands of plants observed along ca 33.4" (EO ID 4402, most recently surveyed in 2018). James' dalea is considered rare in Morton County, Kansas, but not rare in Baca County, Colorado (Figure 96). Freeman (Freeman 1989) states that "James' dalea is relatively secure on the Cimarron National Grassland as judged by the size and density of populations surveyed during this study."

Habitat

Across its range, James' dalea occurs in dry hills, juniper plains, desertscrub, rocky slopes, and grasslands, from 5,000-6,500 ft (SEINet 2024).

Within the plan area, it is confined to the rocky breaks north of the Cimarron River on the Cimarron National Grassland and the rocky upland prairie within the Comanche National Grassland (Freeman 1989, Kuhn et al. 2011). Freeman (Freeman 1989) states that "Some habitat fragmentation and degradation has occurred on the Grassland due to conversion of shortgrass prairie for agricultural use in the 1930s and development of areas for gas and oil production. Oil and gas pipelines and well access roads have impacted the species most severely in sections 16, 17, and 18, T34S, R43W." This is considered to constitute a decline in habitat trend for this species.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Freeman (Freeman 1989) states that "some habitat fragmentation and degradation has occurred on the Grassland due to conversion of shortgrass prairie for agricultural use in the 1930s and development of areas for gas and oil production. Oil and gas pipelines and well access roads have impacted the species most severely in sections 16, 17, and 18, T34S, R43W. Fortunately, the species was probably never as

abundant in these sections as along the limestone outcrops immediately to the east. Grazing is not a threat to the species. Very minor mechanical damage attributable to visitors at the Overlook Area along KS 27 and at Point of Rocks was noted.”

Habitat

Threats to habitat include conversion of shortgrass prairie to agricultural use, oil and gas development, road development, and recreation (Freeman 1989). Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Habitat for James' dalea includes rocky, often calcareous, slopes and breaks in shortgrass prairies, and occasionally also silty, level prairie (Freeman 1989). Within the plan area, James' dalea has been associated with soils of the Potter-Mansker complex and Otero fine sandy loam and with outcrops of the Ogallala Formation (Freeman 1989). It requires freedom from new road and pipeline construction (Freeman 1989).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

James' dalea occur in soils of the Potter-Mansker complex and Otero fine sandy loam (Freeman 1989). The cessation of cultivation at sites within the Cimarron National Grassland seems to have benefited this species by providing new habitat (Freeman 1989). On the Comanche National Grassland, the rocky upland prairie where James' dalea occurs has low disturbance, is inaccessible by cattle, and has low representation of exotic species (Kuhn et al. 2011). The species is associated with diverse habitat types including juniper woodland, midgrass prairie, pinyon juniper woodland, rocky upland prairie, and shortgrass prairie (Kuhn et al. 2011). Therefore, its ecological conditions are not considered restricted in the plan area.

Critical biological characteristics

James' dalea is an herbaceous perennial with thick, woody roots and pealike, pale-yellow flowers (Freeman 1989). Flowering occurs from April through August, sometimes again in the fall, with fruiting from August to October (Freeman 1989). The fruits are small legumes (Freeman 1989).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found specifically for this species. Legumes can provide valuable forage plants for bees in honey production, and numerous species are browsed by livestock and serve as important browse plants for wildlife (Freeman 1989, Johnson 2006a). Legumes are known to be atmospheric nitrogen fixers through symbiotic relationships with soil bacteria. However, native grassland legumes likely contribute only a small amount of Nitrogen enrichment to soils, having evolved in low nutrient sites such as the Great Plains grasslands (VanRiper et al. 2010).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found specifically for this species.

Maps of Species Range

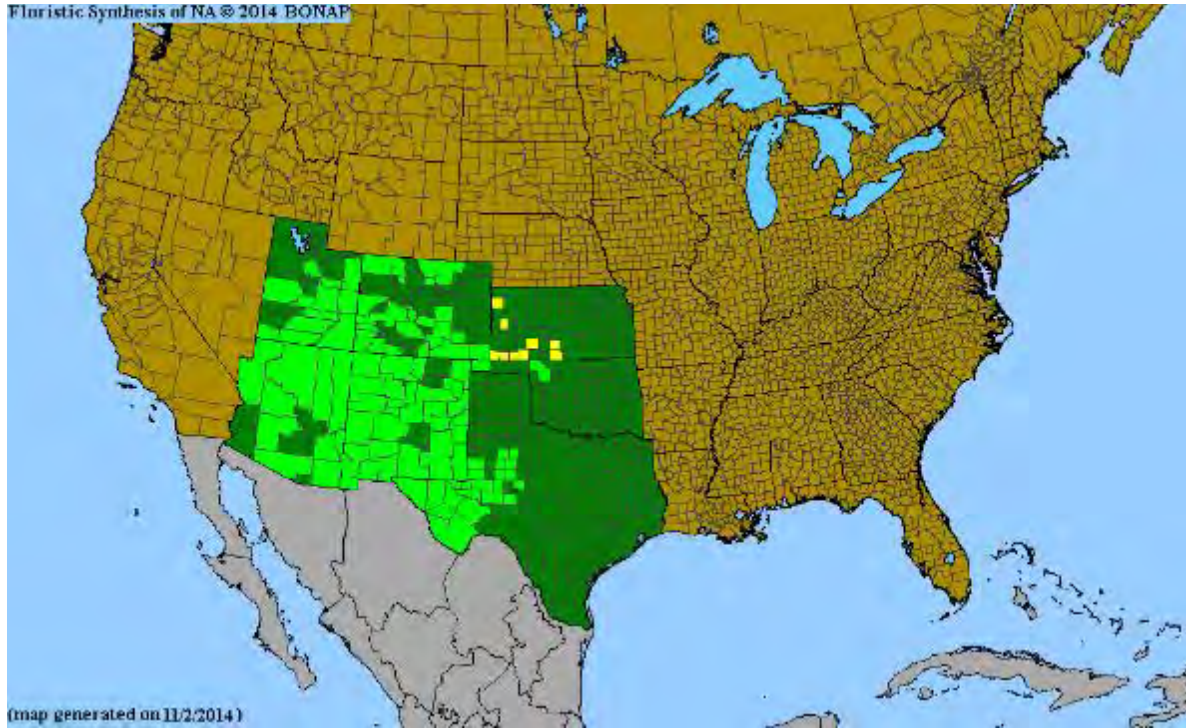


Figure 96. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Large-bract scurfpea

(*Pedimelum cuspidatum*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Five documented occurrences on the Cimmaron National Grassland (NG) from 1961-2023 (Van Scoyoc 2024). Three in and four in SEINet, which are likely duplicates (Van Scoyoc 2024).

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Livestock grazing and habitat fragmentation.
 - b. Habitat: Livestock grazing.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Habitat trends in the plan area are unknown. Trends consistent with shortgrass prairie
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are five documented occurrences in the plan area. Population numbers in the plan area are unknown.
 - b. Ecological conditions: Unknown.

Species Status

G4; S1 in Colorado; S4 in Kansas.

Taxonomy

Pedimelum cuspidatum is accepted as valid (NRCS 2025, ITIS 2024). Synonym is *Psoralea cuspidata* (NatureServe 2025). Other common names for this species include largebract Indian breadroot, tall-bread scurf-pea, and buffalo pea (NRCS 2025, NatureServe 2025).

Species range

Overall Species range

In the United States, the species occurs in Colorado, Kansas, Nebraska, Oklahoma, South Dakota, Texas (NatureServe 2025) and Montana (NRCS 2025).

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are at the northern edge of the species range (Figure 97).

Distribution, abundance, and trend in the plan area

Population

Population trends in the plan area are unknown. Five occurrences were recorded on the Cimarron NG from 1961-2023 (Van Scoyoc 2024).

Habitat

Habitat for large-bract scurfpea includes rocky mixed-grass and shortgrass prairies (Kansas Wildflowers & Grasses 2024). Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Livestock grazing is likely to be a threat to populations.

Habitat

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Rainshadow of the Rocky Mountains.

Soils nondescript. Sunny, open, non-shaded areas.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Unknown.

Critical biological characteristics

Perennial herb growing in height from 10-36 inches with blue to purple flowers in May and June (Kansas Wildflowers & Grasses 2024). Insect pollinated.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Woody legumes, including large-bract scurfpea, are known to host bacteria that can fix atmospheric nitrogen. However, native grassland legumes likely contribute only a small amount of Nitrogen enrichment to soils, having evolved in low nutrient sites such as the Great Plains grasslands (VanRiper et al. 2010).

The tuberous roots are edible.

Provides value as a soil stabilizer (Fern et al. 2024).

Pollinated by insects.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information was found suggesting influences of ecosystem structure or function on this species aside from the general forces that structure prairie plant communities.

Maps of Species Range

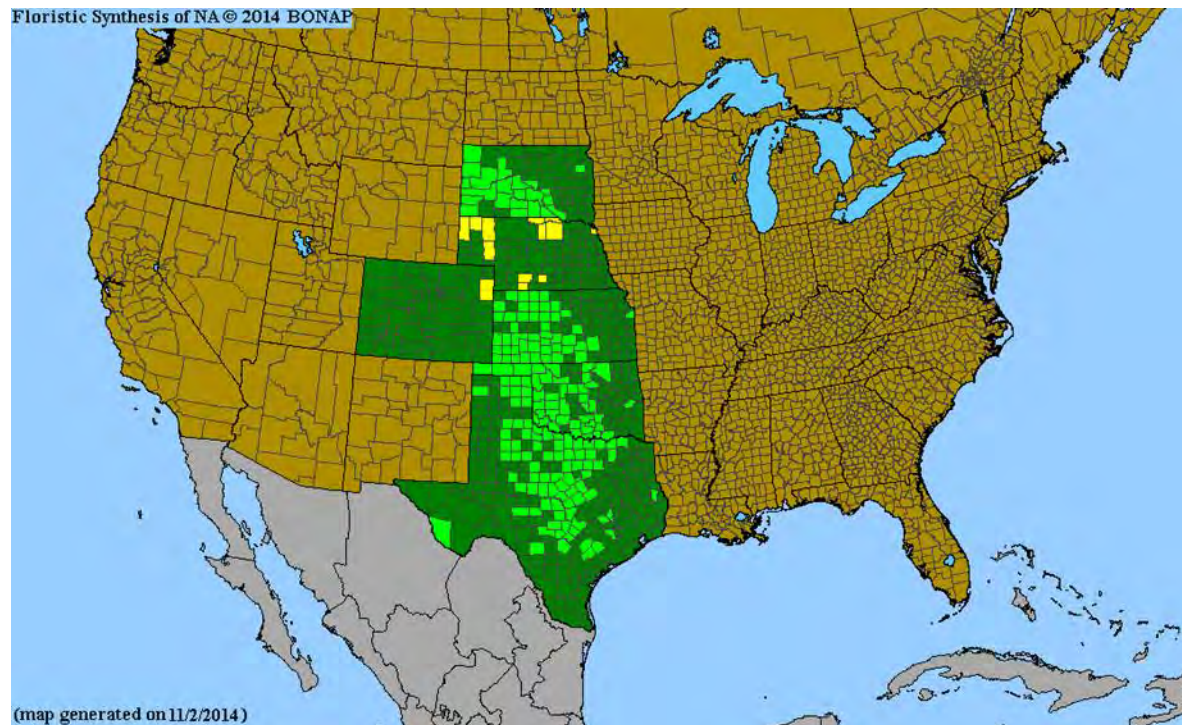


Figure 97. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Least duckweed

(*Lemna minuta*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are four documented occurrences from 1991 on the Cimarron and Comanche National Grassland (Van Scoyoc 2024). Three of these occurrences are also listed in GBIF and SEINet (Van Scoyoc 2024).

Year of Last Known Occurrence: 1991

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Drought, development, and livestock grazing.
 - b. Habitat: Climate stressors, development, and livestock grazing.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Aquatic habitat trends are declining in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Species appears to be at the eastern edge of its range
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are four documented occurrences in the plan area. Population numbers are unknown.
 - b. Ecological conditions: Aquatic habitat is restricted in the plan area.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

Lemna minuta Kunth is accepted as valid (ITIS 2024, NRCS 2025) the species has several taxonomic synonyms including *Lemna minima*, *Lemna minuscula*, *Lemna valdiviana* var. *abbreviata*, *Lemna valdiviana* var. *minima* (ITIS 2024, NRCS 2025). Other common names include minute duckweed (Van Scoyoc 2024).

Species range

Overall Species range

In North America, occurs in Alabama, Arizona, California, Colorado, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Massachusetts, Missouri, Nebraska, Nevada, New Mexico, Oklahoma, Oregon,

Texas, Utah, Washington, West Virginia, Wyoming and British Columbia (NatureServe 2025) (Figure 98). The exact native range is not well known (iNaturalist 2025). Least duckweed has also been introduced in Europe where it has become naturalized and is spreading (California Native Plant Society 2024).

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area appear to be at the eastern edge of the species patchy range in North America (Figure 98), although Weber (2012) cite that more duckweed specimens need to be collected to have a clear understanding of their distribution.

Distribution, abundance, and trend in the plan area

Population

Population trends are unknown due to limited observances in the plan area. Weber (2012) cite that “duckweeds need much more collecting before we have a clear understanding of the taxa and their distribution”.

Habitat

Least duckweed plants were found in pools at the edge of a cattail slough in the bottom of Picture Canyon in the plan area (SEINet 2024). Habitat trends are declining for wetland ecosystems in the plan area. Suitable wetland habitat is likely to decrease in the future due to drought and increasing temperatures. Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Climate variability and drought are threats to water resources which duckweeds depend on to survive. As a wetland obligate aquatic species (NRCS 2025), least duckweed is dependent on the presence of still or slow-moving water.

Land development is a threat outside of the plan area; however, may be of little concern inside the plan area due to the protection of federal lands. Conservation issues in the Cimarron Grasslands Ecological Focus Area include grassland conversion for other agricultural uses which decreases the presence of native plants and causes population fragmentation (Rohweder 2022).

Least duckweed may be susceptible to livestock grazing both on and off the plan area in the Cimarron Grasslands. Duckweeds can be a food source for wildlife (USFS 2024) and may also be consumed by livestock. Inappropriate grazing is listed as one of the conservation issues facing the Cimarron Grasslands (Rohweder 2022).

Habitat

In the United States, wetland habitat is negatively impacted by development, drought, and altered frequency of precipitation events. In addition, unsuitable grazing practices may alter habitat and decrease heterogeneity in Kansas grasslands (Rohweder 2022). Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Least duckweed is an aquatic plant species growing only on the surface of slow-moving water bodies (GBIF 2023) and is listed as a Wetland Obligate species on the National Wetland Plant List (Lichvar et al. 2016).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Riparian and wetland habitats are limited in the plan area (Hazlett 2004). Based on National Wetlands Inventory data, the approximate extent of riparian and wetland habitat is ~1% of the total plan area and therefore habitat is considered restricted for this species.

Critical biological characteristics

Least duckweed is a perennial, herbaceous, free-floating aquatic plant that grows in calm freshwater habitats including drainages, ditches, lakes and ponds (Duenas 2009, GBIF 2023). Duckweeds (genus *Lemna*) are recognized as the smallest flowering plants on Earth (USFS 2024) and least duckweed is the smallest of the duckweed species. They reproduce both sexually and asexually, and the flowers likely attract flies, mites, spiders and bees (USFS 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Patches of duckweed can provide habitat for aquatic organisms and serve as an important food source for waterfowl and fish (USFS 2024). Therefore, decreases in least duckweed population size alters the food web structure and habitat for some native species that depend on their presence.

Duckweeds can influence species diversity and community composition by competing with other aquatic species. Least duckweed forms free-floating mats on the surface of water which reduces light penetration and gas exchange through the water column for other species (Duenas 2009). Least duckweed is often considered an invasive species where it has been introduced outside of its natural range, such as in European countries (Ceschin et al. 2018, iNaturalist 2025).

Least duckweed can reduce water pollution by absorbing pollutants, including nutrients and heavy metals. In simulated experiments, least duckweed showed strong phytoremediation potential as a hyperaccumulator of phosphates and nitrates in water with high nutrient concentrations (Ceschin et al. 2020). Thus, least duckweed may provide an ecosystem service by removing nutrients in water bodies with elevated nutrient levels from livestock inputs or agricultural runoff.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Under elevated nitrate and phosphate levels, least duckweed showed a decrease in chlorophyll content and an increase in peroxidative damage (Ceschin et al. 2020) which may indicate a decline in population numbers in water with extremely high nutrient concentrations.

Maps of Species Range

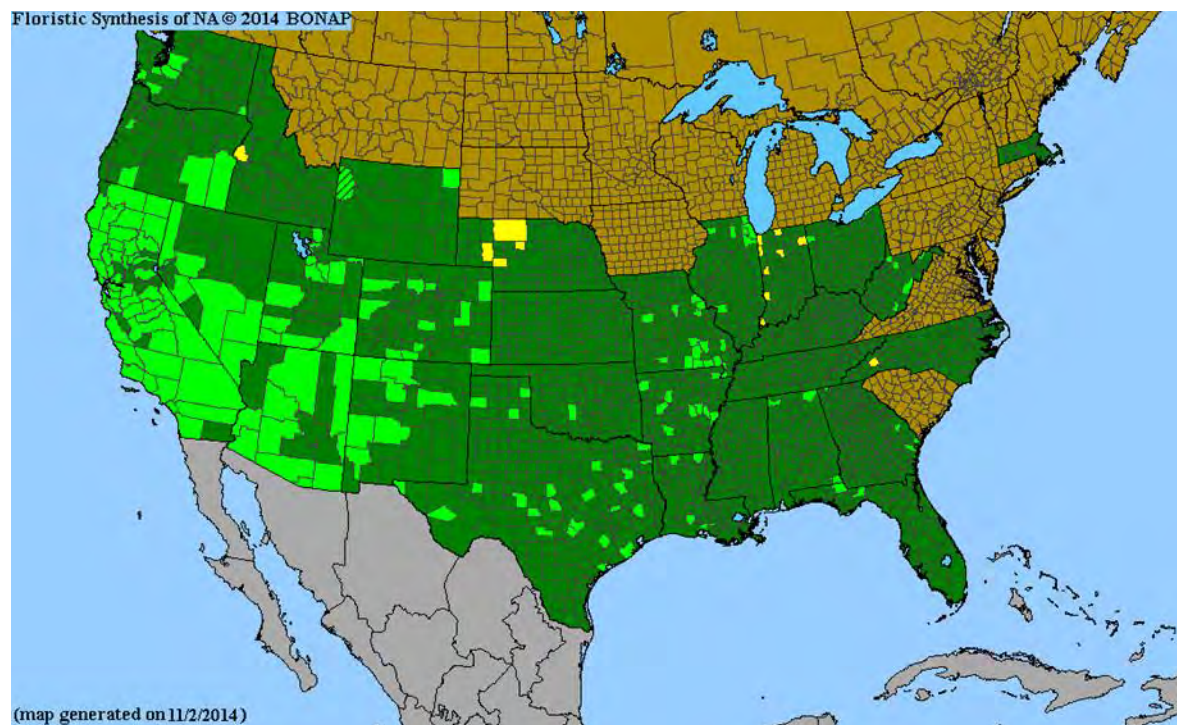


Figure 98. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

A liverwort

(*Plagiochasma wrightii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF contains three occurrence records from 2015-2016 (Van Scoyoc 2024). These records have protected locality information “due to name conservation status.” The Missouri Botanical Garden confirmed that this species has been documented at two locations within the Comanche National Grassland (Jordan K. Teisher, Missouri Botanical Garden, pers. comm. 6/7/2024). Therefore, it is known to occur in the plan area.

Year of Last Known Occurrence: 2016

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: climate stressors, low population size, and limited dispersal capacity.
 - b. Habitat: climate stressors, destruction, and alteration.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: species' known habitat within the plan area shows no evidence of disturbance and therefore is considered stable.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: population size is not known; two individuals have been documented in the plan area.
 - b. Ecological conditions: calcareous soils are not limited in the plan area; species seems to use both wet and dry habitats.

Species Status

G3; SNR in Colorado; SNR in Kansas.

Taxonomy

Plagiochasma wrightii is accepted as valid; taxonomic synonyms include *Cheilanthes hookeri* and *Cheilanthes standleyi* (NRCS 2025).

Species range

Overall Species range:

This species is distributed in the east (eastern Texas, Oklahoma, Kansas, Missouri, and disjunct in North Carolina) and southwestern United States, where it occurs from western Texas west to Arizona and Nevada, in the U.S., south to Veracruz, Durango, and Coahuila, in Mexico (NatureServe 2025).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range.

Distribution, abundance, and trend in the plan area

Population:

A total of two individuals have been observed in the plan area (Van Scoyoc 2024).

Habitat

This liverwort has different habitat associations across its range (NatureServe 2025). In the eastern part of its range, it occurs along streams and creeks and can typically be found along damp rock underhangs (NatureServe 2025). In the western part of its range, the species' habitat is characterized by heat and dryness (xerothermophyte). In the western portion of its range, the species is associated with oak-pinyon pine-juniper forests or with desert plants like *Opuntia*, *Fouquieria*, *Agave*, *Yucca*, etc. (NatureServe 2025). This species prefers calcareous substrate such as limestone .

Within the plan area, the species has been documented in the vicinity of Picketwire Canyon and Picture and Holt Canyons at an elevation of ~4300 ft (Van Scoyoc 2024, Tropicos 2015, 2016, Malone et al. 2020). At one location it was growing on a vertical cliff face, and the other location it was growing over moss (Tropicos 2015, 2016). Habitat surrounding the occurrence records appears stable with no roads, trails, oil and gas, or other land-disturbing activities.

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Warming temperatures under projected climatic conditions are generally expected to threaten bryophytes because of their high sensitivity to elevated temperatures (He et al. 2016). Bryophytes lose water rapidly when temperature rises, and relative humidity drops. Significant losses in bryophyte diversity are expected in the future (He et al. 2016). Rare and endemic liverworts are threatened by generally low population sizes, limited dispersal capacity, and sensitivity to stochastic events that may exacerbate the threat of local extirpation (Hicks and Davison 1989).

Habitat

Liverworts are threatened by gross alterations and destruction of habitat (Hicks and Davison 1989). Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

This species is typically associated with hot, dry habitat in the western portion of its range (NatureServe 2025); however, one of the two records in the plan area were associated with riparian habitat near a creek. In Oklahoma, this species has been similarly observed in both wet and dry habitats: on both moist, shaded travertine ledges along streams and on dry sandstone bluffs (Little 1936). This species prefers calcareous substrate such as limestone (Hicks and Davison 1989). Bryophytes are generally drought sensitive, are highly dependent on external water, and many species are known to be sensitive to high temperatures because of their relatively low temperature optima for photosynthesis (He et al. 2016). Liverworts are understudied (Malone et al. 2020) and this species' full ecological conditions requirements may not be fully characterized.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species has been documented in two canyon habitats within the Comanche National Grassland portion of the plan area (Van Scoyoc 2024). It prefers calcareous substrate such as limestone (Hicks and Davison 1989).

Given this species' biology, it is likely to be vulnerable to drought. Basara (2013) states a growing concern that projected climatic conditions could "enhance future drought conditions in the Great Plains, although confidence in this prediction is low."

Critical biological characteristics

Hicks and Paul (1989) state "Many liverworts are maintained only by asexual reproduction and lack either male or female structures... Although some species regularly produce asexual fragments in abundance, their capabilities to disperse are limited and thus their ability to withstand environmental disturbance is in doubt." The sporophyte of liverworts develops within the gametophyte structures and is sheltered until the spores are mature (He et al. 2016). Liverworts are considered "poikilohydric plants," which means they are unable to control water loss to the environment and therefore their cellular water content fluctuates in concert with external water availability; this species' rhizoids allow it to grow in periodically dry habitats to resist desiccation (Vitt et al. 2014). Rare and endemic liverworts are threatened by generally low population sizes, limited dispersal capacity, and sensitivity to stochastic events that may exacerbate the threat of local extirpation (Hicks and Davison 1989).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Liverworts play an important role in the reestablishment and succession of native biodiversity following disturbance by stabilizing soils, slowing erosion, facilitating water uptake, and impacting seed germination (Malone et al. 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found specifically for this species. In general, bryophytes are affected by habitat destruction and fragmentation, air pollution, changes in water distribution and availability, and changing temperatures (Hicks and Davison 1989, Hylander et al. 2002, Söderström 2006, Root and McCune 2010, Oishi and Morimoto 2013, He et al. 2016, Monteiro and Vieira 2017, Vanneste et al. 2017). Bryophytes are sensitive to changes in microhabitat conditions that affect either substrate availability or microclimate conditions (Lesica et al. 1991, Rambo and Muir 1998, Mills and Macdonald 2005, Dynesius et al. 2008, Schmalholz and Hylander 2011, Schmalholz et al. 2011). Hicks and Paul (1989) recommend habitat preservation to ensure the persistence of rare and endemic liverworts.

Maps of Species Range

Range maps could not be found for this species.

Long-hood milkweed

(*Asclepias macrotis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are five occurrences on the Comanche National Grassland (three from CNHP from 1992 to 2015, four from GBIF from 1944 to 1997, three from iDigBio from 1948 to 1997) (Van Scoyoc 2024). There are two herbarium collections from the Comanche National Grassland in SEINet (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Helium mining, pipelines, road work, recreation, and climate stressors.
 - b. Habitat: Overgrazing and climate stressors.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Habitat trends in the plan area are unknown.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Population in the plan area is disjunct from the main body of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Five known occurrences in the plan area.
 - b. Ecological conditions: Restricted to sandstone and limestone canyons and found in juniper woodlands and prairies.

Species Status

G4; S2 in Colorado.

Taxonomy

Asclepias macrotis Torr. is accepted as valid (Ackerfield 2022, NRCS 2025, Weber et al. 2012). There are no known synonyms for this species. Other common names include longhood milkweed (NRCS 2025) and longhorn milkweed (ITIS 2024).

Species range

Overall Species range:

In North America, occurs in Arizona, Colorado, New Mexico, Oklahoma, and Texas (NatureServe 2025). Long-hood milkweed has been documented from approximately 22 locations in southeastern Colorado, including two locations on the Comanche National Grassland and additional locations on the adjacent JE Ranch which is owned by a conservation group (Van Scoyoc 2024). SEINet lists 341 collection records, of which 30 are in Colorado (some are duplicate specimens) (Van Scoyoc 2024).

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are at the northern edge of the species range (Figure 99).

Distribution, abundance, and trend in the plan area

Population

There are five known occurrences in the plan area. Several populations in Colorado are fewer than ten individuals, and one collection was described as “locally common”. Most populations of long-hood milkweed are small (Clark et al. 2024).

Habitat

Plants are found on dry, sandy or gravelly soil in the southeastern plains at 4500-5500 ft. in elevation (Ackerfield 2022). Long-hood milkweed usually occurs along the upper edges of canyons where soil moisture may be more abundant (Clark et al. 2024).

Abundance is unknown. Habitat is threatened or declining due to helium mining, juniper encroachment, recreation such as mountain biking, and climate stressors. The sandstone/limestone habitat where this species occurs is limited in extent so there is little to no opportunity for northward migration (Clark et al. 2024).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Threats are described for habitat; loss or degradation of habitat is a threat to populations.

One threat to populations includes the current trend toward increasingly long and severe drought which may affect persistence and reproduction (Clark et al. 2024).

Habitat

Long-hood milkweed is restricted to sandstone and limestone canyons and is found in juniper woodlands and prairies. Principal threats are from helium mining, pipelines, road work, recreation, and climate stressors, including the current trend toward increasingly long and severe drought which may affect persistence and reproduction (Clark et al. 2024). Grazing is an ongoing use of the Comanche National

Grassland. This may have impacts on the long-horn milkweed depending on grazing schedule and intensity (Dickson et al. 2023). These are threats to the long-term viability of this species.

Threats to pinyon-juniper woodland and cliffs are described as follows (CPW 2015):

Livestock grazing has degraded the understory grasses of some stands, and invasive cheatgrass has become established in some areas. Tree removal by chaining is a minor source of disturbance within these woodlands but dramatically changes the habitat where it has occurred. Grazing is an ongoing use of the Comanche Grasslands. This may have impacts on the long-hood milkweed depending on grazing schedule and intensity (Dickson et al. 2023).

Oil and gas development, with associated roads, pipeline corridors, and infrastructure, is an ongoing source of disturbance and fragmentation for most pinyon-juniper habitats.

Military training activities are a source of disturbance to this habitat at Fort Carson and Pinyon Canyon Maneuver Site. Increased recreational use of pinyon-juniper forests is also of concern in areas adjacent to growing urban centers in the southeast and southwest portions of the state. These lower elevations often remain accessible year-round and are increasingly utilized for horseback riding, hiking, ATV's, bicycling, and other recreational activities that degrade habitat and disturb wildlife during vulnerable periods.

In areas adjacent to development, pinyon-juniper stands may be part of the wildland-urban interface, where they are most likely to be threatened by the effects of by inappropriate management, intervention, or fire suppression. These activities interrupt the natural seral progression of the impacted stands and may degrade the usefulness of the remaining habitat for wildlife.

Pinyon pine is susceptible to the fungal pathogen *Leptographium wageneri* var. *wageneri*, which causes black stain root disease, and to infestations of the pinyon ips bark beetle, which has caused extensive mortality in pinyon-juniper habitats in southern Colorado. Extended drought can increase the frequency and intensity of both insect outbreaks and wildfire.

Variable disturbance and site conditions across the distribution of this ecosystem have resulted in a dynamic mosaic of interconnected communities and successional stages across the landscape that can be naturally resilient. Since the last major glacial period, the distribution and relative abundance of pinyon and juniper has fluctuated dynamically with changing climatic conditions. Warming conditions during the past two centuries, together with changing fire regime, livestock grazing, and atmospheric pollution, increased the ability of this ecosystem to expand into neighboring communities, at both higher and lower elevations (Tausch 1999). However, precipitation and temperature patterns are projected to change in a direction that is less favorable for pinyon pine, so that juniper may become more dominant, and these habitats may be unable to persist or expand in their current form.

Throughout the state, sandstone, limestone, granite, and shale outcrops are quarried for a variety of uses, which essentially destroys the habitat. In eastern Colorado, wind energy development is frequently concentrated on outcrops and canyon rims, causing fragmentation, disturbance, and loss of habitat.

Surface impacts by transportation corridor disturbance are largely due to road construction and maintenance, including rockfall mitigation.

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Long-hood milkweed is an herbaceous perennial occurring on canyon edges in grasslands and open woodlands and mountains.

In Colorado, this milkweed species is at the northern edge of its range. Populations are known from Las Animas, Baca, and Bent Counties (Ackerfield 2022). Colorado populations are typically found on sandstone rimrock, rocky shale, or rocky slopes of eroded sandstone in the canyon country of the southeastern corner of the state. The plants grow in sparsely vegetated areas of one-seed juniper (*Juniperus monosperma*) and native prairie grasses such as the grama grasses (*Bouteloua* spp.) and needle-and-thread (*Hesperostipa* spp.) (CNHP 2010). Populations at the edges of species ranges may have unique genetic characteristics and adaptations which would make conservation of these populations very important (Clark et al. 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area:

There are five known occurrences on the Comanche National Grassland. Populations are typically small and scattered (Clark et al. 2024). Habitat trend is declining due to the threats described above.

Critical biological characteristics

Occupies canyon edges and may require greater soil moisture to survive (Clark et al. 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Species is vulnerable to drought and wildfire. Overgrazing is likely to limit species presence.

Maps of Species Range

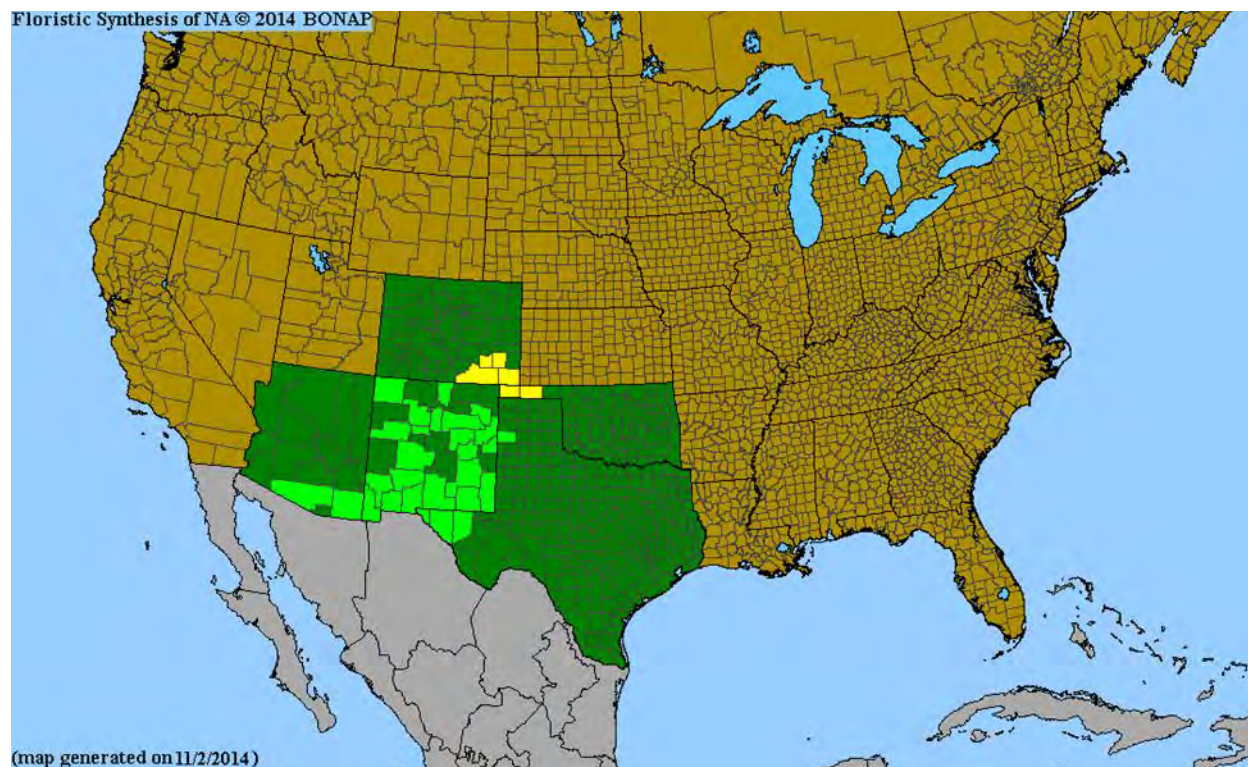


Figure 99. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Lyreleaf greeneyes (*Berlandiera lyrata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: KNHP has ten occurrence polygons in the Cimarron National Grasslands from 1891-2018 (Van Scoyoc 2024). GBIF also has 16 records from 1947-2022; therefore, the species is known to occur in the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: overgrazing, oil and gas development.
 - b. Habitat: overgrazing, oil and gas development.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: pronounced habitat degradation has occurred in the in the heart of this species' largest occurrence in the Cimarron National Grassland.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; number of individuals when counted range from 7 to 200 10-16 occurrences in the plan area.
 - b. Ecological conditions: dry, rocky, limestone soils are not restricted in the plan area.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

USDA NRCS recognizes *Berlandiera lyrata* as valid; *Berlandiera incisa* and *Berlandiera lyrata* var. *macrophylla* are taxonomic synonyms (NRCS 2025).

Species range

Overall Species range:

Lyreleaf greeneyes has a limited range across the southwestern United States, including the Guadalupe Mts. in west Texas south and east to Chihuahua, Nuevo Leon and Tamaulipas (NatureServe 2025) (Figure 100, Figure 101).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure 100, Figure 101).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. The species is considered rare in Morton County, Kansas, but not in Baca or Las Animas Counties in Colorado (Figure 101). Most occurrence records from the Cimarron National Grassland give an indication of the number of individuals observed, which ranges from seven plants to a large population of 200+ plants (Van Scoyoc 2024). For the Cimarron National Grassland, Freeman (1989) states: "The species is represented on the Grassland by several large populations and other smaller ones...Despite the loss and degradation of some habitat in the western portion of the [Cimarron National] Grassland, Lyre-leaf green-eyes in probably relatively secure."

Habitat

Lyreleaf greeneyes is found in evergreen woodland, desert shrub, plains and mesas at elevations from 4,000-7,000 ft (Hazlett 2004, NatureServe 2025, SEINet 2024). It can also use disturbed soils including roadsides (SEINet 2024). Within the plan area, it has been associated with rocky, limestone breaks; rolling, gravelly hills in shortgrass prairie; and chalky and sandstone cliffs (Rohweder 2022). The species has been documented along the north side of the Cimarron River in the Cimarron National Grassland, and in several canyons in the Comanche National Grassland (West Sand Canyon, Sand Canyon, Holt Canyon) (Van Scoyoc 2024, Rohweder 2022). Freeman (1989) states that habitat quality and quantity has declined for this species in the Cimarron portion of the plan area: "Pronounced habitat degradation has occurred in parts of sections 17 and 18, T34S, R43W, in the heart of the largest occurrence."

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

NatureServe identifies overgrazing as a threat to the species (NatureServe 2025), but Freeman (1989) states "grazing does not pose a serious threat to the species." Freeman (1989) states that "Habitat loss resulting from development of the Grassland for oil and gas is the single most serious threat to the species."

Habitat

NatureServe identifies overgrazing as a threat to the species, but Freeman (1989) states "grazing does not pose a serious threat to the species," (NatureServe 2025). Freeman (1989) states that "Habitat loss resulting from development of the Grassland for oil and gas is the single most serious threat to the species."

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

This species can use varied habitat types (NatureServe 2025, SEINet 2024), but in the plan area is typically associated with rocky, limestone prairies (Freeman 1989). All populations in the Cimarron National Grasslands have occurred on soils of the Otero-Lincoln association, especially on Otero fine sandy loam and the Potter-Mansker complex (Freeman 1989). It requires freedom from substantial impacts of oil and gas development, including road and pipeline construction (Freeman 1989). It is intolerant of shade (NRCS 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Dry, rocky, limestone soils in prairies are not restricted in the plan area. This species can also be found on roadsides (Freeman 1989).

Critical biological characteristics

Lyreleaf greeneyes is a perennial forb (SEINet 2024). Flowering occurs from May through October and fruiting from June to October (Freeman 1989, SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

This species has a low tolerance for fire (NRCS 2025).

Maps of Species Range

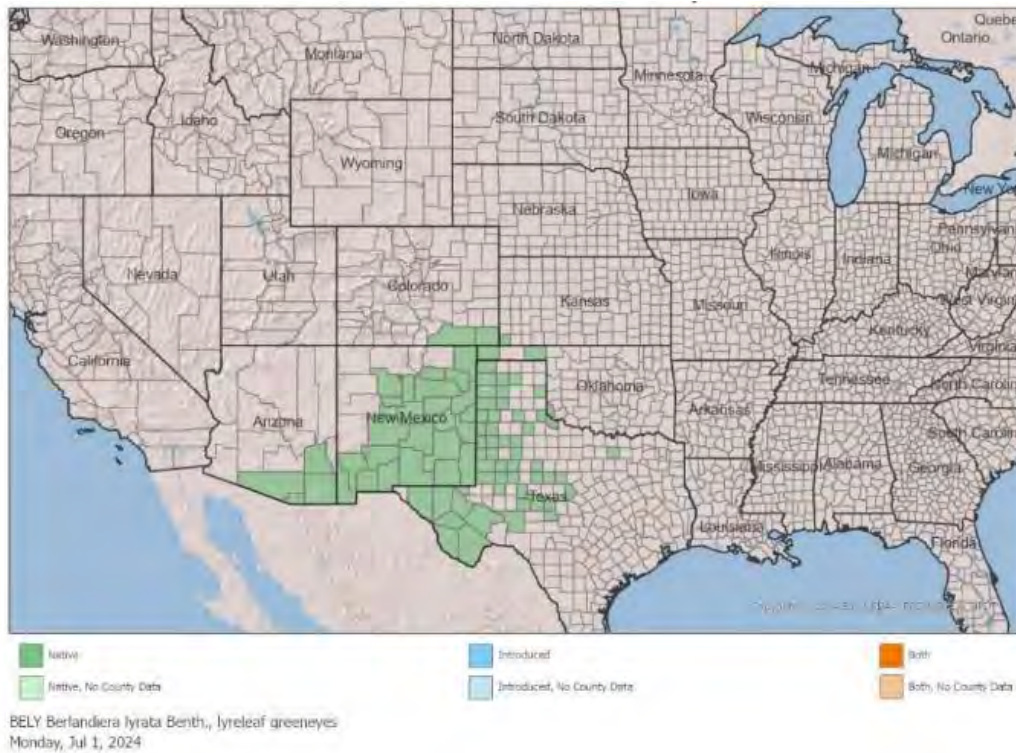


Figure 100. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

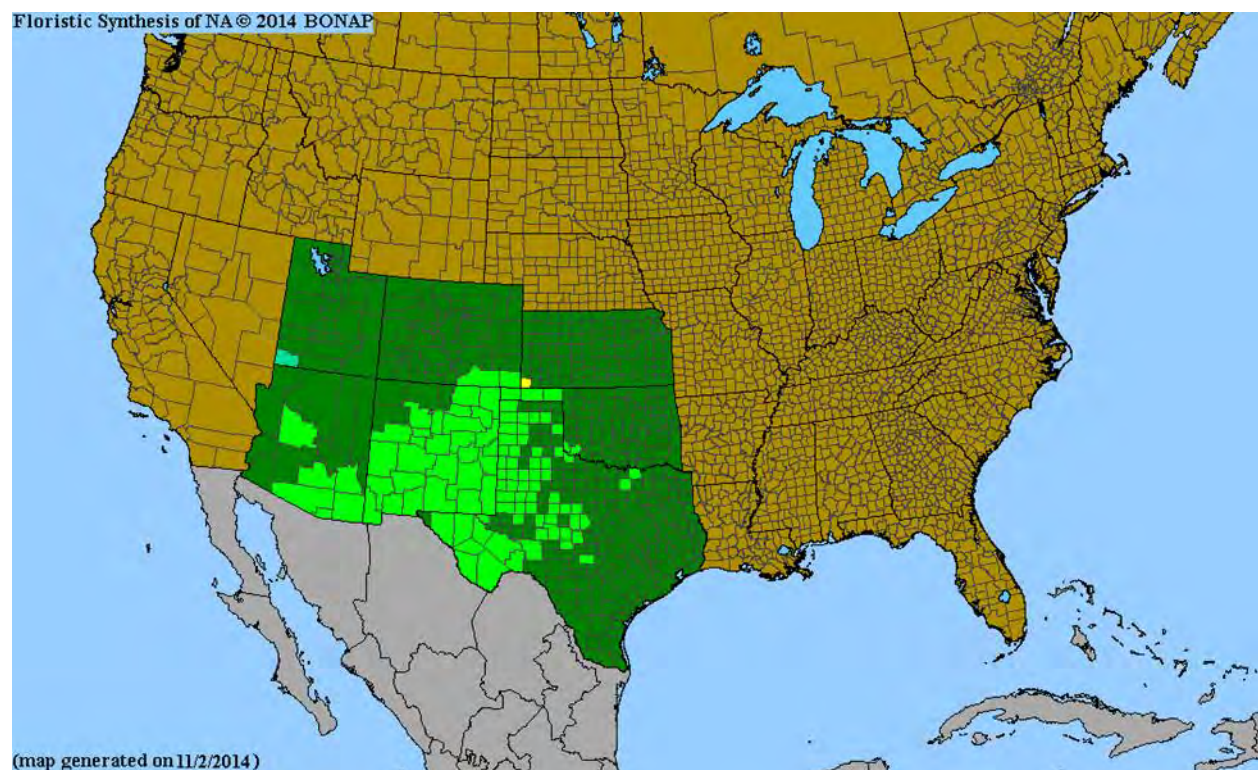


Figure 101. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Loosescape gayfeather

(*Liatris squarrosa* var. *glabrata*; *Liatris squarrosa*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: iDigBio contains one occurrence record from 1929, which has insufficient spatial precision (± 4.5 miles) to determine if it occurred in the plan area (Van Scoyoc 2024). Therefore, the species is not known to occur in the plan area and is not analyzed further.

Year of Last Known Occurrence: N/A

Species Status

G5; S1 in Colorado; SNR in Kansas.

Taxonomy

Liatris squarrosa var. *glabrata* is accepted as valid; a taxonomic synonym is *Liatris glabrata*. Another common name is scaly blazing star (NRCS 2025).

Low silverbush (*Argythamnia humilis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Four documented occurrences on CCNGs: two in 1989 and two in 2007 and 2008 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2008

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Grazing
 - b. Habitat: Livestock grazing, military training, invasive non-native species, altered fire regime, conversion to agriculture, fragmentation from roads and development, gas and oil exploration and extraction. Moderate vulnerability to negative impacts from climate stressors.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: At one of the two known locations (Withers Canyon Corral) there is a declining trend as evidenced by an increase in disturbed area associated with the Corral and what appears to be storage for road materials, a building, and associated parking areas.
 - b. Habitat: No known trend
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area (the Comanche NG in particular) is on the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: known from four occurrences in the plan area, one of which consists of a single individual.
 - b. Ecological conditions: Unknown.

Species Status

G5; S2 in Colorado; SNR in Kansas.

Taxonomy

Argythamnia humilis is accepted as valid (Flora of North America 1993, NRCS 2025, Weber et al. 2012). Ackerfield (2022) uses *Ditaxis humilis* with *Argythamnia humilus* as a synonym.

Species range

Overall Species range

In North America, occurs from Southern Colorado and Kansas south through New Mexico, Oklahoma, Texas and into Mexico (Figure 102).

Description of how the population in the plan area fits within the overall range

Population in the plan area is on the northern edge of the species range, particularly with the occurrence on the Comanche NG at Withers Canyon (CNHP EO 16765) (CNHP 2024).

Distribution, abundance, and trend in the plan area

Population

Known from four occurrences in the plan area, and on both the Cimarron and Comanche National Grasslands. Collection on the Cimarron NG does not have population estimates, the collection from the Comanche NG at Winthers Canyon Corral consists of a single genet. The collection notes associated with EO 16765 note that the site is heavily grazed and acts as a corral for the Winthers Canyon Trail. Analysis of aerial imagery of the Winthers Canyon Corral from 1998 to present (Figure 103 Figure 104) shows proliferation of trails, a new cutoff road, an expansion of what appears to be road grading material and its storage, additional buildings, and an expansion of the corral footprint and impacted area. Estimate of the net increase in disturbed area is approx. 2.5 acres.

Habitat

Described as occurring on grazed level shortgrass prairie CNHP (EO 16765) (CNHP 2024). Associated with the shortgrass prairie EVT which accounts for 445,000 acres of the plan area. Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Grazing is noted as an impact at both occurrences in the plan area.

Habitat

Threats common to the shortgrass prairie EVT and Moderate Vulnerability to negative impacts from climate stressors. Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No ecological conditions noted aside from general shortgrass habitat needs.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Described as occurring on grazed shortgrass prairie in the Comanche NG and as at heavily grazed shortgrass prairie by CNHP (EO 16765) (CNHP 2024).

Critical biological characteristics

No notable biological characteristics found.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No influences are known aside from the general structure of shortgrass prairie.

Maps of Species Range and Known Occurrences in Plan Area

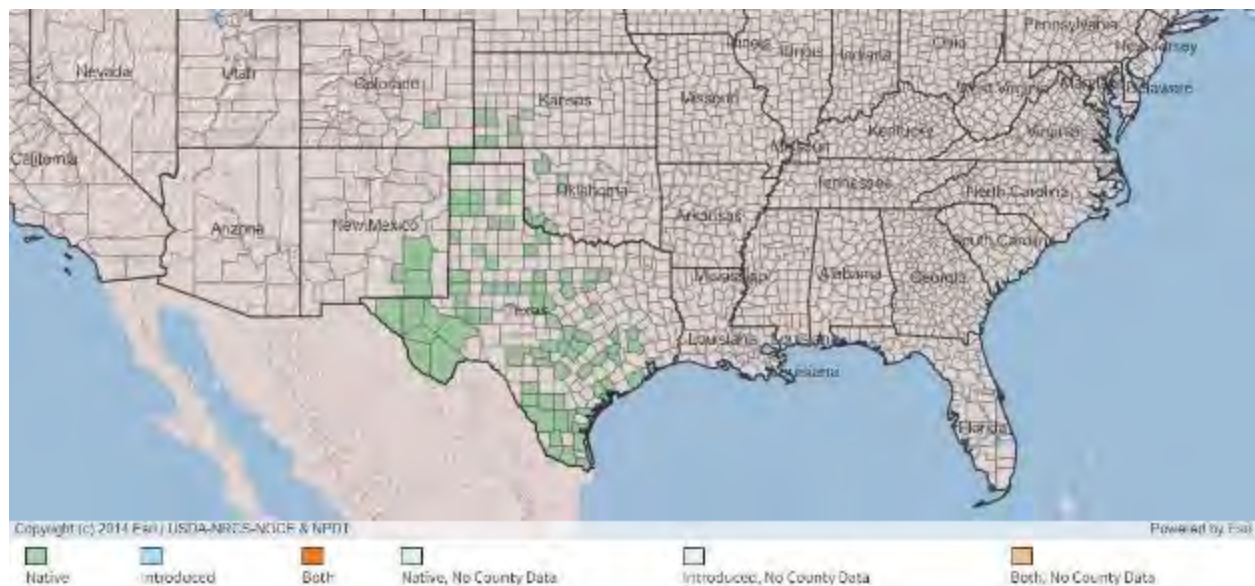


Figure 102. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).



Figure 103. Aerial imagery from 1998 at Winthens Corral.



Figure 104. Aerial imagery from 2023 of Winther Corral. Note expansion of what appears to be the storage of road materials to the northeast of the corral, expansion of footprint of the corral and the addition of what appears to be a building and a cutoff road. Area of new disturbance is estimated around 2.5 acres total around the corral.

Mapleleaf grape

(*Vitis acerifolia*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF (GBIF 2023, 2024) has five occurrence records in the plan area from 1947 through 2007. Some of these records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: herbicide use along highways.
 - b. Habitat: conversion and fragmentation, invasive species, grazing, drought.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: varied habitats; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is on the western edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; five occurrence records; locally common.
 - b. Ecological conditions: uses varied habitat types (cottonwood gallery forest, midgrass prairie, pinyon juniper woodland, riparian, and rocky upland prairie), which collectively are not restricted in the plan area.

Species Status

G4; SNR in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Vitis acerifolia* as valid; taxonomic synonyms include *Vitis longii*, *Vitis longii* var. *microperm*, and *Vitis solonis* (NRCS 2025).

NatureServe states: "It has been suggested that *Vitis acerifolia* could be of hybrid origin, a cross between *V. riparia* and *V. mustangensis* with the possible addition of *V. arizonica* genetic material (Miller et al. 2013, Walker et al. 2019). *Vitis acerifolia* is known to hybridize with other *Vitis* species. For example, *Vitis mustangensis* hybridized with *V. acerifolia* to produce the hybrid *V. x doaniana* (Flora of North America 1993). *Vitis longii* was once considered synonymous with *V. acerifolia* but it was determined that the name *V. acerifolia* had priority (Moore 1991)," (NatureServe 2025). Another common name is riparian grape (Hazlett 2004).

Species range

Overall Species range:

Mapleleaf grape is distributed in the southern Great Plains in the United States, occurring from Colorado south to Texas and east to western Oklahoma and Kansas (NatureServe 2025) (Figure 105, Figure 106).

Description of how the population in the plan area fits within the overall range:

Occurrences in the plan area are on the western edge of the species range (Figure 105, Figure 106).

Distribution, abundance, and trend in the plan area

Population:

The population size and trend are not known. It is locally common in the southern Great Plains (NatureServe 2025). One record from the Comanche National Grassland from 2004 describes the species as a “locally common vine.” It is not considered rare in any counties that overlap the plan area (Figure 106).

Habitat

Across its range, mapleleaf grape occurs in a variety of habitats, including stream bottoms, alluvial floodplain woodlands, riverbanks, prairie ravines, rocky slopes, dry hillsides, dunes, thickets, and along hedgerows and fencerows (NatureServe 2025). Within the plan area, its habitat includes cottonwood gallery forest, midgrass prairie, pinyon juniper woodland, wetland/riparian, and rocky upland prairie (Hazlett 2004, Kuhn et al. 2011). All occurrence records have been distributed at the southern edge of the Comanche National Grassland across both units of the Comanche and the Cimarron. Records in and adjacent to the plan area have noted habitat including limestone outcrops in scrub and grassland, rock outcropping over sandsage prairie, and riparian area in canyon bottom.

Threats (arising from on or off the plan area)

Population

Mapleleaf grape is threatened by herbicide use along highways by state departments of transportation (NatureServe 2025).

Habitat

Threats to habitat include conversion and fragmentation, invasive species, grazing, drought, and other widespread threats; however, declines to this species are not well documented (NatureServe 2025). Grazing is thought to have led to dramatic range reductions of a closely related species, the congener sand grape (*V. rupestris*), in Texas (Morano and Walker 1995).

Ecological conditions

Ecological condition requirements

Mapleleaf grape can use a variety of habitat types including cottonwood gallery forest, midgrass prairie, pinyon juniper woodland, riparian, and rocky upland prairie (Kuhn et al. 2011). Hazlett (2004) considers it a riparian/wetland species, but observation records show it can use a broader array of habitats including rock outcrops in prairie. Callen (2016) characterize its habitat as including ravines, alluvial floodplain woodlands, dunes, rocky slopes, and fencerows, but also note it “exhibits a preference for habitats in the vicinity of streambanks.” It generally tolerates warm and dry environments (Callen et al. 2016). Grapevines are typically more common in early successional areas, including forest gaps (Morano and Walker 1995).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species uses both streamside habitat and rocky hillsides (Ackerfield 2022). Occurrence records show the species uses a mix of habitat types in the plan area, including limestone outcrops, rock outcropping over sandsage prairie, and riparian area in canyon bottom. Collectively, these habitats are not restricted in the plan area.

Critical biological characteristics

Mapleleaf grape is a perennial, shrublike sprawling vine (Callen et al. 2016). It is considered a valuable wild relative of the cultivated wine grape due to its potential as rootstock, resistance to pathogens, and tolerance to salt, drought, and boron (NatureServe 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Mapleleaf grape is considered to have a high resistance to pathogens, and tolerance to salt, drought, and boron (NatureServe 2025). The plants show some resistance to powdery mildew and to root-knot nematodes and have been suggested as a novel source of rootstock as vineyards are affected by climate stressors (NatureServe 2025). It seems to have low climatic sensitivity to changes in precipitation or temperature (Baumgartner et al. 2020).

Maps of Species Range

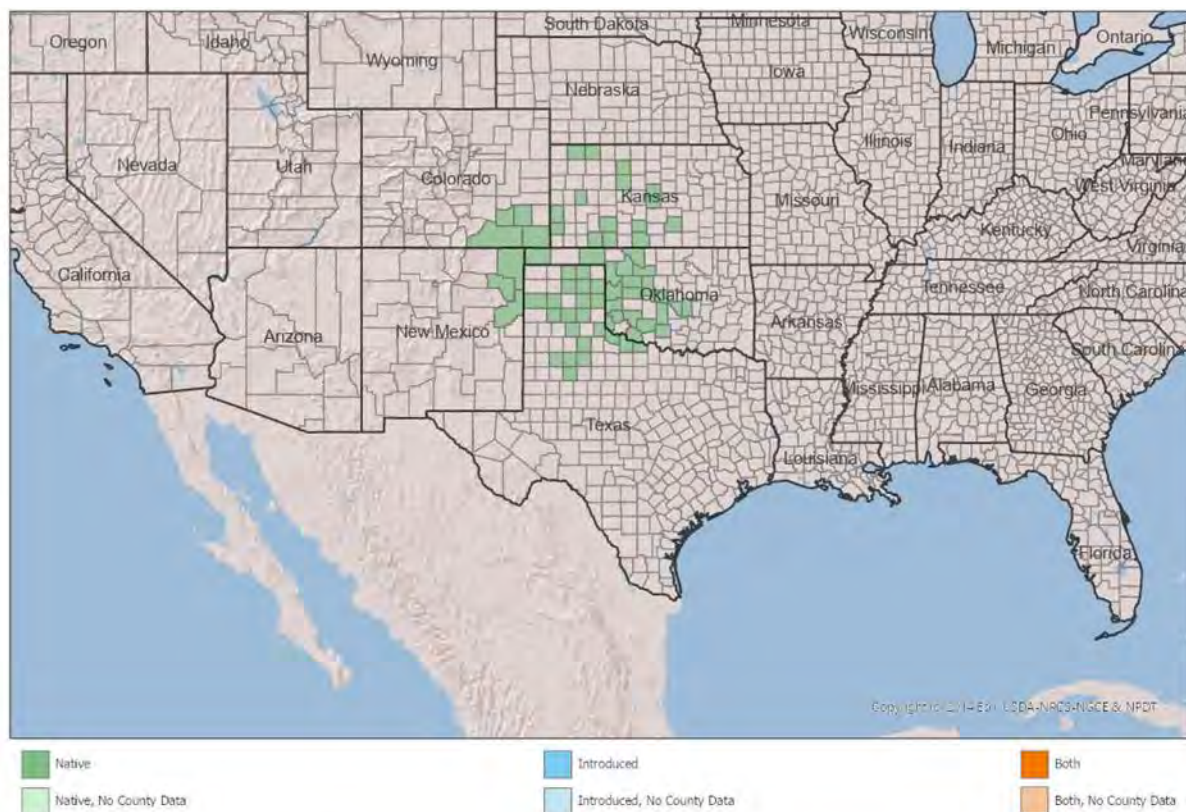


Figure 105. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

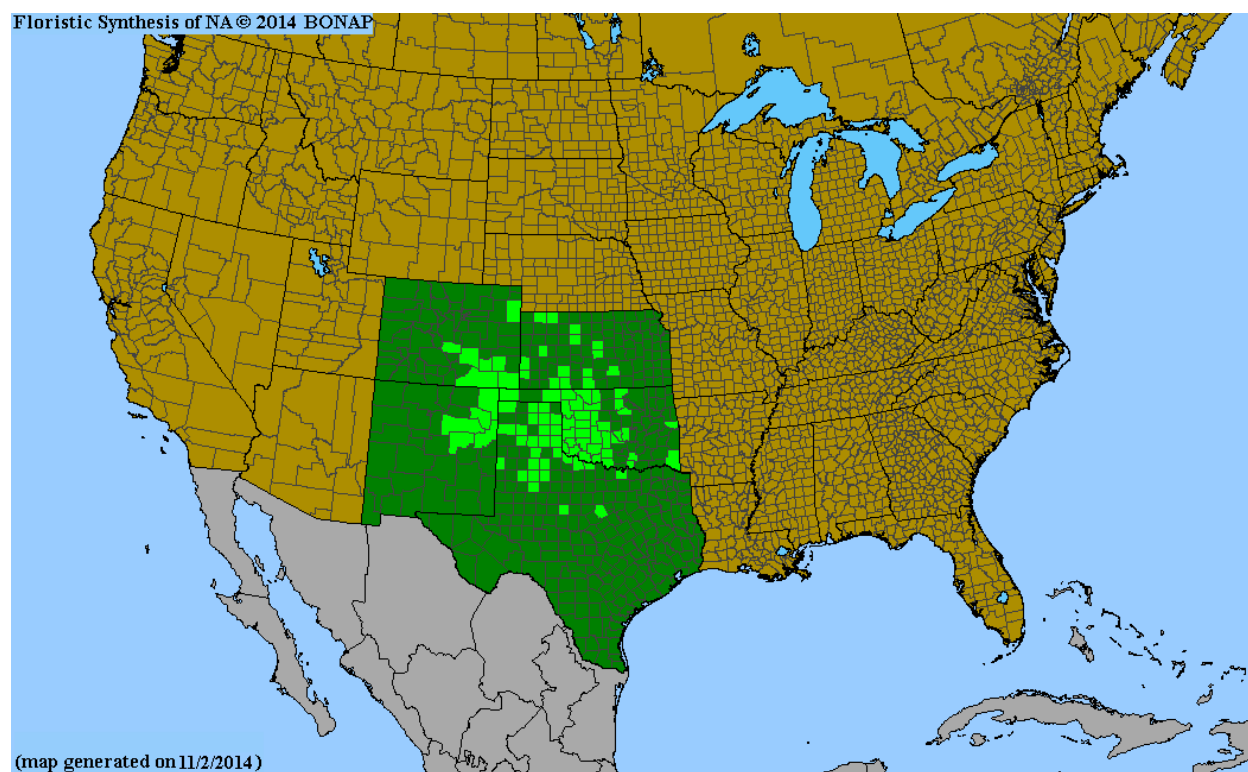


Figure 106. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Marshweed

(*Flaveria campestris*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: GBIF has two occurrence records in the Cimarron National Grasslands, both from 1962 (Van Scoyoc 2024). These records have high spatial uncertainty; the locality is described as "Elkhart, 7 Mi N And 1/2 Mi E Off Hwy 27." There is insufficient precision associated with these records to demonstrate that the species is known to occur in the plan area.

Year of Last Known Occurrence: N/A

Species Status

G4; S2 in Colorado; S1 in Kansas.

May grass

(*Phalaris caroliniana*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has three occurrence records in the Comanche National Grasslands from 1944 to 2007 (Van Scoyoc 2024). The record from 2007 has sufficient spatial precision to demonstrate the species is known to occur in the plan area. The species has S1 status in Colorado, there is a record in the county from 1944, and USDA NRCS considers the species native to Baca County (NRCS 2025).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No known threats.
 - b. Habitat: Habitat alteration from groundwater depletion and invasive species (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: Wetland and riparian habitat have declined in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Size is not known; three occurrence records, but only one definitively within the plan area.
 - b. Ecological conditions: facultative wetland species; usually occurs in wetlands but can also use non-wetlands including disturbed moist areas.

Species Status

G5; S1 in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Phalaris caroliniana* as valid; another common name is Carolina canarygrass (NRCS 2025).

Species range

Overall Species range:

May grass is widely distributed across the southern United States and northern South America, Puerto Rico (where it may be introduced) and in Europe and Australia, where it is introduced (SEINet 2024).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure X).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. Occurrence records give no indication of the number of individuals observed. SEINet states that "It is a common species in suitable habitats through much of the southern portion of the Flora region and in northern Mexico," (SEINet 2024).

Habitat

May grass is associated with wet, marshy, and swampy ground (Hazlett 2004, SEINet 2024). It can also occur in waste places, moist disturbed areas such as roadsides, and wet fields (SEINet 2024). Within the plan area, it has been documented in Holt Canyon and may also occur along Timpas Creek (Van Scoyoc 2024). Riparian and wetland habitat has declined in the plan area due to the dropping groundwater table and the presence of nonnative invasive plant species such as tamarisk (Caleb et al. 1996).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (NatureServe 2025, SEINet 2024).

Habitat

No consulted sources identified threats to habitat (NatureServe 2025, SEINet 2024).

Ecological conditions

Ecological condition requirements

USDA NRCS considers this species a "facultative wetland" species that usually occurs in wetlands but may also occur in non-wetlands in the Great Plains region (NRCS 2025). It requires loamy and alluvial soils with sufficient moisture.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species is a facultative wetland species, which means it usually occurs in wetlands but may also occur in non-wetlands. Riparian and wetland habitats are limited in the plan area (Hazlett 2004). Based on National Wetlands Inventory data, the approximate extent of riparian and wetland habitat is ~1% of the total plan area. However, this species can also use moist disturbed areas such as roadsides (SEINet 2024).

Critical biological characteristics

May grass is an annual canary grass (SEINet 2024). Flowering occurs from July through August (SEINet 2024). The species is invasive in some parts of the world (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

May grass grains have high nutritional value and were used as a food resource by prehistoric human populations (Crites and Terry 1984). It has been associated with grass toxicosis in cattle (Binder et al. 2010).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Anthropogenic processes may create favorable habitat for this species (open/disturbed ground that the species can colonize) (Crites and Terry 1984).

Maps of Species Range

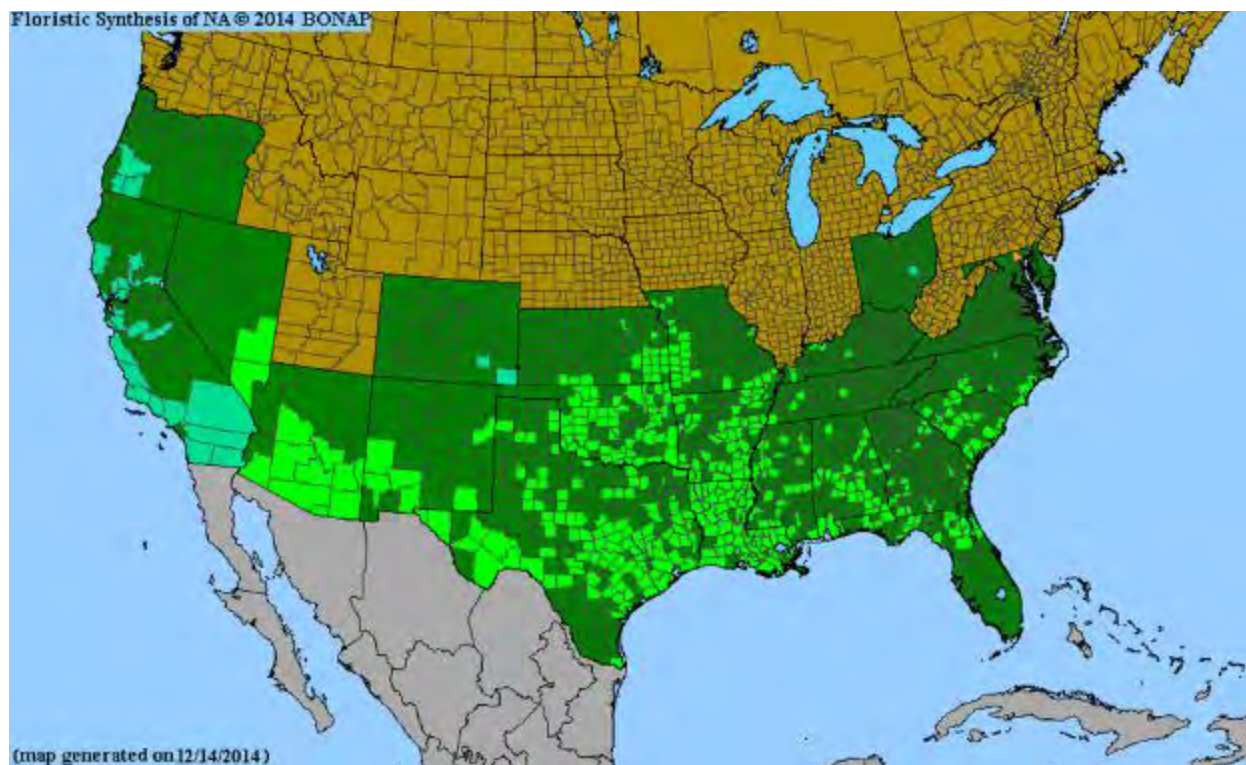


Figure 107. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county; teal indicates species native but adventive in state.

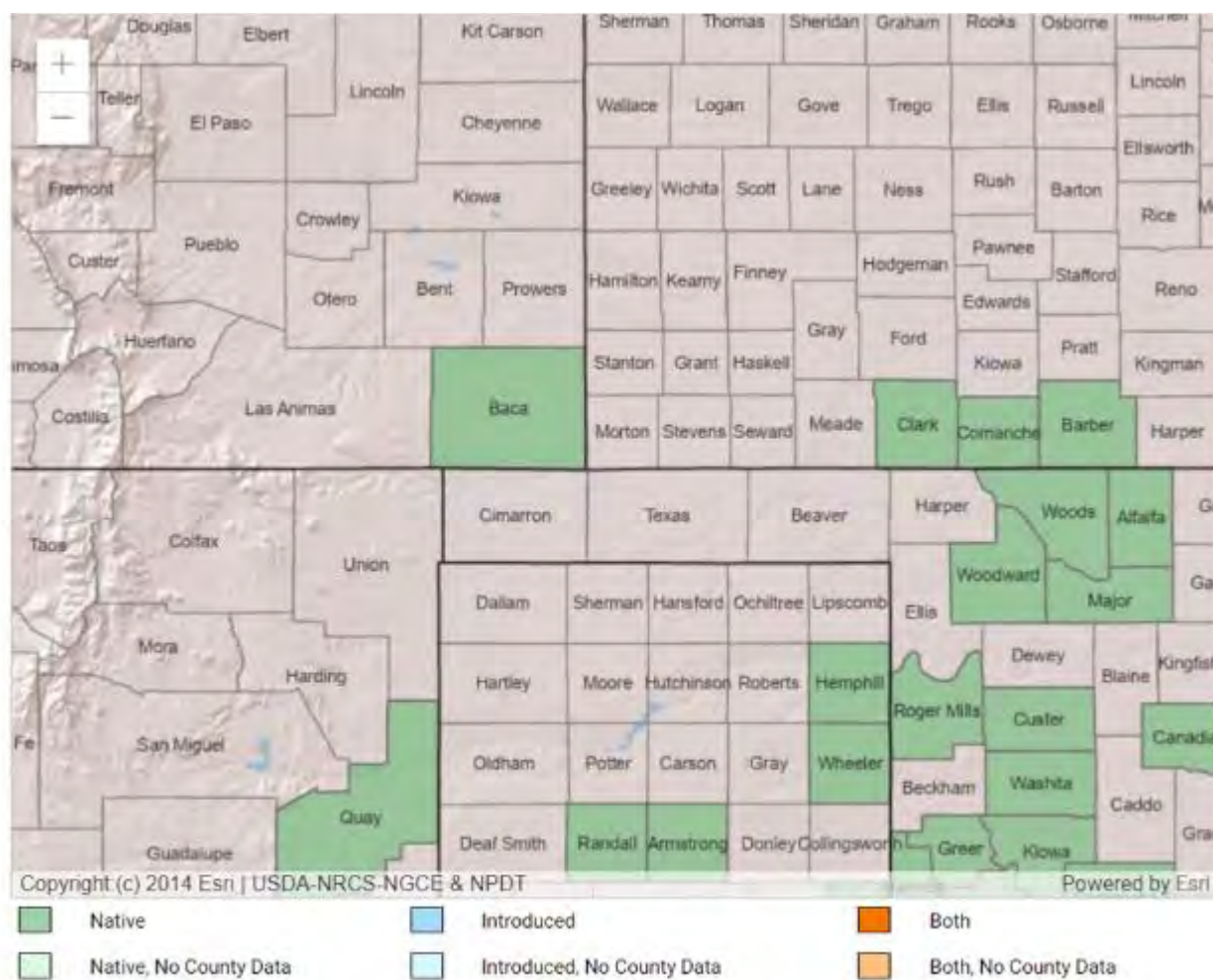


Figure 108. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Meadow flax

(*Linum pratense*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has two occurrence records in the Cimarron National Grasslands, both from 1989 (Van Scoyoc 2024). The locality descriptions of both records states "Cimarron National Grassland"; therefore, the species is considered known to occur in the plan area.

Year of Last Known Occurrence: 1989

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: none known.
 - b. Habitat: none known.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: uses varied habitat types; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is not at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; there are two occurrence records in the plan area which may indicate the species is scattered and scarce where it occurs.
 - b. Ecological conditions: uses varied dry, open habitats, including shortgrass prairie and rocky outcrops.

Species Status

G5; S4 in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Linum pratense* as valid; *Adenolinum pratense* and *Linum lewisii* var. *pratense* are taxonomic synonyms (NRCS 2025). Another common name is Norton's flax (Hazlett 2004).

Species range

Overall Species range:

Meadow flax is distributed in the southwestern United States and Nebraska (Figure 109, Figure 110).

Description of how the population in the plan area fits within the overall range:

The plan area is not endemic, disjunct, or at the edge of the species' range (Figure 109, Figure 110).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. The two occurrence records in the plan area from 1989 describe species as "scattered" and "scarce." The species is not considered rare in any counties that overlap the plan area (Figure 110).

Habitat

Meadow flax is found in open steppe, midgrass prairie, pinyon-juniper woodland, rocky upland prairie, shortgrass prairie, and sandsage prairie at elevations from 3,350-5,740 ft (Hazlett 2004, Kuhn et al. 2011). Within the plan area, it has been documented in rocky, calcareous outcrops of Ogallala Formation at edge of shortgrass prairie on the Cimarron National Grassland (Van Scoyoc 2024). Trends associated with these various habitat types (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats this species' populations (Hazlett 2004, Kuhn et al. 2011, NatureServe 2025, SEINet 2024).

Habitat

Threats common to shortgrass prairie and sandsage prairie (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

This species can use varied habitat types (Kuhn et al. 2011). It often occurs in open, sunny, hot locations (Uno 1984). Small insects and self-pollination (Uno 1984).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The genus *Linum* is composed of species which frequently colonize open, dry habitats and rocky or well-drained soils (Hazlett 2004, Uno 1984). These habitats are not restricted in the plan area.

Critical biological characteristics

Meadow flax is an herbaceous annual; it is considered "a common roadside herbaceous weed" (Uno 1984). Self-pollination is the predominate mode of reproduction and may be facilitated by small insects (Uno 1984).

Important ecological and biological interactions

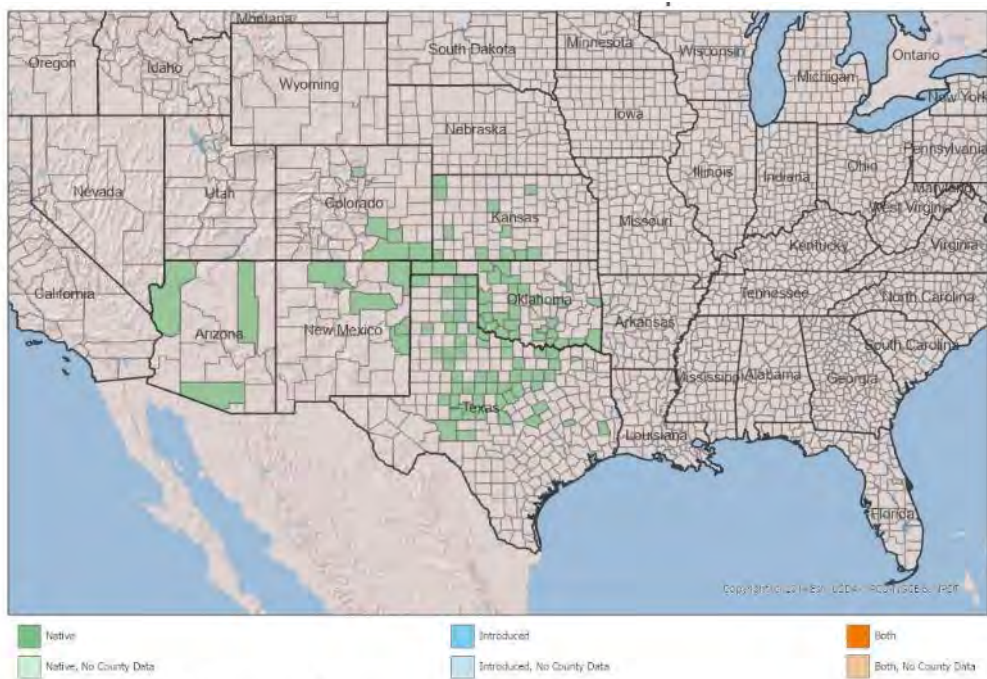
How (or if) this species influences other species or ecosystem diversity or integrity

Meadow flax seems to attract few large insects (mostly tabanid flies), but its flowers do serve as aggregation sites for small insects including beetles (coleopterans) and flies (dipterans) (Uno 1984). These small insects are suspected to help with self-pollination of the flowers (Uno 1984).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range



LPR: *Linum pratense* (Norton) Small, meadow flax
Tuesday, Jul 2, 2024

Figure 109. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

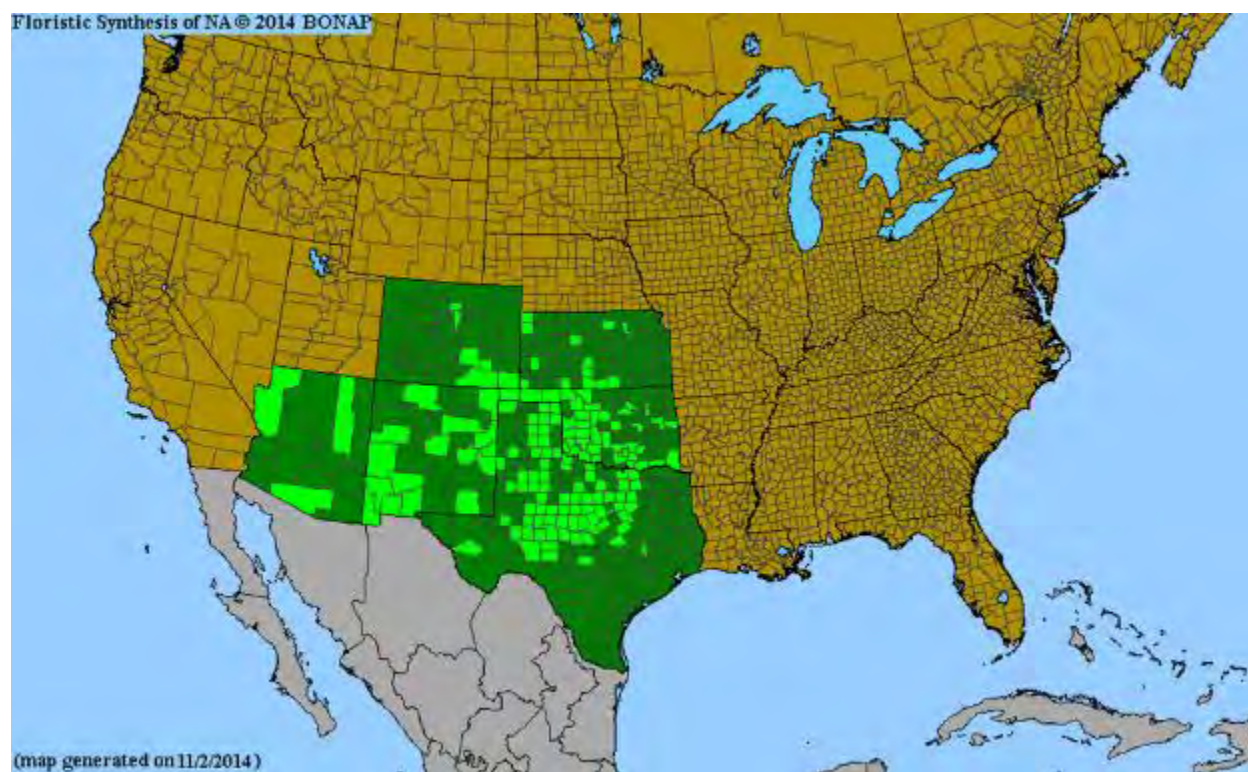


Figure 110. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Narrowleaf purple coneflower

(*Echinacea angustifolia*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has one occurrence record in the Cimarron National Grasslands from 1989 (Van Scoyoc 2024). The locality description for this record states “Cimarron National Grassland.” The record is for *Echinacea angustifolia* var. *angustifolia*; see Taxonomy discussion below. The record demonstrates the species is known to occur in the plan area, although there is taxonomic disagreement on the status of the variety. SEINet also has two occurrence records from 2007 and 2023 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: excessive commercial harvest, inbreeding depression from habitat fragmentation, oil and gas development.
 - b. Habitat: fire suppression, mowing, herbicide use to control noxious weeds, conversion of prairie to pasture, intensive grazing, and oil and gas development.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available, but species has declined across its range.
 - b. Habitat: habitat quality and quantity in the plan area has declined because of oil and gas development in the species' occupied habitat and fire suppression.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the western edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: there are between 1 to 3 occurrences in the plan area; occurrences in the plan area are noted to range from scattered to common and are distributed east to west across plan area.
 - b. Ecological conditions: varied habitat types including shortgrass prairie and roadsides which are not restricted in the plan area.

Species Status

G5; S2 in Colorado; S5 in Kansas.

Taxonomy

USDA NRCS recognizes *Echinacea angustifolia* var. *angustifolia* as valid; *Brauneria angustifolia* and *Echinacea pallida* var. *angustifolia* are taxonomic synonyms (NRCS 2025). USDA Plants recognizes both the species and two different varieties as valid – the var. *strigosa* does not occur near the plan area. Analysis of the range of the species here is based upon the taxa without varieties.

NatureServe does not have a rank for the variety because they state: "Varieties of *Echinacea angustifolia* are not considered distinct in the Flora of North America treatment (2006c) following the work of Binns et al. (2002) that found the varieties indistinguishable. Likewise, Ackerfield (2022) does not recognize any varieties of *Echinacea angustifolia* Weakley and Southeastern Flora Team (2023) retain these varieties, following the monograph by R.L. McGregor (1968)," (NatureServe 2025).

Species range

Overall Species range:

Narrowleaf purple coneflower is widespread throughout the Great Plains region of North America (NatureServe 2025).

Description of how the population in the plan area fits within the overall range:

The plan area is at the western edge of the species' range (Figure 111, Figure 112).

Distribution, abundance, and trend in the plan area

Population:

Across its range, narrowleaf purple coneflower has declined by 10-30% (NatureServe 2025). Declines have been documented in fire-suppressed prairie remnants (Dykstra 2013, Wagenius et al. 2020). Within the plan area, the population size and trend are not known. One record in the Cimarron National Grassland from 1989 states narrowleaf purple coneflower was "scattered" on the south side of the Cimarron River (Van Scoyoc 2024). One record from the Comanche National Grassland from 2023 describes species as "Estimated frequency within viewshed: Common (101-500)." It is not considered rare in any counties that overlap the plan area (Figure 112), but Hazlett (2004) states it is rare in Colorado. There are many occurrence records adjacent to the Comanche National Grassland (Van Scoyoc 2024).

Habitat

Across its range, narrowleaf purple coneflower grows in full sun in dry, mixed and tall grass prairies, rocky barrens, and limestone bluffs at elevations from 320-5,250 ft (SEINet 2024, NatureServe 2025). Two active oil wells occur 2,000 feet of one occurrence record in the Cimarron National Grassland, along with pipelines and surface disturbance associated with this infrastructure. This, along with a highly departed fire return interval for the prairie ecosystems in the plan area, are expected to have contributed to a decline in habitat quality and quantity for this species.

Threats (arising from on or off the plan area)

Population

Populations of narrowleaf purple coneflower may be threatened by excessive commercial harvest. NatureServe states that in "north central Kansas, this species has been harvested commercially for over 100 years (Price and Kindscher 2007) but interviews with wild harvesters revealed that 'experienced diggers use practices that moderate harvest intensity by rotating harvest areas and selectively harvesting at low density' (Price and Kindscher 2007). Excessive commercial harvest for medicinal purposes is a

potential future threat depending on the demand of the market, local economics, and the standing of cultivated sources. When roots are shallowly harvested with less root length removed, plants can resprout; one study found 50% of plants resprouted at harvest sites. This research suggests that the species is capable of recovering after severe harvest if the plants are given time to recover (Kindscher et al. 2008). Castle et al. (2014) assessed the risk of overharvest as moderate for this species based on life history, effects of harvest, populations size, habitat, and demand including the consideration availability of cultivated resources.” (NatureServe 2025)

Habitat fragmentation also threatens populations by producing isolated and small populations that are subject to inbreeding depression leading to decreased reproductive success (NatureServe 2025). Oil and gas development may pose a threat to the species’ population in the plan area given proximity of this infrastructure to the one documented occurrence record.

Habitat

Fire suppression resulting in habitat succession, mowing, herbicide use to control noxious weeds, conversion of prairie to pasture, intensive grazing, development are all threats to habitat for narrowleaf purple coneflower (NatureServe 2025). Oil and gas development may pose a threat to the species’ habitat in the plan area given proximity of this infrastructure to the one documented occurrence record.

Ecological conditions

Ecological condition requirements

This species can use varied habitat types, including tallgrass prairie, midgrass prairie, juniper woodland, and rocky barrens (NatureServe 2025, SEINet 2024, Kuhn et al. 2011), (Dykstra 2013). It can use rocky to sandy-clay soils (SEINet 2024). It requires full sun, and freedom from the threats identified above. It needs enough compatible mates to ensure reproductive success; this tends to be the limiting factor for the species rather than a shortage of pollinators (Wagenius et al. 2020). Dykstra (2013) suggests that “the smallest populations may benefit from artificial gene flow in the form of pollen or seed from other populations (genetic rescue).”

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species can use varied habitat types but requires freedom from being outcompeted by woody and large herbaceous species that tend to dominate in the absence of a natural fire regime (Wagenius et al. 2020). Lack of fire may currently limit narrowleaf purple coneflower distribution in the plan area, as the unit has a history of aggressive fire suppression and highly departed fire return interval for the prairie ecosystems (USFS 2005a). Narrowleaf purple coneflower also requires sufficiently large populations to maintain reproductive success (Dykstra 2013). Though there are limited occurrence records in the Cimarron, there are many occurrence records around the Comanche National Grassland.

Critical biological characteristics

Narrowleaf purple coneflower is a long-lived perennial forb in the Aster family (Asteraceae) that takes several years to reach sexual maturity (NatureServe 2025). This species has a deep tap root and coarsely hairy leaves that provide resilience against drought and other disturbances (NatureServe 2025). Flowering occurs late spring to midsummer (SEINet 2024). It is pollinated by native bees (Wagenius et al. 2020). Its seeds are dispersed by wind, gravity, and likely birds (NatureServe 2025). This species is drought and disturbance tolerant and produces abundant seed in favorable conditions (NatureServe 2025). Recruitment rarely occurs from dormant seeds (Dykstra 2013).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species is pollinated by generalist insects (Dykstra 2013).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Fire synchronizes reproduction, leading to increased mating opportunities and improved reproduction for this species (Wagenius et al. 2020). However, once populations are reduced to very low numbers, reversing population decline through prescribed or natural periodic fire may be unlikely (NatureServe 2025). Controlled burns at some occurrences may encourage population growth in larger populations, but the impact of fire was diminished for small populations (<20 individuals) (NatureServe 2025).

Maps of Species Range

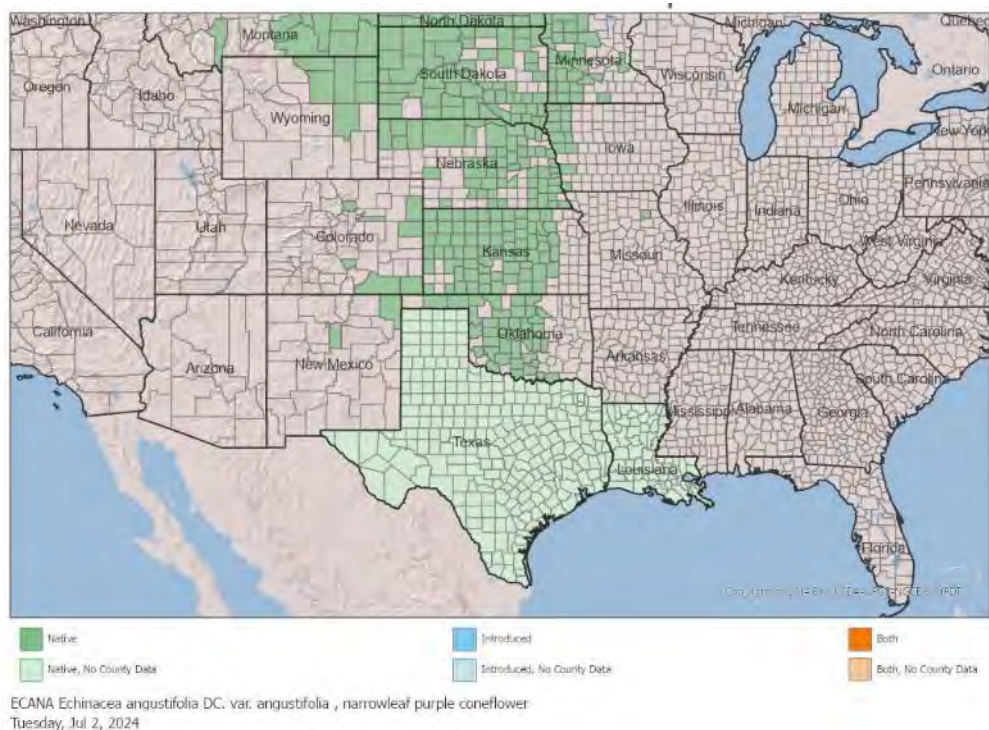


Figure 111. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

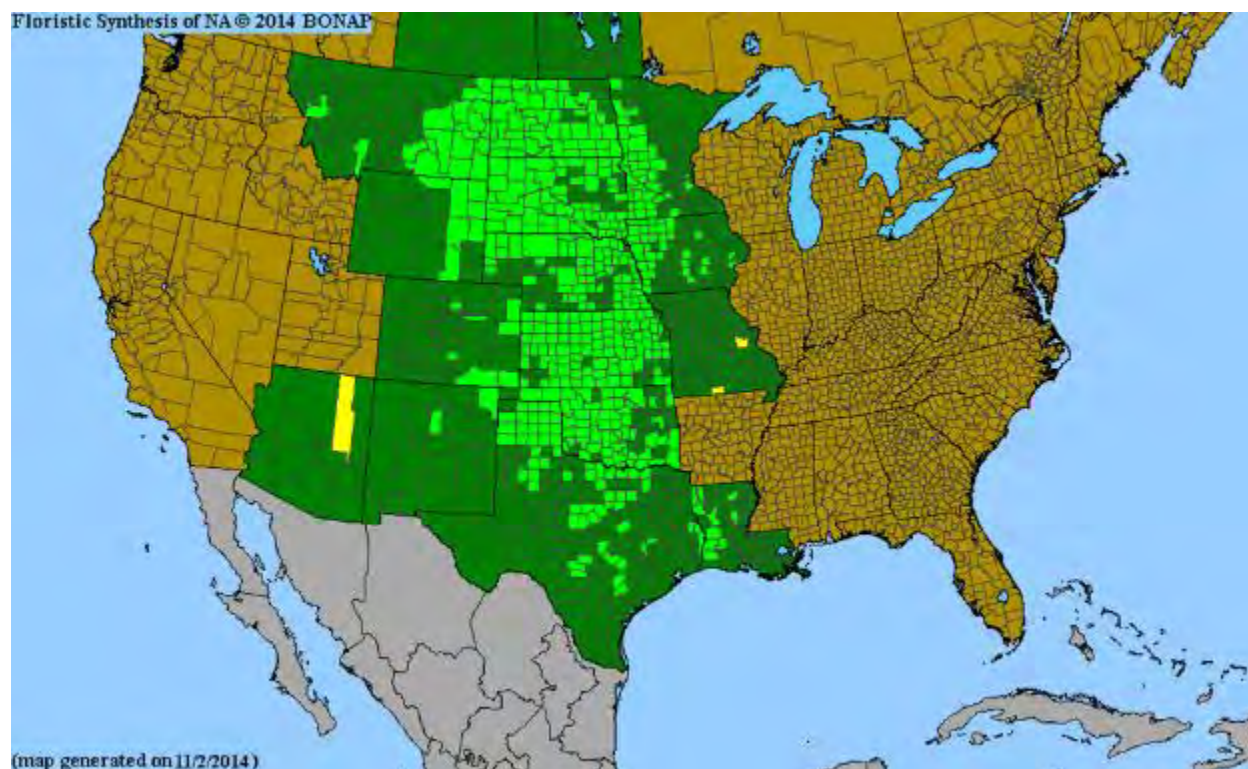


Figure 112. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Narrowleaf willow

(*Salix exigua*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: SEINet has two occurrence records: one from 2007 and one from 2023 (Van Scoyoc 2024). Both these records have sufficient precision to demonstrate that this species is known to occur in the plan area. However, the S1 ranking for *Salix exigua* in Kansas is the result of taxonomic confusion and legacy data rather than true rarity.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Insects, overgrazing, trampling, and heavy wildlife browsing.
 - b. Habitat: Climate stressors and lack of natural disturbance regime.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: Wetland habitat has declined in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Neither distinct taxa is endemic, disjunct, or at the edge of the range in the plan area.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Taken either individually or collectively there are dozens of occurrences in the plan area.
 - b. Ecological conditions: Facultative wetland species; wetland habitat is restricted in the plan area.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

Salix exigua is accepted as valid, with many taxonomic synonyms and varieties (Ackerfield 2022, NRCS 2025, Weber et al. 2012). There are two distinct taxa (as either individual species (*Salix exigua*) and (*Salix interior*) or as varieties or subspecies of the parent species (var/subspecies *exigua* and var/subspecies *interior*) present in the plan area, making database searches confusing, confounding, and incomplete because as a whole they present the 2 taxa as 4 taxa. Other common names are coyote willow (Ackerfield 2022) and sandbar willow (Weber et al. 2012). There is reason to conclude that the S1 ranking for Kansas is an artifact of taxonomic issues (incompletely incorporated synonymy where vars and distinct species are not treated as the same taxa) rather than true rarity.

Species range

Overall Species range:

Narrowleaf willow is distributed through most of western North America, from California east to Texas and north to Canada; south to northern Mexico (SEINet 2024) (Figure 113, Figure 114).

Description of how the population in the plan area fits within the overall range:

The plan area is at the eastern edge of the species' range (Figure 113, Figure 114). In Kansas, it is known only from Morton County (Figure 114).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. This is one occurrence record from the Cimarron and one from the Comanche. The collection from the Comanche states "Estimated frequency within viewshed: Frequent (11-100)." It is not considered rare in any counties that overlap the plan area (Figure 113), although BONAP does not show it occurring in Morton County, Kansas. The species is considered critically imperiled in Kansas. Lemly and Culver (2013, 2013) describe the species as "Abundant and common along streams and rivers, ditches and floodplains throughout Colorado."

Habitat

Across its range, narrowleaf willow occurs in thickets along watercourses at elevations from 1,000-8,500 ft (SEINet 2024). It is most common on sandbars, mudbars, and moist alluvial soil (SEINet 2024). Within the plan area, narrowleaf willow has been documented in a sandy wash near mouth of Picture Canyon on the Comanche National Grassland and in the sandy pond banks at Point of Rocks on the Cimarron National Grassland. Riparian and wetland habitat has declined in the plan area due to the dropping groundwater table and the presence of nonnative invasive plant species such as tamarisk, although narrowleaf willow commonly co-occurs with tamarisk (Caleb et al. 1996)(Anderson 2006).

Threats (arising from on or off the plan area)

Population

Narrowleaf willow is susceptible to predation by insects, including leaf mining beetles, lepidopterans, sawflies, and galling insects (Anderson 2006). This species is vulnerable to heavy grazing, trampling, and wildlife browsing pressure, and can take years to recover from heavy pressure (Anderson 2006).

Habitat

Narrowleaf willow is adapted to most forms of disturbance, and lack of regular, natural disturbance (e.g., via river management and regulation) can reduce the species habitat and its genetic diversity by promoting clonal growth over seedling regeneration (Douhovnikoff et al. 2005). Projected climatic conditions may negatively affect the availability of wetland habitat on which this species relies.

Ecological conditions

Ecological condition requirements

In the Great Plains, narrowleaf willow is a Facultative Wetland species on the National Wetland Plant List (Lichvar et al. 2016), meaning it usually occurs in wetlands, but may occur in non-wetlands. It is adapted to coarse- and medium-textured soils (NRCS 2025). An intermediate level of soil fines (e.g., mean of 15–25%) is important for this species, as too many fines can result in limited aeration and restricted root growth and too few fines can translate to low water holding capacity and a propensity for periodic drought stress (Caplan et al. 2012). It has high fire tolerance, medium drought tolerance, intermediate shade tolerance, and low soil fertility requirements (NRCS 2025). It is very tolerant of flooding, but seedlings require protection from intense scouring during floods (Anderson 2006). It requires gradual declines in the water table because abrupt declines in water table (>0.8 inch/day) reduce growth and survival (Anderson 2006). It is primarily pollinated by insects (Anderson 2006).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species is a facultative wetland obligate species. Riparian and wetland habitats are limited in the plan area (Hazlett 2004). Based on National Wetlands Inventory data, the extent of riparian and wetland habitat is ~1% of the total plan area. Despite the limited amount of wetland/riparian habitat, this species has a wide elevational range and can grow in a variety of habitat types provided it has suitable microhabitat with moist or wet soil (e.g., in plains, desert shrub, along streams, gravel bars, lakeshores, and ditches) (Anderson 2006).

Critical biological characteristics

Narrowleaf willow is a perennial shrub with rhizomatous, rapid growth (NRCS 2025). Narrowleaf willow is a pioneer species and is one of the first species to colonize fresh alluvial deposits (Anderson 2006). Reduced disturbance results in greater clonal growth and reduced genetic variation for this species (Duhovnikoff et al. 2005).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Willows are also an important component of riparian ecosystems and help stabilize streambanks, provide stream shading, and contribute to input of organic matter; willows are an extremely important browse for moose, deer and elk, provide cover for nongame birds, game birds, waterfowl, small mammals, amphibians, and nesting habitat for migratory passerines (Lemly and Culver 2013, Culver and Lemly 2013). Narrowleaf willow may form extremely dense stands, essentially excluding other shrub species (Anderson 2006). This species is commonly used for riparian revegetation projects (Caplan et al. 2012).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Narrowleaf willow is adapted to most forms of disturbance (Anderson 2006). It is top-killed by fire but readily resprouts and is among the first species to appear following fire (Anderson 2006). However, after

fire, livestock grazing in the first 2 to 3 years may substantially damage young, palatable willow stems (Anderson 2006).

Maps of Species Range

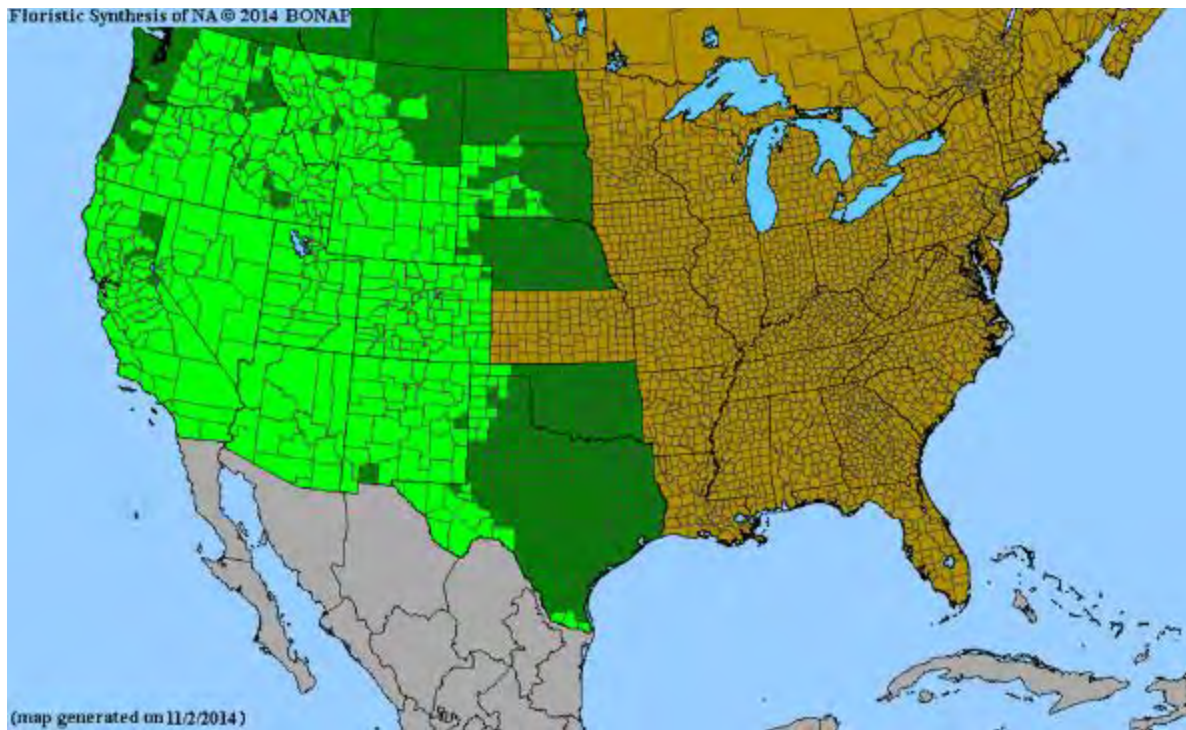


Figure 113. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

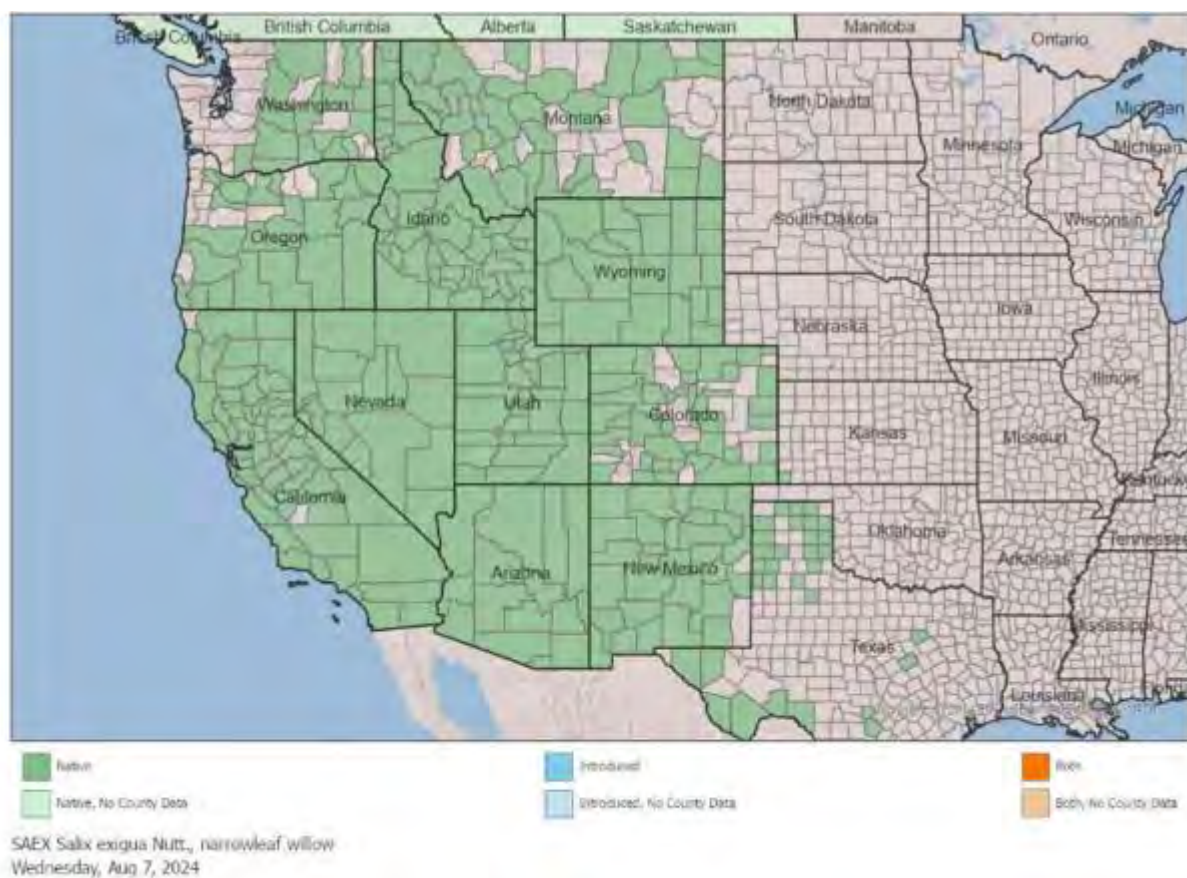


Figure 114. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Nealley's dropseed (*Sporobolus nealleyi*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is at least one occurrence record on the Comanche National Grassland from 1997 (Van Scoyoc 2024). This occurrence record has a spatial uncertainty of $\pm 1,000$ m but the locality description states, "Picket Wire Canyonlands, Comanche National Grassland; Top of Eroded Knob Overlooking The Purgatoire River."

Year of Last Known Occurrence: 1997

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No significant threats are known from the consulted sources.
 - b. Habitat: Sandsage prairie is threatened by grazing, fire suppression resulting in woody encroachment, and energy development.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends are unknown from the consulted sources.
 - b. Habitat: Sandsage prairie vegetation type is declining in habitat quality.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The occurrence in the plan area is on the northeastern edge of the species' range
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There is one documented occurrence record in the plan area. Population numbers are unknown.
 - b. Ecological Conditions: Ecological conditions are not restricted.

Species Status

G5; S2 in Colorado.

Taxonomy

Sporobolus nealleyi is accepted as valid (Ackerfield 2022, NRCS 2025, Weber et al. 2012). Another common name for this species is gyp dropseed (Ackerfield 2022, NRCS 2025).

Species range

Overall Species range

The range includes Texas, Nevada, Arizona, New Mexico and south into Coahuila, Mexico (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The population in the plan area is on the northeastern edge of the species' range (Figure 115).

Distribution, abundance, and trend in the plan area

Population

There is one documented occurrence record for the species from 1997, the occurrence record does not specify population size or trend.

Habitat

Sandy, gypsiferous and/or alkaline soil, and blowing gypsum sands (NatureServe 2025). In Colorado, Nealley's dropseed inhabits gypsum flats and dry slopes from 4200 to 7500 feet (Ackerfield 2022). Hazlett (2004) documented the species in "open steppe" in Otero County, CO.

The sandsage prairie community type is found in association with dune fields and other areas of sandy habitat throughout a large area of the western Great Plains, from South Dakota and Wyoming south into Texas and New Mexico. It is the second-most widespread vegetation type in the plan area, and the most abundant type for the Cimarron National Grassland, specifically (USFS 2005a). In Kansas, the sandsage prairie habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of the historic sandsage habitat has been lost or converted for agricultural uses (CPW 2015). The remaining tracts have good landscape connectivity, but the species composition is highly altered (CPW 2015).

Threats (arising from on or off the plan area)

Population

Unknown.

Habitat

For sandsage prairie at a broad scale, the primary threats to sandsage prairie are loss and fragmentation of habitat and degradation of ecological integrity (e.g., conversion to agriculture, expanding exurban development, construction of roads, energy development, encroachment of woody plants, and targeted eradication of sandsage with herbicide) (Locklear 2021, CPW 2015, Rohweder 2022). Weather, climate, fire and grazing constitute the most important processes impacting this system, and these processes are also interactive (Locklear 2019). While sandsage prairie is fairly resilient to the effects of drought in the Great Plains, there are biological limits to the ability of this vegetation to tolerate prolonged episodes of severe drought and may be at the limits of its drought tolerance in southeastern Colorado (Rondeau et al. 2018, Locklear 2019).

At the unit level, grazing occurs over most of the plan area across both states. Long-term continuous grazing of domestic livestock has considerably altered these shrubland habitats from their pre-settlement condition (Rohweder 2022). Generally, domestic livestock grazing tends to favor the increase of sandsage over associated native grasses therefore decreasing herbaceous cover. Fire is an important disturbance process for sandsage prairie, and fire suppression has caused encroachment of woody species such as eastern redcedar (Locklear 2019) and less mosaiced successional conditions (USFS 2008). Oil and gas drilling and associated infrastructure is another threat that may reduce or fragment this

habitat, but the extent of this has not been quantified at this time. This activity only occurs on the Cimarron National Grassland.

While habitat loss and deleterious management practices are recognized as threats to sandsage prairie vegetation, the significance of these losses to the larger Great Plains ecoregion has not been examined (Locklear 2021).

Ecological conditions

Ecological condition requirements

Found in sandy and gravelly soils, usually in those derived from gypsum, or near alkaline habitats associated with desert grasslands, from 2,000- 10,000 ft (610-3048 m), and flowers from August to October (SEINet 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The ecological conditions are widely dispersed across the plan area, but the sandsage prairie community has a declining trend in habitat quality in the plan area.

Critical biological characteristics

Unknown.

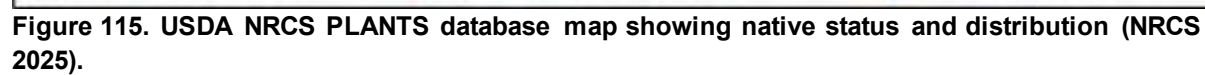
Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.



New Mexico blackberry

(*Rubus neomexicanus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has two occurrence records on the Comanche National Grassland from 1948 and 2022 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: habitat alteration.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: Riparian habitat in the plan area is declining (see Threats and Trends Appendix), species is associated with moist sites.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are two known occurrences in plan area. One occurrence record states "Estimated frequency within viewshed: Occasional (6-10)."
 - b. Ecological conditions: occupies varied habitats including forested and riparian areas, and canyons. Species is associated with moderately moist sites which is a restricted ecological condition in the plan area.

Species Status

G5; S1 in Colorado.

Taxonomy

USDA NRCS recognizes *Rubus neomexicanus* as valid; taxonomic synonyms are *Oreobatus deliciosus* and *Rubus exrubicundus* (NRCS 2025). SEINet also states that "There is a little uncertainty in the Taxonomy of this species, with some referring to it as *R. deliciosus* var. *neomexicanus*," (SEINet 2024).

Species range

Overall Species range:

New Mexico blackberry has a limited distributed within the southwestern United States. It occurs in Arizona, southern Colorado, New Mexico, and southern Utah (Figure 116).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure 116).

Distribution, abundance, and trend in the plan area

Population:

The occurrence record from 2022 states "Estimated frequency within viewshed: Occasional (6-10)."

Habitat

New Mexico blackberry is associated with forested and riparian areas, mountain slopes and canyons at elevations from 4,600-9,400 ft (Brasher 2001, SEINet 2024). It prefers a moderate supply of moisture (SEINet 2024). Within the plan area, it has been documented in Carrizo Canyon and may also occur in Sand Canyon (Van Scoyoc 2024). In Carrizo Canyon, it occurred in riparian cottonwood willow and shrubland forest on canyon wall/vertical cliffside in sandstone soils.

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Brasher 2001, NatureServe 2025, SEINet 2024).

Habitat

Threats associated with riparian ecosystems (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

This species can use several habitat types but prefers a moderate supply of moisture (SEINet 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

While the species is associated with varied habitat types, including, riparian and canyon habitats (SEINet 2024). However, the species is associated with places which have a moderate supply of moisture which represents a restricted ecological condition.

Critical biological characteristics

New Mexico blackberry is a perennial, erect shrub (Brasher 2001). The fruits are described as “hardly palatable” (Brasher 2001).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Although there is limited information specifically for this species, the fruits of most species in the genus *Rubus* are generally a source of food for a small birds and mammals, and the brambles can provide shelter and nesting sites.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found for this species.

Maps of Species range and Known Occurrences in Plan Area

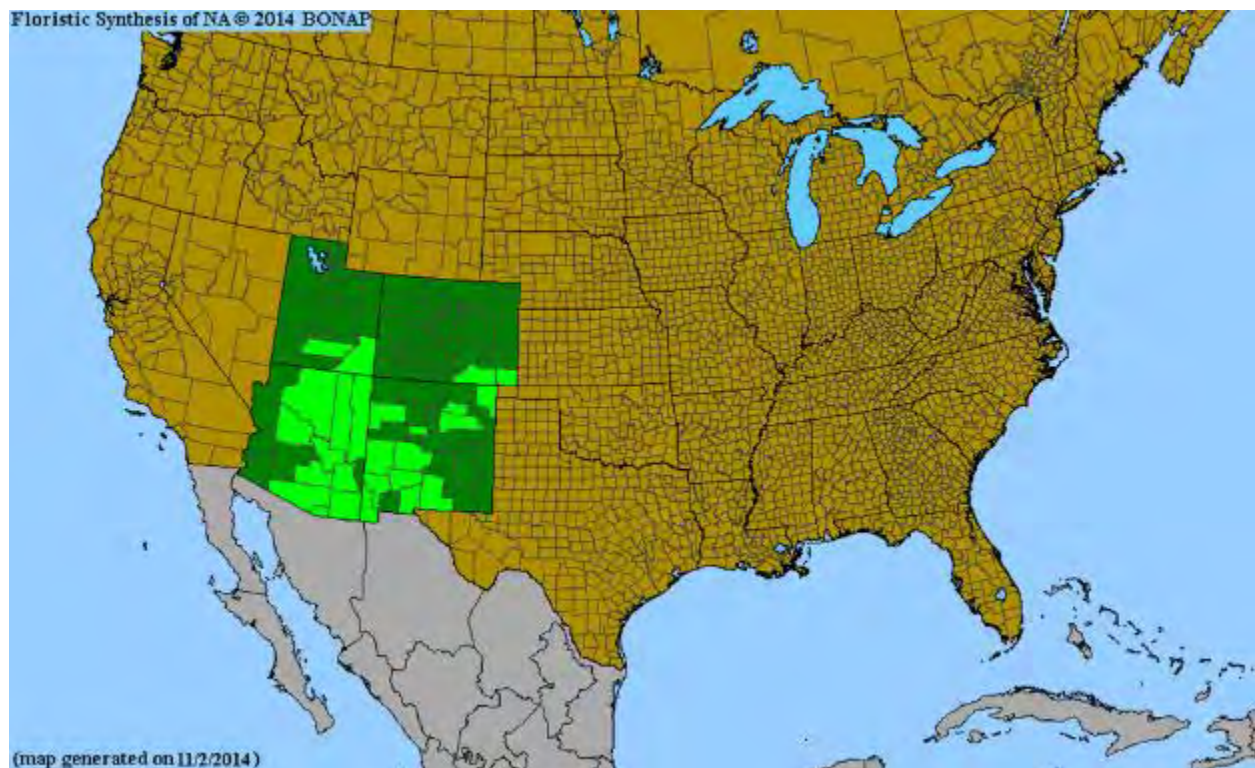


Figure 116. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county; teal indicates species native but adventive in state.

Oklahoma plum

(*Prunus gracilis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: CNHP contains one Level 2 element occurrence record in the plan area from 1981 (EO ID 17061) (CNHP 2024); KNHP contains two occurrence records from 1961 and 1968, which are also in GBIF (Van Scoyoc 2024). The CNHP EO has a mapping precision of minutes, and the land status is described as private (CNHP 2024). SEINet has three occurrence records from 1961-2007 (Van Scoyoc 2024). A SEINet record from 2007 has sufficient precision to demonstrate this species is known to occur in the plan area.

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: black knot disease, webworms.
 - b. Habitat: management of road rights-of-way could be a potential threat.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: varied well-draining habitats; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northwestern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: there is one occurrence record in the plan area, rare in all counties that overlap the plan area.
 - b. Ecological conditions: uses varied habitat types with well-draining soils (roadsides, sand-sage prairie, woodlands, rocky canyons and ravines), which collectively are not restricted in the plan area.

Species Status

G4; S1 in Colorado; S1 in Kansas.

Taxonomy

Prunus gracilis is accepted as valid (NRCS 2025).

Species range

Overall Species range:

Oklahoma plum is distributed in the south-central United States (Figure 117).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northwestern edge of the species' range (Figure 117).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. It is considered rare in all counties that overlap the plan area (Figure 117). Occurrence records give no indication of the number of individuals observed.

Habitat

Across its range, Oklahoma plum occurs along fence rows, open woodlands, woodlands' edge, forest openings, hillsides, and slopes (NPIN 2025). Hazlett (2004) characterizes its habitat in the plan area as shaded rocky canyons and ravines. Within and adjacent to the plan area, it has been associated with roadside sand bank, sandsage rangeland, and roadside fencerow in dry, loose sandy prairie (SEINet 2024). Occurrence records are distributed at the southern edge of the Cimarron National Grassland. The single occurrence that can be attributed with certainty to the plan area is from "sand or silt on weedy sandsage rangeland"

Threats (arising from on or off the plan area)

Population

The species is susceptible to the fungal infection called black knot disease (NPIN 2025). Like many members of the rose family, it can get also get webworms (NPIN 2025). The manifestation of these threats at the population scale is not known (IUCN 2024).

Habitat

Management of road rights-of-way could be a potential threat to this species' habitat, since the one reliable occurrence record in the plan area from 2007 describes its habitat as "along Forest Road 736 at the end of County Road F." However, neither NatureServe (NatureServe 2025) nor IUCN (2024) identify any known threats to this species or its habitat.

Ecological conditions

Ecological condition requirements

Oklahoma plum requires well-drained woodland sands and does best in part-shade with room to colonize (NPIN 2025). It requires pollination by insects (IUCN 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Because this species can use such varied habitats (fence rows, open woodlands, woodlands edge, forest openings, hillsides, slopes, sandy roadsides, upland thickets, waste places, etc.) (IUCN 2024), its ecological conditions are not restricted in the plan area.

Critical biological characteristics

Oklahoma plum is a perennial, low-growing deciduous shrub (NPIN 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The fruit of Oklahoma plum is consumed by birds and mammals (NPIN 2025). Butterflies, bees, and other insect pollinators utilize the flowers, and the species is characterized as having “special value to native bees” but the Xerces Society for Invertebrate Conservation (NPIN 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

The effects of changing climatic conditions on plant phenology have been documented across a wide range of taxa, including the related species *Prunus spinosa* (Cosmulescu et al. 2022).

Maps of Species Range

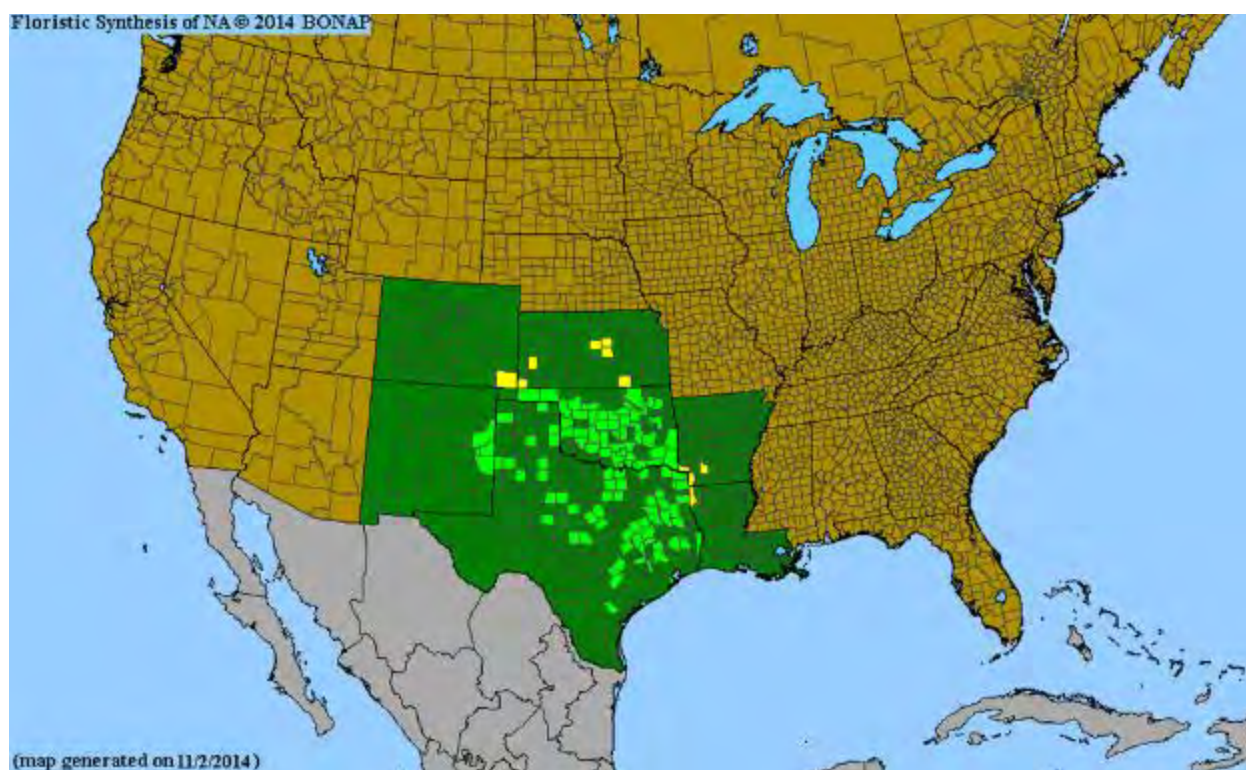


Figure 117. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

One-flower flatsedge (*Cyperus retroflexus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One documented occurrence on the Cimarron National Grassland (NG) in 2007 (Van Scoyoc 2024). The locality note for the collection specifies "Cimarron National Grassland: along Cimarron River and Turkey Trail."

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No known threats, but possibly disturbance by large mammals.
 - b. Habitat: Grazing pressure, ground water depletion, climate stressors, and invasive species.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Riparian ecosystems in the plan area are declining from groundwater depletion and invasive species.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Single occurrence in the plan area is at the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There is one documented occurrence in the plan area. Population numbers in the plan area are unknown.
 - b. Ecological conditions: Riparian areas are restricted in the plan area.

Species Status

G5; S1 in Kansas.

Taxonomy

Cyperus retroflexus Buckley is accepted as valid (Flora of North America 1993, NRCS 2025). Synonyms include *Cyperus uniflorus* (Flora of North America 1993, NRCS 2025). Other common names include oneflower flatsedge (NRCS 2025).

Species range

Overall Species range

In North America, occurs in Alabama, Arizona, Arkansas, District of Columbia, Kansas, Kentucky, Louisiana, Mississippi, Missouri, New Jersey, New Mexico, Oklahoma, Pennsylvania, and Texas (Figure 1, Figure 2) (NatureServe 2025). NatureServe identifies this species as Critically Imperiled or Imperiled in four of these states, including Kansas (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

Occurrence in the plan area is at the northern edge of the species range (Figure 118).

Distribution, abundance, and trend in the plan area

Population

Abundance and trend in the plan area are unknown. The single collection (Figure 118) was made during a floristic inventory focusing on species of conservation concern and noxious weeds of the Cimarron and Comanche National Grasslands. The species was subsequently reported as an addition to the flora of Kansas (Kuhn et al. 2011).

Habitat

Notes from the 2007 collection record identified the habitat as "low sand dunes in the river bottom, with scattered cottonwood" at 3,375 ft. elevation (Van Scoyoc 2024). FNA lists habitat as damp, disturbed soils, and croplands (Flora of North America 1993).

Threats (arising from on or off the plan area)

Population

No known threats to populations were identified in the consulted sources. Grazing pressure may affect population sizes due to the species habitat preference and the possibility of trampling in these wetter locations.

Habitat

Grazing pressure.

Invasion and competition from non-native species that quickly inhabit and grow on damp, disturbed soils on which this species is found. Great plains streams and riparian areas have a very high vulnerability to negative impacts from climate stressors with a very high confidence.

Ecological conditions

Ecological condition requirements

The species shows a preference for damp, disturbed soils (Flora of North America 1993).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Unknown.

Critical biological characteristics

One-flower flatsedge is a perennial rhizomatous sedge.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Suitable habitat of damp disturbed soil must be present for this species.

Maps of Species Range

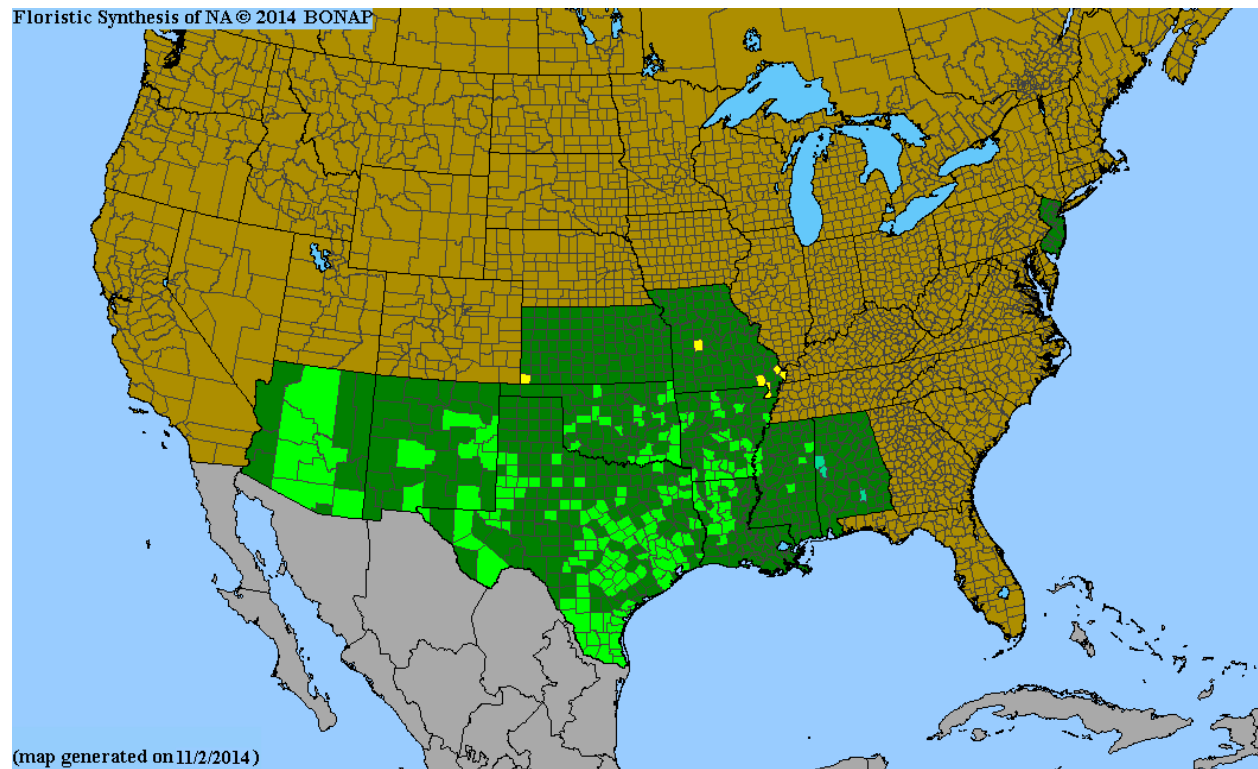


Figure 118. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Oppositeleaf false bahia

(*Picradeniopsis oppositifolia*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has four occurrence records in the plan area from 1989-2007 (Van Scoyoc 2024). Additionally, KNHP has three occurrence polygons from 1989-2008 (Van Scoyoc 2024). Some of these records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2008

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: varied habitats; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the eastern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; eight occurrence records.
 - b. Ecological conditions: uses varied arid habitat types, including open steppe and roadsides, which are not restricted in the plan area.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

USDA NRCS recognizes *Picradeniopsis oppositifolia* as valid; a taxonomic synonym is *Bahia oppositifolia* (NRCS 2025).

Species range

Overall Species range:

Oppositeleaf false bahia is distributed from Mexico to Texas, Colorado, New Mexico, and Arizona (NatureServe 2025) (Figure 119, Figure 120).

Description of how the population in the plan area fits within the overall range:

The plan area is at the eastern edge of the species' range (Figure 119, Figure 120).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. NatureServe characterized this species as "common in Great Plains," (NatureServe 2025). It is considered rare in Morton County, Kansas, but not in any counties that overlap the Comanche National Grassland (Figure 120). One record from 2008 describes species as "infrequent in dry creekbed." Another from 2008 notes "ten plants in flower/fruit." A record from the Cimarron 1989 states "plants scattered along roadside."

Habitat

Across its range, oppositeleaf false bahia occurs in plains and low hills, dry foothills, roadsides, saline flats, shale sites. at elevations from 2,900-8,200 ft (SEINet 2024, NatureServe 2025). Within the plan area, it has been associated with open steppe and disturbed, often roadside soils (Hazlett 2004). Occurrence records have been distributed across all units of the plan area. Records from iDigBio and KNHP in the plan area have noted habitat including sandsage prairie with large patches of yucca, limestone breaks, and exposed sandy soil on the edge of highway pavement (Van Scoyoc 2024). Hazlett (2004) notes this species "occasionally thrive(s) in the mesic roadside habitat" of the Comanche National Grassland.

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Hazlett 2004, Kuhn et al. 2011, NPIN 2025, SEINet 2024, NatureServe 2025).

Habitat

No consulted sources identified threats to habitat (Hazlett 2004, SEINet 2024, NatureServe 2025).

Ecological conditions

Ecological condition requirements

Oppositeleaf false bahia often grows in hot, arid regions (Mery et al. 2022). It requires sandy or gravelly soil in open habitat (Ackerfield 2022).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Oppositeleaf false bahia can use a variety of habitat types, including sand-sage prairie, open steppe, roadsides, and limestone breaks (Hazlett 2004, Van Scoyoc 2024). Collectively these types of habitats are not restricted in the plan area.

Critical biological characteristics

Oppositeleaf false bahia is a perennial forb in the aster family (Asteraceae) (SEINet 2024). It has compounds that inhibit other plants from growing near it, which likely provides it an ecological advantage over neighboring plants and other competitors (Mery et al. 2022).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Oppositeleaf bahia contains chemical compounds that inhibit or interfere with the development of other plant species; because of this, it often grows in populations that are clearly separated from neighboring vegetation (Mery et al. 2022). This species is not readily eaten by livestock except when forage is scarce but may be considered potentially dangerous to livestock if consumed (Deem et al. 1939).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found for this species.

Maps of Species Range

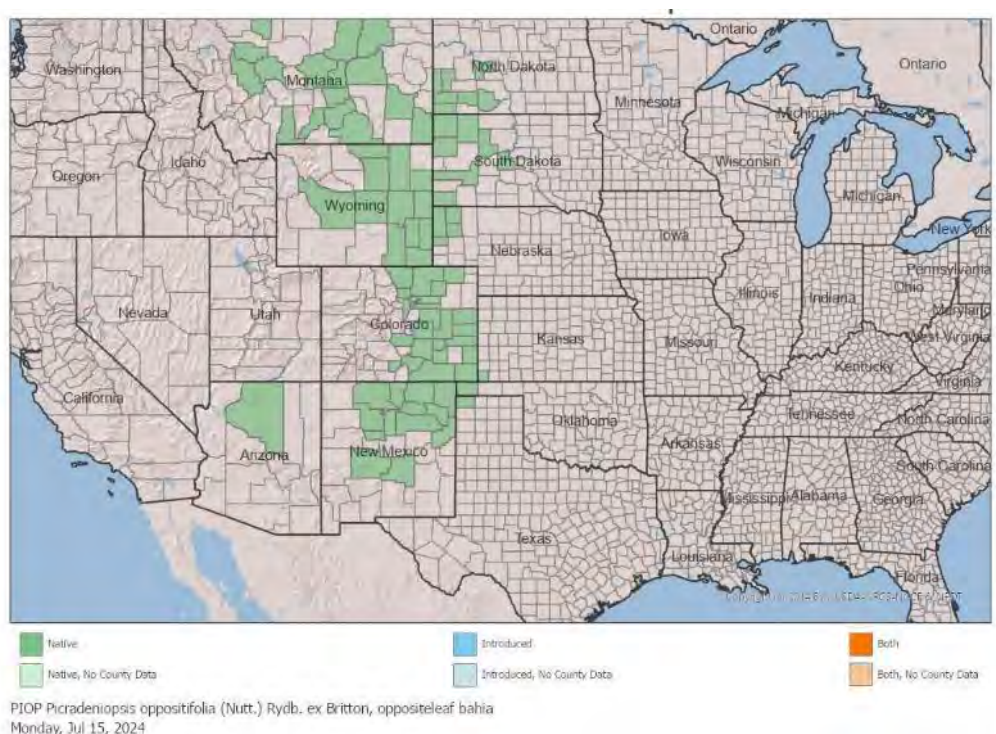


Figure 119. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

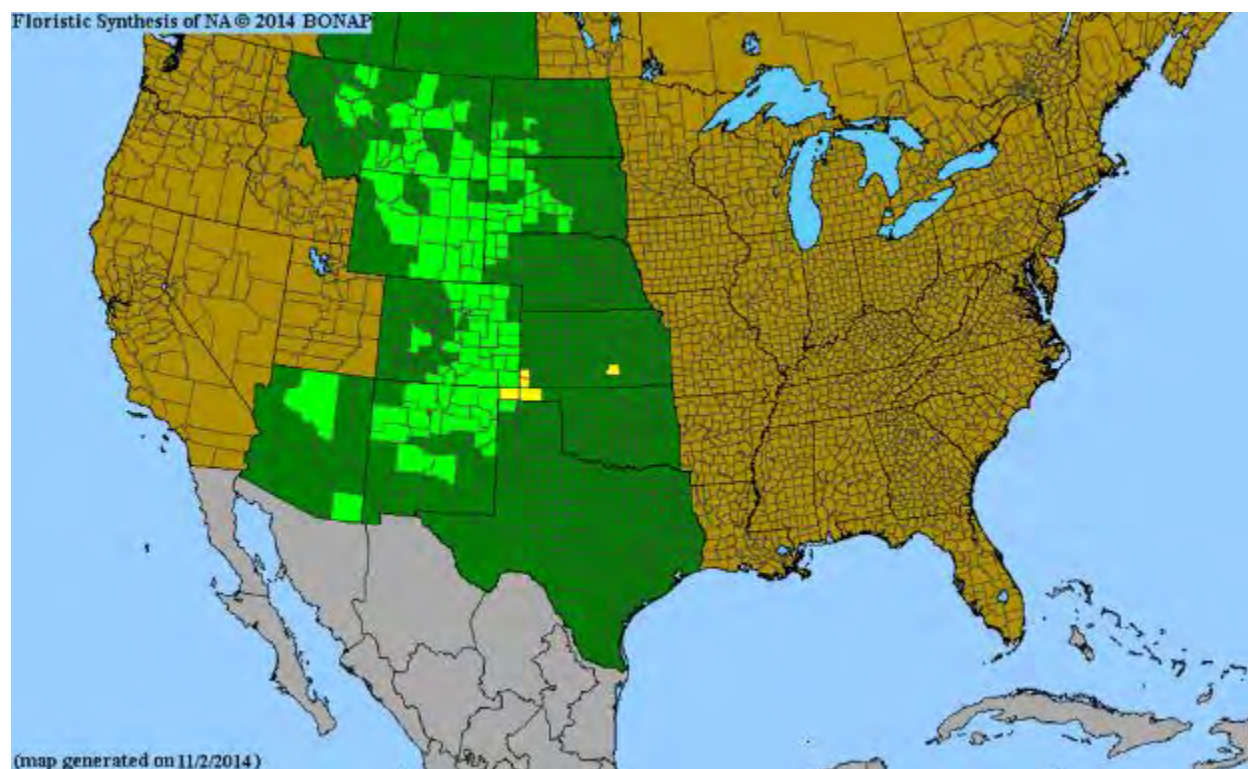


Figure 120. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Painted milkvetch

(Astragalus ceramicus var. filifolius)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: SEINet portal contains four location records and Kansas National Heritage Program has two additional location records (Van Scoyoc 2024). There is a total of six observation locations for this species in the plan area (Van Scoyoc 2024). Five of the locations are within the Cimmaron Unit and one is in the Carrizo Unit (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: In the Kansas herbarium records it indicates populations are usually small and local. These may be vulnerable to local extinction from overgrazing by livestock or conversion of habitat to cropland and oil and gas development. In addition, populations on unstabilized sand dunes or riverbanks or bars may be subject to local extinction due to the ephemeral nature of the substrate (USFS 2001a).
 - b. Habitat: Painted milkvetch is found exclusively on substrates derived from wind-blown sands and is frequently from loose sands in herbarium specimen labels. Preferred habitat is subject to frequent, natural change, vulnerable to conversion to croplands or change in community composition due to overgrazing by livestock and fire suppression (USFS 2001a).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: populations on unstabilized sand dunes or riverbanks or bars may be subject to local extinction due to the ephemeral nature of the substrate (USFS 2001a).
 - b. Habitat: Trend in the habitat is not known, although this species requires early successional habitat (Montana Field Guide 2025) and the occurrences in the plan area are associated with riparian (cottonwood/juniper), dunes and alluvium, and sandsage. Riparian and sandsage ecosystems have declining trends in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the southern eastern edge of the species' range
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population. Known from six collection locations in the plan area. In the Kansas herbarium records it indicates populations are usually small and local. Within the Kansas Heritage database, one occurrence record indicates 50-100 plants in 3 close groups
 - b. Ecological conditions: Painted milkvetch requires the open sand of early successional areas, and suitable habitat may be reduced when plant succession leads to later stages in which vegetation covers areas of formerly open sand. Historically, the diversity of sandhills plant communities was maintained by a fire cycle of 20-30 years. The activity of pocket gophers (*Thomomys talpoides*) also appears to be an important force in initiating blowouts and maintaining early seral vegetation (Montana Field Guide 2025). The 2005 vegetation ecology report it shows that early and mid-

seral conditions (the kind suitable for a colonizing species like painted milkvetch) are well represented across the habitat types of the CCNG (USFS 2005a).

Species Status

T4; SNR in Colorado; S1 in Kansas.

Taxonomy

Astragalus ceramicus var. *filifolius* is accepted as valid (NRCS 2025, Ackerfield 2022, Weber et al. 2012). Synonyms for this species include *Astragalus longifolius* and *Phaca longifolia* (NRCS 2025, ITIS 2024).

Species range

Overall Species range

Variety *filifolius* grows in the counties of eastern Montana, adjacent North and South Dakota, and other regions of the Great Plains (Montana Field Guide 2025). It is rare in the Great Plains except in the sandhill region of Nebraska where it is common (Montana Field Guide 2025). Painted milkvetch is also known to occur in Arizona, Colorado, Kansas, Montana, North Dakota, Nebraska, New Mexico Oklahoma, South Dakota, Texas, and Wyoming (NatureServe 2025)

Description of how the population in the plan area fits within the overall range

The plan area is at the southern, eastern edge of the species' range (Figure 121).

Distribution, abundance, and trend in the plan area

Population

The six occurrence records in the plan area. Five of the occurrence records are on the Cimarron Unit and one is on the Carrizo. Within the Kansas Heritage database, one occurrence record indicates 50-100 plants in 3 close groups in the plan area.

Painted milk-vetch is critically imperiled in Kansas due to its extreme rarity. The species can be easily overlooked, except when in fruit. and this may be a factor in the apparent rarity of the species (Freeman 1989). Little data exists on abundance, but Kansas herbarium record indicated populations are usually small and local (USFS 2001a).

Population trend in the habitat is not known, although this species requires early successional habitat (Montana Field Guide 2025) and in the 2005 vegetation ecology report it shows that early and mid-seral conditions (the kind suitable for a colonizing species like painted milkvetch) are well represented across the habitat types of the CCNG (CCNG 2005 Vegetation Ecology). Within the Kansas Heritage database, one occurrence record indicates 50-100 plants in 3 close groups

Habitat

Painted milkvetch is associated with sandy soils, dunes, sandhills, and sandstone outcroppings, elevation 3600-8000ft (Ackerfield 2022). NatureServe (NatureServe 2025) habitat description for Painted milkvetch is dunes and sandy hollows in rolling plains, sometimes in sandy fields, or sand bars of intermittent

stream. Freeman (1989) describes habitat as sand dunes and sandy soils, especially on sandsage prairies in the southern Great Plains.

One record in SEINet indicates occurrence is in Sand Canyon and the habitat it is found in is mature cottonwood forest with scattered juniper on sandy silt substrate (SEINet 2024). Two other records are on the north side of Cimarron River in a habitat with eroding gravelly dune sand over silty, gravelly riverbank; sandsage prairie; One in Sand Hills of Cimarron River. Within the Kansas Heritage database, one occurrence record indicates 50-100 plants in 3 close groups.

Occurrence records are within Western Great Plains Shortgrass Prairie, Western Cool Temperature Pasture and Hayland, and Western Great Plains Sandhill Steppe (Landfire 2024).

Trend in the habitat is not known, although this species requires early successional habitat (Montana Field Guide 2025) and in the 2005 vegetation ecology report it shows that early and mid-seral conditions (the kind suitable for a colonizing species like painted milkvetch) are well represented across the habitat types of the CCNG.

Ostille et al. (1997) reports that sandsage prairies face continued threats from disturbance; overgrazing, conversion to croplands, and stochastic events.

Threats (arising from on or off the plan area)

Population

Potential threats to populations could also come from incompatible recreational activities and invasion by non-native plants (Montana Field Guide 2025). In the Kansas herbarium records it indicates populations are usually small and local. These may be vulnerable to local extinction from overgrazing by livestock or conversion of habitat to cropland. In addition, populations on unstabilized sand dunes or riverbanks or bars may be subject to local extinction due to the ephemeral nature of the substrate.

Habitat

The removal of natural disturbance regimes, including fire, ungulate grazing and pocket gopher activity, leads to dune stabilization and reduces the extent of early seral blowout vegetation areas upon which this species depends. Painted milkvetch would benefit from restoration of the fire regime and moderate grazing, at least in years following burns. Severe destabilization of the dunes, e.g., from off-road vehicle use, could also threaten its habitat (Montana Field Guide 2025).

Painted milkvetch is found exclusively on substrates derived from wind-blown sands and is frequently from loose sands in herbarium specimen labels. Preferred habitat is subject to frequent, natural change, vulnerable to conversion to croplands or change in community composition due to overgrazing by livestock and fire suppression (USFS 2001a).

Threats common in the shortgrass prairie (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Painted milkvetch requires the open sand of early successional areas, and suitable habitat may be reduced when plant succession leads to later stages in which vegetation covers areas of formerly open sand. Historically, the diversity of sandhills plant communities was maintained by a fire cycle of 20-30 years. The activity of pocket gophers (*Thomomys talpoides*) also appears to be an important force in initiating blowouts and maintaining early seral vegetation (Montana Field Guide 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Habitat for painted milkvetch is found exclusively on substrates derived from wind-blown sands and is frequently from loose sands in herbarium specimen labels.

Occurrence records are within Western Great Plains Shortgrass Prairie, Western Cool Temperature Pasture and Hayland, and Western Great Plains Sandhill Steppe (Landfire 2024). The occurrence records occur within 3 of the 4 mapped ecosystems (Canyonlands, riparian woodlands and aquatic habitats, and the sandsage prairie) that were identified within the previous draft LMP (USFS 2005a).

This species requires early successional habitat (Montana Field Guide 2025) and in the 2005 vegetation ecology report it shows that early and mid-seral conditions (the kind suitable for a colonizing species like painted milkvetch) are well represented across the habitat types of the CCNG (USFS 2005a).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (Ackerfield 2022, NatureServe 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The following animal species have been reported as pollinators of this plant species or its genus where their geographic ranges overlap: *Bombus vagans*, *Bombus appositus*, *Bombus auricomus*, *Bombus bifarius*, *Bombus borealis*, *Bombus centralis*, *Bombus fervidus*, *Bombus flavifrons*, *Bombus huntii*, *Bombus mixtus*, *Bombus nevadensis*, *Bombus rufocinctus*, *Bombus ternarius*, *Bombus terricola*, *Bombus occidentalis*, *Bombus pensylvanicus*, *Bombus griseocollis*, and *Bombus insularis* (Montana Field Guide 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

This species requires early successional habitat (Montana Field Guide 2025) and in the 2005 vegetation ecology report it shows that early and mid-seral conditions (the kind suitable for a colonizing species like painted milkvetch) are well represented across the habitat types of the CCNG (USFS 2005a).

Subject to the same influences as the ecosystems in which it grows and appears capable of colonizing after natural and artificial disturbances.

Maps of Species Range

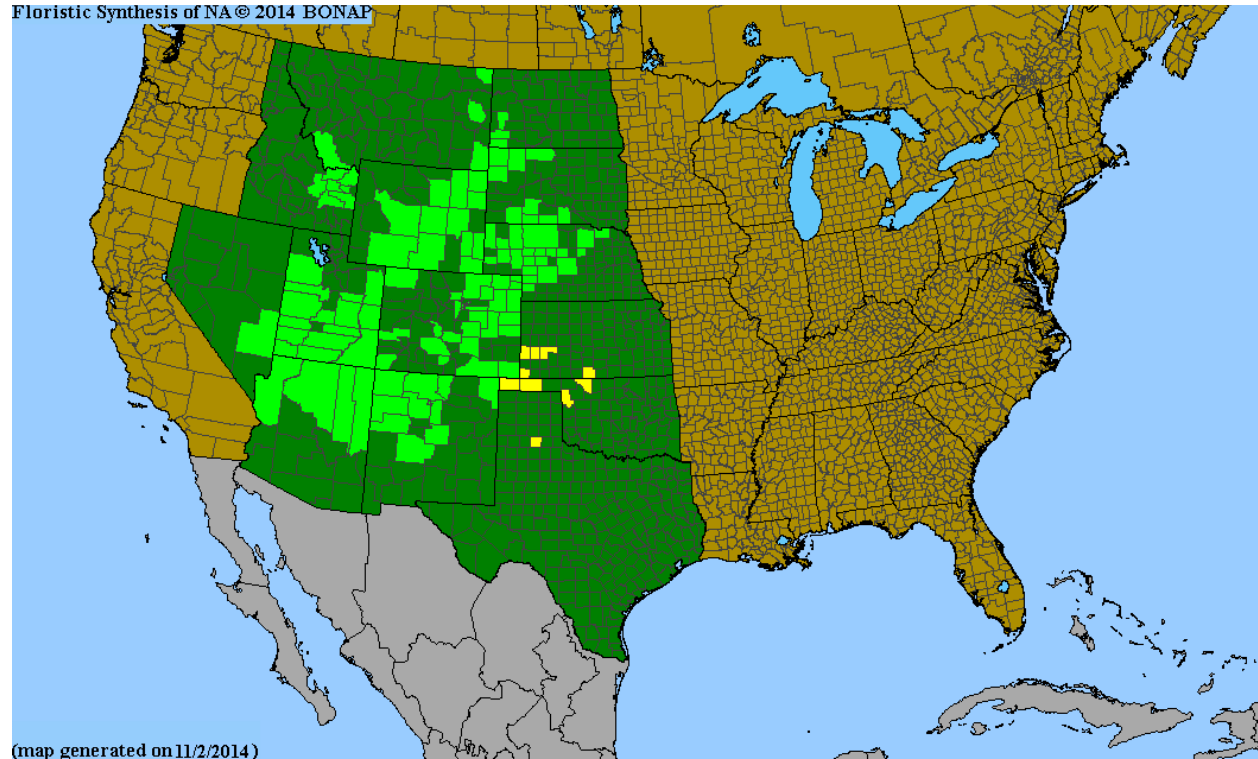


Figure 121. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county (range map is for *Astragalus ceramicus* not the variety).

Pink mimosa (*Mimosa borealis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: there are ~20 occurrence records with varying degree of spatial precision within the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025, Hazlett 2004, Kuhn et al. 2011).
 - b. Habitat: Most observations occurred within the western great plain's shortgrass prairie. Common stressors and threats include fragmentation, altered fire regime, overgrazing by livestock, and invasive species (in the less xeric regions). Fire suppression and certain grazing patterns such as continuous heavy grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. The short grasses that dominate this system are extremely drought- and grazing-tolerant although continuous heavy grazing and extended drought (3-4 years) will reduce cover of dominant species. (NatureServe 2025).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend is unknown.
 - b. Habitat: There is a declining trend in the quality of the habitat of shortgrass prairie in the plan area (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are ~20 occurrence records that occur in the Carrizo Unit. All the observations occurred in the southern portion of the unit within Picture Canyon, Holt Canyon, and Sand Canyon. Observations are not well distributed within the plan area. All locations are spatially mapped within the canyonlands ecosystem (USFS 2005a). There has not been any monitoring or surveys done to know if other occurrences or populations exist in the plan area.
 - b. Ecological conditions: No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025, Hazlett 2004, Kuhn et al. 2011). Typically, this species was found in rocky areas near canyons in the plan area. Hazlett (2004) describes habitat in the plan area as shaded rocky canyons and ravines and rocky: exposed limestone/shale barrens. Kuhn (2011) found this species within midgrass prairie and pinyon juniper woodland vegetation types in the plan area. Collectively the habitat of this species is not restricted.

Species Status

G5; S2 in Colorado; S1 in Kansas.

Taxonomy

Mimosa borealis is accepted as valid (Ackerfield 2022, NRCS 2025, ITIS 2024).

Species range

Overall Species range

Pink Mimosa distribution is Colorado, Kansas, New Mexico, Oklahoma, and Texas (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range (Figure 122, Figure 123).

Distribution, abundance, and trend in the plan area

Population

There are ~20 occurrence records that occur in the Carrizo Unit. All the known observations occurred in the southern portion of the unit within Picture Canyon, Holt Canyon, and Sand Canyon. Observations are not well distributed within the plan area. All locations are spatially mapped within the canyonlands ecosystem (USFS 2005a). While the known locations are only within the Southern portion of the Carrizo Unit, there is not presence/absence data to know if this species occurs or has potential habitat elsewhere in the plan area.

Herbarium records are from varies habitat locations. A few from talus slopes, rocky grasslands, canyon slope, sandstone breaks, shortgrass prairie above sandstone ledges, or open rocky ground or slopes.

Population trend for this species in the plan area is unknown.

Habitat

Ackerfield (2022) describes the habitat for this species as rocky soil, canyons, 4000-5200 ft elevation. Hazlett (2004) describes habitat as shaded rocky canyons and ravines and rocky: exposed limestone/shale barrens. Kuhn (2011) found this species within midgrass prairie and pinyon juniper woodland vegetation types.

Herbarium records are from varies habitat locations. A few from talus slopes, rocky grasslands, canyon slope, sandstone breaks, shortgrass prairie above sandstone ledges, or open rocky ground or slopes. Eighteen of the observations were spatially mapped within the Western Great Plains Shortgrass Prairie and one within Western Great Plains Riparian Herbaceous, and one in Western Cool Temperate Fallow/Idle Cropland (Landfire 2024).

There was no information suggesting the habitat trend is declining.

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, Hazlett 2004, Kuhn et al. 2011, NatureServe 2025).

Habitat

Most observations occurred within the western great plain's shortgrass prairie. Common stressors and threats include fragmentation, altered fire regime, overgrazing by livestock, and invasive species (in the less xeric regions). Fire suppression and certain grazing patterns such as continuous heavy grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. The short grasses that dominate this system are extremely drought- and grazing-tolerant although continuous heavy grazing and extended drought (3-4 years) will reduce cover of dominant species (NatureServe 2025).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, Hazlett 2004, Kuhn et al. 2011, NatureServe 2025).

Typically, this species was found in rocky areas near canyons in the plan area. Hazlett (2004) describes habitat in the plan area as shaded rocky canyons and ravines and rocky: exposed limestone/shale barrens. Kuhn (2011) found this species within midgrass prairie and pinyon juniper woodland vegetation types in the plan area.

The soil description for this species is rocky soils. Limestone-based, Caliche type, Sandy, Sandy Loam, Medium Loam, Clay Loam Clay (NPIN 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are ~20 occurrence records that occur in the Carrizo Unit. All the known observations occurred in the southern portion of the unit within Picture Canyon, Holt Canyon, and Sand Canyon. Observations are not well distributed within the plan area. All locations are spatially mapped within the canyonlands ecosystem (USFS 2005a). Eighteen of the observations were spatially mapped within the Western Great Plains Shortgrass Prairie and one within Western Great Plains Riparian Herbaceous, and one in Western Cool Temperate Fallow/Idle Cropland (Landfire 2024).

Trend of ecological conditions in plan area is unknown.

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (Ackerfield 2022, Hazlett 2004, Kuhn et al. 2011, NatureServe 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This thorny shrub is covered with small, very fragrant pink puffballs in the spring. It is a good nectar source for bees and butterflies. Great for the xeric garden. Can take extreme heat and harsh conditions once established (NPIN 2025).

The wildlife use for this species includes Nectar-insects, Browse, Cover (NPIN 2025). It can also be browsed by livestock

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

None known at this time.

Maps of Species Range

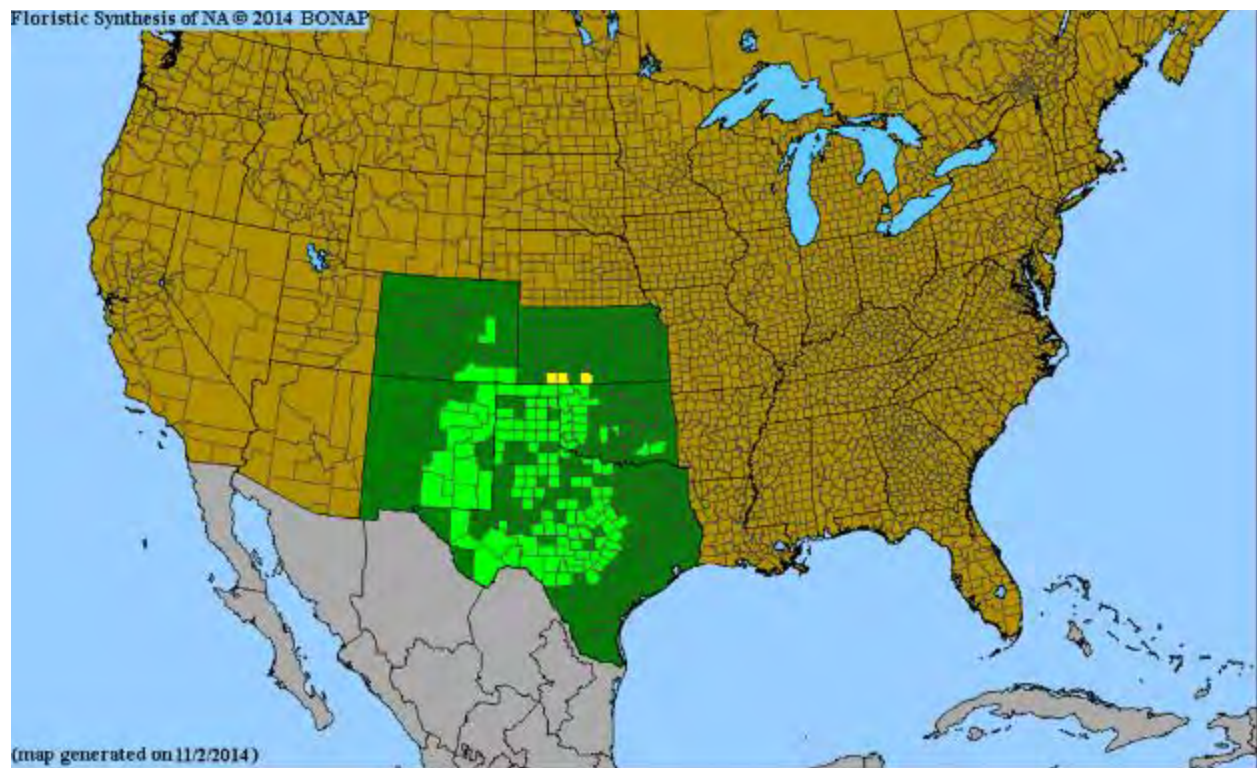


Figure 122. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

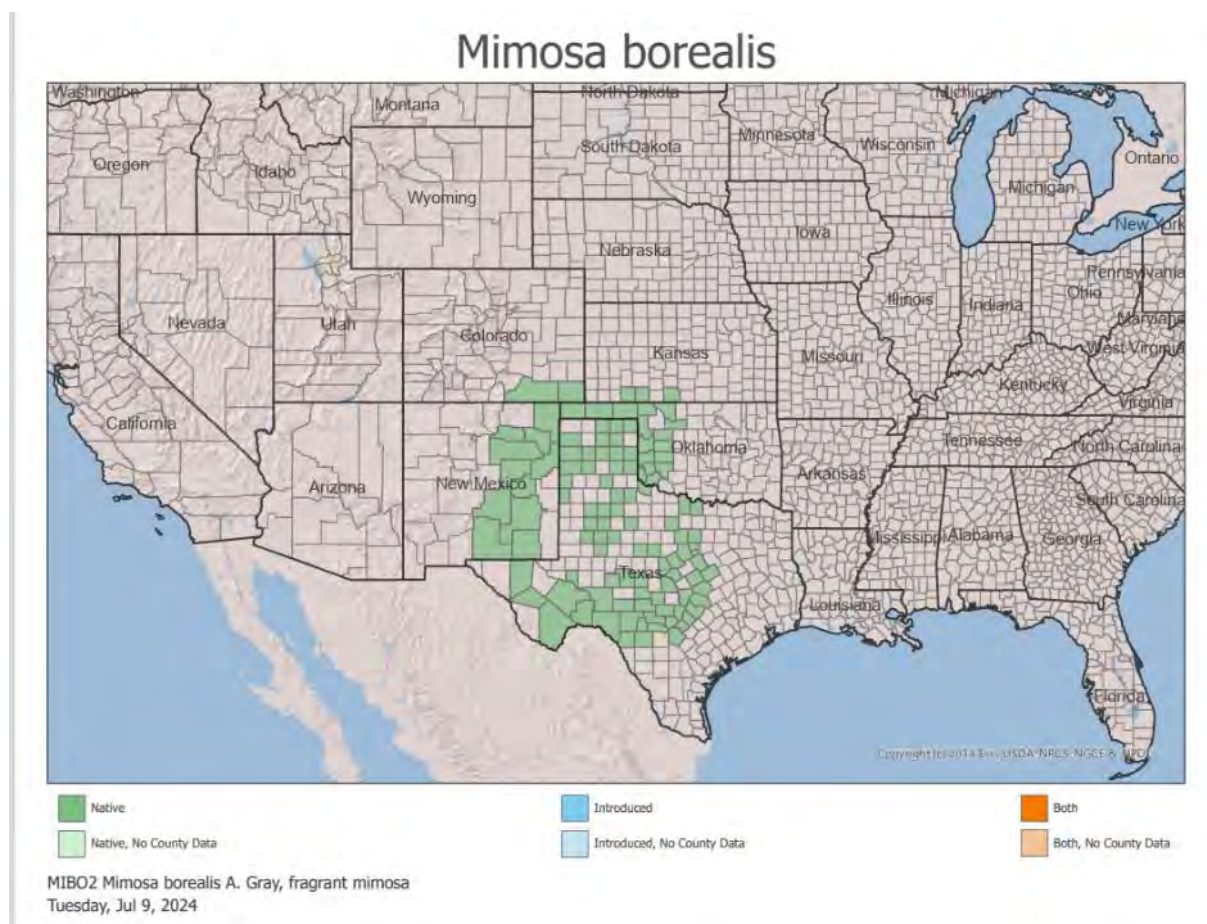


Figure 123. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Plains ironweed

(*Vernonia marginata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: KNHP contains six occurrence polygons from 1893-2005; two of these occurrence records are also in GBIF (Van Scoyoc 2024). Although not all these occurrence records have sufficient locational precision to determine they occurred in the plan area, some do. A survey in 1975 verified that the species was extant at the historical location; the survey directions are described as “Cimarron NG Site” (Van Scoyoc 2024). Five flowering individuals were observed in a different location in 2005, and the element occurrence polygon falls squarely within the plan area in the Cimarron National Grassland (Van Scoyoc 2024). Therefore, the species is known to occur in the plan area.

Year of Last Known Occurrence: 2005

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No known threats.
 - b. Habitat: Non-native invasive species, groundwater depletion. Threats associated with the habitat type (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: The collection remarks describe “weedy prairie” habitat where specimens of this species were collected; predominance of weeds and groundwater depletion represent a decline in habitat quality.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: there are six occurrence polygons; one occurrence had five individuals
 - b. Ecological conditions: “facultative” species that occurs in both wetlands and non-wetlands in the Great Plains region; based on use of varied habitats, ecological conditions are not restricted in the plan area. Weedy prairie is not restricted in the plan area

Species Status

G5; S1 in Colorado; S1 in Kansas.

Taxonomy

Vernonia marginata is accepted as valid (NRCS 2025).

Species range

Overall Species range:

Plains ironweed occurs in the southern Great Plains of the United States and Castillon, Coahuila, Mexico (Jones 1972, SEINet 2024) (Figure 124).

Description of how the population in the plan area fits within the overall range:

The plan area is at the eastern edge of the species' range (Figure 124).

Distribution, abundance, and trend in the plan area

Population:

Range-wide, NatureServe describes plains ironweed as "Moderately wide-ranging, common in NM, otherwise abundance unknown," (NatureServe 2025).

The population size in the plan area is not known. The collection records from 1975 state "reported plants as few" (Van Scoyoc 2024). The collection records from 2005 state "five flowering individuals counted" (Van Scoyoc 2024). The population trend in the plan area is not known.

Habitat

Habitat for plains ironweed includes ditches, sandy flats, stream banks, intermittent stream beds, low areas, and wet pastures, at an elevational range of 1968 – 6562 ft (600 – 2000 m) (Jones 1972, SEINet 2024, NatureServe 2025, Flora of the Southeastern United States 2024). Ackerfield (2022) gives an elevational range in Colorado of 3500- 7000 ft and describes habitat as "prairie."

The species has only been documented within the Cimarron National Grassland portion of the plan area along the Cimarron River and "near duck ponds" (i.e., Point of Rocks Ponds) (Van Scoyoc 2024). Observations in the plan area have been associated with "low, weedy prairie" and sandy soil (Van Scoyoc 2024). Reference to "weedy prairie" in the 1975 collection remarks suggests habitat quality has declined within the plan area where this species occurs. Furthermore, this species seems to use habitat with a high-water table, which has declined in the Cimarron River due to groundwater depletion of the Ogallala-High-Plains Aquifer (Brikowski 2008).

Threats (arising from on or off the plan area)

Population

None of the sources consulted identified threats to populations (Flora of the Southeastern United States 2024, Jones 1972, NPIN 2025, SEINet 2024, NatureServe 2025, NRCS 2025).

Habitat

None of the sources consulted identified threats to habitat (Flora of the Southeastern United States 2024, Jones 1972, NPIN 2025, SEINet 2024, NatureServe 2025, NRCS 2025).

Ecological conditions

Ecological condition requirements

Jones (1972) states that most ironweeds require habitat with standing water for part of the year. Shinnery (1950) states that plains ironweed grows in “dry soil” in western Texas. USDA NRCS considers plains ironweed a “facultative” species that occurs in both wetlands and non-wetlands in the Great Plains region (NRCS 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The occurrence records and polygons within the plan area intersect with 27 different existing vegetation types, including Western Great Plains Shortgrass prairie (Van Scoyoc 2024, Landfire 2024). Although plains ironweed does use habitat with a high-water table, it is not restricted to that habitat (NRCS 2025). Therefore, the ecological conditions for plains ironweed are not considered to be restricted in the plan area.

Critical biological characteristics

Plains ironweed is a perennial herb in the aster family (Jones 1972, SEINet 2024, NPIN 2025). It flowers from July-August (Jones 1972, SEINet 2024, Flora of the Southeastern United States 2024). Its fruit is a cypsela (NPIN 2025). Plains ironweed can hybridize and produce fertile F₁ hybrids with other ironweeds, including *Vernonia fasciculata* x *V. marginata* and *V. corymbosa* x *V. marginata* (Jones 1972). It can also hybridize with *V. baldwini* ssp. *interior* (Jones 1972).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

The Xerces Society for Invertebrate Conservation indicates that plains ironweed has “special value to native bees” (NPIN 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found specifically for this species.

Maps of Species Range

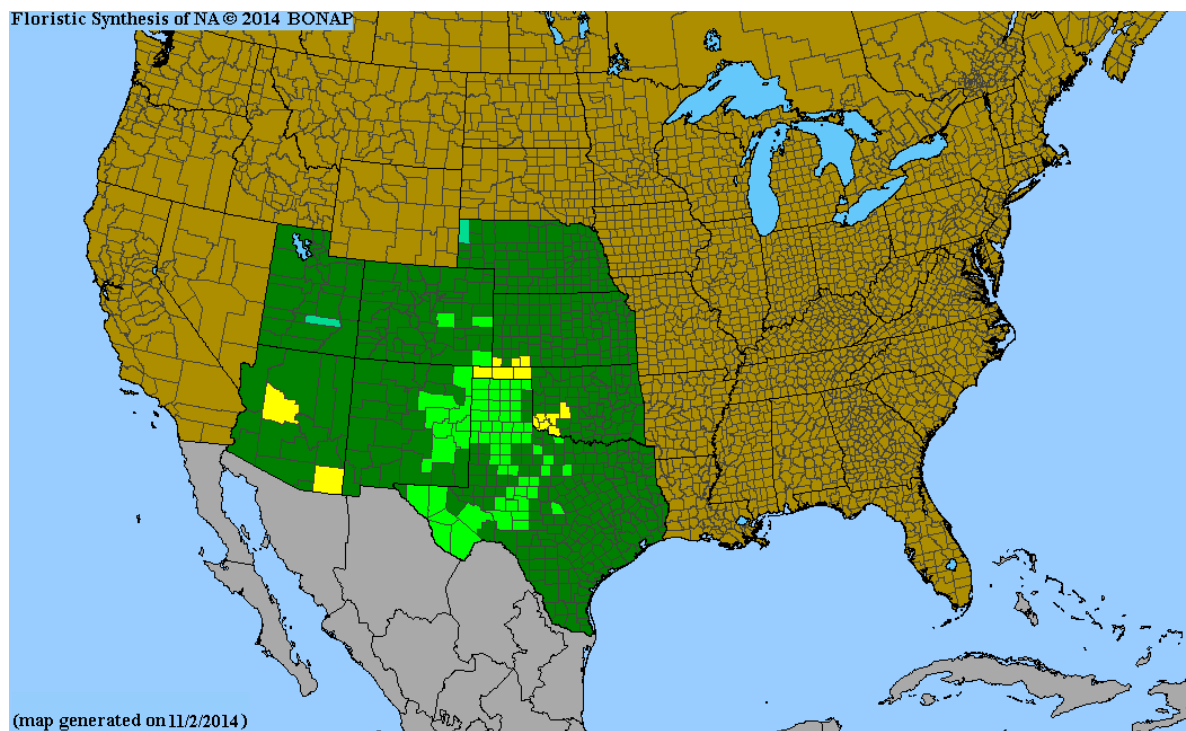


Figure 124. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Plains Lemmon beebalm

(*Monarda pectinata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has five occurrence records in the plan area from 1947-2022 (Van Scoyoc 2024). Additionally, KNHP has one occurrence polygon from 2008 (Van Scoyoc 2024). Some of these records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: varied habitats; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is not at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; six occurrence records.
 - b. Ecological conditions: uses highly varied habitat types (midgrass prairie, pinyon juniper woodland, riparian, rocky upland prairie, shortgrass prairie, and sand-sage prairie), which collectively are not restricted in the plan area.

Species Status

G5; SNR in Colorado; S2 in Kansas.

Taxonomy

Monarda pectinata Nutt. is accepted as valid (Ackerfield 2022, NRCS 2025, Weber et al. 2012). Other common names are plains beebalm (Ackerfield 2022, SEINet 2024) and pony beebalm (NRCS 2025).

Species range

Overall Species range:

Plains Lemmon beebalm is distributed from South Dakota south to Kansas, Oklahoma and Texas, west to Utah, Colorado and Wyoming (NatureServe 2025).

Description of how the population in the plan area fits within the overall range:

The plan area is not at the edge of the species' range (Figure 125, Figure 126).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend are not known. One record from 1982 describes the species as "locally common." Other occurrence records do not give an indication of the number of individuals. It is considered rare in Morton County, Kansas, but not in any counties that overlap the Comanche National Grassland (Figure 126).

Habitat

Across its range, plains Lemmon beebalm occurs in pine forest, pinyon-juniper, and grassland habitats at elevations from 4,000-8,000 ft (SEINet 2024). In Colorado, the species occurs in dry, open slopes, and meadows (Ackerfield 2022). Weber (2012) identify the species as "common on the plains, outer foothills, and in the San Luis Valley near the Great Sand Dunes".

Within the plan area, it has been associated with midgrass prairie, pinyon juniper woodland, riparian, rocky upland prairie, shortgrass prairie, and sand-sage prairie (Kuhn et al. 2011). Occurrence records have been distributed across both units of the Comanche and the Cimarron. Records in and adjacent to the plan area have noted habitat including basalt caprock, talus slopes, valley floors, and rocky slopes.

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Kuhn et al. 2011, NPIN 2025, SEINet 2024, NatureServe 2025).

Habitat

No consulted sources identified threats to habitat (Kuhn et al. 2011, NPIN 2025, SEINet 2024, NatureServe 2025).

Ecological conditions

Ecological condition requirements

Plains Lemmon beebalm can use a variety of habitat types (midgrass prairie, pinyon juniper woodland, riparian, rocky upland prairie, shortgrass prairie, and sand-sage prairie) (Kuhn et al. 2011). Observation records suggest a preference for dry, rocky conditions.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Because this species can use such varied habitats, including shortgrass prairie, its ecological conditions are not restricted in the plan area.

Critical biological characteristics

Plains Lemmon beebalm is an annual herb in the mint family (Lamiaceae) (SEINet 2024).

Important ecological and biological interactions

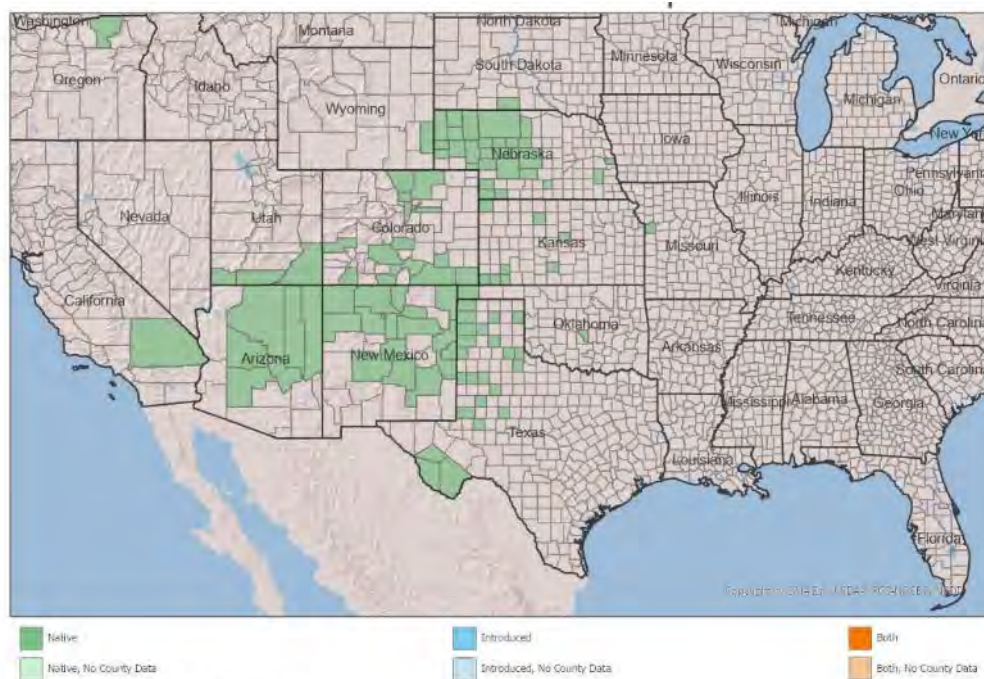
How (or if) this species influences other species or ecosystem diversity or integrity

The Xerces Society for Invertebrate Conservation identifies plains Lemmon beebalm as having “special value” to native bees and bumble bees (NPIN 2025). *Monarda* species are often used in seed mixes to provide summer forage to wildlife and generally have high ecological value for a variety of pollinators (Smith 2023).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Monarda species tend to be susceptible to powdery mildew (Smith 2023), which is favored by environments with high humidity and moderate temperatures.

Maps of Species Range



MOPE *Monarda pectinata* Nutt., pony beebalm
Friday, Jul 5, 2024

Figure 125. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

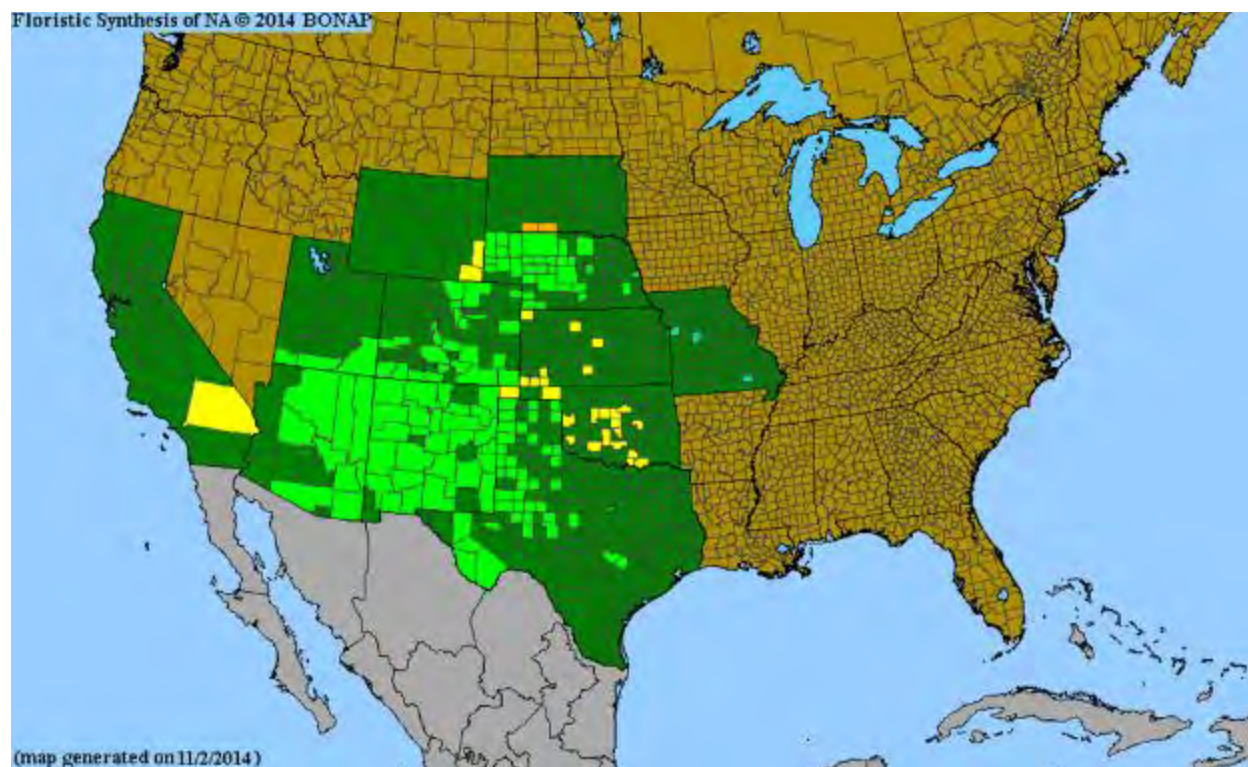


Figure 126. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Poison suckleya

(*Suckleya suckleyana*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Two documented occurrences on the CCNGs from 2003 and 2004 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2004

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Changes to hydrologic conditions and invasive species.
 - b. Habitat: Changes to hydrologic conditions.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: The number of playas in the plan area is stable, but size and water holding capacity have decreased, primarily from sedimentation. Playa clusters in the plan area have decreased due to long-term drought, leaving more isolated playas. Condition, or health, of playas is considered compromised because of past activities degrading playas and their contributing areas
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Two documented occurrences in the plan area. Population numbers in the plan area are unknown and likely fluctuate as an annual plant.
 - b. Ecological conditions: Unknown.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

Suckleya suckleyana (Torr.) Rydb. is accepted as valid (Ackerfield 2022, Flora of North America 1993, NRCS 2025, Weber et al. 2012). Synonyms include *Atriplex suckleyana* (Flora of North America 1993).

Species range

Overall Species range

In North America, occurs in Colorado, Kansas, Montana, Nebraska, New Mexico, Oklahoma, Wyoming, and two Canadian provinces (NatureServe 2025). Other sources list the species range as including North

Dakota and Texas (NRCS 2025). The species is listed as Critically Imperiled in three of these states including Kansas.

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are at the eastern edge of the species range (Figure 127).

Distribution, abundance, and trend in the plan area

Population

There are two documented occurrences in the plan area (Figure 127); however, plants may be under collected and likely fluctuate due to their annual life cycle. Information about population size and abundance in the plan area was not found.

Habitat

Weber (2012) cite poison suckleya plants as “locally frequent on drying pond borders and alkaline, often irrigated soils from Greeley to Colorado Springs”, Colorado. Plants occur on the margins of ponds and lakes, dried lake bottoms or beds of seasonal pools, and fields from 3500 to 8500 feet in elevation (Ackerfield 2022).

Threats (arising from on or off the plan area)

Population

Populations may be threatened by changes in hydrology or invasive species that compete for resources in riparian habitats.

Habitat

Changes to hydrologic regime. Some playas in the plan area are impacted by windmills or are bisected by county roads/OHV roads have experienced sedimentation and isolation and fragmentation.

Ecological conditions

Ecological condition requirements

Annual succulent herb that shows a preference for moist soils including the edges of receding ponds, dry lake bottoms, reservoirs, agricultural fields and along creeks and ditches (Flora of North America 1993). In the Great Plains, poison suckleya is listed as a Facultative Wetland species on the National Wetland Plant List (Lichvar et al. 2016). Populations appear to tolerate physical disturbance given the habitats in which they grow.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Unknown.

Critical biological characteristics

Plants are adaptable to dry conditions and are often reduced in size to only a few leaves or fruits (Weber et al. 2012).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Poison suckleya is known to be toxic to animals including livestock. All parts of the plant contain cyanogenic glycoside which is hydrolysed into cyanide and may cause sudden death (Guide to Poisonous Plants 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Plants prefer moist soil and may be the only green plant in late summer in these locations making it attractive to herbivores (Guide to Poisonous Plants 2024).

Maps of Species Range

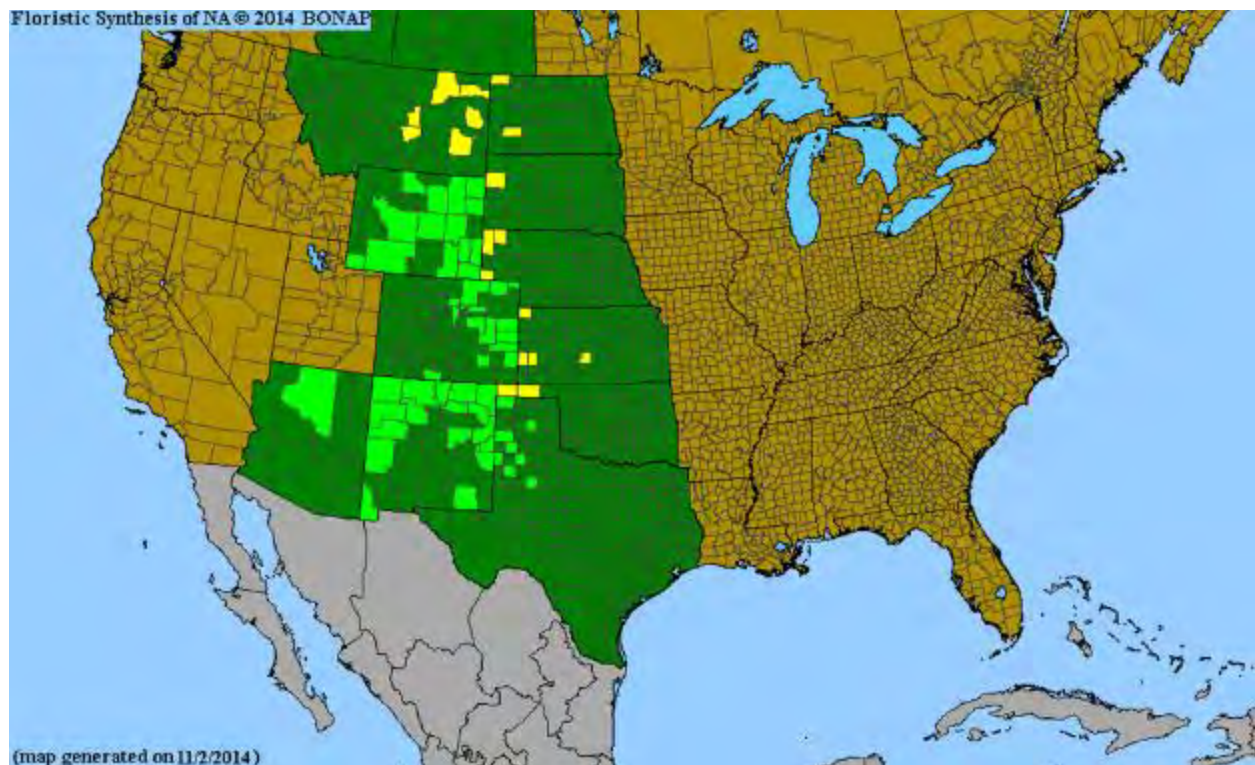


Figure 127. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Prairie cupgrass

(*Eriochloa contracta*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has two occurrence records in the plan area from 1975 and 2007 (Van Scoyoc 2024). The record from 2007 has sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: species uses disturbed habitats and at one of the two known locations (Withers Canyon Corral) there has been an increase in disturbed areas.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is not at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; two occurrence records.
 - b. Ecological conditions: disturbed habitats, including roadsides, are not restricted in the plan area.

Species Status

G5; S2 in Colorado; S5 in Kansas.

Taxonomy

Eriochloa contracta is accepted as valid (NRCS 2025).

Species range

Overall Species range:

Prairie cupgrass is known only from the United States; it is native and common in the central United States, and adventive to the east and southwest (SEINet 2024) (Figure 128, Figure 129).

Description of how the population in the plan area fits within the overall range:

The plan area is not at the edge of the species' range (Figure 128, Figure 129).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. The two occurrence records give no indication of the number of individuals observed. It is not considered rare in any counties that overlap the plan area (Figure 129). Northam (1995) states that prairie cupgrass is a native Kansas species that "has increased dramatically as a cropland weed during the last decade in west- and north-central Kansas."

Habitat

Prairie cupgrass is found in fields, ditches, roadsides, and other disturbed areas (Kuhn et al. 2011, SEINet 2024). One occurrence record was along the Cimarron River in the Cimarron National Grassland (1975) and the other (2007) was from the Timpas Unit of the Comanche in the Winthers Canyon Corral (Van Scoyoc 2024). Analysis of aerial imagery of the Winthers Canyon Corral from 1998 to present (Figure 130, Figure 131) shows proliferation of trails, a new cutoff road, an expansion of what appears to be road grading material and its storage, additional buildings, and an expansion of the corral foot print and impacted area. Estimate of the net increase in disturbed area is approx. 2.5 acres. However, because this species benefits from disturbed areas, this disturbance may have actually increased habitat quantity for this species.

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Northam and Stahlman 1995, Kuhn et al. 2011, SEINet 2024, NatureServe 2025).

Habitat

No consulted sources identified threats to habitat (Northam and Stahlman 1995, Kuhn et al. 2011, SEINet 2024, NatureServe 2025).

Ecological conditions

Ecological condition requirements

Prairie cupgrass is found primarily in disturbed areas such as fields, ditches, and roadsides (Kuhn et al. 2011, SEINet 2024). USDA NRCS considers prairie cupgrass a "facultative" species that occurs in both wetlands and non-wetlands in the Great Plains region (NRCS 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

One record (00986406) described prairie cupgrass as occurring “At corrals in heavily grazed shortgrass prairie with *Opuntia imbricata*” in the Comanche NG. This species uses varied types of disturbed habitats (Kuhn et al. 2011), which is consistent with this observation. Although prairie cupgrass can use moist habitats, it is not restricted to that habitat (NRCS 2025). Therefore, the ecological conditions for prairie cupgrass are not considered to be restricted in the plan area.

Critical biological characteristics

Prairie cupgrass is an annual graminoid (NRCS 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found specifically for this species. A congener, Texas cupgrass (*Eriochloa sericea*), is a forage species for livestock, but no other species are considered major economically important forage species (Shaw and Smeins 1979). Shaw (1979) call prairie cupgrass “a weed in crop fields.”

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

The genus *Eriochloa* has several species with “weedy” characteristics, many of which have experienced range expansions, probably through human transport (Northam and Stahlman 1995).

Maps of Species Range and Known Occurrences in Plan Area

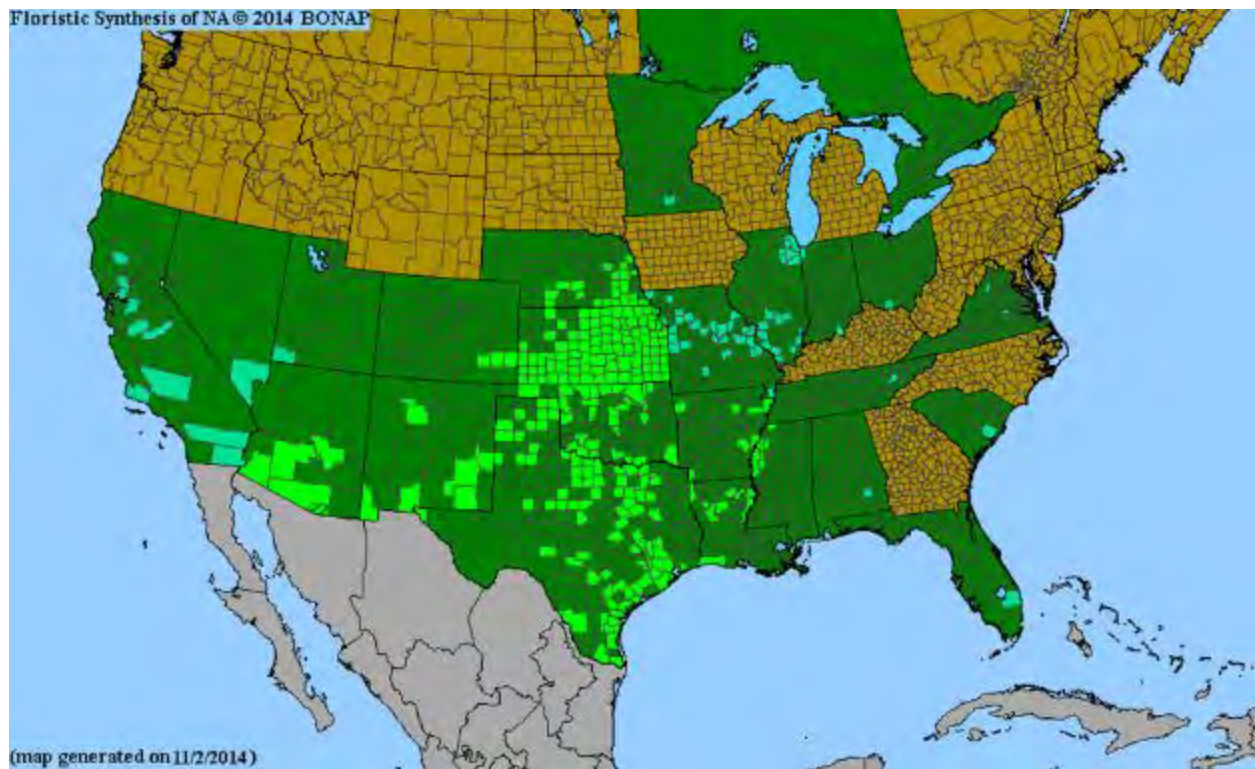


Figure 128. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

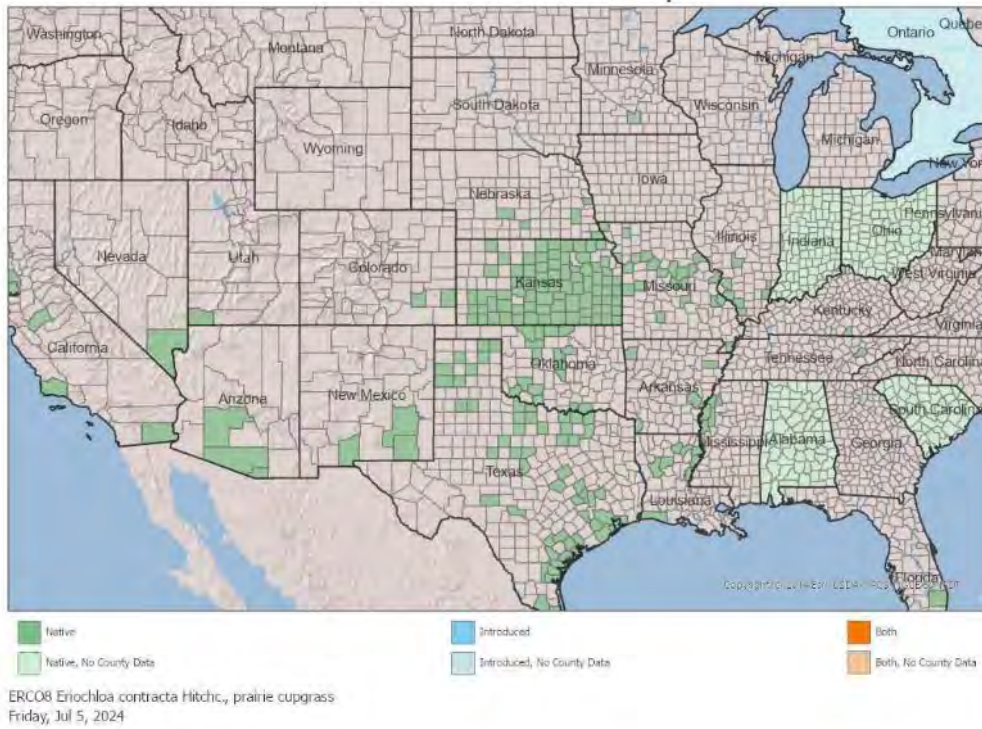


Figure 129. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).



Figure 130. Aerial imagery from 1998 at Winthers Corral.



Figure 131. Aerial imagery from 2023 of Winther Corral. Note expansion of what appears to be the storage of road materials to the northeast of the corral, expansion of footprint of the corral and the addition of what appears to be a building and a cutoff road. Area of new disturbance is estimated around 2.5 acres total around the corral.

Prairie redroot

(*Ceanothus herbaceus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF contains one occurrence record from 1989 (Van Scoyoc 2024). The record locality is described as "Cimarron National Grassland, ca 2 m ENE of Wilburton along US 56." Therefore, this species is known to occur in the plan area.

Year of Last Known Occurrence: 1989

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: land-use conversion, habitat fragmentation, overgrazing.
 - b. Habitat: land-use conversion, habitat fragmentation, overgrazing.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: species' known habitat within the plan area appears stable, considering this species can benefit from roadside habitat.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the west-central portion of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: population size is not known, but occurrence records document the species is locally common in the plan area.
 - b. Ecological conditions: dry soils with full sun exposure are not limited in the plan area.

Species Status

G5; S2 in Colorado; S4 in Kansas.

Taxonomy

Ceanothus herbaceus is accepted as valid; taxonomic synonyms include *Ceanothus herbaceus* var. *pubescens*, *Ceanothus ovatus*, *Ceanothus ovatus* var. *pubescens*, and *Ceanothus pubescens* (NRCS 2025). Another common name is Jersey tea (NRCS 2025). NatureServe notes this species is "Called *Ceanothus ovatus* in most older floras," (NatureServe 2025).

Species range

Overall Species range:

This species occurs from Texas northward into the Great Plains of the United States (Linex 2020a) (Figure 132).

Description of how the population in the plan area fits within the overall range:

The plan area is in the west-central portion of the species' range (Figure 132).

Distribution, abundance, and trend in the plan area

Population:

The specimen record states the species is "Locally common in prairie and along roadside in ditch" (Freeman 1989). The population size in the plan area is not known but based on the occurrence report it is not considered to be low.

Habitat

Prairie redroot is found in sandy or rocky soil, prairies, and plains (SEINet 2024). Linex (2020a) notes it may be found on roadcuts with limestone soil, and is most often found in dry, shallow-rocky soils in full sun.

The species has only been documented in one location within the Cimarron National Grassland portion of the plan area (Van Scoyoc 2024). It was found in prairie habitat and along the roadside in ditch (Van Scoyoc 2024). Habitat surrounding the occurrence point appears stable, considering this species can benefit from disturbed habitat formed by roadcuts (Linex 2020a).

Threats (arising from on or off the plan area)

Population

NatureServe states "Land-use conversion and habitat fragmentation are moderate threats to this species," (NatureServe 2025). Overgrazing can pose another threat (Linex 2020a).

Habitat

NatureServe states "Land-use conversion and habitat fragmentation are moderate threats to this species," (NatureServe 2025). Overgrazing can pose another threat (Linex 2020a).

Ecological conditions

Ecological condition requirements

This species typically requires dry, shallow-rocky soils with full sun (Linex 2020a). It depends on the presence of pollinating insects and requires freedom from overgrazing (Linex 2020a).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Prairie redroot requires dry, shallow-rocky soils in full sun. This habitat type is not limited in the plan area.

Critical biological characteristics

Prairie redroot is a small perennial shrub (Linex 2020a). This species generally flowers late May to early June (SEINet 2024) and has been documented flowering in the plan area in June (Van Scoyoc 2024). In Texas, it has been documented to produce green seeds in late April and mature seeds by early June (Linex 2020a).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

SEINet (2024) states this species “has a symbiotic relationship with a nitrogen-fixing bacteria. Insects are attracted by the flowers, deer eat the leaves, and birds eat the fruit. Native Americans once made the leaves into a tea and used the large woody roots as fuel on bison hunts and when firewood was scarce.” Its flowers are attractive to many pollinators and provides nectar and pollen during the early spring season (Linex 2020a). Its leaves have high protein content and are valuable forage for wild large herbivores, including bison (Craine et al. 2015). NatureServe notes this is an economically important genus for medicine/drug development (NatureServe 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Linex (2020a) note that this species is readily browsed and vulnerable to overgrazing by livestock.

Prairie redroot exhibits vigorous postfire regrowth but cover declines immediately after fire and increases in the years following fire as ramets become increasingly branched (Throop and Fay 1999). Throop (1999) states: “The flexible life history responses shown by *Ceanothus herbaceous* in response to fire and (deer) herbivores suggests tolerance of both forms of damage.”

Maps of Species range and Known Occurrences in Plan Area

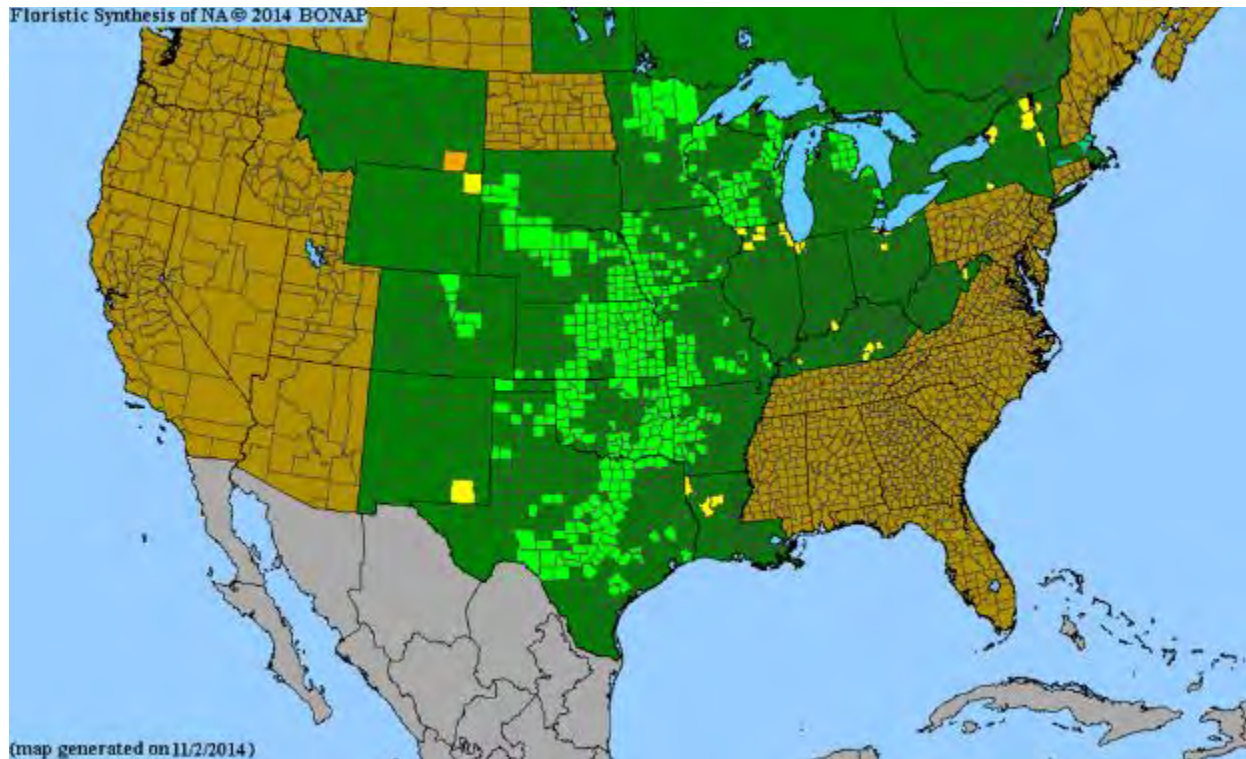


Figure 132. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Prairie skeletonplant

(*Stephanomeria pauciflora*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has eight occurrence records across the plan area from 1949-2021 (Van Scoyoc 2024). Several records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: no discernable trend; species uses varied habitat types. Some of the habitats have declining trends in the plan area, but the pioneer nature of this species makes it likely that the micro habitat is increasing in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the eastern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; eight occurrence records the records that indicate population sizes range from "frequent in area" to "infrequent".
 - b. Ecological conditions: uses early seral portions of varied habitats including midgrass prairie, pinyon juniper woodland, roadside habitat, rocky upland prairie, shortgrass prairie, sandsage prairie which taken together does not represent a restricted ecological condition in the plan area

Species Status

G5; SNR in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Stephanomeria pauciflora* as valid with seven taxonomic synonyms. Another common name is brownplume wirelettuce (NRCS 2025).

Species range

Overall Species range:

Prairie skeletonplant is distributed from southern California to Texas and Kansas, north to Colorado, Utah and Wyoming (NatureServe 2025) (Figure 134, Figure 133).

Description of how the population in the plan area fits within the overall range:

The plan area is at the eastern edge of the species' range (Figure 134, Figure 133).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. A record from 1979 in the Comanche National Grassland states the species is "common in the area." A record from 2014 in the Cimarron National Grassland states the species is "infrequent." It is not considered rare in any counties that overlap the plan area (Figure 133).

Habitat

Prairie skeletonplant is found in sandy, gravelly washes and slopes in desert shrub communities, juniper woodlands, open, sandy short-grass plains at elevations from 650 4,900 ft (SEINet 2024) and is a pioneer species within those varied habitats. Within the plan area, it has been documented in Sand Canyon in the Comanche National Grassland and along the Cimarron River in the Cimarron National Grassland (Van Scoyoc 2024).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Vasek 1979, Toft 1984, Kuhn et al. 2011, NatureServe 2025, SEINet 2024).

Habitat

No consulted sources identified threats to habitat (Vasek 1979, Toft 1984, Kuhn et al. 2011, NatureServe 2025, SEINet 2024).

Ecological conditions

Ecological condition requirements

This species uses varied habitats including midgrass prairie, pinyon juniper woodland, roadside habitat rocky upland prairie, shortgrass prairie, and sandsage prairie (Kuhn et al. 2011). It is an early successional species (Vasek 1979).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Given this species' use of varied, sandy habitat types, including shortgrass prairie and roadsides (Vasek 1979, Kuhn et al. 2011), its ecological condition requirements are not considered restricted in the plan area.

Critical biological characteristics

Prairie skeletonplant is a perennial herb in the Aster family (Asteraceae) (SEINet 2024). Flowering occurs from April through October (SEINet 2024). The species is a short-lived pioneer species that can use minor natural disturbances and along roadsides (Vasek 1979).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Parasitoid bee flies in the genus *Phthiria* and *Oligodranes* (family: Bombyliidae) seem to specialize on only a few flower species, including prairie skeletonplant (Toft 1984).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found for this species.

Maps of Species Range

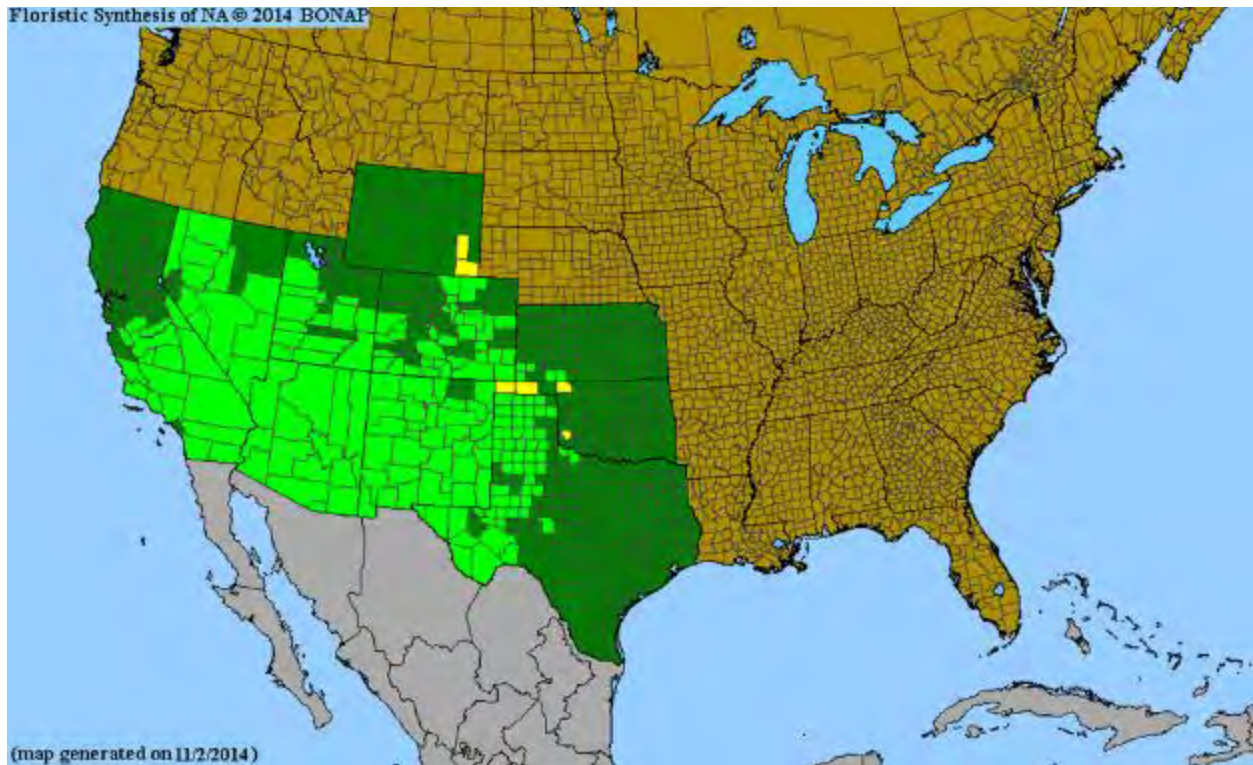


Figure 133. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

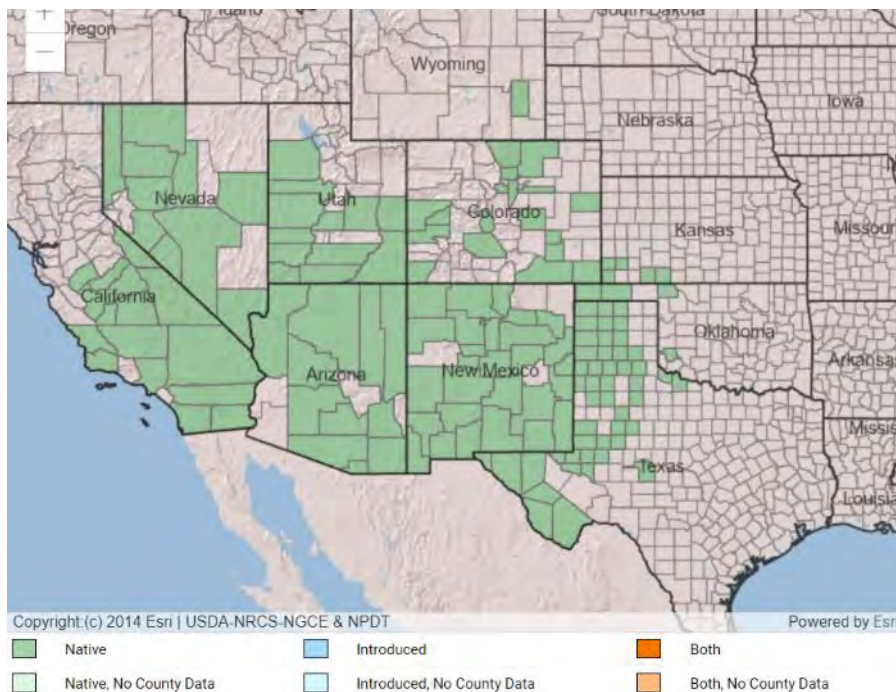


Figure 134. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Queen's delight (*Stillingia sylvatica*; *Stillingia sylvatica* ssp. *sylvatica*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Occurrence records from the University of Colorado Museum of Natural History and the University of Kansas Biodiversity Institute documented the species in the plan area in 2007 and 2010, respectively (Van Scoyoc 2024). CNHP has one Level Two element occurrence polygon (EO ID 17103) for *Stillingia sylvatica* that partially overlaps plan area and was most recently surveyed in 1981 (CNHP 2024, Van Scoyoc 2024). The Estimated Representation Accuracy is ranked as "low" and the land status for the occurrence is listed as private. The subspecies (*Stillingia sylvatica* ssp. *sylvatica*) is also known to occur in the plan area based on an occurrence polygon that occurs solely in the plan area and was most recently surveyed in 2010 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2010

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: overcollection for the medicinal plant industry.
 - b. Sand-sage prairie is threatened by overgrazing, fire and trampling and has high vulnerability to climate stressors.
2. Declining trends in populations or habitat in the plan area:
 - a. No population trends in plan area are available for the species nor subspecies.
 - b. Habitat may have declined in the plan area for the species because of windmill and road development; sandsage has a declining trend in habitat quality in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species and subspecies range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: few occurrence records in the plan area for both the species (n=2) and subspecies (n=1), but Freeman (1989) calls the species "abundant" in the sand-sage prairie of the Cimarron, while other estimates call it "scattered" and one of the occurrences is noted to contain a single plant.
 - b. Ecological conditions: the sand-sage ecosystem encompasses approximately 164,675 acres in the plan area and is not considered restricted.

Species Status

G5; S1 in Colorado; SNR in Kansas.

Taxonomy

Stillingia sylvatica L. is accepted as valid (Ackerfield 2022, NRCS 2025). The subspecies is also recognized as valid, with four taxonomic synonyms (*Stillingia angustifolia*, *Stillingia salicifolia*, *Stillingia spathulate*, *Stillingia sylvatica* var. *salicifolia*) (NRCS 2025). There are two recognized subspecies; *sylvatica* which occurs in the plan area and *tenuis* which only occurs in Florida. References herein to the parent species (*S. sylvatica*) are synonymous with *S. sylvatica* ssp. *sylvatica*.

Species range

Overall Species range:

Queen's delight has a fairly large range from Colorado south to Texas and east to Virginia and Florida; the subspecies (*Stillingia sylvatica* ssp. *sylvatica*) is also fairly widespread (NatureServe 2025) (Figure 135).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the subspecies' range (Figure 135).

Distribution, abundance, and trend in the plan area

Population:

Across its range, queen's delight is considered relatively stable (NatureServe 2025). However, Robbins (1991) characterized the species as having experienced declines over the past ten years.

Within the plan area, the population size and trend in the plan area is not known. Occurrence records give some indications of the number of individuals; one record from 2007 notes species is "scattered" (Van Scoyoc 2024). Freeman (1989) describes that the species is "abundant on slopes" in the sandsage prairie of the Cimarron National Grassland. The species is considered rare in Baca County, but common in Morton County (Figure 135). Recent observations of the species (n=2) have been limited to the south side of the Cimarron River within the Cimarron National Grassland (Van Scoyoc 2024).

The subspecies' occurrence polygon is on the south side of the Cimarron River within the Cimarron National Grassland (Van Scoyoc 2024). The occurrence record for the subspecies states "one fruiting plant observed" in 2010 (Van Scoyoc 2024).

Habitat

Across its range, queen's delight is found in dry forests and sandhills; in Colorado it occurs on sand dunes (NatureServe 2025) along the Cimarron River (Ackerfield 2022).

Within the plan area, the species has been documented along the south side of the Cimarron River in the Cimarron National Grassland (Van Scoyoc 2024). One record described its habitat as "sandy soil, sand prairie" with associated taxa of sand sagebrush (*Artemisia filifolia*), bractless blazingstar (*Mentzelia nuda*), camphorweed (*Heterotheca subaxillaris*), and annual buckwheat (*Eriogonum annuum*) (Van Scoyoc 2024). This occurrence record is intersected by a road that leads to an active oil well. One occurrence record from 2007 noted proximity to a windmill; the windmill has created ~0.2 acres of disturbance in the vicinity of the species' occurrence (Figure 136). Because the species' sparse occurrence records are proximate or intersected by a road and a windmill, habitat is considered to have declined for the species.

The subspecies has also been documented on the south side of the Cimarron River in the Cimarron National Grassland (Van Scoyoc 2024).

Threats (arising from on or off the plan area)

Population

NatureServe states that: "This species has historically been collected from the wild and used for medicinal purposes. Some experts in the medicinal plant industry have suggested that trade is medium to large, and demand has increased over the past ten years (Robbins 1999). According to Michael McGuffin, president of the American Herbal Products Association, use of this herb is marginal (pers. comm., January 2001); however, it is commercially available and information about efficacy and use is widely available. Sources of commercial products should be monitored to determine whether potential increased demand would affect wild populations," (NatureServe 2025).

Habitat

Overgrazing, fire, and trampling; High vulnerability to climate stressors.

Ecological conditions

Ecological condition requirements

Johnston (1963) state the species has a "requirement for deep and somewhat loose quartz sandy loam." It requires freedom from overcollection for the medicinal plant industry (Robbins 1999, NatureServe 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Sandy soils and sandhills are not restricted in the plan area. The sand-sage ecosystem encompasses approximately 164,675 acres of NFS lands; 64,624 acres on the Cimarron, and 100,050 acres on the Carrizo unit of the Comanche. Therefore, its ecological conditions are not considered restricted.

Critical biological characteristics

Queen's delight is a desert herb that grows in sandy, xeric soils. In Texas, the species has been documented to flower in May and June (Johnston and Warnock 1963).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

USDA NCRS (2024) characterizes this species as having minor to moderate value as a food source for terrestrial birds. Roots of this species are collected from the wild for medicinal use (NatureServe 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Subject to the same influences as the ecosystems in which it grows.

Maps of Species range and Known Occurrences in Plan Area

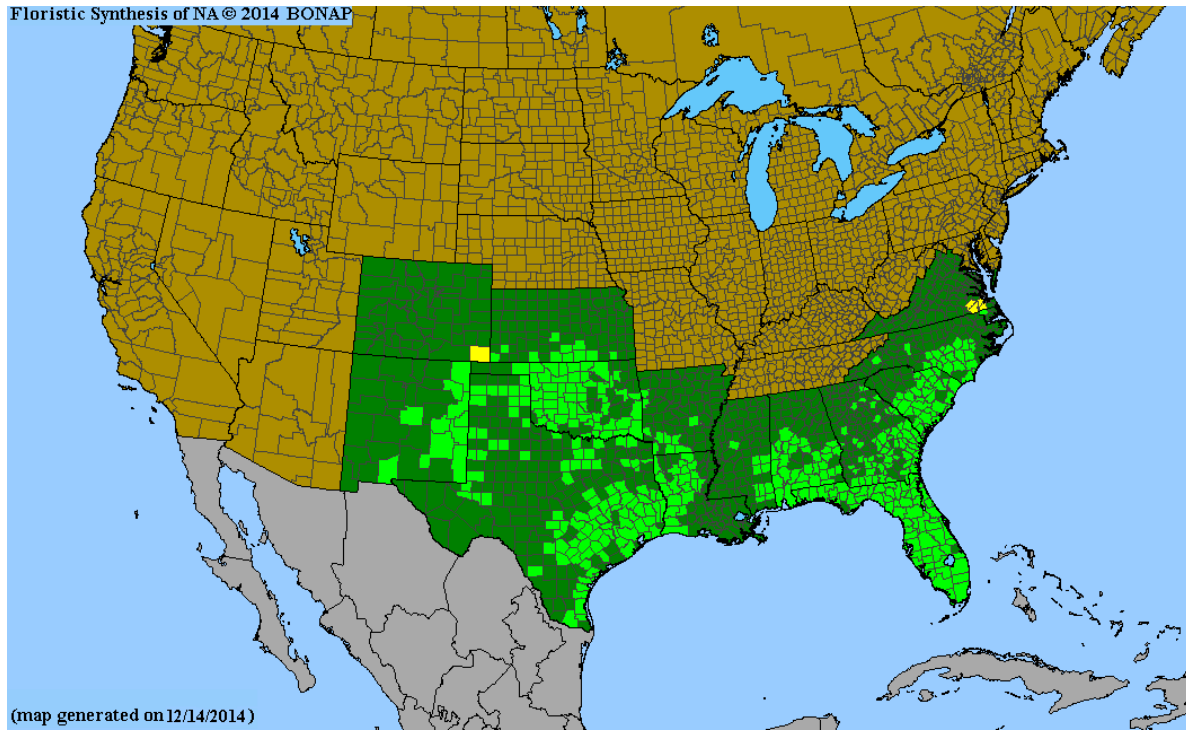


Figure 135. County occurrence data for *Stillingia sylvatica* from Biota of North America Program (BONAP). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.



Figure 136. Occurrence record of *Stillingia sylvatica* from 2007 (blue point) showing proximity to road and windmill.

Reiuchenbach's hedgehog cactus

(*Echinocereus reichenbachii* var. *perbellus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: KNHP contains two element occurrence polygons from 1978-2018 that fall squarely within the plan area (Van Scoyoc 2024). IDigBio contains five occurrence records from 1951-1987 (Van Scoyoc 2024). Therefore, the variety is known to occur in the plan area.

Year of Last Known Occurrence: 2018

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: oil and gas development, collection for the horticultural trade, competition with invasive prickly pear cactus.
 - b. Habitat: oil and gas development, sand/gravel quarries, land use change, landscape fragmentation, and climate stressors.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Available survey data shows a stable trend in the few places where occurrences have been re-visited.
 - b. Habitat quantity and quality has declined in the plan area because of oil and gas development.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known – reportedly locally common on the Cimarron, while rare within the Comanche. There are seven occurrences known in the plan area.
 - b. Ecological conditions: the species is spatially restricted to a very small portion of the plan area; micro-habitat selection seems to restrict its distribution.

Species Status

T4; SNR in Colorado; S1 in Kansas.

Taxonomy

Echinocereus reichenbachii var. *perbellus* is accepted as valid; taxonomic synonyms include *Echinocereus caespitosus* var. *perbellus* and *Echinocereus perbellus* (NRCS 2025). Another common name is lace hedgehog cactus (NRCS 2025).

Species range

Overall Species range:

Reichenbach's hedgehog cactus occurs in the Great Plains grassland in Colorado, New Mexico, and from central Texas to the western edge of Oklahoma and southeast corner of Kansas (The Encyclopedia of Cacti 2024) (Figure 137).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure 137).

Distribution, abundance, and trend in the plan area

Population:

NatureServe considers this an "apparently secure variety." It states that the variety is "Sometimes abundant on rocky hills in the grasslands of north central Texas and adjacent Oklahoma, also into southeastern New Mexico and Colorado" (NatureServe 2025).

The population size in the plan area is not known. Freeman (1989) reports the species to be locally common in Cimarron National Grassland ("fairly common in sections 16 and 17, T34S, R43W, where it occurs in mixed populations with *E. viridiflorus*") (Freeman 1989), USDA 2001). Hazlett (2004) describes the species as rare on Comanche National Grassland; he notes it is an "infrequent" plant that needs additional survey work to discern its presence and/or abundance on the Comanche National Grassland.

One site in the plan area (EL Code: PDCAC060C6) has been surveyed three times from 1988 to 2018. The EO data states: "2018-09-07: More than 100 plants observed in 3 - 5 acres in SE4 Sec 16, north of Murphy Trailhead. 2014-05-18: Approx. 150 plants scattered in small groups in SE4 Sec 17. 1988-10-05: Plants scattered to common over most of E2 sec 17 and much of sec 16" (Van Scoyoc 2024). The population trend in the plan area cannot be determined from this data but does not suggest a population decline.

Habitat

Reichenbach's hedgehog cactus occurs on dry, sandy or rocky uplands and slopes in shortgrass prairie, generally over limestone (Freeman 1989, Kuhn et al. 2011). Within the plan area, the variety *perbellus* has only been documented in the western edge of the Cimarron National Grassland north of the Cimarron River (Van Scoyoc 2024). The habitat of one occurrence record is described as "Gravelly bluffs and slopes of hills N of Cimarron R. Grazed shortgrass prairie w/numerous trails used for access to gas and oil wells" (EL Code: PDCAC060C6) (Van Scoyoc 2024). Gas pipelines and at least one active well occurs within this species' small occurrence area in the Comanche National Grassland. The surface disturbance for the one active well is ~ ¼ acre out of the species' total occurrence polygon of ~130 acres (Van Scoyoc 2024) (Figure 138). Several NFS-Level 2 roads also cross the species' occurrence polygons, and aerial imagery shows evidence of surface disturbance beyond the routes in the MVUM (Figure 138). This is expected to have contributed to a declining in habitat quality and quantity for this species (Freeman 1989).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Oil and gas development represents both a threat to both habitat and populations (e.g., by trampling individual cactus through well pad or pipeline construction). Another potential threat to populations is collection for the horticultural trade (Freeman 1989). Grazing is not considered a threat to the species (Freeman 1989). Butler (2012) identify an additional threat of competition with invasive prickly pear cactus (*Opuntia* spp.), which occupies a similar niche as Reichenbach's hedgehog cactus and competes for limited resources.

Habitat

Threats to habitat include disturbance from oil and gas development and quarrying for sand or gravel (Van Scoyoc 2024, Freeman 1989). Land use change, landscape fragmentation, and climate variability threaten this species' habitat, and these factors interact in complex ways as described further under "Influence of ecosystem structure and function on this species" (Butler et al. 2012).

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Reichenbach's hedgehog cactus grows in dry grassland, often on limestone outcrops and rimrock in bottom of valleys (USFS 2001b, The Encyclopedia of Cacti 2005). While it is usually found on limestone, it can also use sandy soils including Otero fine sandy loam and Potter-Mansker complex (Freeman 1989, USFS 2001b). Its success may depend on availability of habitat for pollinators (USFS 2001b). It requires freedom from competition with invasive prickly pear cactus (*Opuntia* spp.) (Butler et al. 2012) and freedom from excessive horticultural collection.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Within the plan area, this species has been observed in ~1,000 acres of habitat in the western edge of the Cimarron National Grassland (Van Scoyoc 2024). Hazlett (2004) describes it as rare on the Comanche National Grassland and no occurrence records could be found on the Comanche. This mirrors observations of Butler (2012), which suggests that this species appears to be spatially clumped on the landscape, possibly due to micro-habitat selection.

Hazlett (2004) characterizes its habitat as rocky (exposed limestone/shale barrens) and open steppe. In terms of soil type, Reichenbach's hedgehog cactus prefers limestone outcrops but can also use sandy soils (USFS 2001b).

Although surface disturbance associated with oil and gas development has reduced and fragmented the species' habitat in the plan area, this disturbance reflects a relatively small portion of its overall mapped occurrences.

Critical biological characteristics

Reichenbach's hedgehog cactus is a long-lived, low cactus (USFS 2001b). It flowers in spring from late May through mid-June (USFS 2001b). Fruiting is suspected to occur from mid-June through July, but

further study is needed on this variety's life history (USFS 2001b). Seeds of cacti within this genus are typically spread by small mammals (Butler et al. 2012).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Congeners are reported to be pollinated by medium-sized, solitary bees, hawkmoths, and hummingbirds (USFS 2001b).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Butler (2012) modeled how three climate scenarios might affect the distribution of this hedgehog cactus species (*Echinocereus reichenbachii*) by the 2050s and the 2080s. They found that under all scenarios investigated, the total land area of suitable habitat for the species increased (Butler et al. 2012). However, these modeled results are complicated by the fact that but that the species has slow rate of dispersal, physical barriers to dispersal including land use change, and exhibits patchy populations (Butler et al. 2012). Consequently, its actual realized niche under climate scenarios may be reduced compared to model predictions of increased suitable habitat (Butler et al. 2012).

Maps of Species Range and Known Occurrences in Plan Area

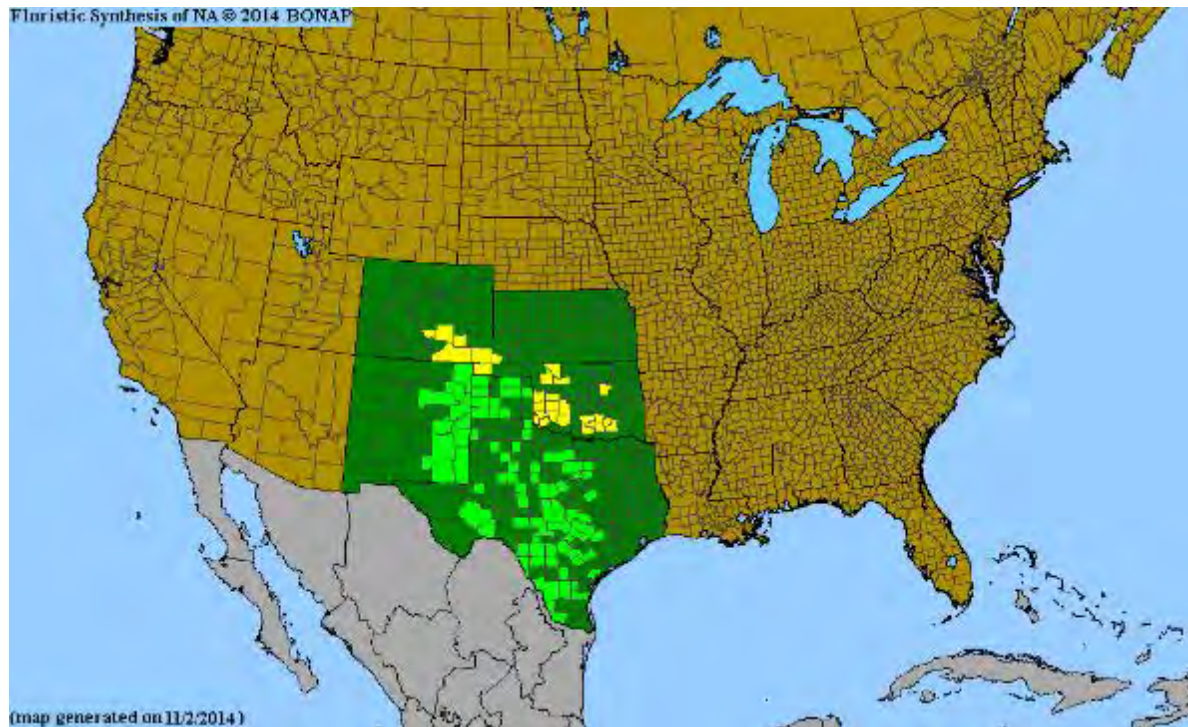


Figure 137. County occurrence data from Biota of North America Program (BONAP 2025) BONAP shows no map for *Echinocereus reichenbachii* var. *perbellus*, so only *Echinocereus reichenbachii* is shown. Dark green color indicates species presence in state and native; brown indicates

species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

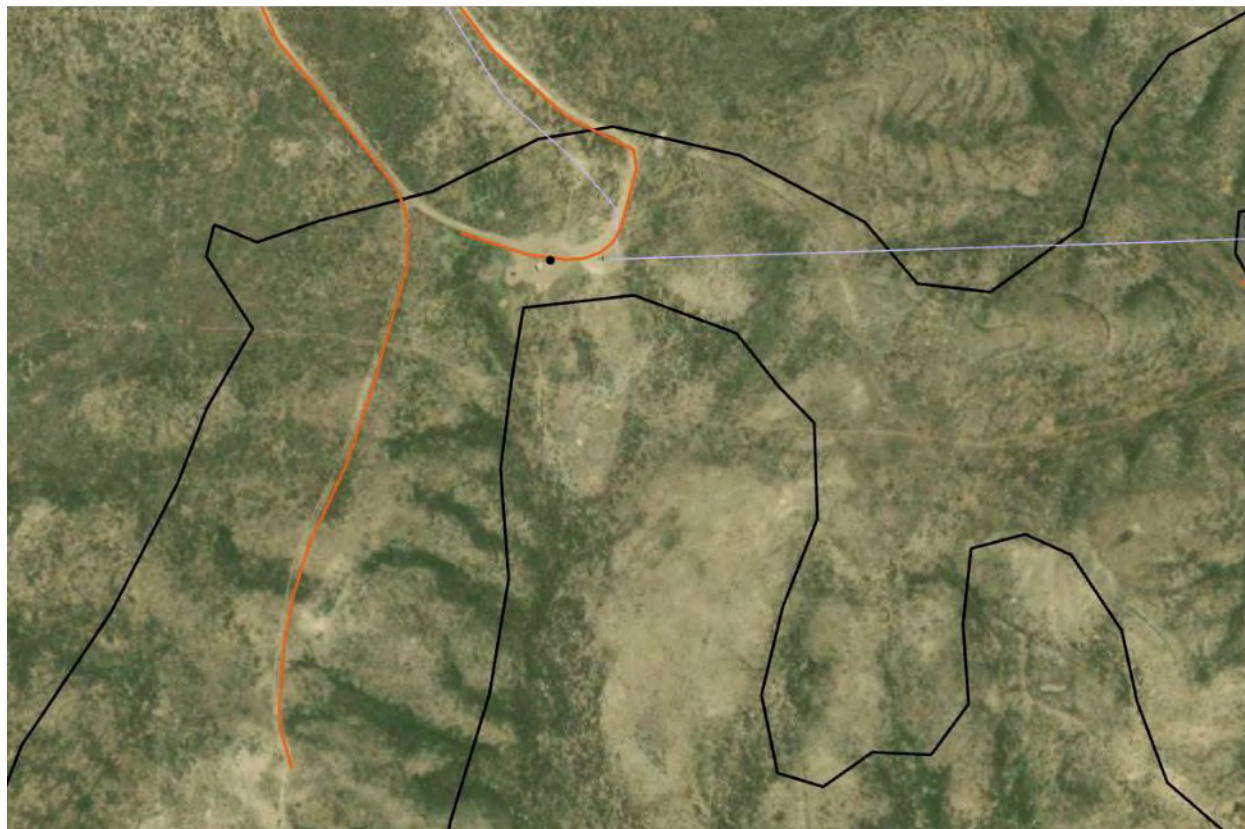


Figure 138. Aerial imagery showing habitat degradation in the element occurrence polygon for Reichenbach's hedgehog cactus. The element occurrence polygon is shown in black outline. Black circle shows active gas well within the element occurrence polygon; purple line shows gas pipeline; orange line shows NFS Level 2 road designated for use by high-clearance vehicles.

Reverchon's stickleaf

(*Mentzelia reverchonii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are three documented occurrence records in SEINet in the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025). The one occurrence record is close to a road therefore there is potential for trampling from human activity in the area.
 - b. Habitat: Common threats on and/or off the plan area include; housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend for this species in the plan area is unknown.
 - b. Habitat: Species uses varied habitats, no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The occurrences in the plan area is on the northeaster edge of the species range
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known. There are three occurrence record within the plan area.
 - b. Ecological conditions: No sources consulted identified any ecological requirements needed for this species aside from general habitat needs

Species Status

G5; S2 in Colorado; S1 in Kansas.

Taxonomy

Mentzelia reverchonii is accepted as valid (NRCS 2025, ITIS 2024, NatureServe 2025, Ackerfield 2022).
Synonym for this species is *Nuttallia reverchonii* (NRCS 2025, ITIS 2024).

Species range

Overall Species range

Reverchon's stickleaf distribution is Colorado, Kansas, New Mexico, Oklahoma, and Texas (NatureServe 2025, Flora of North America 1993).

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are on the northeastern edge of the species range (Figure 139, Figure 140).

Distribution, abundance, and trend in the plan area

Population

There are three occurrence records, one is within the Timpas Unit occurring in the Canyonland ecosystem and two occur in the Carrizo Unit within the sandsage ecosystem (USFS 2005a). Hazlett (2004) indicates this species is not known to occur in the plan area but could occur in eastern Las Animas County. Kuhn (2011) identified this species as occurring in Las Animas and Otero County.

Population trend for this species in the plan area is unknown.

Habitat

Reverchon's stickleaf is a biennial or perennial shrub that occurs in grasslands, prairie shale knolls, 3800-5500 ft in elevation (Ackerfield 2022). Flora of North America describes habitat as grasslands on eroded riverbanks, roadsides, roadcuts, sparsely vegetated hillside slopes, sandy, gravelly, clayey, occasionally gypsum soils (Flora of North America 1993). Hazlett (2004) describes it as rocky: exposed limestone/shale barrens. Kuhn (2011) describes habitat as midgrass prairie and shortgrass prairie in a floristic inventory of the Cimarron National and Comanche National Grasslands.

There are three herbarium record finds in the plan area. The occurrence record in the Timpas unit, locality is Purgatoire Canyon in the Comanche Grasslands. The habitat is rimrock and slopes below to flats along river. The other records are in North Picket House draw and Burrows draw in the shortgrass prairie.

The occurrence records are spatially mapped within the Western Great Plains Shortgrass Prairie (Landfire 2024). The Burrows occurrence record is 150 feet adjacent to a dirt road that is open year-round.

Species uses varied habitats with no discernable trend.

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025). There is one occurrence record is close to a road therefore there is potential for trampling from human activity in the area.

Habitat

Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025, Flora of North America 1993). Species is perennial, flowers May through August (Ackerfield 2022).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are three herbarium record finds in the plan area. The occurrence record in the Timpas Unit, locality is Purgatoire Canyon in the Comanche Grasslands. The habitat is rimrock and slopes below to flats along river. The other records are in North Picket House draw and Burrows draw in the shortgrass prairie.

The occurrence records are spatially mapped within the Western Great Plains Shortgrass Prairie (Landfire 2024). The Burrows occurrence record is 150 feet adjacent to a dirt road that is open year-round.

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (NatureServe 2025, Flora of North America 1993).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species range and Known Occurrences in Plan Area

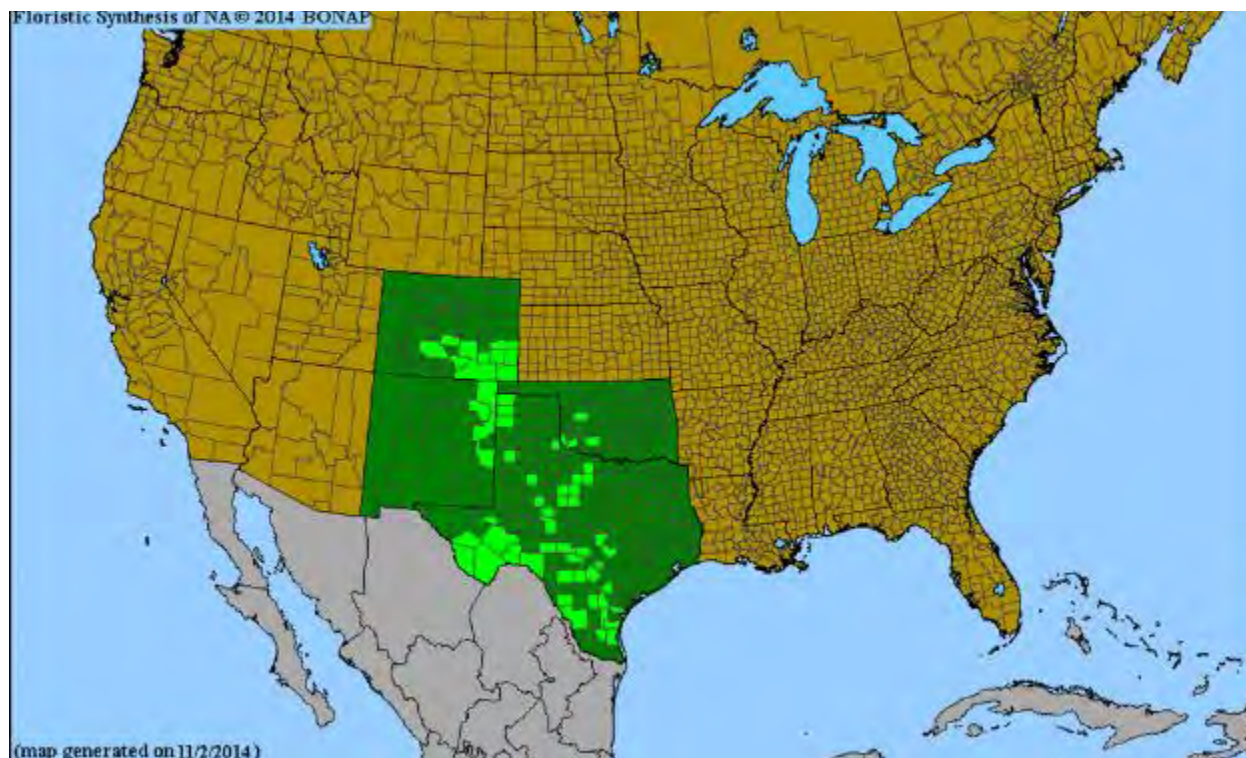
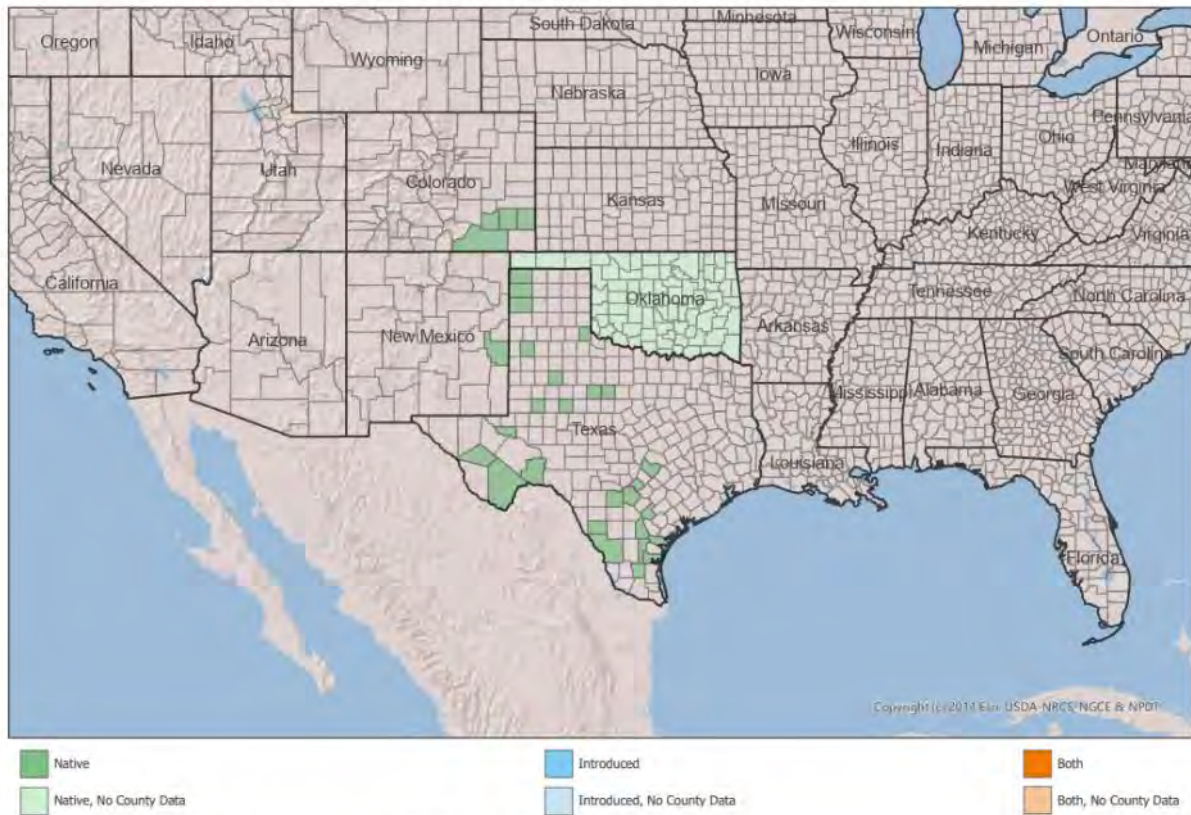


Figure 139. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Mentzelia reverchonii



MEREZ *Mentzelia reverchonii* (Urb. & Gilg) H.J. Thomp. & Zavort., Reverchon's blazingstar
Wednesday, Aug 7, 2024

Figure 140. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Rocky Mountain bladderpod

(*Lesquerella (Physaria) calcicola*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Two documented occurrences on the Comanche National Grassland (NG) in Otero County, Colorado from 1948 and 1997 (Van Scoyoc 2024). The collection from 1948 is documented in iDigBio and the collection from 1997 is documented in SEINet (Van Scoyoc 2024).

Year of Last Known Occurrence: 1997

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Drought, and surface disturbance including development, mining, quarrying, and recreational activities.
 - b. Habitat: Drought, climate stressors, and surface disturbance (as above).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Habitat trends are currently unknown, but unlikely on a declining trend – shale barrens are likely to be stable.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are within the very restricted range of the species. The species is narrowly endemic to shale barrens in Colorado and New Mexico which are quite limited.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are two documented occurrences in the plan area. Current population numbers are not known, however the collection in 1997 cited plants as locally common.
 - b. Ecological conditions: Shale barrens in the plan area are uncommon and patchily distributed, therefore the habitat is considered restricted.

Species Status

G3; S3 in Colorado.

Taxonomy

Lesquerella calcicola Rollins is accepted as valid in PLANTS database (NRCS 2025) and *Physaria calcicola* is accepted as valid by other authorities (Ackerfield 2022, Flora of North America 1993). Weber (2012) with the two being recognized by most sources as synonyms of one another.

Species range

Overall Species range

In North America, occurs only in Colorado and New Mexico (NatureServe 2025). Plants are regionally endemic to the Arkansas River Valley shale barrens.

Description of how the population in the plan area fits within the overall range

The species has a limited range and is endemic to Colorado and New Mexico (Figure 141). In the Checklist of Vascular Plants of the Comanche NG, Rocky Mountain bladderpod was listed as present in Otero County and “could occur” in Las Animas and Baca County because it is known from a nearby area (Hazlett 2004).

Distribution, abundance, and trend in the plan area

Population

There are two documented occurrences in the plan area, however little is known of abundance and trend. The 1997 herbarium collection record in Otero County on the Comanche NG lists the species as locally common (SEINet 2024). Distribution is naturally limited in the plan area because plants are restricted to shale barrens in the shortgrass prairie.

Habitat

The species grows in a largely barren habitat with calcareous soils in the shortgrass prairie. Plants grow on barren slopes in the Arkansas River Valley (Munson and Sher 2015) including shale barrens and bluffs, calcareous hills and ravines, grasslands and pinyon-juniper communities (Flora of North America 1993). Ackerfield (2022) lists the habitat as shale, limestone, and gypsum, often in pinyon-juniper from 4800 to 6900 feet. In Colorado, the species grows on shale from the Niobrara Formation. Weber (2012) identify Rocky Mountain bladderpod as “endemic of the Piceance Basin growing on Green River Shale”.

The shale barrens are small (less than 1,000 acres) and patchily distributed (USFS 2005a) and therefore considered restricted in the plan area. Due to shortgrass prairie conversion on private lands, the Comanche NG provides consistent habitat quality and quantity for this plant (USFS 2005a).

Threats (arising from on or off the plan area)

Population

Little is known of the threats to plant populations but largely understood to be synonymous with threats to the shale barren habitat in the shortgrass prairie (Neid et al. 2007).

Habitat

Neid (2007) states threats to habitat may include habitat conversion, development, surface disturbance whereby shales are subject to the mining of gypsum and landscape material, and invasion by weedy species.

Ecological conditions

Ecological condition requirements

Calcareous soils on barrens in the Arkansas River Valley.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The shale barrens encompass a small amount of acreage and are patchily distributed in the plan area (USFS 2005a) therefore connectivity among populations is likely minimal. Quality of the ecological conditions in the plan area is not known. Trend of ecological conditions on the Comanche NG shale barrens is not known from the consulted sources.

Critical biological characteristics

Rocky Mountain bladderpod is a very small perennial herbaceous cushion plant in the mustard family. Little is known about the ecology and critical biological characteristics of this species (USFS 2005a).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species provides diversity in a specialized and largely barren habitat where few other native species may be likely to occur or able to persist. The yellow flowers of this small mustard species likely attract native bees, moths, butterflies and other insects as pollinators.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Little is known of the ecosystem influences on this species, however some areas of apparently suitable habitat on calcareous soils are not occupied (Neid et al. 2007). Increasing temperatures are likely to push the species into unsuitable habitat.

Maps of Known Occurrences in Plan Area

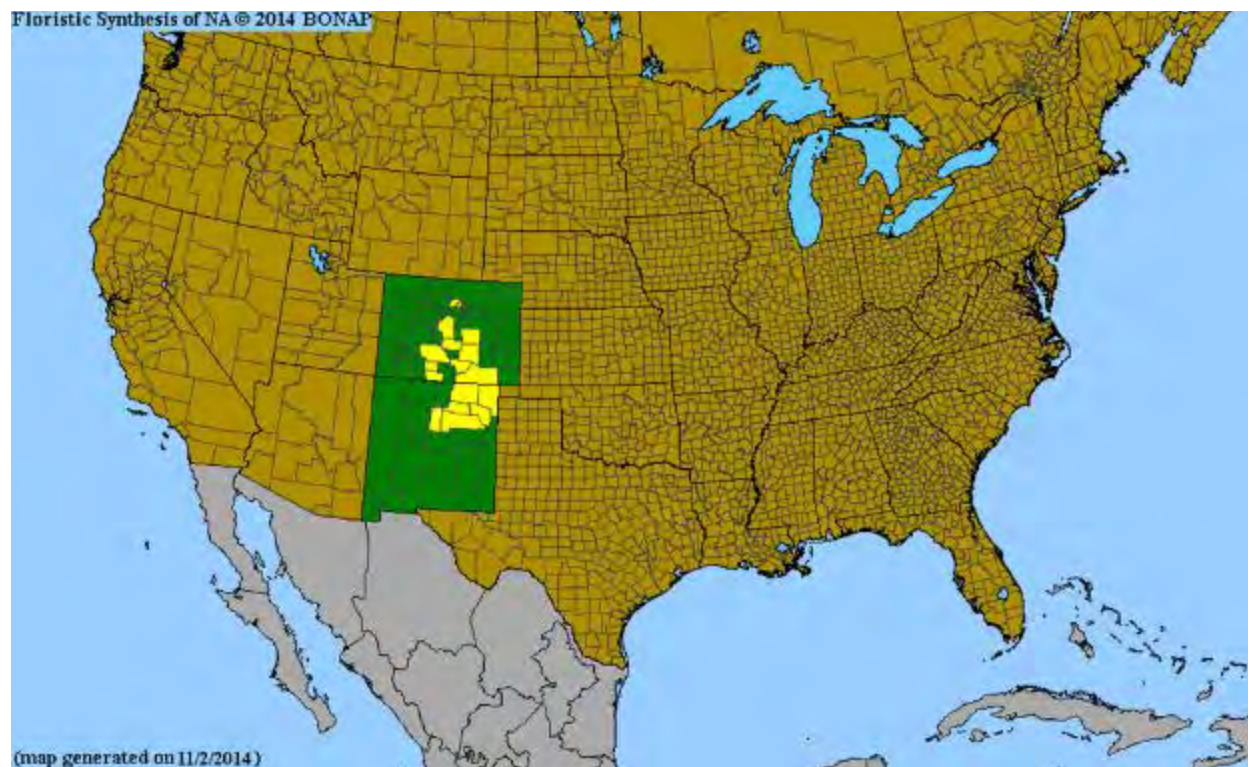


Figure 141. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Rocky Mountain nailwort

(*Paronychia depressa*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: KNHP contains two occurrence polygons from 1971; one of these occurrence records is also in GBIF (Van Scoyoc 2024). All occurrence records are based on a single survey in 1971, which reported these plants as common in the Cimarron National Grassland near Point of Rocks; however, a subsequent survey in 1988 searched “most of the suitable habitat” in this area with no plants found (Van Scoyoc 2024). Therefore, the species is no longer known to occur in the plan area due to uncertainty as to whether it persists in the plan area.

Year of Last Known Occurrence: 1971

Species Status

G4; SNR in Colorado; S1 in Kansas.

Taxonomy

Paronychia depressa is accepted as valid (NRCS 2025). Another common name for this species is spreading nailwort (NRCS 2025) or great plains nailwort (Rohweder 2022).

Rocky Mountain phacelia

(*Phacelia denticulata*)

Species in Native and Known to Occur on National Forest System lands in Plan Area: No

Rationale/Evidence of Occurrence: there is one occurrence record within the plan area (Van Scoyoc 2024). It is described as between Iron and Minnie Canyons, Pinyon Canyon Maneuver site which is not in the plan area. This species is not known to occur in the plan area.

Year of Last Known Occurrence: 1998

Species Status

G3; S3 in Colorado.

Maps of Species range and Known Occurrences in Plan Area

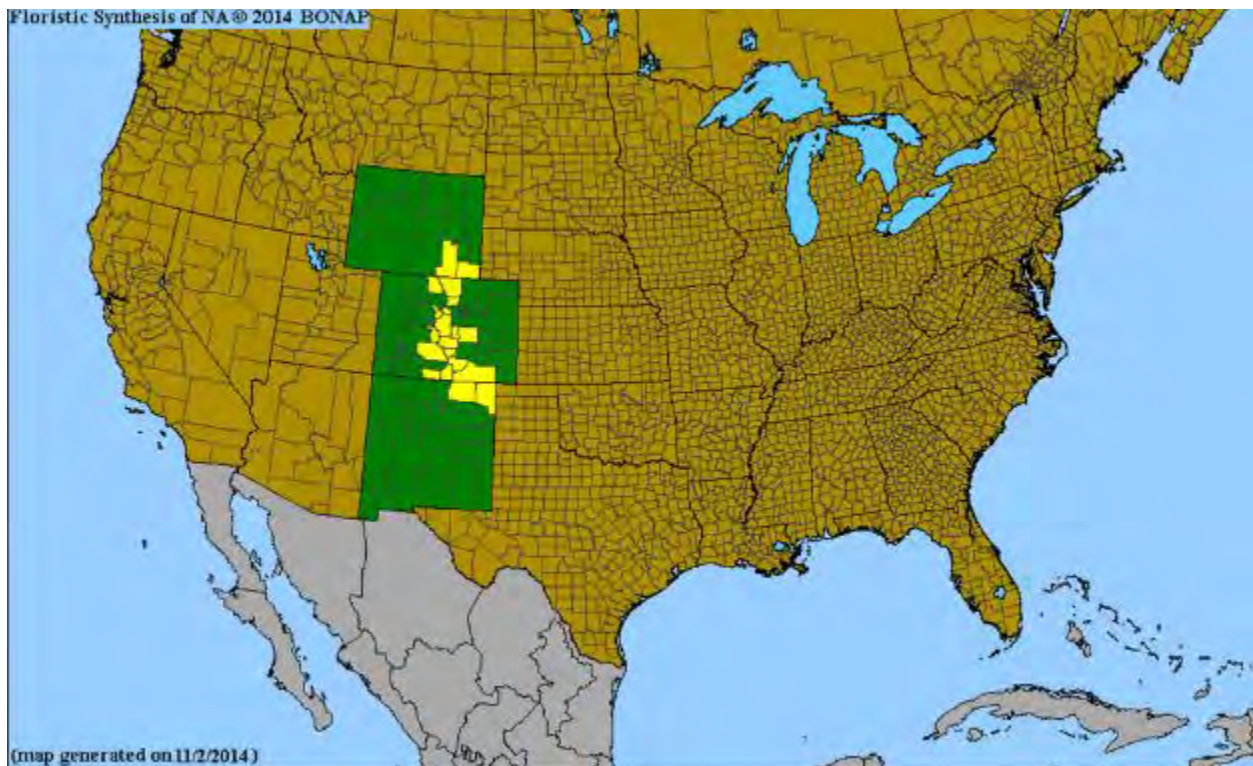


Figure 142. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

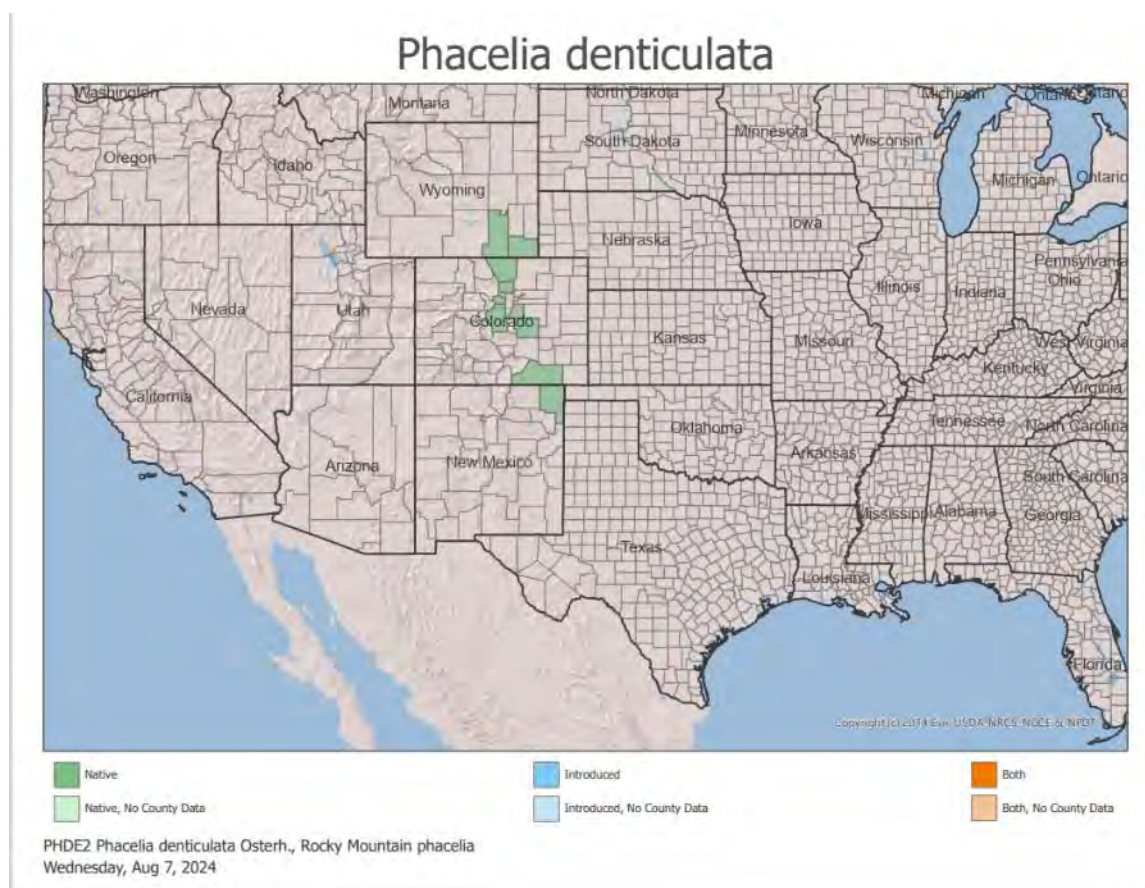


Figure 143. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Rocky Mountain rhombo-pod (*Cleomella palmeriana*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: There is one documented occurrence on the Cimarron and Comanche National Grasslands from 1962 (Van Scoyoc 2024). The herbarium specimen is listed as "*Cleomella* unknown". No other consulted databases contain occurrence records (Van Scoyoc 2024). Due to the limited observation lacking the specific epithet of *palmeriana* and low spatial precision, the species is not currently known to occur in the plan area and is not analyzed further.

Year of Last Known Occurrence: N/A

Species Status

G3; S3 in Colorado.

Taxonomy

Cleomella palmeriana M.E. Jones is accepted as valid (Ackerfield 2022, NRCS 2025). Synonyms include *Cleomella cornuta*, *Cleomella montrosae*, and *Cleomella nana*, and *Cleomella palmeriana* var. *goodrichii* (NRCS 2025). Another common name is Rocky Mountain stickseed (NRCS 2025).

Rosy palafoxia

(*Palafoxia rosea*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: there are ~19 occurrence records with varying degree of spatial precision in SEINet, GBIF, and iDigBio within the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Potentially threatened by road work, mining, and weed invasion (Wyoming Field Guide 2024).
 - b. Habitat: Most observations occurred within the western great plain's shortgrass prairie. Common stressors and threats include fragmentation, altered fire regime, overgrazing by livestock, and invasive species (in the less xeric regions). Fire suppression and certain grazing patterns such as continuous heavy grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. The short grasses that dominate this system are extremely drought- and grazing-tolerant although continuous heavy grazing and extended drought (3-4 years) will reduce cover of dominant species (NatureServe 2025).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend is unknown.
 - b. Habitat: Shortgrass prairie has a declining trend in the quality of habitat in the plan area (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northern edge of the species' range (Figure 1, Figure 2, Figure 3).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are at least 19 occurrence records that occur in the Timpas and Carrizo Unit (16 observations are in the Timpas Unit). Most observations were near canyons (Holt canyon, Carrizo Canyon, Bravo Canyon, Iron Canyon, Picketwire canyonlands, Vogel Canyon, Highbee Canyon). Seventeen locations are spatially mapped within the canyonlands ecosystem and two within the shortgrass prairie (USFS 2005a). Fifteen of the observations were spatially mapped within the Western Great Plains Shortgrass Prairie, and the remaining were in Central Mixedgrass Prairie Shrubland, Western Great Plains Riparian Woodland, Western Great Plains Sandhill Steppe, and Northern & Central Plains Ruderal & Planted Shrubland (Landfire 2024).
 - b. Ecological conditions: No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025, Hazlett 2004, Kuhn et al. 2011). Hazlett (2004) describes habitat as sandy soils. Kuhn (2011) found this species within pinyon juniper woodland, roadside, rocky upland prairie, shortgrass prairie, sandsage prairie vegetation types. The soil description for this species is Sandy, Sandy Loam, Medium Loam, Clay Loam, Clay, Limestone-based, Caliche type (NPIN 2025) which taken together do not represent a restricted ecological condition in the plan area.

Species Status

G5; S2 in Colorado; S1 in Kansas.

Taxonomy

Palafoxia rosea is accepted as valid (Ackerfield 2022, NRCS 2025, ITIS 2024). USDA Plants Database recognizes two varieties for this species including *Palafoxia rosea* var. *macrolepis* and *Palafoxia rosea* var. *rosea* (NRCS 2025).

Species range

Overall Species range

Rosy palafoxia distribution is Colorado, Kansas, New Mexico, Oklahoma, Texas, and Wyoming (NatureServe 2025)

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range (Figure 144, Figure 145).

Distribution, abundance, and trend in the plan area

Population

There are ~19 occurrence records that occur in the Timpas and Carrizo Unit (16 observations are in the Timpas Unit). The locality of most observation was in close proximity to canyons (Holt canyon, Carrizo Canyon, Bravo Canyon, Iron Canyon, Picketwire canyonlands, Vogel Canyon, Highbee Canyon). Seventeen locations are spatially mapped within the canyonlands ecosystem and two within the shortgrass prairie (USFS 2005a).

Herbarium records are from varies habitat locations. Some occur along weedy roadside and rocky roadcut, shortgrass prairie above sandstone ledges and pavement, near picnic area hillside and lush creek banks, along a riverbank, canyon with sandy soil, sandstone canyon, along Purgatoire river, pinyon juniper woodland.

Population trend for this species in the plan area is unknown.

Habitat

Ackerfield (2022) sandy soil of the southeastern plains, 4000-5500 ft elevation. Hazlett (2004) describes habitat as sandy soils. Kuhn (2011) found this species within pinyon juniper woodland, roadside, rocky upland prairie, shortgrass prairie, sandsage prairie vegetation types. The soil description for this species is Sandy, Sandy Loam, Medium Loam, Clay Loam, Clay, Limestone-based, Caliche type (NPIN 2025).

Herbarium records are from varies habitat locations. Along weedy roadside and rocky roadcut Shortgrass prairie above sandstone ledges and pavement, near picnic area hillside and lush creek banks, along a riverbank, canyon with sandy soil, sandstone canyon, along Purgatoire river, pinyon juniper woodland. Fifteen of the observations were spatially mapped within the Western Great Plains Shortgrass Prairie, and the remaining were in Central Mixedgrass Prairie Shrubland, Western Great Plains Riparian Woodland, Western Great Plains Sandhill Steppe, and Northern & Central Plains Ruderal & Planted Shrubland (Landfire 2024).

There are no clear threats and habitats do not appear to be declining, and therefore sensitive status does not appear to be warranted (USFS 2002). However, due to its limited distribution and abundance in R2, we recommend that it be considered as an Emphasis Species on the National Grasslands in WY and CO (USFS 2002).

Threats (arising from on or off the plan area)

Population

Potentially threatened by road work, mining, and weed invasion (Wyoming Field Guide 2024).

Habitat

Most observations occurred within the western great plain's shortgrass prairie. Common stressors and threats include fragmentation, altered fire regime, overgrazing by livestock, and invasive species (in the less xeric regions). Fire suppression and certain grazing patterns such as continuous heavy grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. The short grasses that dominate this system are extremely drought- and grazing-tolerant although continuous heavy grazing and extended drought (3-4 years) will reduce cover of dominant species (NatureServe 2025).

There are no clear threats and habitats do not appear to be declining, and therefore sensitive status does not appear to be warranted (USFS 2002). However, due to its limited distribution and abundance in R2, we recommend that it be considered as an Emphasis Species on the National Grasslands in WY and CO (USFS 2002).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025, Hazlett 2004, Kuhn et al. 2011).

Hazlett (2004) describes habitat as sandy soils. Kuhn (2011) found this species within pinyon juniper woodland, roadside, rocky upland prairie, shortgrass prairie, sandsage prairie vegetation types.

The soil description for this species is Sandy, Sandy Loam, Medium Loam, Clay Loam, Clay, Limestone-based, Caliche type (NPIN 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are ~19 occurrence records that occur in the Timpas and Carrizo Unit (16 observations are in the Timpas Unit). The locality of most observation was in close proximity to canyons (Holt canyon, Carrizo Canyon, Bravo Canyon, Iron Canyon, Picketwire canyonlands, Vogel Canyon, Highbee Canyon). Seventeen locations are spatially mapped within the canyonlands ecosystem and two within the shortgrass prairie (USFS 2005a). Fifteen of the observations were spatially mapped within the Western Great Plains Shortgrass Prairie, and the remaining were in Central Mixedgrass Prairie Shrubland, Western Great Plains Riparian Woodland, Western Great Plains Sandhill Steppe, and Northern & Central Plains Ruderal & Planted Shrubland (Landfire 2024).

Trend of ecological conditions in plan area is unknown.

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (Ackerfield 2022, NatureServe 2025, Hazlett 2004, Kuhn et al. 2011).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Attractive to bees, butterflies and birds. Larva Host: some Lepidoptera species (Native Plant Society of Texas 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

None known at this time.

Maps of Species range and Known Occurrences in Plan Area

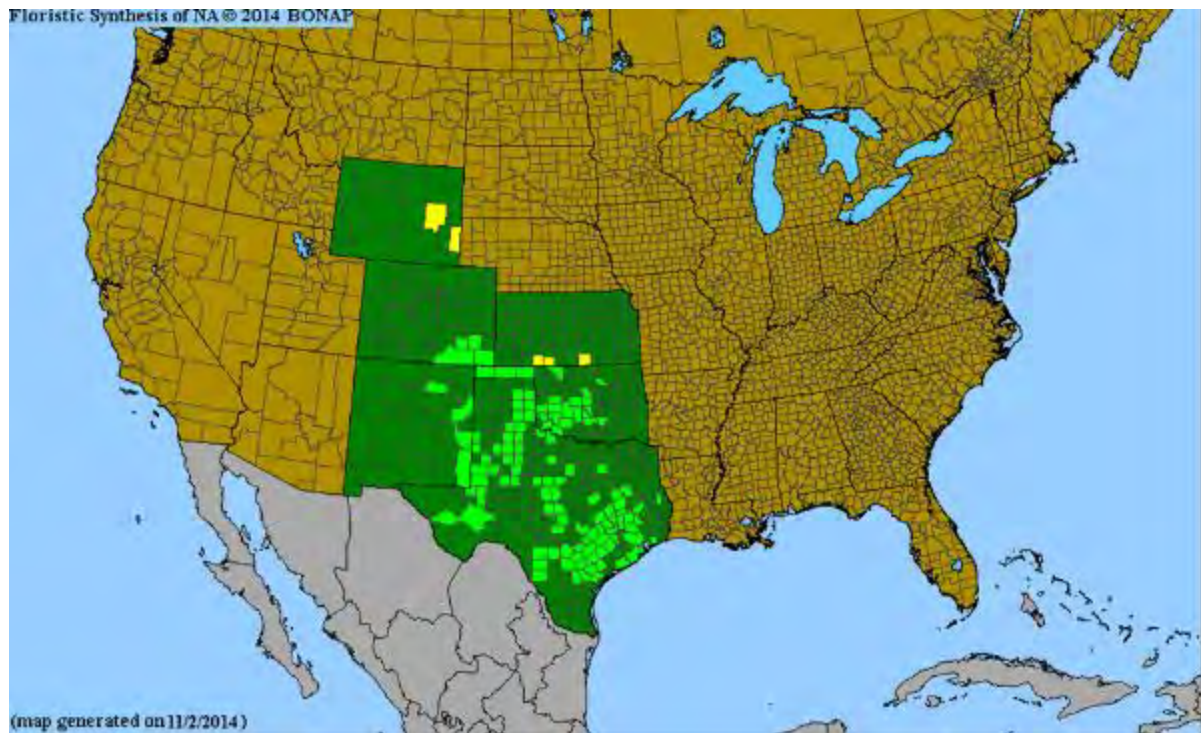
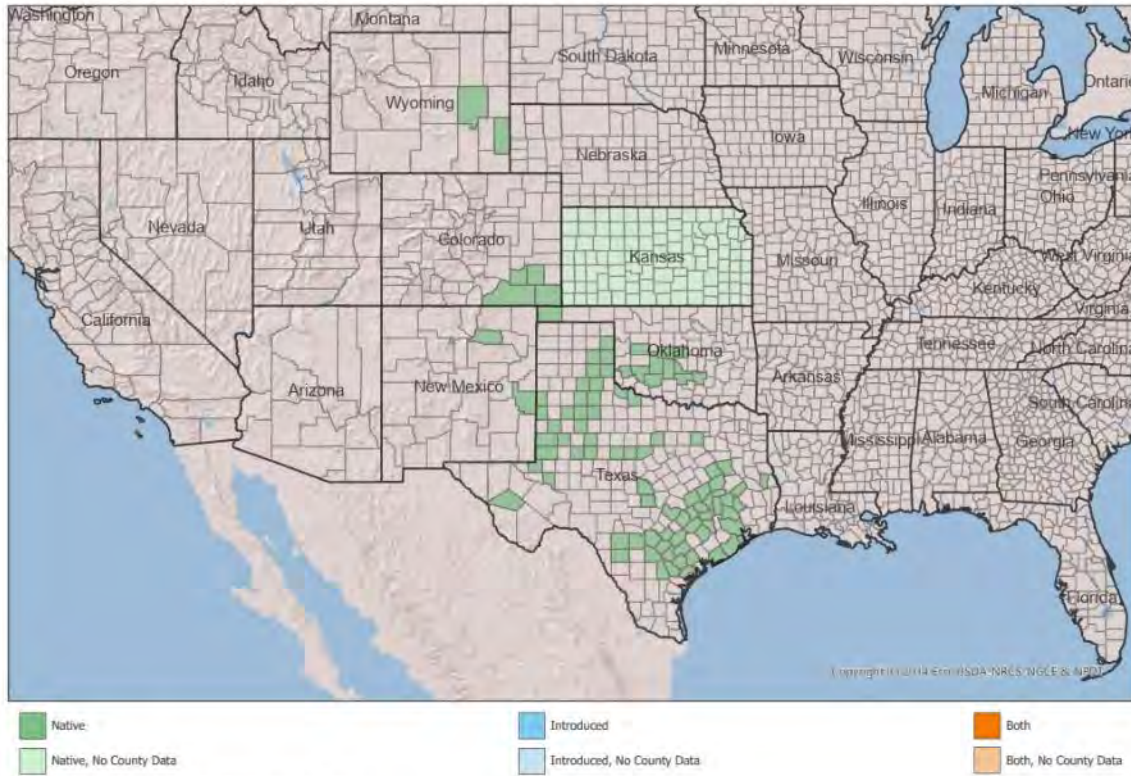


Figure 144. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Palafoxia rosea



PARO Palafoxia rosea (Bush) Cory, rosy palafox
Wednesday, Jul 10, 2024

Figure 145. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Roundleaf four-o'clock

(*Mirabilis rotundifolia*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: Hazlett (2004) stated that this species was known to occur in Otero County within the Comanche National Grassland. SEINet, GBIF, and iDigBio have one documented occurrence record in the plan area from 1946 (Van Scoyoc 2024). The herbarium record lists the collection occurring in Fremont County, (which is outside the plan area) Portland, shale hills. The record was georeferenced to Otero County where there is a topographic feature called Shale Hills. The point location is too imprecise to determine whether this observation occurred in the plan area therefore this species is not known to occur in the plan area and was not analyzed further.

Year of Last Known Occurrence: 1946

Species Status

G2; S2 in Colorado.

Taxonomy

Mirabilis rotundifolia is accepted as valid (Ackerfield 2022, NRCS 2025).

Running fleabane (*Erigeron flagellaris*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CNHP has one occurrence polygon in the Comanche National Grasslands from 2018 (CNHP 2024, Van Scoyoc 2024). This polygon falls squarely within the plan area and has sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2018

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: oil and gas development.
 - b. Habitat: oil and gas development.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: habitat in the plan area has declined because of natural gas pipelines that overlap species' occurrence polygon.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the eastern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There is one documented occurrence record with a single plant observed at that location.
 - b. Ecological conditions: uses varied habitats, including limestone breaks.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

Erigeron flagellaris A. Gray is accepted as valid (Ackerfield 2022, NRCS 2025, Weber et al. 2012). *Erigeron flagellaris* var. *typicus* and *Erigeron nudiflorus* are taxonomic synonyms. Another common name is trailing fleabane (NRCS 2025).

Species range

Overall Species range:

Running fleabane is widespread throughout the Great Plains (NatureServe 2025) (Figure 146, Figure 147).

Description of how the population in the plan area fits within the overall range:

The plan area is at the eastern edge of the species' range (Figure 146, Figure 147).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. The single occurrence record in the plan area from 2018 states one plant was observed (Van Scoyoc 2024). There is no county data for Morton County, Kansas; it is not considered rare in Las Animas County, Colorado (Figure 147).

Habitat

Running fleabane is found in open meadows and grassy slopes, pinyon pine, oak-pine, pine, aspen, and spruce-fir, at elevations from 6,800-11,800 ft (NatureServe 2025, SEINet 2024). It can also use moist habitats created at the margins of stock tanks (SEINet 2024) and disturbed areas (Nesom 1976).

Within the plan area, it has been documented in limestone breaks north of the Cimarron River on the Cimarron National Grassland (Van Scoyoc 2024). Two natural gas pipelines intersect the one occurrence polygon and are considered to contribute to a decline in this species' habitat in the plan area.

Threats (arising from on or off the plan area)

Population

Oil and gas development is considered a threat to this species' population in the plan area, given that the only known occurrence polygon overlaps with this infrastructure.

Habitat

Oil and gas development is considered a threat to this species' habitat in the plan area, given that the only known occurrence polygon overlaps with this infrastructure. However, running fleabane can also use disturbed habitat (Nesom 1976).

Ecological conditions

Ecological condition requirements

This species can use varied habitat types (NatureServe 2025, SEINet 2024). The single occurrence record in the plan area was associated with limestone breaks (Van Scoyoc 2024). USDA NRCS considers

running fleabane a “facultative” species that occurs in both wetlands and non-wetlands in the Great Plains region (NRCS 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Although running fleabane uses moist habitats, it is not restricted to that habitat type (NRCS 2025). It is a common inhabitant of disturbed areas (Nesom 1976). Within the plan area, it occurred on limestone breaks. Therefore, the ecological conditions for running fleabane are not considered to be restricted in the plan area.

Critical biological characteristics

Running fleabane is a biennial or short-lived perennial forb in the Aster family (Asteraceae) (Nesom 1976, SEINet 2024). Flowering occurs from April through September (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found specifically for this species. Within the family Asteraceae, the flower heads are habitually visited by a varied group of insects, including pollinating insects and insects that seek shelter within the flower heads; *Erigeron* species are believed to be generalists, pollinated by many different types of insect pollinators (Bailey 2013).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Under future climate scenarios, frost events are likely to be an important factor affecting the abundance of flowering in sensitive species (Inouye 2008). Running fleabane does not seem to suffer much from spring frost damage (Inouye 2008).

Maps of Species Range

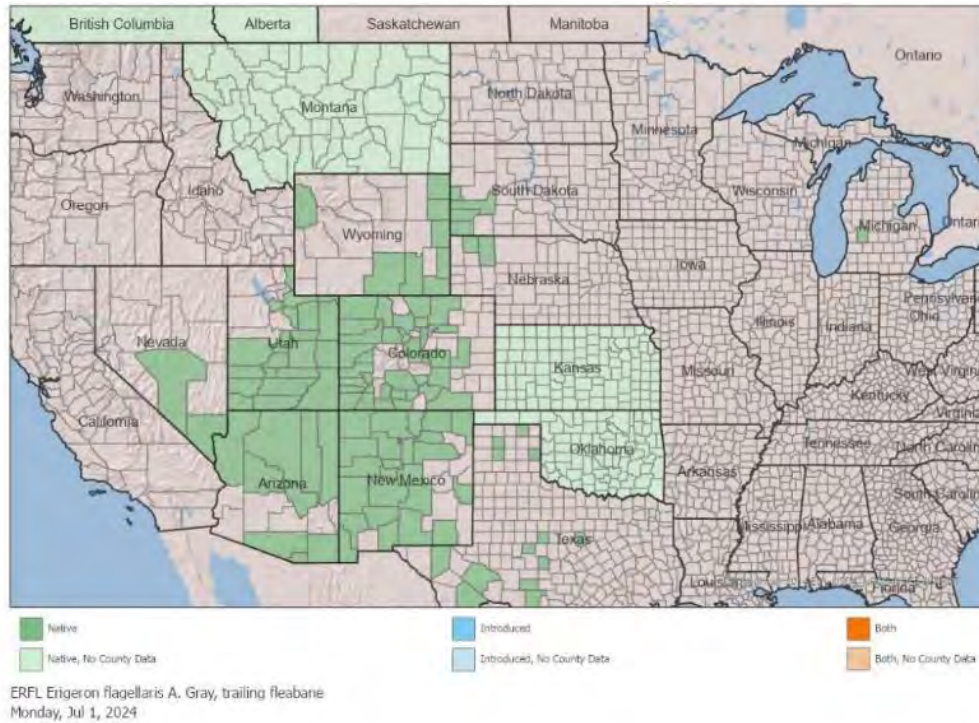


Figure 146. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

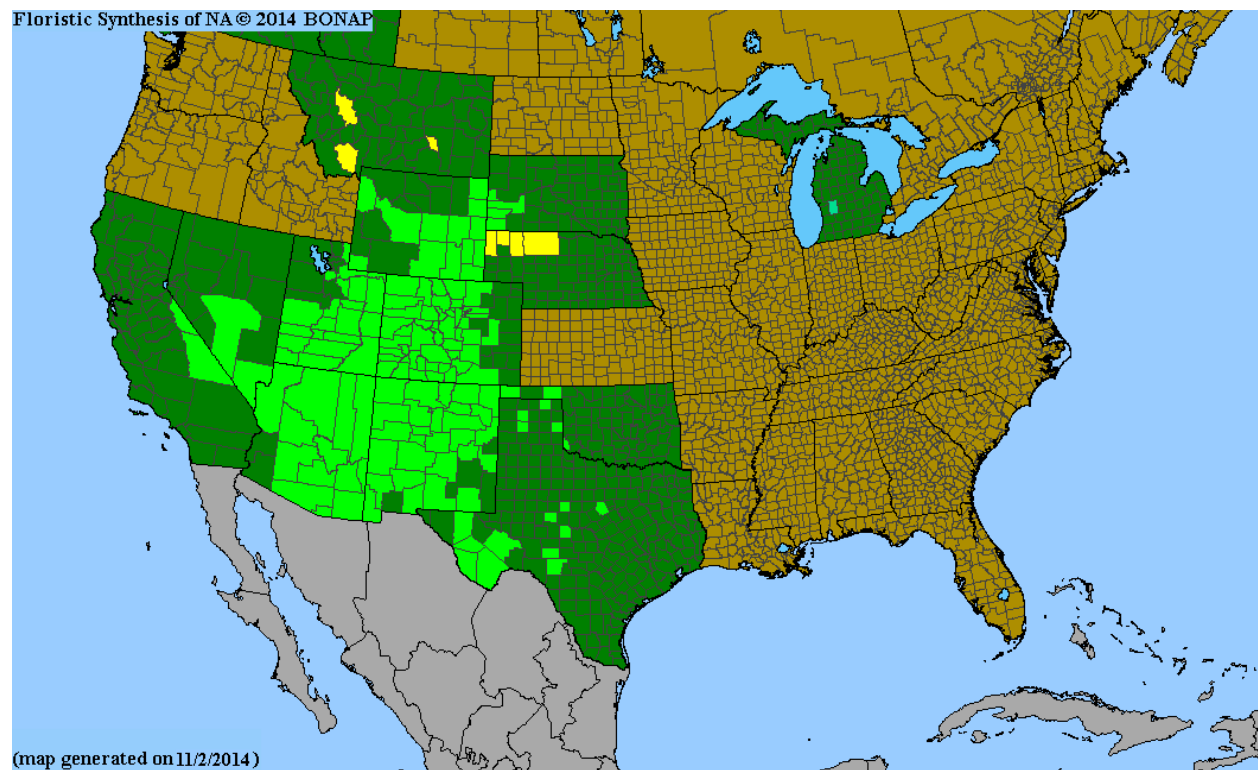


Figure 147. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Sand muhly

(*Muhlenbergia arenicola*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Kansas NHP (KNHP) has 10 recorded observations from 1958 to 1988 in the Plan Area (Van Scoyoc 2024). GBIF has 10 records of observation from 1948 to 2021 in the Plan Area (Van Scoyoc 2024). iDigBio has 9 records of observation from 1948 to 2021 in the Plan Area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: There are no known threats to the species from the consulted sources.
 - b. Habitat: The shortgrass prairie habitat in eastern Colorado is threatened primarily by grazing, as well as non-native species, wildfire, and drought.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trends are unknown.
 - b. Habitat: spatial extent considered stable except for the deviated shortgrass prairie habitat where there is a declining trend in the quality of the habitat.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Species is at the northern edge of its range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Numbers are unknown.
 - b. Ecological Conditions: Not considered restricted within the plan area.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

Muhlenbergia arenicola Buckley is accepted as valid (NRCS 2025). One synonym for this species is known: *Podosemum arenicola* (ITIS 2024).

Species range

Overall Species range

Its range extends from the southwestern United States (Arizona, Colorado, Kansas, New Mexico, Oklahoma and Texas) to central Mexico (NatureServe 2025, SEINet 2024). It also grows, as a disjunct population, in northwestern Argentina (SEINet 2024).

Description of how the population in the plan area fits within the overall range

The records of this species within the Plan Area fall within the known range for the species, but it is considered at the northern edge of its range.

Distribution, abundance, and trend in the plan area

Population

NatureServe has documented data of the species occurring in the general area in Colorado and Kansas of the plan area (NatureServe 2025). Kansas NHP has 10 recorded observations from 1958 to 1988 in the Plan Area. GBIF has 10 records of observation from 1948 to 2021 in the Plan Area (GBIF 2023). iDigBio has 9 records of observation from 1948 to 2021 in the Plan Area (iDigBio 2024). No information is available for population abundance or trend in the plan area.

Habitat

Sand muhly grows on sandy mesas, limestone benches, and in valleys and open desert grasslands, at elevations of 1,968 – 7,005 ft. (600 – 2,135 m) (SEINet 2024). These types of habitats are readily available across the plan area.

The shortgrass prairie habitat type is the dominant habitat type across the plan area. It is considered good with a stable condition in Kansas (Rohweder 2022) but has deviated from historical conditions regarding composition in eastern Colorado.

The sandsage prairie habitat type is the second-most widespread vegetation type in the plan area, and the most abundant type for the Cimarron National Grassland, specifically (USFS 2005a). In Kansas, the sandsage prairie habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of the historic sandsage habitat has been lost or converted for agricultural uses (CPW 2015). The remaining tracts have good landscape connectivity, but the species composition is highly altered (CPW 2015).

Threats (arising from on or off the plan area)

Population

No threats are known at this time.

Habitat

Desert grasslands are being primarily threatened by climate stressors, drought, livestock grazing, wildfire, and woody plant and invasive species encroachment (University of Arizona 2024).

Ecological conditions

Ecological condition requirements

The species requires open desert grasslands, sandy mesas, and limestone benches, and can persist at a wide range of elevations.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The required ecological conditions for this species are well distributed across the plan area and are considered stable except for the dominant shortgrass prairie habitat, which is the most widespread vegetation type in the plan area. In Kansas it is considered good with a stable trend (Rohweder 2022), but in eastern Colorado there is a widespread deviation regarding changes in the composition (lower species diversity, lower abundance of highly palatable grasses, increase in weedy species, and an increase in bare ground).

Critical biological characteristics

Unknown.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

“Sand muhly has little value as forage for livestock or wild grazers. It is effective in controlling wind erosion in very sandy areas” (Utah State University 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

None known at this time.

Maps of Species range and Known Occurrences in Plan Area

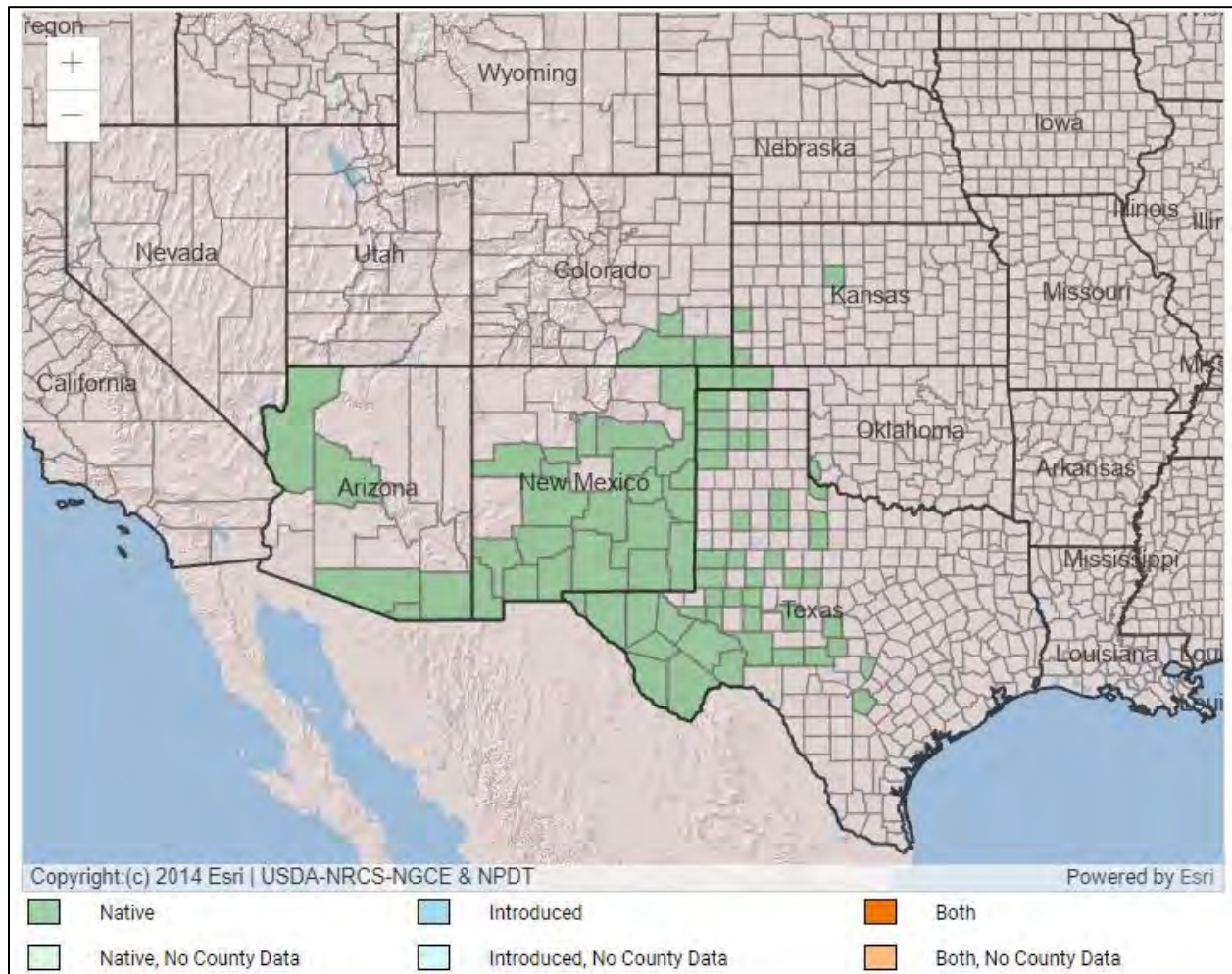


Figure 148. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Sandhill goosefoot

(Chenopodium cycloides)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are eight documented occurrence records in the plan area from SEINet, GBIF, KNHP, and CNHP (GBIF 2023, CNHP 2024, Van Scoyoc 2024).

Year of Last Known Occurrence: 2016

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Smooth goosefoot occurrences are vulnerable to unintentional extirpation. This species depends on moderate levels of disturbance and most populations have been reported from blowouts in sandsage prairies. Suitable habitat is scarce throughout species' range and populations are suspected to fluctuate in size from year to year (Freeman 1989).

Many of the locations are near oil and gas well activities, roads, the Cimarron River, and recreation sites. There is a potential for species to get dug up, driven over or trampled by human activity in the area.

Environmental, demographic, and genetic stochasticity are potential threats to species viability (Ladyman 2006).
 - b. Habitat: Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, recreation, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022) (see Threats and Trends Appendix).

Primary threats to this species described by Ladyman (2006) include habitat loss, modification, and fragmentation throughout the species' range. All known occurrences on the Cimarron National Grassland in Region 2 are in areas open to oil and gas development and livestock grazing. Urbanization is also encroaching on habitat in all states where it occurs, but at the current time, this is a localized threat. Invasive non-native plant species are likely to contribute to habitat loss and to provide direct competition in some occurrences.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Revisitation of sites known historically to have maintained populations of species have turned up no individuals.
 - b. Habitat: Trends associated with the sandsage prairie (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is on the eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are 8 documented occurrence records in the plan area. Freeman (1989) reported population sizes range from as few as 13 to as many as 1000–2000 individuals in the Cimarron NG, but most populations consisted of 50–100 plants

- b. Ecological conditions: Freeman (1989) suggests this species is limited in its distribution by habitat requirements and is disturbance-dependent. All occur on soils of the Vona-Tivoli association on blowouts in sandsage prairie. Jennings (1996) has suggested that species' rarity may be due in part to human efforts at soil stabilization.

Species Status

G3; S2 in Colorado; S2 in Kansas; USFS Region 2 Sensitive Species.

Taxonomy

Chenopodium cycloides is accepted as valid (NRCS 2025, Ackerfield 2022, ITIS 2024).

Species range

Overall Species range

In North America, occurs in Colorado, Kansas, Nebraska, New Mexico, and Texas. Range extent is eastern Colorado, western Nebraska, western Kansas, eastern New Mexico, and western Texas. The taxon is also reported to occur in Oklahoma, but no specimens or verifiable observations could be located for this report (Ladyman 2006).

Description of how the population in the plan area fits within the overall range

The plan area is at the eastern edge of the species' range (Figure 149, Figure 150).

Distribution, abundance, and trend in the plan area

Population

There are eight documented occurrence records within the Carrizo Unit (one record) and Cimmaron NG (seven records) (USFS 2005a). Hazlett (2004) describes this species as rare on the Comanche National Grassland. Kuhn (2011) does not identify this species in a Floristic Inventory of the Cimarron and Comanche National Grasslands. Herbarium records are from Morton County.

NatureServe reports this species as rare in Colorado, New Mexico, Nebraska, Kansas, Oklahoma, and Texas," but notes that may be overlooked and is believed to be more common (NatureServe 2025).

Freeman (1989) suggests this species is limited in its distribution by habitat requirements. Where it occurs in Kansas, populations have been reported as small to very large. Freeman (1989) reported population sizes range from as few as 13 to as many as 1000–2000 individuals on the Cimarron NG, but most populations consisted of 50–100 plants. Revisitation of sites known historically to have maintained populations of species have turned up no individuals (Morse 2001). Freeman (1989) assumes that populations may fluctuate in size from year to year or face local frequent local extinction.

The species appears to have been infrequently encountered by botanists since its first collection. It is an annual species, and like most annuals, the populations exhibit variable sizes from year to year (Freeman 1989). For example, Freeman (1989) noted that individuals in an occurrence in Kansas were sparse and dwarfed in 1990 where they had been relatively frequent and robust in 1988. This variability in both number of individuals and growth habit is likely due to environmental conditions (especially precipitation) affecting seed germination, seedling establishment, and growth (Freeman 1989, Ladyman 2006).

Habitat

Smooth goosefoot occurs in sandy soil of the eastern plains from 4000 to 5500 feet in elevation and flowers from June through September (Ackerfield 2022). Flora of North America (1993) describes it as open sandy areas especially around blowouts on sand dunes. Hazlett (2004) describes it as sandy soils. Freeman (1989) describes habitat as sandy soil on dune, especially in sandsage prairie. Frequently found along the edges and on the slopes of stabilized blowouts; infrequent in loose, exposed, shifting sand. Loose sand per se does not appear to present suitable habitat, and this species is not found within the blowouts. Habitat conditions are generally described as “semi-stable” or “stabilized dunes.” Vegetation plays a major role in stabilizing the surface of dune sand (Ladyman 2006).

All but one of the Grassland populations of Smooth goosefoot occur south of the Cimarron River and all occur on soils of the Vona-Tivoli association. Additional populations may be expected in the choppy dunes that parallel the river on the south for most of its length on the Grassland. (Freeman 1989).

Species requires somewhat disturbed, sandy substrates, particularly stabilized blow-outs in sandsage prairies. Freeman (1989) reports species to be “infrequent in loose, exposed, shifting sand.” However, Jennings (1996) has suggested that species’ rarity may be due in part to human efforts at soil stabilization and, to a lesser extent, managing for forage for livestock (e.g., application of herbicide for broadleaf species) (Morse 2001).

Herbarium records are within the shortgrass prairie, sandsage prairie, and riparian woodlands and aquatic habitat. The occurrence records are spatially mapped within the Western Great Plains Shortgrass Prairie, Western Great Plains Sand Prairie, and Western Cool Temperate Pasture and Hayland (Landfire 2024).

Locality of most herbarium records are near the Cimarron River. Habitat descriptions include, eroding gravelly dune sand over silty, gravelly riverbank; sandsage prairie, rolling sandhill prairie, abundant blowouts in area w/loose sand. No evidence of recent grazing; good grass & forb diversity, narrow band of rolling sand dunes; loose shifting sand in scattered blowouts and along eroding bank, dune complex with stabilized and recent blowouts in sandhill prairie, and sandsage prairie, edge of sand dune blowout (SEINet 2024).

Species uses varied habitats with no discernable trend. Freeman (1989) was not able to document trends in species’ habitat (Morse 2001).

Threats (arising from on or off the plan area)

Population

This species is not known to occur in any areas that are specifically protected from human activities (Ladyman 2006). Smooth goosefoot occurrences are vulnerable to unintentional extirpation. The absence of aboveground evidence of occupation in some years may lead to the unintentional elimination of the seed bank and extirpation of populations by development projects (Ladyman 2006).

Limited mechanical damage resulting from grazing and trampling by cattle was observed in several populations. One population is threatened by bank erosion along the Cimarron River. Freeman (1989). This species depends on moderate levels of disturbance and most populations have been reported from blowouts in sandsage prairies. Suitable habitat is scarce throughout species’ range and populations are suspected to fluctuate in size from year to year (Freeman 1989).

Many of the locations are near oil and gas well activities, roads, the Cimarron River, and recreation sites. There is a potential for species to get dug up, driven over or trampled by human activity in the area.

Habitat

Common threats housing and urban areas, livestock farming and ranching, oil and gas drilling, recreation, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022) (see Threats and Trends Appendix).

Primary threats to this species described by Ladyman (2006) include loss, modification, and fragmentation of habitat is a significant threat throughout the species' range. Its prairie and shrub habitat has significant economic importance for livestock grazing, oil and natural gas production, mineral extraction, and recreation, all of which contribute to habitat loss, modification, and fragmentation. All known occurrences on the Cimarron National Grassland in Region 2 are in areas open to oil and gas development and livestock grazing. Urbanization is also encroaching on habitat in all states where it occurs, but at the current time, this is a localized threat. Invasive non-native plant species are likely to contribute to habitat loss and to provide direct competition in some occurrences. Environmental, demographic, and genetic stochasticity are potential threats to species viability (Ladyman 2006).

Freeman (1989) indicates grazing does not represent a serious threat to the species unless overgrazing occurs, thus threatening the habitat. He suggests natural forces should be allowed to operate in the formation of new blowouts, providing potential habitat for this and other species. Future development of the Grassland for gas and oil should take into account the location and size of known populations. Populations need to be monitored to determine what factors control population dynamics in the species (Freeman 1989).

Ecological conditions

Ecological condition requirements

Freeman (1989) suggests this species is limited in its distribution by habitat requirements. All occur on soils of the Vona-Tivoli association. Jennings (1996) has suggested that species' rarity may be due in part to human efforts at soil stabilization. Freeman (1989) describes this species as disturbance-dependent.

Clumped distribution of this species suggests many seeds may land within short distance from parent plant (Ladyman 2006). This species is self- or cross- pollinated. The pollen is dispersed by wind and is an insect-pollinated species.

Region 2 sensitive species evaluation form report for seed dispersal that the seed (is) likely too large and heavy to be dispersed far by wind, despite attached pericarp; however, persistent high winds contributing to dune formation in preferred habitat may contribute significantly to dispersal." This factor, together with species' annual life cycle and apparent dependence on ephemeral habitats, likely restricts species' dispersal capability considerably (Morse 2001). There is little other information on life history, except as related to restricted habitat preference.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are eight occurrence records within the Carrizo (one record) and Cimmaron Units (seven records) (USFS 2005a). Freeman (1989) suggests this species is limited in its distribution by habitat requirements.

Species requires somewhat disturbed, sandy substrates, particularly stabilized blow-outs in sandsage prairies. Freeman (1989) reports species to be "infrequent in loose, exposed, shifting sand." However, Jennings (1996) has suggested that species' rarity may be due in part to human efforts at soil stabilization and, to a lesser extent, managing for forage for livestock (e.g., application of herbicide for broadleaf species) (Morse 2001).

Herbarium records are within the shortgrass prairie, sandsage prairie, and riparian woodlands and aquatic habitat. The occurrence records are spatially mapped within the Western Great Plains Shortgrass Prairie, Western Great Plains Sand Prairie, and Western Cool Temperate Pasture and Hayland (Landfire 2024).

Locality of most herbarium records are near the Cimarron River. Habitat descriptions include, eroding gravelly dune sand over silty, gravelly riverbank; sandsage prairie, rolling sandhill prairie, abundant blowouts in area w/loose sand. No evidence of recent grazing; good grass & forb diversity, narrow band of rolling sand dunes; loose shifting sand in scattered blowouts and along eroding bank, dune complex with stabilized and recent blowouts in sandhill prairie, and sandsage prairie, edge of sand dune blowout (SEINet 2024).

Critical biological characteristics

Freeman (1989) suggests this species is limited in its distribution by habitat requirements. All occur on soils of the Vona-Tivoli association. Jennings (1996) has suggested that species' rarity may be due in part to human efforts at soil stabilization. Freeman (1989) describes this species as dependent on disturbance. Species requires somewhat disturbed, sandy substrates, particularly stabilized blow-outs in sandsage prairies ecosystems.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species range and Known Occurrences in Plan Area

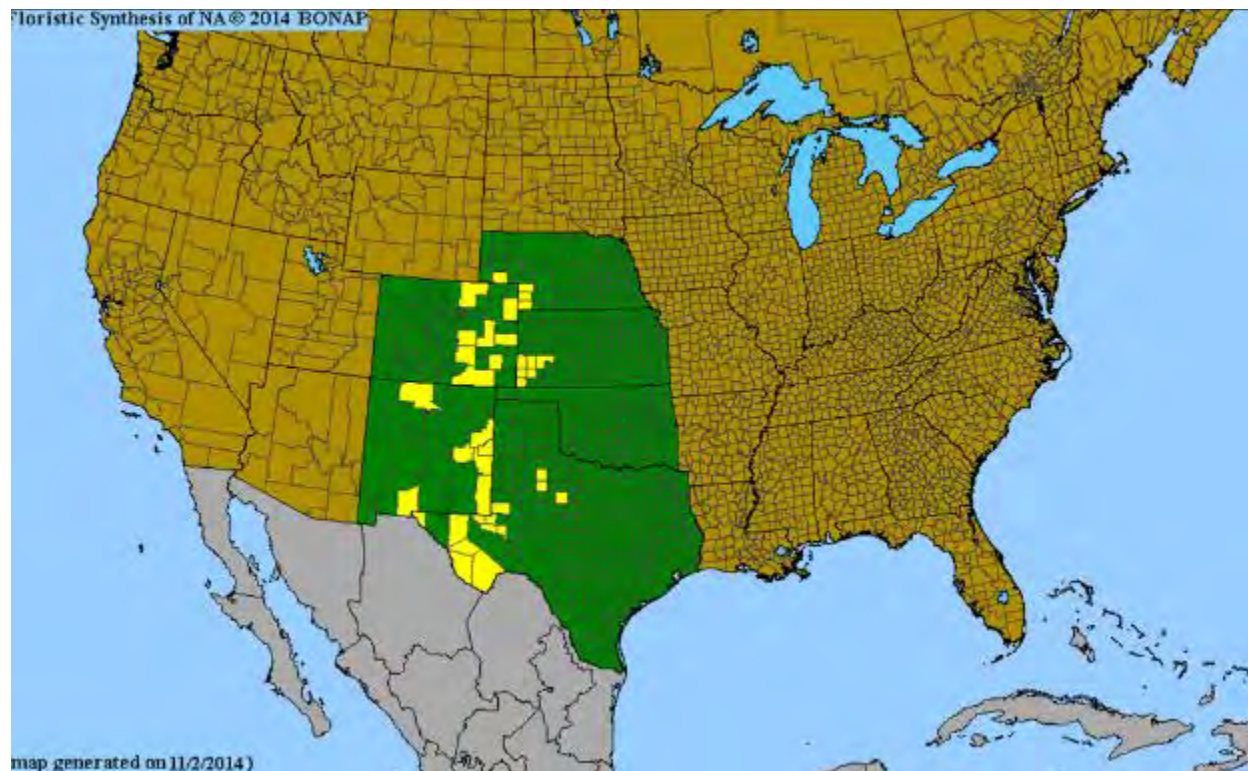


Figure 149. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

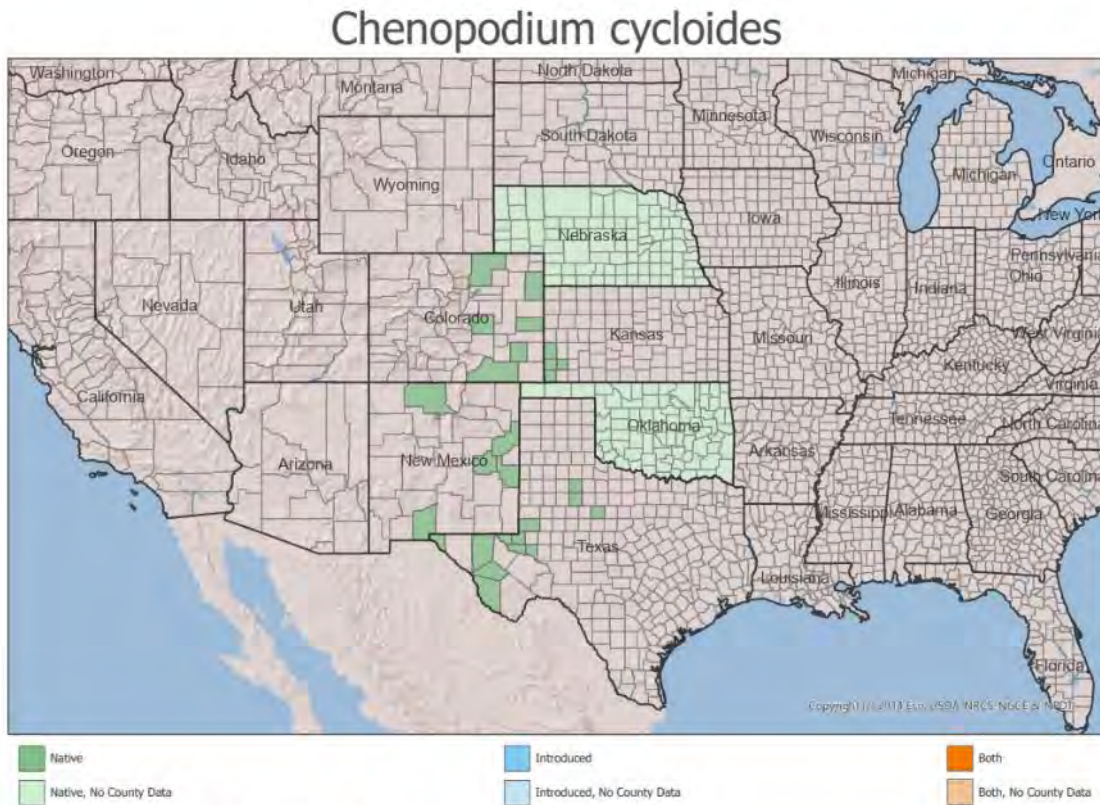


Figure 150. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Sandsage prairie-clover

(*Dalea cylindriceps*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CNHP has three occurrence polygons in the Comanche National Grasslands from 1998-2007 (CNHP 2024, Van Scoyoc 2024). There is a large population along the Cimarron River.

Year of Last Known Occurrence: 2018

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: overgrazing, invasive species including cheatgrass, mechanical damage from recreation, and potentially road maintenance.
 - b. Habitat: overgrazing, invasive species including cheatgrass, off-road vehicle use, and potentially road maintenance.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: sandsage habitat quality and habitat for this species has declined due to heavy off-road vehicle use in its floodplain habitat and grazing impacts on bank erosion.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: populations in the plan area range from small and ephemeral to plants extending along a 1.5-mile stretch.
 - b. Ecological conditions: the sand-sage ecosystem encompasses 18,300 acres in the plan area and is not considered restricted; several sizeable populations suggests that natural forces maintaining habitats favored by this species are not restricted on the Grassland.

Species Status

G3; S2 in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Dalea cylindriceps* as valid; a taxonomic synonym is *Petalostemon macrostachyus* (NRCS 2025). Another common name is Andean prairie clover (NRCS 2025) and massive spike prairie clover (Freeman 1989, Hazlett 2004).

Species range

Overall Species range:

Sandsage prairie clover is discontinuously distributed over the High Plains from southwestern South Dakota and extreme southeastern Wyoming, south to western Texas and north-central and southern New Mexico; west from southwestern Kansas to the Rocky Mountain uplift in Colorado and New Mexico (Freeman 1989) (Figure 151).

Description of how the population in the plan area fits within the overall range:

The plan area is at the eastern edge of the species' range (Figure 151).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. Hazlett (2004) considers it an infrequent species in the Comanche National Grassland. Occurrence records give no indication of the number of individuals (Van Scoyoc 2024).

Freeman (1989) states: "Most populations (in the Cimarron National Grassland) consist of small groups of scattered plants in unstable, disturbance-dependent habitats, such as blowouts, riverbanks, and sand or gravel bars. Small populations of Massive spike prairie-clover may be ephemeral because of the dynamic nature of the species' habitat and the short-lived nature of the plants. The largest Kansas population occurs on the Cimarron National Grassland. This population, 005, is along the gravelly, sandy floodplain of the Cimarron River, 1.5 miles northeast of the KS 27 bridge across the river. Plants extend along a 1.5 mile stretch of the river from the SW 1/4 sec 34, T33S, R42W, northeast into the north-central part of sec 35."

Habitat

Sandsage prairie clover is associated with sandy soils (Hazlett 2004). Across its range, it occurs in sand dunes, sandy shortgrass and sandsage prairie, pinyon-juniper woodlands, and sandy to gravelly banks along intermittent rivers and streams at elevations from 5,000 – 7,000 ft (Freeman 1989, SEINet 2024).

Within the plan area, it has been found in Picture Canyon, Sand Canyon, and West Squaw Canyon in the Comanche National Grassland (Van Scoyoc 2024). It has been observed in roadside edges (EO ID 17556), sandsage prairie (EO ID 17540), and mature cottonwood forest with scattered juniper on sand or sandy silt substrate (EO ID 17541). Sand-sage habitat is relatively stable in the plan area; however, Freeman (1989) gives several lines of evidence that habitat in the plan area has declined for this species: "The largest population occurs in an area of heavy off-road vehicle (ORV) use. Numerous semi-permanent trails were observed through the population in 1988. Habitat degradation at the site ranged from negligible to severe and some mechanical damage to plants was observed. Cattle graze many species of the genus, however, no clear evidence of damage due to grazing was found in any of the Grassland populations. Bank erosion resulting from natural forces and accelerated by grazing has destroyed part of occurrence 006."

Threats (arising from on or off the plan area)

Population

NatureServe states: "The primary threat to this species is competition with invasive species, specifically cheatgrass (*Bromus* spp.) (Locklear 2013). Heavy grazing has reportedly caused declines at multiple sites. In the herbarium record, there are a number of roadside occurrences, which would potentially be threatened by maintenance activities, e.g., mowing, herbicide application (SEINet 2020)," (NatureServe 2025). Mechanical damage from recreation represents another threat (Freeman 1989).

Habitat

Habitat and populations are threatened by overgrazing, invasive species including cheatgrass, heavy off-road vehicle use, and potentially road maintenance (Freeman 1989, NatureServe 2025).

Ecological conditions

Ecological condition requirements

This species requires sandy soils. It benefits from unstable, disturbance-dependent habitats such as sand or gravel bars, riverbanks, or blowouts (Freeman 1989). It requires freedom from grazing damage and off-road vehicle damage (Freeman 1989).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The species is associated with cottonwood gallery forest and sandsage prairie (Kuhn et al. 2011). Reduced stream flow in the Cimarron River since settlement of the High Plains has modified geomorphic forces acting on riverine habitats, but the impact of this change on sandsage prairie clover is not known (Freeman 1989). Freeman (1989) states "The presence of several sizeable populations suggests that natural forces maintaining habitats favored by this species are still operating on the Grassland."

Critical biological characteristics

Sandsage prairie clover is a short-lived herbaceous perennial with a taproot or subterranean caudex and pealike flowers (Freeman 1989). Flowering occurs from May through September, with fruiting from July to September (Freeman 1989). The fruits are legumes (Freeman 1989).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Legumes can provide valuable forage plants for bees in honey production, and numerous species are browsed by livestock and serve as important browse plants for wildlife (Freeman 1989, Johnson 2006a). Legumes are known to be atmospheric nitrogen fixers through symbiotic relationships with soil bacteria. However, native grassland legumes likely contribute only a small amount of Nitrogen enrichment to soils, having evolved in low nutrient sites such as the Great Plains grasslands (VanRiper et al. 2010).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Freeman (1989) states: "This species' propensity for unstable habitats makes protection and management difficult. ORVs should be restricted to specific areas of the floodplain and their impact on ecologically significant areas monitored, including the area occupied by occurrence 005. Grazing is probably only a minor threat to the species at the present time; however, it is a factor in the endangerment of at least one Grassland population."

Maps of Species Range

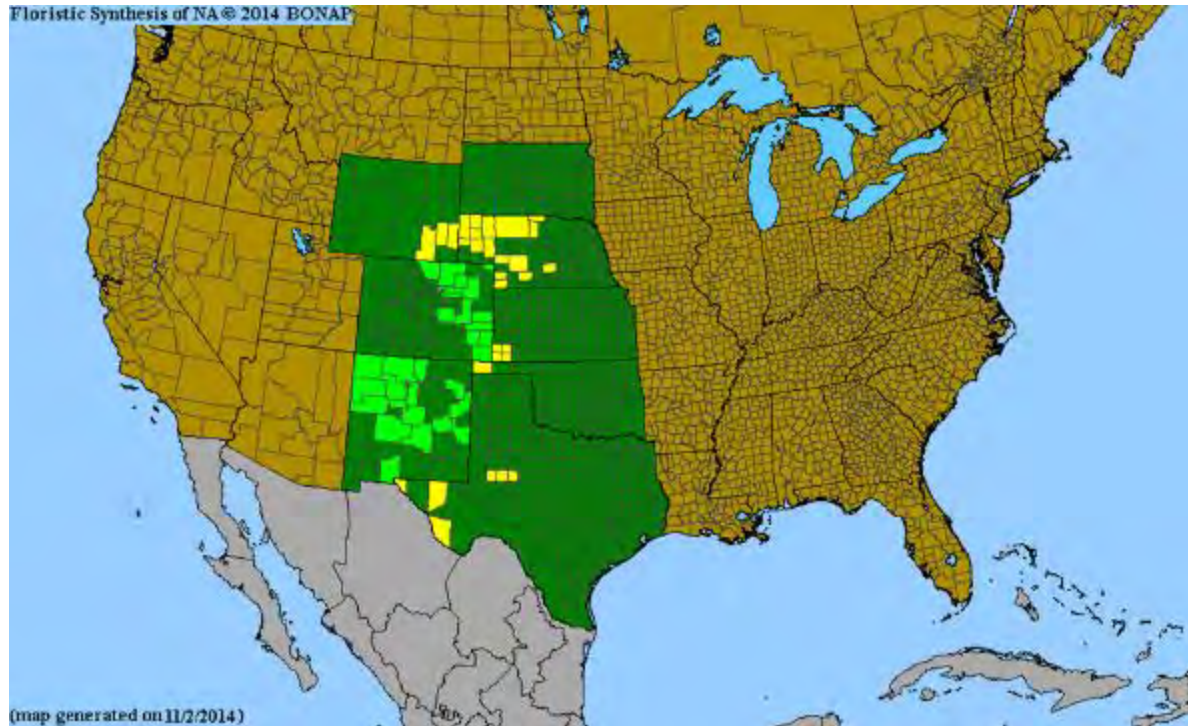


Figure 151. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Sessile water-speedwell

(*Veronica catenata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: Species is said to be a naturalized aquatic plant throughout most of the US (Haddock 2024b). It is also considered adventive in Colorado, Wyoming, and Montana (Lemly and Culver 2013, Culver and Lemly 2013). BONAP (2024) indicate species is present in the state and exotic (Figure 152). Therefore, this species is not known to be native to the plan area.

Year of Last Known Occurrence: N/A

Species Status

G5; S1 in Kansas.

Taxonomy

Veronica anagallis-aquatica is accepted as valid with many synonyms including *Veronica catenata* (Ackerfield 2022, NRCS 2025). *Veronica catenata* is accepted as valid by ITIS (2024) and NatureServe (NatureServe 2025).

Maps of Species Range

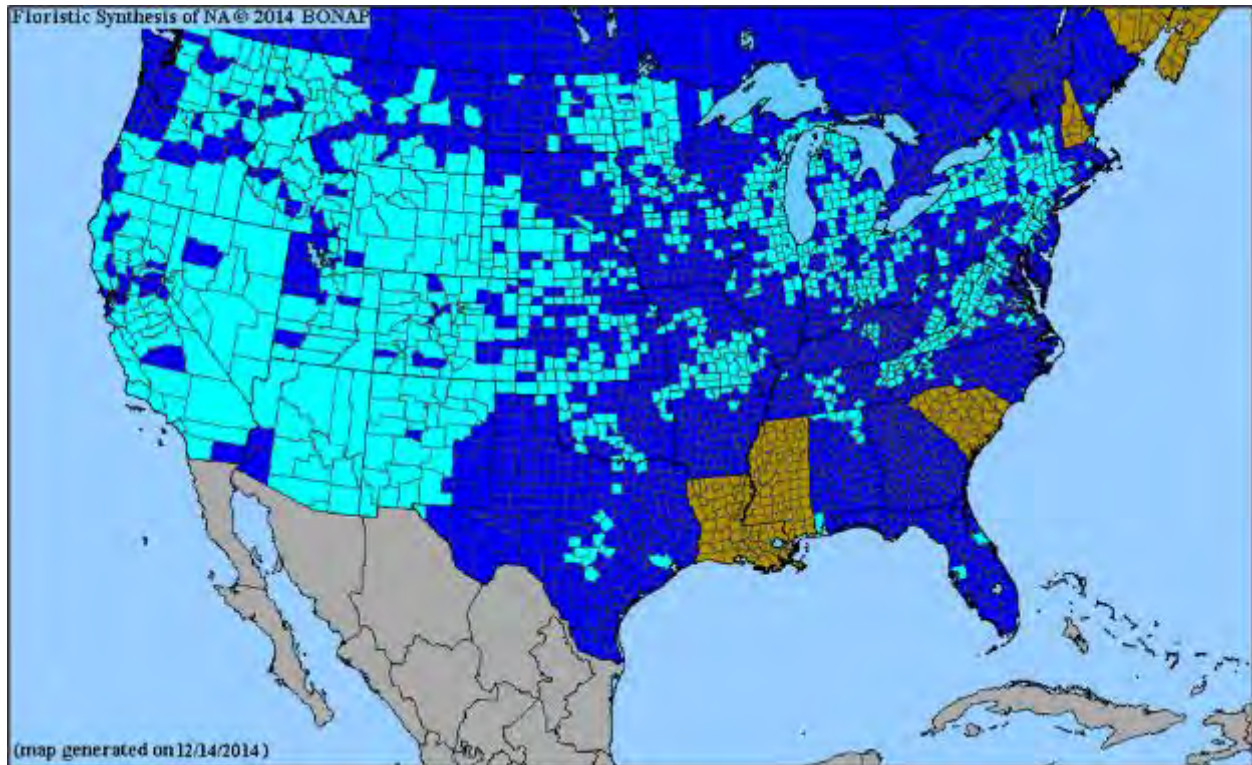


Figure 152. County occurrence data from Biota of North America Program (BONAP 2024). Dark blue indicated species is present in state and exotic and teal indicates species exotic and present.

Shining flatsedge (*Cyperus bipartitus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: Two documented occurrences on the Comanche National Grassland (NG) in 2003 and 2007 from SEINet (Van Scoyoc 2024). One collection was located along Carrizo Creek in Carrizo Canyon and the other 0.5 miles south of Picture Canyon Picnic Area.

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Drought and wildfire.
 - b. Habitat: Drought and wildfire.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Habitat trends are not known from the consulted sources.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The overall range is not restricted and occurrences in the plan area appear to be in the middle of the species range across North America.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are two documented occurrences in the plan area. Population numbers are unknown.
 - b. Ecological conditions: Wetland habitat is restricted.

Species Status

G5; S2 in Colorado; S3 in Kansas.

Taxonomy

Cyperus bipartitus Torr. is accepted as valid (Ackerfield 2022, NRCS 2025, Weber et al. 2012). Synonyms include *Cyperus rivularis*, *Pycneus rivularis*, and *Cyperus niger* var. *rivularis* (ITIS 2024). Other common names include slender flatsedge (NRCS 2025) and brook flatsedge (ITIS 2024).

Species range

Overall Species range

In North America, this species has a widespread range and occurs in nearly every state (n = 47) extending into Canada (NatureServe 2025). Species is listed as Vulnerable in Kansas and Imperiled in Colorado.

Description of how the population in the plan area fits within the overall range

The overall range is not restricted and occurrences in the plan area appear to be in the middle of the species range (Figure 153).

Distribution, abundance, and trend in the plan area

Population

Plants are known from two locations on the Carrizo Unit of the Comanche NG. Distribution, abundance and trend in the plan area are unknown.

Habitat

Habitat generally occurs on wet ground, especially along shores, margins of streams, marshes, shores of ponds, lakes, bogs, low fields, and ditches (NatureServe 2025), and often in disturbed places (Flora of North America 1993). Common in wet gravel or sand and on muddy shores (SEINet 2024).

In Colorado, plants grow along creeks, in moist meadows, and on margins of drying ponds from 3500 to 5500 feet in elevation (Ackerfield 2022). Weber and Wittmann (2012) cite the plants as “rare on gravels bars on streams of the piedmont valleys and plains.”

One collection on the Comanche NG was located along Carrizo Creek in Carrizo Canyon near the picnic area on the hillside and in lush creek banks. The uplands were dominated by *Bouteloua* species and scattered *Rhus aromatica* and the creek banks with *Salix exigua* and Typha. The other collection was made 0.5 miles south of Picture Canyon Picnic Area and listed the habitat as sandstone bluffs, cliffs, and riparian with sandy soils.

Threats (arising from on or off the plan area)

Population

Drought and fire (NRCS 2025).

Habitat

Threats common for wetland ecosystems (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

In the Great Plains, shining flatsedge is listed as a Facultative Wetland species on the National Wetland Plant List (Lichvar et al. 2016).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Unknown.

Critical biological characteristics

Annual sedge with fibrous roots. Low fire and drought tolerance (NRCS 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

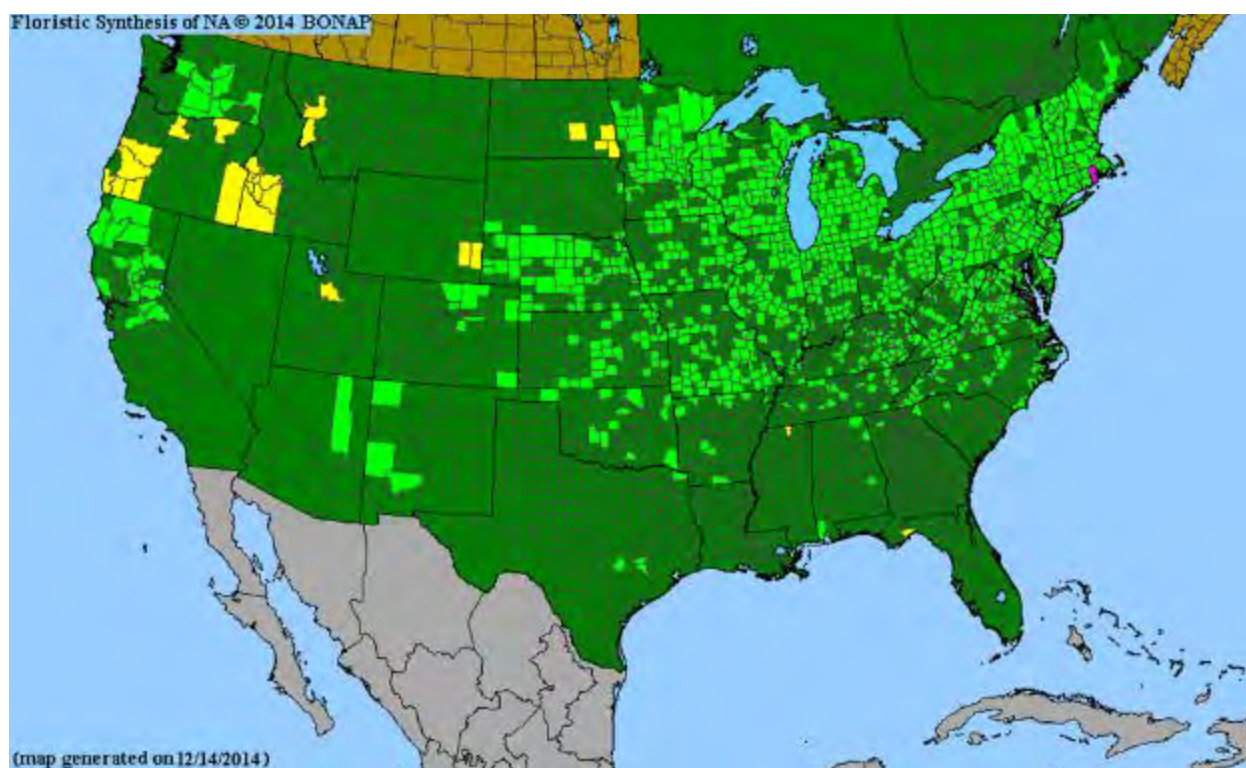


Figure 153. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Shortbeak arrowhead

(*Sagittaria brevirostra*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: The plan area appears outside of the range shown by Beal et al. (1982), but both BONAP and USDA NRCS Plants database show the species as native to the plan area (Figure 154, Figure 155). GBIF has one occurrence record from 1961 in the Cimarron National Grasslands (Van Scoyoc 2024). The locality description of the record states "Elkhart, 9 mi N, 2 mi W; Point of Rocks." Point of Rocks is squarely within the plan area. Therefore, the species is considered both native and known to occur in the plan area.

Year of Last Known Occurrence: 1961

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: drought, and groundwater depletion.
 - b. Habitat: climate stressors, drought, and groundwater depletion.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: aquatic/riparian/wetland habitat in the plan area has declined.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the western edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: At least one occurrence record in the plan area. Population size is not known.
 - b. Ecological conditions: aquatic/riparian/wetland habitat is restricted in the plan area.

Species Status

G5; S2 in Colorado; S4 in Kansas.

Taxonomy

USDA NRCS recognizes *Sagittaria brevirostra* as valid; *Sagittaria engelmanniana* ssp. *brevirostra* is a taxonomic synonym (NRCS 2025).

Species range

Overall Species range:

Shortbeak arrowhead is widely distributed across the central and midwestern United States (Figure 154, Figure 155).

Description of how the population in the plan area fits within the overall range:

The plan area is at the western edge of the species' range (Figure 154, Figure 155).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. The singular occurrence record gives no indication of the number of individuals observed. The species is not considered rare in any counties that overlap the plan area (Figure 155).

Habitat

Short-beak arrowhead is found in waters of at the edges of ponds, lakes, sloughs, ditches, mud flats, swamps, and streams at elevations from 328-5,900 ft (SEINet 2024). Lemly and Culver (2013, 2013) show the plan area as being outside this species' range in Colorado, but state it is "known from northern Colorado, likely to occur elsewhere on the Eastern Slope." Within the plan area, it has been documented at Point of Rocks on the Cimarron National Grassland, which has man-made fishing ponds (Van Scoyoc 2024). This species depends on mesic, marshy habitat. Drawdown of the Ogallala-High-Plains Aquifer has substantially decreased the discharge to rivers across the entire Cimarron National Grassland (USFS 2005a, Brikowski 2008). This is expected to have resulted in a decrease in habitat quantity in the plan area for this species due to reduction in water levels.

Threats (arising from on or off the plan area)

Population

Climate stressors, drought, and groundwater depletion are considered threats to this species because xeric conditions cause physiological stress and reduce its sexual reproduction (Kaul 1991).

Habitat

Future climate predictions may alter temperature and precipitation regimes for aquatic habitats that this species relies on (see Appendix). Drought and groundwater depletion are considered threats to this species' habitat because it depends on presence of mesic soil (Kaul 1991).

Ecological conditions

Ecological condition requirements

USDA NRCS considers shortbeak arrowhead an "obligate" wetland species across its range, including the Great Plains; this means that this species almost always occurs in wetlands (NRCS 2025). It can use waters ranging from slightly basic to slightly acidic to alkaline (SEINet 2024). It often occurs in heavy, nutrient rich mud (Kaul 1991) and requires exposed mud for successful seedling establishment (Kaul 1985). Established plants can withstand some dehydration of the soil, but ultimately it is dependent on presence of marshy habitat—not full submersion or dehydration (Kaul 1991). It also depends on late winter and/or early spring precipitation of a sufficient quantity and duration to allow the shores of streams, ponds, and lakes to become flooded to facilitate successful seed germination and seedling establishment

(Beal et al. 1982). Subsequent seasonal precipitation is less critical for established plants with developed root systems (Beal et al. 1982).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species depends on muddy shoreline and streamside habitat Lemy, 2013, Field guide to Colorado's wetland plants: Identification, ecology and conservation (Culver and Lemly 2013), which are limited in the plan area (Hazlett 2004). Although the plan area has some playa lakes, wetlands, and constructed ponds, these features are typically small and rare (USFS 2008). Based on National Wetlands Inventory data, the approximate extent of all riparian and wetland habitat is ~1% of the total plan area and therefore habitat is considered restricted for this species.

Critical biological characteristics

Shortbeak arrowhead is a rhizomatous, perennial aquatic herb (SEINet 2024). It is technically a “paludal” species, rather than a true aquatic, given its dependence on marshy habitat (Beal et al. 1982). It is considered a “k-selected” species that exhibits a relatively long lifespan and low production of large achenes compared to some annual species of arrowhead (Kaul 1985). Because shortbeak arrowhead is rhizomatous, it is more drought-tolerant than some other species of arrowhead (Kaul 1991).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Shortbeak arrowhead can spread rapidly and is an aggressive invader of exposed mud (Kaul 1985). Birds may distribute its seeds (Beal et al. 1982). Its seeds are eaten by ducks and the tubers are valuable to many species of wildlife, including muskrat, beaver and porcupine (Lemly and Culver 2013, Culver and Lemly 2013).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Xeric environments reduce leaf size and sexual reproduction of this species than mesic conditions; xeric conditions also decrease sexual reproduction (Kaul 1991). Minimal springtime temperatures likely limit its northern boundary (Beal et al. 1982). Precipitation, particularly in late winter and/or spring, is a possible limiting factor in its distributions because of requirements for seed germination and seedling establishment (Beal et al. 1982).

Figure 155. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Showy peavine

(Lathyrus polymorphus var. incanus)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: SEINet and GBIF have four occurrence records on the Comanche NG (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025). All occurrence records are close to a road therefore there is potential for trampling from human activity in the area.
 - b. Habitat: Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022) (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend for this species in the plan area is unknown.
 - b. Habitat: Shortgrass prairie and sandsage prairie have declining trends in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is not at the edge of the species range
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known. There are four occurrence records within the plan area.
 - b. Ecological conditions: No sources consulted identified any ecological requirements needed for this species aside from general habitat needs

Species Status

T4; SNR in Colorado; S1 in Kansas.

Taxonomy

Lathyrus decaphyllus is not found in NatureServe (NatureServe 2025). It is listed as a synonym for *Lathyrus polymorphus* that has two subspecies including *Lathyrus polymorphus* ssp. *incanus*, *Lathyrus polymorphus* ssp. *polymorphus*, and two varieties including *Lathyrus polymorphus* var. *hapemanii* and *Lathyrus polymorphus* var. *polymorphus* (NatureServe 2025). *Lathyrus polymorphus* ssp. *incanus* is the

species used for this overview_and is accepted as valid (NRCS 2025, ITIS 2024, NatureServe 2025, Ackerfield 2022).

Species range

Overall Species range

Showy peavine occurs in Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is not at the edge of the species' range (Figure 156, Figure 157).

Distribution, abundance, and trend in the plan area

Population

There are four occurrence records, one is within the Timpas Unit that occurs in the shortgrass prairie ecosystem and three occur in the Carrizo Unit within the shortgrass prairie ecosystem and sandsage ecosystem (USFS 2005a). Hazlett (2004) indicates this species is not known to occur in the plan area but could occur in eastern Las Animas County and Baca County. Kuhn (2011) identified this species as occurring in Las Animas and Baca County, Colorado.

Population trend for this species in the plan area is unknown.

Habitat

Showy peavine is perennial that occurs in sandy soils from 3500 to 6500 feet in elevation (Ackerfield 2022). Hazlett (2004) describes the habitat as shaded rocky canyons and ravines and sandy soils. Kuhn (2011) describes the habitat as midgrass prairie and shortgrass prairie in a floristic inventory of the Cimarron and Comanche National Grasslands.

There are four herbarium record found in the plan area. The occurrence record habitat in the Timpas Unit is east-west ridge with limestone soil; with scattered juniper and *Yucca glauca* in *Oryzopsis-Hilaria* grassland and the locality is the Comanche Grasslands. The other three located in the Carrizo Unit, list habitat as sand field, sand, and sandsage rangeland with large areas of *Bromus tectorum* and areas of barren sand (SEINet 2024).

Three occurrence records in the Carrizo unit are spatially mapped in the Western Great Plains Shortgrass Prairie and the occurrence record in the Timpas Unit is mapped in the Western Great Plains Cliff and Outcrop (Landfire 2024).

This species uses varied habitats with no discernable trend.

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025). All occurrence records are near a road thus there is potential for habitat disturbance.

Habitat

Common threats include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025, Flora of North America 1993). This species is a perennial forb, herbaceous vine that flowers May through July (Ackerfield 2022).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are four herbarium records found in the plan area. The occurrence record habitat in the Timpas unit is east-west ridge with limestone soil; with scattered juniper and *Yucca glauca* in *Oryzopsis-Hilaria* grassland and the locality is Comanche Grasslands. The other three located in the Carrizo Unit habitat is sand field, sand, and sandsage rangeland with large areas of *Bromus tectorum* and areas of barren sand (SEINet 2024).

Critical biological characteristics

No sources consulted identified critical biological characteristics for this species (NatureServe 2025, Ackerfield 2022).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

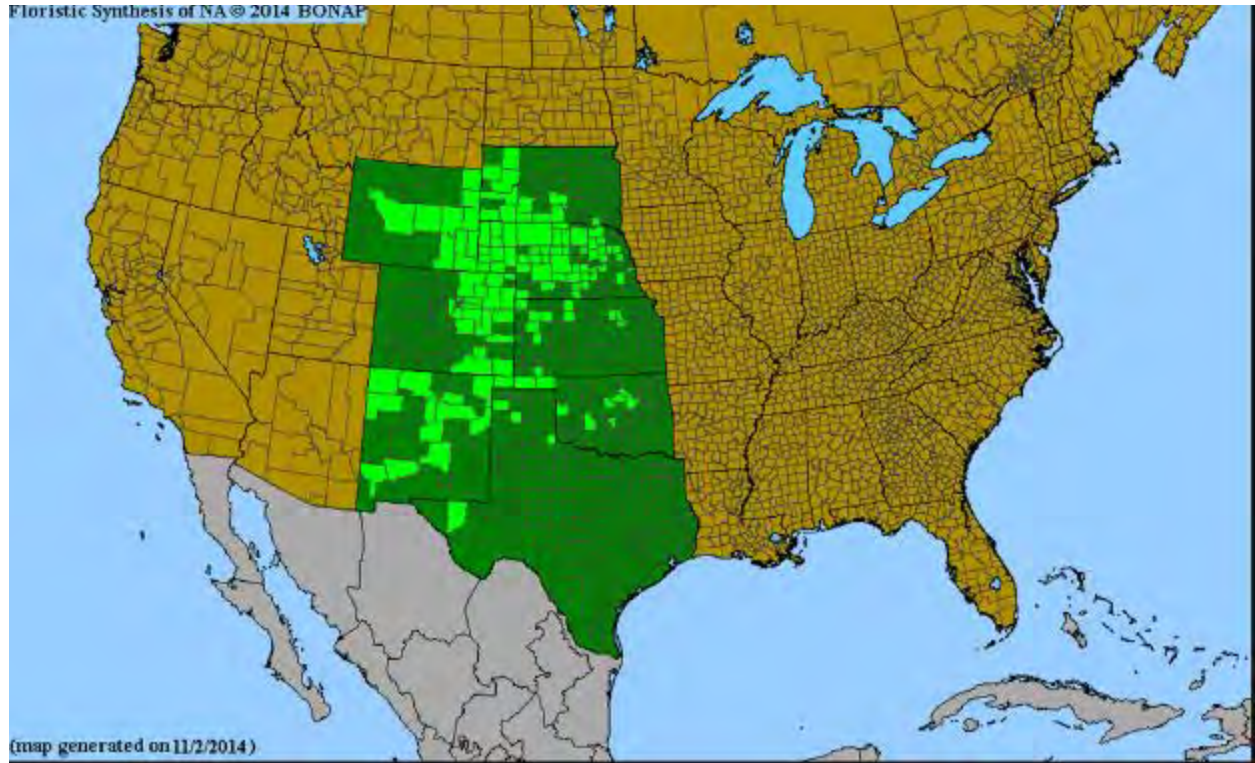
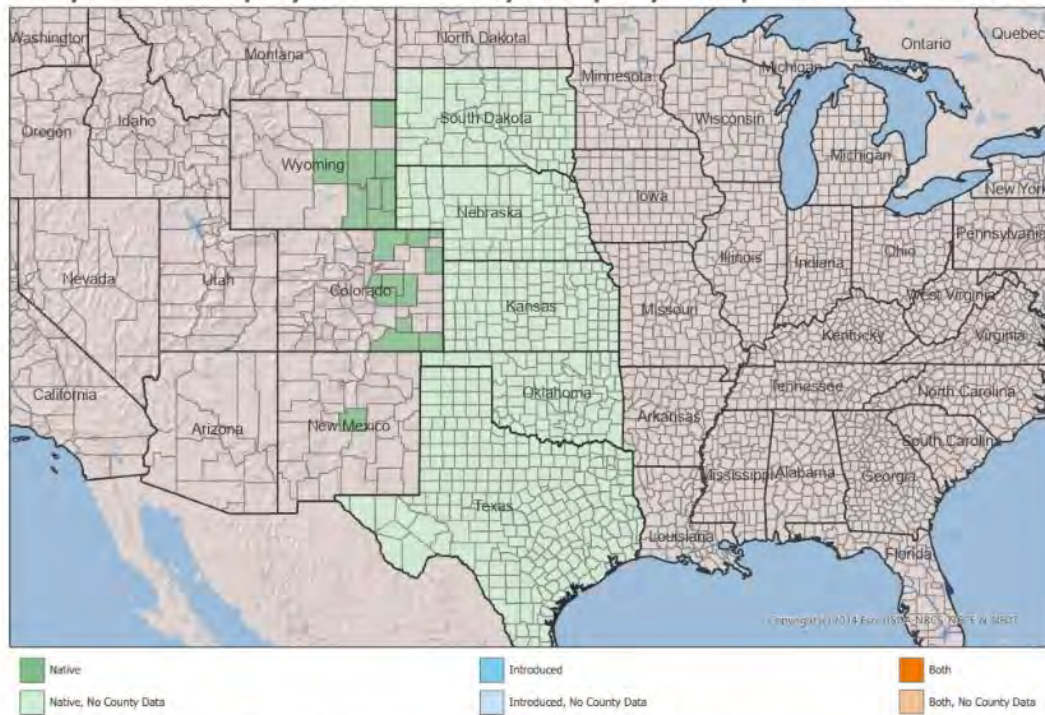


Figure 156. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county. (BONAP has *Lathyrus decaphyllus* as the species listed for this map)

Lathyrus decaphyllus - Lathyrus polymorphus var. incanus)



LAP01 <i>Lathyrus polymorphus</i> Nutt. ssp. <i>incanus</i> (J.G. Sm. & Rydb.) C.L. Hitchc., hoary pea
Wednesday, Aug 7, 2024

Figure 157. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Simple cliffbrake

(*Pellaea glabella* ssp. *simplex*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: CNHP contains two occurrence polygons that partially overlap with the plan area, both from 1985 (CNHP 2024, Van Scoyoc 2024). One of the occurrence records is a Level 1 Element Occurrence Report and the other is a Level 2 (Van Scoyoc 2024). The Level 1 Occurrence Report (EO ID 11395) describes the locality as "Lockwood Canyon, Purgatoire River Valley, near seeps at the base of Dakota sandstone cliffs, S-facing, rock." The Estimated Representation Accuracy is classified as Low, and the polygon overlaps NFS, private, and state lands. There is not sufficient spatial precision with this record to determine that the species occurs in the plan area. The Level 2 Occurrence Report (EO ID 8855) has a mapping precision of seconds, and a small portion of the occurrence polygon overlaps with the plan area, but the species identification is characterized as "questionable." Because of the locational uncertainty in the Level 1 occurrence record and the identification uncertainty of the Level 2 occurrence record, this species is not known to occur in the plan area and is not analyzed further.

Year of Last Known Occurrence: N/A

Species Status

T4; S2 in Colorado.

Taxonomy

Pellaea glabella ssp. *simplex* is accepted as valid; taxonomic synonyms include *Pellaea atropurpurea* var. *simplex*, *Pellaea glabella* var. *simplex*, *Pellaea occidentalis* ssp. *simplex*, and *Pellaea suksdorfiana* (NRCS 2025). Another common name is smooth cliffbrake (NRCS 2025).

Slim-leaf prairie-clover

(*Dalea tenuifolia*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has 28 occurrence records in the plan area from 1929-2022 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: species can use varied sandy and rocky habitats; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: population size not known; 28 occurrence records; common in plan area.
 - b. Ecological conditions: species is well-distributed across the plan area and can occur in varied habitat types.

Species Status

G5; S2 in Colorado; S3 in Kansas.

Taxonomy

USDA NRCS recognizes *Dalea tenuifolia* as valid; a taxonomic synonym is *Petalostemon tenuifolius* (NRCS 2025).

Species range

Overall Species range:

Slim-leaf prairie clover is distributed from southeastern Colorado and western Kansas south to New Mexico and northern Texas (Figure 158, Figure 159).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure 158, Figure 159).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. It is not considered rare in any counties that overlap the plan area. There are 28 occurrence records that are distributed across the Timpas and Carrizo Units of the Comanche National Grassland and the Cimarron National Grassland. Several occurrence records describe species as common.

Habitat

Slim-leaf prairie clover is associated with pinyon-juniper woodland, rocky upland prairie, and shortgrass prairie at elevations from 3,430 to 4,980 feet (Hazlett 2004, Kuhn et al. 2011). Hazlett (2004) considers it a "characteristic plant of the limestone/chalk barrens of the Comanche National Grassland." The species is well-distributed across the plan area (Van Scoyoc 2024).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Hazlett 2004, Kuhn et al. 2011, NatureServe 2025, SEINet 2024).

Habitat

No consulted sources identified threats to habitat (Hazlett 2004, Kuhn et al. 2011, NatureServe 2025, SEINet 2024).

Ecological conditions

Ecological condition requirements

This species has been observed in varied habitats (pinyon-juniper woodland, rocky upland prairie, and shortgrass prairie, disturbed roadsides and trailsides) (Van Scoyoc 2024, Hazlett 2004, Kuhn et al. 2011). It is most common in limestone/chalk barrens (Hazlett 2004) but can also use sandy soils.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Given this species' wide distribution across the plan area and use of varied habitats (Kuhn et al. 2011), its ecological condition requirements are not considered restricted in the plan area.

Critical biological characteristics

Slim-leaf prairie clover is an herbaceous perennial in the pea family (Fabaceae) (NRCS 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Legumes can provide valuable forage plants for bees in honey production, and numerous species are browsed by livestock and serve as important browse plants for wildlife (Freeman 1989, Johnson 2006a). Legumes are known to be atmospheric nitrogen fixers through symbiotic relationships with soil bacteria. However, native grassland legumes likely contribute only a small amount of Nitrogen enrichment to soils, having evolved in low nutrient sites such as the Great Plains grasslands (VanRiper et al. 2010).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found for this species.

Maps of Species Range

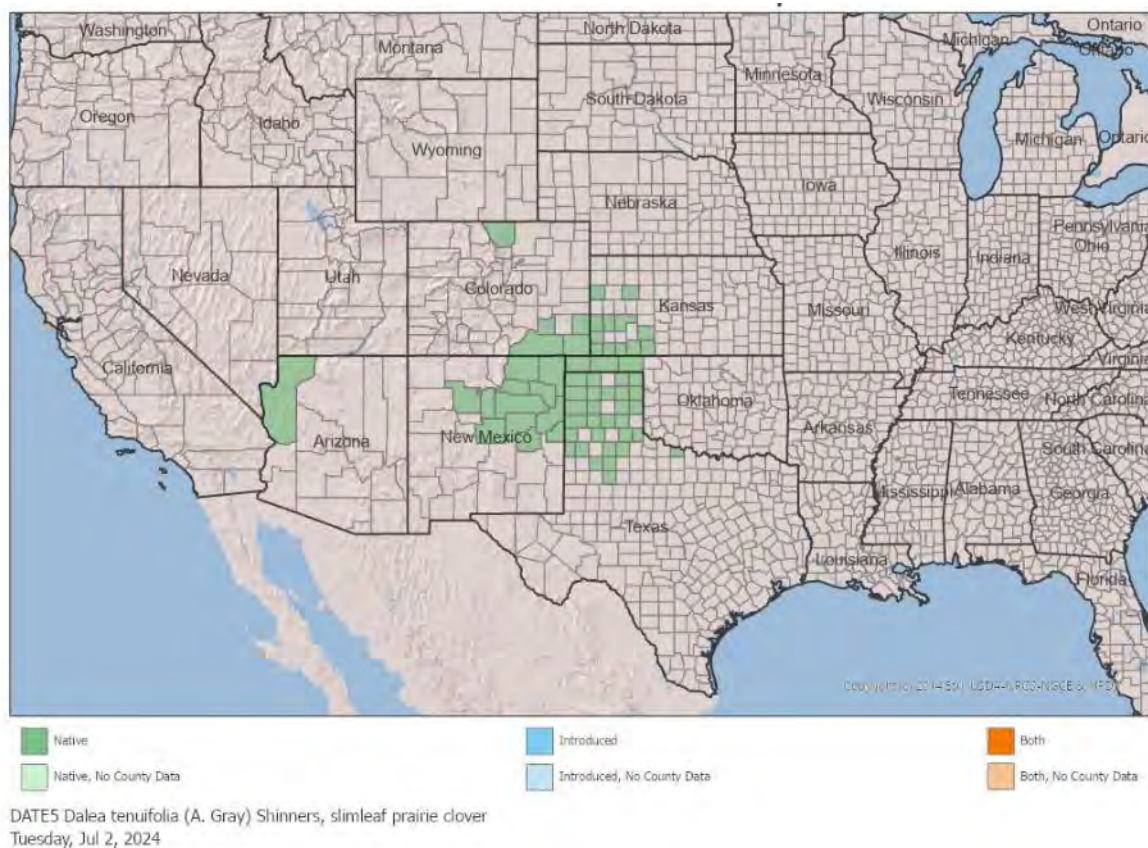


Figure 158. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

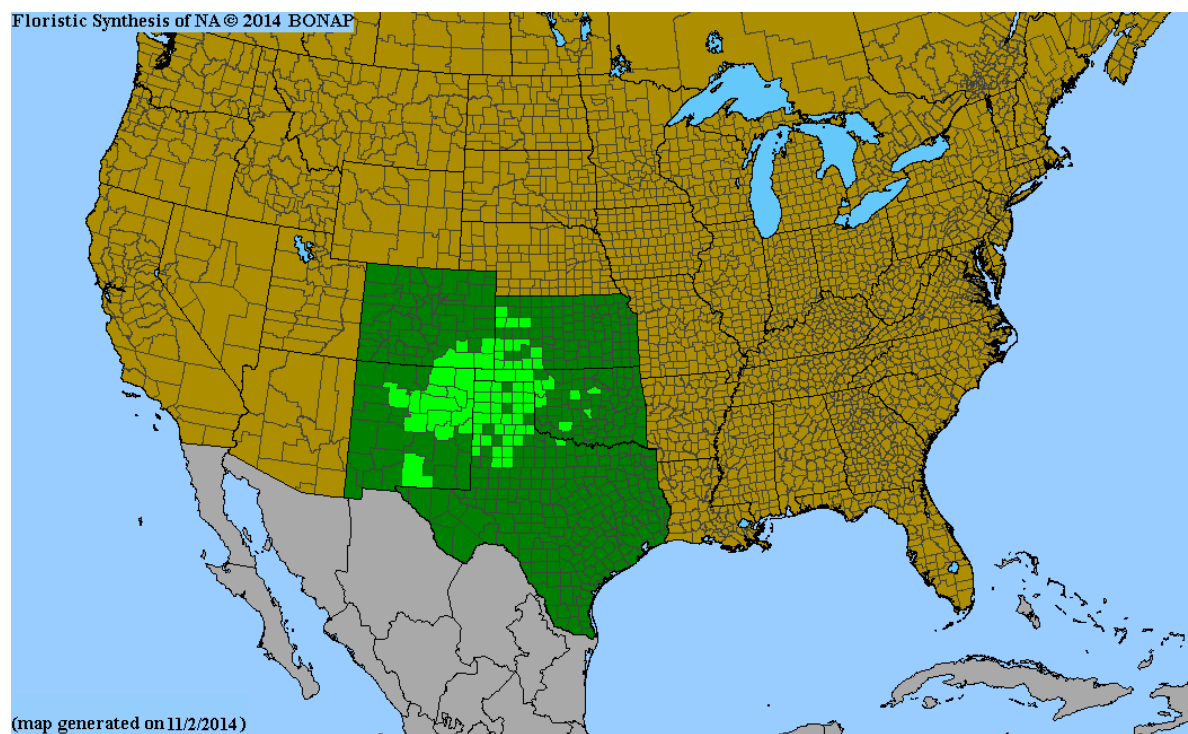


Figure 159. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Small-flower sand-verbena

(*Tripterocalyx micranthus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has six occurrence records in the plan area from 1964-2023 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: stabilization of dunes due to fire suppression, grazing, changing climate, and encroachment of invasive species.
 - b. Habitat: stabilization of dunes due to fire suppression, grazing, changing climate, and encroachment of invasive species.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: no discernable trend; species uses varied habitat types.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the southeastern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; six occurrence records.
 - b. Ecological conditions: uses varied, sandy habitat types.

Species Status

G4; S4 in Colorado; S1 in Kansas.

Taxonomy

USDA NRCS recognizes *Tripterocalyx micranthus* as valid with five taxonomic synonyms (NRCS 2025, SEINet 2024).

Species range

Overall Species range:

Small-flower sand-verbena is widely distributed across the Great Plains of the United States and Alberta and Saskatchewan, Canada (NatureServe 2025) (Figure 160, Figure 161).

Description of how the population in the plan area fits within the overall range:

The plan area is at the southeastern edge of the species' range (Figure 160, Figure 161).

Distribution, abundance, and trend in the plan area

Population:

Across its range, NatureServe considers the species "widespread and abundant." Within the plan area, the population size and trend in the plan area is not known (NatureServe 2025). Occurrence records give limited information on the number of individuals observed; one record from 1964 notes "scarce". It is not considered rare in any counties that overlap with the plan area (Figure 161).

Habitat

Small-flower sand-verbena occurs on sandy soils in desertscrub and desert grasslands at elevations from 4,500-6,000 ft (Hazlett 2004, Kuhn et al. 2011, NatureServe 2025, SEINet 2024). Within the plan area, it has been documented only in the Timpas Unit of the Comanche, including in the Vogel Canyon area and along roadsides and trails (Van Scoyoc 2024).

Dune stabilization has reduced this species' habitat in Canada (Smith 2003), but in the plan area it has been associated with shortgrass prairie (Kuhn et al. 2011), clay loam roadside soils, and at the base of a steep rock ridge.

Threats (arising from on or off the plan area)

Population

Threats to population include the stabilization of dunes due to fire suppression, grazing, changing climate, and encroachment of invasive species (Smith 2003, NatureServe 2025).

Habitat

Threats to habitat include the stabilization of dunes due to fire suppression, grazing, changing climate, and encroachment of invasive species (Smith 2003, NatureServe 2025) (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

This species can use varied, sandy habitat types, including creosote bush, blackbrush, sandy desert shrub, and mixed desert shrub (Hazlett 2004, Kuhn et al. 2011, NatureServe 2025, SEINet 2024). It requires freedom from dune stabilization and invasive species (Smith 2003). It also requires viable conditions for its seed bank (Smith 2003).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Given this species' use of varied, sandy habitat types, including shortgrass prairie (Kuhn et al. 2011), its ecological condition requirements are not considered restricted in the plan area.

Critical biological characteristics

Small-flower sand-verbena is a short-lived annual, drought tolerant plant. Flowering occurs from May to July (SEINet 2024). In favorable years, it can produce large amounts of hardy seeds that remain viable until favorable climatic conditions occur (Smith 2003). Seeds are dispersed by wind (Smith 2003).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found for this species.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Population numbers of this species can fluctuate dramatically from year to year depending on climatic conditions, particularly precipitation (Smith 2003). Because this species is an annual, it is at-risk of short-duration precipitation that trigger germination but are subsequently followed by drought conditions that cannot support the seedling crop (Smith 2003).

Maps of Species Range

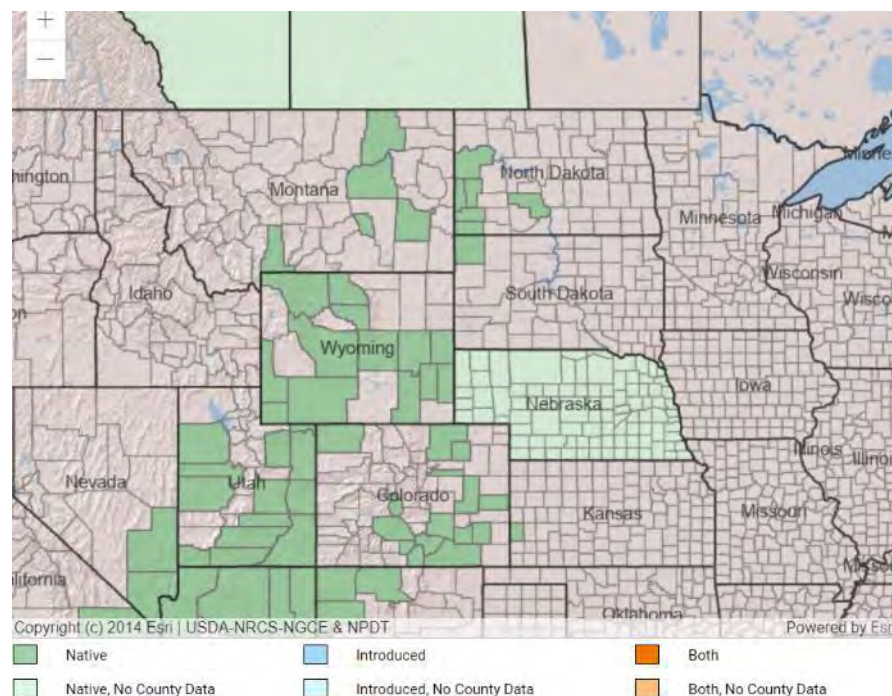


Figure 160. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

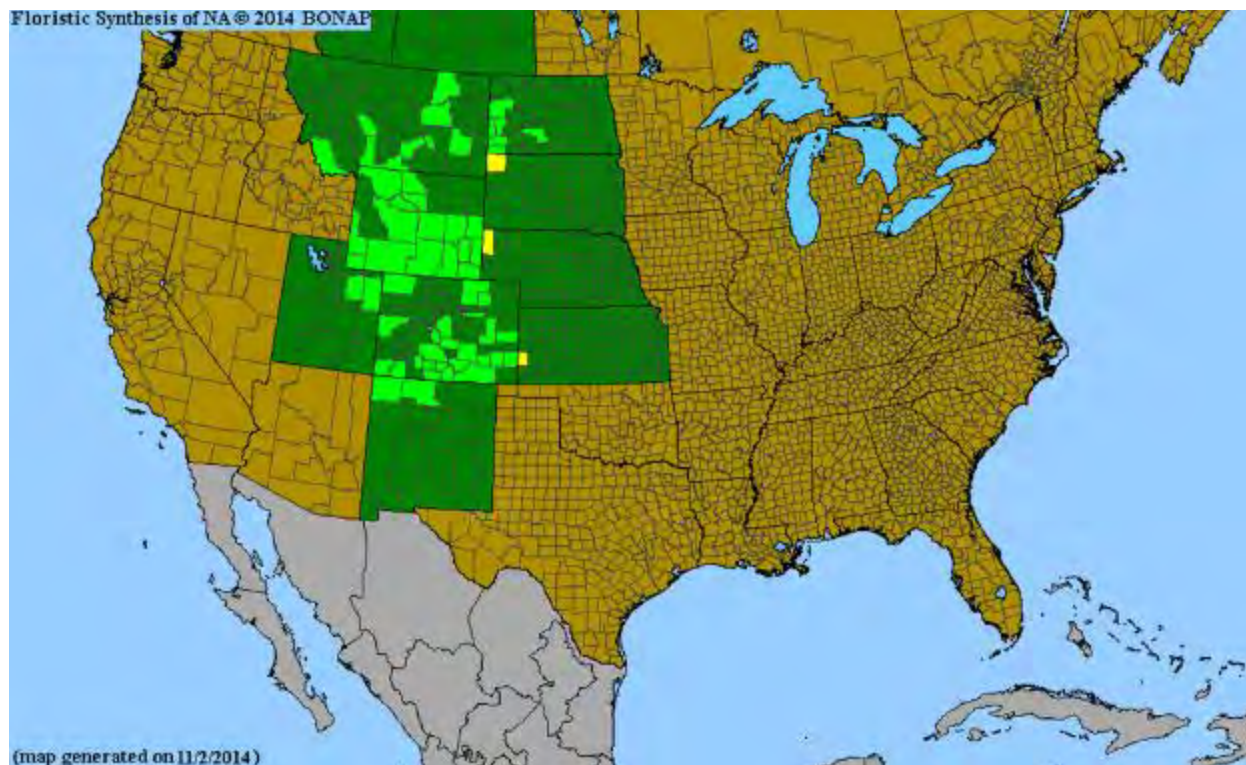


Figure 161. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Small-flowered marsh-elder

(*Iva axillaris*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has two occurrence records in the Timpas Unit of the Comanche National Grasslands from 1997 and 2022 (Van Scoyoc 2024). One of these records has sufficient spatial precision to demonstrate the species is known to occur in the plan area. Both BONAP and the USDA NRCS database show the species as being native to Otero County in the plan area (Figure 162, Figure 163) (NRCS 2025, BONAP 2025). Therefore, the species is native and known to occur in the plan area.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: there are two known occurrences in the plan area.
 - b. Habitat in the plan area is too varied to discern trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; two occurrence records, but only one definitively within the plan area.
 - b. Ecological conditions: occupies varied habitats, including disturbed habitats.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

USDA NRCS recognizes *Iva axillaris* as valid; taxonomic synonyms are *Iva axillaris* ssp. *robustior* and *Iva axillaris* var. *robustior* (NRCS 2025). Another common name is povertyweed (NRCS 2025) and deer-root (BONAP 2025, SEINet 2024).

Species range

Overall Species range:

This variety is widely distributed across the western United States and considered noxious in several states (Figure 162, Figure 163).

Description of how the population in the plan area fits within the overall range:

The plan area is at the eastern edge of the species' range (Figure 162).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. Occurrence records give no indication of the number of individuals.

Habitat

Small-flowered marsh-elder is associated with seasonally wet, saline habitats (SEINet 2024). Within the plan area, it has been found on the muddy margins of excavated stock ponds that serve to collect water for livestock (Kuhn et al. 2011). It can also use a variety of other habitat types including roadside, rocky upland prairie, shortgrass prairie, and riparian habitat (Kuhn et al. 2011).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Pritchard 1987, USFS 2010, Kuhn et al. 2011, NatureServe 2025, SEINet 2024).

Habitat

Threats associated with the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

USDA NRCS considers small-flowered marsh-elder a "facultative" species that occurs in both wetlands and non-wetlands in the Great Plains region (NRCS 2025). It is commonly, but not exclusively, found on poorly drained alkaline clay and clay loams or saline soils (Pritchard 1987).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The species is associated with varied habitat types, especially disturbed habitat (Kuhn et al. 2011). Therefore, its ecological conditions are not considered restricted in the plan area. It seems to have benefitted from creation of excavated stock water ponds (Kuhn et al. 2011).

Critical biological characteristics

Small-flowered marsh-elder is a perennial herb in the Aster family (Asteraceae) (SEINet 2024). Flowering occurs from May through October (SEINet 2024). It spreads mainly clonally by outward growth of its root system and seldom sets viable seed under natural ecosystem conditions in North America (Pritchard 1987).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Seeds of this plant are eaten by beetle larvae (*Smicronyx utilis*), and other parts of the plant are eaten by several species of insect (Montalvo et al. 2010).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Further work is needed to see if plants resprout after wildfire; plants withstand mowing and other mechanical disturbance (Montalvo et al. 2010).

Maps of Species Range

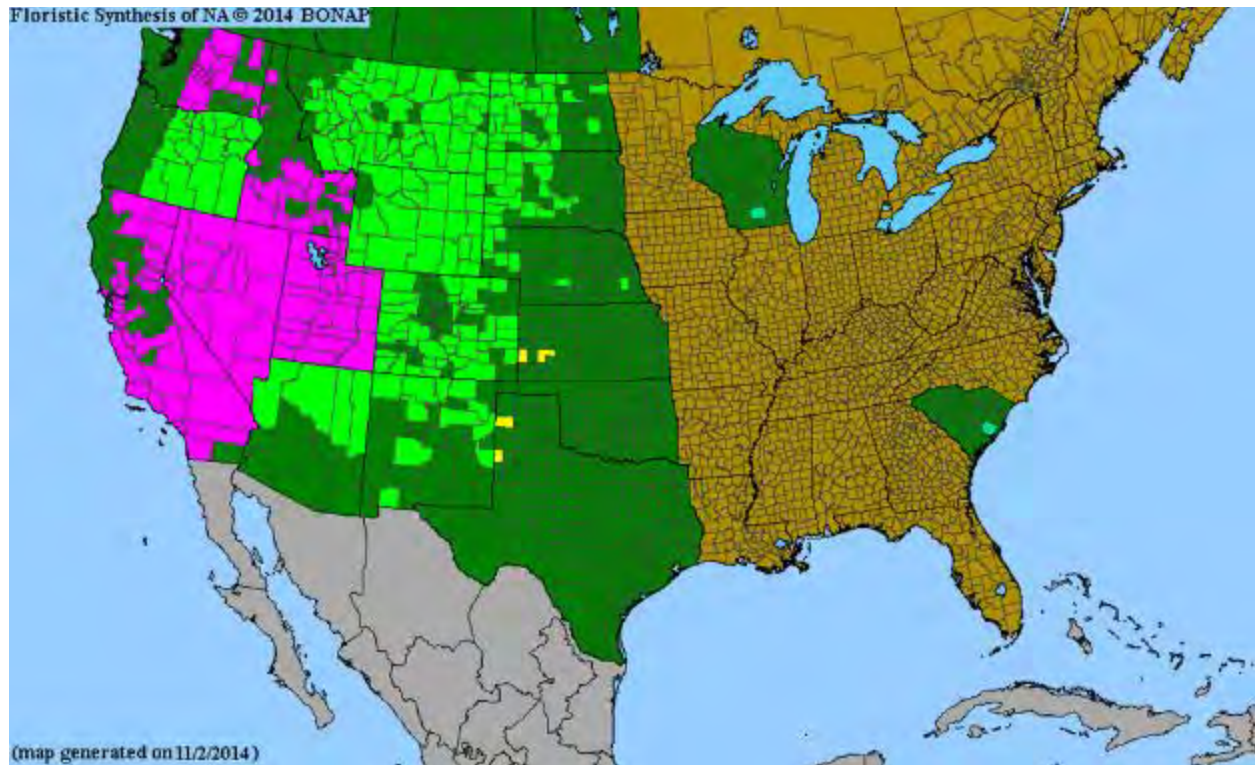


Figure 162. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county; teal indicates species native but adventive in state; pink indicates species noxious (includes noxious-weed seeds).

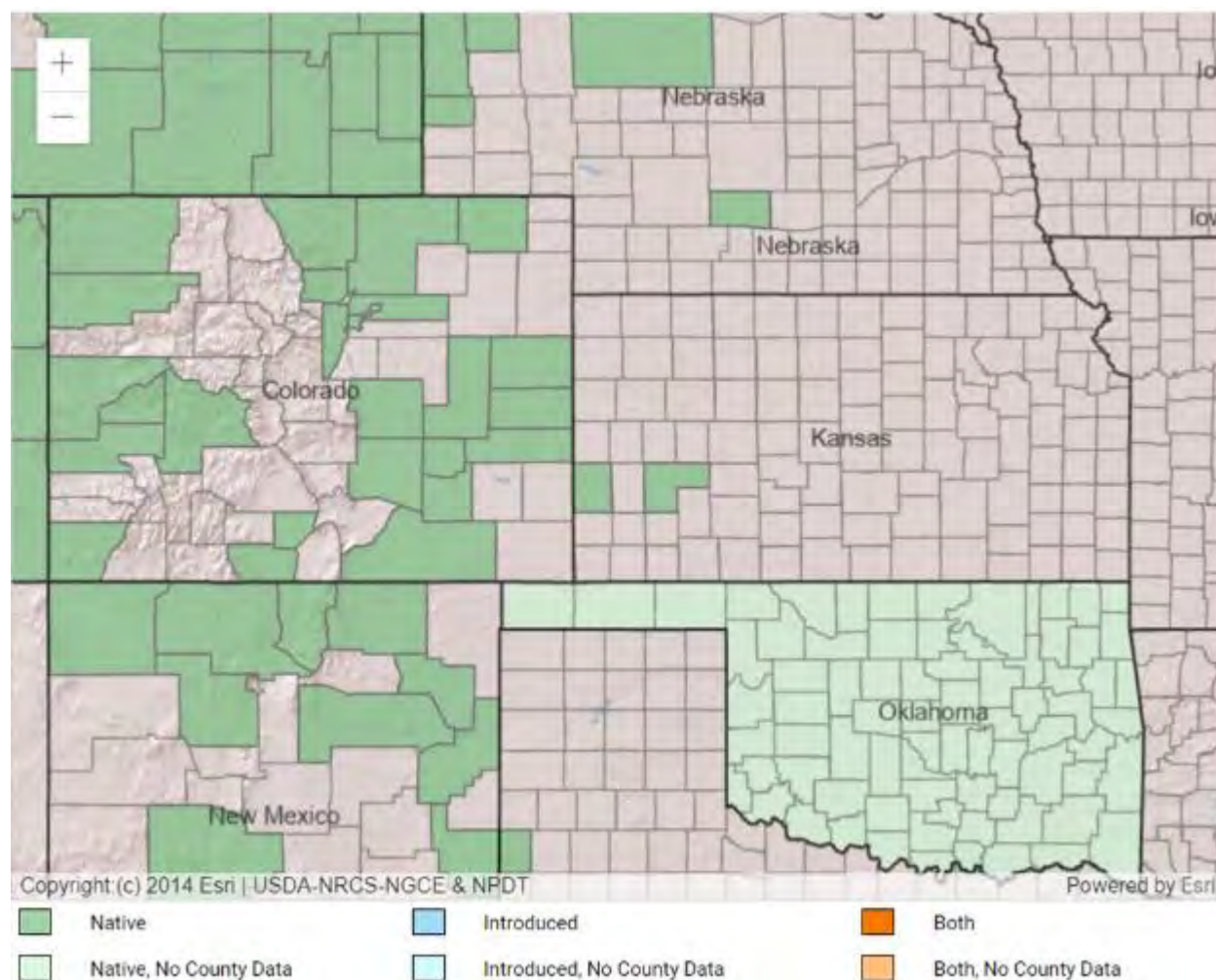


Figure 163. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Smooth goosefoot

(*Chenopodium subglabrum*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are 15 documented occurrence records within the plan area according to SEINet (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified direct threats to populations (Ackerfield 2022, NatureServe 2025). Many of the known locations in the plan area are near roads, trails, and recreation sites.
 - b. Habitat: In general, habitat is threatened by development for housing and urban areas, livestock farming and ranching, oil and gas drilling, recreation, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native species, drought, renewable energy, and fire and fire suppression (see Threats and Trends Appendix).

NatureServe describes threats for this species as follows: invasion by non-native species including leafy spurge and tamarisk, changes to flow regimes, and overgrazing or successional advance in the absence of disturbances (NatureServe 2025). NatureServe (NatureServe 2025) indicates that dune stabilization and fire control are threats, as well as oil and gas development and recreational activities in active dunes.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends for this species are unknown.
 - b. Habitat: This species is known to occupy varied habitat types in the plan area, including shortgrass prairie and canyonlands.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the southern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are 15 documented occurrence records within the plan area. Population size in the plan area is not known.
 - b. Ecological conditions: The species is limited to active sandy areas within its range, so area of occupancy is likely quite small compared to the overall species range extent (NatureServe 2025).

Species Status

G3; SNR in Colorado; SH in Kansas.

Taxonomy

Chenopodium subglabrum, is accepted as valid (Ackerfield 2022, ITIS 2024, NRCS 2025, Weber et al. 2012). One synonym for this species is *Chenopodium leptophyllum* var. *subglabrum* (Ackerfield 2022, ITIS 2024, NRCS 2025).

Species range

Overall Species range

Smooth goosefoot distribution in the United States is Colorado, Kansas, Missouri, Montana, North Dakota, Nebraska, Nevada, South Dakota, Utah, Washington, and Wyoming. In Canada, Alberta, British Columbia, Manitoba, and Saskatchewan (NatureServe 2025). Range extent shows discontinuous distribution of smooth goosefoot from Alberta and Saskatchewan, with an outlying dot in Manitoba, south through Montana, Wyoming, Utah, and Colorado, east to the very western edges of the Dakotas and into the western third of Nebraska, with outlying dots in Washington, Nevada, and Iowa.

NatureServe states: “Kartesz (2009 draft data) shows the outlying reports in Washington, Nevada, and Iowa as introduced. There is a collection from a historical population in Kansas that is thought to be smooth goosefoot (C. Freeman, pers. comm., Dec. 2009), but perhaps due to a data error is not on the FNA map,” (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are at the southern edge of the species’ range (Figure 164, Figure 165).

Distribution, abundance, and trend in the plan area

Population

Population size varies from year to year, but many extant northern occurrences are small in size (NatureServe 2025). There are enough occurrences in Wyoming, Colorado, and Nebraska that it is not tracked in these states; rare in other the states and provinces where it occurs (NatureServe 2025).

Since this species is limited to active sandy areas within its range, area of occupancy is quite small compared to its extent, but there is not enough data on populations to make estimates on the number of individuals (NatureServe 2025). Not all available habitat has been searched, and it is possible that additional habitat may be found (NatureServe 2025).

There are 15 documented occurrence records in the Carrizo and Timpas Units of the Comanche NG (USFS 2005a). Hazlett (2004) indicates this species is known to occur in Otero County and is rare in the region. Kuhn (2011) identified this species in Otero County in a Floristic Inventory of the Cimarron and Comanche National Grasslands. Herbarium collections were made in both Otero and Las Animas Counties in Colorado.

Abundance and trend for populations in the plan area are unknown.

Habitat

Smooth goosefoot occurs in sandy soil of the eastern plains from 3800 to 5700 feet in elevation. Flora of North America (1993) describes the habitat as sandy areas, particularly sand bars in rivers and in sandy blowouts near riverbanks. Hazlett (2004) describes the habitat as open steppe and sandy soils. Hazlett

(2004) indicates this species is infrequent because habitat is uncommon. Kuhn (2011) identified habitat as rocky upland prairie, sandsage prairie, juniper woodland, midgrass prairie, and pinyon-juniper woodland. NatureServe describes habitat as sandy areas, particularly sand bars in rivers and in sandy blowouts near riverbanks (NatureServe 2025). It also grows in the stabilizing sand at the edges of active dunes and blowouts (NatureServe 2025). The species is limited to active sandy areas within its range, so area of occupancy is quite small compared to its extent (NatureServe 2025).

Herbarium records are within the shortgrass prairie and canyonland ecosystem in the plan area. The occurrence records are spatially mapped within landfire existing vegetation types: Western Great Plains Shortgrass Prairie, Rocky Mountain Lower Montane-Foothill Shrubland, Northern & Central Plains Ruderal & Planted Shrubland, and Western Great Plains Cliff and Outcrop (Landfire 2024).

Locality of some of the herbarium records include along Purgatoire River and valley, shale hills, lower sheep canyon, between Bravo and Bent canyon. Habitat descriptions include along creek, rocky uplands near canyon, rocky exposed slopes, weedy canyonside dominated by one-seed Juniper (*Juniperus monosperma*), limestone with scattered juniper, river valley, and Dakota sandstone canyon with scattered juniper (SEINet 2024).

Although this species does require active sandy areas, it does occupy varied habitat communities with no discernable trend.

Threats (arising from on or off the plan area)

Population

None of the consulted sources identified direct threats to this populations (Ackerfield 2022, NatureServe 2025). Many of the locations in the plan area are in close proximity to roads, trails and recreation sites. There is a potential for this species to get dug up or trampled by disturbance. See additional threats under habitat as they are also threats to populations.

Habitat

Common threats to habitat include development for housing and urban areas, livestock farming and ranching, oil and gas drilling, recreation, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (see Threats and Trends Appendix).

NatureServe describes threat concerns for this species as follows: threatened by leafy spurge and tamarisk invasions, changes to flow regimes, and overgrazing or successional advance in the absence of natural/other disturbances (NatureServe 2025). NatureServe indicates that dune stabilization and fire control threats as well as oil and gas development and recreational activities in active dunes (NatureServe 2025).

Ecological conditions

Ecological condition requirements

The species is limited to active sandy areas within its range, so area of occupancy is quite small compared to its extent (NatureServe 2025). This species grows in sunny conditions where soil moisture is typically dry.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are a minimum of 15 occurrence records within the Carrizo and Timpas Units on the Comanche NG (SEINet 2024). Herbarium records are located within the shortgrass prairie and canyonland ecosystem. The occurrence records are spatially mapped within landfire existing vegetation types in Western Great Plains Shortgrass Prairie, Rocky Mountain Lower Montane-Foothill Shrubland, Northern & Central Plains Ruderal & Planted Shrubland, and Western Great Plains Cliff and Outcrop (Landfire 2024). Observations are from Otero and Las Animas County.

Locality of some of the herbarium records include, along Purgatoire River and valley, shale hills, lower sheep canyon, between Bravo and Bent canyon. Habitat descriptions include along creek, rocky uplands near canyon, rocky exposed slopes, Weedy canyonside dominated by oneseed juniper, limestone with scattered Juniper, river valley, and Dakota sandstone canton with scattered juniper (SEINet 2024).

Critical biological characteristics

Smooth goosefoot is an herbaceous, annual plant that flowers from July through September (Ackerfield 2022).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

This species likely contributes to integrity being an early successional species that is adapted to disturbance.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

This annual plant is likely influenced by disturbance, has shallow roots and is able to colonize sandy disturbed areas.

Maps of Species Range

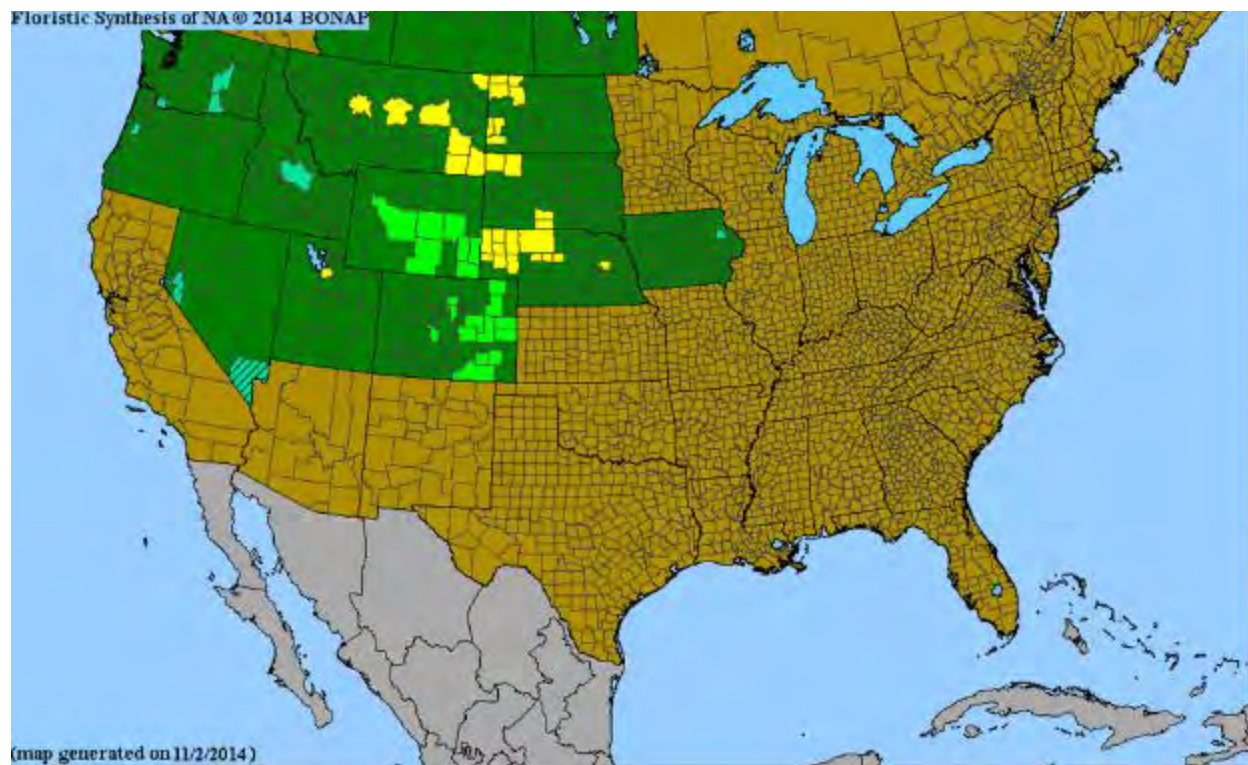


Figure 164. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county. Distribution map is for *Oenothera cinerea*.

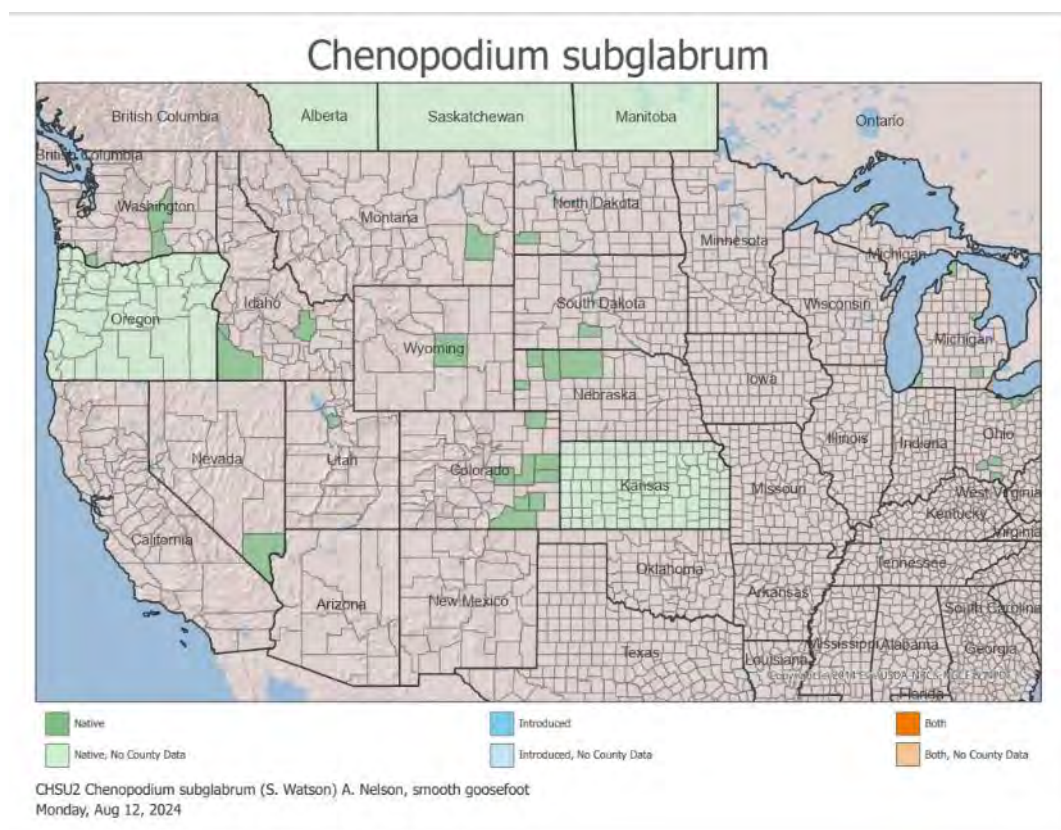


Figure 165. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Southwestern cloak fern

(*Astrolepis integerrima*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: One occurrence in 2008 on the Comanche National Grassland (NG) in Sand Canyon (Van Scoyoc 2024). Of the sources identified, no records were found to indicate that the species occurs on the Cimmaron NG.

Year of Last Known Occurrence: 2008

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Drought and wildfire.
 - b. Habitat: Helium mining, pipelines, road work, recreation, drought, and livestock grazing.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Trends associated with the canyonlands habitat type (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Populations are small and scattered due to habitat requirements, and Colorado is at the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: One known occurrence in the plan area and
 - b. Ecological conditions: associated with a restricted ecological condition (e.g., cliffs and canyon edges).

Species Status

G5; S1 in Colorado.

Taxonomy

Astrolepis integerrima (Hook.) Benham & Windham is accepted as valid (Ackerfield 2022, NRCS 2025). Synonyms include *Cheilanthes integerrima*, *Notholaena integerrima*, and *Notholaena sinuata* var. *integerrima* (NRCS 2025). Another common name associated with this species is hybrid cloakfern (NRCS 2025). This species is thought to be derived from hybridization between *A. cochisensis* and *A. sinuata*, and somewhat intermediate in characteristics between the two.

Species range

Overall Species range

In North America, southwestern cloak fern occurs in Alabama, Arizona, Colorado, New Mexico, Nevada, Oklahoma, Texas, and throughout Mexico (NRCS 2025). iNaturalist includes 500 observations, mostly near the US/Mexico border, and includes one observation in Colorado (iNaturalist 2025, Van Scoyoc 2024).

Description of how the population in the plan area fits within the overall range

The population on the Comanche NG is in at the northern edge of the species range (Figure 166).

Distribution, abundance, and trend in the plan area

Population

One occurrence was documented on the Comanche NG in Sand Canyon (Figure 166), which is one of 11 collection records from Colorado (SEINet 2024); several of these are duplicate specimens. Habitat for the 2008 collection was listed as “along sandstone cliffs with *Juniperus monosperma* and *Rhus aromatica*” (SEINet 2024). The number of limited collections indicates that there are few populations in Colorado; abundance and population trends are not documented for this occurrence. Plants occur on sandstone outcrops in Colorado (Ackerfield 2022) and throughout North America on rocky hillsides and cliffs, usually on limestone or calcareous substrate (Flora of North America 1993).

Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

Southwestern cloak fern is likely to be affected by drought and wildfire. Threats are described in detail below for the habitat.

Habitat

Southwestern cloak fern is restricted to sandstone and limestone canyons and is found in juniper woodlands and prairies. General threats are from helium mining, pipelines, road work, recreation, and increasingly long and severe drought which may affect persistence and reproduction. Livestock grazing is an ongoing use of the Comanche NG. These are all threats to the long-term viability of this species.

Threats to pinyon-juniper woodland and cliffs are as follows (CPW 2015):

Livestock grazing has degraded the understory grasses of some stands, and invasive cheatgrass has become established in some areas. Tree removal by chaining is a minor source of disturbance within these woodlands but dramatically changes the habitat where it has occurred. The Comanche NG is grazed by livestock.

Energy production, mining, oil and gas development, with associated roads, pipeline corridors, and infrastructure, is an ongoing source of disturbance and fragmentation for most pinyon-juniper habitats. Throughout the state of Colorado, sandstone, limestone, granite, and shale outcrops are quarried for a

variety of uses including energy production and mining, which essentially destroys the habitat. In eastern Colorado, wind energy development is frequently concentrated on outcrops and canyon rims, causing fragmentation, disturbance, and loss of habitat.

Human intrusions and disturbance by military training activities are a source of disturbance to this habitat at Fort Carson and Piñon Canyon Maneuver Site. Increased recreational use of pinyon-juniper forests is also of concern in areas adjacent to growing urban centers in the southeast and southwest portions of the state. These lower elevations often remain accessible year-round and are increasingly utilized for horseback riding, hiking, ATV's, bicycling, and other recreational activities that degrade habitat and disturb wildlife during vulnerable periods. Surface impacts by disturbance in the transportation corridor are largely due to road construction and maintenance, including rockfall mitigation.

In areas adjacent to development, pinyon-juniper stands may be part of the wildland-urban interface, where they are most likely to be threatened by the effects of inappropriate management intervention or fire suppression. These activities interrupt the natural seral progression of the impacted stands and may degrade the usefulness of the remaining habitat.

Pinyon pine trees are susceptible to the fungal pathogen *Leptographium wagneri* var. *wagneri*, which causes black stain root disease, and to infestations of the pinyon ips bark beetle (*Ips confuses*), which has caused extensive mortality in pinyon-juniper habitats in southern Colorado. Extended drought can increase the frequency and intensity of both insect outbreaks and wildfire.

Variable disturbance and site conditions across the distribution of this ecosystem have resulted in a mosaic of interconnected communities and successional stages across the landscape that can be naturally resilient. Since the last major glacial period, the distribution and relative abundance of pinyon and juniper has fluctuated dynamically with changing climatic conditions. Warming conditions during the past two centuries, together with changing fire regime, livestock grazing, and atmospheric pollution, increased the ability of this ecosystem to expand into neighboring communities, at both higher and lower elevations (Tausch 1999). However, precipitation and temperature patterns are projected to change in a direction that is less favorable for pinyon pine, so that juniper may become more dominant, and these habitats may be unable to persist or expand in their current form.

Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Southwestern cloak fern is a perennial fern occurring on cliffs and canyon edges in juniper woodland (Flora of North America 1993). Ackerfield (2022) lists the habitat for this species as sandstone outcrops and NatureServe cites that the species occurs on calcareous substrates, primarily limestone, rocky slopes, cliffs, and hillsides (NatureServe 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There is one known occurrence on the Comanche NG, therefore information on ecological conditions is lacking.

Critical biological characteristics

Occupies sandstone outcrops, cliffs and canyon edges, thus there is limited available habitat in the plan area, due to the very specific topographic and geologic habitat requirements.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity:

Unknown from the reviewed literature and sources, but the species likely provides diversity and physical cover in a largely barren habitat (i.e., cliff faces).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences):

Due to its habitat preferences, the species is likely to be threatened by drought and wildfire.

Maps of Species Range

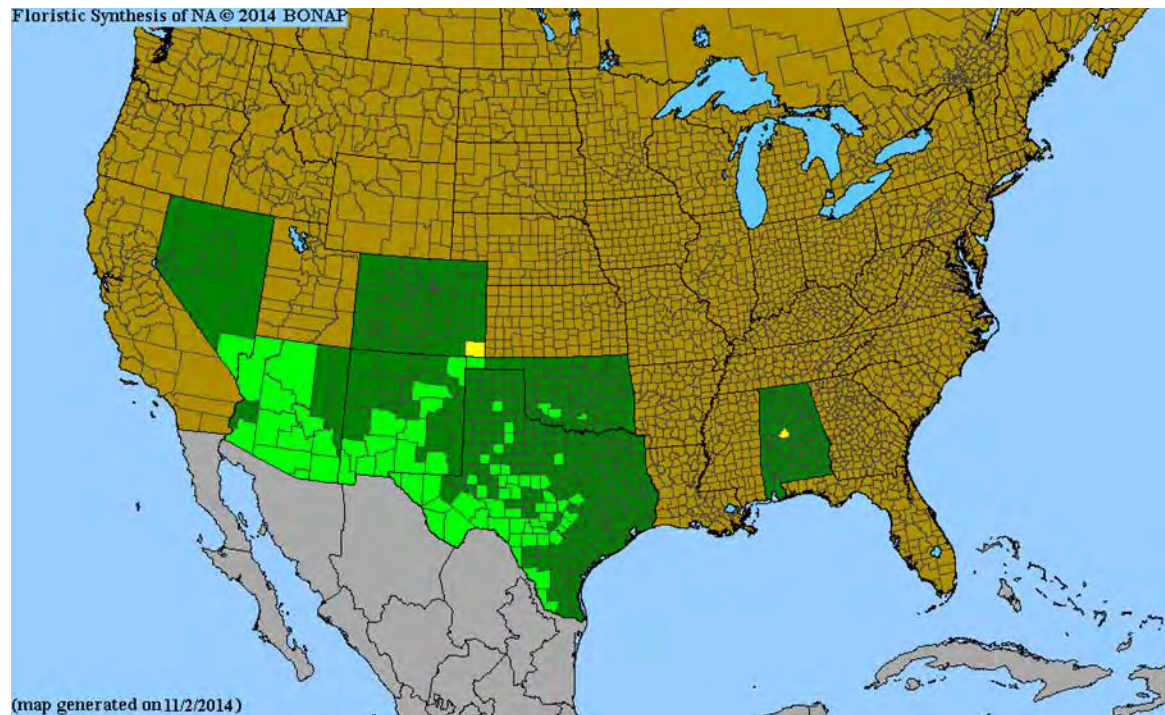


Figure 166. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Spreading three-awn grass (*Aristida divaricata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has five occurrence records in the plan area from 1948 through 1997 (Van Scoyoc 2024). The record from 1997 describes the locality as “Comanche National Grassland. Carrizo Creek: Near Campground, Ca. 4 Mi. W. Of Las Animas County Line.” Therefore, the species is known to occur in the plan area.

Year of Last Known Occurrence: 1997

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: overgrazing.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: varied dry, open habitats; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is not at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; five occurrence records.
 - b. Ecological conditions: uses varied dry, open habitat types that are widespread in the plan area.

Species Status

G4; SNR in Colorado; S1 in Kansas.

Taxonomy

USDA NRCS recognizes *Aristida divaricata* as valid (NRCS 2025); another common name is poverty threeawn (Hazlett 2004, NRCS 2025).

Species range

Overall Species range:

Spreading three-awn grass is distributed from the southwestern United States through Mexico to Guatemala (SEINet 2024) (Figure 167, Figure 168).

Description of how the population in the plan area fits within the overall range:

The plan area is not at the edge of the species' range (Figure 167, Figure 168).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. Occurrence records do not give an indication of the number of individuals observed. It is not considered rare in any counties that overlap the plan area (Figure 168). It is rare in the southern High Plains of Kansas and primarily distributed south of the Arkansas River (Freeman 2001). Freeman (2001) states that "it is unclear why this species, which is common and often locally abundant in states to the west and south, disappeared so suddenly and so nearly completely from the (Kansas) state's flora." All records of this species have been in the Comanche portion of the plan area; the species does not have a status ranking in Colorado.

Habitat

Across its range, spreading three-awn grass occurs on dry hills and plains, especially in pinyon-juniper-grassland zones at elevations from 4,000-7,000 ft (SEINet 2024). Within the plan area, it has been associated with midgrass prairie, pinyon juniper woodland, riparian, sand-sage prairie, and disturbed habitat including roadsides (Hazlett 2004, Kuhn et al. 2011). Occurrence records have been distributed across the southwestern portion of the Carrizo Unit of the Comanche NG. Records in and adjacent to the plan area have noted habitat including riparian sandbar along Carrizo Creek and open slopes.

Threats (arising from on or off the plan area)

Population

Because spreading three-awn grass is highly palatable to grazing animals (NRCS 2025), overgrazing is considered a threat to populations. Freeman (2001) notes that most species in the *Aristida* genus in Kansas "increase in abundance in response to moderate to intense grazing."

Habitat

No consulted sources identified threats to habitat (Hazlett 2004, Kuhn et al. 2011, SEINet 2024, NatureServe 2025).

Ecological conditions

Ecological condition requirements

Spreading three-awn grass can use a variety of dry, open sites (SEINet 2024, Hazlett 2004, Kuhn et al. 2011). In Kansas, it is most common in sandsage prairies and sandy to gravelly shortgrass prairies (Freeman 2001). It has intermediate shade tolerance, high fire and drought tolerance, and low moisture requirements (NRCS 2025). It is adapted to medium to coarse textured soils (NRCS 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Dry, open habitats are not restricted in the plan area.

Critical biological characteristics

Spreading three-awn grass is a perennial graminoid (NRCS 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Spreading three-awn grass is highly palatable to grazing animals (NRCS 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Brady et al. (1989) found this species was a more dominant component of the shortgrass prairie in an ungrazed portion of NFS lands compared to an allotment grazed year-round.

Maps of Species Range

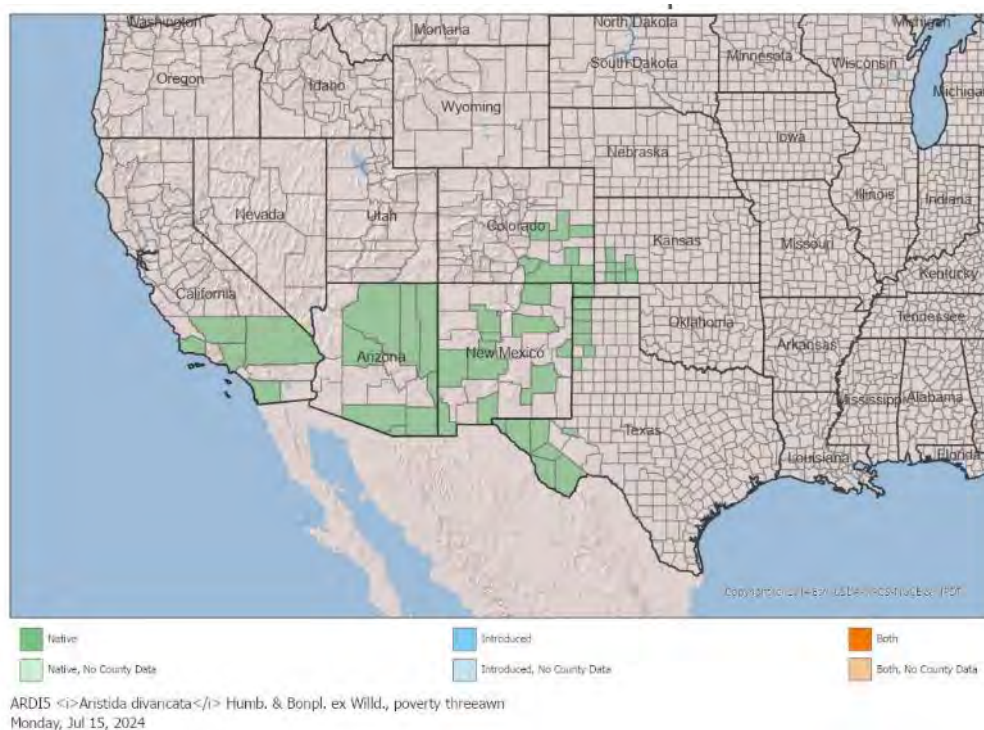


Figure 167. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

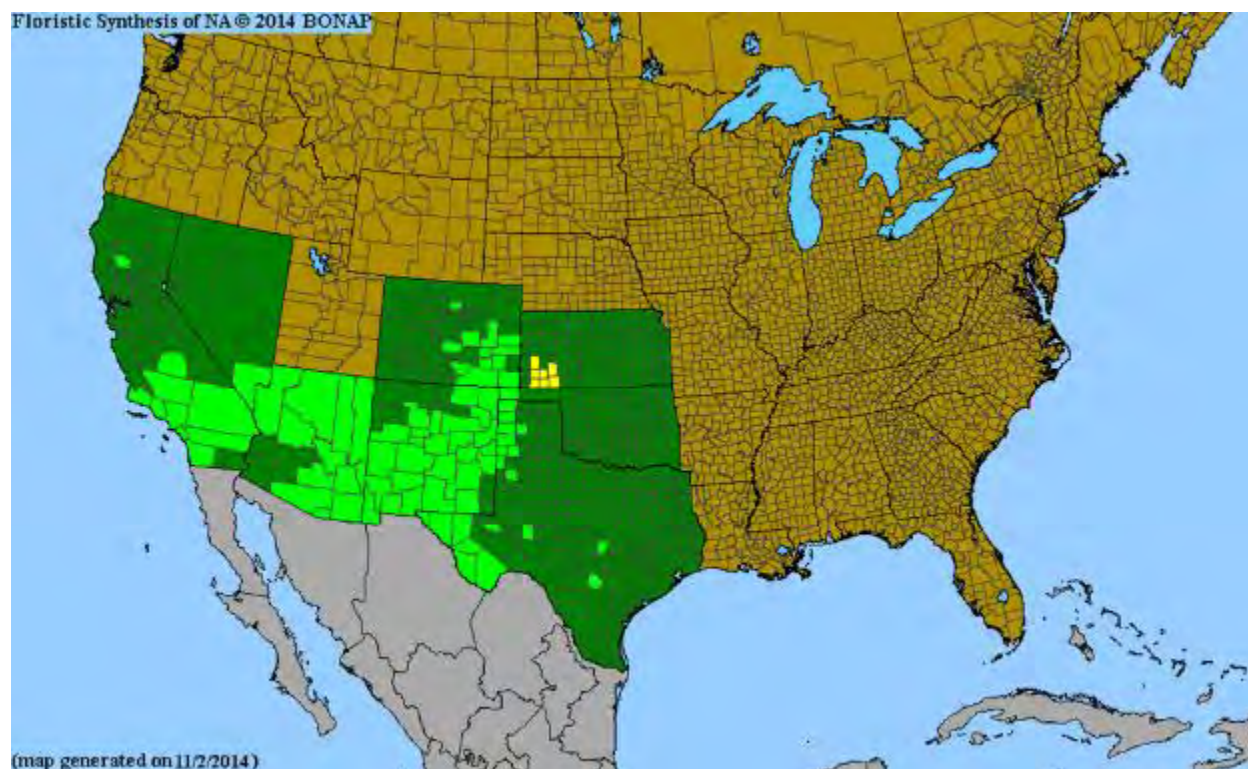


Figure 168. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Springfield bluestem

(*Bothriochloa springfieldii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CNHP has 5 species observation records between 2007 and 2011, GBIF has 3 records from 1994 to 2021, and iDigBio has 2 records in 2021 (Van Scoyoc 2024). The species has also been documented on the Comanche National Grassland according to Hazlett (2004).

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: None known from the consulted sources.
 - b. Habitat: Wildfire, grazing, drought, and agricultural development to the plains and desert shrub communities. However, this species is a generalist and has a wide range of habitats and can be found in.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No trends known at this time.
 - b. Habitat: Non-artificial waterways that could be used by this species are declining, as well as the plains and desert shrub communities.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Species is at the northeastern edge of its range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Numbers are unknown, there are between 3 and 8 total occurrences in the plan area
 - b. Ecological Conditions: Not restricted.

Species Status

G5; S1 in Colorado.

Taxonomy

The valid scientific name is *Bothriochloa springfieldii* (Gould) Parodi (NRCS 2025). Synonyms include *Andropogon springfieldii* Gould and *Bothriochloa springfieldii* var. *springfieldii* (Gould) Parodi (TSN 41490) (ITIS 2024). Other common names include Springfield's beardgrass and Springfield's beard grass (ITIS 2024, NRCS 2025).

Species range

Overall Species range

Known from southeastern Colorado, Utah, Arizona, New Mexico, Texas, Louisiana, northern Mexico, and portions of South America (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

Part of the plan area is within the known species range; however, it is considered to be at the northeastern edge of the species' range.

Distribution, abundance, and trend in the plan area

Population

This species has been documented in Baca County, Colorado (Hazlett 2004). There is no distribution, abundance, or trend data for the species in the plan area.

Habitat

Sandstone cliffs and ledges, rocky uplands, ravines, along waterways and roadsides, plains and sandy areas, and in desert shrub communities at 3,000 to 8,000 ft (NatureServe 2025, SEINet 2024). According to Hazlett (2004), this species has been documented on the Comanche National Grassland in shaded rocky canyons and ravines and sandy soils. This species is a generalist, and therefore its habitat is widely distributed throughout the plan area. Trends for these habitats vary between declining waterways to stable or increasing sandy areas and roadsides.

Threats (arising from on or off the plan area)

Population

None known at this time.

Habitat

Sandstone cliffs and ledges, and rocky uplands are areas less prone to development due to their armored nature, and do not appear to be threatened at this time. Waterways being used for agricultural purposes are not being threatened at this time; however, naturally occurring riparian areas and drainages are threatened by climate stressors and anthropogenic disturbances that impact the ground water levels and recharge, as well as the encroachment of non-native species such as tamarisk. Disturbed corridors like roadways are not threatened. Plains, sandy areas, and desert shrub communities are being impacted by livestock grazing, development for various purposes, wildfire and climate stressors.

Ecological conditions

Ecological condition requirements

This species can occupy a wide variety of habitats and ecological conditions.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There is likely suitable habitat in the plan area due to the wide range of ecological conditions where this species occurs.

Critical biological characteristics

Flowers in the summer, between June and September (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

None known at this time.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

None known at this time.

Maps of Species Range

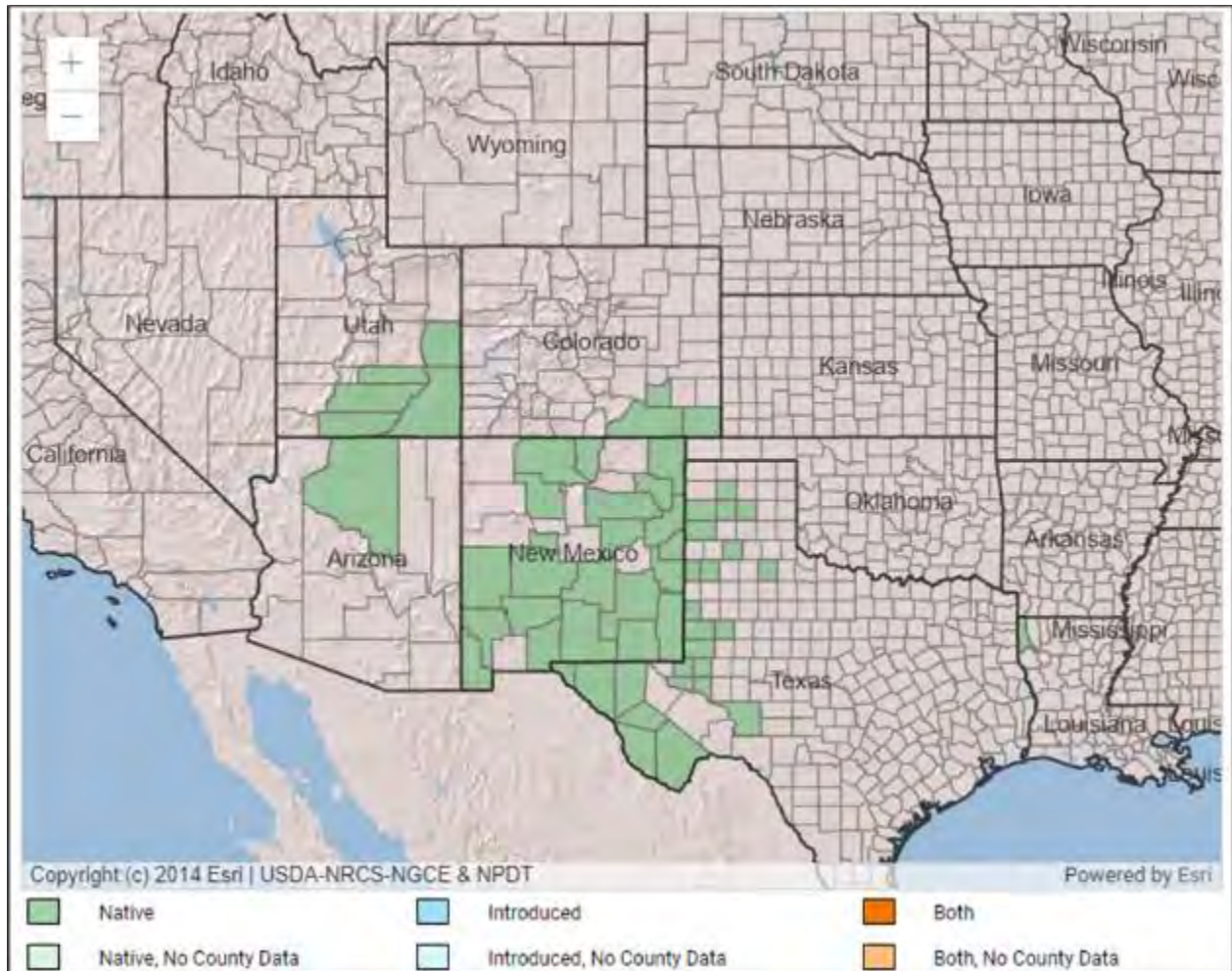


Figure 169. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Star cloakfern

(*Notholaena standleyi*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF contains nine occurrence records from 1947-2009 (Van Scoyoc 2024). At least two records from 2009 have sufficient spatial precision to demonstrate the species occurs in the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2009

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends are available.
 - b. Habitat: species occurs on cliff faces; trend is unknown.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: population size is not known, but occurrence records suggest low numbers in the plan area.
 - b. Ecological conditions: Associated with a restricted ecological condition (e.g., cliffs and canyon edges).

Species Status

G4; S1 in Colorado.

Taxonomy

Notholaena standleyi is accepted as valid; taxonomic synonyms include *Cheilanthes hookeri* and *Cheilanthes standleyi* (NRCS 2025).

Species range

Overall Species range:

The species' distribution is "centered in the Sonoran and Chihuahuan deserts, from Baja California in the west to Texas and Coahuila, Mexico, in the east; its northernmost populations are found in Colorado and Oklahoma, and its range extends deep into southern Mexico" (Kao et al. 2020) (Figure 170).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure 170).

Distribution, abundance, and trend in the plan area

Population:

Twenty-five plants were observed in 2009 in Whitby Canyon within the Comanche National Grassland (Van Scoyoc 2024). It is considered rare in Baca County (Figure 170). The population size in the plan area is not known but based on the occurrence report it is considered to be low.

Habitat

Star cloakfern is found in rocky canyons, along cliffs, and among rocks, from 1,000-6,500 ft (305-1981 m) (SEINet 2024). Smith (2010) notes it may be found on multiple rock types.

Within the plan area, the species has been documented in Whitby Canyon, Comanche National Grassland. There, it was observed in a "SSW-facing sandstone wall of canyon above spring; in rock crevices with *Schizachyrium scoparium*, *Rhus trilobata*, and *Sabina monosperma*" (Van Scoyoc 2024). Because this species occurs in steep, sandstone canyon walls, its habitat in the plan area is considered stable.

Threats (arising from on or off the plan area)

Population

None of the sources consulted identified threats to populations (Smith 2010, Kao et al. 2020, SEINet 2024, NatureServe 2025, Van Scoyoc 2024).

Habitat

None of the sources consulted identified threats to habitat (Smith 2010, Kao et al. 2020, SEINet 2024, NatureServe 2025, Van Scoyoc 2024).

Ecological conditions

Ecological condition requirements

This species requires rocky, xeric habitat (Smith 2010). It can use a variety of rocky substrates, including granite and limestone (Smith 2010, SEINet 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Star cloakfern requires suitable rocky, xeric habitat (Smith 2010). Star cloakfern was observed in Whitby Canyon within the Comanche National Grassland, but older records from the 1940s indicate it may also occur in Sand and Gallinas Canyons and Mesa de Maya. Its habitat within the plan area is considered stable because rocky ledges and canyon walls are typically stable features on the landscape. Because it can use a variety of rocky substrates (Smith 2010), its ecological conditions are not restricted in the plan area.

Critical biological characteristics

Star cloakfern is a xeric-adapted fern. The fern life cycle is made up of two distinct phases: the large, long-lived, iteroparous sporophyte and the small, short-lived, semelparous gametophyte (Wild and Gagnon 2005). Star cloakfern is perennial that spreads rhizomatously (Smith 2010). It produces spores (sporulates) from late spring to fall (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found specifically for this species.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found specifically for this species. Ferns generally appear to be unpalatable to grazing herbivores, and their distribution is primarily driven by abiotic factors (Wild and Gagnon 2005). Climate and habitat may limit the dispersal and establishment of ferns; research suggests that local patchy distributions are not solely due to microhabitat rarity, but also dispersal or recruitment limitations (Wild and Gagnon 2005).

Maps of Species Range

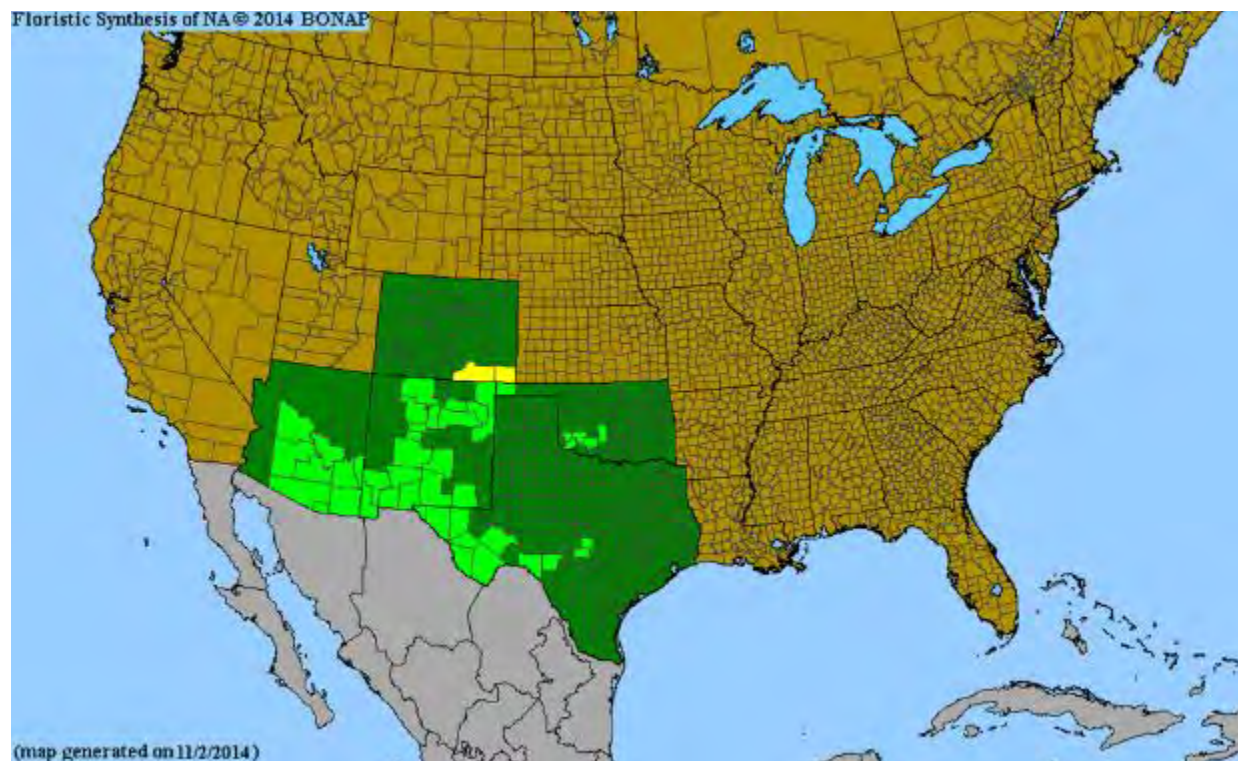


Figure 170. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Tall silverbush

(*Argythamnia mercurialina*; *Argythamnia mercurialina* var. *mercurialina*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are ~9 occurrence records in the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025). All locations are in close proximity to roads and the three occurrences in the Cimmaron Unit are near oil and gas well activity. There is a potential for species to get dug up or trampled but human activity in the area.
 - b. Habitat: Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, recreation, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend for this species in the plan area is unknown.
 - b. Habitat: Species uses varied habitats, no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is not at the edge of the species range
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known. There is ~9 occurrence record within the plan area.
 - b. Ecological conditions: No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025). Species is herbaceous/sub-shrub perennial, flowers, May through July (Ackerfield 2022, NRCS 2025).

Species Status

G5; S2 in Colorado; SNR in Kansas.

Taxonomy

Argythamnia mercurialina is accepted as valid (NatureServe 2025). *Ditaxis mercurialina* is the accepted name in ITIS for this species and the recognized synonyms are *Argythamnia mercurialina* and

Argythamnia mercurialina var. *mercurialina* (ITIS 2024, Ackerfield 2022). Synonym for *Argythamnia mercurialina* var *mercurialina* in USDA plants databases is *Ditaxis mercurialina* (NRCS 2025).

Species range

Overall Species range

Tall silverbush occurs in Arizona, Colorado, Kansas, New Mexico, Oklahoma, and Texas (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is not at the edge of the species' range (Figure 171, Figure 172).

Distribution, abundance, and trend in the plan area

Population

There are ~9 occurrence record within the Carrizo and Cimmaron Unit (USFS 2005a). Hazlett (2004) indicates this species is known to occur in Otero and Baca County and could occur in eastern and western Las Animas in the plan area. Kuhn (2011) identified this species in Baca and Morton County in a Floristic Inventory of the Cimarron and Comanche National Grasslands.

Population and population trend for this species in the plan area is unknown.

Habitat

Tall Silverbush occurs in sandy or rocky soil, 4000-4500 ft in elevation. Flowers May through July (Ackerfield 2022) NatureServe describes habitat as Rocky prairies hillsides (NatureServe 2025). Hazlett (2004) describes it as Shaded rocky canyons and ravines. Kuhn (2011) identified habitat as midgrass prairie, riparian, and rocky upland prairie in a Floristic Inventory of the Cimarron and Comanche National Grasslands.

Observation records are within the canyonlands (6), shortgrass prairie (1) and riparian woodlands and aquatic habitat ecosystems (2). The occurrence records are spatially mapped within the Western Great Plains Shortgrass Prairie, Western Great Plains Floodplain Herbaceous, Central Mixedgrass Prairie Shrubland, and the Western Great Plains Riparian Herbaceous (Landfire 2024).

Some of the observation records localities was in Picture Canyon and Holt canyon, tributary to Cimmaron River. Habitat descriptions for some of the records is talus slopes, sandstone bluffs, cliffs, and riparian, sandy soil, sandy soil on floodplain of creek, spring fed pond with juncus and coyote willow, small rocky knob of prairie hills (SEINet 2024).

Species uses varied habitats, no discernable trend.

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025). All locations are near roads and the three occurrences in the Cimmaron Unit are near oil and gas well activity. There is a potential for disturbance by human activity in the area.

Habitat

Common threats include housing and urban areas, livestock farming and ranching, oil and gas drilling, recreation, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression.

Ecological conditions

Ecological condition requirements

No sources consulted identified ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are ~9 occurrence record within the Carizo and Cimmaron Unit (USFS 2005a). Observation records are within the canyonlands (6), shortgrass prairie (1) and riparian woodlands and aquatic habitat ecosystems (2). The occurrence records are spatially mapped within the Western Great Plains Shortgrass Prairie, Western Great Plains Floodplain Herbaceous, Central Mixedgrass Prairie Shrubland, Western Great Plains Riparian Herbaceous (Landfire 2024).

Some of the observation records localities was in Picture Canyon and Holt canyon, tributary to Cimmaron River. Habitat descriptions for some of the records is talus slopes, sandstone bluffs, cliffs, and riparian, sandy soil, sandy soil on floodplain of creek, spring fed pond with juncus and coyote willow, small rocky knob of prairie hills (SEINet 2024).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species. Species is herbaceous/sub-shrub perennial, flowers, May through July (Ackerfield 2022, NRCS 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

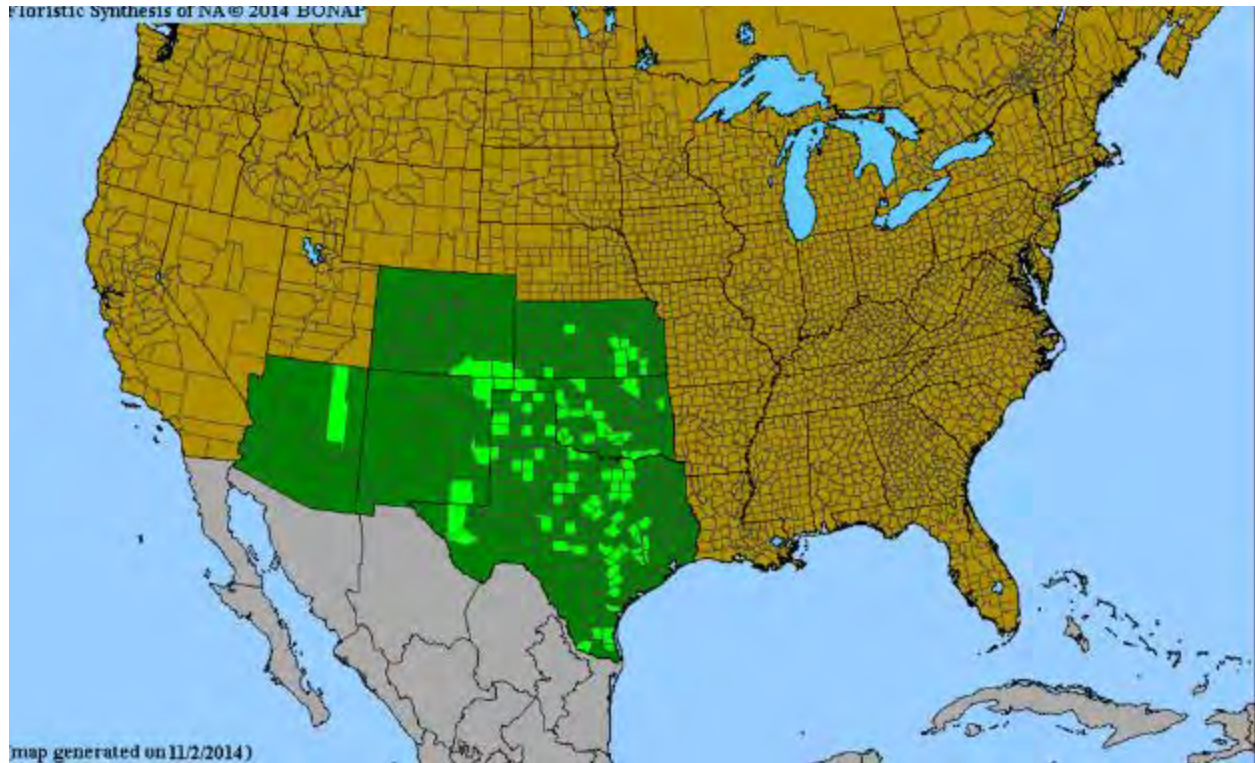


Figure 171. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

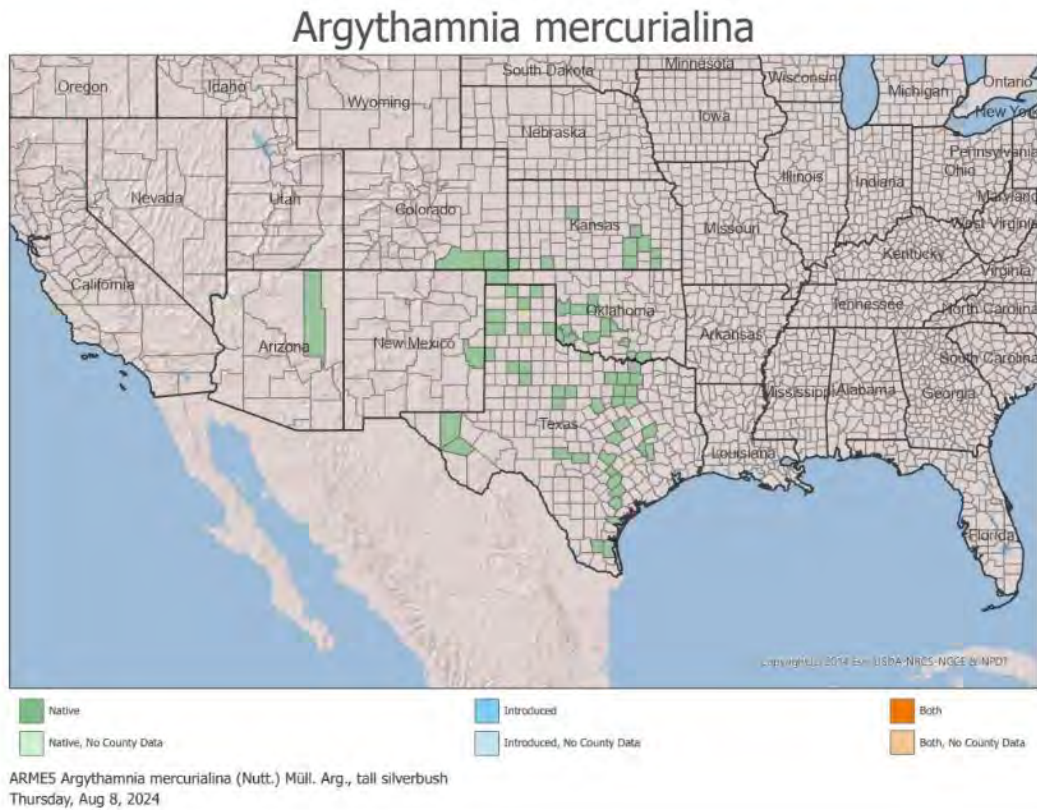


Figure 172. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Texas bergia

(*Bergia texana*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: At least one occurrence was documented on the Comanche National Grassland (NG) in 2007 (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Livestock grazing, invasive species, and drought.
 - b. Habitat: Livestock grazing, roads, invasive species, drought, and wetland modification.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Playa wetlands have a declining trend in the plan area due to sedimentation.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The occurrence in the plan area is on the western edge of the main body of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: One documented occurrence in the plan area. Population numbers in the plan area are unknown.
 - b. Ecological conditions: Aquatic habitat is restricted in the plan area.

Species Status

G5; S2 in Colorado; S2 in Kansas.

Taxonomy

Bergia texana (Hook.) Seub. ex Walp. is accepted as valid (NRCS 2025). Synonyms include *Elatine texana* (NRCS 2025). Another common name is Texas water-fire (Flora of North America 1993).

Species range

Overall Species range

In North America, occurs in Arkansas, California, Colorado, Idaho, Illinois, Kansas, Louisiana, Missouri, Montana, Nebraska, Nevada, New Mexico, Oklahoma, Oregon, South Dakota, Texas, Utah and Washington (Figure 173) (NatureServe 2025). Texas bergia is also known to occur in northern Mexico

(Figure 173). This species is considered vulnerable or imperiled in ten of the United States in which it occurs (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

There is one population documented from the Comanche NG in Colorado (Van Scoyoc 2024). This occurrence is on the western edge of the main part of the species range (Figure 173).

Distribution, abundance, and trend in the plan area

Population

There is one known occurrence record on the Comanche NG, which is one of ten known occurrences in Colorado (Kuhn et al. 2011, Van Scoyoc 2024). Abundance and trend are not known for the population.

Habitat

Wetlands and playas are limited in the plan area.

Threats (arising from on or off the plan area)

Population

Threats are described for habitat; loss or degradation of habitat is a threat to populations.

Habitat

Threats to wetlands are described based on (CPW 2015) including incompatible agriculture and natural system modifications, transportation and utility corridors, problematic species and pathogens, pollution, and climatic variability (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Texas bergia is a Wetland Obligate species on the National Wetland Plant List (NRCS 2025) found growing in muddy and moist soils (iNaturalist 2025). Habitat consists of muddy or sandy shores and flats, emergent shorelines of rivers, lakes, playas, pools, ditches and ponds (Flora of North America 1993).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species depends on wetland habitat and has only one occurrence record on the Comanche NG. Connectivity is likely poor as most wetlands are isolated. Seeds may be distributed by birds to other locations. The ecological conditions trend is likely declining due to increasingly severe and long drought periods.

Critical biological characteristics

Texas bergia is a wetland dependent, hydrophyte that almost always occurs in wetlands (NRCS 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown from the reviewed literature and sources.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Texas bergia is vulnerable to drought and would be expected to decline under warmer, drier conditions.

Maps of Species Range

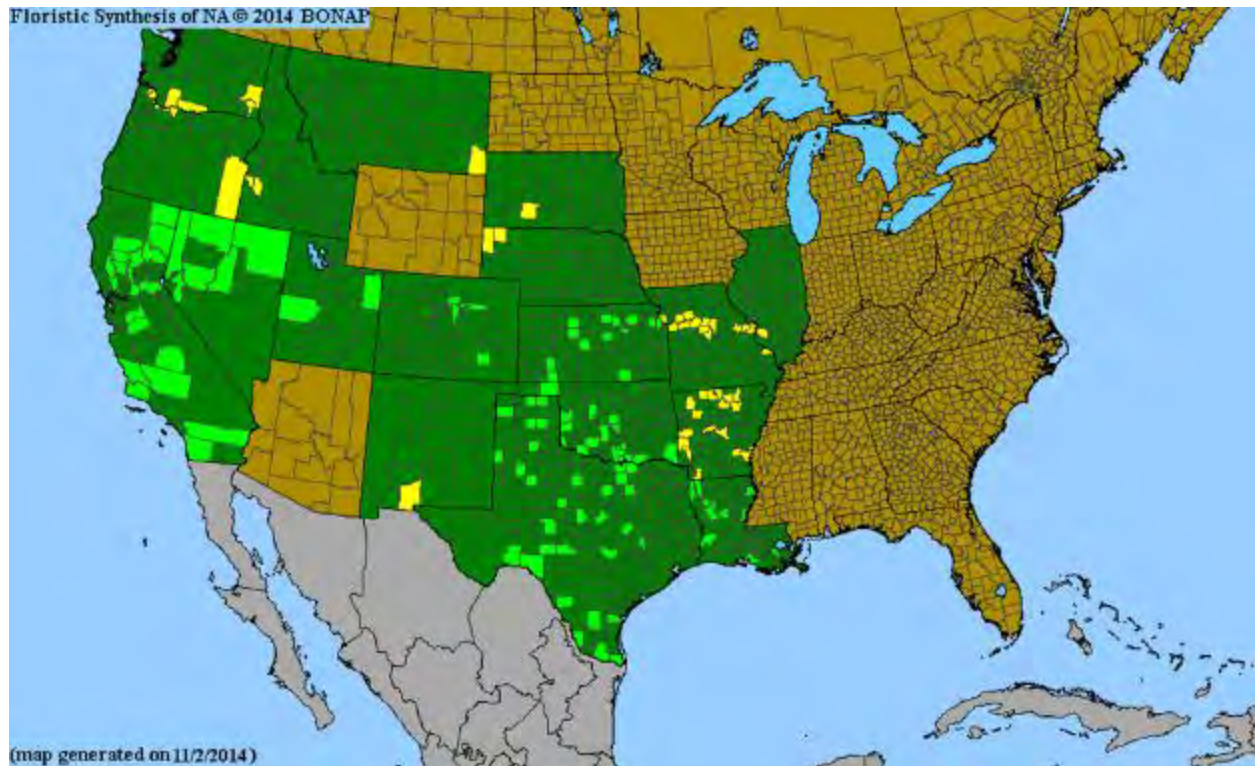


Figure 173. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Texas bindweed

(*Convolvulus equitans*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has 20 occurrence records across the plan area from 1929-2023 (Van Scoyoc 2024). Some of these records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: species can use varied habitat types, including disturbed habitats; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; considered locally common in some parts of the plan area.
 - b. Ecological conditions: uses varied upland habitats (shortgrass prairie, midgrass prairie, roadsides, etc.).

Species Status

G5; SNR in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Convolvulus equitans* as valid; *Convolvulus hermannioides* and *Convolvulus simulans* are taxonomic synonyms (NRCS 2025). Another common name is hoary bindweed (Hazlett 2004).

Species range

Overall Species range:

Texas bindweed is distributed central and southern California, Arizona, southern Utah and Colorado, New Mexico, Kansas, Oklahoma, Texas, and Nebraska, south to central Mexico and South America (SEINet 2024) (Figure 174, Figure 175).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure 174, Figure 175).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. A few occurrence records give an indication of the number of individuals on the Cimarron National Grassland: one from 1988 notes "Locally common vine along roadside and in disturbed prairie"; another from 1988 states "scarce in the area"; one from 1989 states species is "locally common." It is not considered rare in any counties that overlap the plan area (Figure 175).

Habitat

Texas bindweed is found on dry plains and hills and along the dry margins of ephemeral washes, at elevations from 2,500-6,500 ft (SEINet 2024). Within the plan area, it is often associated with disturbed, often roadside soils (Hazlett 2004). It has been documented in all units on both the Cimarron and Comanche National Grassland (Van Scoyoc 2024).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Hazlett 2004, Kuhn et al. 2011, NatureServe 2025, SEINet 2024).

Habitat

No consulted sources identified threats to habitat (Hazlett 2004, Kuhn et al. 2011, NatureServe 2025, SEINet 2024).

Ecological conditions

Ecological condition requirements

This species occurs in various habitat types, including juniper woodland, shortgrass prairie, midgrass prairie, roadside, and rocky upland prairie (Hazlett 2004, Kuhn et al. 2011). USDA NRCS considers Texas bindweed a "facultative upland" species in the Great Plains region (NRCS 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Given this species' use of varied, upland habitat types, including shortgrass prairie and roadsides (Hazlett 2004, Kuhn et al. 2011), its ecological condition requirements are not considered restricted in the plan area.

Critical biological characteristics

Texas bindweed is a perennial herbaceous vine in the morning glory family (Convolvulaceae) (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Texas bindweed is a low-value food source for large mammals and terrestrial birds (NRCS 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found for this species.

Maps of Species Range

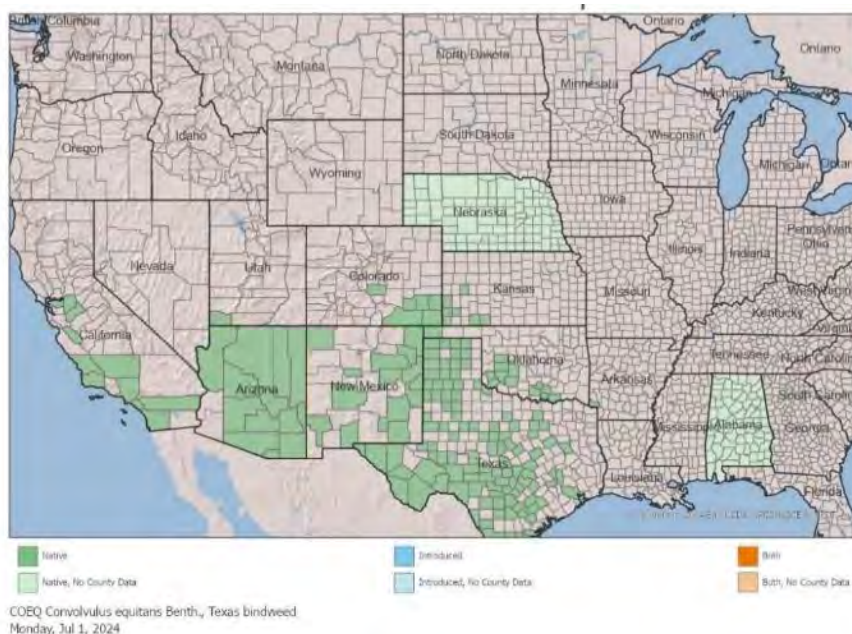


Figure 174. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

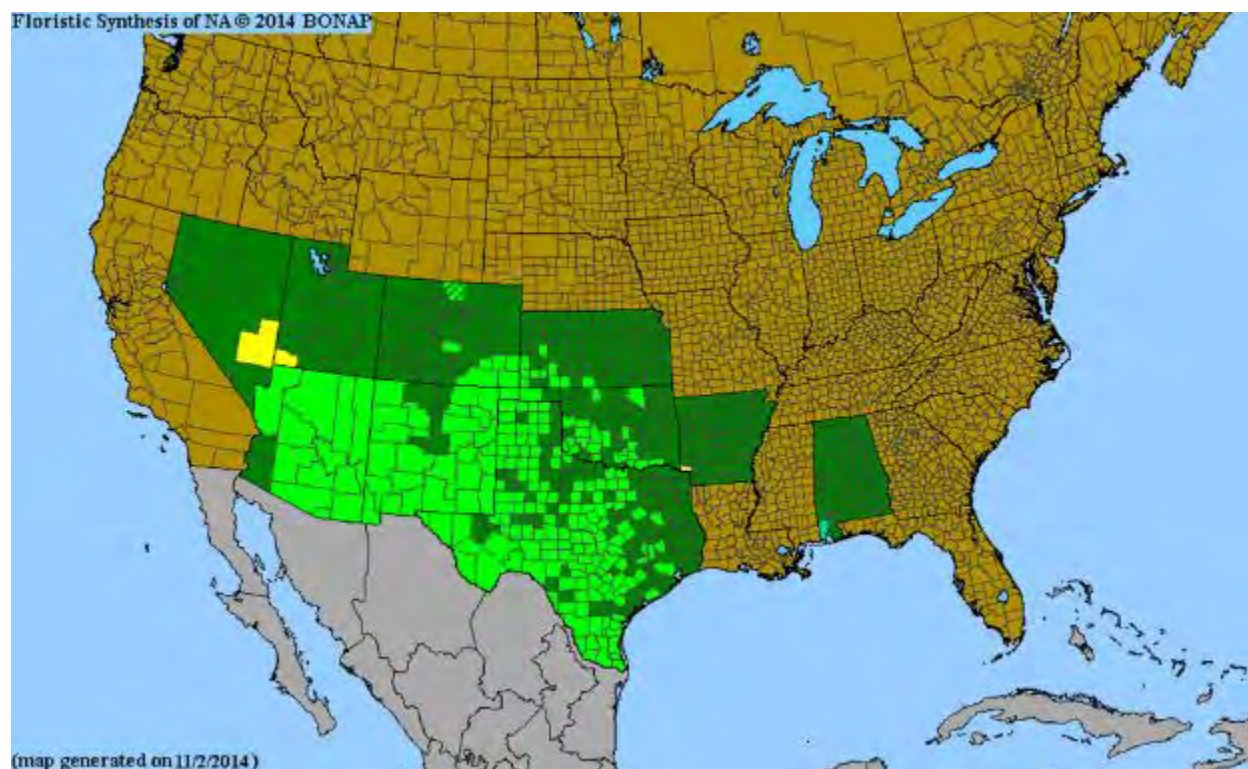


Figure 175. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Texas dropseed

(*Sporobolus texanus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There is one documented observation record in GBIF from 2021 (Van Scoyoc 2024). SEINet has two documented observation records (2007 and 2008) that are both noted as being collected on the Comanche National Grassland (Van Scoyoc 2024).

Year of Last Known Occurrence: 2021

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Drought conditions are further exacerbating the threat of non-natives encroaching into riparian areas and out-competing native vegetation like Texas dropseed.
 - b. Habitat: Tamarisk is a known threat to this habitat and is present in the plan area. Additional threats included drought and upland conversion that drains wetlands.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trend in population is unknown.
 - b. Habitat: Trends common in this habitat type (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The species is at the center of its range but is disconnected and patchy in the plan area.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population numbers are unknown at this time. There are two known occurrences in the plan area
 - b. Ecological Conditions: Restricted in the plan area.

Species Status

G5; S2 in Colorado; S1 in Kansas.

Taxonomy

The currently accepted valid name is *Sporobolus texanus* Vasey (TSN 42151) (ITIS 2024, NRCS 2025).

Species range

Overall Species range

The general range includes Arizona, Colorado, Kansas, Nebraska, New Mexico, Oklahoma, Texas, and Utah (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The population in the plan area is in the middle of the species range

Distribution, abundance, and trend in the plan area

Population

Based on the few documented observation records it would appear that the population is scattered across the plan area. There is not enough information, however, to determine the abundance or trend for this species. It is unknown whether additional survey efforts have occurred in the plan area for this species.

There are two herbarium records available that were collected on the Comanche National Grassland (Van Scoyoc 2024). One record was collected in 2008 in Picture Canyon, Baca County along a creek and sandstone canyon walls (Van Scoyoc 2024). The other record was collected in 2007 along Forest Road 802, Otero County, in a heavily grazed pasture with a stock pond (Van Scoyoc 2024). A third observation record was collected via iNaturalist (iNaturalist 2025) and was found in the GBIF database (GBIF 2023). This observation was made in 2021 at a trailhead in Purgatoire Canyon.

Habitat

Plants can be found along creeks, ponds, and in wet alkaline habitats from 500 to 11,000 feet (SEINet 2024). Nationwide, the rate of net wetland loss increased substantially across the United States, and the dominant driver is conversion to upland (Lang et al. 2024). Mechanisms of upland conversion include drainage and other less direct mechanisms, including increased temperature and evaporation and changes in precipitation patterns (Lang et al. 2024). Within the Interior Plains ecoregion, the National Wetland Condition Assessment (NWCA) found that 24% of wetland areas rated good for the vegetation index and 11% rated good for the nonnative plant indicator. In Kansas, the current quality of herbaceous wetland habitat is unknown, but the trend in quantity is declining (Rohweder 2022).

Threats (arising from on or off the plan area)

Population

No known threats to the population. This species is not well studied.

Habitat

Riparian habitats are threatened by drought conditions and lower precipitation levels which limit stream capacity and aquifer recharge, as well as promote the encroachment of non-natives (e.g., tamarisk) that reduce water levels as well as force native plants out through competition and allelopathy (Rohweder 2022, USFS 2005a). Continued or increased irrigation use for agriculture also impacts riparian habitats (Rohweder 2022).

Ecological conditions

Ecological condition requirements

Wet, alkaline habitats along creeks and ponds.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Overall, the trend is downward for riparian habitats and the distribution of its habitat is scattered across the plan area (see Habitat Trend in the Plan Area above).

Critical biological characteristics

Not enough is known about this species to know of any critical biological characteristics. For surveying and identification, this plant flowers between July and October (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Not known at this time.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Drought conditions or absence of wet, alkaline soils would limit this plant's ability to maintain viable populations where they currently exist.

Maps of Species Range

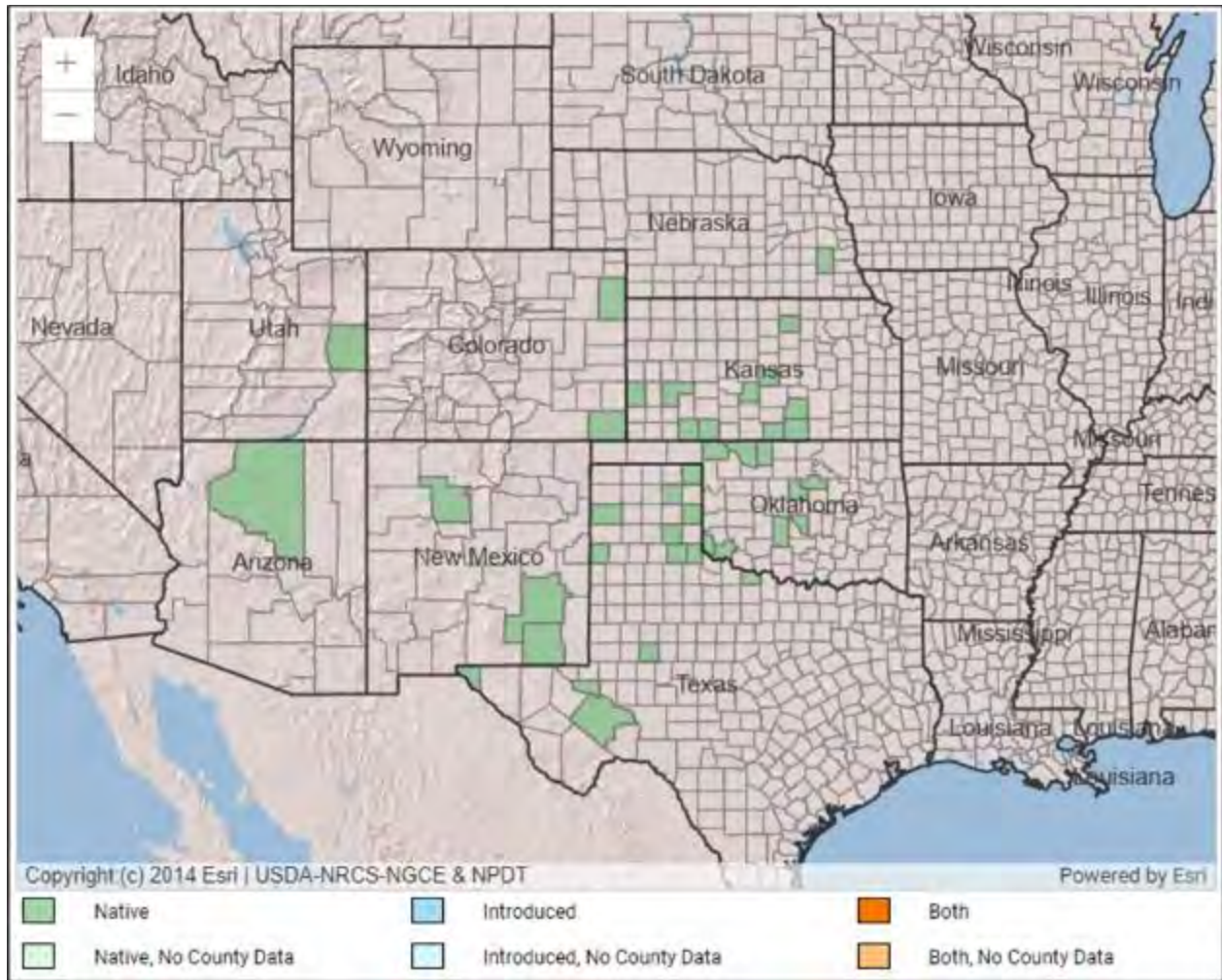


Figure 176. Native species range at the county level (NRCS 2025).

Toad rush

(*Juncus bufonius*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has one occurrence record in the Cimarron National Grasslands from 1961 (Van Scoyoc 2024). This record has high spatial uncertainty (6.2 miles), but the locality description says, "Cimarron National Grassland." Therefore, the species is known to occur in the plan area.

Year of Last Known Occurrence: 1961

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No known threats from the consulted sources.
 - b. Habitat: Drought, climate stressors, and groundwater depletion.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Unknown.
 - b. Habitat: Riparian/wetland habitat in the plan area has declined.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is not at the edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Size not known; one known occurrence record.
 - b. Ecological conditions: Riparian/wetland habitat is restricted in the plan area.

Species Status

G5; S4 in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Juncus bufonius* as valid (NRCS 2025). SEINet (2024) states: "*Juncus bufonius* is a highly polymorphic complex that is poorly understood systematically. Insufficient evidence exists upon which to base the segregation of the plethora of taxa that have been recognized out of this group in the past," (SEINet 2024).

Species range

Overall Species range

Toad rush is a cosmopolitan species found essentially throughout North America except north of the Alaskan and Canadian Taiga (SEINet 2024) (Figure 177, Figure 178).

Description of how the population in the plan area fits within the overall range:

This species has a very extensive range, but the population in the plan area is on the southeastern edge of the body of the species range before there is a large blank spot across the southern plains (Figure 177, Figure 178).

Distribution, abundance, and trend in the plan area

Population

Across its range, toad rush is considered a “widespread, weedy species” (SEINet 2024). Within the plan area, the population size and trend in the plan area is not known. The singular occurrence record gives no indication of the number of individuals observed. The species is not considered rare in any counties that overlap the plan area (Figure 178).

Habitat

Across its range, toad rush occurs in moist soils in meadows, along lakeshores or stream banks, ditches, or roadsides, and drawdown areas (Hazlett 2004, SEINet 2024). It is commonly found in disturbed wet meadows, roadsides, muddy or drying ponds, lake shores and streams in Colorado Lemy, 2013, Field guide to Colorado's wetland plants: Identification, ecology and conservation (Culver and Lemly 2013).

Within the plan area, it has been documented south of the Cimarron River on the Cimarron National Grassland (Van Scoyoc 2024). Drawdown of the Ogallala-High-Plains Aquifer has substantially decreased the discharge to rivers across the entire Cimarron National Grassland (USFS 2005a, Brikowski 2008). This is expected to have resulted in a decrease in habitat quantity in the plan area for this species.

Threats (arising from on or off the plan area)

Population

No consulted sources identified threat to this species' populations (Hazlett 2004, SEINet 2024).

Habitat

Future climate predictions may alter temperature and precipitation regimes for aquatic habitats that this species relies on (see Appendix). Drought and groundwater depletion are considered threats to this species' habitat because it depends on presence of mesic soil (SEINet 2024).

Ecological conditions

Ecological condition requirements

USDA NRCS considers toad rush an “obligate” wetland species in the Great Plains; this means that this species almost always occurs in wetlands (NRCS 2025). It predominantly occurs on pond shores but can also use varied mesic habitats including compacted soils along paths or in vehicle tracks (SEINet 2024). It can use both sandy and silty soils so long as they are moist or venally wet (SEINet 2024). It is intolerant of shade (NRCS 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species depends on wetland habitat, which is limited in the plan area (Hazlett 2004). Although the plan area has some playa lakes, wetlands, and constructed ponds, these features are typically small and rare (USFS 2008). Based on National Wetlands Inventory data, the approximate extent of all riparian and wetland habitat is ~1% of the total plan area and therefore habitat is considered restricted for this species.

Critical biological characteristics

Toad rush is an annual grasslike forb that exhibits a fast growth rate and high seed production (SEINet 2024, NRCS 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Toad rush has low palatability to browsing and grazing animals (NRCS 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Toad rush is easily dispersed by humans and has become established as an invasive species across much of the world outside of its native range, including Antarctica (Cuba-Díaz et al. 2013).

Maps of Species Range

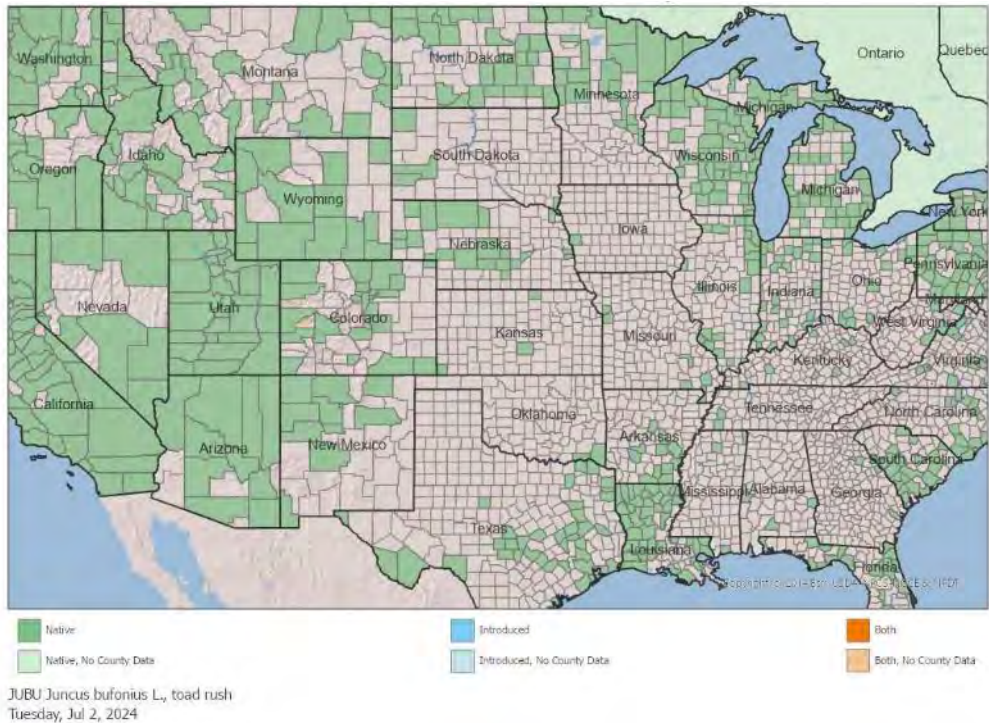


Figure 177. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

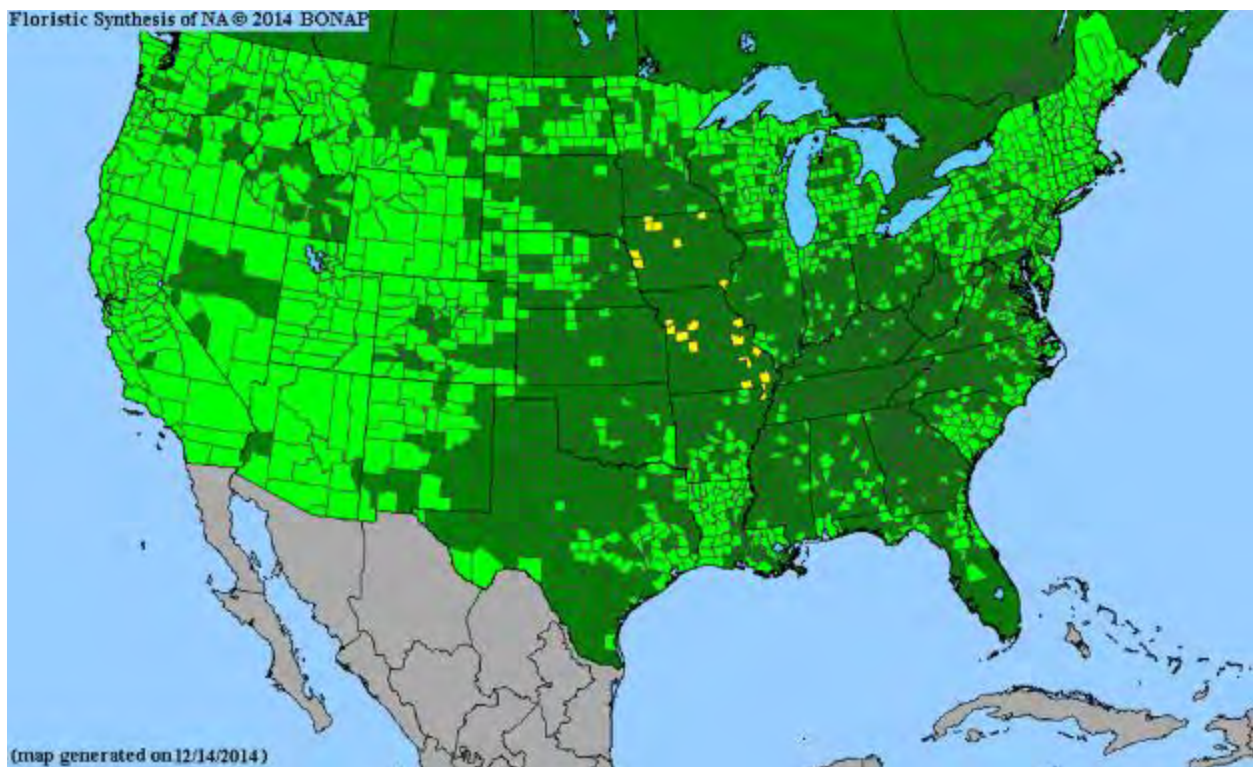


Figure 178. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not

present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Trailing ratany

(*Krameria lanceolata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are approximately 20 occurrence records with varying degree of spatial precision in SEINet, GBIF, and iDigBio within the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, Hazlett 2004, Kuhn et al. 2011, NatureServe 2025). There are some threats to individual plants. Out of 20 observations, seven of the known occurrences are found in the vicinity of abandoned and active oil and gas well activity sites. Human activity associated with oil and gas well can impact individuals by driving over them or trampling and potentially uprooting the plant.
 - b. Habitat: Most observations occurred within the western great plain's shortgrass prairie. Common stressors and threats include fragmentation, altered fire regime, overgrazing by livestock, and invasive species (in the less xeric regions). Fire suppression and certain grazing patterns such as continuous heavy grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. The short grasses that dominate this system are extremely drought- and grazing-tolerant although continuous heavy grazing and extended drought (3-4 years) will reduce cover of dominant species (NatureServe 2025).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend is unknown.
 - b. Habitat: Half of the documented occurrences are from ecosystems that have declining trends in either habitat quantity, quality, or both in the plan area (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northern edge of the species' range (Figure 179, Figure 180).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are ~20 occurrence records that occur in the Timpas, Carrizo and Cimarron Unit (only one occurrence record was within the Timpas Unit).
 - b. Ecological conditions: This species can use varied habitat types, including sandsage prairie, midgrass prairie, rocky upland prairie, and the shortgrass prairie vegetation types (Kuhn et al. 2011). However, this species is adapted to most soil types and can reliably be found in pastures which have not had long-term overgrazing (Linex 2020b) of which there is very little in the plan area, making the ecological conditions restricted in the plan area.

Species Status

G5; S2 in Colorado; S4 in Kansas.

Taxonomy

Krameria lanceolata is accepted as valid (Ackerfield 2022, NRCS 2025, ITIS 2024). Synonym for Trailing Ratany are *Krameria secundiflora* and *Krameria spathulata* (NRCS 2025).

Species range

Overall Species range

Trailing ratany occurs in Arkansas, Arizona, Colorado, Florida, Georgia, Kansas, New Mexico, Oklahoma, and Texas (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range (Figure 179, Figure 180).

Distribution, abundance, and trend in the plan area

Population

There are approximately 20 occurrence records that occur on the Timpas and Carrizo Units of the Comanche NG and Cimarron NG (only one occurrence record was within the Timpas Unit). Approximately ten are spatially mapped within the canyonlands ecosystem, three within sandsage prairie and seven within the shortgrass prairie ecosystem (USFS 2005a). The observation within the units is not scattered widely throughout. There is the one location in the Timpas Unit and most observations are along the southern edge in the Carrizo Unit, and along the Cimarron River corridor in the Cimarron Unit.

Herbarium records are from varied locations. A few from open areas between sandstone pavement at top of east facing slope of canyon, short-grass prairie, sandstone outcroppings, open rocky ground, gravelly prairie hillslope, shallow soil in upland grassland.

Population trend for this species in the plan area is unknown.

Habitat

Primarily on sandy, calcareous or occasionally clay-based soils, usually in open grassy habitats with oak, or oak and pine from sea level to 1500 m (NatureServe 2025). Ackerfield (2022) describes the habitat as sandy or rocky soils, 4000-4900 ft elevation. Hazlett (2004) describes habitat as open steppe. Kuhn (2011) found this species within sandsage prairie, midgrass prairie, rocky upland prairie, and the shortgrass prairie vegetation types.

Herbarium records are from varied locations. A few from open areas between sandstone pavement at top of east facing slope of canyon, short-grass prairie, sandstone outcroppings, open rocky ground, gravelly prairie hillslope, shallow soil in upland grassland. Seventeen of the locations were spatially mapped within the Western Great Plains Shortgrass Prairie, and one was within Western Cool Temperate Pasture and Hayland, Western Cool Temperate Urban Shrubland, and Western Cool Temperate Fallow/Idle Cropland (Landfire 2024).

There was no information suggesting the habitat trend is declining.

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, Hazlett 2004, Kuhn et al. 2011, NatureServe 2025).

Seven of the known occurrences are found in the vicinity of abandoned and active oil and gas well activity sites. Human activity associated with oil and gas well can impact individuals by driving over them or trampling and potentially uprooting the plant.

Habitat

Most observations occurred within the western great plain's shortgrass prairie. Common stressors and threats include fragmentation, altered fire regime, overgrazing by livestock, and invasive species (in the less xeric regions). Fire suppression and certain grazing patterns such as continuous heavy grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. The short grasses that dominate this system are extremely drought- and grazing-tolerant although continuous heavy grazing and extended drought (3-4 years) will reduce cover of dominant species (NatureServe 2025).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, Hazlett 2004, Kuhn et al. 2011, NatureServe 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are ~20 occurrence records that occur in the Timpas, Carrizo and Cimarron Unit (only one occurrence record was within the Timpas Unit). Approximately 10 are spatially mapped within the canyonlands ecosystem, three within sandsage prairie and seven within the shortgrass prairie ecosystem (USFS 2005a). Seventeen of the locations where spatially mapped within the Western Great Plains Shortgrass Prairie and one was within Western Cool Temperate Pasture and Hayland, Western Cool Temperate Urban Shrubland, and Western Cool Temperate Fallow/Idle Cropland (Landfire 2024).

This species can use varied habitat types, including sandsage prairie, midgrass prairie, rocky upland prairie, and the shortgrass prairie vegetation types (Kuhn et al. 2011). This species is adapted to most soil types and can reliably be found in pastures which have not had long-term overgrazing (Linex 2020b).

There are no required ecological conditions required for this species.

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (Ackerfield 2022, Hazlett 2004, Kuhn et al. 2011, NatureServe 2025).

This species is adapted to most soil types and can reliably be found in pastures which have not had long-term overgrazing (Linex 2020b).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Trailing ratany, provides excellent quality forage for deer, antelope, and all classes of livestock and responds favorably to prescribed burns (Linex 2020b).

The roots of this species are used to make a medicinal tea that is taken to combat diarrhea, hair and teeth loss, and cancer of the tongue (NatureServe 2025)

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

None known at this time.

Maps of Species Range

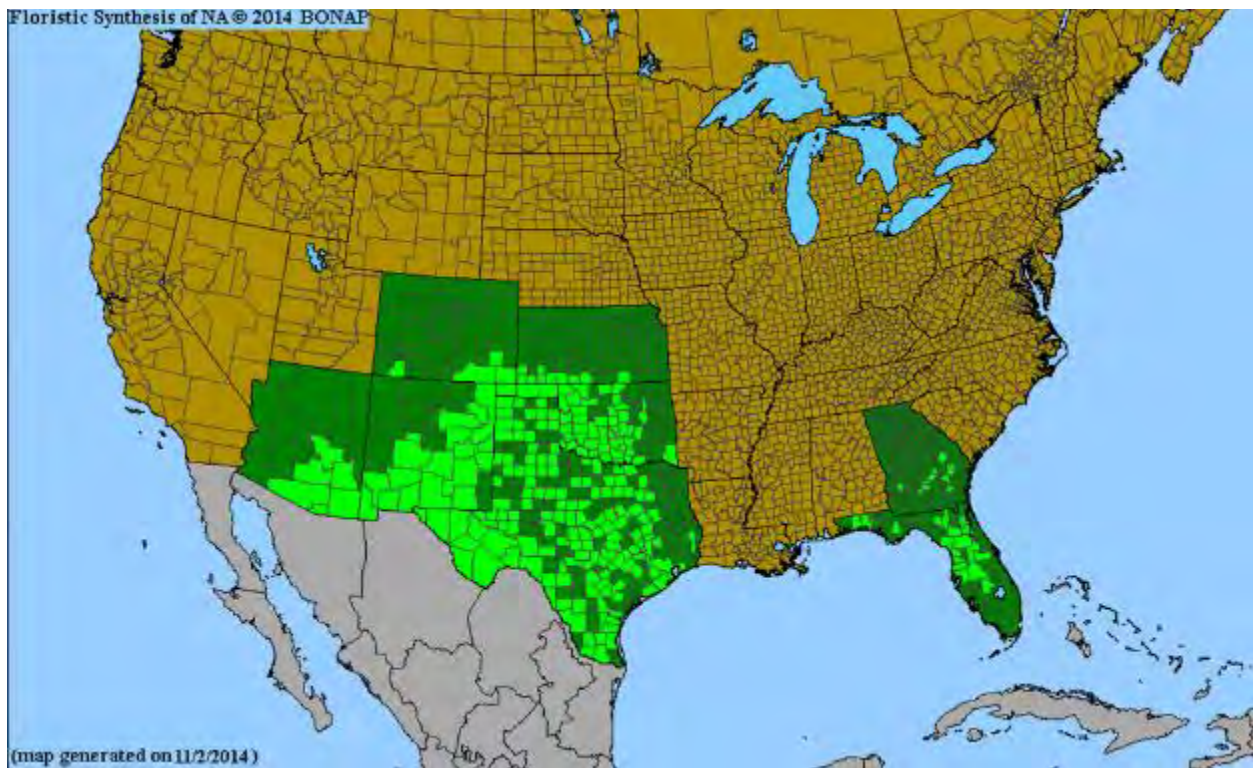


Figure 179. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

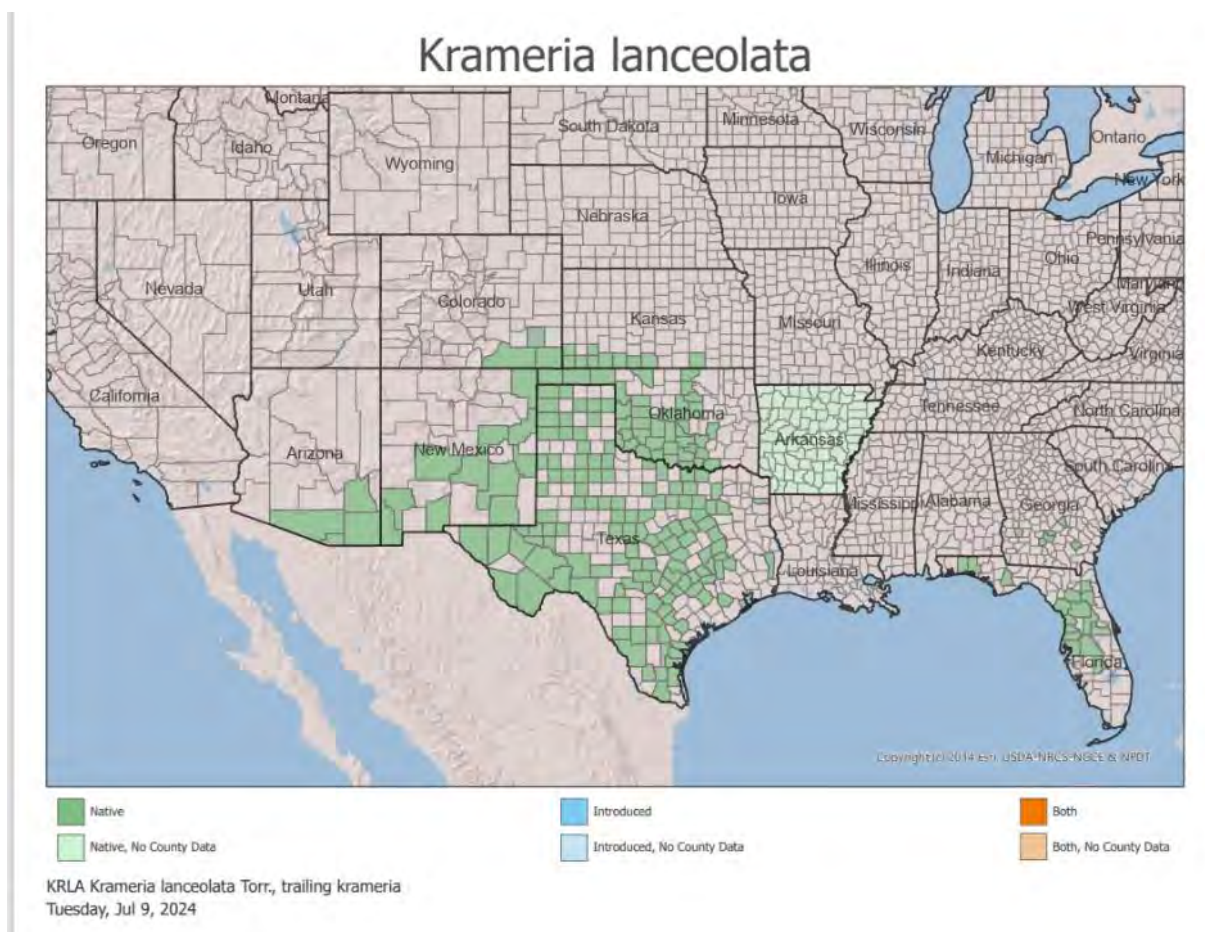


Figure 180. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Trinidad milkvetch

(*Astragalus puniceus*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: there is one occurrence record within the plan area. The herbarium record has the locality as Las Animas, Comanche National Grassland intersect 169 and 26 roads face of volcanic ridge of Mesa De Maya regions, North Face (Van Scoyoc 2024). The intersection on county highways 169 and 26 is within the plan area. Hazlett (2004) stated that this species was known to occur in western Las Animas County within the Comanche National Grassland.

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species
 - b. Habitat: Common stressors and threats to the Western Great Plains Shortgrass Prairie include fragmentation, altered fire regime, overgrazing by livestock, and invasive species (in the less xeric regions). Fire suppression and certain grazing patterns such as continuous heavy grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. The short grasses that dominate this system are extremely drought- and grazing-tolerant although continuous heavy grazing and extended drought (3-4 years) will reduce cover of dominant species (NatureServe 2025)
2. Declining trends in populations or habitat in the plan area:
 - a. Population: unknown
 - b. Habitat: The single occurrence in the plan area is from shortgrass prairie which has experienced a declining trend in quality of habitat in the plan area. The specific habitat listed for the single occurrence is underneath oak, pine, mock orange, and hoptree indicating a closer relationship with Pinyon woodlands (the only pines in the plan area) which can't be said to be declining (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the Northern Eastern edge of the species' range (Figure 181).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known, but occurrence records indicate there is only one occurrence record in the plan area.
 - b. Ecological conditions: No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025).

Species Status

G4; S2 in Colorado.

Taxonomy

Astragalus puniceus is accepted as valid (NRCS 2025, Ackerfield 2022).

Species range

Overall Species range

Distribution for this species in the USA is CO, NM, OK, and Texas (NatureServe 2025)

Description of how the population in the plan area fits within the overall range

The plan area is at the northeastern edge of the species' range (Figure 181).

Distribution, abundance, and trend in the plan area

Population

There is one occurrence record within the Carrizo unit in the plan area. This species occurs within the shortgrass prairie ecosystem (USFS 2005a).

Population trend for this species in the plan area is unknown.

Habitat

Dry, rocky slopes, grasslands, elevation 5000-6500 ft elevation (Ackerfield 2022). Hazlett (2004) describes habitat for this species as rocky, exposed limestone/shale barrens.

Herbarium specimen record indicates this species was located on a face of volcanic ridge of Mesa De Maya regions, north facing. The location is within the Western Great Plains Shortgrass Prairie (Landfire 2024) and Loamy Plains Ecological Site. The same herbarium collection notes the habitat as "In grasslands, under thickets of mixed oak, pine, Philadelphus, Ptelea".

Trends associated with the shortgrass prairie.

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, NatureServe 2025). There was very little information found for this species.

Habitat

There is one location that occurs within Western Great Plains Shortgrass Prairie in the plan area. Common stressors and threats for this type include fragmentation, altered fire regime, overgrazing by livestock, and invasive species (in the less xeric regions). Fire suppression and certain grazing patterns such as continuous heavy grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. The short grasses that dominate this

system are extremely drought- and grazing-tolerant although continuous heavy grazing and extended drought (3-4 years) will reduce cover of dominant species (NatureServe 2025).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Trinidad milkvetch habitat is not limited within the plan area. Its habitat requirements are fairly general; dry, rocky slopes, and grasslands (Ackerfield 2022).

This species occurs within the Western Great Plains Shortgrass Prairie and Developed Roads (Landfire 2024).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (Ackerfield 2022, NatureServe 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

None known at this time.

Maps of Species Range

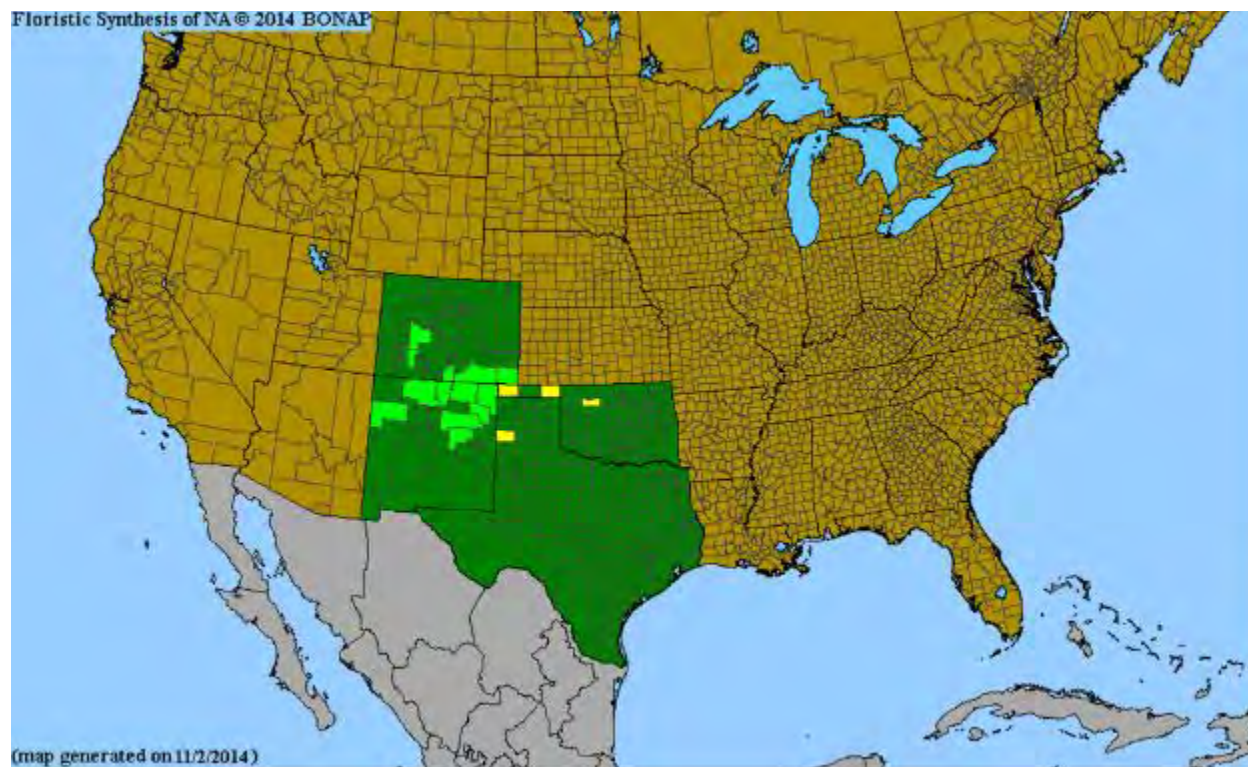


Figure 181. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Upland brittle bladderfern (*Cystopteris tenuis*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: iDigBio contains one occurrence record from 1999 (Van Scoyoc 2024). The scientific name is characterized as “*Cystopteris* undetermined” and the spatial uncertainty of the record is 6.2 miles (10,000 m); therefore, this species is not known to occur in the plan area.

Year of Last Known Occurrence: N/A

Species Status

G5; SNR in Colorado; S1 in Kansas.

Ward's goldenweed (*Oonopsis wardii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: No

Rationale/Evidence of Occurrence: iDigBio contains one occurrence record from 1983 (Van Scoyoc 2024). The locality description states, "Along CO 71, 1/8 mi N of intersection with US 350" and has insufficient spatial precision to determine if it occurred in the plan area (Van Scoyoc 2024). County Road 71 serves as the boundary between the plan area on the west and private land on the east. The herbarium sample does not specify which side of the road the occurrence was on; therefore, the species is not known to occur in the plan area and is not analyzed further.

Year of Last Known Occurrence: N/A

Species Status

G3; S1 in Colorado.

Taxonomy

Oonopsis wardii is accepted as valid; taxonomic synonyms include *Haplopappus fremontii* ssp. *wardii* and *Haplopappus wardii*. Another common name is Ward's false goldenweed (NRCS 2025).

Warty caltrop (*Kallstroemia parviflora*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are four documented occurrences on the Cimarron and Comanche National Grasslands (CCNGs) from 1961 through 1971; three of these are also listed in iDigBio and SEINet (Van Scoyoc 2024).

Year of Last Known Occurrence: 1971

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Unknown, but possibly a lack of disturbance.
 - b. Habitat: Unknown.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Plants grow in varied and disturbed habitat types in dry areas; thus, the trend is unknown.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
4. Population in the plan area is not endemic, disjunct, or at the edge of the range Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: At least four documented occurrences in the plan area. Population numbers are unknown.
 - b. Ecological conditions: Unknown, but not likely to be restricted.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

Kallstroemia parviflora J.B.S. Norton is accepted as valid (Ackerfield 2022, NatureServe 2025, NRCS 2025, Weber et al. 2012). Synonyms include *Kallstroemia intermedia* (NRCS 2025). Other common names include carpet weed (Flora of North America 1993) and small-flowered carpetweed (iNaturalist 2025).

Species range

Overall Species range

In North America, occurs in most southwestern states and Mexico including Arizona, California, Colorado, Washington D.C., Illinois, Kansas, Maryland, Mississippi, Missouri, Nevada, New Mexico, Oklahoma, Pennsylvania, Texas, Utah, and throughout Mexico (NatureServe 2025). The species is listed as Critically Imperiled in Kansas and Utah (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

Population in the plan area is not endemic, disjunct, or at the edge of the range (Figure 182).

Distribution, abundance, and trend in the plan area

Population

There are four documented occurrences on the CCNGs. The most recent collection that could be identified from the consulted sources took place in 1971 (Van Scoyoc 2024). The species may be under collected in the plan area, due to its annual lifecycle and habitat preference for disturbed areas where it may be considered more common.

Habitat

Across its range, plants are known to occur on dry and disturbed areas and grasslands (Flora of North America 1993) from 4500-7000 feet in elevation (NatureServe 2025). In Colorado, plants can be found growing on roadsides and disturbed areas, usually in sandy soil from 4000 to 5300 feet in elevation (Ackerfield 2022). Weber (Weber et al. 2012) state that plants are infrequent in sandy soil and occur in the Arkansas River drainage.

Threats (arising from on or off the plan area)

Population

Unknown from the consulted sources. Plants show a preference for disturbed soils and thus populations may be threatened by a lack of disturbance.

Habitat

Unknown from the consulted sources.

Ecological conditions

Ecological condition requirements

Warty caltrop requires dry, gravelly or sandy soils (NPSNM 2025). Plants have been found on roadsides and disturbed areas and may require localized disturbance to persist.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Unknown.

Critical biological characteristics

Warty caltrop is an herbaceous annual plant that flower from July through October (Flora of North America 1993). The prostrate plants spread along the ground to form dense mats with orange-yellow flowers (NPSNM 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown from the consulted sources. However, this species is likely a pollinator plant for insects with its showy orange-yellow flowers. Warty caltrop is likely an early colonizer on bare soils and thus provides diversity and cover in dry disturbed areas where other native species may not be able to persist.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

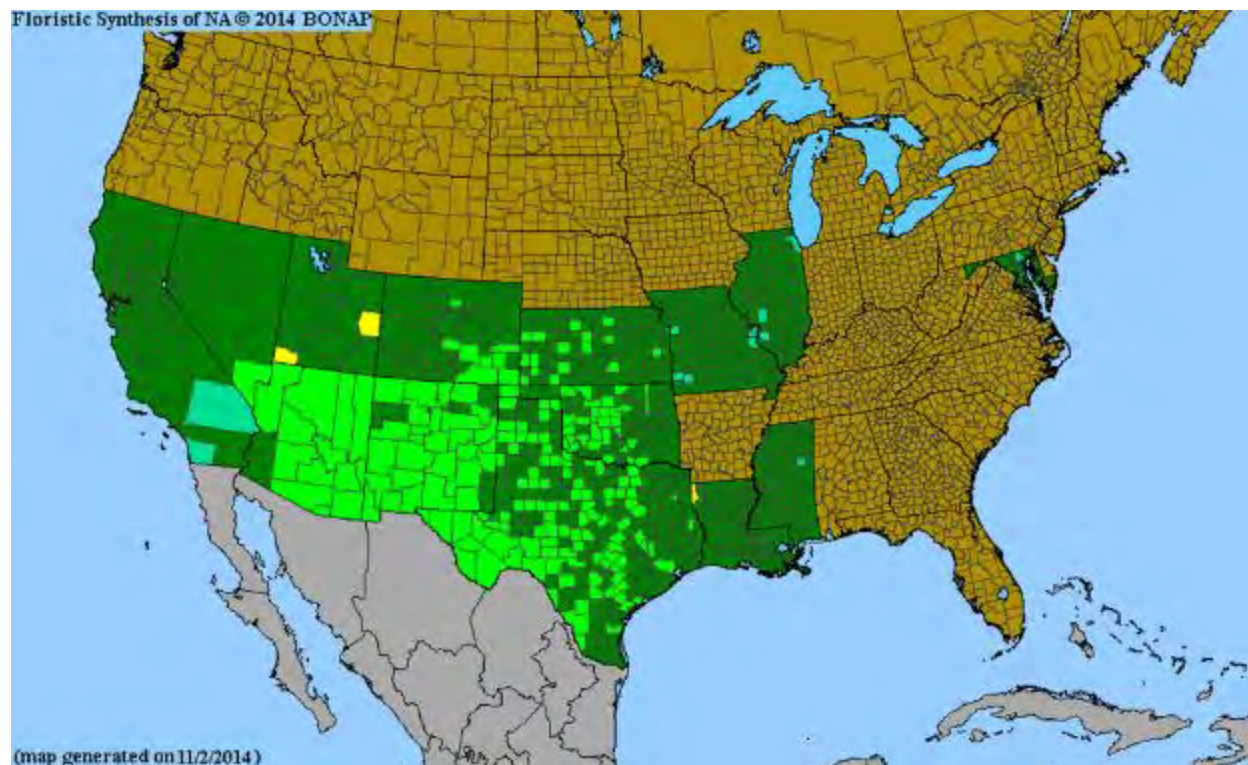


Figure 182. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Wavy-leaf twinevine (*Sarcostemma crispum*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CNHP has one occurrence record in the Comanche National Grasslands from 2009 (CNHP 2024, Van Scoyoc 2024). This record has sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2009

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: species can use varied habitat types, including canyonlands, arid slopes, and hills, and open-wooded slopes; these habitats are considered stable or increasing in the case of juniper woodlands.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; one occurrence record.
 - b. Ecological conditions: uses varied habitats (canyons, open-wooded slopes, arid slopes).

Species Status

G4; S1 in Colorado.

Taxonomy

NatureServe recognizes this species as *Sarcostemma crispum*. USDA NRCS recognizes *Funastrum crispum* as valid (NRCS 2025). *Sarcostemma crispum* and *Sarcostemma lobata* are taxonomic synonyms (NatureServe 2025). Another common name is climbing milkweed (SEINet 2024).

Species range

Overall Species range:

Wavy-leaf twinevine is distributed across central and west Texas, Colorado, Oklahoma, central and southern New Mexico, southern Arizona, to central Mexico and northeast Baja California (NatureServe 2025) (Figure 183, Figure 184).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure 183, Figure 184).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. The single occurrence record in the plan area states "a few individuals" were observed (EO ID 16613). It is considered rare in Baca and Las Animas Counties (Figure 184).

Habitat

Wavy-leaf twinevine is found in rocky soils on hills, open-wooded slopes, arid slopes and canyons, often among shrubs, at elevations from 3,000-5,500 ft (NatureServe 2025, SEINet 2024). Within the plan area, it has been documented in Big Hole Canyon in juniper woodland near edge of bluff line (Van Scoyoc 2024). Juniper woodlands in southeast Colorado have expanded due to fire suppression and drought (CPW 2015). Juniper has also increased in distribution and abundance in some ecosystems within the plan area, such as the canyonlands (USFS 2005a).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (NatureServe 2025, SEINet 2024).

Habitat

No consulted sources identified threats to habitat (NatureServe 2025, SEINet 2024).

Ecological conditions

Ecological condition requirements

This species can use varied habitat types (NatureServe 2025, SEINet 2024). The single occurrence record in the plan area was associated with dry soil and partial shade (Van Scoyoc 2024). This climbing vine benefits from the presence of shrubs such as juniper to climb (NatureServe 2025, SEINet 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The canyonland ecosystem is characterized by an abundance of oneseed juniper (*Juniperus monosperma*) along canyons' slopes and walls (USFS 2008). Therefore, ecological conditions are not considered restricted for this species.

Critical biological characteristics

Wavy-leaf twinevine is a perennial herbaceous vine (SEINet 2024). Flowering occurs from April through August (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found for this species. Pollinators of the genus *Funastrum* include bees (families Apidae and Andrenidae), butterflies (families Danaidae and Hesperidae), and possibly wasps (Jürgens et al. 2008).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found for this species.

Maps of Species Range

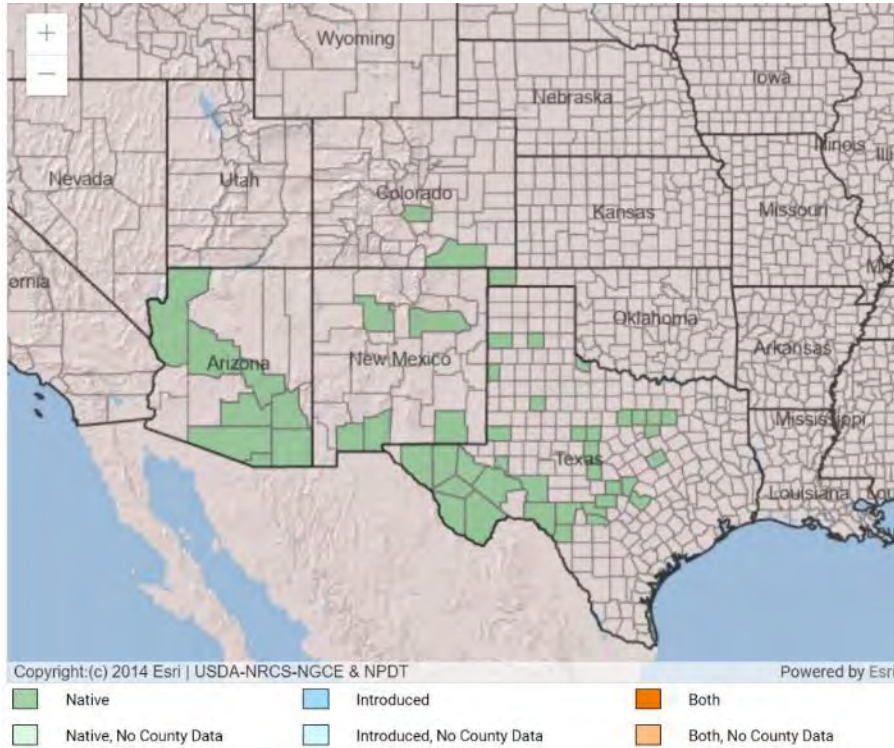


Figure 183. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

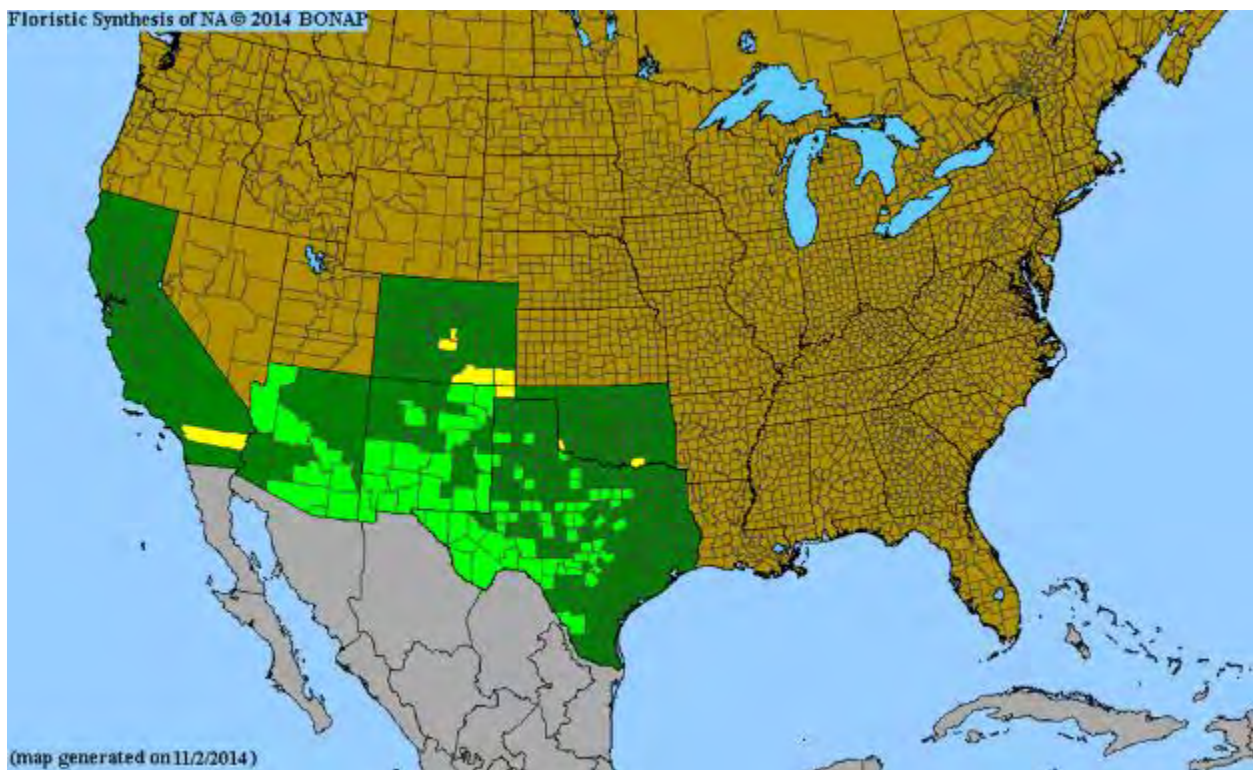


Figure 184. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Waxy rushpea

(*Hoffmannseggia glauca*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: there are approximately 15 occurrence records with varying degree of spatial precision in SEINet, GBIF, and iDigBio within the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Approximately eight of the known occurrences are found in the vicinity of abandoned and active oil and gas well activity sites. This species can persist in disturbed conditions, but human activity associated with oil and gas well can impact individuals by driving over them or trampling and potentially uprooting the plant.
 - b. Habitat: General habitat threats include grazing, oil and gas development, roads, fire suppression, and invasive species. Most of these threats to the habitat will not impact the waxy rushpea as this species is somewhat of a “weedy” plant that colonize disturbed sites (Hazlett 2004). This native is an ecological pioneers that can establish in large roadside patches or in fallow ground (Hazlett 2004)
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend is unknown.
 - b. Habitat: Habitat trend is unknown.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northern edge of the species’ range (Figure 185, Figure 186).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known, but occurrence records indicate there are ~15 observation locations in the Cimmaron and the Timpas Unit.
 - b. Ecological conditions: Ecological conditions do not appear restricted in the plan area.

Species Status

G5; SNR in Colorado; S1 in Kansas.

Taxonomy

Hoffmannseggia glauca is accepted as valid (Ackerfield 2022, NRCS 2025, ITIS 2024). Synonym for waxy rushpea is *Hoffmannseggia densiflora*, *Hoffmannseggia densiflora* var. *capitata*, *Hoffmannseggia densiflora* var. *demissa*, *Hoffmannseggia densiflora* var. *pringlei*, *Hoffmannseggia densiflora* var. *stricta*, *Hoffmannseggia falcaria* (NRCS 2025).

Species range

Overall Species range

Waxy rushpea distribution is AZ, CA, CO, KS, NM, NV, OK, and TX (NatureServe 2025)

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range (Figure 185, Figure 186).

Distribution, abundance, and trend in the plan area

Population

There are ~15 occurrence records that occur in the Timpas and Cimarron Unit. Three are spatially mapped within the canyonlands ecosystem, one in the sandsage prairie ecosystem and the rest within the shortgrass prairie ecosystem (USFS 2005a).

Herbarium records are from varied locations A few of the records were located near the Cimarron River, or along wet ditches, or in heavily grazed locations, or in Picket Wire Canyonlands, or open fishing ponds with scattered stands of Tamarix.

Population trend for this species in the plan area is unknown.

Habitat

Grazed or disturbed desert scrub, grassland; tolerant of a wide range of soil types (NatureServe 2025). Ackerfield (2022) describes the habitat as rocky soil, fields, 4200-4800 ft elevation. Hazlett (2004) describes habitat as open steppe and considers this species somewhat of a "weedy" plant that colonize disturbed sites. This native is an ecological pioneer that can establish in large roadside patches or in fallow ground.

Herbarium records are from varied locations A few of the records were located near the Cimarron River, or along wet ditches, or in heavily grazed locations, or in Picket Wire Canyonlands, or open fishing ponds with scattered stands of Tamarix. Ten of the locations were spatially mapped within the Western Great Plains Shortgrass Prairie and others were within Developed Roads, Western Cool Temperate Pasture and Hayland, and Western Great Plains Floodplain Shrubland (Landfire 2024).

There was no information suggesting the habitat trend is declining.

Threats (arising from on or off the plan area)

Population

Approximately eight of the known occurrences are found in the vicinity of abandoned and active oil and gas well activity sites. This species can persist in disturbed conditions, but human activity associated with oil and gas well can impact individuals by driving over them or trampling and potentially uprooting the plant.

Habitat

General habitat threats include grazing, oil and gas development, roads, fire suppression, and invasive species. Most of these threats to the habitat will not impact the waxy rushpea as this species is somewhat of a “weedy” plant that colonize disturbed sites (Hazlett 2004). This native is an ecological pioneer that can establish in large roadside patches or in fallow ground (Hazlett 2004).

Common stressors and threats for shortgrass prairie include fragmentation, altered fire regime, overgrazing by livestock, and invasive species (in the less xeric regions). Fire suppression and certain grazing patterns such as continuous heavy grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. The short grasses that dominate this system are extremely drought- and grazing-tolerant although continuous heavy grazing and extended drought (3-4 years) will reduce cover of dominant species (NatureServe 2025).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, Hazlett 2004), (NatureServe 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are ~8 occurrence records occurrence records that all occur in the Cimarron Unit and ~ 7 in the Timpas Unit. Three are spatially mapped within the canyonlands ecosystem, one in the sandsage prairie ecosystem and the rest within the shortgrass prairie ecosystem (USFS 2005a).

Ten of the locations where within the Western Great Plains Shortgrass Prairie, and others were within Developed Roads, Western Cool Temperate Pasture and Hayland, and Western Great Plains Floodplain Shrubland (Landfire 2024).

There are no required ecological conditions required for this species. This species can persist in disturbed areas such as roadsides and fallow grounds (Hazlett 2004).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species (Ackerfield 2022, Hazlett 2004), (NatureServe 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Plant is considered a good soil binder (SEINet 2024).

Ethnobotany: The small tubers are collected and eaten raw, boiled, or preferably roasted; tubers are also commonly used as hog feed (SEINet 2024).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

None known at this time.

Maps of Species Range

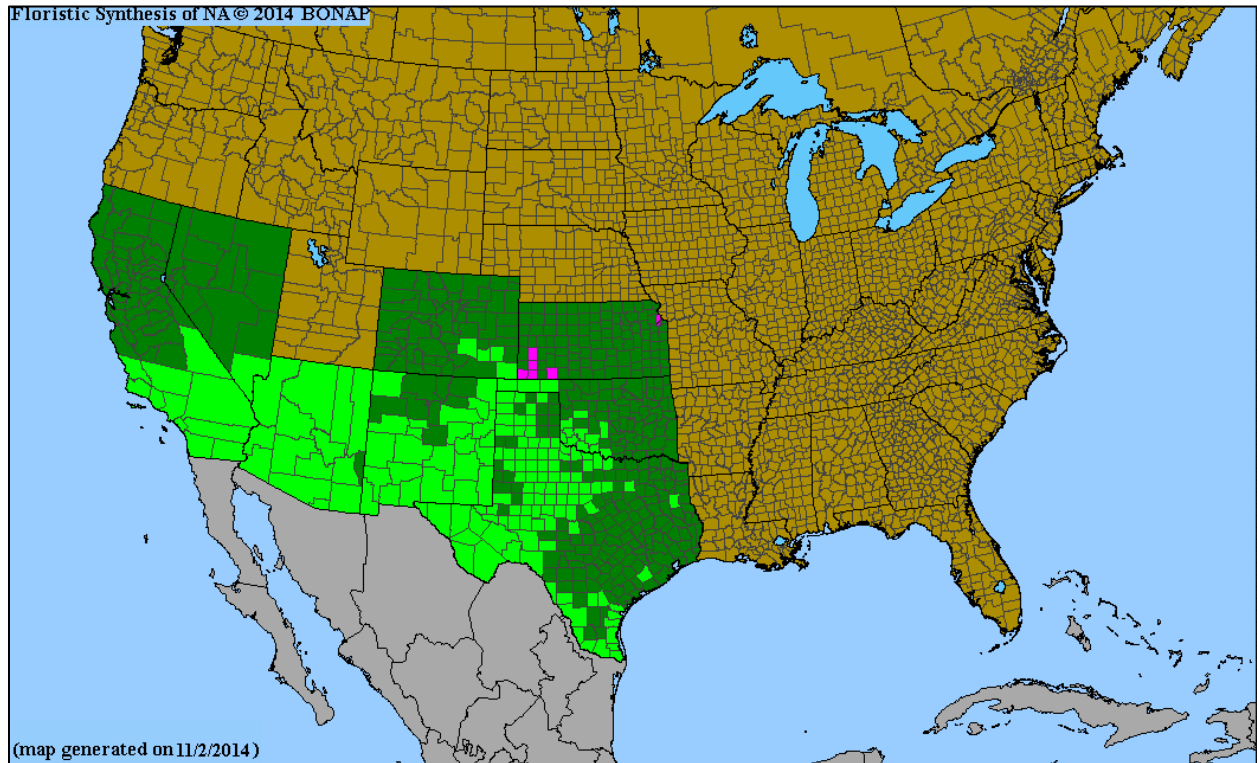
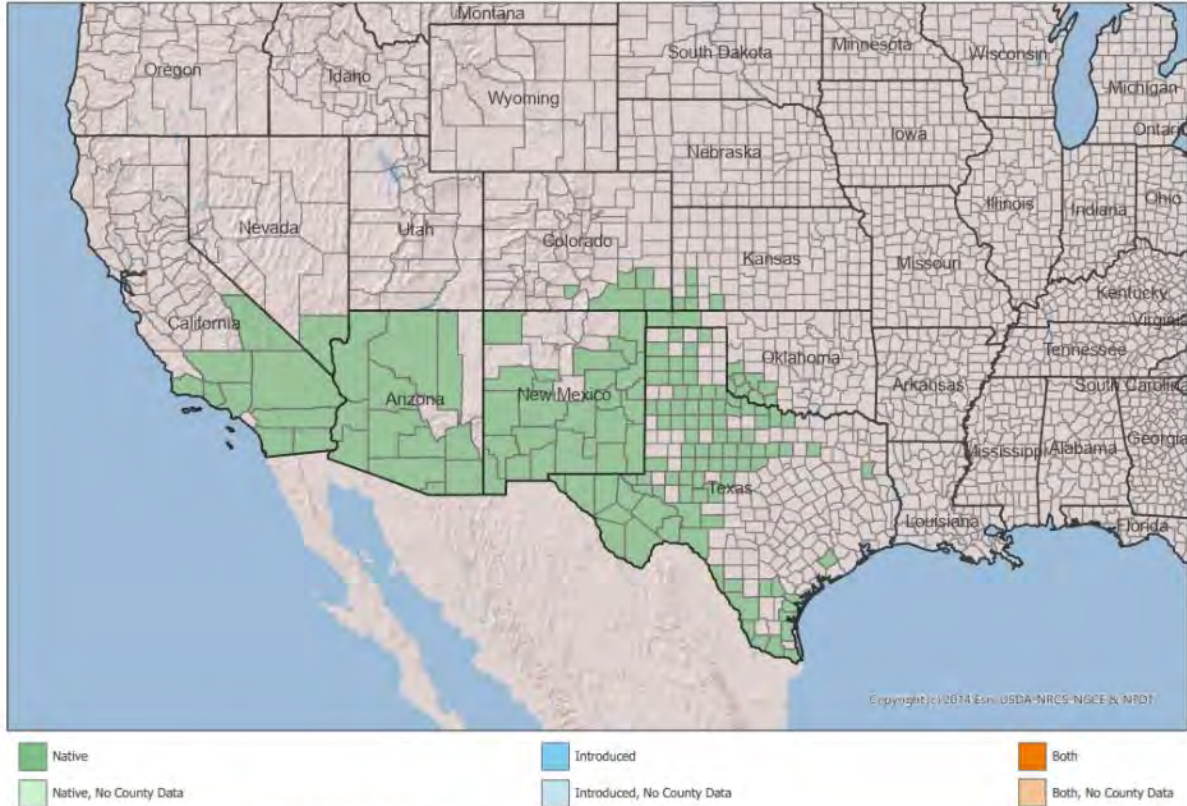


Figure 185. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Hoffmannseggia glauca



HOGL2 Hoffmannseggia glauca (Ortega) Eifert, Indian rushpea
Tuesday, Jul 9, 2024

Figure 186. USDA PLANTS database distribution data

Weak-leaf bursage

(*Ambrosia confertiflora*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has seven occurrence records in the plan area from 1972-1992 (Van Scoyoc 2024). Some of these records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 1992

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: varied habitats, particularly disturbed habitat; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is not at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; seven occurrence records.
 - b. Ecological conditions: uses varied habitat types (roadsides, rocky upland prairie, juniper woodland, shortgrass prairie, etc.), which collectively are not restricted in the plan area.

Species Status

G5; SNR in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Ambrosia confertiflora* as valid; another common name is weakleaf bur ragweed (NRCS 2025), slimleaf bursage (SEINet 2024), and Mexican ragweed (Hazlett 2004).

Species range

Overall Species range:

Weakleaf bursage is distributed in central and southern California, east to southern Kansas, Oklahoma, and Texas; south to central Mexico (SEINet 2024) (Figure 187, Figure 188). The species is a problematic, highly invasive species in Israel and Australia (Matzrafi et al. 2023).

Description of how the population in the plan area fits within the overall range:

The plan area is not at the edge of the species' range (Figure 187, Figure 188).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend are not known. One record from the Cimarron National Grassland from 1987 describes species as "locally common." Other occurrence records do not give an indication of the number of individuals. It is not considered rare in any counties that overlap the plan area (Figure 188).

Habitat

Across its range, weakleaf bursage occurs on hillsides, slopes, mesas, fields and along roadsides at elevations from 1,000-6,500 ft (SEINet 2024). It is common in waste places and disturbed sites (SEINet 2024). Within the plan area, it has been associated with open steppe, disturbed, often roadside, soils, juniper woodland, rocky upland prairie, and shortgrass prairie (Hazlett 2004, Kuhn et al. 2011). Occurrence records have been distributed across the Carrizo Unit of the Comanche and the Cimarron.

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Hazlett 2004, Kuhn et al. 2011, Matzrafi et al. 2023, SEINet 2024, NatureServe 2025).

Habitat

No consulted sources identified threats to habitat (Hazlett 2004, Kuhn et al. 2011, Matzrafi et al. 2023, SEINet 2024, NatureServe 2025).

Ecological conditions

Ecological condition requirements

Weakleaf bursage can use a variety of habitat types (juniper woodland, rocky upland prairie, shortgrass prairie, disturbed sites, and cultivated fields) (Hazlett 2004, Kuhn et al. 2011, Matzrafi et al. 2023).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Because this species can use such varied habitats, including disturbed habitats such as roadsides (Hazlett 2004, Kuhn et al. 2011), its ecological conditions are not restricted in the plan area.

Critical biological characteristics

Weakleaf bursage is a perennial herb in the aster family (Asteraceae); its fruits are spiny burs (SEINet 2024). When introduced outside of their native range, ragweeds (genus: *Ambrosia*) can be among the most noxious invasive weeds in the world (Matzrafi et al. 2023).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Weakleaf bursage supports a diverse array of insects, which can use it for reproduction and feed upon the plant's sap and foliage (Goeden and Ricker 1975). This species can be an aggressive competitor in agricultural fields (Matzrafi et al. 2023). It has prolific seed dispersal, rapid sprouting and growth, and exhibits high phenotypic plasticity (Yair et al. 2020). The seeds are highly sensitive to burial depth and rarely emerge when buried deeper than 0.4 inches (1 cm) (Yair et al. 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Studies from Israel have shown that seed emergence of weakleaf bursage is reduced by increasing temperature regimes and inhibited by a nighttime/daytime temperature regime of 82/93°F (28/34°C). This species is easily dispersed by human activities (Yair et al. 2020).

Maps of Species Range

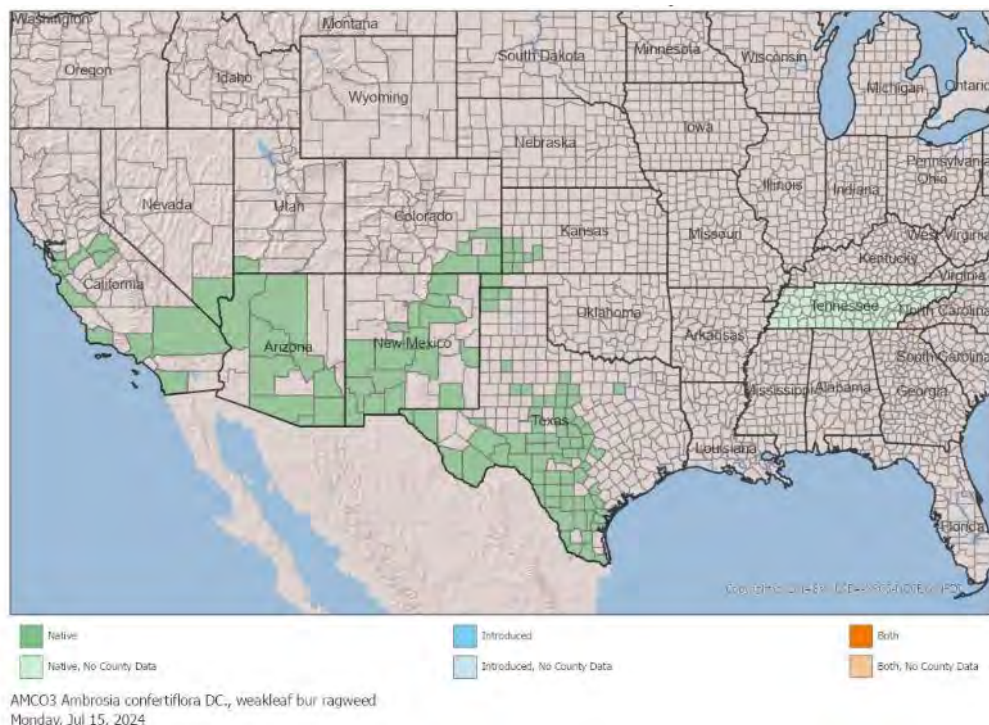


Figure 187. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

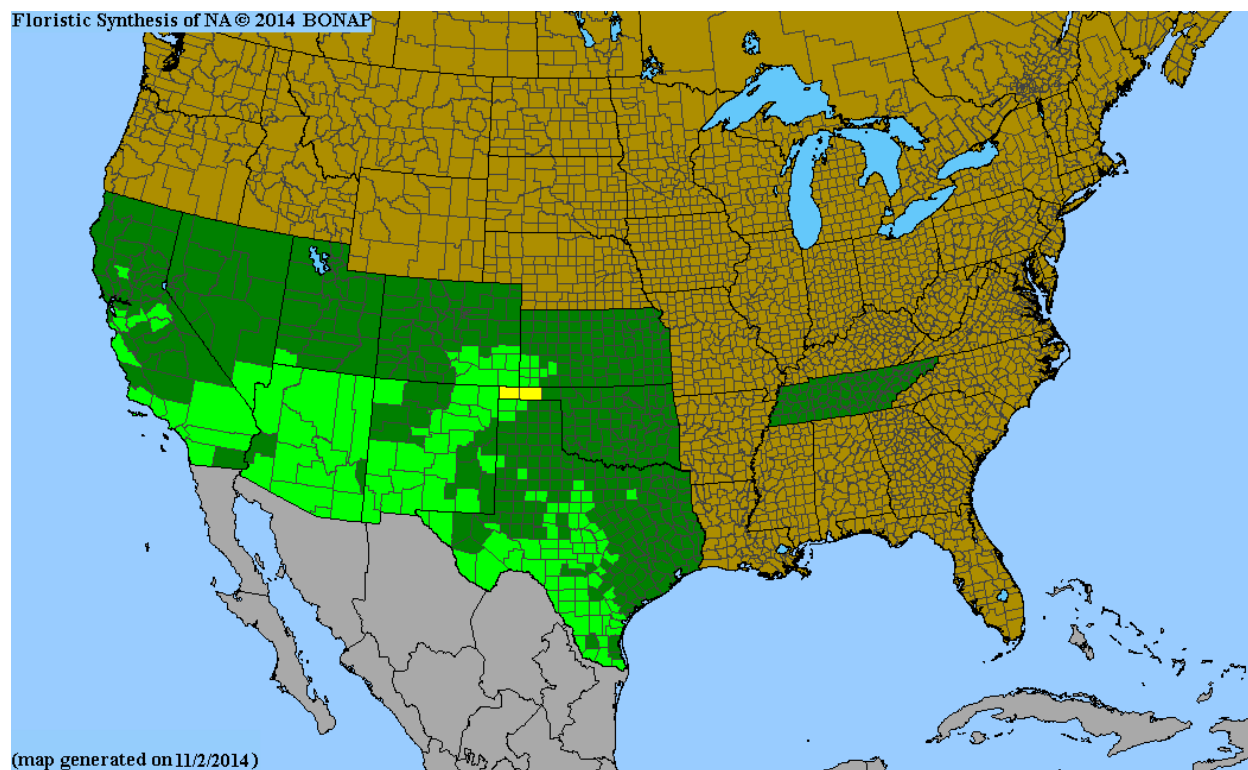


Figure 188. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Western bitterweed

(*Hymenoxys odorata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has 11 occurrence records across the plan area from 1964-2022 (Van Scoyoc 2024). Several records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: no discernable trend; species uses varied habitat types and benefits from overgrazing.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is not at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; 11 occurrence records.
 - b. Ecological conditions: uses varied habitats, prefers alkali soil and disturbed sites; well-distributed across the plan area.

Species Status

G5; SNR in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Hymenoxys odorata* as valid; a taxonomic synonym is *Picradenia odorata*. Another common name is bitter rubberweed (NRCS 2025).

Species range

Overall Species range:

Western bitterweed is distributed in the southwestern United States and south into Mexico (SEINet 2024) (Figure 189, Figure 190).

Description of how the population in the plan area fits within the overall range:

The plan area is not at the edge of the species' range (Figure 189, Figure 190).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. It is not considered rare in any counties that overlap the plan area (Figure 190).

Habitat

Western bitterweed is found along roadsides, open flats, mesquite and creosote-bush flats, ditches and drainage areas, stream banks and bottoms at elevations below 5,000 ft (SEINet 2024). Kuhn (2011) characterizes the habitat associations as midgrass prairie, pinyon-juniper woodland, rocky upland prairie, and shortgrass prairie. It has been documented across all three units of the plan area (Van Scoyoc 2024). Most records in the plan area have been associated with roadsides (Van Scoyoc 2024).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Hazlett 2004, Kuhn et al. 2011, NatureServe 2025, SEINet 2024).

Habitat

No consulted sources identified threats to habitat (Hazlett 2004, Kuhn et al. 2011, NatureServe 2025, SEINet 2024).

Ecological conditions

Ecological condition requirements

This species uses varied habitats including midgrass prairie, pinyon-juniper woodland, rocky upland prairie, shortgrass prairie, and roadsides (Kuhn et al. 2011). It can grow in clay, clay loam, alkali, adobe, sandy, and alluvial soils, but is most common in drainage areas such as flood plains, lake beds, and along roadsides (Ueckert and Calhoun 1988). In the plan area, it prefers alkali soils (Hazlett 2004). It is dependent on autumn and winter precipitation and tends to increase in abundance on poorly managed rangeland compared to well-managed rangeland (Ueckert and Calhoun 1988).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

This species' use of varied habitat types with alkali/fine-textured soils, including midgrass prairie, pinyon-juniper woodland, rocky upland prairie, shortgrass prairie, and roadsides (Hazlett 2004, Kuhn et al. 2011). Alkali soils are common in Otero County, Colorado, especially along Timpas Creek (Hazlett 2004). The species is well-distributed across the plan area.

Critical biological characteristics

Western bitterweed is an annual herb in the Aster family (Asteraceae) (SEINet 2024). Flowering occurs from April through June (SEINet 2024). It is prolific producer of seed and an early successional species that establishes well on seriously disturbed sites (Ueckert and Calhoun 1988).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Western bitterweed is poisonous to livestock (Hazlett 2004).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Western bitterweed typically increases in abundance in overgrazed rangeland (SEINet 2024). Its populations fluctuate in response to precipitation, generally increasing in abundance in years with above normal, autumn-winter precipitation, and being only rare or only occasional in dry years (Ueckert and Calhoun 1988).

Maps of Species range and Known Occurrences in Plan Area

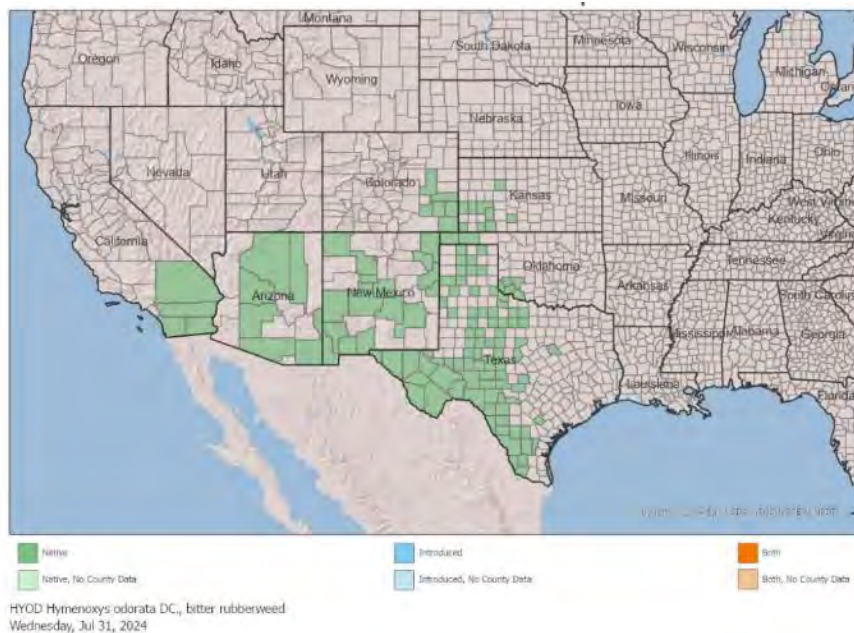


Figure 189. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

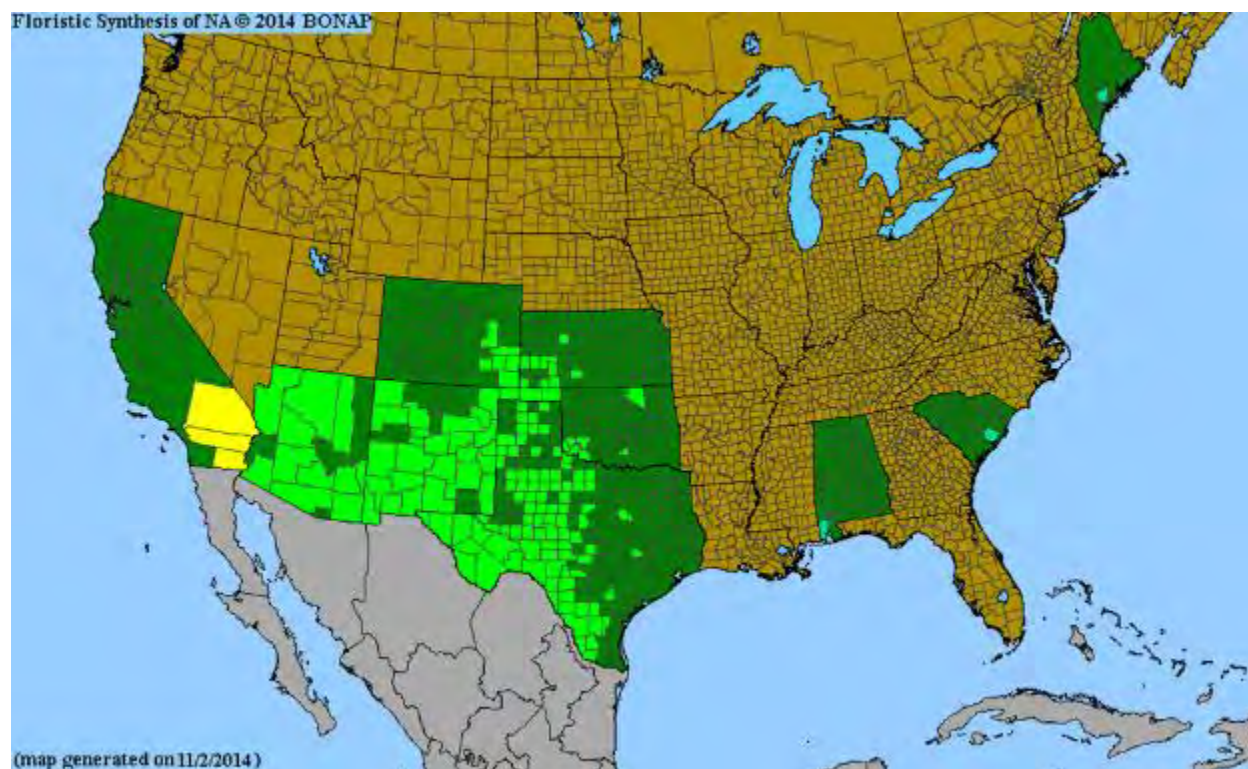


Figure 190. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Western lettuce

(*Lactuca ludoviciana*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are two documented occurrences on the Cimmaron National Grassland (NG) from 1961 and 1982 (Van Scoyoc 2024). Both collections were made in Morton County, Kansas.

Year of Last Known Occurrence: 1982

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Threats to populations are unknown.
 - b. Habitat: Threats common in the habitat type (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Trends common in the habitat type (see Threats and Trends Appendix).
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The species does not have a restricted range and occurrences in the plan area appear to be in the middle of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are two occurrences in the plan area. Population numbers for these occurrences are unknown.
 - b. Ecological conditions: Unknown, but not likely to be restricted.

Species Status

G4; S2 in Colorado; S5 in Kansas.

Taxonomy

Lactuca ludoviciana (Nutt.) Riddell is accepted as valid (Ackerfield 2022, Flora of North America 1993, NRCS 2025, Weber et al. 2012). Synonyms include *Lactuca campestris* and *Lactuca campestris* var. *typica* (ITIS 2024, NRCS 2025). Other common names include biennial lettuce, biannual lettuce (NRCS 2025), Louisiana lettuce, wild lettuce (ITIS 2024) and western wild lettuce (Haddock 2024a).

Species range

Overall Species range

In North America, occurs in 25 states covering most of the western United States including Colorado and Kansas and three Canadian provinces (NatureServe 2025). The species range appears to be widespread.

Description of how the population in the plan area fits within the overall range

The species does not have a restricted range and occurrences in the plan area appear to be in the center of the species range (Figure 191). Most of the known populations of this species are on the Great Plains (iNaturalist 2025).

Distribution, abundance, and trend in the plan area

Population

Two collections were made on the Cimarron NG in 1961 and 1982. Neither of the collections lists information about distribution, abundance, or trend in the plan area. Plants may be common and early successional opportunists and thus under collected in the plan area.

Habitat

Plants inhabit openings in forests, stream banks, and prairies (Flora of North America 1993). The species is distributed throughout Kansas in open prairies and disturbed areas (Haddock 2024a). In Colorado, the species is frequent, but scattered, especially in sandhills on the plains (Weber et al. 2012). Ackerfield (2022) lists habitat as plains and hillsides from 3500-6500 feet in elevation. Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No known threats to populations from the consulted sources.

Habitat

Multiple sources indicate that this species grows in disturbed areas on mostly limestone soils. Threats common in the habitat type (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Unknown, although plants have been found growing mostly on limestone soils.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Unknown.

Critical biological characteristics

Western lettuce is an herbaceous biennial with a tall flowering stalk in the Aster family (Asteraceae) that grows from a taproot (iNaturalist 2025). Flowers open for only a brief time in morning (Haddock 2024a).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Listed as a Facultative Upland species on the National Wetland Plant List (Lichvar et al. 2016) meaning that plants usually do not occur in wetlands, although they might.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

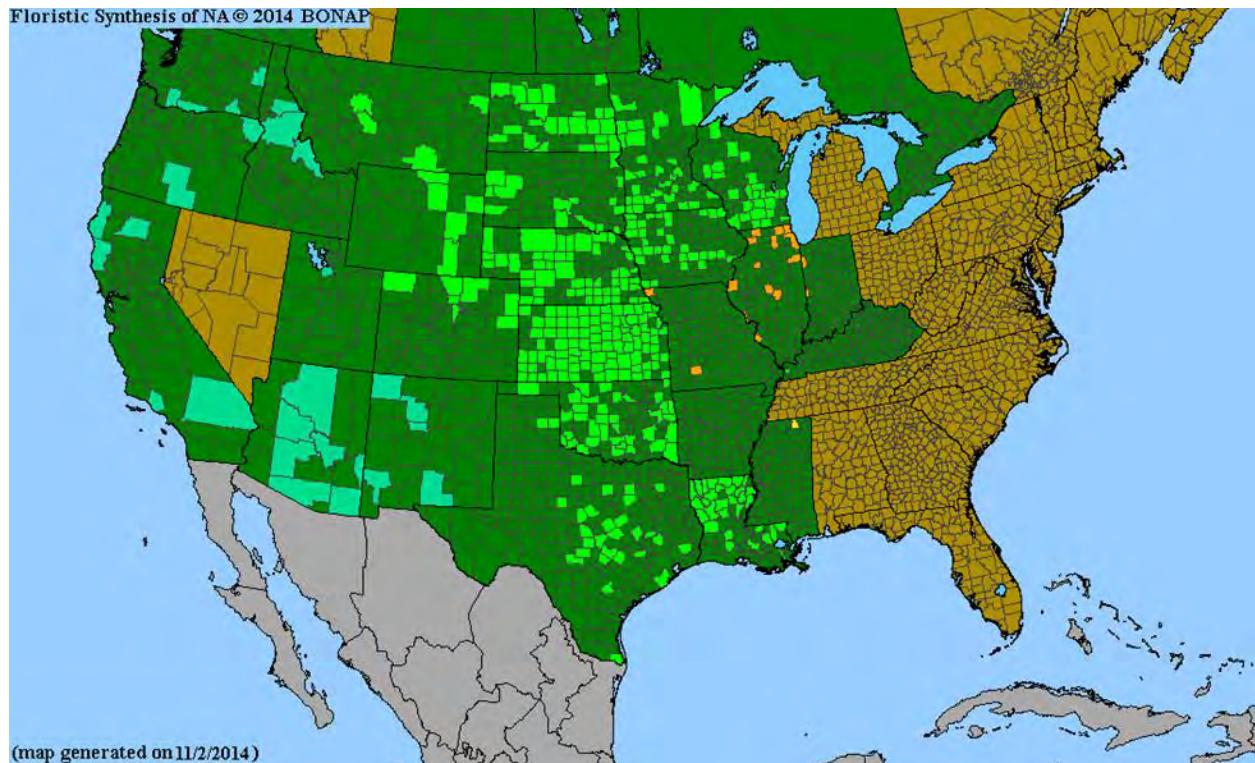


Figure 191. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not

present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Western soapberry

(*Sapindus saponaria* var. *drummondii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: SEINet contains nine occurrence records of this variety from 1948-2011 (Van Scoyoc 2024). Some of these records have sufficient spatial precision to demonstrate that this variety is known to occur within the plan area.

Year of Last Known Occurrence: 2011

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: possibly browsing by cattle, floods and fire, very low genetic variability.
 - b. Habitat: possibly browsing by cattle, floods and fire.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trend in the plan area is unknown.
 - b. Habitat: species uses shaded rocky canyons and ravines; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northern edge of the variety's range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population numbers are unknown; species is considered rare in all Colorado counties that overlap the plan area, but not rare in Morton County, Kansas.
 - b. Ecological conditions: hardy, adaptable species with occurrence records from both Grasslands.

Species Status

G5T5; S1 in Colorado; S3 in Kansas.

Taxonomy

Sapindus saponaria var. *drummondii* is accepted as valid (NRCS 2025, NatureServe 2025). A taxonomic synonym is *Sapindus drummondii* (NRCS 2025).

Species range

Overall Species range

Western soapberry is distributed in Louisiana, Mexico New Mexico, north to Kansas and southwest Missouri (NPIN 2025). This species has been widely planted in shelterbelts throughout the southern Great Plains (Tirmenstein 1990).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the variety's range (Figure 192, Figure 193).

Distribution, abundance, and trend in the plan area

Population

Within the plan area, the population size and trend in the plan area is not known. It is considered rare in Baca, Las Animas, and Otero Counties, Colorado, but not rare in Morton County, Kansas (Figure 17).

Habitat

Across its range, western soapberry grows along stream banks, wood margins, and rocky hillsides (NPIN 2025). It can occur in cottonwood gallery forests, midgrass prairie, pinyon-juniper woodland, and riparian areas (Kuhn et al. 2011). Hazlett (2004) classifies its primary habitat in the plan area as shaded rocky canyons and ravines. The species has been documented only within the Carrizo Unit of the Comanche National Grassland portion of the plan area in Colorado. It has been documented in several canyons across the Carrizo Unit and in the Cimarron National Grassland (SEINet 2024).

Threats (arising from on or off the plan area)

Population

Threats to the variety include browsing by cattle, possible floods and fire, very low genetic variability (NatureServe 2025). However, this tree has low palatability to browsing and grazing animals (NRCS 2025) and is rarely eaten by domestic livestock except where other forage is scarce or unavailable (Tirmenstein 1990). Fire is likely a more significant threat because the species is very intolerant of fire (NRCS 2025).

Habitat

Possible threats to the variety's habitat include browsing by cattle, floods and fire (NatureServe 2025). However, this tree has low palatability to browsing and grazing animals (NRCS 2025) and is rarely eaten by domestic livestock except where other forage is scarce or unavailable (Tirmenstein 1990). Fire is likely the most significant threat because the species is very intolerant of fire (NRCS 2025).

Ecological conditions

Ecological condition requirements

This species is adapted to a variety of soils—ranging from rich to infertile—and can grow in sun or part shade in dry or moist sites (NPIN 2025, Tirmenstein 1990). It is generally hardy, being tolerant of drought, wind, heat, poor soil, and air pollution, and seems unaffected by insect or disease issues (NPIN 2025). It is intolerant of fire (NRCS 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Western soapberry can use a variety of soil textures and soil moisture levels (NRCS 2025). It often grows as a dominant or codominant member of Southwestern riparian communities but is a generally adaptable species that can also make use of infertile habitats such as waste grounds (Tirmenstein 1990). It is known to occur in several canyons across the Carrizo Unit and in breaks of the Cimarron River in the Cimarron National Grassland (SEINet 2024). This relatively wide distribution across the plan area suggests its ecological conditions are not restricted.

Critical biological characteristics

Western soapberry is a small, long-lived deciduous tree that exhibits a moderate growth rate (SEINet 2024, NRCS 2025). Its fruits contain a poisonous alkaloid called saponin (NPIN 2025). Western soapberry occurs in any southwestern riparian woodlands that are considered climax or post-climax communities but can also grow well in early seral communities including infertile waste grounds (Tirmenstein 1990).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Western soapberry is the larval host plant for a butterfly called the Soapberry Hairstreak (*Phaeostrymon alcestitis*) (NPIN 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Species has high drought tolerance but is intolerant of fire (NRCS 2025). Postfire sprouting from underground rhizomes is possible but has not been documented; burning is generally not recommended for the southwest riparian woodlands in which this species tends to occur (Tirmenstein 1990).

Maps of Species Range

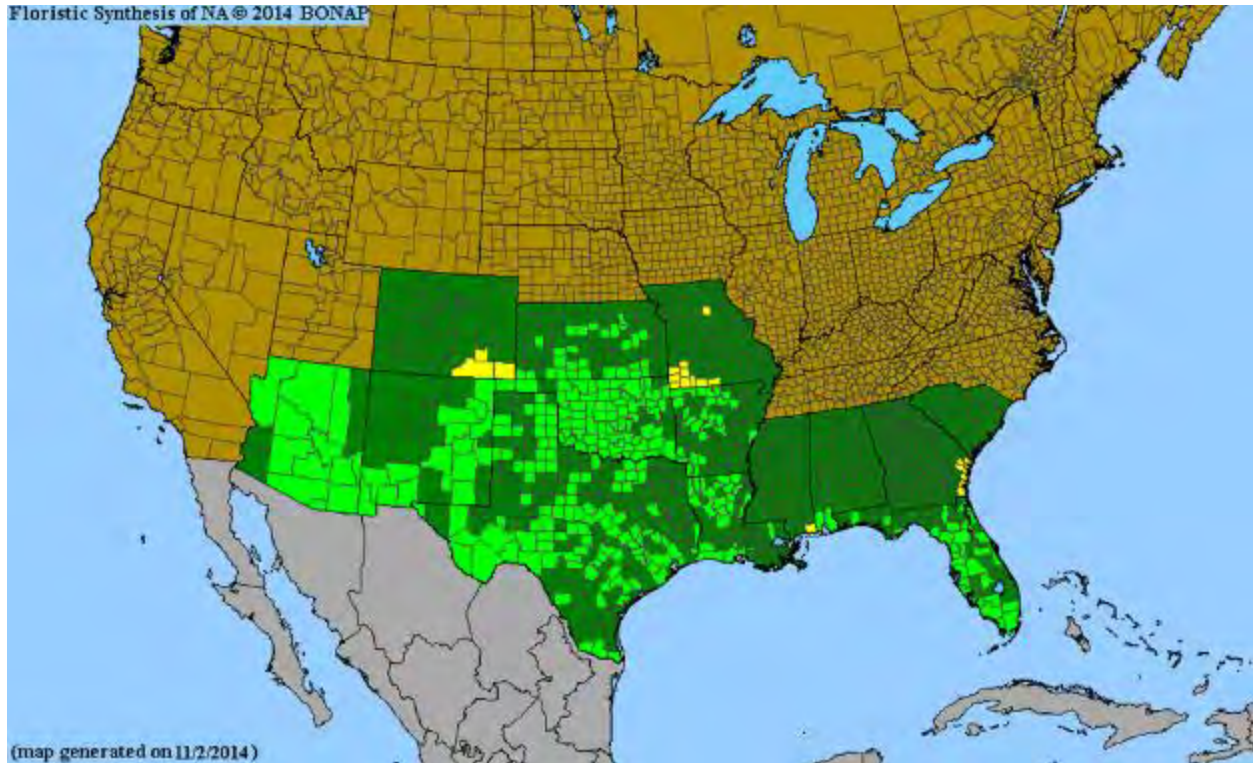
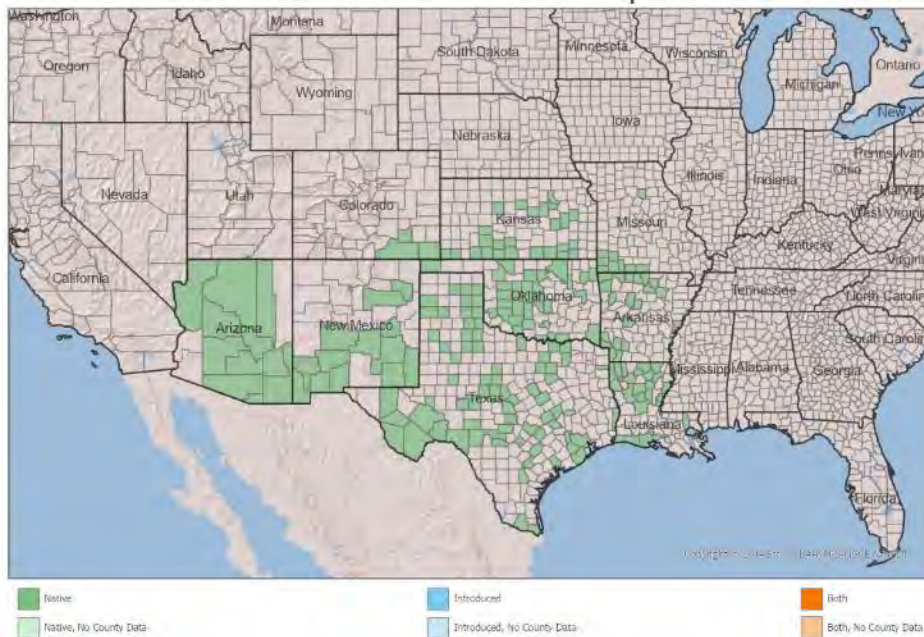


Figure 192. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county. Note map is for the species (*Sapindus saponaria*).



SASAD: *Sapindus saponaria* L. var. *drummondii* (Hook. & Arn.) L.D. Benson, western soapberry
Monday, Sep 9, 2024

Figure 193. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025). Note map is for the variety (*Sapindus saponaria* var. *drummondii*).

White fluffgrass

(*Tridens albescens*)

Species is Native and Known to Occur on National Forest System lands in Plan Area: No

Rationale/Evidence of Occurrence: GBIF contains two occurrence records, both from 1965 in the Cimarron National Grassland (GBIF 2023). The source data for both records is the H.A. Stephens Herbarium at Emporia State University. The occurrence remarks from both collection records describe the locality as "Elkhart, 3 mi N on Hwy 27." One collection was made "On roadside and prairie" (Kerbs and Schulenberg 2016b) and the other "In prairie near Hwy" (Kerbs and Schulenberg 2016a). The georeferencing notes state "Georeferenced along stretch of Highway 27 within Elkhart city limits" and have an uncertainty of +/- 2000 m (Van Scoyoc 2024, SEINet 2024). The location is within ~590 ft (180 meters) of the boundary of the plan area; therefore, there is insufficient precision to determine if this species occurs within the plan area or adjacent state or private land. Because of the uncertainty in the location of the occurrence records, this species is not known to occur in the plan area and is not analyzed further.

Year of Last Known Occurrence: N/A

Species Status

G4; S1 in Kansas.

White wild onion

(*Allium textile*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are at least six documented occurrences on the Cimarron Comanche National Grasslands (CCNGs) from 1995 to 2010 (Van Scoyoc 2024). Plants are documented from both in the Carrizo and Timpas Units in Colorado, as well as on the Cimarron NG in Kansas. GBIF contains two documented occurrences from 1995 and iDigBio contains one occurrence in 1995 on the Comanche NG in Otero County (Van Scoyoc 2024).

Year of Last Known Occurrence: 2010

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Unknown.
 - b. Habitat: Unknown.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Habitat trends in the plan area are unknown.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the southern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: There are six documented occurrences in the plan area. Population numbers are unknown.
 - b. Ecological conditions: Unknown, but not likely to be restricted.

Species Status

G5; SNR in Colorado; S2 in Kansas.

Taxonomy

Allium textile A. Nelson & J.F. Macbr. is accepted as valid (Ackerfield 2022, NRCS 2025, Weber et al. 2012). Synonyms include *Allium aridum*, *Allium reticulatum* var. *playanum* (Flora of North America 1993), *Allium geyeri* var. *textile*, and *Allium reticulatum* (ITIS 2024, NRCS 2025). Other common names include textile onion (NRCS 2025), wild onion, and prairie onion (ITIS 2024).

Species range

Overall Species range

In North America, occurs in Colorado, Idaho, Iowa, Kansas, Minnesota, Montana, Nebraska, Nevada, New Mexico, North Dakota, South Dakota, Utah, Washington, Wyoming, and three Canadian provinces (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are at the southern edge of the species range (Figure 194).

Distribution, abundance, and trend in the plan area

Population

Herbarium specimens are documented across the plan area on both the Carrizo and Timpas Units of the Comanche NG in Colorado, and on the Cimarron NG in Kansas. Collections in the same year (1997) occurred both in Picture Canyon on the Comanche NG and at a scenic overlook on the Cimarron NG (SEINet 2024). An herbarium collection from 2010 lists the location at David's Canyon and another from 1995 on David Canyon Road on the Timpas Unit of the Comanche NG (SEINet 2024).

Population trends are largely unknown for the occurrences in the plan area from the consulted sources. The herbarium collection from 1995 lists plants as "infrequent" occurring on the open grassland (SEINet 2024).

Habitat

Across its range, plants are known to occur in dry plains and hills (Flora of North America 1993). Plants grow on dry sunlit locations throughout the Great Plains in addition to the Rocky Mountains and Great Basin (iNaturalist 2025). In Colorado, textile onion occurs on dry slopes (Ackerfield 2022) in the plains and outer foothill mesas (Weber et al. 2012).

In the plan area, plants are documented as occurring in a variety of habitat types. An herbarium collection from 1995 on the Comanche NG lists the habitat as "open grassland, infrequent" (Van Scoyoc 2024). One herbarium specimen from Picture Canyon on the Comanche NG lists the habitat as a lush canyon with a Salix-dominated wet draw, Juniperus-dominated canyon rim, and shortgrass prairie (SEINet 2024). Another herbarium collection in Otero County, CO in the plan area identifies the habitat as shale outcrops of rocky upland prairie dominated by *Oryzopsis* (SEINet 2024). A collection from the Cimarron NG lists habitat as "rocky prairie dominated by *Xanthisma spinulosum*, *Bouteloua* spp., and *Aristida* spp." (SEINet 2024).

Threats (arising from on or off the plan area)

Population

Threats to populations are unknown. This species is identified as a common species of wild onion in central North America (Plants For A Future 2024). Plants are known to be grazed, as noted in an herbarium collection from Picture Canyon on the Carrizo Unit in 2007 (SEINet 2024), however they reproduce both by seed and bulb thus it is unknown if grazing is a threat.

Habitat

Threats to habitat are unknown. White wild onion grows in a variety of habitat types across the Great Plains.

Ecological conditions

Ecological condition requirements

White wild onion grows in full sun (Montana Field Guide 2025) and plants are unable to tolerate shade (Plants For A Future 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are at least six documented occurrences across the plan area on both the Cimarron and Comanche NGs. The trend of ecological conditions in the plan area is unknown.

Critical biological characteristics

White wild onion is an herbaceous short-lived perennial with white flowers that reproduces both by seed and bulbs (NRCS 2025). After harvest, the regrowth rate is slow (NRCS 2025).

Plants show a high tolerance to both wildfire and drought (NRCS 2025).

White wild onion has a high palatability for grazing and browsing animals (NRCS 2025). Leaves, roots and flowers can all be eaten (Plants For A Future 2024). Toxic sulfides are present in the plant which can cause low toxicity if eaten, although plants can be eaten safely in small amounts (NPIN 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Plants have white conspicuous flowers (NRCS 2025) that attract pollinators and wildlife including hummingbirds, butterflies (NPIN 2025), bees and flies (Burke Museum 2025). Species that have been reported as pollinators of this plant or others in the *Allium* genus include Vancouver bumble bee, Central bumble bee, Yellow-head bumble bee, Hunt's bumble bee, Black tail bumble bee, Forest bumble bee, Western bumble bee, and Gypsy Cuckoo bumble bee (Montana Natural Heritage Program 2020).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

A reduction of surrounding vegetative cover may be beneficial for this species because of its preference for full sun and intolerance of shade.

Maps of Species Range

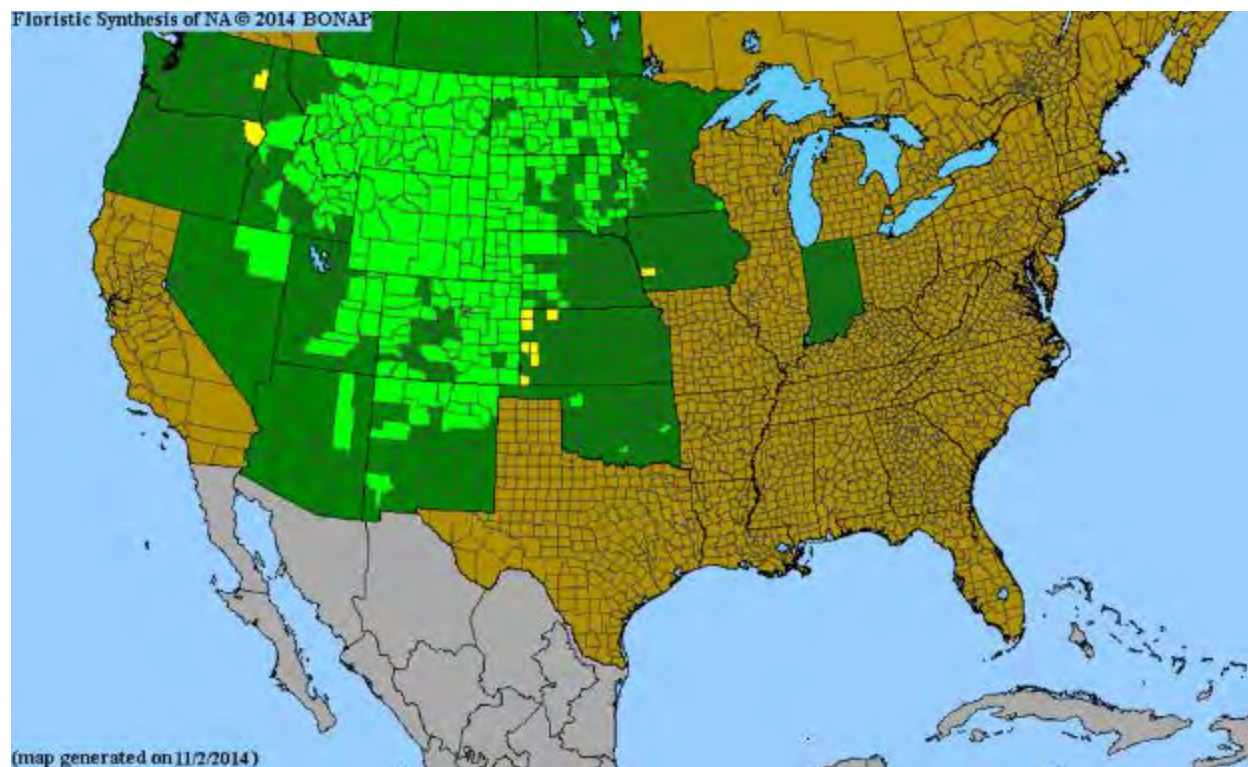


Figure 194. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Winter-fat

(*Krascheninnikovia lanata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are at least eight documented occurrences on the Cimarron Comanche National Grasslands (CCNGs) from 1947 to 2011 (Van Scoyoc 2024). Two occurrences from 1947 and 1975 were found in GBIF (GBIF 2023) and two from 1972 and 1991 were found in iDigBio (Van Scoyoc 2024).

Year of Last Known Occurrence: 2011

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Development, habitat conversion, and high-severity fire.
 - b. Habitat: Development, habitat conversion, and woody encroachment.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Habitat trends are not known from the consulted sources.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Occurrences in the plan area are at the eastern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: At least eight occurrences in the plan area. Population numbers are unknown.
 - b. Ecological conditions: Unknown, but not likely to be restricted.

Species Status

G5; SNR in Colorado; S2 in Kansas.

Taxonomy

Krascheninnikovia lanata (Pursh) A. Meeuse & Smit is accepted as valid (Ackerfield 2022, NatureServe 2025, NRCS 2025, Weber et al. 2012). Synonyms include *Ceratoides lanata*, *Ceratoides lanata* var. *ruinina*, *Certaoides lanata* var. *subspinosa*, *Eurotia lanata*, and *Eurotia lanata* var. *subspinosa* (NRCS 2025). Other common names include winterfat (NRCS 2025), white sage, and winter sage (Carey 1995a).

Species range

Overall Species range

In North America, occurs in all western U.S. states (n=17) and four Canadian provinces. Most states rank winter-fat as secure or no status, except Kansas where it is ranked as imperiled and Oklahoma where it is critically imperiled (NatureServe 2025). Winter-fat occurs throughout the intermountain region except in the northwest corner of central Oregon (SEINet 2024).

Description of how the population in the plan area fits within the overall range

Occurrences in the plan area are at the eastern edge of the species range (Figure 195).

Distribution, abundance, and trend in the plan area

Population

Within the plan area, the population size and trend is unknown. There are existing herbarium records of collections across the Comanche NG and this species is likely under collected due to its common presence. Occurrence records give no indication of the number of individuals. No herbarium records for winter-fat were identified from the consulted sources on the Cimarron NG in Kansas where the plant is ranked as imperiled.

Habitat

Habitat includes open slopes, plains, and pinyon-juniper and sagebrush from 4000 to 9500 feet (Ackerfield 2022). Weber (2012) cites that plants form large, pure stands on gravelly benches in the lower river valleys of Colorado.

Herbarium specimen records from the plan area and nearby locations in Colorado indicate that winter-fat occurs in a wide variety of habitat types including shortgrass prairie, riparian areas, juniper savannah, and roadsides on dry, sandy, gravel, and clay soil (SEINet 2024).

Threats (arising from on or off the plan area)

Population

Threats to populations are generally unknown but could include stochastic events, fire, and ground disturbance of plant roots (e.g., development and habitat conversion). Plants are grazed on by livestock and wildlife, but they have the ability to resprout in response to light grazing. Winter-fat is often killed or top-killed by high-severity fire but has been reported to survive low-severity fire (Carey 1995a).

Habitat

Development and conversion of native habitat are threats to shortgrass prairie ecosystems. Winter-fat inhabits a wide variety of ecosystems in the plan area therefore threats to the overall habitat are perceived to be minimal. Woody encroachment is considered a threat to both habitat and populations because the plants are intolerant of shade. Carey (1995a) found that winter-fat cover decreased as juniper cover increased.

Ecological conditions

Ecological condition requirements

Winter-fat is usually found growing in relatively low-alkaline soil (Flora of North America 1993). Plants show a tolerance to a variety of textures of soil including fine, medium and coarse (NRCS 2025). Winter-fat has a high tolerance to drought and a low tolerance for shade (NRCS 2025); therefore, open sunny locations without canopy cover are likely necessary for the species to survive.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The habitat preferences of winter-fat do not appear to be restricted, outside of needing open sunny locations, thus ecological conditions for plants may be widespread in the plan area.

Critical biological characteristics

Winter-fat is an evergreen shrub that has high palatability (NRCS 2025). Plants typically have a long lifespan with the ability to resprout following disturbance (NRCS 2025). They reproduce rapidly by seed and have high seedling vigor (NRCS 2025).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Winter-fat is able to persist through drought and may outcompete other plants in the wide variety of habitats where it is found, especially during periods of drought. Winter-fat has been documented to form pure stands (Flora of North America 1993) over extensive areas (Carey 1995a), which could limit diversity at given sites. On the other hand, plants are able to grow in conditions such as on salty and alkaline soils where other plants cannot survive, providing important cover and nesting habitat for rodents and birds.

Winter-fat is evergreen and named such due to its nutritional importance and value for wildlife and domestic livestock (SEINet 2024). Plants provides important forage for browsing and grazing animals (NRCS 2025), especially during winter months when forage is scarce (Carey 1995b). Stems, leaves, and seeds provide a valuable year-round food source to many native animals including rodents, ground squirrels, rabbits, bighorn sheep, mule deer, elk, white-tailed deer, and pronghorn (Carey 1995b). In some areas, overgrazing has reduced or eliminated winter-fat even though plants show a resistance to browsing (Carey 1995b).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Disturbance and high-severity fire may alter community composition by directly impacting and killing plants.

Drought and managed livestock grazing may favor winter-fat due to its high drought tolerance, resistance to light browsing and grazing, and ability to outcompete other species.

Maps of Species Range

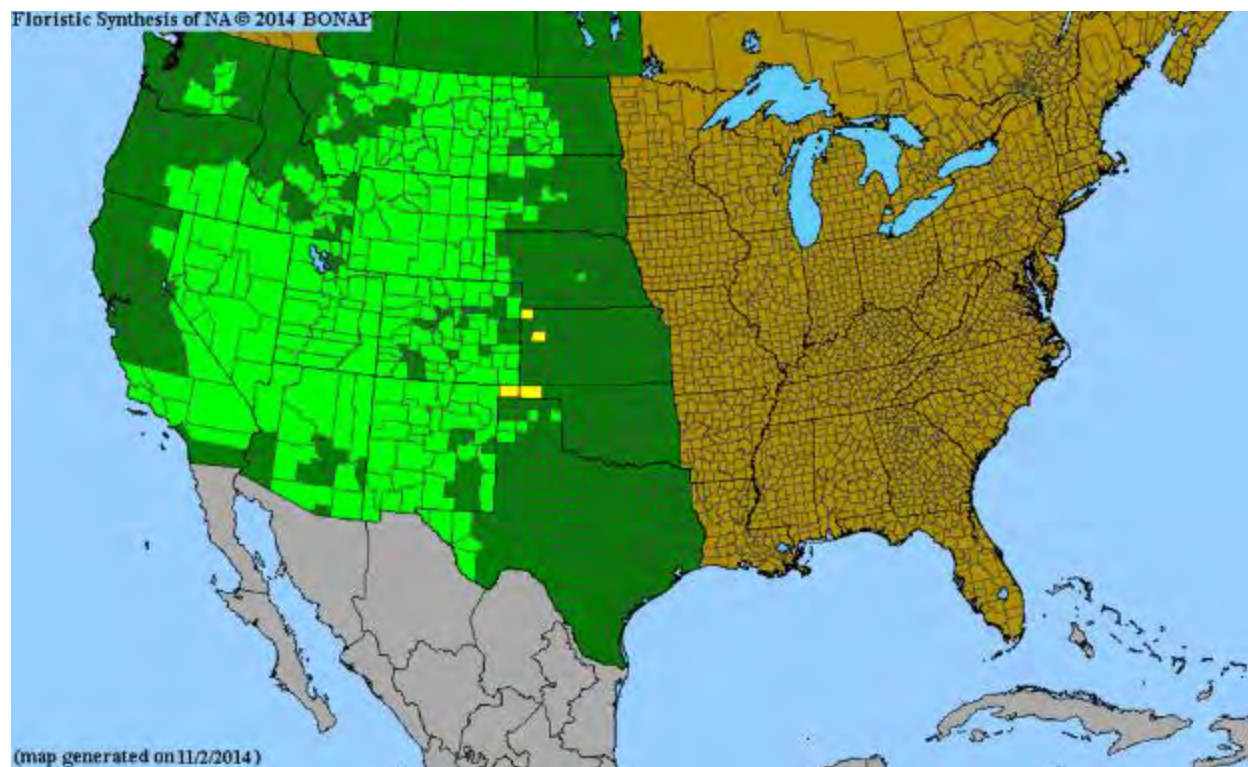


Figure 195. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Woodhouse's false bahia

(*Picradeniopsis woodhousei*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has four occurrence records in the Comanche National Grasslands from 1993-2005 (Van Scoyoc 2024). These records have high spatial uncertainty (over 3,000 ft), but one record from 1997 describes the locality as "Comanche National Grassland. Ca. 14 mi ENE of Campo." Both Hazlett (2004) and Kuhn (2011) characterize the species as present in the Grasslands. Therefore, the species is known to occur in the plan area.

Year of Last Known Occurrence: 2005

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: open steppe and disturbed, roadside soils are considered stable.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the eastern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; two of the four occurrence records characterize species as locally abundant.
 - b. Ecological conditions: dry and disturbed soils are not restricted in the plan area.

Species Status

G4; S2 in Colorado; S2 in Kansas.

Taxonomy

USDA NRCS recognizes *Picradeniopsis woodhousei* as valid; *Bahia woodhousei* is a taxonomic synonym (NRCS 2025). Another common name is Woodhouse's bahia (NRCS 2025).

Species range

Overall Species range:

Woodhouse's false bahia is distributed in the southwestern United States, with a disjunct population in (Figure 196, Figure 197).

Description of how the population in the plan area fits within the overall range:

The plan area is at the eastern edge of the species' range (Figure 196, Figure 197).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. An occurrence record from 1993 states the species was "abundantly colonizing the roadside and roadbed" and another record from 2005 describes the species as "locally abundant." It is not considered rare in any counties that overlap the plan area (Figure 197).

Habitat

Woodhouse's false bahia is found in on sandy, silty, or loamy soils of grasslands, plains, prairies, and roadsides at elevations from 3,200-5,500 ft (SEINet 2024). Within the plan area, it has been associated with open steppe and disturbed, roadside soils (Hazlett 2004). It has been documented in the Carrizo Unit of the Comanche near Picture Canyon and near the Cimarron River (Van Scoyoc 2024).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Hazlett 2004, NatureServe 2025, SEINet 2024).

Habitat

No consulted sources identified threats to habitat (Hazlett 2004, NatureServe 2025, SEINet 2024).

Ecological conditions

Ecological condition requirements

This species can use varied soil types and occurs in different habitats, particularly disturbed soils such as roadsides (Hazlett 2004, SEINet 2024).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Dry and disturbed habitats are not restricted in the plan area.

Critical biological characteristics

Woodhouse's false bahia is a perennial herb in the Aster family (Asteraceae) (SEINet 2024). Flowering occurs from May through September (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found for this species.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found for this species. A congener, oppositeleaf false bahia (*Picradeniopsis oppositifolia*), has been shown to have lower abundance in high-rainfall years and greater abundance in low-rainfall years (Wilcox et al. 2021).

Maps of Species Range

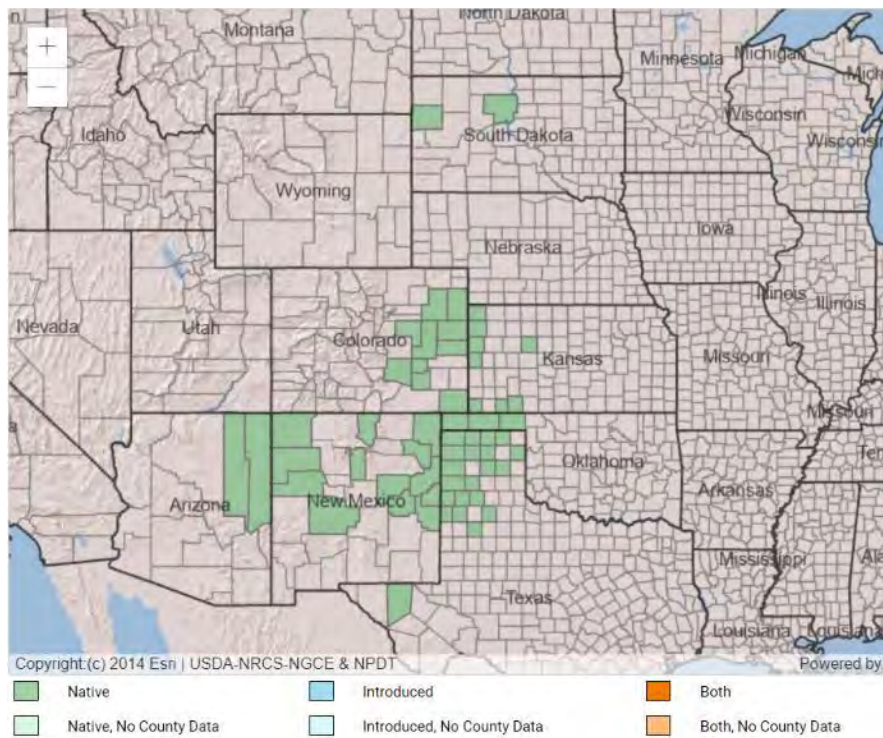


Figure 196. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

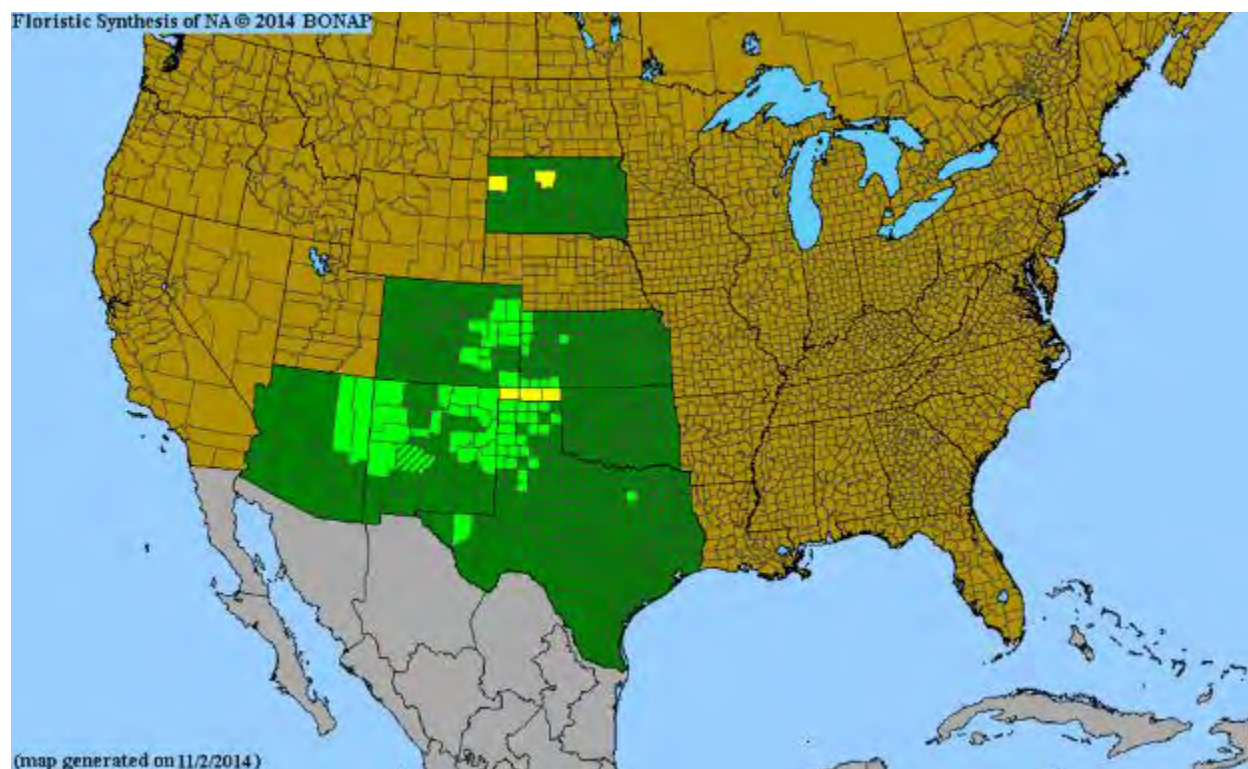


Figure 197. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Woolly butterfly-weed

(*Gaura villosa*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: There are approximately 19 occurrence records in SEINet, iDigBio, and GBIF within the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this species (Ackerfield 2022, Flora of North America 1993). Many of the locations are in close proximity to roads and the occurrences in the Cimmaron Unit are near oil and gas well activity. There is a potential for species to get dug up or trampled but human activity in the area.
 - b. Habitat: Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, recreation, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trend for this species in the plan area is unknown.
 - b. Habitat: Cottonwood gallery riparian and sandsage are declining in the plan area
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northern edge of the species range
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known. There is a minimum of 19 occurrence record within the plan area.
 - b. Ecological conditions: No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022, NatureServe 2025).

Species Status

G5; S1 in Colorado; SNR in Kansas.

Taxonomy

For the species *Gaura villosa* var *typica*, the species overview is for the parent species *Gaura villosa*. NatureServe (NatureServe 2025), USDA NRCS PLANTS, Ackerfield, and ITIS all refer to *Gaura villosa* as *Oenothera cinerea* (NatureServe 2025, NRCS 2025, Ackerfield 2022, ITIS 2024). Synonyms for *Oenothera cinerea* include *Gaura cinerea* and *Gaura villosa* (NRCS 2025).

Species range

Overall Species range

Woolly butterfly-weed occurs in California, Colorado, Kansas, New Jersey, New Mexico, Oklahoma, and Texas (Flora of North America 1993).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range (Figure 198, Figure 199)

Distribution, abundance, and trend in the plan area

Population

There are 19 occurrence records within the Carrizo and Cimarron Unit (USFS 2005a). Hazlett (2004) indicates this species (*Gaura villosa*) is known to occur in Baca County. Kuhn (2011) identified this species in Baca and Morton County in a Floristic Inventory of the Cimarron and Comanche National Grasslands.

Population and population trend for this species in the plan area is unknown.

Habitat

Woolly Butterfly-weed occurs in sandy soil, 4200-5500 ft in elevation. Flowers June through August (Ackerfield 2022). Hazlett (2004) describes it as sandy soils. Kuhn (2011) identified habitat as cottonwood gallery forest, rocky upland prairie, sandsage prairie, in a Floristic Inventory of Cimarron and Comanche National Grasslands.

Most of the observation records are within the shortgrass prairie and sandsage prairie ecosystem. There are a few occurrences in the canyonland and the riparian woodlands and aquatic habitat ecosystem. The occurrence records are spatially mapped within landfire existing vegetation types; Western Great Plains Shortgrass Prairie, developed roads, Western Cool Temperate Fallow/Idle Cropland, Western Great Plains Sand Prairie, and Western Cool Temperate Urban (Landfire 2024).

Some of the observation habitat descriptions include sandy grasslands, roadside and sandsage prairie, along ditch, sandy shortgrass prairie pasture, sandsage prairies, and eroded areas (SEINet 2024).

Species uses varied habitats with no discernable trend.

Threats (arising from on or off the plan area)

Population

No sources consulted identified threats to this species (Ackerfield 2022, Flora of North America 1993). Many of the locations are near roads and the occurrences in the Cimarron Unit are near oil and gas well activity. There is a potential for species to get dug up or trampled but human activity in the area.

Habitat

Common threats on and/or off the plan area include housing and urban areas, livestock farming and ranching, oil and gas drilling, recreation, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

No sources consulted identified any ecological requirements needed for this species aside from general habitat needs (Ackerfield 2022). Species is herbaceous, perennial, flowers June through August. *Gaura* spp. are typically rather weedy plants. *Oenothera cinerea* to be self-incompatible (Ackerfield 2022, Flora of North America 1993).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are approximately 19 occurrence record within the Carrizo and Cimmaron Unit (USFS 2005a). Most of the observation records are within the shortgrass prairie and sandsage prairie ecosystem. There are a few occurrences in the canyonland ecosystem and the riparian woodlands and aquatic habitat. The occurrence records are spatially mapped within landfire existing vegetation types; Western Great Plains Shortgrass Prairie, developed roads, Western Cool Temperate Fallow/Idle Cropland, Western Great Plains Sand Prairie, and Western Cool Temperate Urban (Landfire 2024).

Some of the observation habitat descriptions include sandy grasslands, roadside and sandsage prairie, along ditch, sandy shortgrass prairie pasture, sandsage prairies, and eroded areas (SEINet 2024).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this species. Species is herbaceous, perennial, flowers June through August. *Gaura* spp. are typically rather weedy plants.

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

This species can be somewhat weedy at times.

Maps of Species Range

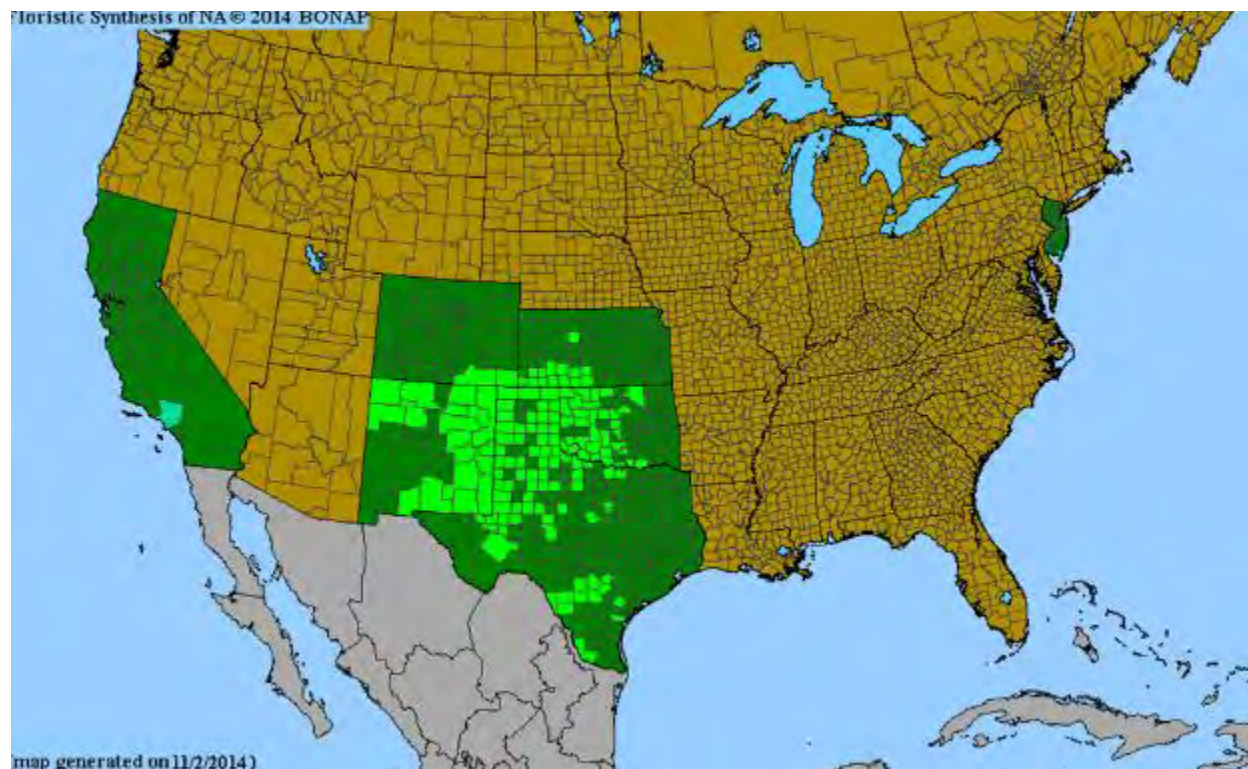


Figure 198. County occurrence data from Biota of North America Program (BONAP 2024). Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

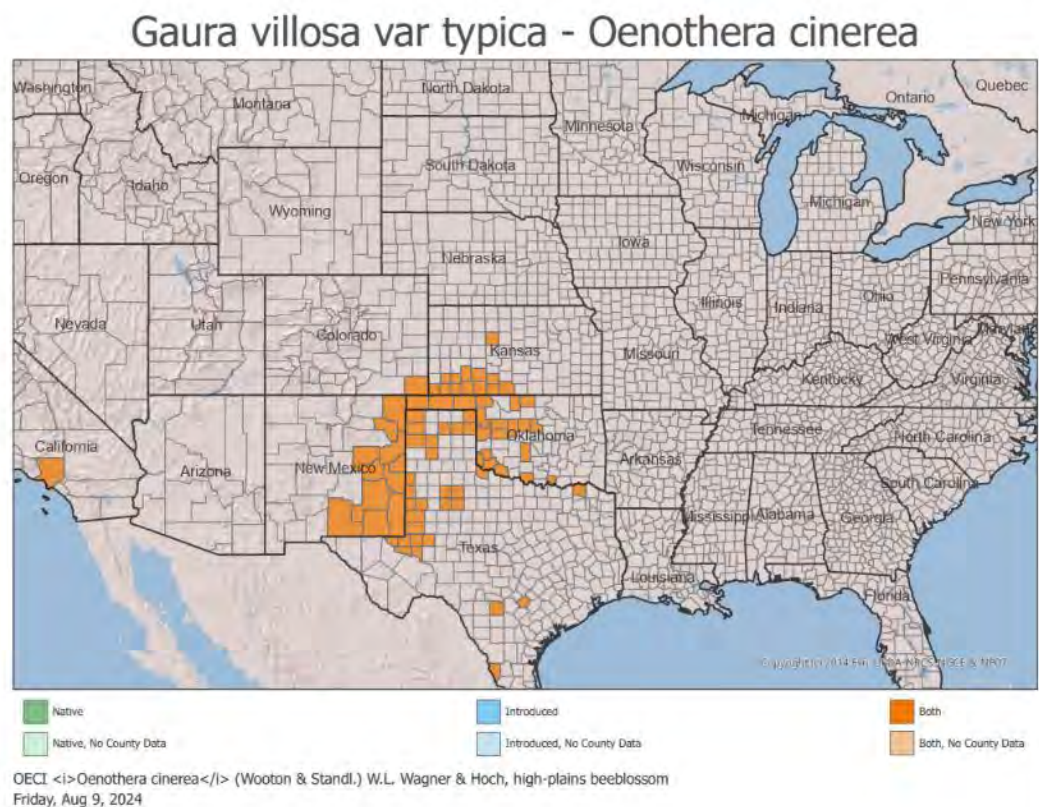


Figure 199. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Woolly prairie-clover

(*Dalea lanata*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has four occurrence records in the Cimarron National Grassland from 1970-2022 (GBIF 2023). Some of these records have sufficient spatial precision to demonstrate this species is known to occur in the plan area.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: overgrazing.
 - b. Habitat: Unknown.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: Species can use varied sandy habitats including sandsage prairie and playas which have a declining trend in the quality of habitat in the plan area.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: population size not known; four occurrence records, one of which describes species as common to locally abundant.
 - b. Ecological conditions: sandy soils are not restricted in the plan area; species can use both stabilized and unstable sand habitat.

Species Status

G5; S2 in Colorado; SNR in Kansas.

Taxonomy

USDA NRCS recognizes *Dalea lanata* as valid (NRCS 2025). There are two varieties of the species, which have at times been treated as separate species: var. *lanata* is a Great Plains taxon found in Texas and eastern New Mexico; var. *terminalis* is found in Arizona and western New Mexico (SEINet 2024).

Species range

Overall Species range:

Woolly prairie clover is distributed from Utah to Kansas, south to Arizona, New Mexico, Texas, and northern Mexico (SEINet 2024) (Figure 200, Figure 201).

Description of how the population in the plan area fits within the overall range:

The plan area is at the edge of the species' range (Figure 200, Figure 201).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend are not known. It is not considered rare in any counties that overlap the plan area (Figure 201). There are four occurrence records; one from 1988 states "Common to locally abundant in blowouts in loose sand."

Habitat

Across its range, woolly prairie clover occurs on stabilized sand dunes and other sandy sites, at elevations from 2,000 – 6,500 ft (SEINet 2024). Within the plan area, it is associated with sandy soils and sandsage prairie (Hazlett 2004, Kuhn et al. 2011). It has also been observed along the sand pond banks at Point of Rocks, dominated by salt cedar (*Tamarix ramosissima*), narrowleaf willow (*Salix exigua*), and bulrushes (*Scirpus*) (Van Scoyoc 2024).

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Hazlett 2004, Kuhn et al. 2011, NatureServe 2025, SEINet 2024). However, Johnson (2006a) states that woolly prairie clover is "an excellent browse for livestock as well as being utilized by wildlife" and so overgrazing is considered a threat.

Habitat

No consulted sources identified threats to habitat (Hazlett 2004, Kuhn et al. 2011, NatureServe 2025, SEINet 2024).

Ecological conditions

Ecological condition requirements

This species requires sandy soils. It seems to be able to use both stabilized dune habitats (SEINet 2024) and unstable habitats such as blowouts.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The species depends on sandy soil (Hazlett 2004). It occurs in a variety of habitat types including banks, sand dunes, shortgrass prairie, as long as they have sandy substrate. Sandy soil is not restricted in the plan area.

Critical biological characteristics

Woolly prairie clover is an herbaceous perennial with a woody root crown and pealike flowers (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Legumes can provide valuable forage plants for bees in honey production, and numerous species are browsed by livestock and serve as important browse plants for wildlife (Freeman 1989, Johnson 2006b). Legumes host soil bacteria which are capable of fixing atmospheric nitrogen. However, native grassland legumes likely contribute only a small amount of Nitrogen enrichment to soils, having evolved in low nutrient sites such as the Great Plains grasslands (VanRiper et al. 2010).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found for this species.

Maps of Species Range

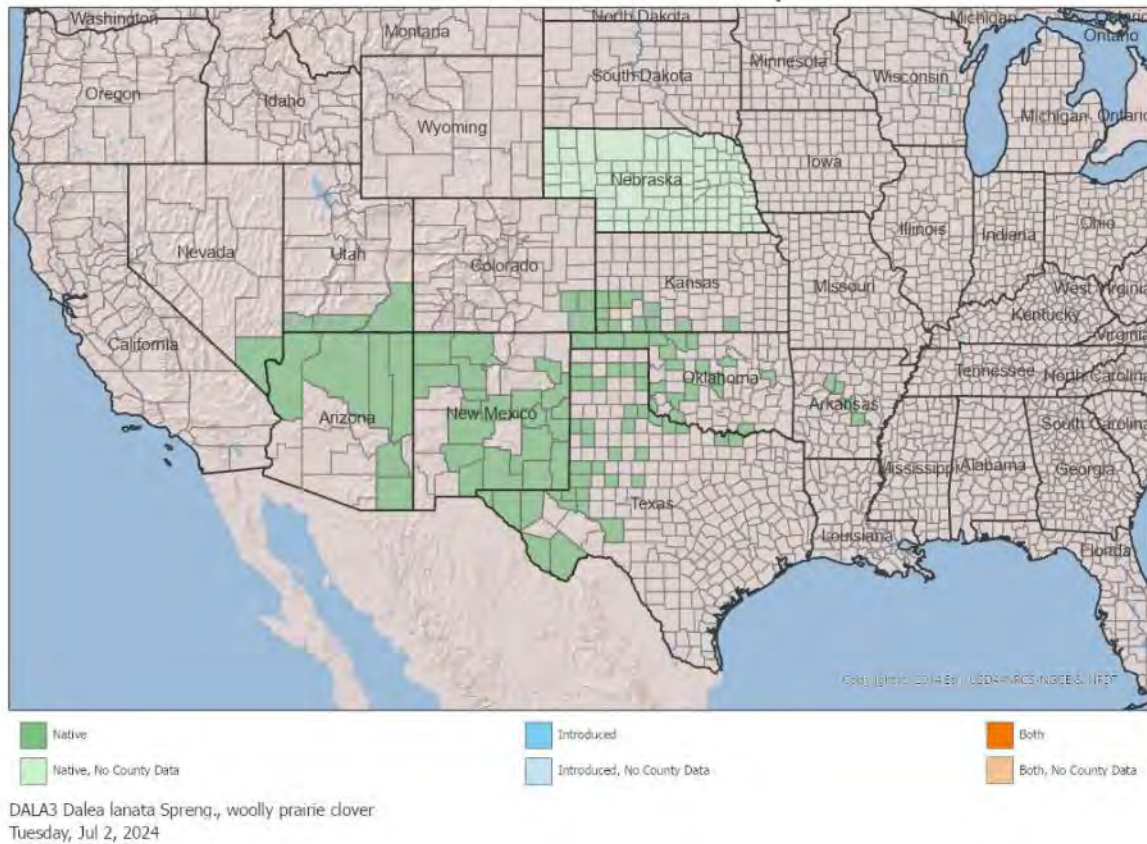


Figure 200. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

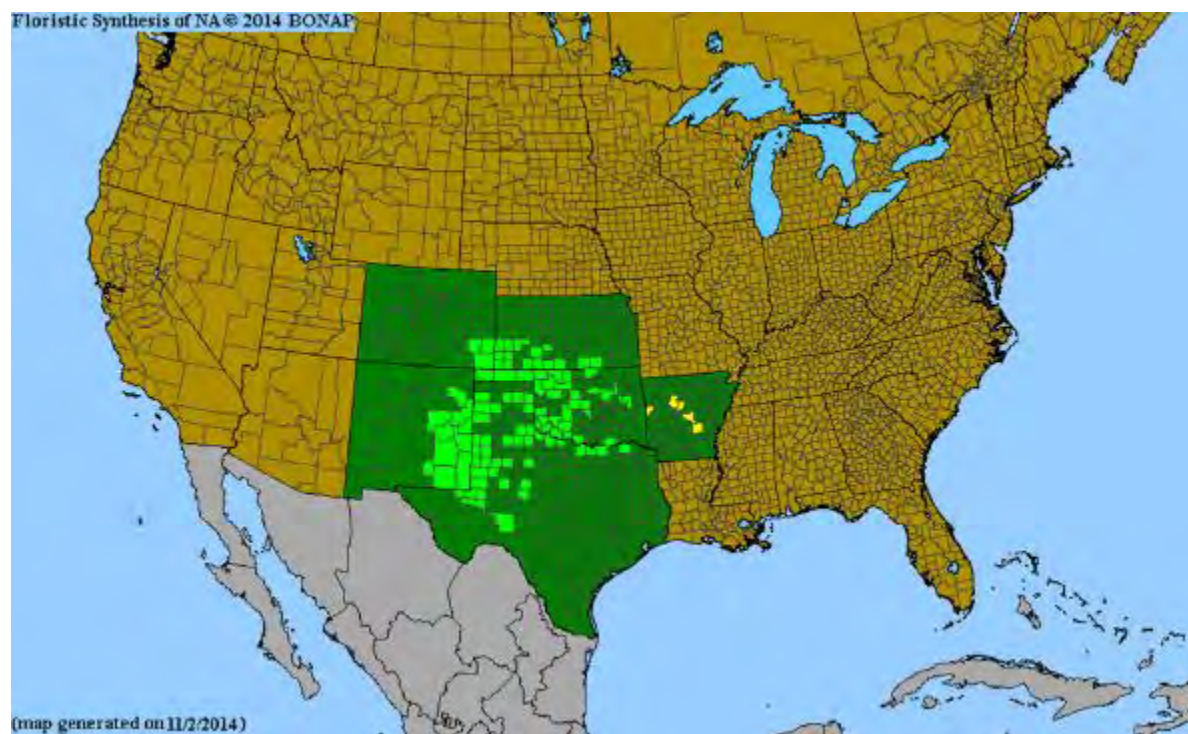


Figure 201. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Wooton's lacefern

(*Cheilanthes wootonii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CNHP contains three occurrence polygons (EOID 5879, 16615, and 16616) within the plan area from 1994 and 2009 (CNHP 2024, Van Scoyoc 2024).

Year of Last Known Occurrence: 2009

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: potential threat of increasing recreation.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: species occurs in generally inaccessible rock outcrops in canyons; occurrence report indicates lack of disturbance.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: the 3 EO from CNHP note the population sizes as "a few individuals", "a few clumps", and "20-30 plants" indicating the total known population is not much larger than 30 plants (CNHP 2024).
 - b. Ecological conditions: cliffs and rocky habitat are not limited in the plan area.

Species Status

G5; S1 in Colorado.

Taxonomy

Cheilanthes wootonii is accepted as valid; another common name is beaded lipfern (NRCS 2025). A taxonomic synonym is *Myriopteris wootonii* (SEINet 2024). SEINet states "Look for this plant under the name *Cheilanthes wootonii*, in texts and in the herbarium. Molecular evidence shows that species traditionally placed in the genus *Cheilanthes* are not all from a single evolutionary lineage, so botanists are in the process of splitting up the genus. The result is that most North American *Cheilanthes* are very recently placed in the genus *Myriopteris*." (SEINet 2024)

Species range

Overall Species range:

This species' geographic range spans the southwestern United States and northwest Mexico (Figure 202).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure 202).

Distribution, abundance, and trend in the plan area

Population:

The element occurrence report near Beaty Canyon (EO 5879) in 1998 states "few individuals ; small (population), but other occurrences known in area, long distance dispersers." The element occurrence report from 2009 (EO ID 16616) states "Number of individuals: a few individuals in rocks." The population size in the plan area is not known but based on the occurrence reports it is considered to be low.

Habitat

Habitat for Wooton's lacefern includes rocky slopes and ledges, usually on igneous substrates, at an elevational range of 2600 – 9500 ft (800 – 2900 m) (SEINet 2024). It can occur on multiple rock types including sandstone (Smith 2010). It favors shaded ledges on south-facing cliffs and ravines (Windham 1983, Hazlett 2004).

The species has only been documented within the southern end of the Timpas Unit and the Carrizo Unit on the Comanche National Grassland (Van Scoyoc 2024). It has been found in small side canyons to Beaty Canyon (EO 5879) and Holt Canyon (EO 16616) (Van Scoyoc 2024). Both occurrences have been associated with northern aspect and rock outcrops; one was predominantly shaded with a moist microclimate (EO 5897) while the other was dry with open exposure (EO 16616) (Van Scoyoc 2024).

The element occurrence report from 1998 in a side canyon of Beaty Canyon (EO ID 5879) states "Very little disturbance in these steep, difficult to access canyon lands." Overall, because this species occurs in steep, inaccessible canyon habitats, its habitat is considered stable.

Threats (arising from on or off the plan area)

Population

None of the sources consulted identified threats to populations (Windham 1983, Smith 2008, 2010, SEINet 2024, NatureServe 2025).

Habitat

The element occurrence report from 1998 in a side canyon of Beaty Canyon (EO ID 5879) states "increasing recreation may impose threat."

Ecological conditions

Ecological condition requirements

The species requires rocky, xeric habitat with suitable microhabitat (Smith 2010, Van Scoyoc 2024). One occurrence report emphasizes the importance of mesic microclimate (EO ID 5879, (Van Scoyoc 2024), but another occurrence record occurred in in a dry sandstone (EO ID 16616). Across its range, it is characterized by a limited distribution and general rarity (Smith 2008), (Smith 2010). Occurrences in the plan area were in both full sun exposure and in shaded habitat (Van Scoyoc 2024). The species is a xerophytic fern with low water requirement (Smith 2010).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Wooton's lacefern requires suitable microhabitat and microclimate (Smith 2008, Van Scoyoc 2024). Its microhabitat requirements are not fully characterized, and different habitats appear to be used with the plan area (shaded and sunny, dry and mesic) (Van Scoyoc 2024). The amount of suitable microhabitat on the plan is impossible to assess but is often rare across the species' overall range (Wild and Gagnon 2005). Wooton's lacefern has been observed in two different canyons across the plan area, both on the Comanche National Grassland (Van Scoyoc 2024). One occurrence record in the plan area (EO 5879) describes Wooton's fern habitat as "very localized" (Van Scoyoc 2024). Its habitat within the plan area is considered stable by virtue of inaccessibility, although increasing recreation is recognized as a potential threat. Because it can use a variety of rocky substrates, its ecological conditions are not restricted in the plan area.

Critical biological characteristics

Wooton's lacefern is a small, xeric-adapted fern (Smith 2010). The fern life cycle is made up of two distinct phases: the large, long-lived, iteroparous sporophyte and the small, short-lived, semelparous gametophyte (Wild and Gagnon 2005). Wright's cliffbrake is a perennial that spreads by rhizomes (Smith 2010). It produces spores in summer-fall (SEINet 2024). Sexual reproduction is not required, and moisture is not required for production of the sporophytes (Smith 2010). Wooton's lacefern is suspected to hybridize with Fendler's lip fern (*Myriopteris fendleri* or *Cheilanthes fendleri*) (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found specifically for this species.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found specifically for this species. Ferns generally appear to be unpalatable to grazing herbivores, and their distribution is primarily driven by abiotic factors (Wild and Gagnon 2005). Climate and habitat may limit the dispersal and establishment of ferns; research suggests that local patchy distributions are not solely due to microhabitat rarity, but also dispersal or recruitment limitations (Wild and Gagnon 2005).

Maps of Species Range

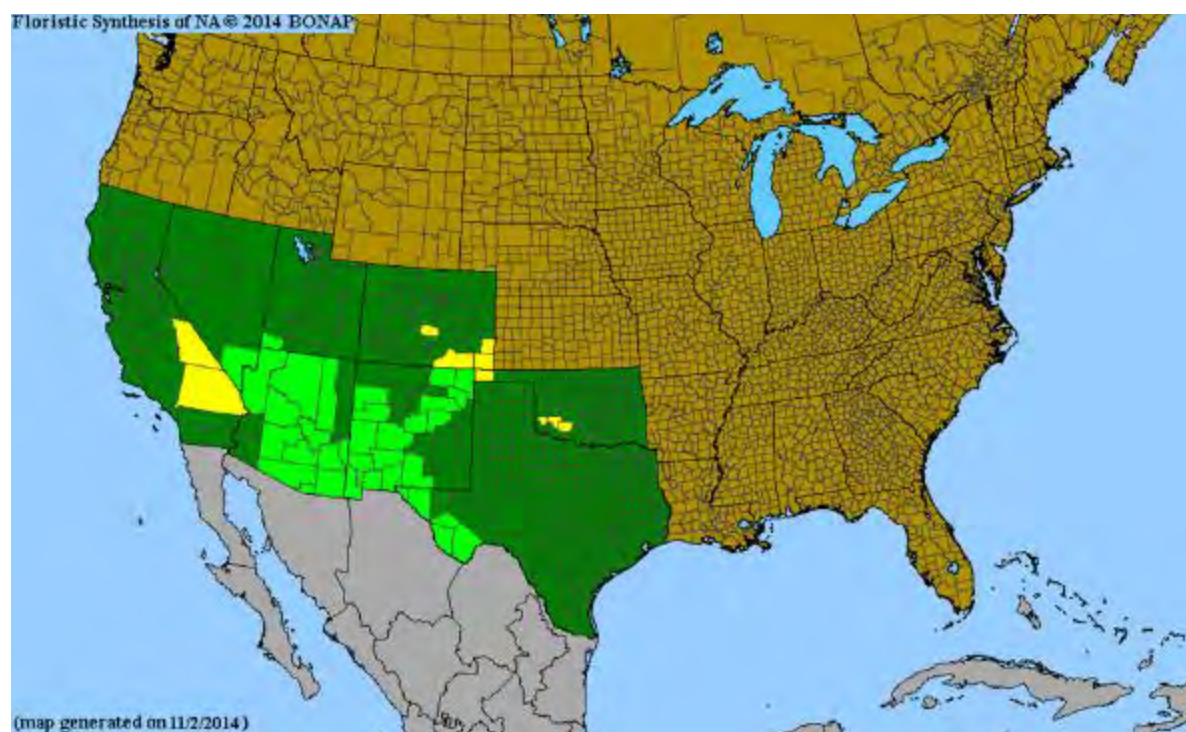


Figure 202. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Wright thelypody

(*Thelypodium wrightii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: SEINet contains two occurrence records from 2007 that confirm the species' presence on the Comanche National Grassland (Van Scoyoc 2024). Based on these occurrence records from the Rocky Mountain Herbarium, the species is known to occur in the plan area. GBIF contains one occurrence record from 1948 (Van Scoyoc 2024). Although GBIF does not provide precision information, the source data from Colorado State University's Charles Maurer Herbarium describes the locality as: "United States, Colorado, Baca County, mct of Sand & Gallinas Canyons, tributary to Cimarron River, vicinity of Wilson Ranch 27 mi S of Pritchett 37.02 -102.84 WGS84." The reference remarks state "There is no clear confluence of Sand Canyon and Gallinas Canon in the form of a tributary of the Cimarron River. The UTM used is on the border of S5, S8. It looks to me like the confluence does not occur in Colorado, but rather over the state line."

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: rocky outcrops in canyons where this species has been documented are considered stable because of general inaccessibility.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size in plan area is not known; two occurrence records in the plan area.
 - b. Ecological conditions: rocky outcrops and canyons are not restricted in the plan area.

Species Status

G4; S2 in Colorado.

Taxonomy

Thelypodium wrightii is accepted as valid; another common name is Wright's thelypody (NRCS 2025).

Species range

Overall Species range:

Wright thelypody occurs in the southwestern United States and Mexico (Figure 203).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure 203).

Distribution, abundance, and trend in the plan area

Population:

The population size in the plan area is not known, and collection remarks do not give any indication of population size (SEINet 2024). There are two occurrence records in the plan area. The population size and trend in the plan area are not known.

Habitat

Habitat for wright thelypody includes rock crevices, shady slopes, rocky hillsides, canyons, stream banks, creek beds, pinyon-juniper communities, oak woodlands, at an elevational range of 2500 to 7500 feet (SEINet 2024). SEINet states it uses rich soils; Ackerfield (2022) characterizes its habitat as "rock outcrops and hillsides," (SEINet 2024).

Within the plan area, wright thelypody has been documented in Holt Canyon and in the Puragtorie River canyon between Bravo and Bent Canyons within the Carrizo Unit of the Comanche National Grassland (SEINet 2024). It may also occur within Gallinas Canyon in the Comanche National Grassland (Van Scoyoc 2024). Its habitat within Holt Canyon was described as "Among large sandstone blocks on steep westerly-facing slope" (SEINet 2024). Its habitat in Sand and Gallinas Canyon was described as basalt caprock. Its habitat near Bravo and Bent Canyon was dominated by One-seed Juniper (*Juniperus monosperma*), Sideoats grama (*Bouteloua curtipendula*), and Alderleaf mountain mahogany (*Cercocarpus montanus*) (SEINet 2024). These habitats are considered stable in the plan area due to their general inaccessibility.

Threats (arising from on or off the plan area)

Population

None of the sources consulted identified threats to populations (Ackerfield 2022, SEINet 2024, NatureServe 2025).

Habitat

None of the sources consulted identified threats to habitat (Ackerfield 2022, SEINet 2024, NatureServe 2025).

Ecological conditions

Ecological condition requirements

Limited information could be found for this species' ecological condition requirements. It may require partial shade (SEINet 2024). Occurrences within the plan area were all within canyon habitats (SEINet 2024). Neither USDA NRCS (NRCS 2025) nor Lichvar (2016) provide a wetland indicator status rating for this species.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Within the plan area, this species has been observed in the canyonland ecosystem of the Comanche National Grassland. Although limited information could be found concerning this species' ecological condition requirements, its ecological conditions are not considered restricted in the plan area because of the prevalence of canyonlands.

Critical biological characteristics

Wright thelypody is a biennial to perennial forb in the mustard family (SEINet 2024). It flowers from June-October (SEINet 2024). It has been documented fruiting in plan area in early August (Rocky Mountain Herbarium 2007).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Species Range

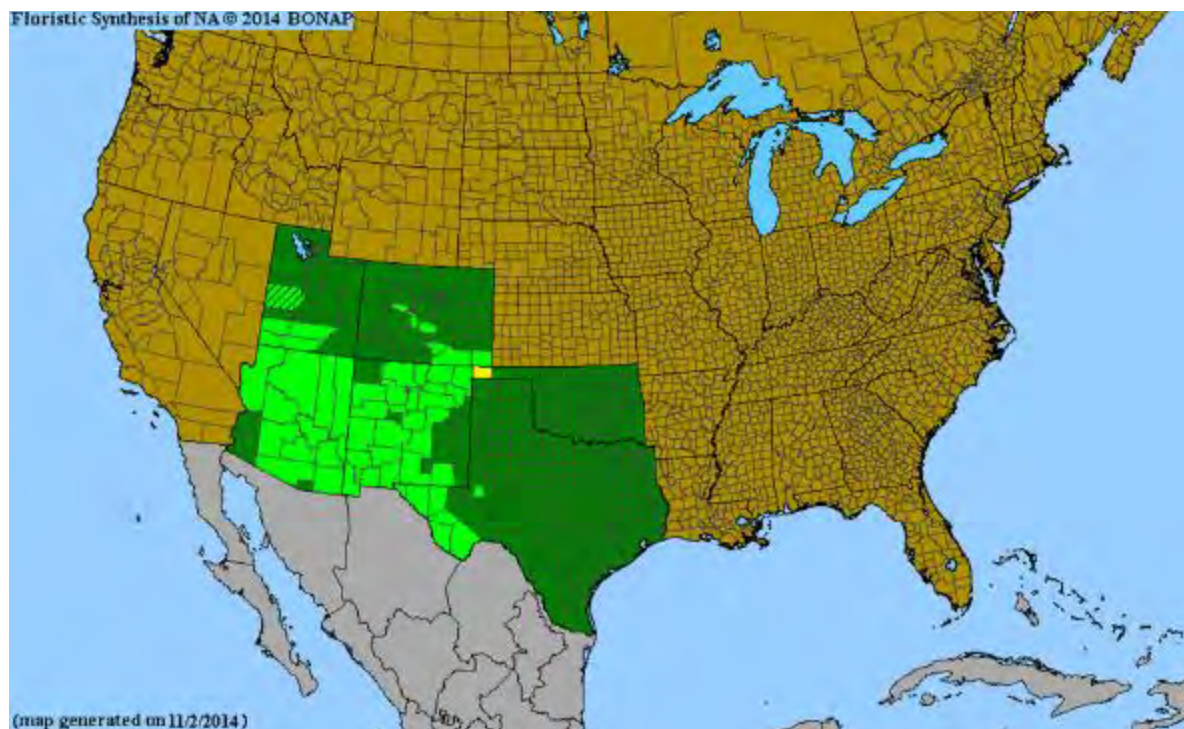


Figure 203. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Wright's cliffbrake

(*Pellaea wrightiana*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: CNHP contains five occurrence polygons from 1972-2007; the spatial accuracy of these records ranges from low (1985 observation) to high (2007 observation) (CNHP 2024, Van Scoyoc 2024). The 2007 polygon occurs solely within the plan area; therefore, this species is known to occur.

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: No population trends in plan area are available.
 - b. Habitat: species occurs in generally inaccessible cliff habitats; occurrence reports indicate stable habitat conditions.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Collection remarks describe a "a very large population" at one location in the plan area.
 - b. Ecological conditions: cliffs and rocky slope habitat are not limited in the plan area.

Species Status

G5; S2 in Colorado.

Taxonomy

Pellaea wrightiana is accepted as valid (NRCS 2025). The taxonomic status of Wright's cliffbrake has long been disputed (Windham et al. 2022). *Pellaea ternifolia* var. *wrightiana* is a taxonomic synonym (Windham et al. 2022, NatureServe 2025).

Species range

Overall Species range:

This species geographic range spans most of the southwestern United States and northwest Mexico (Windham et al. 2022, NatureServe 2025) (Figure 204). Disjunct populations occur in North Carolina (Cartwright 2019).

Description of how the population in the plan area fits within the overall range:

The plan area is at the northern edge of the species' range (Figure 204).

Distribution, abundance, and trend in the plan area

Population:

The element occurrence report from Pat Canyon in 1993 states "Population consists of fewer than 20 stems (12). Sporangia mature (dark) at time of visit; did not search entire area of potential habitat." The element occurrence report from 1994 (EO ID 3934) states "Large population for Colorado. A very large population, vigorous growth." This occurrence polygon occurs in Purgatoire Canyon, and over half of the polygon occurs in the plan area (Van Scoyoc 2024). The population size in the plan area is not known but based on the 1994 occurrence report it is not considered to be low.

Habitat

Habitat for wright's cliffbrake includes cliffs and rocky slopes, on a variety of acidic to mildly basic substrates at an elevational range of 984 – 9514 ft (300 – 2900 m) (SEINet 2024). It has been associated with acidic-reaction outcrops across much of its range (McMillan et al. 2018). It is typically more common on southern and western slopes (Heafner 2001, Windham 1983), although it has also been observed in the plan area on north-facing slopes (EO ID 10600).

The species has only been documented within the Comanche National Grassland portion of the plan area (Van Scoyoc 2024). It has been found in the southern portion of both the Timpas and Carrizo Units in Holt, Lockwood, Pat, Purgatoire, and Picture Canyons (Van Scoyoc 2024). All observations within the plan area have been on Dakota sandstone cliffs (Van Scoyoc 2024).

The element occurrence report from 1994 in Purgatoire Canyon (EO ID 3934) states "Extensive, undisturbed, naturally protected habitat... no impact visible...very difficult land access, no human-use." Some of the occurrence records occur in active allotments, but the element occurrence report from 2007 (EO ID 16859) states "cattle cannot access small cracks in sandstone canyon walls." Overall, because this species occurs in inaccessible cliff habitats, its habitat is considered stable.

Threats (arising from on or off the plan area)

Population

None of the sources consulted identified threats to populations (Windham 1983, Heafner 2001, McMillan et al. 2018, Windham et al. 2022, SEINet 2024, NatureServe 2025). Populations in North Carolina have declined, but the mechanism for declines is not known (McMillan et al. 2018).

Habitat

None of the sources consulted identified threats to habitat (Windham 1983, Heafner 2001, McMillan et al. 2018, Windham et al. 2022, SEINet 2024, NatureServe 2025).

Ecological conditions

Ecological condition requirements

The species requires cliffs and rocky slope habitat of suitable pH. Heafner (2001) notes that “smaller individuals also grow out of crevices in the bare rock but rarely survive the growing season because of intense reflected heat.” This species requires partial shade, which can be provided by low-hanging species such as juniper or pinyon or other structure such as a rock overhang (Windham 1983, Heafner 2001). The species is a xerophytic fern with low water requirement (Heafner 2001).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Its primary ecological requirement is cliffs and rocky slope habitat. It has been observed in five different canyons across the plan area (Van Scoyoc 2024). Its habitat within the plan area is considered stable by virtue of inaccessibility. Therefore, the ecological conditions for Wright’s cliffbrake are not considered to be restricted in the plan area.

Critical biological characteristics

Wright’s cliffbrake is a cryptic, xeric-adapted cheilanthoid fern (Windham 1983). The fern life cycle is made up of two distinct phases: the large, long-lived, iteroparous sporophyte and the small, short-lived, semelparous gametophyte (Wild and Gagnon 2005). Wright’s cliffbrake is perennial and strongly rhizomatous, reproducing predominately asexually (Windham 1983). It produces spores (sporulates) in summer-fall (SEINet 2024). It is a fertile hybrid between *P. truncata* and *P. ternifolia* and is typically tetraploid (Windham et al. 2022). It can hybridize with *P. truncate*, *P. ternifolia arizonica*, and *P. atropurpurea* (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found specifically for this species.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found specifically for this species. Ferns generally appear to be unpalatable to grazing herbivores, and their distribution is primarily driven by abiotic factors (Wild and Gagnon 2005). Climate and habitat may limit the dispersal and establishment of ferns; research suggests that local patchy distributions are not solely due to microhabitat rarity, but also dispersal or recruitment limitations (NRCS 2025).

Maps of Species Range

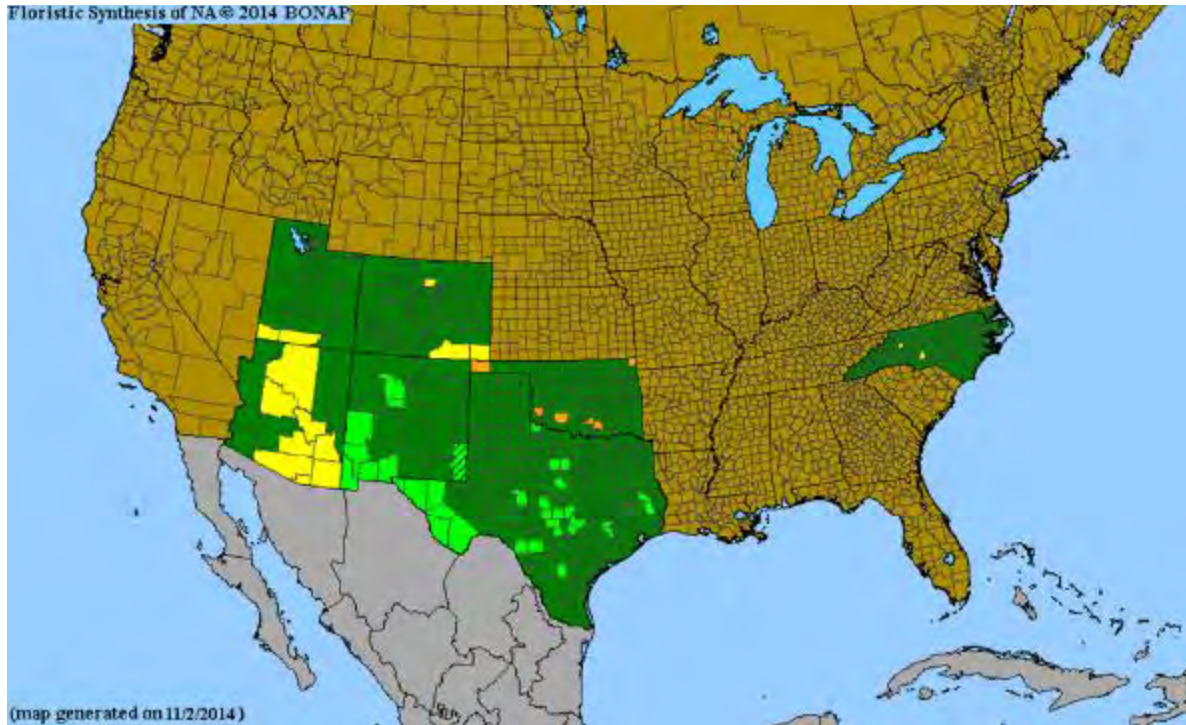


Figure 204. County occurrence data from Biota of North America Program (BONAP 2025) Dark green color indicates species is present in state and native; brown indicates species is not present in state; light green indicates species present and not rare in the county; yellow indicates species present and rare in the county.

Wright's false willow

(*Baccharis wrightii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has 3 occurrence records across the plan area from 2000-2022 (Van Scoyoc 2024). Some of these records have sufficient precision to demonstrate the species is known to occur in the plan area.

Year of Last Known Occurrence: 2022

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: no known threats.
 - b. Habitat: no known threats.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: no population trends in plan area are available.
 - b. Habitat: species can use varied habitat types, including shale barrens, juniper woodland, open steppe; no discernable trend.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The population in the plan area is not at the edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: size not known; considered locally common in some parts of the plan area.
 - b. Ecological conditions: uses varied upland habitats (shale barrens, juniper woodland, open steppe, etc.).

Species Status

G4; SNR in Colorado; S1 in Kansas.

Taxonomy

USDA NRCS recognizes *Baccharis wrightii* as valid; another common name is Wright's Baccharis (NRCS 2025).

Species range

Overall Species range:

Wright's false willow is distributed in Arizona, Colorado, Kansas, New Mexico, Oklahoma, Texas, Utah, and south into Mexico (Chihuahua, Durango, Sonora) (Van Scoyoc 2024) (Figure 205).

Description of how the population in the plan area fits within the overall range:

The plan area is not at the edge of the species' range (Figure 205).

Distribution, abundance, and trend in the plan area

Population:

Within the plan area, the population size and trend in the plan area is not known. One record from 2000 describes the species as "Infrequent in rocky soils in open juniper forest." BONAP has no data on rarity of this species by county. There have only been a few occurrence records in the plan area—all in the Timpas Unit of the Comanche, but there are several records adjacent to both Units in the Comanche.

Habitat

Wright's false willow occurs on dry sandy plains in sandy, limestone, gravelly or saline soils, at elevations from 5,000 to 6,000 feet (Van Scoyoc 2024). Within the plan area, it is often associated with rocky, exposed limestone/shale barrens and open steppe (Hazlett 2004). Occurrence records are concentrated in the Timpas Unit of the Comanche National Grassland.

Threats (arising from on or off the plan area)

Population

No consulted sources identified threats to populations (Hazlett 2004, Kuhn et al. 2011, Fernandes et al. 2022, NatureServe 2025, Van Scoyoc 2024).

Habitat

No consulted sources identified threats to habitat (Hazlett 2004, Kuhn et al. 2011, Fernandes et al. 2022, NatureServe 2025, Van Scoyoc 2024).

Ecological conditions

Ecological condition requirements

This species can use varied habitat types, including pinyon-juniper woodland, shale barrens, and shortgrass prairie (Hazlett 2004, Kuhn et al. 2011). USDA NRCS considers Wright's false willow a "facultative upland" species in the Great Plains region (NRCS 2025).

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

Given this species' use of varied, upland habitat types, including shortgrass prairie (Hazlett 2004, Kuhn et al. 2011), and a variety of soil types (SEINet 2024). Therefore, its ecological condition requirements are not considered restricted in the plan area.

Critical biological characteristics

Wright's false willow is a perennial subshrub to shrub in the aster family (Asteraceae) that flowers May - July and produces a dandelion-like seedhead (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

No information could be found for this species.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

No information could be found for this species. The genus *Baccharis* is generally understudied, but commonly seen as weedy or invasive (Fernandes et al. 2022).

Maps of Species Range

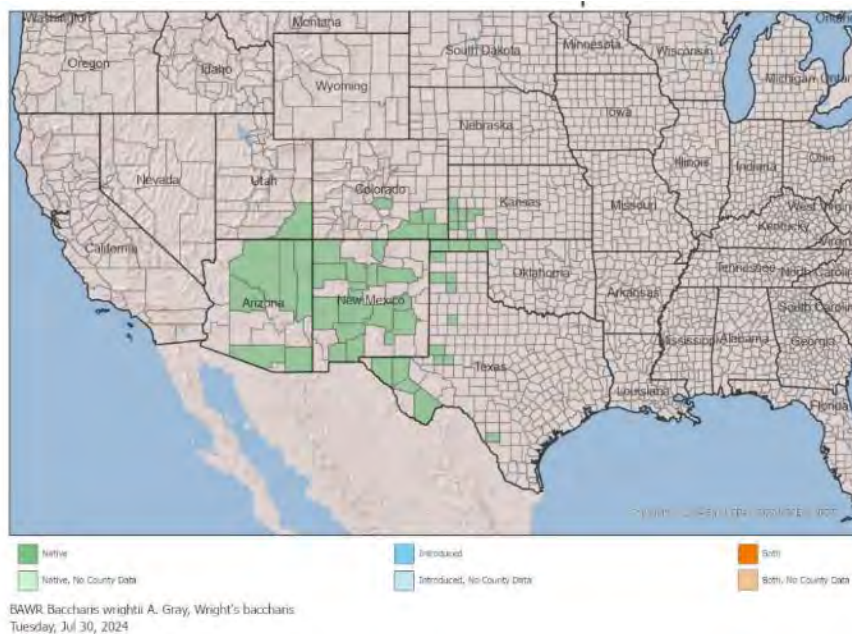


Figure 205. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Wright's goldenrod

(*Solidago wrightii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF has three records of occurrence for the plan area from 1991 to 2023, and iDigBio has two records of occurrence for the Plan Area from 1991 to 2021 (Van Scoyoc 2024). Some of these records have sufficient spatial precision to demonstrate this species is known to occur in the plan area.

Year of Last Known Occurrence: 2023

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: Loss or fragmentation of its habitat.
 - b. Habitat: Climate stressors, livestock grazing, and fire suppression as well as disturbances that can fragment the habitat such as energy development.
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Trend is not known at this time.
 - b. Habitat: The shortgrass prairie habitat is stable in Kansas but has deviated from historical conditions regarding composition in eastern Colorado. The woodlands have shown an increase in distribution.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. Species is at the northern edge of its range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: between 2-5 known occurrences in the plan area
 - b. Ecological conditions: It does not appear that ecological conditions are restricted in the plan area.

Species Status

G4; S2 in Colorado.

Taxonomy

The currently accepted valid name is *Solidago wrightii* A. Gray (ITIS 2024). Other synonyms include *Solidago bigelovii* A. Gray, *Solidago wrightii* var. *adenophora* S.F. Blake, *Solidago wrightii* var. *wrightii* A. Gray, and *Solidago bigelovii* var. *wrightii* (A. Gray) A. Gray (TSN 36320) (ITIS 2024).

Species range

Overall Species range

The complete range of this species includes Arizona, Colorado, New Mexico, Oklahoma and Texas (NatureServe 2025). It's more widespread in the southwest and Texas compared to further north in the Great Plains area (Colorado and Oklahoma).

Description of how the population in the plan area fits within the overall range

Part of the plan area is within the overall species range; however, this species is considered at the northern edge of its range.

Distribution, abundance, and trend in the plan area

Population

NatureServe did not have any distribution data available for this species. GBIF has three records of occurrence for the plan area from 1991 to 2023, and iDigBio has two records of occurrence for the plan area from 1991 to 2021 (Van Scoyoc 2024). There is no information about the abundance and trend of populations in the plan area.

Habitat

Mainly in canyons and oak brush in south central Colorado (NatureServe 2025). In general, it grows in dry areas and hillsides with oak, juniper and pine woods. It's associated with interior chaparral, semidesert grasslands, pinyon juniper woodlands, and disturbed areas with an elevational range of 3200 to 8800 feet. These habitats are widely available in the plan area.

The shortgrass prairie habitat type is the dominant habitat type across the plan area. It is considered good with a stable condition in Kansas (Rohweder 2022) but has deviated from historical conditions regarding composition in eastern Colorado (Crockett et al. 2023).

The sandsage prairie habitat type is the second-most widespread vegetation type in the plan area, and the most abundant type for the Cimarron National Grassland, specifically (USFS 2005a). In Kansas, the sandsage prairie habitat is declining both in quality and quantity (Rohweder 2022). In Colorado, about 20% of the historic sandsage habitat has been lost or converted for agricultural uses (CPW 2015). The remaining tracts have good landscape connectivity, but the species composition is highly altered (CPW 2015).

Juniper has increased in distribution and abundance in some ecosystems within the plan area, particularly the canyonlands of the Comanche National Grassland (USFS 2005a). The current ecosystem condition is likely well outside the historic range (USFS 2005a), but the overall trend is unknown.

Threats (arising from on or off the plan area)

Population

Loss or fragmentation of habitat.

Habitat

Climate stressors, livestock grazing, and fire suppression are all threats to the habitat that can impact the presence and quality of the woodlands and the associated understory, as well as the shortgrass prairie vegetation type. Habitat fragmentation can be caused by oil and gas development and the presence of roads, which reduces the size and distribution of connected continuous habitat. Threats common in the shortgrass prairie (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Dry, arid areas with oak, juniper, and/or pine woodlands.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

The plan area is widely dispersed with dry, semiarid grasslands and areas containing oak, juniper and/or woodlands. The shortgrass prairie habitat type is the most widespread vegetation type in the plan area and is considered stable (Rohweder 2022). Pinyon-juniper woodlands and Savanna habitats are restricted in the plan area but have shown an increased distribution and abundance, particularly in the canyonlands of the Comanche NG (USFS 2005a).

Critical biological characteristics

Species generally grows in dry areas and hillsides with oak, juniper and pine woods. It's known to flower from July to October and can grow to be three feet tall (SEINet 2024).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown.

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown.

Maps of Known Occurrences in Plan Area

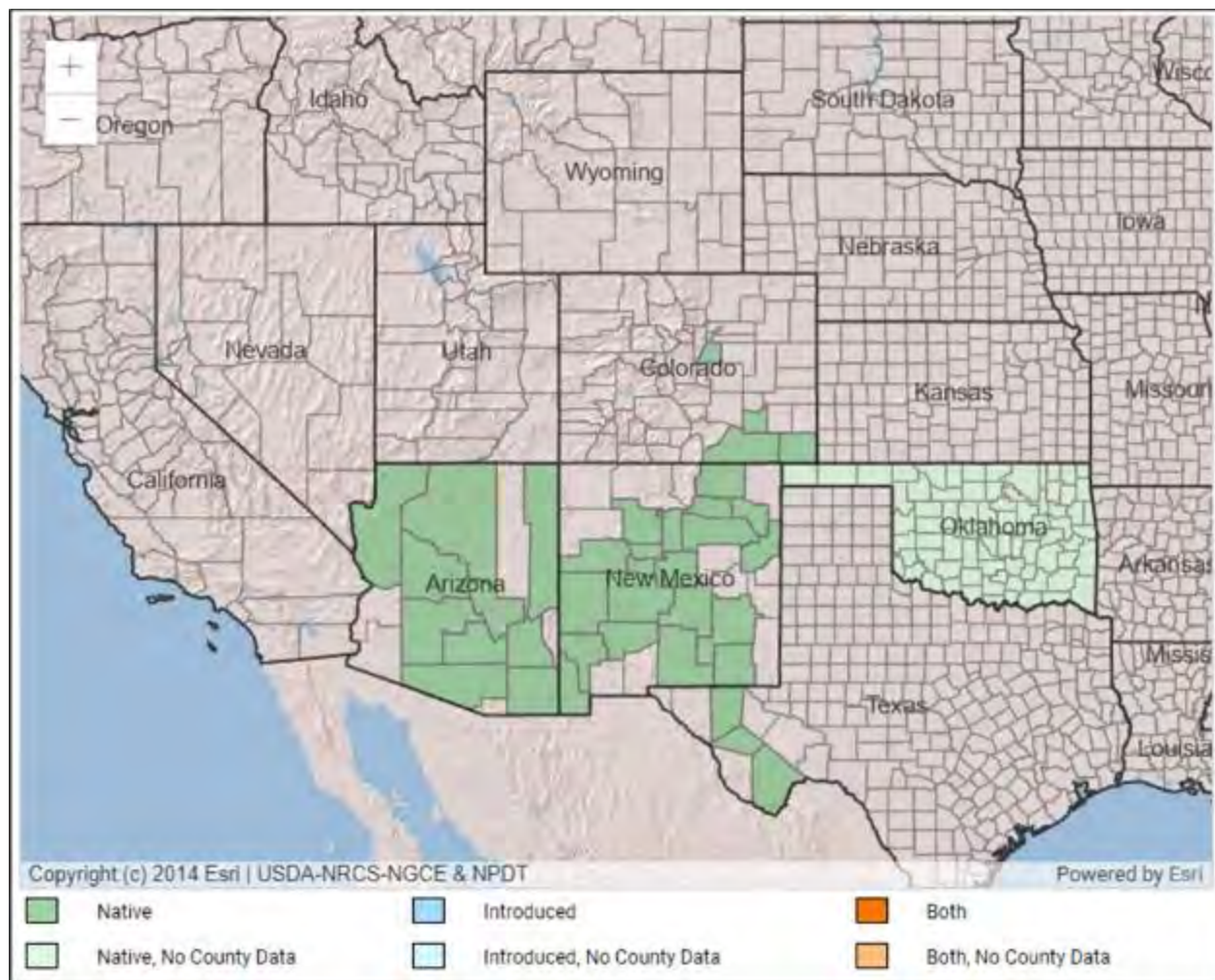


Figure 206. Species distribution for Wright's goldenrod (NRCS 2025).

Wright's three-awn grass

(*Aristida purpurea* var. *wrightii*)

Species is Native and Known to Occur on National Forest System Lands in Plan Area: Yes

Rationale/Evidence of Occurrence: GBIF and SEINet have three documented occurrence records in the plan area (Van Scoyoc 2024).

Year of Last Known Occurrence: 2007

Summary of indicators of conservation concern

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat).
 - a. Population: No sources consulted identified threats to this variety.
 - b. Habitat: General threats include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, recreation, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (CPW 2015, Rohweder 2022). Threats common in the varied habitat types (see Threats and Trends Appendix).
2. Declining trends in populations or habitat in the plan area:
 - a. Population: Population trends in the plan area are unknown.
 - b. Habitat: Variety uses varied habitats.
3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range):
 - a. The plan area is at the northern edge of the species' range.
4. Low population numbers or restricted ecological conditions (habitat) within the plan area:
 - a. Population: Population size is not known. There are three documented occurrences in the plan area.
 - b. Ecological conditions: Wright's three-awn grass has been associated with a variety of habitats in the plan area. Given this breadth of habitat associations, its ecological conditions are not considered restricted.

Species Status

TNR: S1 in Colorado; NA in Kansas.

Taxonomy

Aristida purpurea var. *wrightii* is accepted as valid and synonyms are *Aristida brownii* and *Aristida wrightii* (NatureServe 2025, NRCS 2025). This species may be confused with var. *nealleyi*, but it also intergrades with var. *purpurea* and var. *parishii* (SEINet 2024, Flora of North America 1993).

Species range

Overall Species range

Wright's three-awn grass occurs in Arizona, California, Colorado, New Mexico, Oklahoma, Texas, and Utah (NatureServe 2025).

Description of how the population in the plan area fits within the overall range

The plan area is at the northern edge of the species' range (Figure 207).

Distribution, abundance, and trend in the plan area

Population

There are three documented occurrence records on the Timpas (1) and Carrizo (2) Units of the Comanche NG within the canyonlands ecosystem (USFS 2005a). Kuhn (2011) found this species in Las Animas and Baca County in a floristic inventory.

One of the observations on the Timpas Unit is 150 feet from a Scenic Byway route.

Population and population trends for this variety in the plan area is unknown.

Habitat

Species grows on sandy to gravelly hills and flats from 1,500 to 5,000 feet (SEINet 2024). Kuhn (2011) describes habitat as juniper woodlands and midgrass prairie in a floristic inventory of the Cimarron and Comanche National Grasslands.

Herbarium records are within the canyonlands ecosystem (USFS 2005a). The occurrence records are spatially mapped within the Western Great Plains Shortgrass Prairie (Landfire 2024).

The locality of the observation includes one in Sand Creek Canyon, side canyon of Holt Canyon, and one in the Purgatoire River valley. Habitat descriptions of the occurrence records is lower slopes and bottoms of narrow side canyons, on slopes, and hills flanking river valley dominated by one-seed juniper (*Juniperus monosperma*) (SEINet 2024).

Species uses varied habitats. Trends common in the habitat type (see Threats and Trends Appendix).

Threats (arising from on or off the plan area)

Population

No sources consulted identified any unique threats to this variety.

Habitat

General threats to the habitat include housing and urban areas, livestock farming and ranching, oil and gas drilling, commercial and industrial areas, annual and perennial non-timber crops, roads and railroads, recreation, invasive non-native/alien species, droughts, renewable energy, and fire and fire suppression (Rohweder 2022, CPW 2015) (see Threats and Trends Appendix).

Ecological conditions

Ecological condition requirements

Wright's three-awn grass has been associated with a variety of habitats in the plan area, including sandy to gravelly hills and flats, juniper woodlands, and midgrass prairie. Given the breadth of habitat associations, its ecological conditions are not considered restricted.

Amount, quality, distribution, connectivity, status, and trend of ecological conditions in plan area

There are three occurrence records on the Comanche NG, one in the Timpas Unit and two in the Carrizo Unit. Herbarium records are within the canyonlands ecosystem (USFS 2005a). The occurrence record is spatially mapped within the Western Great Plains Shortgrass Prairie (Landfire 2024).

The locality of the observation is in Sand Creek Canyon, side canyon of Holt Canyon, and Purgatoire River valley. Habitat descriptions of the occurrence records includes lower slopes and bottoms of narrow side canyons, on slopes, and hills flanking river valley dominated by one-see juniper (*Juniperus monosperma*) (SEINet 2024).

Critical biological characteristics

No sources consulted identified any critical biological characteristics for this variety. Wright's three-awn grass flowers when soil moisture is sufficient (Van Scoyoc 2024).

Information was found relating to the parent species. Purple three-awn grass is adapted to dry, recently disturbed sites. It is a warm-season, native perennial bunchgrass that is seral on most sites. Purple three-awn grass is highly competitive during droughts lasting only a few years. It tends to decrease during periods of extended drought (Howard 1997). This species is generally unpalatable due to its spike-like awns and tends to increase with grazing and maintains a persistent seedbed (Howard 1997).

Important ecological and biological interactions

How (or if) this species influences other species or ecosystem diversity or integrity

Unknown at the variety level.

Information at the parent level include forage value of purple three-awn grass is only poor to fair (Howard 1997). Black-tailed prairie dog graze purple three-awn lightly but don't prefer it. Purple three-awn grass is often one of the few grasses remaining in areas severely disturbed by prairie dogs (Howard 1997).

Purple three-awn grass tends to increase with grazing (Howard 1997). The seeds are food for some songbirds, like the Junco, and plants provide nesting materials or habitat for some native bees, fur, and game animals (NPIN 2025). Plants attract butterflies, serve as a larval host for skippers and Satyrs, and are highly deer resistant (NPIN 2025).

Influence of ecosystem structure and function on this species (includes departure from NRV or new influences)

Unknown at the variety level.

Purple three-awn grass is seral on most sites but is a component of stable plant communities on some sites. It is one of the first grasses to establish on abandoned fields and other disturbed sites (NRCS 2025). It is capable of thriving in areas that have been heavily grazed.

Maps of Species Range

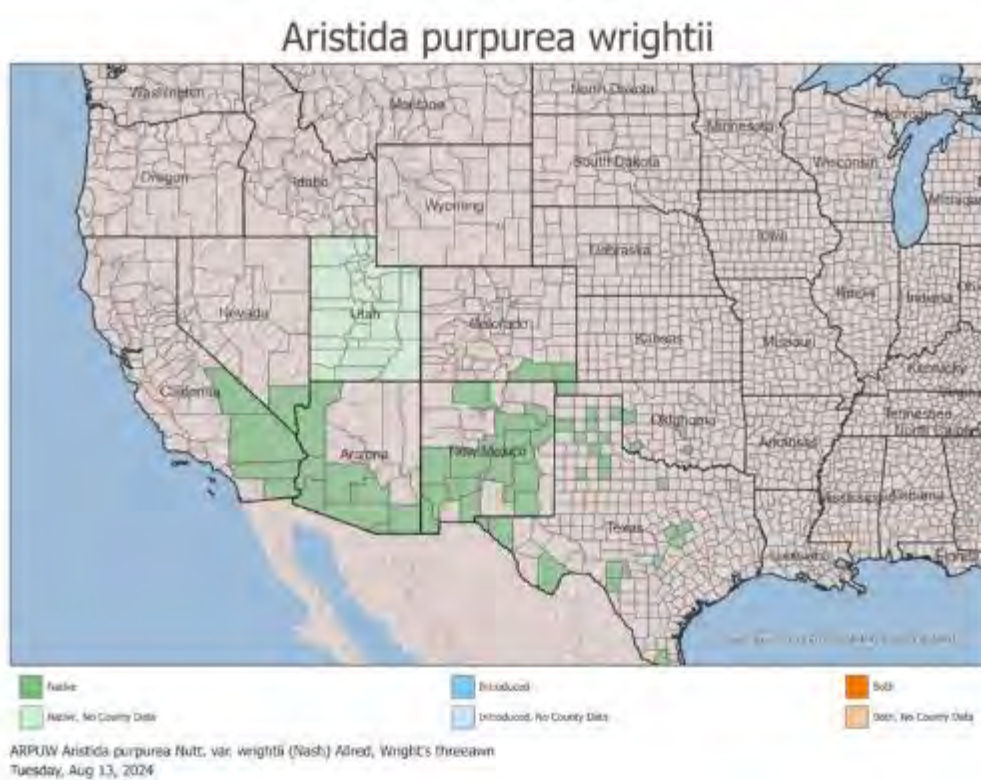


Figure 207. USDA NRCS PLANTS database map showing native status and distribution (NRCS 2025).

Consolidated Literature Cited

- Ackerfield, J. 2022. Flora of Colorado. 2nd ed. Fort Worth, TX: BRIT Press, Fort Worth Botanic Garden. 4 p.
- Anderson, M. 2006. *Salix exigua* (online data) Fire effects information system. Missoula, MT: USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Date Accessed: August 8, 2024. Available at: <https://www.fs.usda.gov/database/feis/plants/shrub/salexi/all.html>
- Bailey, P. 2013. Pollination Biology of the Endemic *Erigeron lemmonii* A. Gray, and It's Insect Visitor Networks Compared to Two Widespread Congeners *Erigeron arisoli* G.L. Nelson and *Erigeron neomexicanus* A. Gray (Asteraceae). Ph.D. Dissertation, University of Guelph, Guelph, ON, Canada. 187 p. <http://hdl.handle.net/10214/6373>
- Bartkowska, M.P. and Johnston, M.O. 2012. Pollinators cause stronger selection than herbivores on floral traits in *Lobelia cardinalis* (Lobeliaceae). *New Phytologist* 193: 1039-1048. <https://www.doi.org/10.1111/j.1469-8137.2011.04013.x>
- Basara, J., Maybourn, J.N., Peirano, C.M., Tate, J.E., Brown, P.J., Hoey, J.D., and Smith, B.R. 2013. Drought and associated impacts in the Great Plains of the United States—a review. *International Journal of Geosciences* 4(6A2): 72-81. <https://doi.org/10.4236/ijg.2013.46A2009>
- Baumgartner, A., Donahoo, M., Chitwood, D.H., and Peppe, D.J. 2020. The influences of environmental change and development on leaf shape in *Vitis*. *American Journal of Botany* 107(4): 676-688. <https://www.doi.org/10.1002%2Fajb2.1460>
- Beal, E.O., Wooten, J.W., and Kaul, R.B. 1982. Review of the *Sagittaria engelmanniana* Complex (Alismataceae) With Environmental Correlations. *Systematic Botany* 7(4): 417-432. <https://doi.org/10.2307/2418675>
- Binder, E.M., Blodgett, D.J., Currin, J.F., Caudell, D., Cherney, J.H., and LeRoith, T. 2010. *Phalaris arundinacea* (reed canarygrass) grass staggers in beef cattle. *Journal of Veterinary Diagnostic Investigation* 22(5): 802-805. <https://doi.org/10.1177/104063871002200529>
- Blossingame, J.L. 1968. Revision of the genus *Pilosyles* in the Southwestern United States. M.S. Thesis, Texas Tech University, Lubbock, TX. 63 p. <http://hdl.handle.net/2346/14722>
- BONAP, the Biota of North America Program. 2025. North American Vascular Flora: Taxonomic Data Center Query (TDC-Q) (online data) (The project record contains date-stamped copies of relevant species and ecosystem data from this source). Berkeley, CA: The University of California, Berkeley, The University and Jepson Herbaria. Date Accessed: May 7, 2025. Available at: <https://bonap.net/tdc>
- Borsai, O., Hassan, M.A., Negrușier, C., Raigón, M.D., Boscaiu, M., Sestraș, R.E., and Vicente, O. 2020. Responses to salt stress in portulaca: Insight into its tolerance mechanisms. *Plants* 9(12): 24. <https://doi.org/10.3390/plants9121660>
- Brady, W.W., Stromberg, M.R., Aldon, E.F., Bonham, C.D., and Henry, S.H. 1989. Response of a Semidesert Grassland to 16 Years of Rest from Grazing. *Journal of Range Management* 42(4): 284-288. <https://journals.uair.arizona.edu/index.php/jrm/article/viewFile/8383/7995>
- Brasher, J.W. 2001. Rosaceae rose family. Part one: *Rubus* L. raspberries, blackberries, thimbleberries. *Journal of the Arizona-Nevada Academy of Science* 33(1): 50-57. <https://www.jstor.org/stable/40022254>
- Brikowski, T.H. 2008. Doomed Reservoirs in Kansas, USA? Climate Change and Groundwater Mining on the Great Plains Lead to Unsustainable Surface Water Storage. *Journal of Hydrology* 354(1): 90-101. <https://doi.org/10.1016/j.jhydrol.2008.02.020>
- Brower, L.P., Taylor, O.R., Williams, E.H., Slayback, D.A., Zubieta, R.R., and Ramirez, M.I. 2012. Decline of monarch butterflies overwintering in Mexico: Is the migratory phenomenon at risk? *Insect Conservation and Diversity* 5(2): 95-100. <https://doi.org/10.1111/j.1752-4598.2011.00142.x>
- Burke Museum. 2025. Burke Herbarium image collection: Vascular plants, macrofungi, and lichenized fungi of Washington (online data) (The project record contains date-stamped copies of relevant species and ecosystem data from this source). Seattle, WA: University of Washington. Date Accessed: May 06, 2025. Available at: <https://www.burkeherbarium.org/imagecollection>
- Butler, C.J., Wheeler, E.A., and Stabler, L.B. 2012. Distribution of the Threatened Lace Hedgehog Cactus (*Echinocereus reichenbachii*) Under Various Climate Change Scenarios. *The Journal of the Torrey Botanical Society* 139(1): 46-55. <https://www.jstor.org/stable/41475121>

- Cable, T.T., Seltman, S., and Cook, K.J. 1996. Birds of Cimarron National Grassland. Gen. Tech. Rep. RM-GTR-281. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 108 p. <https://doi.org/10.2737/RM-GTR-281>
- CalFlora. 2024. The Calflora Database (online data) (The project record contains date-stamped copies of relevant species and ecosystem data from this source). Berkeley, CA. Date Accessed: May 6, 2024. Available at: <https://www.calflora.org>
- California Native Plant Society. 2024. Calscape: California's native plant destination (online data) (The project record contains date-stamped copies of relevant species and ecosystem data from this source). Sacramento, CA. Date Accessed: May 6, 2024. Available at: <https://calscape.org>
- Callen, S.T., Klein, L.L., and Miller, A.J. 2016. Climatic niche characterization of 13 North American Vitis species. American Journal of Enology and Viticulture 67: 339. <https://www.ajevonline.org/content/67/3/339>
- Cao, J., Xu, J., Pan, X., Monaco, T.A., Zhao, K., Wang, D., and Rong, Y. 2021. Potential impact of climate change on the global geographical distribution of the invasive species, Cenchrus spinifex (Field sandbur, Gramineae). Ecological Indicators 131: 8. <https://doi.org/10.1016/j.ecolind.2021.108204>
- Caplan, T.R., Cothorn, K., Landers, C., and Hummel, O.C. 2012. Growth response of coyote willow (Salix exigua) cuttings in relation to alluvial soil texture and water availability. Restoration Ecology 21(5): 627-638. <https://doi.org/10.1111/j.1526-100X.2012.00928.x>
- Carey, J.H. 1995a. Fire Effects Information System (FEIS): Krascheninnikovia lanata (website). USDA Forest Service, Rocky Mountain Research Station, Last Modified: November 18, 2024. Date Accessed: August 2, 2024. <https://www.fs.usda.gov/database/feis/plants/shrub/kralan/all.html>
- Carey, J.H. 1995b. Species: Lolium multiflorum (website). USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory <http://www.fs.fed.us/database/feis/>
- Cartwright, J. 2019. Ecological Islands: Conserving Biodiversity Hotspots in a Changing Climate. Frontiers in Ecology and the Environment 17(6): 331-340. <https://doi.org/10.1002/fee.2058>
- Caruso, C.M., Maherali, H., and Sherrard, M. 2006. Plasticity of physiology in Lobelia: Testing for adaptation and constraint. Evolution 60: 980-90. <https://doi.org/10.1111/j.0014-3820.2006.tb01176.x>
- Ceschin, S., Abati, S., Ellwood, N.T.W., and Zuccarello, V. 2018. Riding invasion waves: Spatial and temporal patterns of the invasive Lemna minuta from its arrival to its spread across Europe. Aquatic Botany 150: 1-8. <https://doi.org/10.1016/j.aquabot.2018.06.002>
- Ceschin, S., Crescenzi, M., and Iannelli, M.A. 2020. Phytoremediation potential of the duckweeds Lemna minuta and Lemna minor to remove nutrients from treated waters. Environmental Science and Pollution Research 27(13): 15806-15814. <https://doi.org/10.1007/s11356-020-08045-3>
- Churchill, S., Feeman, C.C., and Kantak, G.E. 1988. The vascular flora of the Niobrara Valley Preserve and adjacent areas in Nebraska. Transactions of the Nebraska Academy of Sciences and Affiliated Societies 178: 1-15. <https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1177&context=tnas>
- Clark, S.A., Tripp, B., Hankins, D., Rossier, C.E., Varney, A., and Nairn, I. 2024. Good fire II: Current barriers to the expansion of cultural burning and prescribed fire use in the United States and recommended solutions. Good Fire. Vol. II. Dated: March 5, 2024. Happy Camp, CA: Karuk Tribe. 71 p. <https://karuktribeclimatechangeprojects.files.wordpress.com/2024/03/good-fire-ii-march-2024.pdf>
- Clinebell, R.R., Crowe, A., Gregory, D.P., and Hoch, P.C. 2004. Pollination ecology of Gaura and Calylophus (Onagraceae, tribe Onagreae) in western Texas, U.S.A. Annals of the Missouri Botanical Garden 91(3): 369-400. <https://www.jstor.org/stable/3298616>
- CNHP, Colorado Natural Heritage Program. 2010. Ecological systems: Shortgrass prairie (website). Colorado Natural Heritage Program, Last Modified: September 21, 2010. Date Accessed: October 27, 2024. <https://cnhp.colostate.edu/cnhpblog/2010/09/21/ecological-systems-shortgrass-prairie/>
- CNHP, Colorado Natural Heritage Program. 2024. Colorado Rare Plant Guide (online data) (The project record contains date-stamped copies of relevant species and ecosystem data from this source). Date Accessed: May 14, 2025. Available at: <https://cnhp.colostate.edu>
- Cooper, B.J., Moore, M.J., Douglas, N.A., Wagner, W.L., Johnson, M.G., Overson, R.P., Kinoshian, S.P., McDonnell, A.J., Levin, R.A., Raguso, R.A., Flores Olvera, H., Ochoterena, H., Fant, J.B.,

- Skogen, K.A., and Wickett, N.J. 2023. Target enrichment and extensive population sampling help untangle the recent, rapid radiation of *Oenothera* Sect. *Calylophus*. *Systematic Biology* 72(2): 249-263. <https://doi.org/10.1093/sysbio/syac032>
- Cooper, S.V. 2003. Assessment of Kootenai National Forest vegetation types with potential for *Silene spaldingii* in the Tobacco Plains, Rexford Bench and Salish Range Foothills. Helena, MT: Montana Natural Heritage Program, Supervisor's Office. <https://mtnhp.mt.gov/resources/Reports/?year=2003>
- Cooper, S.V. and Jean, C. 2001. Wildfire Succession in plant communities natural to the Alkali Creek Vicinity, Charles M. Russel National Wildlife Refuge, Montana. Helena, MT: Montana Natural Heritage Program. 70 p. <https://www.biodiversitylibrary.org/page/37368558#page/3/mode/1up>
- Cosmulescu, S., Ștefănescu, D., and Stoenescu, A.-M. 2022. Variability of phenological behaviours of wild fruit tree species based on discriminant analysis. *Plants* 11(1): 1-8. <https://www.doi.org/10.3390/plants11010045>
- Cox, J.R., Giner-Mendoza, M., Dobrenz, A.K., and Smith, M.F. 1992. Defoliation effects on resource allocation in Arizona cottontop (*Digitaria californica*) and Lehmann lovegrass (*Eragrostis lehmanniana*). *Journal of the Grassland Society of Southern Africa* 9(2): 53-59. <https://doi.org/10.1080/02566702.1992.9648300>
- Coxe, R. 2023. A comprehensive guide to Dwarf Milkweed (*Asclepias involucrata*) (website). McMullen House Garden Shop, Last Modified: March 27, 2023. Date Accessed: August 30, 2024. <https://shop.mcmullenhouse.com/dwarf-milkweed-asclepias-involucrata/>
- CPW, Colorado Parks and Wildlife. 2015. State wildlife action plan: A strategy for conserving wildlife in Colorado. Denver, CO: Colorado Parks and Wildlife. 865 p. <https://cpw.widencollective.com/assets/share/asset/nbenjdfemj>
- Craine, J.M., Towne, E.G., Miller, M., and Fierer, N. 2015. Climatic warming and the future of bison as grazers. *Scientific Reports* 5(1): 16738. <https://doi.org/10.1038/srep16738>
- Crites, G.D. and Terry, R.D. 1984. Nutritive value of maygrass, *Phalaris caroliniana*. *Economic Botany* 38(1): 114-120. <https://doi.org/10.1007/BF02904421>
- Crockett, E.T.H., Atkins, J.W., Guo, Q., Sun, G., Potter, K.M., Ollinger, S., Silva, C.A., Tang, H., Woodall, C.W., Holgerson, J., and Xiao, J. 2023. Structural and species diversity explain aboveground carbon storage in forests across the United States: Evidence from GEDI and forest inventory data. *Remote Sensing of Environment* 295: 113703. <https://doi.org/10.1016/j.rse.2023.113703>
- Cuba-Díaz, M., Troncoso, J.M., Cordero, C., Finot, V.L., and Rondanelli-Reyes, M. 2013. *Juncus bufonius*, A New Non-Native Vascular Plant in King George Island, South Shetland Islands. *Antarctic Science* 25(3): 385-386. <https://doi.org/10.1017/S0954102012000958>
- Culver, D.R. and Lemly, J.M. 2013. Field guide to Colorado's wetland plants: Identification, ecology and conservation (Part 2). Fort Collins, CO: Colorado National Heritage Program (CNHP). 319-694 pp. <https://cnhp.colostate.edu/library/field-guides/colorado-wetland-field-guide/>
- Decker, K. 2006. *Asclepias uncialis* Greene (Wheel Milkweed): A Technical Conservation Assessment. Dated: April 24, 2006. Washington, DC: USDA Forest Service, Rocky Mountain Region (R2). 51 p. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5206820.pdf
- Deem, A.W., Thorp, F., Jr., and Durrell, L.W. 1939. Range plant newly found to be poisonous. *Science* 89(2315): 435. <https://doi.org/10.1126/science.89.2315.435.a>
- Delisle, J. 2024. *Amorpha nana* record. Wright, M. email Lawrence, KS, January 26, 2024.
- Dennhardt, L.A. 2016. Evidence of climate niche creation in the northern Great Plains: The history of invasion, population genetics, competitive effect, and long-term trends of *Poa pratensis* L. Ph.D. Dissertation. Agriculture and Applied Science, Biological Sciences, North Dakota State University, Fargo, ND. 284 p. <https://hdl.handle.net/10365/28229>
- Dickson, T.L., Poynor, B., and Helzer, C.J. 2023. Cattle graze central US milkweeds at least as much as grasses, even under patch-burn-grazing management. *Rangeland Ecology & Management* 87: 158-166. <https://doi.org/10.1016/j.rama.2023.01.001>
- Douhovnikoff, V., McBride, J.R., and Dodd, R.S. 2005. *Salix exigua* clonal growth and population dynamics in relation to disturbance regime variation. *Ecology* 86(2): 446-452. <https://doi.org/10.1890/04-0257>
- Duenas, M.A. 2009. Least Duckweed (*Lemna minuta*) (online data). Wallingford, UK: CABI Digital Library. Date Published: November 25, 2009. Date Accessed: May 6, 2024. Available at: <https://doi.org/10.1079/cabicompendium.108968>

- Dykstra, A.B. 2013. Seedling recruitment in fragmented populations of *Echinacea angustifolia*. Ph.D. Dissertation, University of Minnesota, Minneapolis, MN. 122 p.
<https://hdl.handle.net/11299/146654>
- Dynesius, M., Åström, M., and Nilsson, C. 2008. Microclimatic buffering by logging residues and forest edges reduces clear-cutting impacts on forest bryophytes. *Applied Vegetation Science* 11(3): 345-354. <https://doi.org/10.3170/2008-7-18457>
- Elzinga, C.L., Salzer, D.W., and Willoughby, J.W. 1998. Measuring and monitoring plant populations. BLM Technical Reference 1730-1. Denver, CO: U.S. Department of the Interior, Bureau of Land Management (BLM), National Business Center. 496 p.
- Fern, K., Fern, A., and Morris, R. 2024. *Pediomelum cuspidatum* (website). Useful Temperate Plants, Last Modified: October 12, 2022. Date Accessed: May 15, 2024.
<https://temperate.theferns.info/viewtropical.php?id=Pediomelum+cuspidatum>
- Fernandes, G.W., Oki, Y., and Barbosa, M. 2022. *Baccharis: From evolutionary and ecological aspects to social uses and medicinal applications*. Cham, Switzerland: Springer Cham. 578 p.
<https://link.springer.com/book/10.1007/978-3-030-83511-8>
- Fertig, W. and Markow, S. 2000. State species abstract: Wyoming natural diversity database: *Salix barrattian* barratt willow. Laramie, WY: University of Wyoming, Wyoming Natural Diversity Database. 1-3 pp.
- Flora of North America. 1993. Flora of North America (online data) (The project record contains date-stamped copies of relevant species and ecosystem data from this source) Flora of North America Association. Date Published: January 22, 2024. Date Accessed: October 31, 2024. Available at: http://floranorthamerica.org/Main_Page
- Flora of the Southeastern United States. 2024. *Vernonia marginata*, (Torrey) Rafinesque, plains ironweed (website). North Carolina Botanical Garden. Date Accessed: November 11, 2024.
<https://fsus.ncbg.unc.edu/main.php?pg=show-taxon-detail.php&taxonid=67081>
- Forero, L., Nader, G., Craigmill, A., Ditomaso, J.M., Puschner, B., and Maas, J. 2011. Livestock-Poisoning Plants of California. Dated: January, 2011. ANR Pub. 8398. Richmond, CA: University of California, Agriculture and Natural Resources. 44 p. <https://doi.org/10.3733/ucanr.8398>
- Freeman, C.C. 1989. Rare plants of the Cimarron National Grassland, Kansas: Final report. 42. Lawrence, KS: Kansas Natural Heritage Program, Kansas Biological Survey.
- Freeman, C.C. 2001. The Genus *Aristida* (Poaceae) in Kansas. *Transactions of the Kansas Academy of Science* 104: 144-157. <https://www.jstor.org/stable/3627808>
- Fritzler, L.D. 2020. Grazing patterns, diet quality, and performance of cow - calf pairs grazing short grass prairie using continuous or high stocking density grazing strategies. M.S. Thesis, West Texas A&M University, Canyon, TX. 118 p. <https://hdl.handle.net/11310/390>
- Fuhlendorf, S.D. and Engle, D.M. 2001. Restoring heterogeneity on rangelands: Ecosystem management based on evolutionary grazing patterns. *BioScience* 51(8): 625-632. [https://doi.org/10.1641/0006-3568\(2001\)051\[0625:RHOREM\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2001)051[0625:RHOREM]2.0.CO;2)
- GBIF, Global Biodiversity Information Facility. 2023. GBIF: Free and open access to biodiversity data (online data) (The project record contains date-stamped copies of relevant species and ecosystem data from this source). Copenhagen, DK: GBIF Secretariat. Date Accessed: May 6, 2024. Available at: <https://www.gbif.org>
- Goeden, R.D. and Ricker, D.W. 1975. The Phytophagous Insect Fauna of the Ragweed, Ambrosia Confertiflora, in Southern California. *Environmental Entomology* 4: 301-306.
<https://www.doi.org/10.1093/ee/4.2.301>
- Grunau, L., Handwerk, J., and Spackman-Panjabi, S. 2011. Colorado Wildlife Action Plan: Proposed rare plant addendum. Dated: June, 2011. Fort Collins, CO: Colorado Natural Heritage Program for Rare Plant Conservation Initiative. 171 p. <https://www.natureserve.org/sites/default/files/co-swap-plants-ddcf-final.pdf>
- Gucker, C. and Shaw, N. 2018. Hoary tansyaster (*Dieteria canescens*), (Pursh), A. Gray (website). Western Forbs. Date Accessed: September 4, 2024. <https://westernforbs.org/species/dieteria-machaeranthera-canescens-hoary-tansyaster/>
- Guide to Poisonous Plants. 2024. *Suckleya*, poisonous suckleya (website). Colorado State University, College of Veterinary Medicine and Biomedical Sciences, Last Modified: 2023. Date Accessed: November 11, 2024. <https://poisonousplants.cvmbs.colostate.edu/plant/31>

- Guilloy, H., González, E., Muller, E., Hughes, F.M.R., and Barsoum, N. 2011. Abrupt drops in water table level influence the development of *Populus nigra* and *Salix alba* seedlings of different ages. *Wetlands* 31(6): 1249-1261. <https://doi.org/10.1007/s13157-011-0238-8>
- Haddock, M. 2024a. Kansas wildflower & grasses: *Lactuca ludoviciana*, western wild lettuce, (Nutt.) Riddell (website). Kansas State University. Date Accessed: November 12, 2024. https://kswildflower.org/flower_details.php?flowerID=59
- Haddock, M.J. 2024b. Wildflowers and grasses of Kansas: A field guide. Revised ed. Lawrence, KS: University Press of Kansas. 496 p. <https://doi.org/10.2307/jj.12832917>
- Hastings, N.D. and Rothenberger, S.J. 2013. A floristic analysis and comparison of plant communities in Harlan County, Nebraska. *Transactions of the Nebraska Academy of Sciences and Affiliated Societies* 33: 25-34. <https://digitalcommons.unl.edu/tnas/421/>
- Hazlett, D.L. 2004. Vascular plant species of the Comanche National Grassland in Southeastern Colorado. Gen. Tech. Rep. RMRS-GTR-130. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 36 p. <https://doi.org/10.2737/rmrs-gtr-130>
- Hazlett, D.L., Schiebout, M.H., and Ford, P.L. 2009. Vascular plants and a brief history of the Kiowa and Rita Blanca National Grasslands. Gen. Tech. Rep. RMRS-GTR-233. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 44 p. <https://doi.org/10.2737/RMRS-GTR-233>
- He, X., He, K.S., and Hyvönen, J. 2016. Will bryophytes survive in a warming world? Perspectives in Plant Ecology, Evolution and Systematics 19: 49-60. <https://doi.org/10.1016/j.ppees.2016.02.005>
- Heafner, K.D. 2001. *Pellaea wrightiana* Hooker (Pteridaceae) in North Carolina Revisited With a New Record for Eastern North America and a Key to *Pellaea* Species in the Carolinas. *Castanea* 66(4): 319-326. <https://www.jstor.org/stable/4033921>
- Heil, K.D. and Bleakly, D.L. 2006. *Penstemon jamesii* Benth. (James' beardtongue): A technical conservation assessment. Dated: November 28, 2006. Lakewood, CO: USDA Forest Service, Rocky Mountain Region. 36 p. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5206877.pdf
- Hicks, M.L. and Davison, P.G. 1989. Some rare, endemic, and disjunct liverworts in north Carolina. *Castanea* 54(4): 255-261. <https://www.jstor.org/stable/4033514>
- Hill, E., Bergstrom, J., Cordell, H.K., and Bowker, J.M. 2009. Natural resource amenity service values and impacts in the US. Athens, GA: University of Georgia, Dept of Agriculture and Applied Economics and USDA Forest Service, Southern Research Station. 73 p.
- Hill, S. 2003. Conservation assessment for black-stem spleenwort (*Asplenium resiliens* Kunze). Champaign, Ill: Illinois Natural History Survey. 2-29 pp. <https://www.ideals.illinois.edu/items/10121>
- Hobbs, R.J. and Huenneke, L.F. 1992. Disturbance, diversity, and invasion: implications for conservation. *Conservation Biology* 6(3): 324-337. <https://doi.org/10.1046/j.1523-1739.1992.06030324.x>
- Howard, J.L. 1997. Fire Effects Information System (FEIS): *Aristida purpurea* (website). (Virtual Dataset). USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Last Modified: 2014. Date Accessed: November 6, 2024. <https://www.fs.usda.gov/database/feis/plants/graminoid/aripur/all.html>
- Hulett, G.K., Tomelleri, J.R., and Hampton, C.O. 1988. Vegetation and flora of a sandsage prairie site in Finney County, southwestern Kansas. *Transactions of the Kansas Academy of Science* 91(3/4): 83-95. <https://doi.org/10.2307/3628341>
- Hylander, K., Jonsson, B.G., and Nilsson, C. 2002. Evaluating buffer strips along boreal streams using bryophytes as indicators. *Ecological Applications* 12(3): 797-806. [https://doi.org/10.1890/1051-0761\(2002\)012\[0797:EBSABS\]2.0.CO;2](https://doi.org/10.1890/1051-0761(2002)012[0797:EBSABS]2.0.CO;2)
- iDigBio. 2024. iDigBio (online data) (The project record contains date-stamped copies of relevant species and ecosystem data from this source) Integrated Digitized Biocollections (iDigBio), the National Resource for Advancing Digitization of Biodiversity Collections (ADBC), funded by the National Science Foundation. Date Accessed: May 14, 2025. Available at: <https://www.idigbio.org>
- iNaturalist. 2025. Online database (online data) (The project record contains date-stamped copies of relevant species and ecosystem data from this source). Date Accessed: May 1, 2025. Available at: <https://www.inaturalist.org>
- Inouye, D.W. 2008. Effects of Climate Change on Phenology, Frost Damage, and Floral Abundance of Montane Wildflowers. *Ecology* 89(2): 353-362. <https://doi.org/10.1890/06-2128.1>

- ITIS, Integrated Taxonomic Information System. 2024. Integrated Taxonomic Information System (online data) (The project record contains date-stamped copies of relevant species and ecosystem data from this source) ITIS Steering Committee, in cooperation with the U.S. Department of the Interior, Geological Survey (USGS), and the Smithsonian Institution. Date Accessed: May 6, 2024. Available at: <https://www.itis.gov>
- IUCN, International Union for Conservation of Nature. 2024. The IUCN red list of threatened species (website). International Union for Conservation of Nature (IUCN). Date Accessed: October 31, 2024. <https://www.iucnredlist.org/>
- Jellen, E.N., Kolano, B.A., Sederberg, M.C., Bonifacio, A., and Maughan, P.J. 2011. *Chenopodium*. In Kole, C., ed. *Wild crop relatives: Genomic and breeding resources*. Berlin, Germany: Springer Berlin Heidelberg. 35-61 pp. https://doi.org/10.1007/978-3-642-14387-8_3
- Jogesh, T., Overson, R.P., Raguso, R.A., and Skogen, K.A. 2016. Herbivory as an important selective force in the evolution of floral traits and pollinator shifts. *AoB Plants (AoBP)* 9(1): 15. <https://www.doi.org/10.1093%2Faobpla%2Fplw088>
- Johnson, M.B. 2006a. Legumes of the Texas Rio Grande region. *Aridus* 18(1): 1-8. <https://cales.arizona.edu/desertlegumeprogram/sites/cales.arizona.edu.desertlegumeprogram/files/aridus18-1.pdf>
- Johnson, S.L. and Lincoln, D.E. 2000. Allocation responses to CO₂ enrichment and defoliation by a native annual plant *heterotheca subaxillaris*. *Global Change Biology* 6: 767-778. <https://www.doi.org/10.1046/j.1365-2486.2000.00355.x>
- Johnson, W.J. 2006b. Cumulative effects of past projects on wildlife. Libby, MT: USDA Forest Service, Kootenai NF. 62 p.
- Johnston, M.C. and Warnock, B.H. 1963. The three species of *Stillingia* (Euphorbiaceae) in far western Texas. *The Southwestern Naturalist* 8(2): 100-106. <https://www.doi.org/10.2307/3669552>
- Jones, S.B. 1972. A systematic study of the fasciculatae group of *vernonia* (compositae). *Brittonia* 24(1): 28-45. <https://www.doi.org/10.2307/2805545>
- Jürgens, A., Dötterl, S., Liede-Schumann, S., and Meve, U. 2008. Chemical diversity of floral volatiles in *asclepiadoideae-asclepiadeae* (apocynaceae). *Biochemical Systematics and Ecology* 36(11): 842-852. <https://www.doi.org/10.1016/j.bse.2008.10.005>
- Kansas Wildflowers & Grasses. 2024. Tall-Bread Scurf-Pea (*Pediomelum cuspidatum*) (online data). (Version November 25, 2014). Manhattan, KS: Kansas State University Libraries. Date Published: 2014. Date Accessed: May 15, 2024. Available at: https://kswildflower.org/flower_details.php?flowerID=659
- Kao, T.-T., Rothfels, C.J., Melgoza-Castillo, A., Pryer, K.M., and Windham, M.D. 2020. Intraspecific Diversification of the Star Cloak Fern (*Notholaena Standleyi*) in the Deserts of the United States and Mexico. *American Journal of Botany* 107(4): 658-675. <https://www.doi.org/10.1002/ajb2.1461>
- Kaul, R.B. 1985. Reproductive Phenology and Biology in Annual and Perennial *Alismataceae*. *Aquatic Botany* 22(2): 153-164. [https://doi.org/10.1016/0304-3770\(85\)90044-0](https://doi.org/10.1016/0304-3770(85)90044-0)
- Kaul, R.B. 1991. Foliar and Reproductive Responses of *Sagittaria calycina* and *Sagittaria brevirostra* (*Alismataceae*) to Varying Natural Conditions. *Aquatic Botany* 40(1): 47-59. [https://doi.org/10.1016/0304-3770\(91\)90073-E](https://doi.org/10.1016/0304-3770(91)90073-E)
- Kerbs, B. and Schulenberg, J. 2016a. *Tridens albescens* (Vasey) (#727752521) (online data) Wootton & Standl. (Version Version 29.1). Emporia, KS: Emporia State University. Date Accessed: May 17, 2024. Available at: <https://www.gbif.org/occurrence/727752521>
- Kerbs, B. and Schulenberg, J. 2016b. *Tridens albescens* (Vasey) (#727752524) (online data) Wootton & Standl. (Version Version 29.1). Emporia, KS: Emporia State University. Date Accessed: May 17, 2024. Available at: <https://www.gbif.org/occurrence/727752524>
- Kuhn, B., Nelson, B.E., and Hartman, R.L. 2011. A floristic inventory of the Cimarron National Grassland (Kansas) and the Comanche National Grassland (Colorado). *Journal of the Botanical Research Institute of Texas* 5(2): 753-772. <http://www.jstor.org/stable/41972334>
- Ladyman, J.A.R. 2005. *Oenothera harringtonii* Wagner, Stockhouse & Klein (Colorado Springs evening-primrose): A Technical Conservation Assessment. Dated: February 1, 2005. Centennial, CO: JNJ Associates. 44 p. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5206869.pdf
- Ladyman, J.A.R. 2006. *Chenopodium cycloides* A. Nelson (sandhill goosefoot): A technical conservation paper. Dated: October 2, 2006. Centennial, CO: JnJ Associates, LLC. 62 p. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5206833.pdf

- Landfire. 2024. Biophysical Settings Description and Quantitative Models (online data) USDA Forest Service. Date Accessed: April 17, 2024. Available at: <https://landfire.gov/vegetation/bps-models>
- Lang, M.W., Ingebritsen, J.C., and Griffin, R.K. 2024. Status and trends of wetlands in the conterminous United States 2009 to 2019. Dated: March 22, 2024. Washington, DC: U.S. Department of the Interior, U.S. Fish and Wildlife Service (FWS). 43 p. <https://www.fws.gov/media/status-and-trends-wetlands-conterminous-united-states-2009-2019>
- Lemly, J.M. and Culver, D.R. 2013. Field guide to Colorado's wetland plants: Identification, ecology and conservation. Loveland, CO: Colorado Natural Heritage Program, Colorado State University. 2-318 pp. <https://mountainscholar.org/items/4679a7ec-263f-4c62-bf09-a06e9ef90b07>
- Lesica, P., McCune, B., Cooper, S.V., and Shic Hong, W. 1991. Differences in lichen and bryophyte communities between old-growth and managed second-growth forests in the Swan Valley, Montana. Canadian Journal of Botany 69: 1745-1755. <https://doi.org/10.1139/b91-222>
- Lichvar, R.W., Banks, D.L., Kirchner, W.N., and Melvin, N.C. 2016. The national wetland plant list: 2016 wetland ratings. Phytoneuron 30: 1-17. <https://www.phytoneuron.net/2016Phytoneuron/30PhytoN-WetlandRatings2016.pdf>
- Linex, R. 2020a. Inland ceanothus. Ranch & rural living, March, 2020, 101 (6): 5-7 pp. <https://www.proquest.com/scholarly-journals/inland-ceanothus/docview/2383815757/se-2>
- Linex, R. 2020b. Trailing Ratany. Texas Master Naturalist, Central Texas Chapter. 4 p. <https://txmn.org/centraltexas/files/2020/06/Trailing-Ratany.pdf>
- Little, E.L. 1936. The liverworts of Oklahoma. The Bryologist 39(2): 25-34. <https://www.doi.org/10.2307/3238968>
- Locklear, J.H. 2017. Endemic plants of the central grassland of North America: Distribution, ecology, and conservation status. Journal of the Botanical Research Institute of Texas 11: 193-234. <https://journals.brit.org/jbrit/article/view/1172>
- Locklear, J.H. 2019. Sandsage prairie: floristics, structure, and dynamics of a Great Plains plant community. Journal of the Botanical Research Institute of Texas 13(1): 253-278. <https://doi.org/10.17348/jbrit.v13.i1.851>
- Locklear, J.H. 2021. The Sandsage prairie ecological system: Biodiversity hotspot for the great plains. Natural areas journal 41(1): 64-74. <https://doi.org/10.3375/043.041.0109>
- Lueders, A.S., Kennedy, P.L., and Johnson, D.H. 2006. Influences of management regimes on breeding bird densities and habitat in mixed-grass prairie: An example from North Dakota. The Journal of Wildlife Management 70(2): 600-602. [https://doi.org/10.2193/0022-541X\(2006\)70\[600:1OMROB\]2.0.CO;2](https://doi.org/10.2193/0022-541X(2006)70[600:1OMROB]2.0.CO;2)
- Malone, A.I., Brinda, J.C., and Tripp, E.A. 2020. A survey of the liverworts from Colorado's Comanche National Grassland. Evansia 36(4): 114-120. <https://www.doi.org/10.1639/0747-9859-36.4.114>
- Matzrafi, M., Wolberg, S., Abu-Nassar, J., Zelinger, E., Bar, E., Cafri, D., Lewinsohn, E., and Shtein, I. 2023. Distinctive Foliar Features and Volatile Profiles in Three Ambrosia Species (Asteraceae). Planta 257: 79. <https://www.doi.org/10.1007/s00425-023-04113-3>
- McLauchlan, K. 2003. Plant cultivation and forest clearance by prehistoric North Americans: Pollen evidence from Fort Ancient, Ohio, USA. The Holocene 13(4): 557-566. <https://doi.org/10.1191/0959683603hl646rp>
- McMillan, P.D., Pivorun, E.B., Porcher, R.D., Davis, C., Whitten, D., and Wade, K. 2018. Three Remarkably Disjunct Fern Species Discovered in Pickens County, South Carolina. Phytoneuron 21: 1-5. <https://www.phytoneuron.net/2018Phytoneuron/21PhytoN-SCFerns.pdf>
- Mery, D.E., Compadre, A.J., Ordóñez, P.E., Selvik, E.J., Morocho, V., Contreras, J., Malagón, O., Jones, D.E., Breen, P.J., Balick, M.J., Gaudio, F.G., Guzman, M.L., and Compadre, C.M. 2022. Analysis of plant-plant interactions reveals the presence of potent antileukemic compounds. Molecules 27(9): 1-20. <https://www.doi.org/10.3390/molecules27092928>
- Michigan State University, Michigan Natural Features Inventory. 2024. Asplenium viride, green spleenwort (website). Michigan State University, Michigan Natural Features Inventory. Date Accessed: August 5, 2024. <https://mnfi.anr.msu.edu/species/description/15875/Asplenium%20viride/>
- Milchunas, D., Augustine, D., and Sprock, H. 2020. 11490 Western Great Plains Shortgrass Prairie: Landfire Biophysical Model. Washington, DC: USDA Forest Service. Originally Released: August, 2020. <https://landfire.gov/>

- Miller, R.F., Chambers, J.C., Pyke, D.A., Pierson, F.B., and Williams, C.J. 2013. A review of fire effects on vegetation and soils in the Great Basin Region: Response and ecological site characteristics. Gen. Tech. Rep. RMRS-GTR-308. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 126 p.
- Mills, S.E. and Macdonald, S.E. 2005. Factors influencing bryophyte assemblage at different scales in the western Canadian boreal forest. *The Bryologist* 108(1)(1): 86-100. [https://doi.org/10.1639/0007-2745\(2005\)108\[86:Fibaad\]2.0.Co;2](https://doi.org/10.1639/0007-2745(2005)108[86:Fibaad]2.0.Co;2)
- Missouri Botanical Garden. 2015. *Plagiochasma wrightii* (online data) Sull. Saint Louis, MO: Missouri Botanical Garden. Date Published: November 21, 2015. Date Accessed: July 6, 2024. Available at: <https://swbiodiversity.org/seinet/collections/individual/index.php?occid=31157630&clid=0>
- Missouri Botanical Garden. 2016. *Plagiochasma wrightii* (online data) Sull. Saint Louis, MO: Missouri Botanical Garden. Date Published: January 8, 2016. Date Accessed: July 6, 2024. Available at: <https://swbiodiversity.org/seinet/collections/individual/index.php?occid=31157634&clid=0>
- Montalvo, A.M., Goode, L.K., and Beyers, J.L. 2010. Plant Profile for *Iva axillaris*. Dated: October 3, 2010. Riverside, CA: Riverside-Corona Resource Conservation District and USDA Forest Service, Pacific Southwest Research Station. 7 p. [https://www.fs.usda.gov/psw/publications/beyers/psw_2010_beyers015\(montalvo\)ivaaxillaris.pdf](https://www.fs.usda.gov/psw/publications/beyers/psw_2010_beyers015(montalvo)ivaaxillaris.pdf)
- Montana Field Guide. 2025. Online database (website). mt.gov: Montana's Official State Website. Date Accessed: May 1, 2025. <https://fieldguide.mt.gov>
- Montana Natural Heritage Program. 2020. Montana Natural Heritage Program, (online data) (The project record contains date-stamped copies of relevant species and ecosystem data from this source). Helena, MT. Date Published: 29 June 2020. Date Accessed: May 14, 2025. Available at: <https://mtnhp.mt.gov>
- Monteiro, J. and Vieira, C. 2017. Determinants of stream bryophyte community structure: bringing ecology into conservation. *Freshwater Biology* 62(4): 695-710. <https://doi.org/10.1111/fwb.12895>
- Morano, L.D. and Walker, M.A. 1995. Soils and plant communities associated with three *Vitis* species. *The American Midland Naturalist* 134: 254-263. <https://www.doi.org/10.2307/2426296>
- Morse, C.A. 2001. R2 sensitive species evaluation form: *Chenopodium cycloides* A. Nelson, sandhill goosefoot. Dated: December 9, 2001. Lakewood, CO: USDA Forest Service, Rocky Mountain Region (R2). 3 p. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5261709.pdf
- Mueller, N.G. 2018. Documenting the evolution of agrobiodiversity in the archaeological record: Landraces of a newly described domesticate (*Polygonum erectum*) in North America. *Journal of Archaeological Method and Theory* 26(1): 313-343. <https://doi.org/10.1007/s10816-018-9375-1>
- Nabhan, G.P., Buckley, S., and Dial, H. 2015. Pollinator plants of the desert southwest: Native milkweeds (*Asclepias subverticillata*). TN-PM-16-1-AZ. Tucson, AZ: U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS), Tucson Plant Materials Center. 2-35 pp. https://efotg.sc.egov.usda.gov/references/public/AZ/azpmctn16-Native_Milkweeds.pdf
- Native Plant Society of Texas. 2024. Rosy Palafox (*Palafoxia rosea*) (online data). Fredericksburg, TX: Native Plant Society of Texas. Date Accessed: July 10, 2024. Available at: <https://www.npsot.org/posts/native-plant/palafoxia-rosea/>
- Native Plant Trust. 2024. Go botany: *Polygonum erectum* — upright knotweed (website). Native Plant Trust. Date Accessed: November 13, 2024. <https://gobotany.nativeplanttrust.org/species/polygonum/erectum/>
- NatureServe. 2025. NatureServe Explorer (online data) (The project record contains date-stamped copies of relevant species and ecosystem data from this source). Arlington, VA. Date Accessed: May 06, 2025. Available at: <https://explorer.natureserve.org>
- Neid, S., Decker, K., Handwerk, J., and Panjabi, S.S. 2007. Rare plant surveys on the Pinon Canyon Maneuver Site 2006-2007. Fort Collins, CO: Colorado Natural Heritage Program. 50 p. https://www.cnhp.colostate.edu/download/documents/2007/PCMS_FINAL_122107.pdf
- Nesom, G.L. 1976. A New Species of *Erigeron* (Asteraceae) and its Relatives in Southwestern Utah. *Brittonia* 28(2): 263-272. <https://doi.org/10.2307/2805837>
- Nesom, G.L. 2014. Taxonomy of *Cyclanthera* (Cucurbitaceae) in the USA. *Phytoneuron* 11: 1-17. <https://www.phytoneuron.net/2014Phytoneuron/11PhytoN-Cyclanthera.pdf>
- Northam, F.E. and Stahlman, P.W. 1995. Range extension of Southwestern cupgrass (*Eriochloa acuminata*) into Kansas. *Transactions of the Kansas Academy of Science* 98(1/2): 68-71. <https://doi.org/10.2307/3628080>

- NPIN, Native Plant Information Network,. 2025. Online database (website). University of Texas at Austin, Lady Bird Johnson Wildflower Center, Native Plant Information Network (NPIN). Date Accessed: May 1, 2025. <https://www.wildflower.org/explore/index.php>
- NRCS, USDA Natural Resources Conservation Service. 2025. Plant list of attributes, names, taxonomy, and symbols (PLANTS) database (online data) (The project record contains date-stamped copies of relevant species and ecosystem data from this source). Date Accessed: May 5, 2025. Available at: <https://plants.usda.gov>
- Oishi, Y. and Morimoto, Y. 2013. Identifying indicator species for bryophyte conservation in fragmented forests. *Landscape and Ecological Engineering* 12(1): 107-114. <https://doi.org/10.1007/s11355-013-0220-0>
- Olsen, K. 2013. Colorado River cutthroat trout habitat resistance and resilience to climate change. M.S. Thesis. Fisheries Biology, Utah State University, Logan, UT. 136 p. <https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=2963&context=etd>
- Olsen, K.M. 1997. Pollination Effectiveness and Pollinator Importance in a Population of *Heterotheca subaxillaris* (Asteraceae). *Oecologia* 109: 114-121. <http://www.jstor.org/stable/4221499>
- Olson, D.H. and Burnett, K.M. 2013. Geometry of forest landscape connectivity: Pathways for persistence. In Anderson, P.D. and Ronnenberg, K.L., eds., Density management in the 21st century: West side story. Gen. Tech. Rep. PNW-GTR-880. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 220-238 pp. <https://doi.org/10.2737/PNW-GTR-880>
- Oregon State University. 2024. *Amorpha nana*, dwarf wild indigo (website). Oregon State University. Date Accessed: November 12, 2024. <https://landscapeplants.oregonstate.edu/plants/amorpha-nana>
- Panjabi, S. and Smith, G. 2014. Recommended best management practices for Colorado green gentian (*Frasera coloradensis*): Practices developed to reduce the impacts of road maintenance activities. Dated: May, 2014. Fort Collins, CO: Colorado Natural Heritage Program, Colorado State University. 11 p. <https://api.mountainscholar.org/server/api/core/bitstreams/351a5076-e44b-40eb-876a-7d0a77f8fb9c/content>
- Peterson, P.M. 2021. Ear Muhly (*Muhlenbergia arenacea*) (online data) (Buckley) Hitchc. Flora of North America. Date Published: May 11, 2021. Date Accessed: June 6, 2024. Available at: http://beta.floranorthamerica.org/Muhlenbergia_arenacea
- Peterson, P.M. and Valdés-Reyna, J. 2005. *Eragrostis* (Poaceae: Chloridoideae: Eragrostideae: Eragrostinae) from northeastern Mexico. *SIDA, Contributions to Botany* 21(3): 1363-1418. <https://www.jstor.org/stable/41968402>
- Plants For A Future. 2024. Textile Onion (*Allium textile*) (online data) Nels. & Macbr. Devon, UK: Plants For A Future. Date Accessed: June 12, 2024. Available at: <https://pfaf.org/User/Plant.aspx?LatinName=Allium+textile>
- Pleasants, J.M. and Oberhauser, K.S. 2013. Milkweed Loss in Agricultural Fields Because of Herbicide Use: Effect on the Monarch Butterfly Population. *Insect Conservation and Diversity* 6(2): 135-144. <https://doi.org/10.1111/j.1752-4598.2012.00196.x>
- Prairie Moon Nursery. 2024. Showy Beardtongue (*Penstemon cobaea*) (online data). Winona, MN: Prairie Moon Nursery. Date Accessed: 2024. Available at: <https://www.prairiemoon.com/penstemon-cobaea-showy-beardtongue>
- Press, M.C. and Phoenix, G.K. 2005. Impacts of parasitic plants on natural communities. *New Phytologist* 166: 737-751. <https://www.doi.org/10.1111/j.1469-8137.2005.01358.x>
- Pritchard, G.H. 1987. Poverty weed (*Iva axillaris* Pursh): Its Distribution and Control. *Plant Protection Quarterly* 2: 69-73. <https://caws.org.nz/PPQ12/PPQ%2002-2%20pp069-73%20Pritchard.pdf>
- Rambo, T.R. and Muir, P.S. 1998. Forest floor bryophytes of *Pseudotsuga menziesii*-*Tsuga heterophylla* stands in Oregon: Influences of substrate and overstory. *The Bryologist* 101(1): 116. [https://doi.org/10.1639/0007-2745\(1998\)101\[116:FFBOPM\]2.0.CO;2](https://doi.org/10.1639/0007-2745(1998)101[116:FFBOPM]2.0.CO;2)
- Robbins, C. 1999. Medicine from U.S. Wildlands: An Assessment of Native Plant Species Harvested in the United States for Medicinal Use and Trade and Evaluation of the Conservation and Management Implications. Prepared for the Nature Conservancy. Dated: July, 1999. Cambridge, UK: TRAFFIC. 29 p. <https://www.fs.usda.gov/biology/resources/pubs/plants/medplnt.pdf>
- Robson, D.B. 1997. Ecology of rare vascular plants in southwestern Saskatchewan. M.S. Thesis. Crop Science and Plant Ecology, University of Saskatchewan, Saskatoon, SK, Canada. 140 p. <https://harvest.usask.ca/items/d0eda5c9-21b2-45db-8532-fce81b1d8be2>

- Rocky Mountain Herbarium. 2007. Wright's Thelypody (*Thelypodium wrightii* subsp. *oklahomensis*) (online data) Al-Shehbaz. Laramie, WY: Rocky Mountain Herbarium. Date Published: June 21, 2007. Date Accessed: July 6, 2024. Available at: <https://swbiodiversity.org/seinet/collections/individual/index.php?occid=4715264&clid=0>
- Rohweder, M.R. 2022. Kansas Wildlife Action Plan. 3rd ed. Dated: June, 2022. Pratt, KS: Ecological Services Section, Kansas Department of Wildlife and Parks. 183 p. <https://ksoutdoors.com/Services/Kansas-SWAP>
- Rondeau, R.J., Decker, K.L., and Doyle, G.A. 2018. Potential consequences of repeated severe drought for shortgrass steppe species. *Rangeland Ecology & Management* 71(1): 91-97. <https://doi.org/10.1016/j.rama.2017.07.002>
- Root, H.T. and McCune, B. 2010. Forest floor lichen and bryophyte communities in thinned *Pseudotsuga menziesii* - *Tsuga heterophylla* forests. *The Bryologist* 113(3)(3): 619-630. <https://doi.org/10.1639/0007-2745-113.3.619>
- Schmalholz, M. and Hylander, K. 2011. Microtopography creates small-scale refugia for boreal forest floor bryophytes during clear-cut logging. *Ecography* 34(4): 637-648. <https://doi.org/10.1111/j.1600-0587.2010.06652.x>
- Schmalholz, M., Hylander, K., and Frego, K. 2011. Bryophyte species richness and composition in young forests regenerated after clear-cut logging versus after wildfire and spruce budworm outbreak. *Biodiversity and Conservation* 20(12): 2575-2596. <https://doi.org/10.1007/s10531-011-0092-2>
- SEINet, Arizona-New Mexico Chapter. 2024. Welcome to SEINet (online data) (The project record contains date-stamped copies of relevant species and ecosystem data from this source). Tempe, AZ: Arizona State University. Date Accessed: May 7, 2025. Available at: <https://swbiodiversity.org/seinet>
- Seischab, F.K., Bernard, J.M., and Fiala, K. 1985. Above- and Belowground Standing Crop Partitioning of Biomass by *Eleocharis Rostellata* Torr. in the Byron-Bergen Swamp, Genesee County, New York. *The American Midland Naturalist* 114(1): 70-76. <https://www.doi.org/10.2307/2425242>
- Shaw, R.B. and Smeins, F.E. 1979. Epidermal characteristics of the callus in *Eriochloa* (Poaceae). *American Journal of Botany* 66(8): 907-913. <https://doi.org/10.2307/2442231>
- Shinners, L.H. 1950. Notes on Texas compositae - IV. Field and Laboratory 18(1): 25-32. <https://scholar.smu.edu/fieldandlab/vol18/iss1/5/>
- Simonin, K.A. 2000. Fire Effects Information System (FEIS): *Bouteloua eriopoda* (website). USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Date Accessed: July 1, 2024. <https://www.fs.usda.gov/database/feis/plants/graminoid/boueri/all.html>
- Skogen, K.A., Jogesh, T., Hilpman, E.T., Todd, S.L., Rhodes, M.K., Still, S.M., and Fant, J.B. 2016. Land-use change has no detectable effect on reproduction of a disturbance-adapted, hawkmoth-pollinated plant species. *American Journal of Botany* 103(11): 1950-1963. <https://doi.org/10.3732/ajb.1600302>
- Smith, B. 2003. Status of the Small-Flowered Sand Verbena (*Tripterocalyx micranthus*) in Alberta. Dated: May, 2003. Alberta Wildlife Status Report No. 48. Edmonton, AB, Canada: Alberta Fish and Wildlife and Alberta Conservation Association. 36 p. <https://open.alberta.ca/dataset/7af17018-ca5c-4fda-958e-0729178469e9/resource/74dbae4f-a896-4b68-8312-44cf66915a25/download/2003-sar-statussmallfloweredsandverbena-may2003.pdf>
- Smith, B.A. 2008. Fern Habitats and Rare Ferns in Oklahoma. *Journal of the Oklahoma Native Plant Society* 8(1): 66. <https://doi.org/10.22488/okstate.17.100063>
- Smith, B.A. 2010. Four Western Cheilantheid Ferns in Oklahoma. *Oklahoma Native Plant Record* 10: 76. <https://doi.org/10.22488/okstate.17.100077>
- Smith, C.M., Goudie, R.I., and Cooke, F. 2001. Winter age ratios and the assessment of recruitment of Harlequin Ducks. *Waterbirds* 24(1): 39-44. <https://doi.org/10.2307/1522241>
- Smith, P.D. and McDonough, M.H. 2001. Beyond Public Participation: Fairness in Natural Resource Decision Making. *Society & Natural Resources* 14(3): 239-249. <https://doi.org/10.1080/089419201750111056>
- Smith, R.S. 2023. Performance of *Monarda* species and Cultivars: An ornamental and ecological study in Georgia, USA. M.S. Thesis, University of Georgia, Athens, GA. 150 p. <https://www.proquest.com/openview/3ef81d63930e47e255a2cfb2a2f9c2a7/1?pq-origsite=gscholar&cbl=18750&diss=y>

- Smith, T.R. 2021. Responses of pacific fishers to habitat changes as a result of forestry practices in Southwestern Oregon. M.S. Thesis. Wildlife Biology, Utah State University, Logan, UT. 165 p. <https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=9224&context=etd>
- Söderström, L. 2006. Conservation Biology of Bryophytes. *Lindbergia* 31(1/2): 24-32. <http://www.jstor.org/stable/20150204>
- Srivastava, R., Srivastava, V., and Singh, A. 2023. Multipurpose benefits of an underexplored species purslane (*Portulaca oleracea* L.): A critical review. *Environmental Management* 72(2): 309-320. <https://doi.org/10.1007/s00267-021-01456-z>
- Steinberg, P. 2001. *Prosopis glandulosa* (online data) Fire Effects Information System. Washington, DC: USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Date Accessed: June 6, 2024. Available at: <https://www.fs.usda.gov/database/feis/plants/tree/progla/all.html>
- Tausch, R.J. 1999. Historic pinyon and juniper woodland development. Pages 12-19. *in* Monsen, S.B. and Stevens, R., eds. Ecology and management of pinyon-juniper communities within the Interior West: Sustaining and restoring a diverse ecosystem; September 15-18, 1997; Ogden, UT, Proc. RMRS-P-9. USDA Forest Service, Rocky Mountain Research Station. https://www.fs.usda.gov/rm/pubs/rmrs_p009.pdf
- Tesky, J.L. 1992. Fire effects information system: *Salix nigra* (website). USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Last Modified: 2024. Date Accessed: June 6, 2024. <https://www.fs.usda.gov/database/feis/plants/tree/salnig/all.html>
- Texas A&M AgriLife Extension, Plants of Texas Rangelands Virtual Herbarium. 2024. *Bouteloua eriopoda*, Black Grama (Torr.) (online data). College Station, TX: Texas A&M AgriLife Extension Service. Date Accessed: May 16, 2024. Available at: <https://rangeplants.tamu.edu/plant/black-grama/>
- The Biota North America Program (BONAP), North American Plant Atlas. 2014. California Amaranth (*Amaranthus californicus*) (online data) (Atlas). (Version December 15, 2014). Chapel Hill, NC: The Biota North America Program (BONAP). Date Published: December 15, 2014. Date Accessed: June 4, 2024. Available at: <https://bonap.net/Napa/TaxonMaps/Genus/County/Amaranthus>
- The Encyclopedia of Cacti. 2005. *Echinocereus reichenbachii* subs. *perbellus* LLIFLE - Encyclopedia of Living Forms. Originally Released: November 14, 2005. http://www.llifle.com/Encyclopedia/CACTI/Family/Cactaceae/7602/Echinocereus_reichenbachii_subs_perbellus
- The Encyclopedia of Cacti. 2024. *Echinocereus*, Engelm. *in* Wisliz. (website). LLIFLE - Encyclopedia of Living Forms. Date Accessed: November 18, 2024. <https://www.llifle.net/Encyclopedia/CACTI/Family/Cactaceae/Echinocereus/>
- Thomas, G.J. 2021. Plant guide for Arizona cottontop (*Digitaria californica*). Tucson, AZ: U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS), Tucson Plant Materials Center. 4 p. https://plants.usda.gov/DocumentLibrary/plantguide/pdf/pg_DICA8.pdf
- Thomas, J.W., Franklin, J.F., Gordon, J., and Johnson, K.N. 2006. The Northwest Forest Plan: Origins, components, implementation experience, and suggestions for change. *Conservation Biology* 20(2): 277-287. <https://doi.org/10.1111/j.1523-1739.2006.00385.x>
- Throop, H.L. and Fay, P.A. 1999. Effects of fire, browsers and galls on New Jersey tea (*Ceanothus herbaceus*) growth and reproduction. *The American Midland Naturalist* 141(1): 51-58. <https://www.jstor.org/stable/2426965>
- Tirmenstein, D.A. 1990. Fire Effects Information System (FEIS): *Sapindus saponaria* var. *drummondii* (website). USDA Forest Service, Rocky Mountain Research Station, Last Modified: 2024. Date Accessed: 2024. <https://www.fs.usda.gov/database/feis/plants/tree/sapsapd/all.html>
- Toft, C.A. 1984. Resource shifts in bee flies (bombyliidae): Interactions among species determine choice of resources. *Oikos* 43(1): 104-112. <https://doi.org/10.2307/3544251>
- Towner, H.F. 1977. The biosystematics of *Calylophus* (Onagraceae). *Annals of the Missouri Botanical Garden* 64(1): 48-120. <https://doi.org/10.2307/2395236>
- Tropicos. 2015. *Plagiochasma wrightii* (Sull) (online data) Amanda I. Malone - 6 - MO - (BC:MO-2945536/A:6696370) Tropicos. Date Published: November 21, 2015. Date Accessed: June 7, 2024. Available at: <https://www.tropicos.org/specimen/100917042>

- Tropicos. 2016. *Plagiochasma wrightii* (Sull) (online data) Amanda I. Malone - 24 - MO - (BC:MO-2945537/A:6696371) Tropicos. Date Published: January 8, 2016. Date Accessed: July 5, 2024. Available at: <https://www.tropicos.org/specimen/100917031>
- Ueckert, D. and Calhoun, M. 1988. Ecology and toxicology of bitterweed (*Hymenoxys odorata*). Chapter 11. In James, L.F., Ralphs, M.H. and Nielsen, D.B., eds., *The ecology and economic impact of poisonous plants on livestock production*. Boca Raton, FL: CRC Press. 131-143 pp. <https://doi.org/10.1201/9780429310225-11>
- University of Arizona. 2024. North American desert grassland (website). Tucson, AZ. Date Accessed: September 3, 2024. <https://wrangle.org/ecotype/north-american-desert-grassland#:~:text=The%20geographic%20area%20in%20which,see%20map%3B%20McClaran%201995>
- Uno, G.E. 1984. The Role of Persistent Sepals in the Reproductive Biology of *Linum pratense* (Linaceae). *The Southwestern Naturalist* 29(4): 429-433. <https://doi.org/10.2307/3670995>
- Uresk, D.W. and Mergen, D.E. 2014. Ecological Model for Classifying and Monitoring of Green Needlegrass/Western Wheatgrass/Blue Gramma/Buffalograss Ecological Type. *Intermountain Journal of Sciences* 20(1-3): 1-13. <https://arc.lib.montana.edu/ojs/index.php/IJS/article/view/635/485>
- USDA Agricultural Research Service. 2018. Milkweed (*Asclepias* spp.) (online data). Washington, DC: U.S. Department of Agriculture, Agricultural Research Service. Date Published: June 26, 2018. Date Accessed: July 5, 2024. Available at: <https://www.ars.usda.gov/pacific-west-area/logan-ut/poisonous-plant-research/docs/milkweed-asclepias-spp/>
- USFS, USDA Forest Service. 2001a. Region 2 Sensitive Species Evaluation Form: *Astragalus ceramicus* E. Sheld var. *filifolius* (A. Gray) F. J. Herm. Painted Milk-Vetch. Dated: November 26, 2001. Washington, DC: USDA Forest Service. 3 p.
- USFS, USDA Forest Service. 2001b. Region 2 Sensitive Species Evaluation Form: Lace Hedgehog Cactus (*Echinocereus reichenbachii* var. *prebellus*). Washington, DC: USDA Forest Service. 3 p.
- USFS, USDA Forest Service. 2002. Region 2 Individual Species Recommendations: Rose palafox (*Palafoxia rosea*). Dated: October 1, 2002. Washington, DC: USDA Forest Service. 1 p.
- USFS, USDA Forest Service. 2005a. Cimarron and Comanche National Grassland: Vegetation/Ecology. Specialist Reports. Dated: May 10, 2006. Washington, DC: U.S. Department of Agriculture. 150 p.
- USFS, USDA Forest Service. 2005b. Cimarron and Comanche National Grasslands: Ecological sustainability. Dated: June 10, 2005. Washington, DC: USDA Forest Service. 115 p.
- USFS, USDA Forest Service. 2008. Cimarron and Comanche National Grasslands: Land Management Plan. Dated: October, 2008. Pueblo, CO: USDA Forest Service. 233 p.
- USFS, USDA Forest Service. 2010. *Iva axillaris* Pursh ssp. *robustior*, Povertyweed, (Hook.) Bassett (website). USDA Forest Service, Last Modified: October 10, 2010. Date Accessed: November 18, 2024. [https://www.fs.usda.gov/psw/publications/beyers/psw_2010_beyers015\(montalvo\)ivaaxillaris.pdf](https://www.fs.usda.gov/psw/publications/beyers/psw_2010_beyers015(montalvo)ivaaxillaris.pdf)
- USFS, USDA Forest Service. 2024. Common Duckweed (*Lemna minor*) (online data). Washington, DC: USDA Forest Service. Date Accessed: May 6, 2024. Available at: https://www.fs.usda.gov/wildflowers/plant-of-the-week/lemna_minor.shtml
- USFS, USDA Forest Service 2005c. Cimarron and Comanche National Grasslands Land Management Plan: Ecological Sustainability. Dated: October 6, 2005. Washington, DC: U.S. Department of Agriculture. 150 p.
- USFS, USDA Forest Service 2006. Species diversity evaluation: Plants habitat needs, distribution, and description of plants species-of-concern and species-of-interest Cimarron and Comanche National Grasslands. Dated: November 14, 2006. Washington, DC: USDA Forest Service. 19 p.
- USFS, USDA Forest Service 2018. R2 sensitive species list evaluation: *Frasera coloradensis*. Dated: February, 2018. Lakewood, CO: USDA Forest Service, Rocky Mountain Region (R2). 3 p. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd593868.docx
- Utah State University. 2024. Giant Dropseed (*Sporobolus giganteus*) (online data) (EcoRestore Utah Portal Extension). Logan, UT: Utah State University. Date Accessed: June 21, 2024. Available at: <https://extension.usu.edu/ecorestore/assessment-tool?list=true>

- Van Scoyoc, M. 2024. Species Occurrence Data for the Cimarron-Comanche National Grasslands (HTML output auto-generated from multiple data sources such as iDigBio, GBIF, and others). Dated: April 2024. Denver, CO: USDA Forest Service, Mountain Planning Service Group.
- Vanneste, T., Michelsen, O., Graae, B.J., Kyrkjeeide, M.O., Holien, H., Hassel, K., Lindmo, S., Kapás, R.E., and De Frenne, P. 2017. Impact of climate change on alpine vegetation of mountain summits in Norway. *Ecological Research* 32(4): 579-593. <https://doi.org/10.1007/s11284-017-1472-1>
- VanRiper, L.C., Larson, D.L., and Larson, J.L. 2010. Nitrogen-limitation and invasive sweetclover impacts vary between two great plains plant communities. *Biological Invasions* 12(8): 2735-2749. <https://doi.org/10.1007/s10530-009-9678-y>
- Vasek, F.C. 1979. Early Successional Stages in Mojave Desert Scrub Vegetation. *Israel Journal of Botany* 28(3-4): 133-148. <https://doi.org/10.1080/0021213X.1979.10676865>
- Vitt, D., Crandall-Stotler, B., and Wood, A. 2014. Bryophytes: Survival in a dry world through tolerance and avoidance. In Rajakaruna, N., Boyd, R. and Harris, T., eds., *Plant ecology and evolution in harsh environments*. Hauppauge, NY: Nova Publishers. 267-295 pp. [https://www.researchgate.net/publication/297363188_Bryophytes_Survival_in_a_dry_world_throu](https://www.researchgate.net/publication/297363188_Bryophytes_Survival_in_a_dry_world_through_tolerance_and_avoidance)
[gh_tolerance_and_avoidance](https://www.researchgate.net/publication/297363188_Bryophytes_Survival_in_a_dry_world_throu)
- Wagenius, S., Beck, J., and Kiefer, G. 2020. Fire Synchronizes Flowering and Boosts Reproduction in a Widespread but Declining Prairie Species. *Proceedings of the National Academy of Sciences USA* 117(6): 3000-3005. <https://doi.org/10.1073/pnas.1907320117>
- Walker, J., Montgomery, C., Cordes, J., and Mangan, M. 2019. Morphological variation, habitat, and conservation status of parthenogenetic *Aspidoscelis tessellatus* pattern class C in the canyonlands of southeastern Colorado, USA. *Herpetological Conservation and Biology* 14: 119-131. https://www.herpconbio.org/Volume_14/Issue_1/Walker_et_al_2019.pdf
- Warren, N. and Redders, J. 2001. R2 sensitive species recommendations: *Oenothera engelmannii*. Dated: October 1, 2001. Lakewood, CO: USDA Forest Service, Rocky Mountain Region (R2). 1 p. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd593868.docx
- Weber, W.A., Wittmann, R.C., and Müller-Wille, L.W. 2012. *Colorado flora western slope: A guide to vascular plants*. 4th ed. Boulder, CO: University Press of Colorado. 527 p. <https://www.jstor.org/stable/j.ctt46nv0n>
- Wilcox, K.R., Blumenthal, D.M., Kray, J.A., Mueller, K.E., Demer, J.D., Ocheltree, T., and Porensky, L.M. 2021. Plant Traits Related to Precipitation Sensitivity of Species and Communities in Semiarid Shortgrass Prairie. *New Phytologist* 229(4): 2007-2019. <https://doi.org/10.1111/nph.17000>
- Windham, M.D. 1983. The ferns of Elden Mountain, Arizona. *American Fern Journal* 73(3): 85-93. <https://doi.org/10.2307/1546855>
- Windham, M.D., Huiet, L., Metzgar, J.S., Ranker, T.A., Yatskievych, G., Haufler, C.H., and Pryer, K.M. 2022. Once More Unto the Breach, Dear Friends: Resolving the Origins and Relationships of the *Pellaea wrightiana* Hybrid Complex. *American Journal of Botany* 109(5): 821-850. <https://doi.org/10.1002/ajb2.1850>
- Woch, M.W., Migdałek, G., Jedrzejczyk, I., Podsiedlik, M., and Stefanowicz, A.M. 2022. The genetic diversity of *Asplenium viride* (Aspleniaceae) fern colonizing heavy metal-polluted sites. *Plant Growth Regulation* 98(2): 359-369. <https://doi.org/10.1007/s10725-022-00864-3>
- Wyoming Field Guide. 2024. Rosy Palafox (*Palafoxia rosea*) (online data). Laramie, WY: University of Wyoming. Date Accessed: August 12, 2024. Available at: <https://fieldguide.wyndd.org/?species=palafoxia%20rosea>
- Yair, Y., Goldwasser, Y., Sibony, M., Eizenberg, H., and Rubin, B. 2020. Differential Germination and Growth Response to Temperature of Three Ambrosia Weed Species—Implications for Future Spread. *Frontiers in Agronomy* 2: 1-10. <https://www.doi.org/10.3389/fagro.2020.573860>

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Appendix D:
Scenery Resources

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Appendix D: Scenery Resources

Introduction

Under the current forest plan, the scenic resources of the CCNG are managed using the visual management system and visual quality objectives. Visual quality objectives are standards of measurement used to assess the aesthetic quality of landscapes, focusing on the degree of human impact on the scenic character of an area used for assessing proposed and existing impact to scenic quality. Management area standards and guidelines assign visual quality objectives for each area. The current management direction, based on inventories completed in the 1980s, doesn't reflect changed conditions and visitor use patterns, and uses a system no longer considered the best available scientific information for managing scenery in an ecosystem context.

The Forest Service has been managing scenery as a resource since the 1970s. The visual management system, established in 1974, provided the framework to inventory the visual resource and provided measurable standards (visual quality objectives) for managing scenery. When the LMP was adopted in 1984, scenic resources were inventoried and analyzed using visual resource inventories completed in the 1980s. In 1995, the Forest Service replaced the visual management system with the scenery management system (SMS).

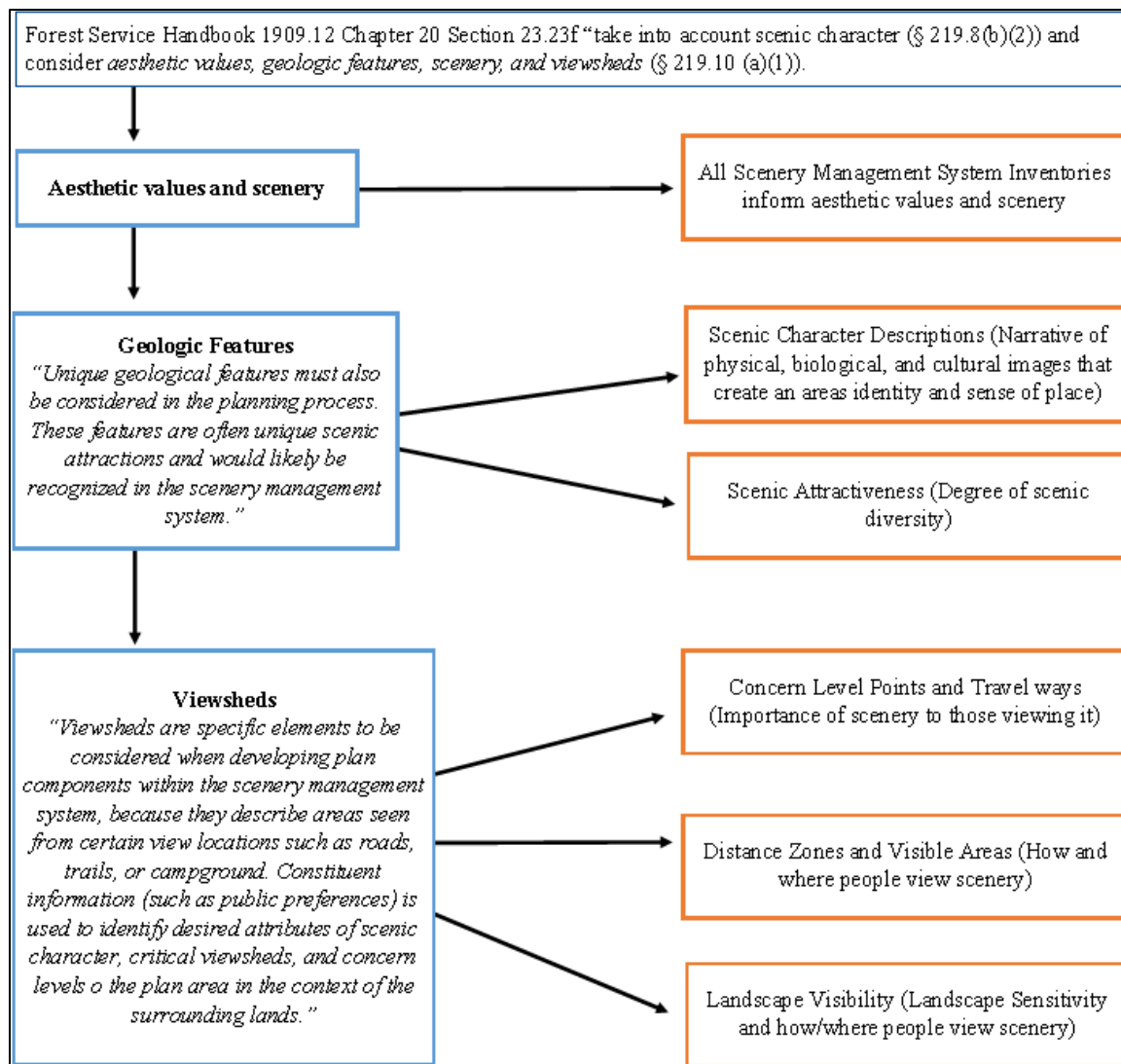
The Planning Rule requires that the plan must include plan components, including standards or guidelines, to provide for scenic character (§ 219.10(b)(1)(i)). When developing plan components, the Responsible Official shall take into account scenic character (§ 219.8(b)(2)) and consider aesthetic values, geologic features, scenery, and viewsheds (§ 219.10 (a)(1)). The Scenery Management System (SMS) represents the agency's latest science in fulfilling its legal requirements for managing scenic resources. Forest Service Manual 1921.03 requires that plan revisions use the SMS to address scenic character and develop scenery-related plan direction, unless the Responsible Official provides written justification and receives concurrence from the Regional Forester. This provides a framework for developing plan components related to scenic character by evaluating and assigning values to the scenic resources based on how people interact with the landscape, both while visiting the national forest and as the landscape serves as a backdrop to their experiences outside of the national forest.

Other guidance to support meeting the requirements of the 2012 Planning Rule include Forest Service Manual 2380 and Landscape Aesthetics - A Handbook for Scenery Management (Agriculture Handbook 701) (U.S. Department of Agriculture 1995). These documents describe the framework and contain additional information on the Scenery Management System. Additionally, several concepts detailed in Forest Service Manual 2310, Chapter 10 - Sustainable Recreation Planning are complementary to the Scenery Management System (SMS). Ecological processes and disturbance patterns provide a foundation for scenic character. Valued aspects of the built environment are integral to SMS and contribute to a landscape's sense of place. Public engagement and stakeholder input can be included in SMS to ensure that the values of the public and how/where they relate to and interact with the landscape can inform decision-making processes on desired scenic integrity objectives and plan components.

The USDA Forest Service Washington Office developed a SMS National Inventory Mapping Protocol to meet the intent of the planning rule requirements and supporting Forest Service Manual and Handbook direction. The protocol ensures that the same processes and considerations are folded into each plan development or revision effort. Products from the National Inventory Mapping Protocol include:

- Scenic character descriptions
- Scenic attractiveness (degree of scenic diversity)
- Concern levels (importance of scenery to those viewing it)

Figure 1. Scenery Management System Inventories ensure that Land Management Plan revision efforts take into account scenic character and consider aesthetic values, geologic features, scenery, and viewsheds



- Landscape visibility (landscape sensitivity and how/where people view scenery)
- Scenic classes (combination of concern levels and visibility, assigns the importance of scenery for comparison with other resource)
- Existing scenic integrity (intactness of scenic character attributes)

These inventories are essential to inform the forest assessment and establish the existing scenic conditions. Based on these products, the interdisciplinary team and public can work together to develop desired scenic integrity objectives and other components for the plan revision. The revised plan and associated scenery components will help those implementing management across the landscape understand which desired scenic character attributes are to remain intact.

Through the SMS planning process, up to date existing condition inventories are completed. Desired conditions and other plan components for scenic character will be developed and integrated with other resources and social demands or expectations, and scenic integrity objectives will be established in the revised land management plan. SMS inventories have been completed to provide the existing condition of scenic resources on the national grasslands and provide unit-wide data layers for managing scenic resources in the future.

Past Approaches and Existing Data Sources

The Visual Management System informed the development of the current Cimarron and Comanche National Grasslands Plan. Since that time, the agency shifted to the Scenery Management System, which integrates many of the same concepts from the earlier Visual Management System while updating terminology and increasing the role of constituents throughout the inventory and planning processes. It also borrows from concepts of ecosystem management and improves the integration of other biological, physical, and social/cultures resources into scenery management planning (U.S. Department of Agriculture 1995). As the Cimarron and Comanche National Grasslands Plan Revision effort continues, information from past efforts will be used as appropriate to inform the assessment and plan development process.

When the Cimarron and Comanche National Grasslands prepared for the Land and Resource Management Plan Revision, the planning team developed several of the required Scenery Management System Inventories. While the methodology used at that time reflects the guidance from the 2020 National Scenery Management System Inventory Mapping Protocol, data updates, requirement changes, and changed conditions prompted us to recreate preliminary inventories not available from the previous effort. These products will be reviewed and validated internally, as well as through public engagement efforts.

Scenic Character Descriptions

Scenic character is a combination of the physical, biological, and cultural images that gives an area its scenic identity and contributes to its sense of place. Scenic character provides a frame of reference from which to determine scenic attractiveness and to measure scenic integrity (36 CFR 219.19). Scenic character descriptions for ecological subregions across Cimarron and Comanche National Grasslands include:

- How the landscape has developed over time using information from archeologists, historians, ecologists, and others familiar with the influences of the Cimarron and Comanche National Grasslands landscapes.
- Existing scenic attributes such as landform, vegetative patterns, water characteristics, and cultural features.

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Revised Land Management Plan*

- Existing scenic attributes which affect the senses of the aesthetic experience other than sight, such as sound, smell, taste, touch.

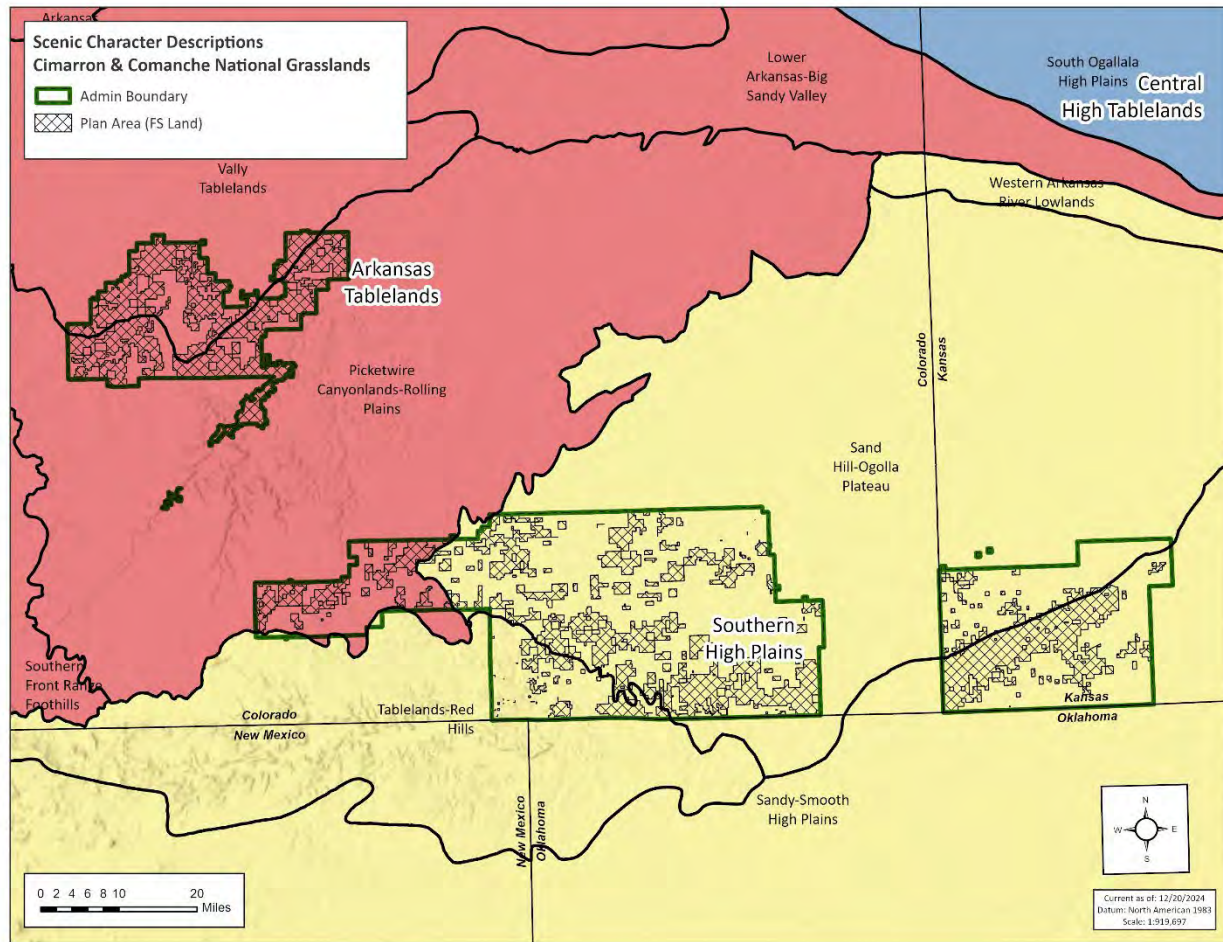
To capture the scenic character descriptions as outlined above, Provinces and Ecological subregions of the United States were used to understand the diversity of landscapes represented across the Forest and Grasslands. While much of the vegetation (patterns, existing, potential), geological, landform, and water characteristics are supported from subregion and land type association summaries and other existing data and information, we integrated local knowledge and cultural influences to understand what these individual areas mean to local communities and how they interact with the landscape in these settings. In building this inventory, the land type association ecoregions were used as they best highlight these scenic character areas, and due to other ecological regions not being available in this area.

The Cimmaron and Comanche National Grasslands fall within 2 ecological provinces: The Arkansas Tablelands and the Southern High Plains. Two subregions, covering XXX acres of the Grasslands, were used to understand the scenic character of the landscape within the Arkansas Tablelands area (figure 2). These subregions include the Arkansas Valley Tablelands and the Picketwire Canyonlands-Rolling Plains. Character Units within the Southern High Plains portion of the Grasslands include the Sand Hill Ogalla Plateau, Sandy Smooth High Plains, and Tablelands-Red Hills

Table 1. Summary of acres in each Scenic Character Units

Scenic Character Unit (Province - Subregion)	Acres
Arkansas Tablelands - Arkansas Valley Tablelands	
Arkansas Tablelands - Picketwire Canyonlands-Rolling Plains	
Southern High Plains - Sand Hill Ogalla Plateau,	
Southern High Plains - Sandy Smooth High Plains	
Southern High Plains - Tablelands-Red Hills	

Figure 2. Scenic Character Description Inventory Map utilizing the ecological units to capture larger areas of similar landscapes



Arkansas Tablelands Province

The Arkansas Tablelands cover the western third of the Comanche National grassland. The predominant landforms of this province include undulating hills, deposits of shale, and sand and gravel soil types. There are also areas with deposits of sandstone and limestone.

Vegetation is classified as short and mid grass prairie. Grass species include: grama-buffalo prairie, sand sage-bluestem prairie, and juniper woodland.

Land use is typically ranching and farming and other related agricultural activities.

Arkansas Valley Tablelands

This section includes undulating and rolling plains of shale that are moderately dissected by streams. Large stream valleys, isolated mesas and rolling to hilly dunes are also present. Elevations range from 3,610 to 6,235 feet. Predominant vegetation consists of short and mid-grass prairies with some woodland. Bison and wolves are historic residents. White-tailed deer, mule deer, and antelope are the residents today. Occasionally black bears, elk and mountain lions can be spotted. Lark, harriers, prairie falcons and burrowing owls are present year-round. This area is the northern range of the roadrunner. Prairie

rattlesnakes, gopher snakes, snapping turtles and toads are the dominant reptiles. Catfish are also present in the lakes and streams.

Fire, drought, insects and disease have been the primary forms of disturbance. Precipitation averages 10 to 17 inches per year. The average temperature is 45 degrees. Surface water is characterized by its association with sand and gravel and is scarce where shale bedrock is present. The Arkansas, Cuchara, Purgatoire, Apishipa and St. Charles Rivers flow through the section. The predominant land-uses are farming and ranching. There are some urban areas along the western boundary, the suburbs of Denver and Colorado Springs. Approximately 8% of the land is irrigated for farming.

Picketwire Canyonlands Rolling Plains

This sub-section covers the western 3rd of the Carrizo Unit and the southern and eastern portions of the Timpas unit. Vogel and Picketwire Canyons, two very distinct features in the area, attract a lot of visitors to the area. Vegetation consists of juniper and Pinon Pine. Cottonwoods are visible along the river bottoms and as evidence of past homesteads. The Purgatoire River and Timpas Creek are the primary water features within this subsection. There are numerous other intermittent streams that dissect the area. There are also numerous man-made impoundments, made primarily for livestock grazing. The road system consists of Colorado Highways 350, 109 and 106, which are all paved two lane highways. County roads that follow the township and range section lines are improved gravel roads, passable in passenger vehicles. The terrain provides opportunities for solitude, especially in the deep canyons. Roads, however, make most of the area accessible. Recreation activities include scenic driving, mountain biking, historic and pre-historic exploration, bird watching, and use of the developed recreation facilities. The dominant landscape use is livestock grazing. There is some evidence of oil and gas production. Fencing, gates, cattleguards, and stock tanks are visible throughout. There is an occasional windmill still present.

Southern High Plains Province

The Southern High Plains are in the Great Plains geomorphic province. The predominant landforms are flat plains with extensive erosional material from the adjacent mountains. This process has resulted in a region being moderately dissected. Landforms are mostly smooth plains with smaller tablelands. Elevations range from 2,600 to 4,000 feet. The formation of the rock forms took place during the Paleozoic, Mesozoic and Cenozoic eras. Soil is deep; fine to coarse, and well drained with limited moisture for plant use.

Vegetation is classified as sand sage-bluestem prairie with short to mid-grasses predominant. Grass species include blue gramma, buffalo, hairy grammar and little bluestem. Shrub or tree vegetation includes pinon pine, juniper, yucca, rabbit brush, sage, and Cottonwood trees are also found along the river bottoms.

Land use is typically agriculture and cattle grazing activities that are visible on the landscape.

Sand Hill Ogalla Plateau

The Sand Hill Ogalla Plateau unit is located north of the Cimarron River within the Cimarron National Grassland boundary. The area considered short grass prairie comprised of grass varieties including Blue Grama, Buffalo, Galletaa Sand Dropseed, Purple Three Awn, and Western Wheatgrass. There are also Yucca and Cholla Cactus mixed into the landscape with clumps of Juniper and Cottonwood trees along the Cimarron River. The soils are well drained loamy soils derived from limestone and shale. The Cimarron River runs dry most of the year, with subsurface flows. Point of Rocks man-made fishing ponds originally built for migrating waterfowl contribute to recreation within the unit. Point of Rocks interpretive site provides parking, delineated fencing, and three interpretive signs overlooking the river and the Point of Rocks Ranch A 19-mile section of the Santa Fe National Historic Trail crosses the area southwest to northeast, paralleling the river. The Murphy and Conestoga Trailheads are located at either end of the

trail. A companion trail that parallels the SFT is used today to prevent damage to the historic ruts still visible today.

The Sante Fe Trail runs along the river corridor and adds significant cultural and historical context to the location. Point of Rocks formation, a significant 150-foot overlook used by travelers on the Sante Fe Trail provides views to the south and west. The Santa Fe Trail is identified with limestone posts that are inter-visible along the trail. Middle Spring was a water source for travelers along the Sante Fe Trail. Middle Spring offers a developed picnic area with water, picnic sites, trails, interpretive signs and toilets.

This area generally receives 12-16 inches of precipitation per year, mainly in the form of summer thunderstorms. Winter snow is short lived. Summer temperatures often exceed 100 degrees.

Richfield Kansas is the only small community, near the Cimarron National Grassland and located within this landscape subsection. Wildlife includes turkey, coyote, beaver, mule deer, some white-tail deer, and occasionally elk. Numerous songbirds and migrating waterfowl are also heard. Rodents and reptiles are abundant.

Highway 27/51 travels north/south through the area. Highways 27 & 51 are separate roads, but for a short east west section they are the same route. The remaining roads are improved gravel surface, passable by passenger vehicles. Many roads, both public and private, parallel the township and range section lines traverse the area. Numerous oil and gas wells, tank batteries, windmills, stock tanks, fences, irrigation equipment, and roads are visible throughout the area. There is also a Morton County gravel pit visible on the north side of the river. The level of disturbance would be considered high. There are ample opportunities for solitude away from the developed recreation sites.

Sandy Smooth High Plains

The Sandy Smooth High Plains Unit located south of the Cimmaron River within the Cimmaron National Grassland Boundary. Although plainly visible the river corridor flows mostly under the surface. The Cimmaron Recreation Area, Wilburton, and Mallard ponds though man-made foster outdoor fishing opportunities in a natural appearing setting. The Cimmaron Recreation Area includes a campground, picnic sites, group areas, and fishing piers. The Cottonwood Picnic Site includes gym sets, picnic tables, water, and toilets. The soil consists of sandy windblown deposits that limit the growth of prairie vegetation. Several large "blow-outs" appear as moving sand dunes. The flat, gently rolling landscape is classified as a mid-grass prairie. The rolling hills covered with native grasses, sage, yucca, cholla and other prairie vegetation. Prairie vegetation mostly short grasses and sand sage covers the landscape. The area normally receives about 10-13" of rain per year usually during summer thunderstorms. In the river bottom cottonwood trees line the riverbanks. Cedar trees, cottonwoods, and Russian olive planted as windbreaks remain as evidence of the early homesteads. Elevations range from 3400-4600 feet with 10-15% slopes.

Communities within this unit are Elkart, Rolla, and Wilburton. Oil and Gas Production and Livestock Grazing contribute to most of the economic base. Man-made visible improvements include Oil and gas field developments, drilling rigs, pipelines, pump jacks, windmills, stock tanks, a rectilinear road system, miles of fencing, farm equipment, private in-holdings, homes, barns, and sheds. Highway 56/51 crosses the unit southwest to northeast. Highway 51 also continues north and south. The South River Road, an improved gravel road, facilitates a lot of traffic in the area.

Historically small farms and grazing homesteads were dominant until the Dust Bowl Era of the 1930's shifted agricultural use to ranching. Lap or ship siding, adobe blocks, metal roofs, and native rock were the building materials. Few, if any cultural resources remain visible today.

The skies are almost always blue and clear, and wind seems to be always present. The wildlife in the area include deer, turkey, coyote, songbirds, amphibians, reptiles, and occasionally elk.

Tablelands Red Hills

This sub-section is in the southwestern corner of Baca County. It includes the land southwest of Carrizo Canyon. Many intermittent streams exist, as do some springs. The steep rock cliffs at Carrizo Picnic Area draw the public to this area. There are few developed roads in the area contributing to solitude. There are no paved roads within this sub-region. This sub-region is unlike others on the grasslands because of the road pattern and topography. The normal pattern is to follow township and range section lines, but here the topography does not allow that. What exists is a road pattern that is very irregular, following the dendritic stream pattern. This area would provide the highest level of solitude on the Comanche National Grassland. Hunting and dispersed recreation are the largest recreation activities. The only developed site within this sub-region is the Carrizo Picnic Area.

As with the other sub-regions on the grasslands, buffalo and wolves are the historic residents of the area. Today, white-tailed deer, mule deer and pronghorn antelope are residents of the area and coyote are also present. Elk, black bears and occasionally mountain lions come into the area. This is the northern range of the road runner habitat.

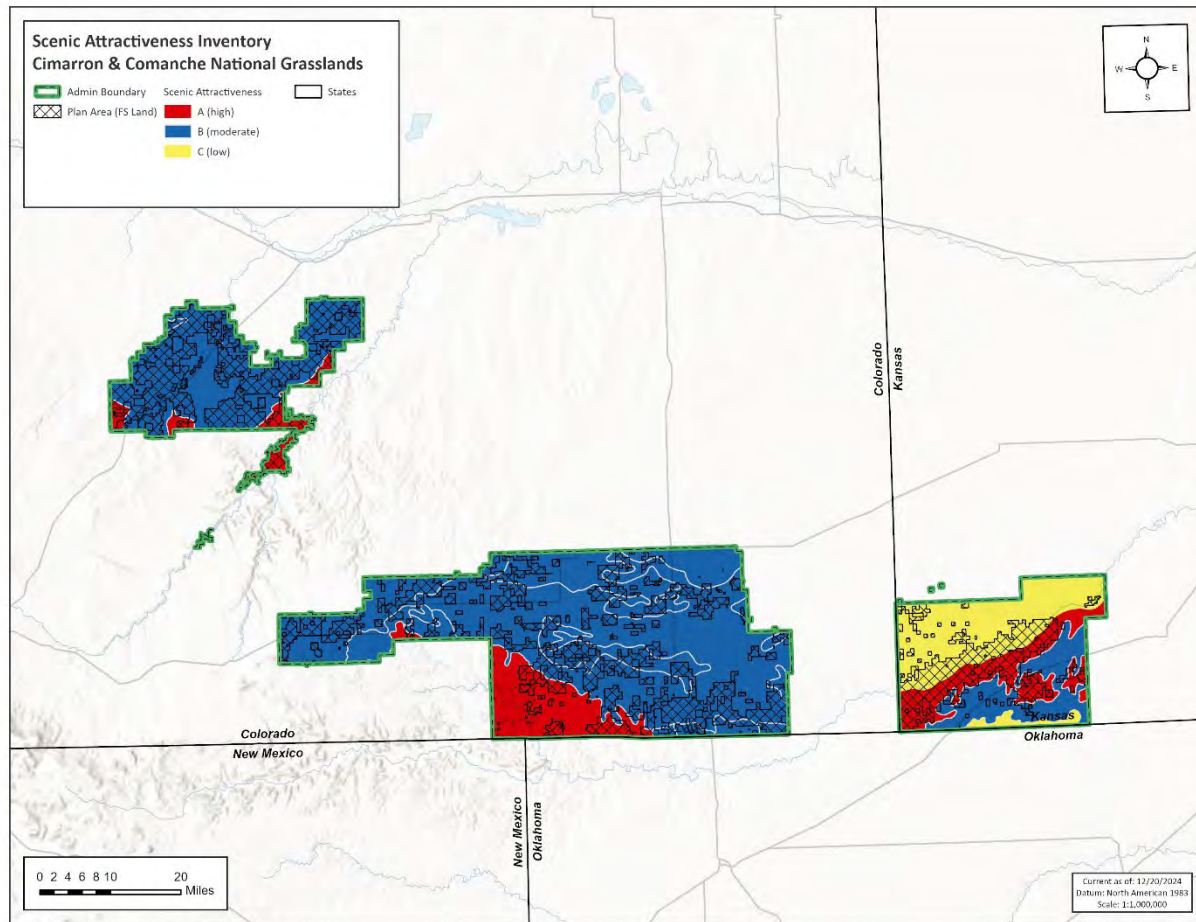
Scenic Attractiveness

Scenic attractiveness is the primary indicator of the intrinsic scenic beauty of a landscape and of the positive responses it evokes in people. It helps determine landscapes that are important for scenic beauty, based on commonly held perceptions of the beauty of landform, vegetation pattern, composition, surface water characteristics, and land use patterns and cultural features. The scenic importance of a landscape is based on human perception of the intrinsic beauty of landform, rock form, water form, and vegetation pattern.

The scenic attractiveness inventory breaks the landscape into three classifications:

- **Class A:** Distinctive (extraordinary or special landscapes which stand out from common landscape). Areas where landform, vegetation patterns, water characteristics, and cultural features combine to provide unusual, unique, or outstanding scenic quality. These landscapes have strong positive attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, patterns, and balance.
- **Class B:** Common (refers to landscapes with ordinary and routine scenic attractiveness). Areas where landform, vegetation patterns, water characteristics, and cultural features combine to provide ordinary or common scenic quality. These landscapes have positive yet common attributes of variety, unity, vividness, mystery intactness, order, harmony, uniqueness, patterns, and balance.
- **Class C:** Indistinctive. Areas where landform, vegetation patterns, water characteristics, and cultural features have low scenic quality. Often, water and rock form of any consequence are missing in class C landscapes. These landscapes have weak or missing attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.

Figure 3. Scenic Attractiveness Inventory. This inventory captures the diversity and variety of scenic elements in an area



Scenic attractiveness comprises multiple data sets including vegetation, geomorphology, waterbodies, slopes, streams, and rivers.

To develop this inventory the geomorphology formed the base layer, as the features covered the entire surface and those features coincided with other data sets such as rivers, streams, and slopes. In addressing the flat landscape, slopes were adjusted to distinguish the scenic attractiveness compared to the region. This was done by raising the slopes contributing to Class A or Distinctive to 15% and above, Class B or Common from 10%-15%, and Class C or Indistinctive representing any slopes below 10%.

Table 2. Scenic Attractiveness area and total acres

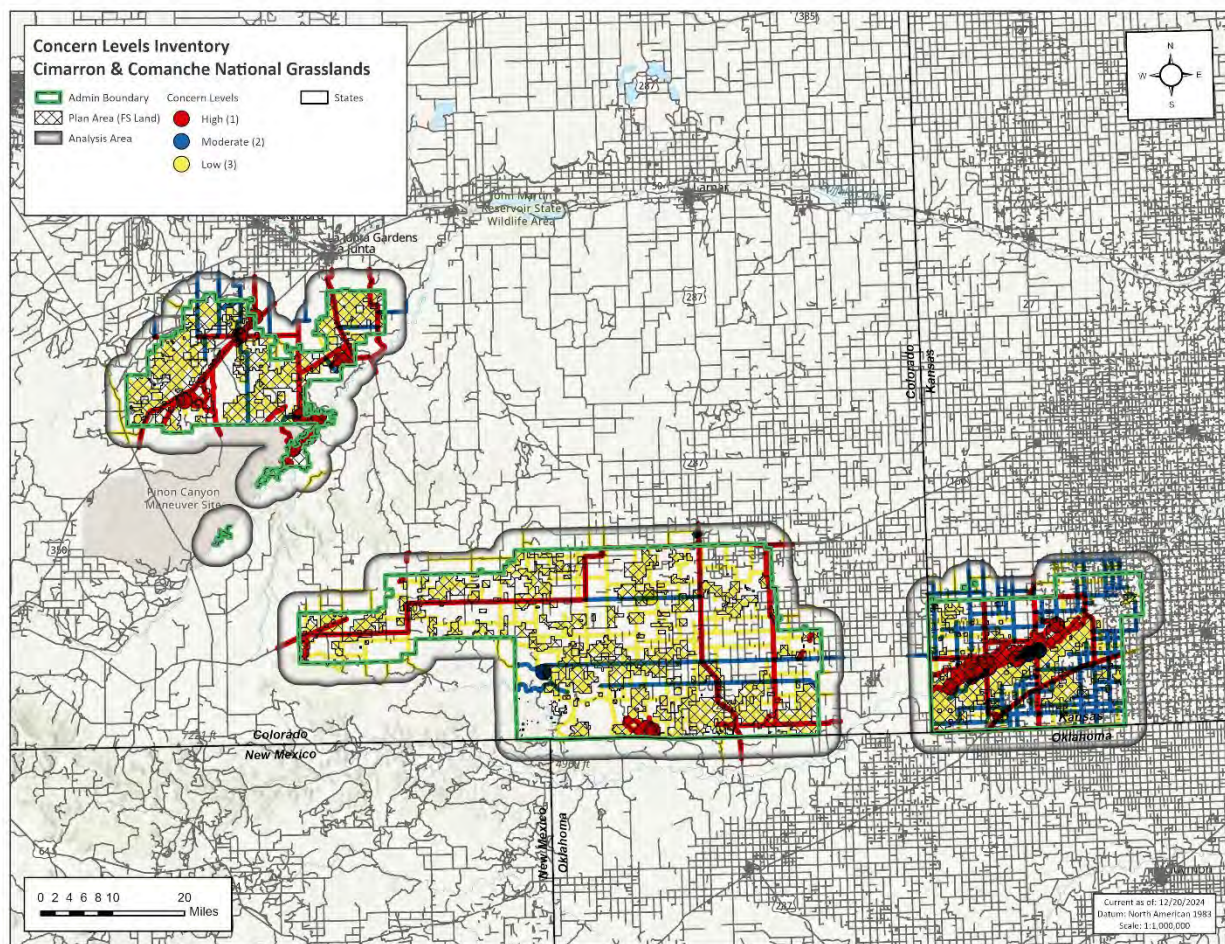
Scenic Attractiveness	Total Acres
A	109,237
B	396,787
C	46,158
Total:	552,182

Concern Level Points and Travelways

Concern Levels help us capture public importance placed on landscapes viewed from travelways and use areas. Points are use areas that receive concentrated public viewing use such as campgrounds, scenic overlooks, visitor centers, lakes, interpretive sites, and so on. Travelways are linear features across the landscape with concentrations of public viewing, such as roads, trails, railroads, and streams. Concern levels provide a foundation for other aspects of the scenery management system such as landscape visibility and distance zones. They also influence the development of existing and desired Scenic Integrity Objectives, which guide the management of scenery resources.

Concern Levels are divided into three categories. Level 1 represents travelways and use areas of high concern for scenery management. Level 2 are locations of moderate concern. Areas assigned to Level 3 represent locations of low concern. Data used to identify Concern Level Points and Travelways have substantially updated since earlier revision efforts, therefore these inventories were re-created and validated to support SMS inventories. Refer to Landscape Aesthetics, A Handbook for Scenery Management, Agriculture Handbook 701, for detailed information on determining concern levels (U.S. Department of Agriculture 1995).

Figure 4. The Concern Levels Inventory captures the importance of the view from those viewing the landscape



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Concern Level 1: all primary and secondary travel routes, use areas, and water bodies where the level of interest in scenery is high is a concern level 1 regardless of the level of use. Initial Concern Level 1 Points and Travelways included:

- Santa Fe National Historic Trail and all its offshoots
- Santa Fe National Historic Trail and Scenic Byway and all its places to pull off or viewpoints
- Picket Wire Canyonlands recreation area and primary access roads and trails
- All roads associated with the self-guided Carrizo Auto Tour
- Research natural areas
- Administrative designated areas
- Primary roads
- All recreation sites at Development Scale 4 and 5, as well as Historic Sites, Lookouts/Cabins, Resorts, Interpretive sites, and Viewing areas
- Nearby non-National Forest Service points of interest, including Historical Sites, Interpretive sites, campgrounds, lookouts, and resorts.

Table 3. Concern Level 1 Features

Feature	Identifier
Concern Level 1 Points	Picket Wire Canyon-Dinosaur Track Site, Picket Wire Corrals, Sierra Vista, Iron Spring, Timpas Picnic Site, Vogel Canyon Picnic Site, Picture Canyon Picnic Site, Rourke Ranch Lookout/Cabin, Withers Canyon Trailhead, Murphy Trailhead, Conestoga Trailhead, Cimarron Group Picnic Site, Middle Spring Picnic Site, Cottonwood Picnic Site, Point of Rocks, Cimarron Overlook, Atwood Ponds Fishing Site, Cimarron Campground, Cimarron Picnic Site, Point of Rocks Fishing Site
Concern Level 1 Travelways	Roads: BAC-36, BAC-C, Beaver Pond, Berryman B-1, BOC No.1, Bridge Pond, Bunkhouse Admin, Caliche Pit, Cave Spring, Cherokee B-2, CIG Pipeline, Cimarron, Cimarron Rec. Area, Cimarron River P.G., CO-109, CO-71, Conestoga, Cow Camp, Crack Cave Admin, Crows, David Canyon, David Canyon A, Dean's, Dell, Dominick, Dunkle A-1, Dunkle A-3, Eagley 1, Elkhart NW Access, Gear A No.1, Grasslands 15-1, Grave, Hog, House, Interstate 1-1, Interstate 2-10, Interstate J2-15, ISU #32 South, ISU #90, ISU No.32, ISU No.7, KS-27, KS-27/51, KS-51, LAS-169, Last Chance Admin, Lindsey Dam, Lookout, Mclain 2-34, McDougal A-1, Middle Spring, Middle Spring Access, Mongone, Mor-16, Mor-A, MOR-State Line RD, Murphy, Nash, Nicks, North River, North Spring Admin, North Troy, Oates, On Top of Hill, OTE-13, OTE-25, OTE-35, OTE-36, OTE-N, Perkins A-1, Picketwire Admin, Picture Canyon, Picture Canton Admin, Point Rocks Access, Protection, Raindrop, River Access 1, River Overlook, Rourke Ranch Admin, Rourke Ranch Admin B, Rourke Ranch Admin E, Rourke Well Admin, Rumor, Santa Fe Trail Unit A No. 1-7, Santa Fe Trail Unit A #2.2, Santa Fe Trail Field, Seager, South River, South Troy, Strip Ponds, Tank, Teal Pond, Top Line, Track Site Admin, Trak Trail Admin, Tucker Trail, Tuttle, Twin Springs Admin, US-160, US-287, US-350, US-56, KS-51, US Govt. 1-15, USA Eagley A-2, Walsh B No.1, Withers ½ Admin, Withers Canyon, Yoder Trails: Track Site Spur, Middle Spring Connector, Picketwire Canyonlands, Arch Rock, Outlaw, Point of Rocks Loop, Cimarron River Trail, Santa Fe Historic Trail Alt. Route E, Santa Fe Historic Trail Alt. Route C, Santa Fe Historic Trail Alt. Route B, N RTE Middle Spring Connector, Middle Spring Nature Cutoff, Sierra Cista Santa Fe Trail connector, Santa Fe Historic Trail Alt. Route D, Point of Rocks Trail, Withers Loop Trail, Sheep Canyon Cutoff, West Turkey, Santa Fe National Historic Trail, Aubry Cutoff Santa Fe National Historic Trail, Homestead, Picketwire Canyonlands, Santa Fe Nature, Cottonwood, Cimarron Overlook, Point of Rocks Ponds, Vogel Canyon, Overlook, Middle Spring Nature, Companion, Santa Fe National Historic Trail-North RTE, Mesa, Outlaw, Mesa, Prairie, Grandpa-FT. Union Military, Sand Trap, Hill Climb, Barlow-Sanderson Wagon Road, Rock Art 2 Spur, Homestead Spur, Dragonfly Spur

Concern Level 2: Includes all seen areas from primary travel routes, use areas, and water bodies where the forest or grassland visitors have a moderate interest in scenic qualities or low interest in scenic qualities if the area receives moderate to high use. Initial Concern Level 2 Points and Travelways included:

- All secondary access roads (including all Maintenance Level 4 roads)
- Trail Class Level 3-5
- All recreation sites at Development Scale 3
- Nearby non-National Forest Service points of interest, including Viewing areas and Picnic areas

Table 4. Concern Level 2 Features

Feature	Identifier
Concern Level 2 Points	Carrizo Canyon Picnic Site, Wilburton Pond Fishing Site, Mallard Ponds Fishing Site
Concern Level 2 Travelways	OTE-11, OTE-W, BAC-W, MOR-V, MOR-Q, MOR-15, MOR-22, MOR-23, OTE-21, David Canyon H, Ben-7, MOR-C, MOR-17, MOR-26, MOR-U, MOR-P, STE-3, BAC-J, OTE-R, OTE-B, MOR-B, South River, MOR-11, MOR-C, MOR-16, MOR-28, STE-U, OTE-16, BAC-5 TH AVE, BAC-9 TH AVE, MOR-W, MOR-13, Tunnerville Turnout, MOR-H, MOR-21, MOR-J, MOR-28, OTE-26, OTE-L, Carrica, BAC-Hill ST, BAC-Tipton ST, Interstate G-4, Travis, Jerry, MOR-F, East LPC Blind, MOR-18, MOR-17, MOR-24, STE-3, STE-P, OTE-12, MOR-7, MOR-12, GEAR A-2, MOR-19, MOR-J, OTE-5, OTE-18, OTE-17, Dry Creek, OTE-S, BEN-S, BAC-DD, BAC-2 ND AVE, MOR-9, MOR-13, MOR-14, MOR-E, MOR-11, Wilburton Pond, MOR-F, MOR-Z, MOR-27, STE-V, BAC-M, MOR-D, MOR-2, MOR-S, Cimarron Ponds Access, MOR-G, MOR-Q, MOR-L, MOR-16, MOR-T, MOR-N, OTE-16.5 Trails: Mallard Pond, Wilburton Pond, Carrizo Rock Art Spur, Carrizo H/C Viewing Area, East Turkey, Wilburton to Turkey, Carrizo Canyon

Concern Level 3: All remaining roads, trails, and recreation sites are not included in Concern Levels 1 and 2. These landscapes and secondary travelways and use areas have local importance only and generally get low to moderate recreation use.

Table 5. Concern Level 3 Features

Concern Level Feature	Identifier
Concern Level 3 Points	Cimarron Sportsman Club Target Range, Shooting Range
Concern Level 3 Travelways	All remaining roads and trails

Landscape Visibility

Landscape visibility inventory helps identify important viewsheds across the Forest. Viewsheds are specific elements to consider when developing plan components within the scenery management system because they describe areas seen from certain view locations such as roads, trails, or campgrounds (Forest Service Handbook 1909.12, Chapter 20, Section 23.23f).

This inventory provides a reflection of the public concern (importance) of scenery along travel ways and at use areas as captured in the concern levels inventory. It also considers the degree of discernible detail (sensitivity) of the landscape and the distance from the viewer. Distance zones are identified as foreground (up to ½ mile from the viewer), middleground (1/2 mile to 4 miles from the viewer), and background (4 miles from viewer to the horizon).

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To develop a Landscape Visibility Inventory on a flat landscape a model was built to established all of the previously listed categories. Buffers allowed the distances to be captured, highlighting the impacts any improvement makes on a flat landscape to the surrounding area. Along with this high concern level areas were located where slopes either allowed for visual vistas, or in locations where the topography offered variety or seclusion.

Figure 5. The Landscape Visibility Inventory captures what is visible based on the concern level inventory and slope data

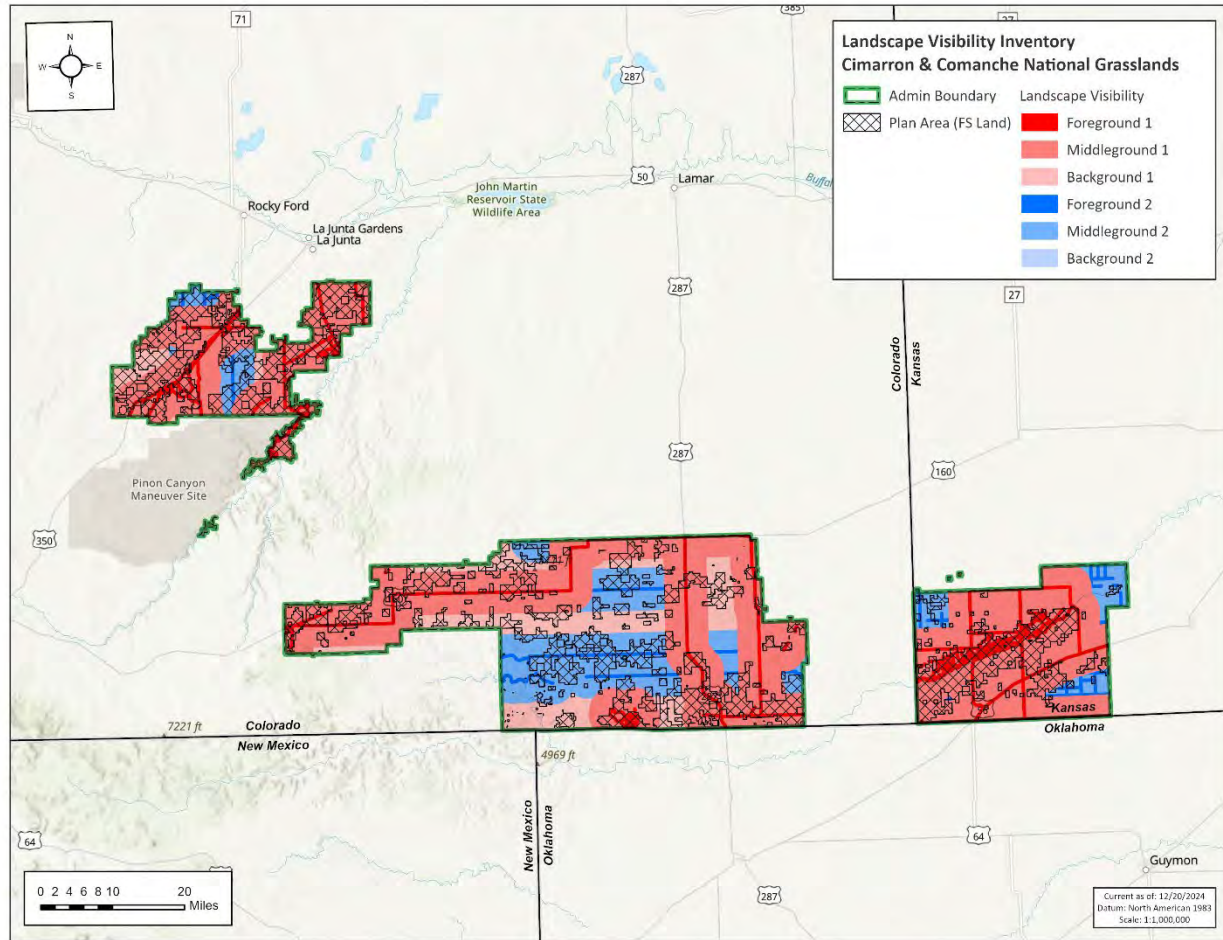


Table 6. Landscape visibility based on Concern Level Points and Travelways. Broken into distance zones by acreage and percentage from the Landscape Visibility inventory

Visibility Distance and Concern Level	Total Acres	Percent of the Plan Area
Foreground Concern Level 1	82,458	15%
Middle-ground Concern Level 1	308,345	56%
Foreground Concern Level 2	12,905	2%
Middle-ground Concern Level 2	87,831	16%
Background Concern Level 1	60,723	11%
Background Concern Level 2	0	0%
Total Acres included in the data	552,263	100%

Due to the flat nature of the landscape, all portions of the grasslands are visible from concern level 1 and 2 travelways and points. There were no acres for Background Level 2, Foreground Level 3, Middle-ground Level 3, or Background Level 3. This analysis illustrates the visibility of impacts on this unit can be seen from concern level travel ways and points for further distances than other forest service units. However, the highest concern level points on the unit are located within canyons, showing that the public seek after the canyons for either seclusion or for the different experience the canyon landscapes create.

Scenic Classes

Scenic classes are a measure of the value of scenery in a National Forest and used during land management planning to compare the importance of scenery along with the importance of other resources, such as timber, wildlife, old growth, and minerals (U.S. Department of Agriculture 1995). These classes are a combination of scenic attractiveness and landscape visibility, which takes into consideration the sensitivity and importance of scenic resources. Represented by 7 values, scenic classes 1 and 2 have high value for scenery, 3 through 5 have moderate value, and classes 6 and 7 have low value. This inventory does not take into consideration existing scenic integrity or desired conditions. It helps inform the revised plan development and desired scenic integrity objectives across the landscape.

Table 7. This table illustrates the layering in priority of the scenic classes by each distance zone, concern level, and scenic attractiveness level

Distance Zones/Seldom Seen and Concern Levels	Fg CL1	Mg CL1	Bg CL1	Fg CL2	Mg CL2
Scenic Attractiveness A	1	1	1	2	2
Scenic Attractiveness B	1	2	2	2	3
Scenic Attractiveness C	1	2	3	2	4

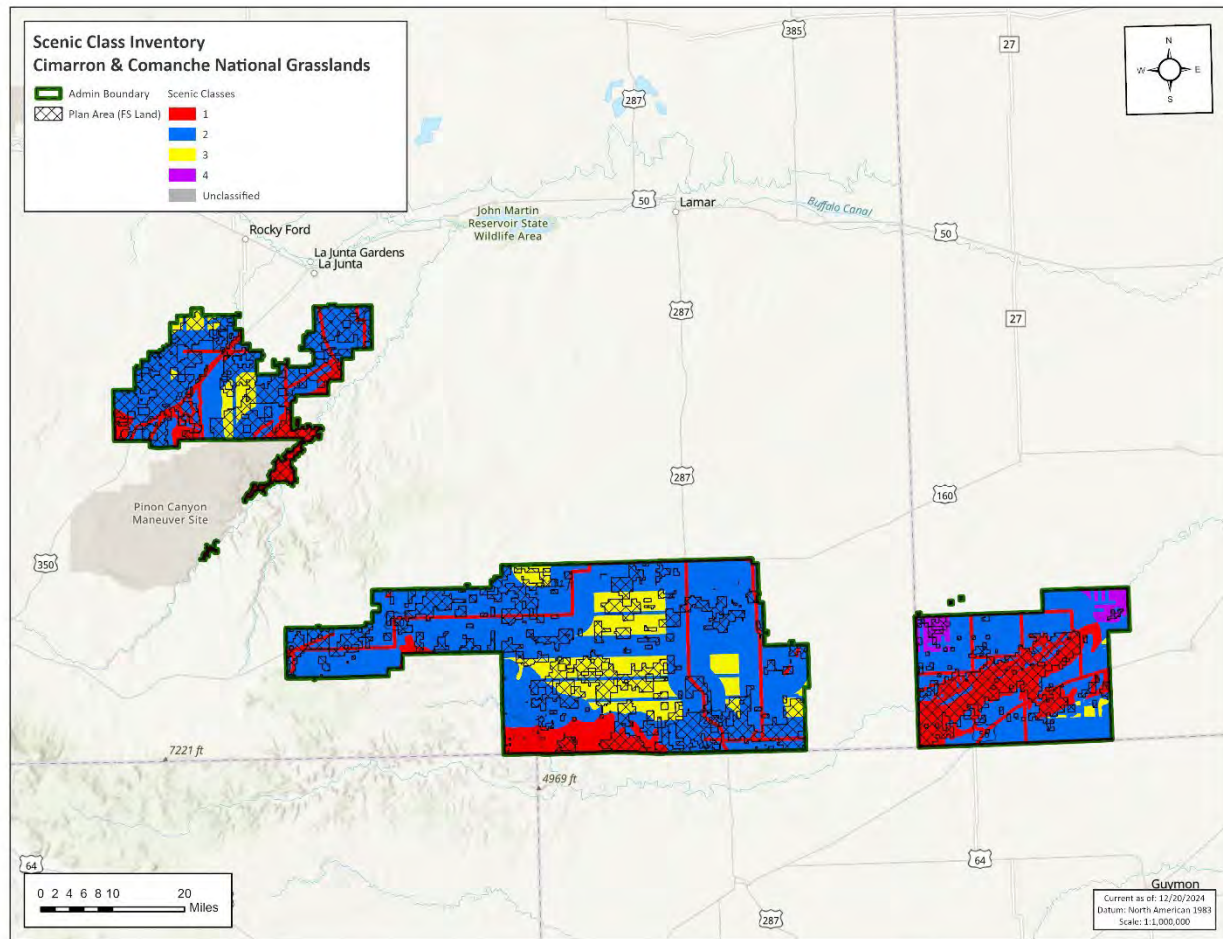
U.S. Department of Agriculture 1995

Fg = Foreground, Mg = Middle ground, Bg = Background, CL = Concern Level

Table 8. Scenic Classes by area and acres

Scenic Classes	Total Acres
1 (High)	162,167
2 (High)	312,342
3 (Moderate)	72,730
4 (Moderate)	4,942
Not Classified	83
Total:	552,264

Figure 6. Scenic Class Inventory is a combination of landscape visibility and scenic attractiveness to understand the importance of scenery resources across the area



Scenic Classes

There are up to seven values for Scenic Classes. The inventory ratings indicate the scenic value of landscape areas, irrespective of the existing scenic integrity inventory or desired conditions. Generally scenic classes 1 and 2 have high public value for scenery, classes 3 through 5 have moderate public value for scenery, and classes 6 and 7 have low public value scenery (USDA Forest Service 1995, page 4-15).

The Cimarron and Comanche National Grasslands' Scenic Classes all fall into high and moderate public value for scenery. Scenic Classes 1-3 being classified as high capture the varied vistas created by water and windswept landscapes. Scenic Class 4 being classified as moderate represents moderate and unified hills that are a more common landscape element.

Existing Scenic Integrity

Scenic integrity represents the degree of direct human-caused deviation across the landscape. It is evaluated by measuring the degree of alteration in line, form, color, and texture from the natural or natural-appearing landscape character. Mapping the existing scenic integrity allows us to understand how landscape character currently deviates from what would naturally be expected to occur there. This

creates a baseline for comparing how different alternatives analyzed in the revised plan environmental analysis would affect scenery resources. There are four, nationally defined Scenic Integrity Objectives that can serve as desired conditions, and one (very low) used only in describing existing conditions.

Table 9. Descriptions of scenic integrity classifications

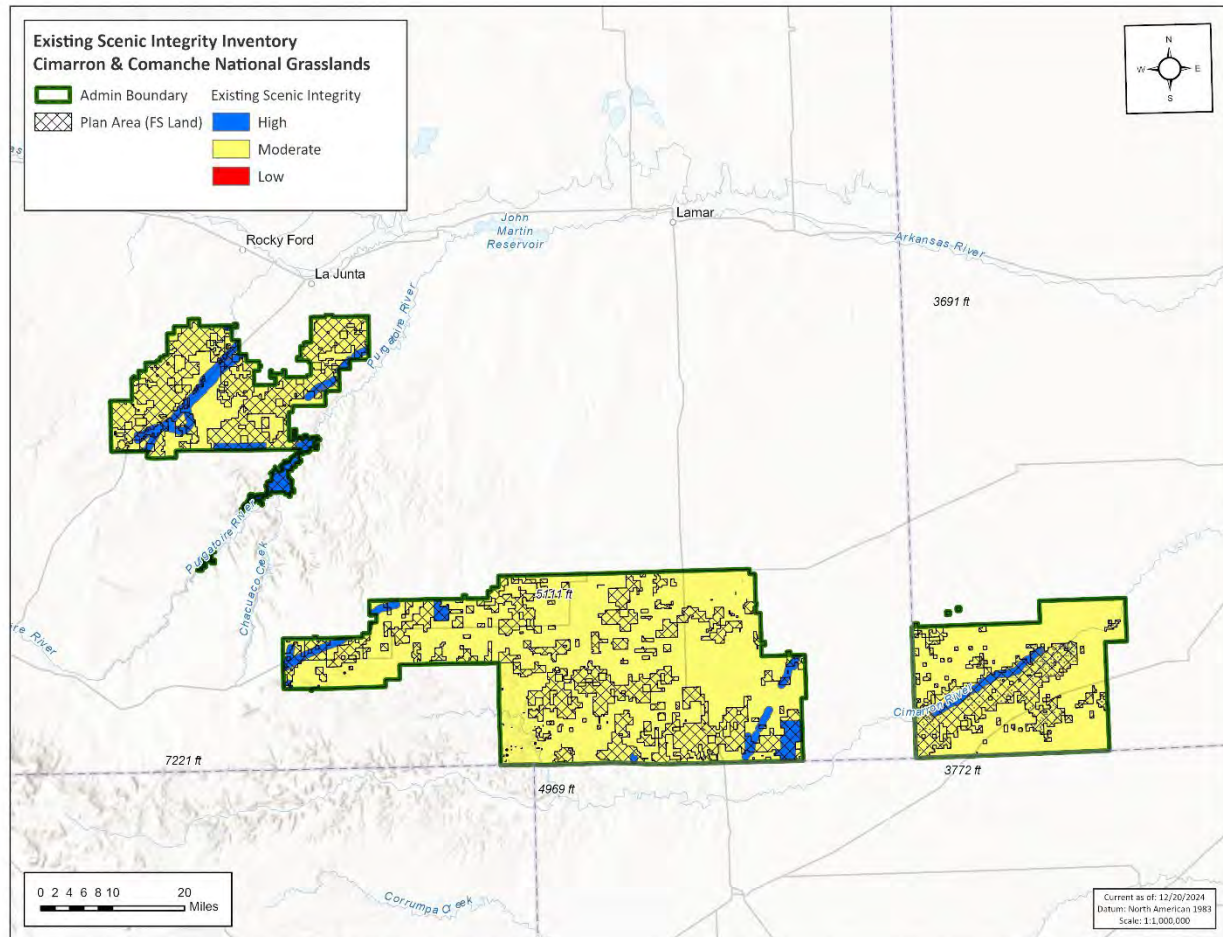
Scenic Integrity	Description
Very High	The landscape is intact with only minor changes from the valued attributes described in the scenic character.
High	Management activities are unnoticed, and the landscape appears unaltered.
Moderate	Management activities are noticeable but are subordinate to the scenic character. The landscape appears slightly altered.
Low	The landscape appears altered. Management activities are evident and sometimes dominate but are designed to blend with surroundings by repeating form, line, color, and texture of the attributes described in the scenic character.
Very Low	Used to describe landscapes that are heavily altered and in which the valued attributes described in the scenic character are not evident. Very Low is only used to describe existing scenic integrity and is NOT used as a Scenic Integrity Objective or desired condition.

Table 10. Existing Scenic Integrity by areas and acreage

Existing Scenic Integrity	Total Acres
High	83,648
Moderate	479,424
Low	1,912

The existing scenic integrity within the Cimarron and Comanche Grasslands display mostly moderate with areas of high scenic character where a variety of higher values combine. Areas with steeper slopes, water sources, cultural and historical context, and recreation elements were of higher concern to the public and were consistently highlighted as high scenic integrity. Low scenic integrity areas highlighted locations with greater industrial development connected with lower concern from the people viewing the landscapes. However, areas along the Sante Fe National Historic Trail have high oil and gas development, and special care needs to be taken in the reclamation of these sites when production ceases. This would better support the user's experience along a significant historical route. No areas registered as very low in the analysis.

Figure 7. Existing Scenic Integrity Inventory is developed by using a moderate base, and then mapping high scenic locations by designation, concern levels, or recreation use. Low areas are mapped representing specific vegetation treatments, oil and gas development



Considerations During Revised Plan Development

The Scenery Management System products help inform landscape character goals, desired conditions, and scenic integrity objectives in the revised plan. After the assessment and these inventories are complete, the revision team will develop alternatives to define where and to what degree deviations from landscape character are appropriate, prioritize management goals in areas of low scenic integrity, and identify strategies to move towards the desired conditions for scenery resources across the Cimarron and Comanche National Grasslands.

Desired scenic integrity objectives represent the minimum degree to which desired scenic character attributes are to remain intact (U.S. Department of Agriculture 1995). There are four nationally defined Scenic Integrity Objectives that can serve as desired conditions as shown in the table below.

Table 11. Descriptions of Scenic Integrity Objectives to help inform Desired Conditions under the land management revision plan

Scenic Integrity Objectives	Description
Very High	The landscape is intact with only minor changes from the valued attributes described in the scenic character.
High	Management activities are unnoticed and the landscape appears unaltered.
Moderate	Management activities are noticeable but are subordinate to the scenic character. The landscape appears slightly altered.
Low	The landscape appears altered. Management activities are evident and sometimes dominate but are designed to blend with surroundings by repeating form, line, color, and texture of the attributes described in the scenic character.

Literature Cited

- McNab, W. H., D. T. Cleland, J. A. Freeouf, J. E. Keys, G. J. Nowacki, and C. A. Carpenter. 2007. Description of ecological subregions: Sections of the conterminous United States. Gen. Tech. Rep. WO-76B, U.S. Department of Agriculture, Forest Service, Washington, DC.
- U.S. Department of Agriculture, Forest Service. 1995. Landscape Aesthetics: A handbook for scenery management. Agriculture Handbook Number 701, U.S. Department of Agriculture, Forest Service, Mt. Shasta, CA.
- _____. 2020. National scenery management system inventory mapping protocols. U.S. Department of Agriculture, Forest Service.