Resource Concepts Inc

December 27, 2024

Via Email: www.fs.usda.gov/project/htnf/?project=64139
Heidi.guenther@usda.gov

Ms. Heidi Guenther
Botanist/Invasive Plant Program Manager
U.S. Forest Service (USFS)
Humboldt-Toiyabe National Forest Headquarters
1200 Franklin Way
Sparks, NV 89431

Subject: Aerial Application of Herbicides for Invasive Species EA

Dear Ms. Guenther:

The attached comments are submitted on behalf of Recourse Concepts, Inc (RCI) with respect to the subject Environmental Assessment. RCI appreciates the USFS addressing this important subject and encourages moving forward with the proposed aerial treatment of invasive species that are presently overrunning a significant portion of our public lands in Nevada. If there are questions regarding the comments submitted, please don't hesitate to notify me at [redacted], or my mobile phone at [redacted].

Respectfully submitted,

[redacted]

John L. McLain
Principal Range Specialist Emeritus

USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Intermountain Region, Humboldt-Toiyabe National Forest November 2024

Aerial Application of Herbicide on the Humboldt-Toiyabe National Forest in Nevada

Environmental Assessment, Finding of No Significant Impact, and Draft Decision Notice

For More Information Contact:
Heidi Guenther, Botanist/Invasive Plant Program Manager
1200 Franklin Way
Sparks, NV 89431
heidi.guenther@usda.gov
Phone: 775-352-1223
Fax: 775-355-5399

Photo Credit: Paine wildfire scar located about 15 miles northeast of Ely, Nevada on the west side of the North Schell Mountain Range. Amery Sifre, October 2020

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Project Information

Project Name: Aerial Application of Herbicide on the Humboldt-Toiyabe National Forest in Nevada (This project was originally scoped as *Invasive Plant Control Projects Using Aerial Application of Herbicide Project*). The name was changed to better reflect the purpose of the project and the Proposed Action.

Project Initiation Date: 6/7/2023

Proponent Name: Humboldt-Toiyabe National Forest

Responsible Official: Jon Stansfield, Forest Supervisor

Unit: Humboldt-Toiyabe National Forest

Counties: Carson City, Clark, Douglas, Elko, Eureka, Humboldt, Lander, Lincoln, Lyon, Mineral, Nye, Washoe, and White Pine counties, Nevada

Anticipated Implementation: Spring of 2025

Signing Authority: Forest Supervisor

PALS Tracking: 64139

Project Webpage: https://www.fs.usda.gov/project/?project=64139

General Location: National Forest System (NFS) lands in Nevada, excluding areas defined by specific features or designations (i.e., designated Wilderness and Wilderness Study Areas and Research Natural Areas [RNAs]).

Introduction

The proposed aerial application of herbicide on the Humboldt-Toiyabe National Forest (HTNF) would treat and potentially restore lands affected by non-native invasive plant species (NNIPS) across the Forest in Nevada (approximately 5.6 million acres). Possible treatment of all National Forest System (NFS) lands within the state that meet the criteria established in this Environmental Assessment (EA) are located in Carson City, Clark, Douglas, Elko, Eureka, Humboldt, Lander, Lincoln, Lyon, Mineral, Nye, Washoe, and White Pine counties, Nevada (Figure 1). Areas that do not meet the criteria (i.e., designated Wilderness and Wilderness Study Areas and Research Natural Areas [RNAs]) would not be treated with aerial herbicide application.

When this EA is completed, the responsible official would either authorize the aerial application of herbicide in areas infested with NNIPS or recommend the preparation of an Environmental Impact Statement (EIS). This Proposed Action describes the conditions under which the aerial application of herbicide would be approved, and implementation side boards would be established to reduce the potential for impacts to the public and valuable Forest resources.

The Forest is currently operating under two previous decisions that authorize the use of ground-based herbicides to treat NNIPS in Nevada. These decisions include the Noxious Weed Control Program (USFS 1996) and the Noxious Weed Management and Control Program (USFS 2001a).

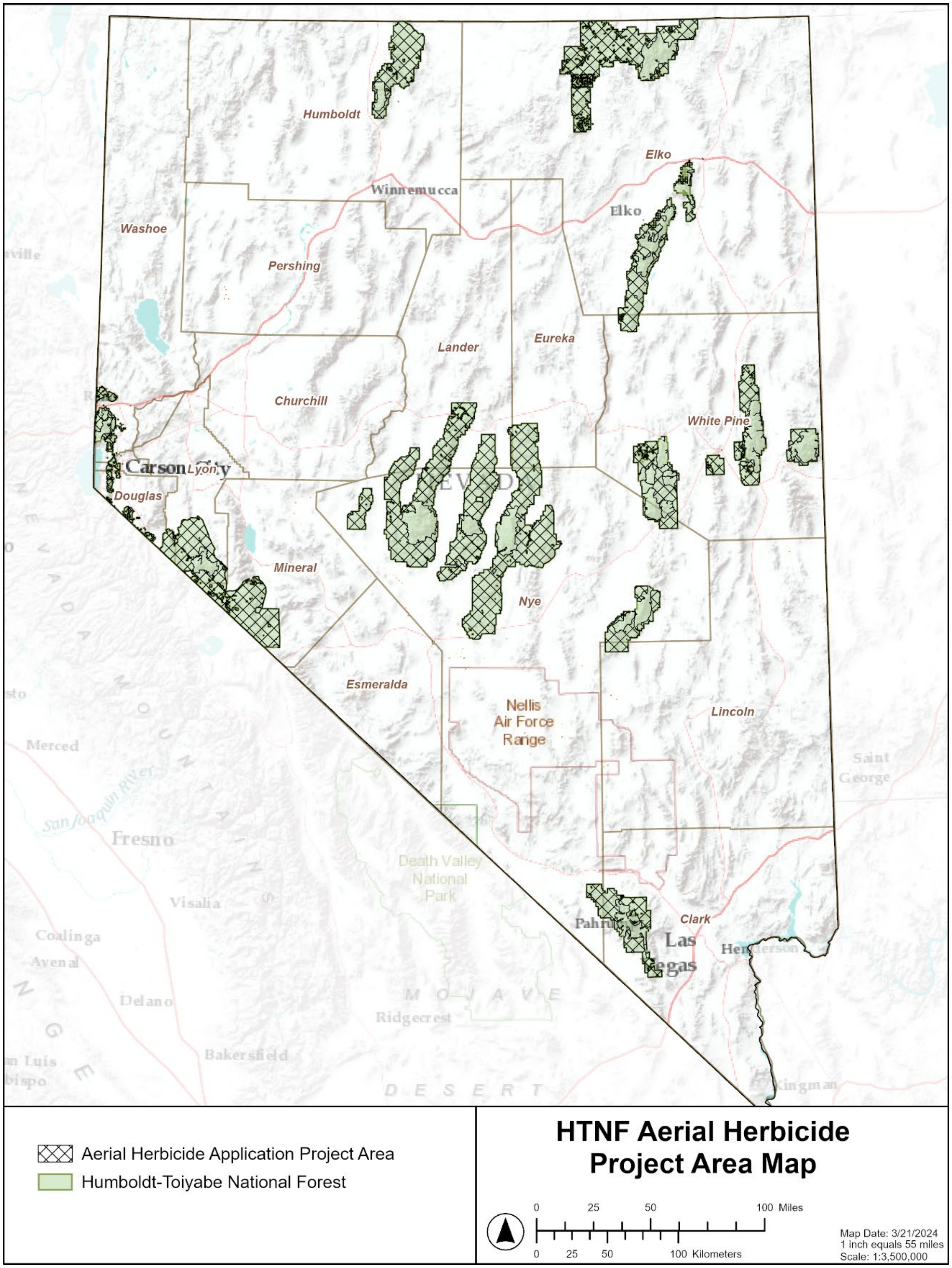

Figure 1. Location of the project area.

The herbicides and other ground-based treatment options authorized in those decisions would not change as a result of the decision to authorize the aerial application of herbicide in this analysis. NNIPS treatment on HTNF lands in California are authorized under the decision notice for the California Integrated Weed Management Program (USFS 2018) and would not be affected or changed as a result of this analysis, as the proposed aerial herbicide applications would only occur in Nevada.

This EA has been prepared to determine whether implementation of the Proposed Action may significantly affect the quality of the human environment and thereby require the preparation of an EIS. By preparing this EA, agency policy and direction to comply with the National Environmental Policy Act (NEPA) is being fulfilled.

Background

Between 2001 and 2020, sagebrush ecosystems across the western United States have lost an average of 1.3 million acres annually to invasive annual grasses. The expansion of invasive annual grasses contributed to the loss of both core sagebrush areas and areas where there is opportunity for growth (USGS 2020). Across the HTNF, there has been an increase in invasive annual grasses over the last 20 years. According to the U.S. Geological Survey (USGS) annual grass cover monitoring, in 2000, approximately 9,183 acres of the HTNF was comprised of 20 to 40 percent invasive annual grass cover. By 2016, that cover had increased to approximately 258,097 acres. A similar increase is seen in areas across the Forest with between 40 to 60 percent cover. In 2000, there were approximately 268 acres with invasive annual grass cover between 40 and 60 percent; by 2016, that coverage had increased to 53,352 acres (Boyte and Wylie 2017). Based on the most recent data from the multi-resolution land characteristics consortium, invasive annual grasses currently occupy approximately 1,536,329 acres within the project area boundary (Figure 2) (MRLC 2024). It is not possible for the Forest to keep up with these rates of expansion using the ground-based control methods currently available.

Wildfire activity in the Great Basin is also changing. Over recent decades, the size of wildfires and rate of spread have increased. It is now common for wildland fires to consume more than 100,000 acres during any given incident. To illustrate the severity of these changes, in July 2018, the Martin Fire in northern Nevada consumed nearly a half million acres during a five-day period. On July 8th, the fire grew 200,000 acres in a 24-hour period. This growth was fueled by an abundance of fine, flashy fuels and was driven by hot dry winds. The Martin Fire is one example of a trend toward large, wind driven fires carried by expanding NNIPS infestation. Other recent wildfires with similar conditions include the Sugar Loaf, Bull Run, Mountain View, and Pine Haven wildfires.

Wildland Urban Interface (WUI) has become an area of increased concern due to expanding fine flashy fuels. There are many factors that have driven this change, but none have been more influential than the increase in density and size of infestations of NNIPS (Fusco et al. 2019). These species represent the fine, flashy fuels that help create favorable conditions for large catastrophic wildfires. Due to the increased size and rapid growth of wildfires, they pose a much larger threat to health and human safety, property, and ecosystem damage than past fires that were smaller, slower, and more manageable (Poland et al. 2001, Prior et al. 2017).

Purpose and Need: Why do we need to act?

The purpose and need for this project are consistent with the goals, objectives, and desired conditions outlined in the Humboldt National Forest Land and Resource Management Plan (USFS 1986a, as amended) and the Toiyabe National Forest Land and Resource Management Plan (USFS 1986b, as amended) (Collectively referred to as the Forest Plans).

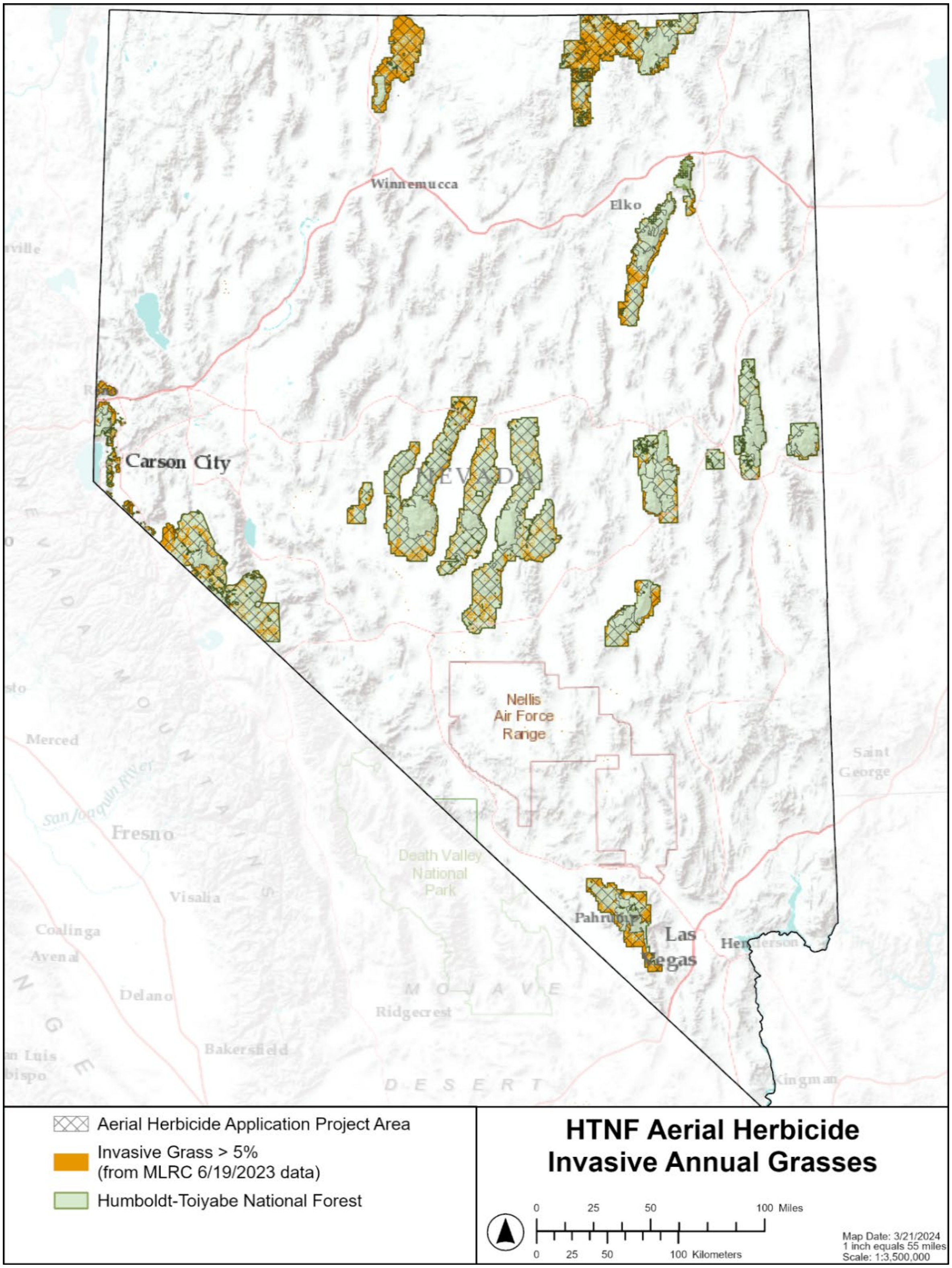

Figure 2. Invasive annual grass locations within the project area.

Both the Humboldt and Toiyabe Forest Plans include plan components directing the Forest to control NNIPS (USFS 1986a IV-7, 37-38; USFS 1986b IV-4, 12). Current ground-based treatment options are limited by reach (hose length), access, topography, and cost. Additional methodologies are needed to address the threat of expanding invasive annual grasses and other NNIPS infestations. There is a need to authorize advanced tools and strategies required for time-effective integrated pest management. This need for comprehensive and aggressive management of NNIPS is multifaceted:

NNIPS are diminishing the natural resource values of the HTNF.

Across the HTNF, the expansion of NNIPS populations is displacing native plants; decreasing resources for native plant populations; reducing the functionality of habitat and forage for wildlife and livestock; threatening populations of threatened, endangered, and sensitive (TES) species; altering physical and biological properties of soil and resulting runoff conditions; altering microclimate conditions; and changing the intensity and frequency of fires. When NNIPS seeds are present in the soil seed bank following a disturbance, especially wildfire, they can germinate quickly and outcompete native plants for water and nutrients. This can lead to a plant community dominated by NNIPS that is difficult to restore to healthy native vegetation. The expansion of NNIPS (especially invasive annual grasses) following fires contributes to the expansion of fine, flashy fuels across the Great Basin, leading to a grass-fire cycle in which frequent fires make it increasingly difficult to restore native plant communities.

There must be a timely and flexible response to new NNIPS, new NNIPS infestations, and landscape-scale disturbances.

On the HTNF, NNIPS are spread by use of transportation systems, recreation visitors, livestock grazing, fuels reduction projects, wildfires, and fire suppression activities. They are also spread by wildlife, wind, and water. Wildland fires are frequent on NFS lands, and the burned areas typically become infested with NNIPS following an event. The HTNF needs flexibility to treat expanded and newly identified infestations in a timely manner based on local site conditions and identified priorities. A broad range of treatment methods need to be available for use on the HTNF, including approaches that improve efficiency and effectiveness at the landscape scale.

Existing and future NNIPS populations on the HTNF require active and integrated management.

NNIPS infestations exist throughout the HTNF, and without management, these infestations will increase in size and distribution. Active, efficient, and effective NNIPS management is necessary to contain NNIPS within existing boundaries, reduce infestation densities, and reduce the establishment of new infestations. Control efforts should be focused on infestations that can realize the greatest resource benefits. Such efforts would focus on NNIPS with the highest risk of spread that have not yet become established and have the highest likelihood of control success.

Management Direction: What are we required to do?

The need for this project responds to the goals, objectives, and desired conditions outlined in the Forest Plans. The United States Department of Agriculture Forest Service (Forest Service) must also comply with numerous relevant federal and state laws, regulations, policies, executive orders, national strategies, and directives that govern vegetation management pertaining to NNIPS and native plant communities and assign responsibility for active treatment of NNIPS to minimize or eliminate adverse effects to the environment. The following laws and regulations specifically provide for control of NNIPS:

- Carlson-Foley Act of 1968 (PL 90-583) authorizes and directs federal agencies to permit control of NNIPS on federal lands by state and local governments on a reimbursement basis in connection with similar weed control programs carried out on adjacent nonfederal land.

- Federal Noxious Weed Act of 1974 (PL 93-629) defines noxious weeds (a subcategory of NNIPS) and authorizes the Secretary of Agriculture to cooperate with other agencies, organizations, or individuals to control and prevent such species.
- The Federal Land Policy Management Act of 1976 (PL 94-579) authorizes control of NNIPS on rangeland.
- The National Forest Management Act of 1976 (PL-94-588) authorizes removal of deleterious plant growth through forest plans.
- The Wilderness Act of 1964, as amended (October 1978) specifies that the management goal for designated Wilderness is to retain their primitive character and influence, without permanent improvements or human habitation, to preserve natural condition.
- U.S. Forest Service Pesticide Use Management and Coordination Handbook (FSH2109.14) directs proper use, containment and safety procedures for pesticide use by Forest Service personnel.
- U.S. Forest Service Pesticide-Use Management and Coordination (FSM 2100, Chapter 2150) directs the Forest Service to plan, evaluate, and review pesticides and their uses, as well as provide for safety in pesticide use, storage, transportation, and disposal.
- Invasive Species Management (FSM 2900) lists laws and regulations for the Forest Service to adhere to and states that the Forest Service NNIPS policy and management objectives will be based on integrated pest management.
- Code of Federal Regulations, 36 CFR 222.8 directs the Forest Service to cooperate with local weed control districts to analyze and develop NNIPS control programs where there are national forests.
- Forest Service Manual 2259.03 states, “Forest officers shall cooperate fully with State, County and Federal officials in implementing 36 CFR 222.8 and Sections 1 and 2 of Public Law 90-583. Within budgetary constraints, the Forest Service shall control to the extent practical, noxious farm weeds on all NFS lands.”
- Executive Order 13112 Invasive Species (64 FR 6183; 2022) directs federal agencies “to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological and human health impacts that invasive species cause.”
- Nevada Revised Statutes NRS 555.200 authorizes the control of noxious weeds from public domain and directs reimbursement by the federal government.

Proposed Action: What are we proposing to do?

The HTNF proposes to expand current integrated pest management to include:

- Aerial herbicide application using rotary-wing aircraft (i.e., helicopter), fixed-wing aircraft, and unmanned aerial vehicle (UAV) equipment. Aerial application of herbicides would be used based on a) treatment objective and priority of the infestation, b) accessibility, topography, and the size of treatment area, c) the expected efficiency and effectiveness of the method selected, d) the risk for spread or invasion into other locations, and e) the potential to harm priority habitats and vegetation complexes such as those associated with threatened, endangered, or sensitive species.
- Aerial application would be used in accordance with all herbicide label instructions.
- Thirteen herbicides could be available for aerial application use on HTNF lands in Nevada: 2,4-D amine, aminocycopyrachlor, aminopyralid, chlorsulfuron, clopyralid, glyphosate,

aquatic glyphosate, imazapic, imazapyr, indaziflam, metsulfuron-methyl, rimsulfuron, and triclopyr butoxyethyl ester (BEE).

This project would authorize the aerial application of herbicide on NFS lands in Nevada except for the areas described below or in the design elements (Appendix A). An interdisciplinary working group would identify future treatment areas using some, if not all, of the following common characteristics:

- Where size of potential treatment block or topographic setting makes the use of ground-based treatment options infeasible, impractical, or unsafe.
- Where there is an abundance of NNIPS and fine fuels in the plant community (greater than five percent).
- Burn areas where NNIPS have potential to hinder/prevent native plant recovery.
- Areas with habitat restoration and other land management needs.
- Where there is potential risk to sagebrush and other vulnerable ecosystems from expansion of NNIPS populations.
- In areas where partners and adjacent landowners are proposing similar treatments and consistent treatments across boundaries would facilitate the control of large infestations.

Areas defined by specific designations (i.e., designated Wilderness and Wilderness Study Areas and RNAs) are not included in the project area and would not be treated with aerial herbicide application.

Conditions limiting aerial herbicide application use within the project area could change over time. For example, while a pinyon-juniper woodland in Phase III of succession may not be targeted for treatment, if the woodland was to burn in a stand replacing fire, it would no longer be in Phase III and may be identified for treatment to address potential NNIPS infestations.

The implementation plan would consider the efficacy of aerial application, specifically its ability to penetrate the existing canopy cover of the native plant community and reach the underlying target NNIPS or soil surface, while also minimizing impacts to native ecosystems (including the direct mortality of native species and native seeds within the soil seed bank). Distinctions would be made for treatments using preemergent versus post-emergent herbicides during the implementation plan process.

Implementation Plans

Due to the large size and long timeframe of this proposed project, the Proposed Action activities would include implementation plans, which would evaluate specific aerial herbicide application treatment at a smaller site-specific scale within the project area and would occur over a defined timeframe. The implementation plan would consider the specific environmental conditions and the resources therein that could be affected by each aerial herbicide application treatment. Such considerations would be evaluated by an interdisciplinary team of experts that would contribute to the completion of the Implementation Plan Template (Appendix C). The implementation plan would need to be completed prior to the initiation of any and all aerial application treatments. The objectives of the implementation plan are to consider the impacts of an aerial herbicide application on natural resources and human health and safety in order to promote the native ecosystem functions of a landscape through the removal of NNIPS, while also mitigating any potential adverse impacts through adherence to herbicide label requirements, stringent safety measures, and design elements developed for specific resource protections.

In general, implementation areas would be identified at the sub-watershed (12-digit Hydrologic Unit Code (HUC12)) level with individual treatment areas identified within the sub-watershed boundary. For scale, a sub-watershed typically ranges from approximately 10,000 to 40,000 acres in size.

The implementation plan would consider the specific environmental conditions and the resources therein that could be affected by each aerial herbicide application treatment. Such considerations would be evaluated by an interdisciplinary team of experts that would contribute to the completion of the Implementation Plan Template (Appendix C). The implementation plan would need to be completed prior to the initiation of any and all aerial application treatments. The objectives of the implementation plan are to consider the impacts of an aerial herbicide application on natural resources and human health and safety in order to promote the native ecosystem functions of a landscape through the removal of NNIPS, while also mitigating any potential adverse impacts through adherence to herbicide label requirements, stringent safety measures, and design elements developed for specific resource protections.

Specific management prescriptions involved aerial herbicide applications would be identified and refined through the completion of the implementation plans and will incorporate direction from the forest-level NEPA decision and consultation with the United States Fish and Wildlife Service (USFWS) and the Nevada State Historic Preservation Officer. Each implementation plan would include an objective, timeline, treatment(s), management strategy, and potential partners (if applicable). A monitoring section will be incorporated into each implementation plan to determine herbicide effectiveness and compliance with design elements (Appendix C).

Implementation plans for the project include procedures for closing treatment areas to public access and to post signage at public access points notifying the public of planned and recently treated areas. Risks of public exposure to herbicides from aerial applications will be minimal with implementation of the implementation plan.

Herbicides

Herbicide formulations and mixtures could contain one or more of the active ingredients displayed in Table 1. In Table 1, the Maximum Application Rate Analyzed for each active ingredient is derived from Human Health and Ecological Risk Assessments submitted by Syracuse Environmental Research Associates, Inc. (SERA) to the Forest Service, except rimsulfuron which uses the *Rimsulfuron Ecological Risk Assessment Final* written by the United States Department of the Interior, Bureau of Land Management (BLM) (2014). The Maximum Application Rate Analyzed for each herbicide is the value that was used in the respective risk assessment to evaluate the herbicide’s effects on the environment and human health. These risk assessments also serve as the primary sources for much of the analyses in this EA and its supporting documents. Thus, the Maximum Application Rate Analyzed values provided Table 1 are specifically for analyzing the effects of each herbicide and are not necessarily the rates that would be used upon the implementation of the Proposed Action. The application rate used when implementing the Proposed Action would be based on both the guidance in the respective SERA or BLM risk assessment and on the label instructions of the herbicide, which are evaluated and registered with the Environmental Protection Agency (EPA) under federal law (40 CFR Part 156). The herbicide also must be approved for use within the State of Nevada by the Nevada Department of Agriculture (NDA). Maximum label application rates may change due to variations in herbicide formulations and directions specific to aerial application. The label instructions of the herbicide in use will always be followed to ensure that applications are appropriate and lawful.

Additional herbicides may be added in the future, at either the Forest Plan or project level, through appropriate risk analysis, NEPA procedures, and Endangered Species Act (ESA) consultation.

Table 1. Herbicides Proposed for Aerial Application on NNIPS Occurrences on HTNF Lands in Nevada.[1,2]

Active Ingredient	Maximum Application Rate Analyzed	Target Species	Application Mode	Surfactants	Half-life/ Persistence of Herbicides and Surfactants	Common Brand Name[3]
2,4-D amine	4 lb acid equivalent (a.e.) per acre	Broadleaf plants	Post-emergent	Methylated seed oils and vegetable oils; non-ionic surfactants	7-23 days	2,4-D
Aminocyclopyrachlor	0.28 lb a.e. per acre per year	Medusahead and broadleaf plants like leafy spurge	Pre-emergent on grasses, post-emergent for broadleaf	Methylated seed oils and vegetable oils; non-ionic surfactants; invert emulsions	Ester formulation: 315 days in aerobic soils [4]	Method
Aminopyralid	0.11 lb a.e. per acre	Medusahead and broadleaf plants	Pre-emergent on grasses, post-emergent for broadleaf	Non-ionic surfactant; invert emulsion	130.4 days	Milestone
Chlorsulfuron	0.09 lb active ingredient (a.i.) per acre	Broadleaf plants	Post-emergent	Methylated seed oils and vegetable oils; non-ionic surfactants, but only if the surfactants are non-acidifying	6.8-185 days	Telar XP
Clopyralid	0.5 lb a.e. per acre per year	Broadleaf plants	Post-emergent	Non-ionic surfactants	14-29 days	Transline
Glyphosate	0.35-8.0 lb a.e. per acre (2 lb a.e. per acre average)	Non-selective; actively growing plants	Post-emergent	Non-ionic surfactant	1.8-180 days in aerobic soils [4]	Roundup Pro
Aquatic glyphosate	0.35-8.0 lb a.e. per acre (2 lb a.e. per acre average)	Non-selective; actively growing plants	Post-emergent	Non-ionic surfactant	1.8-180 days in aerobic soils [4]	Roundup Custom
Imazapic	0.119 lb a.i. per acre	Annual grasses and some broadleaved species	Pre-emergent on all species; post-emergent on intolerant broadleaf species	Methylated seed oil (recommended for post-emergent use only)	106-113 days	Plateau

Active Ingredient	Maximum Application Rate Analyzed	Target Species	Application Mode	Surfactants	Half-life/ Persistence of Herbicides and Surfactants	Common Brand Name[3]
Imazapyr	1.5 lb a.e. per acre	Some annual grasses and some broadleaf species	Pre- and post-emergent	Non-ionic surfactant; methylated seed oils, or vegetable oils; silicone-based surfactants; invert emulsions	25-2,972 days	Habitat
Indaziflam	0.13 lb a.i. per acre per year	Plants newly sprouting (non-specific)	Pre-emergent on all species	Not required per label	>150 days in aerobic soils [4]	Rejuvra
Metsulfuron-methyl	0.15 lb a.i. per acre per year	Broadleaf plants	Post-emergent	Non-ionic surfactant; methylated seed oils or vegetable oils	120 days (upper range)	Escort
Rimsulfuron	0.0625 lb a.i. per acre per year	Annual grasses and some broadleaf species	Pre-emergent	Non-ionic surfactant; petroleum crop oil concentrate (COC); modified seed oil (MSO)	5-40 days in aerobic soils [4]	Laramie 24DF
Triclopyr butoxyethyl ester	2.0 lb a.e. per acre per year	Broadleaf plants	Post-emergent	Non-ionic surfactant	0.2-46 days	Garlon 4

[1] A full list of herbicides authorized for use across the HTNF is available in the project record.

[2] References for this table are SERA Human Health and Ecological Risk Assessments for each herbicide except for rimsulfuron, which references the BLM (2014) *Rimsulfuron Ecological Risk Assessment Final*.

[3] Other products using the active ingredient may be used.

[4] Aerobic soils are specified for half-life/persistence if such a specification is provided in the referenced risk assessments.

Adjuvants are specially designed chemicals that are added to an herbicide solution to modify the performance of the total spray mixture. Labels accompanying adjuvants describe their properties and prescribed use rates. Adjuvants perform various functions, including enhanced plant uptake of the herbicide, better mixing of otherwise incompatible herbicides, increased adhesion of the spray to plant surfaces, and reduced spray drift. In many herbicide products, adjuvants are included as part of the pre-mixed formulation as purchased. Applicators can also add adjuvants to spray mixtures prior to application. Detailed information on the effects from adjuvants is found in Appendix B.

2,4-D Amine

2,4-D amine is a selective, systemic herbicide used to control broadleaf weeds in a wide range of plant families. 2,4-D amine works by affecting plant growth processes. Plant roots are usually more sensitive to 2,4-D amine than shoots, although above-ground vegetation shows typical signs of 2,4-D amine soon after application (e.g., wilting and chlorosis) as the active ingredient impacts plant growth (USFS 2017).

Due to its low toxicity and environmental fate profile, aquatic formulations of only 2,4-D amine are classified by the EPA as moderately toxic to mammals and birds. 2,4-D amine is used for NNIPS control in riparian areas and wetlands within 15 feet of surface water. It is also used to control broadleaf weeds in the spring when plants are still young and actively producing basal vegetation. 2,4-D amine has very limited soil residual capability and is useful for sites where herbicide is not desired to remain active in the soil (USFS 2017).

Woody species are generally tolerant of 2,4-D amine applied at rates used to control forbs, although damage can occur to seedlings and saplings. Conifers and evergreen shrubs are more tolerant than deciduous species. Deciduous trees and shrubs may exhibit signs of injury on sprayed foliage (USFS 2017).

Aminocyclopyrachlor

Label for Method 240 SL herbicide (Bayer 2020), containing 25 percent potassium salt of aminocyclopyrachlor provides the following information regarding aminocyclopyrachlor: aminocyclopyrachlor provides control of broadleaf weeds and woody species, including many terrestrial and riparian NNIPS. It provides preemergence and/or postemergence control of the broadleaf weeds, vines, and brush. It is quickly taken up by the leaves, stems, and roots of plants, causing effects within a few hours to a few days, causing epinasty, severe necrosis, stem thickening, growth stunting, leaf crinkling, calloused stems and leaf veins, leaf-cupping, and enlarged roots. Death of treated broadleaf plants may require several weeks to several months for some woody plant species. Aminocyclopyrachlor should not be applied within the root zone of desirable trees and/or shrubs.

Certain species may be sensitive to low levels of aminocyclopyrachlor, including but not limited to conifers (such as Douglas fir, Norway spruce, ponderosa pine, and white pine), deciduous trees (such as aspen, Chinese tallow, cottonwood, honey locust, magnolia, poplar species, redbud, silver maple, and willow species), and ornamental shrubs (such as arborvitae, burning bush, crape myrtle, forsythia, hydrangea, ice plant, magnolia, purple plum, and yew). Injury or loss of desirable trees or vegetation may result if herbicide is applied on or near desirable trees or vegetation, on areas where their roots extend, or in locations where the treated soil may be washed or moved into contact with their roots.

Aminocyclopyrachlor may suppress or severely injure certain established grasses, such as some brome (*Bromus* spp.) and wheatgrass (*Agropyron* spp.) species, especially when the grass plants are stressed by adverse environmental conditions. Aminocyclopyrchlor was noted to damage pines, particularly through root-uptake of the herbicide from the soil (SERA 2012).

Aminocyclopyrachlor may be moved by soil erosion due to wind or water. Drift potential increases at wind speeds of less than three miles per hour (mph) (due to inversion potential) or more than ten mph. Many factors, including droplet size and equipment type, determine drift potential.

Aminopyralid

Albaugh 2023 label for Malibu herbicide, containing 40.23 percent aminopyralid triisopropanolamine salt provides the following information regarding aminopyralid: Aminopyralid provides control of annual and perennial broadleaf weeds, certain annual grasses, and certain woody plants and vines. Aminopyralid provides post-emergence control and preemergence control of emerging seedlings of susceptible weeds and re-growth of certain perennial weeds following application. Aminopyralid applied at 7 to 14 fluid ounces (0.11 to 0.22-pound aminopyralid acid equivalent) per acre can suppress or control many winter annual grasses, including medusahead (*Taeniatherum* [or *Elymus*] *caput-medusae*), and cheatgrass (*Bromus tectorum*). Aminopyralid can be used to treat terrestrial weeds that extend up to the water's edge. Aminopyralid may be applied to control woody plants. Conifers are susceptible to damage from contact with aminopyralid, including foliar, bark, and root exposure (SERA 2007).

Dicots are substantially more sensitive to aminopyralid than monocots (SERA 2007).

Chlorsulfuron

Chlorsulfuron is a selective herbicide formulated as a dry flowable (i.e., small granular pellets) that controls an array of broadleaf weeds (DuPont 2011). It is in the sulfonylurea class of herbicides and works by inhibiting an enzyme, acetolactate synthase, which is essential for plant growth (SERA 2004a). Chlorsulfuron can be applied as a pre- or post-emergent treatment (DuPont 2011). It works best on plants in the early or vegetative stages of growth. Chlorsulfuron is one of only a few herbicides in use that controls weeds in the mustard plant family (Brassicaceae). It is also very useful in controlling weeds in the borage family (Boraginaceae).

Chlorsulfuron is taken up in both the foliage and roots of susceptible plant species. Chlorsulfuron also incorporates into the soil and provides a period of soil residual activity. This period is typically short, lasting a year at most. Because chlorsulfuron remains active in the soil for some time, it can be transported away from the treatment site by wind or water erosion. The herbicide label cautions users when making applications to powdery or light, sandy soils (DuPont 2011).

Woody species are tolerant of chlorsulfuron applied at typical use rates for most broadleaf weeds, although seedlings and saplings could be injured or killed by overspray that covers the foliage and stems (USFS 2017).

Clopyralid

Clopyralid is a systemic herbicide that controls broadleaf weeds in a number of plant families (SERA 2004b). It is in the same class of herbicides as aminopyralid, picloram, and triclopyr and functions by interfering with plant growth (Trevathan 2002a). Plant uptake of clopyralid occurs in both the foliage and the roots.

Woody species are generally tolerant of clopyralid (with the exception of trees and shrubs in the pea family [Fabaceae]), although transitory or temporary damage may occur. Clopyralid is labeled for weed control in deciduous tree plantations, because deciduous trees are tolerant of this herbicide. Likewise, conifers are tolerant of clopyralid.

Glyphosate (and Aquatic Glyphosate)

Glyphosate is a broad-spectrum, non-selective, post-emergence herbicide that can kill or injure vegetation to which it is applied (NuFarm 2011). Glyphosate works only when applied to living plant tissue. It cannot be used as a pre-emergent herbicide or as a soil residual herbicide. Glyphosate works by affecting the production of aromatic amino acids essential to plant growth (SERA 2011a).

Glyphosate molecules bind strongly to soil particles, which prevents leaching into areas where it was not applied or into groundwater (Trevathan 2002b, NuFarm 2011). Glyphosate is not mobile in soil and provides no soil residual activity (NuFarm 2011).

Woody species can be injured or killed by glyphosate when sprayed on living tissue. Younger age classes (e.g., seedlings/saplings) are likely to be killed. Actively growing foliage on mature plants affected by direct spray or drift may be injured, resulting in leaf drop and branch tip necrosis. Spraying thick woody or corky bark with glyphosate will not affect trees and shrubs; however, spraying thin or green bark that is metabolically active could result in injury or, in the case of seedling/sapling trees or shrubs, in mortality. There is no root uptake of glyphosate, so it can be sprayed under foliage and inside drip lines (i.e., circumference of foliage).

Imazapic

Imazapic is a systemic herbicide that provides selective pre- and post-emergence control of annual grasses (particularly cheatgrass and medusahead), some perennial grasses, and some broadleaf weeds. Imazapic inhibits amino acid production necessary for protein synthesis and cell growth (SERA 2004c). Imazapic is taken up in the foliage, stems, and roots of susceptible plant species. A surfactant must be used in post-emergent applications, most commonly a seed or vegetable oil.

Imazapic incorporates into the soil and provides a moderate period of soil residual activity (one to two growing seasons). Imazapic remains within the treatment area and is not known to move laterally in the soil or leach deeply downward (Tu et al. 2001).

Woody species are generally tolerant of imazapic applied at typical use rates for most graminoid and broadleaf weeds, although seedlings and saplings could be injured or killed by overspray that covers the foliage and stems. Dormant trees are much less likely to be injured. Direct spray to foliage could result in minor damage. Trees or shrubs that are usually tolerant to imazapic but are experiencing physiological stress due to environmental conditions (e.g., drought, storm damage, and insect or disease outbreaks) may become susceptible to injury.

Imazapyr

Imazapyr is a broad-spectrum herbicide similar to glyphosate in terms of its non-selectivity. In addition to aquatic macrophytes, it is toxic to annual and perennial grass weeds, broadleaf weeds, vines and brambles, and hardwood brush and trees for forestry site preparation and release of conifers from woody and herbaceous competition (BASF 2012). Some minor conifer growth inhibition may be observed when release treatments are made during periods of active conifer growth. To minimize potential conifer height growth inhibition, the label notes the requirement to avoid broadcast applications to conifer stands (except loblolly pine) before the end of the second growing season. To minimize potential conifer height growth inhibition, broadcast release treatments may be made late in the growing season.

Plant species resistant to imazapyr apparently metabolize it to an immobile form that cannot be translocated to the meristematic tissues. In addition, when imazapyr is applied at high rates, it can result in season-long soil activity, providing residual control of germinating seeds.

Indaziflam

The label for Indaziflam 200SC Herbicide (Bayer 2022a,b), containing 19.05 percent indaziflam, provides the following information regarding indaziflam: indaziflam provides preemergence and residual control of annual grasses and broadleaf weeds by inhibiting cellulose biosynthesis in plants. Indaziflam has minimal postemergence activity and generally does not control weeds that have emerged. It does not control weeds arising from perennial reproductive structures such as tubers or rhizomes, or woody vegetation. On conifer and hardwood production areas, indaziflam may be applied over-the-top of planted trees by aerial or ground equipment. Indaziflam may be applied for pre-emergent weed control in Christmas trees and conifer plantations. Good tolerance is observed on many conifer and hardwood species, including pines species (Minogue 2021). Tolerant conifers include loblolly pine, lodgepole pine, longleaf pine, ponderosa pine, shortleaf pine, slash pine, sugar pine, Virginia pine, western white pine, coast redwood, Douglas fir, giant sequoia, and western larch (Bayer 2022b).

A dry soil surface at time of application and 48 hours after application is optimum for binding the active ingredient to soil particles and preventing its downward movement to the crop’s roots. Moisture is needed for activation of indaziflam. Weeds that germinate prior to activation by rain or irrigation may not be controlled. It may be applied at any time when the ground is not frozen or covered with snow. Weed seeds and seedlings must come into contact with indaziflam prior to emergence to be controlled. If insufficient moisture is present, some weeds may germinate and emerge from below the treated layer of soil. Avoid using indaziflam in areas where soil runoff or erosion is likely to occur.

Avoid direct or indirect spray contact with crop foliage, green bark, roots, or fruit as it may cause localized crop injury or death. Only trunks with callused, mature brown bark may be sprayed.

Metsulfuron-methyl

Metsulfuron-methyl is in the same sulfonylurea class of herbicides as chlorsulfuron and is very similar to chlorsulfuron. It is a selective herbicide formulated as a dry flowable (i.e., small granular pellets) that controls an array of broadleaf weeds. It works by inhibiting an enzyme, acetolactate synthase, which is essential for plant growth (SERA 2004d). Metsulfuron-methyl is applied as a post-emergent treatment, unlike chlorsulfuron, and also works as a pre-emergent herbicide. Metsulfuron-methyl activity is promoted by warm, moist conditions and is slower in cooler, dry weather (Trevathan 2002c). Metsulfuron-methyl works best on plants in the early or vegetative stages of growth. This herbicide is one of only a few herbicides in use that can control weeds in the mustard plant family. It is also very useful in controlling weeds in the borage family.

Metsulfuron-methyl is used to control many species of weeds and deciduous trees on sites where conifers are growing or are to be planted (Bayer 2015). Metsulfuron-methyl may cause temporary yellowing and or growth suppression when the spray solution contacts conifer foliage. Thus, care must be taken to direct the spray solution away from the conifer foliage (Bayer 2015).

Woody species are generally tolerant of metsulfuron-methyl applied at typical use rates for most broadleaf weeds, although seedlings and saplings could be injured or killed by overspray that covers the foliage and stems (USFS 2017). Conifers are more tolerant than deciduous species.

Metsulfuron-methyl is labeled for weed control in conifer plantations, including Douglas-fir and ponderosa pine. However, conifer trees or shrubs that are experiencing physiological stress due to environmental conditions, such as drought or insect or disease outbreaks, may be susceptible to injury from metsulfuron-methyl.

Rimsulfuron

The label for Rimsulfuron 25 herbicide, containing 25 percent rimsulfuron, provides the following information (Helm 2019): rimsulfuron selectively controls certain annual grasses such as cheatgrass, medusahead, and other annual grasses and broadleaf weeds with postemergence and residual (preemergence) activity. Rimsulfuron is absorbed through the roots and foliage of plants, rapidly inhibiting the growth of susceptible weeds. For preemergence weed control, rainfall or sprinkler irrigation is needed to move rimsulfuron into the soil. Weeds will not emerge from preemergence applications. This product is toxic to plants and may adversely impact the forage and habitat of non-target organisms, including pollinators, in areas adjacent to the treated area. Rimsulfuron has the potential to move off-site due to wind erosion.

Triclopyr Butoxyethyl Ester (BEE)

Triclopyr is a selective, systemic herbicide used to control aquatic, broadleaf, and woody weed species. Triclopyr works by disrupting plant growth processes. Triclopyr breaks down quickly and does not typically persist in the soil for more than a few weeks to a few months. Triclopyr does persist in plant material until it dies and begins to decay (Tu et al. 2001).

Triclopyr comes in two forms (SERA 2011b), but only the amine is used in the salt form, as the ester form volatilizes easily. Both forms degrade rapidly to the parent compound, triclopyr acid, in the soil. Triclopyr can leach in permeable soils. The amine salt form is more mobile in soil than the ester form; however, leaching is considered minor in a field setting. Label direction recommends caution when considering triclopyr applications in areas with permeable soils and shallow water tables. Triclopyr is also considered highly mobile in water, the amine form more so than the ester form; although this is not a problem, because triclopyr degrades very quickly to the parent acid in an aquatic environment and does not persist (Tu et al. 2001).

Triclopyr is a selective herbicide that controls trees and brush, and, as such, woody conifer and deciduous species are generally susceptible to triclopyr. The amine form of triclopyr does not readily penetrate woody plant cuticles, so directed foliage sprays with the addition of an effective surfactant or cut surface treatments are needed (Tu et al. 2001). The method of application depends on the presence and type of non-target woody vegetation. Cut surface application methods provide a high degree of protection to surrounding non-target vegetation, while directed foliar spray methods may be used when the potential for non-target damage is not present (SERA 2011b). For example, cut surface treatments on saltcedar (*Tamarix* spp.) would be appropriate when saltcedar occurs mixed in with native trees or shrubs, while directed foliar spray would be appropriate should saltcedar occur in stands not mixed with native trees or shrubs.

Aerial Herbicide Application

Once a location is identified for treatment, herbicide may be applied either by fixed-wing aircraft, rotary-wing aircraft, or by UAV. The type of aircraft selected for a treatment would be based on the physical characteristics of the treatment area, the aircraft's capabilities to meet the project's site specifications, and the size and distribution of the infestation.

The aerial application of herbicide will generally occur in the spring or in the late summer/early fall when ground moisture is such that it allows the NNIPS to access the chemicals. Smaller scale treatments may occur at other times depending on the type of aircraft, chemical used, NNIPS targeted, and local resource concerns.

Design elements (Appendix A) would be used to govern how, when, and where aerial application would be used to treat NNIPS in a treatment area. The design elements provide additional parameters that would protect physical, biological, and social/cultural resources of concern.

Ground support vehicles would be limited to previously disturbed locations adjacent to designated NFS roads and outside of known historic property boundaries. For fixed-wing aircraft, that could include several standard pick-up trucks and individuals to serve as spotters and to help control traffic in the treatment area. Ground support for refilling tanks and refueling would occur at a landing strip near the treatment area. For the use of rotary-wing aircraft, a service vehicle with or without a landing pad, water, pre-mixed herbicide, and fuel for servicing the aircraft would be located near the treatment area in previously disturbed areas along NFS designated roads and at least 300 feet from water. UAV support vehicles would also be located near the treatment area along designated NFS roads and at least 300 feet from water.

Monitoring and Record Keeping

Under the Proposed Action, NNIPS treatments would be recorded, monitored, and reported annually. Detailed, accurate record keeping and effectiveness monitoring are and would continue to be fundamental components of a successful condition-based management program. Record keeping provides a historical record of activities and helps map out future treatment activities. Monitoring and surveying are necessary to determine whether treatments are effective and meeting management objectives. Annual reporting is important and required for program accountability and includes inventorying NNIPS treated and documenting specifics of each treatment annually. Global Positioning System (GPS) devices or other methods are used to map and document NNIPS occurrences and treatment activities.

Treatment data may include the following:

- Name of NNIPS targeted for treatment.
- Treatment method.
- Date and time of treatment.
- Name, location, and estimated area of treatment site.
- Herbicide used, including brand name and Environmental Protection Agency (EPA) registration number, formulation, mix rate, amount applied, applicator’s name, and general weather conditions, including wind speed.

Currently, the HTNF staff use condition-based analysis where weeds are located in relation to the tools that are authorized for use. Staff evaluate species and infestations to prioritize treatments that best meet the management goals of eradication, containment, and long-term control. During staff implementation meetings, the team considers plant species ecology, location, ecological conditions, infestation extent, risk of spread, and effective treatment options. They also consider environmental conditions that may deter effective eradication, control, or containment; potential restoration actions needed; and monitoring protocols using the decision points as described in the review process. The HTNF staff then prioritize treatments for the upcoming field season(s).

While herbicides are known to be effective in eradicating and controlling NNIPS, there are a variety of treatment options available depending on the plant species (See *Catalog of Nevada Noxious Weeds on the HTNF* document in the project record), their invasion status, and their location. As such, use of chemicals is not the default option and would be considered according to site-specific characteristics, needs, and treatment effectiveness. In addition, some treatment methods or tools may be inappropriate in certain areas due to laws, regulations, or policy; topographic considerations, access, or the need to protect sensitive resources.

Features of the Proposed Action

Integrated and Adaptive Weed Management

The Forest currently employs an integrated NNIPS management strategy that focuses on prevention, Early Detection Rapid Response (EDRR), eradication, containment, and long-term control. The EDRR is an essential component of the NNIPS management strategy. The intent of EDRR is to detect new or expanding NNIPS occurrences and target them for treatment when they are small and infrequent, so that its spread and likelihood of causing ecological damage are minimized (Welch et al. 2014). EDRR would be implemented after a large disturbance event such as wildfire, thereby allowing for the early detection and rapid treatment of new NNIPS infestations. Integrated management uses a variety of NNIPS prevention and treatment methods to maximize effectiveness while minimizing negative effects to other resources as well as the likelihood of NNIPS and their occurrences developing tolerance to a particular overused herbicide. The Forest would continue to utilize current ground-based methods as the primary means of managing NNIPS infestations.

Design Elements

Design elements (Appendix A) are actions and practices designed into the Proposed Action to reduce negative impacts of proposed project activities on humans and the environment. They include requirements that must be complied with by law, regulation, policy, best management practices (BMPs), forest plan standards and guidelines, and standard operating procedures. Legal requirements related to the storage, transportation, mixing, application, and disposal of herbicides is also presented in Appendix A. These requirements are currently followed for all HTNF ground-based herbicide treatments and will continue to be adhered to under the Proposed Action. Both the No-Action alternative and Proposed Action share the herbicide application guidelines found in Appendix A. Design elements specific to the aerial application of herbicide are only applicable to the Proposed Action as that is the only alternative that includes the aerial method of application.

Cooperation and Coordination

To increase the effectiveness of NNIPS treatments, the Forest Service would continue cooperative, multi-ownership control efforts and would expand those efforts where possible. Cooperative efforts may include any of the following:

- Sharing databases and information on the presence of NNIPS.
- Sharing resources such as personnel, equipment, and herbicides. This would include working with the state and counties to prioritize roads for NNIPS treatments and developing funding agreements for NNIPS control work along priority roads crossing HTNF lands.
- Using input from the state, counties, and local landowners to help set treatment priorities.
- Applying for and sharing grants and aid as a block of cooperators instead of single agencies or organizations.
- Developing agreements and partnerships to allow treatments to extend past Forest boundaries in order to optimize treatment efficacy and control infestations regardless of land ownership.

Alternatives to the Proposed Action: Are there other ways to meet the purpose and need?

Action Alternatives

No additional alternatives that would meet the stated purpose and need were identified during the scoping process or interdisciplinary team review.

Alternatives Considered but Not Analyzed in Detail

Restoration Alternative

An alternative raised during public scoping was to include other restoration efforts (e.g., adding seed source and controlled burning) in combination with aerial herbicide spraying. Restoration efforts beyond the use of aerial spraying would be outside the scope of this analysis and would require the completion of a separate NEPA process.

The level of this analysis would not provide the specificity necessary to analyze each possible treatment scenario in combination with aerial herbicide treatment. The scope and scale of each restoration effort would be variable across the landscape making it very difficult to analyze during this process and would be dependent on the specific management description. Following aerial spraying, it would be difficult to know what or if additional restoration efforts were necessary. If additional restoration efforts are determined to be necessary, they would be completed as a future option under a separate project-level NEPA analysis. Therefore, a restoration alternative was not analyzed in detail for this project.

Limiting Vectors to Reduce Spread Alternative

Some commenters asked the Forest to consider an alternative that would reduce the initial spread of weeds by limiting the vectors that play a role in NNIPS dispersal (such as transportation systems, recreation visitors, livestock grazing, and fire suppression activities). As part of the EDRR process, the Forest is actively working both internally and with partners to prevent the spread of NNIPS. Through EDRR, the Forest identifies new infestations and uses ground-based treatment methods to prevent further spread. For all proposed activities on HTNF lands that have the potential to spread NNIPS seeds or fragments, design elements to mitigate the spread would be included in each project specific NEPA process.

As described in the purpose and need, NNIPS infestations exist throughout the HTNF, and without management, these infestations will increase in size and distribution. Active, efficient, and effective NNIPS management is necessary to contain NNIPS within existing boundaries, reduce infestation densities, and prevent the establishment of new infestations.

NNIPS can also spread through natural transportation vectors such as wildlife, wind, and flowing water. As such, limiting only anthropogenic vectors and not incorporating the treatment of expanding infestations would not fully meet the purpose and need. Thus, an alternative that limits the movement of various transportation vectors was not analyzed in detail.

Project Screening

Legal and Regulatory Considerations

Given the nature of the project, the responsible official is requesting documentation to demonstrate compliance with the following legal and regulatory considerations in addition to NEPA:

Laws, Regulations, Policies, and Executive Orders:

☒ NFMA/Land Management Plan
☒ Endangered Species Act (ESA)
☒ Sensitive Species (FSM 2670)
☒ National Historic Preservation Act (NHPA)
☒ Tribal Consultation
☒ Clean Air Act (CAA)
☒ Clean Water Act (CWA)
☒ Pertinent Executive Orders

Special Management Areas:

☒ Wilderness
☒ Roadless
☒ Wild & Scenic River Corridor
☒ Recommended Wilderness
☒ Research Natural Areas (RNAs)
☒ National Scenic & Historic Trails
☒ National Recreation Areas

Agencies and Persons Consulted

Given the nature of the project, the responsible official consulted the following agencies and tribes during development and analysis of the project:

Agencies

- Nevada Department of Agriculture (NDA)
- Nevada Department of Wildlife (NDOW)

Native American Tribes

See Table 23 below.

Collaborative Groups

HTNF collaborated with the two agencies listed above.

Public Involvement

On June 7, 2023, the HTNF issued a public scoping notice associated with the aerial application of herbicide for NNIPS control in Nevada and invited comments regarding the scope of the associated NEPA review. The Proposed Action description, the public notice, and other information were made available for review at https://www.fs.usda.gov/project/htnf/?project=64139 or at the HTNF Supervisor's Office (Humboldt-Toiyabe National Forest, 1200 Franklin Way, Sparks, NV 89431). The 30-day scoping period formally began on June 7, 2023, when a legal notice was published in the Reno Gazette Journal (#5726852).

The HTNF utilized the NEPA scoping process in lieu of public involvement requirements stated in 36 CFR Part 800, which is the regulation that implements Section 106 of the NHPA (54 U.S.C. 306108). During the 30-day comment period, comment letters were received from two agencies, one organization, and five individuals. The scoping notice, comment letters, and scoping report are included in the project record.

Based on scoping comments received and input from the Forest Service Interdisciplinary Team, resource issue statements and indicators were developed to be analyzed in this EA (see the Issues Considered for Analysis section below).

Supporting Project Documentation

Table 2. Applicable Project File Documentation to Support Analysis.

Documentation Type	File Name (if applicable/needed)
Scoping Notice of Proposed Action	Invasive Plant Treatments Scoping and Notice 06072023.docx
Public Notice	Published LN 06072023.pdf
Scoping Report	HTNF_Aerial_Herbicide_Draft_Scoping_Report_11-29-2023.pdf
Comment Review-Response	Comment Review-Response-Issue Tracking_HTNF_Aerial_Herbicide_EA_11-29-2023.xlsx

Environmental Impacts: How would our management actions affect the environment?

This EA is conducted according to the Council on Environmental Quality's (CEQ's) regulations for implementing the procedural provisions of the NEPA, effective September 14, 2020 (40 CFR sections 1500-1508, 85 FR 137, p. 43357, July 16, 2020). These regulations apply to any NEPA process that begins after September 14, 2020.

An agency shall prepare an EA when a proposed action is unlikely to have significant effects or when the potential for significant effects is unknown (40 CFR 1501.5). The Potentially Affected Environment section below describes the affected area, setting, and its resources, including ongoing and reasonably foreseeable activities and consideration of the no-action alternative. Then, the following sections describe how the project complies with the relevant laws, regulations, and policies, including the National Environmental Policy Act. Those sections describe the degree of effects and other findings the Responsible Official would use to make a Finding of No Significant Impact. Finally, the Issues Considered for Analysis and Environmental Consequences section includes additional analyses prepared to address concerns from public scoping.

Consistent with current regulations for NEPA, the effects (or impacts) discussions focus on changes to the human environment from the proposed action that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action, including those effects that occur at the same time and place as the proposed action and may include effects that are later in time or farther removed in distance from the proposed action or alternative. Effects do not include those that the agency has no ability to prevent due to limited statutory authority or would occur regardless of the proposed action.

Consistency with relevant laws, regulations, policies, and land management plan components ensures that the proposed action does not exceed thresholds for significance, and supporting analysis and rationale for consistency are provided to reach a Finding of No Significant Impact (FONSI). The NEPA: Finding of No Significant Impact (FONSI) section below includes further analysis prepared to discuss additional effects and address potential issues raised by the public and resource specialists.

Should the analysis in this EA not be able to support the preparation of a FONSI, the Forest will consider either adjusting the Proposed Action in order to reduce the level of impact below a significance threshold or consider the preparation of an EIS consistent with 40 CFR 1502.1-24 direction.

Potentially Affected Environment

The potentially affected environment includes the Nevada portion of HTNF NFS lands (approximately 5.6 million acres) located in Carson City, Clark, Douglas, Elko, Eureka, Humboldt, Lander, Lincoln, Lyon, Mineral, Nye, Washoe, and White Pine counties, Nevada (Figure 1), with some exceptions. Areas that would not be treated with aerial herbicide application include designated Wilderness and Wilderness Study Areas and RNAs.

As discussed above in the Background section, the expansion of invasive annual grasses has contributed to the loss of both core sagebrush areas and areas where there is opportunity for growth, especially over the last 20 years. The Forest Service does not have the ability to control the rates of expansion occurring across the HTNF using the ground-based control methods currently available. Coupled with the range and extent of wildfire activity over similar time periods, control of NNIPS is becoming increasingly challenging across the landscape. As a result, increasing concerns regarding WUI exist as fine flashy fuels increase the occurrence of large catastrophic wildfires. Due to the increased size and rapid growth of wildfires, larger threats to health and human safety, property, and ecosystem damage are occurring compared to past fires that were smaller, slower, and more manageable.

Existing conditions associated with each resource are included in each respective resource impacts analyses.

Consideration of No Action: What would happen if we take no action?

Under the No Action, the aerial herbicide application using rotary-wing, fixed-wing, and UAV equipment would not occur. Current treatment practices would continue. Currently authorized treatment practices include manual treatments (e.g., hand pulling, digging, cutting, grubbing, clipping, mulching, and tarping), mechanical treatments (e.g., mowing and chopping), biological controls (insects and pathogens), herbicide treatments (e.g., direct [manual ground-based applications by wicking, wiping, and stump cutting]; spot spraying; and broadcast spraying). Approved herbicides would continue to be used and retreatment would occur, as necessary. Trends discussed above in the Background section would likely continue resulting in greater challenges to prevent and control the invasion of NNIPS. NNIPS would continue to spread across the landscape resulting in increased damage to NFS land and resources.

Issues Considered for Analysis and Environmental Consequences

The CEQ regulations state that NEPA documents “must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail” (40 CFR 1500.1(b)). Although many issues may arise during scoping, not all of the issues raised warrant analysis in an EA. Issues would be analyzed if (1) an analysis of the issue is necessary to make a reasoned choice between alternatives, or (2) the issue is associated with a significant direct, indirect, or cumulative impact or where an analysis is necessary to determine the significance of the impacts.

The resource issue statements considered for this analysis were developed based on public scoping and interdisciplinary team input. Each statement is located at the beginning of each resource discussion below in the respective Issues and Indicators section. Further details in response to public scoping are included in the Scoping Report located in the project record.

Cumulative Actions

NEPA defines cumulative effects as the incremental environmental impact of a proposed action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (40 CFR 1508.1). These actions are termed cumulative actions. Note that (1) pertinent effects of past actions are reflected in the background discussions of resource-specific sections below and generally not discussed under cumulative effects, and (2) if this analysis indicates no direct or indirect impact on a given resource, there can be no cumulative effects, so none are discussed.

The cumulative effects analysis area generally includes NFS lands in the Nevada portion of the HTNF, excluding areas identified as not being treated. Specifically, the cumulative effects analysis area is described below under each resource discussion if it differs from the general cumulative effects analysis area. In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. Existing conditions reflect the aggregate impact of all prior human actions and natural events that affected the environment and might contribute to cumulative effects. This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis for three reasons.

First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Innumerable actions over the last century (and beyond) impacted current conditions, and trying to isolate the individual actions with residual impacts would be nearly impossible.

Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because information on the environmental impacts of individual past actions is limited, and one cannot reasonably identify each and every action over the last century that contributed to current conditions; thus, assumptions would have to be made, which would increase the inaccuracy of the analysis. By looking at current conditions, the residual effects of past human actions and natural events are sure to be captured, regardless of which particular action or event contributed to those effects.

Finally, the CEQ issued an interpretive memorandum on June 24, 2005, regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions” (CEQ 2005).

The cumulative effects analysis in this EA is also consistent with Forest Service NEPA regulations (73 FR 143, July 24, 2008; p. 43084 - 43099), which state, in part:

> CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives would add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonably foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making (40 CFR 1508.7).

For these reasons, the analysis of past actions in this section is based on current environmental conditions.

The cumulative actions considered in this analysis are any reasonably foreseeable actions where ground-based herbicide applications may occur and where other projects may have temporally and spatially overlapping impacts on the resources affected directly or indirectly by the Proposed Action. Three other Forest Service projects fall into this category: (1) the Forest-wide Prescribed Fire

Project; (2) the Deer Mountain Timber Stand Improvement and Hazardous Fuels Reduction Project; and (3) the East Humboldt and Ruby Mountains Fuels Reduction and Landscape Resilience Project.

These cumulative actions are described below.

Ongoing Ground-based NNIPS Treatment Program: The HTNF utilizes a ground-based treatment program to control NNIPS across the Forest. Within the State of Nevada, the HTNF administers approximately 5.6 million acres with approximately 52,000 acres of currently mapped NNIPS occurrences. Across a ten-year average (between 2013 and 2023), the treatment acres include approximately 3,071 acres per year of ground-based herbicide applications, 600 acres per year of manual/mechanical removal, and 612 acres per year of biological treatments. Ground-based treatments tend to be small areas scattered across the landscape (Table 3) (USFS 2023b). This level of treatment with ground-based treatment is anticipated to continue on the HTNF. The herbicides used in these ground-based treatments have been approved by the EPA for the treatment of NNIPS and are not anticipated to cause unreasonable adverse effects when used in accordance with the herbicide label directions. Herbicide use is based on the need to control the spread of NNIPS that cannot be controlled by manual or mechanical means, assuming a similar amount of time and resources.

Table 3. Average Number of NNIPS Sites Treated with Ground-based Herbicide between 2013 to 2023 on the HTNF Categorized by Size (acres).

	Acreage Ranges						
	0-1	1.01-5	5.01-10	10.01-50	50.01-100	100+	Average
Average Number of Sites Treated with Herbicide per Year between 2013-2023	89.5	26.9	6.5	7.5	1.3	1.2	132.9

Forest-wide Prescribed Fire Project: The Forest Service proposes to increase the pace and scale of prescribed burning to increase resiliency of existing vegetation, restore or maintain proper ecological function to native vegetation communities and wildlife habitats, improve firefighter and public safety, and promote fire adapted communities within WUIs. The proposed project would authorize multiple prescribed burns across the Forest per year, each ranging from approximately 500 to 10,000 acres in size. The aim of this project is to increase the amount of annual prescribed burning each year over the next 15 to 20 years. The actual amount of burning would depend on budget, resources, capacity, and availability of appropriate burn windows.

The Forest-wide Prescribed Fire Project does not include the use of prescribed fire within any congressionally designated Wilderness or RNAs. In addition, the design elements would exclude or modify the use of prescribed fire and associated activities under certain conditions (for example, areas of low resistance or resilience to NNIPS). This proposal does not include specific burn units or areas at this time. An interdisciplinary approach and up-to-date data would be used to identify the locations of specific burn units. The team would use current knowledge of vegetation and habitat conditions, including modeled data such as risk classification and prioritization models followed by on-the-ground field review and verification. Each burn unit/area would be implemented according to Agency policy and direction, following the Interagency Prescribed Fire Planning and Implementation Procedures Guide (PMS-484) (NWCG 2022) which establishes national interagency standards. Overlaps between this project and the aerial herbicide treatment project may occur in areas where NNIPS are known to occur. Burned areas can be treated with pre-emergents to control NNIPS. Sediments from burned areas treated with pre-emergents may result in downstream impacts. Aerial herbicide treatment would expand the potential areas that could be treated beyond ground-based treatments.

Deer Mountain Timber Stand Improvement and Hazardous Fuels Reduction Project: This proposed project was developed to address forest health issues associated with insects, disease, encroachment and overstocking, reduce heavy fuel loading associated with mortality and excluded fire disturbances, reduce impacts to Jarbidge's municipal watershed in the event of catastrophic wildfire, and reduce threats to the wildland urban interface. The purpose is to treat fuels adjacent to and beyond, the wildland urban interface with active forest management consistent with reducing wildfire threat, improving forest health resiliency, and improving wildlife habitat. Timber Stand Improvement, for this project, is associated with improving stands for resources other than timber production.

Forest Service activities would include silviculture treatments to create resiliency, riparian and upland watershed restoration treatments, and fuel management treatments. Treatment methods would include hand work, mechanical work, prescribed fire, and prescriptive grazing.

East Humboldt and Ruby Mountains Fuels Reduction and Landscape Resilience Project: This project is designed to achieve the following goals: (1) reduce hazardous fuels across the landscape and provide defensible areas with an emphasis near the wildland urban interface, private lands, and critical infrastructure to minimize potential impacts from wildfires and aid in suppression of future wildfires; (2) restore, enhance, and maintain vegetative community conditions including sagebrush, aspen, and whitebark pine across the landscape to increase ecosystem resilience and resistance to disturbance; (3) improve wildlife habitat suitability, connectivity, and forage for a variety of wildlife species including sage grouse, bighorn sheep, and mule deer; (4) reduce wildfire risk to and the potential loss of forage resources; (5) reduce fuel loading adjacent to, and within, riparian corridors to protect, enhance, and maintain watershed function vital for sensitive and threatened species, including the Lahontan cutthroat trout; (6) reduce wildfire risk to numerous cultural resources across the landscape; (7) reduce wildfire risk to recreation infrastructure and resources including trails and outdoor recreational opportunities; (8) restore fire to fire dependent ecosystems; (9) maintain road access for treatment implementation and fire suppression efforts; and (10) maintain previously implemented vegetation treatments to increase and prolong their effectiveness.

To achieve these goals and reduce the risk of catastrophic wildfire the Forest Service plans to increase pace and scale of fuels treatments by implementing the East Humboldt and Ruby Mountains Fuels Reduction and Landscape Resilience Project. The Forest Service plans to use mechanical equipment, hand thinning, prescribed fire, prescriptive and targeted grazing to implement up to approximately 20,000 acres per year across the approximate 245,532 acres available for treatment. To reach desired fuels objectives, implementation would require multiple treatments to occur over several years with some treatment units receiving more than one entry using various types of treatment methods.

Analysis Assumptions

There are several assumptions that resource specialists used to conduct their analyses. These assumptions include:

- Design elements listed in Appendix A are part of the Proposed Action and would be implemented during any aerial herbicide application project.
- Aerial application implementation plans would be developed by an interdisciplinary team for each individual treatment area and would specify the application of the design elements to the treatment area.
- Any single aerial application treatment area could range in size up to 10,000 acres depending on the NNIPS targeted and the extent of infestation.
- Resources will be impacted by herbicides as described in the ecological risk assessments.

- Exposure scenarios and their associated hazard quotient (HQ), median lethal dose (LD50), and median lethal concentration (LC50) were assumed to be similar to those referenced in the ecological risk assessments.
- Modeled results in Syracuse Environmental Research Associates (SERA) risk assessment reports referenced in this EA represent a maximum application level that would occur under the Proposed Action.
- This EA would authorize a maximum of ten implementation areas per year in occupied HUC12 watersheds.

The goals of aerial herbicide treatment follow the EDRR progression of eradication, containment, and long-term control.

Soils and Water Quality

Issues and Indicators

Issue Statement SQ1: How would the Proposed Action and alternative affect soil productivity in proposed treatment areas?

Indicators: Risk of increased soil erosion (based on modeling), projected herbicide contamination of and persistence in the soil, and recommended herbicide application rate.

Issue Statement WQ1: How would the Proposed Action and alternative affect water quality in water bodies located within and downstream of proposed treatment areas?

Indicators: Estimated change in sediment delivery to streams (based on modeling); estimated concentration of herbicides in streams and other surface waters (based on modeling); state and federal water quality standards (e.g., nutrients, sediment, bacteria, and temperature) in water bodies adjacent to or directly downstream from proposed treatment areas that may receive pollutant loading; and published literature that describes potential for surface water and groundwater contamination from the application of herbicides.

Direct and Indirect Effects

The Proposed Action has the potential to affect soil productivity and water quality through the following:

- Loss of cover and increased potential for erosion of upper soil horizons (e.g., O and A) and transport of soil in runoff to streams.
    - Projected herbicide contamination of soil: based on depth herbicide will infiltrate soil, properties of herbicide that limit transport (groundwater movement rating, sorption coefficient, and toxicity to soil microbes).
    - Persistence in soil: based on half-life in soil.
- Contamination of soil by herbicides and impacts on soil microbes.
- Degraded water quality in receiving water bodies from sedimentation and direct/indirect herbicide interaction.
- Degraded groundwater quality from leaching herbicide.

Loss of Surface Cover and Subsequent Erosion and Sedimentation

Under the Proposed Action, herbicide would be applied aerially to tracts of land that are infested with NNIPS. Surface disturbance that would have occurred from ground-based treatments would not occur. Other short-term impacts that currently occur as part of treating NNIPS (e.g., loss of surface cover following treatment exposure to rain and wind) would continue but at an increased level due to the ability to treat large areas. Impacts on soil resulting from NNIPS in areas that are not treated would continue under the Proposed Action or No-Action alternatives.

Under the Proposed Action, burned areas would be treated by aerial application of pre-emergent herbicide and native seed mixtures at the same time. This effort would reduce colonization by NNIPS and promote growth of desired vegetation. Burned areas already have limited cover and high potential for erosion. No additional negative impacts are anticipated from post-fire treatment by aerial application.

Impacts on soil that would occur in untreated areas with NNIPS would include decreased surface cover (compared to native species) and other physical related impacts such as decreased organic material and soil crusting (Lacey et al. 1989, Olson 1999). NNIPS can also impact soil chemistry and chemical processes including increases to soil pH, extractable nitrate, and net nitrogen mineralization. Secondary compounds secreted by NNIPS can also affect diversity and abundance of soil microbes and mycorrhizal associations (Weidenhamer and Callaway 2010). These changes can decrease decomposition rates and nutrient cycling (Olson 1999).

Soil erosion has been modeled using Disturbed Water Erosion Prediction Project (WEPP) (Elliot and Hall 1997) at the hillslope scale to demonstrate change in sediment yield in response to NNIPS infestation. The erosion rates and sediment delivery results are estimated by the model based on input values for forested conditions developed by scientists at the Rocky Mountain Research Station. Model inputs for this EA included slope angle, slope length, climate, soil type, buffer width, vegetation treatment, and disturbance return periods. The values for these model inputs were selected from a GIS analysis of available data for the Peavine Sample Treatment Area Implementation Plan example, which is included in the project record. This sample treatment area is located immediately west of the City of Reno. Climate statistics used in the model were based on weather data collected from the Reno Tahoe International Airport in Reno, Nevada (annual total precipitation of 7.2 inches and average temperature of 50.0 degrees Fahrenheit). The Peavine watershed represents some of the potential worst-case scenario conditions that could be encountered in the project area including a high percentage of NNIPS and disturbed surfaces, trails, roads, proximity to key water bodies, and within a municipal watershed. The model uses climate statistics to generate daily weather inputs for a length of time specified by the user.

Two scenarios were modeled using Disturbed WEPP (Table 4). Both scenarios included an upper slope (50 percent gradient 700 feet long) and a lower slope (25 percent gradient 300 feet long) comprised of clay loam soil and covered with native vegetation. Model results can determine sediment delivery at the toe (bottom) of the slope to a potential stream channel or other landscape feature. The only difference between the two model scenarios is a vegetative buffer (shrubs with 80 percent cover) that covered the lower slope in the second scenario (see lower half of Table 4). Each scenario was modeled three different times (i.e., three model runs) to estimate changing conditions over a hypothetical five-year period. Vegetation treatment and percent cover were changed for each run to represent the transition experienced as NNIPS were established in native plant communities in the No Buffer Scenario and the upper slope of the Buffer Scenario. All other model inputs (e.g., soil type, gradient, length, and percent rock) remained the same. Vegetation treatment and Percent Cover also remained the same on the Lower Slope in the Buffer Scenario. In order to develop probabilistic model results, each model run incorporated daily weather input over a 50-year period. These type of model results can identify the probability of a given level of erosion occurring the year following a disturbance.

Table 4. Input Parameters and Results of Disturbed Water Erosion Prediction Project (WEPP) Modeling of Erosion from 2 Hypothetical Weed-infested Hillslopes within the Peavine Treatment Area near Reno, Nevada.

50-25% Slope, Clay Loam, No Buffer		**Year 1**	**Year 3**	**Year 5**
Upper Slope	Gradient (top/mid)	50% / 50%	50% / 50%	50% / 50%
	Horizontal length	700 ft.	700 ft.	700 ft.
	Vegetation treatment	Good grass	Poor grass	Unvegetated
	Percent Cover	60%	40%	20%
	Percent Rock	20%	20%	20%
Lower Slope	Gradient (top/mid)	25% / 25%	25% / 25%	25% / 25%
	Horizontal length	300 ft.	300 ft.	300 ft.
	Vegetation treatment (no buffer)	Good grass	Poor grass	Unvegetated
	Percent Cover	60%	40%	20%
	Percent Rock	20%	20%	20%
Results	Probability of erosion	2%	4%	20%
	Erosion rate (tons/acre): 10-year period	0.000	0.000	0.130
	Probability of sediment delivery	2%	6%	28%
	Sediment delivery (tons/acre): 10-year return period	0.000	0.000	0.134
50-25% Slope, Clay Loam, Buffer		**Year 1**	**Year 3**	**Year 5**
Upper Slope	Gradient (top/mid)	50% / 50%	50% / 50%	50% / 50%
	Horizontal length	700 ft.	700 ft.	700 ft.
	Vegetation treatment	Good Grass	Poor Grass	Unvegetated
	Percent Cover	60%	40%	20%
	Percent Rock	20%	20%	20%
Lower Slope	Gradient (top/mid)	25% / 25%	25% / 25%	25% / 25%
	Horizontal length	300 ft.	300 ft.	300 ft.
	Vegetation treatment (buffer)	Shrubs	Shrubs	Shrubs
	Percent Cover	80%	80%	80%
	Percent Rock	20%	20%	20%
Results	Probability of erosion	2%	4%	20%
	Erosion rate (tons/acre): 10-year period	0.000	0.000	0.120
	Probability of sediment delivery	2%	4%	8%
	Sediment delivery (tons/acre): 10-year return period	0.000	0.000	0.000

In these scenarios, the amount of exposed soil surface would increase over a period of roughly five years as NNIPS establish themselves onto previously uninfested slopes in the Peavine treatment area. Prior to weed infestation (Year 1) ground cover was 60 percent. By Year 5, native species have been replaced by NNIPS. Ground cover was reduced at this time to approximately 20 percent with exposed surface and compacted soils that are similar to the "skid trail" condition defined in the Disturbed WEPP model (Elliot and Hall 1997). Native species have died out at this time. This condition represents an unvegetated surface. Bare soil surfaces would be at increased risk during this time from raindrop impact, runoff, and erosion. This risk would be especially evident on high-gradient slopes and result in minimal increases on low-gradient slopes.

Assuming no change in soil type or rock fragment, model results suggest that a change in ground cover associated with weed infestation could result in considerable increases in erosion rate and sediment delivery at the end of the five-year period. For instance, a hillslope covered by native bunchgrass would not produce measurable erosion or sediment delivery from a storm with a ten-year recurrence interval. However, the same hillslope infested by weeds without a buffer would produce 0.134 ton per acre of sediment delivery to a stream channel from the same storm. Model results also suggest sediment delivery to a stream channel is eliminated with the presence of a well-vegetated 300-foot buffer at the base of the slope. Although model estimates of predicted erosion rates are plus or minus 50 percent at best (Elliot and Hall 1997), the results provide a sense of change that occurs during weed infestation.

Notably, loss of soil productivity would be greater during infestation due to the increased risk of soil erosion (Elliot et al. 1999). If the infested areas are treated, native vegetation would reestablish and the risk of soil erosion would be relatively less, due to increased surface cover and organic matter content.

Under the Proposed Action, the greatest potential for erosion and sediment delivery would occur in response to decreased ground cover and increased exposure of soil surfaces following aerial application of herbicide. The relative effect of these impacts has been analyzed for a representative treatment scenario (Table 5) using the Disturbed WEPP model (Elliot and Hall 1997). The modeled scenario shows a 1,000-foot slope in the Peavine treatment area that is treated with aerial application of herbicide. The slope is heavily infested with NNIPS, comprised of clay loam soil, and includes an upper slope (900 feet long, 50 percent gradient) and a lower slope (100 feet long, 25 percent gradient). Pre-treatment conditions include a monoculture of weeds with approximately 25 percent ground cover and degraded soil conditions. The unvegetated condition represented by the "Skid Trail" vegetation treatment in Disturbed WEPP adequately represents these conditions. Herbicide treatment results in 90 percent mortality of weeds, reducing ground cover from 25 percent down to 10 percent in the following year. Ground cover improves to 50 percent at the end of the next two growing seasons as native plants reestablish. The improved vegetation cover is adequately represented by the "Good Grass" condition in Disturbed WEPP.

Modeled results from this scenario indicate an increase in the probability of erosion and sediment delivery to streams as a result of vegetation mortality immediately following aerial application of herbicide. Completely eradicating an NNIPS occurrence on a hillslope will be rare and represents a worse-case scenario. The initial focus of this project will be containing the edges of NNIPS and preventing their expansion. The impact of this condition would be short-term however, as potential rates of erosion in response to the ten-year storm event decrease to zero when native plant species become established and percent cover from vegetation returns to 50 percent. In the absence of NNIPS under the Proposed Action, soil chemistry and soil microbial populations would also return to healthy levels in support of decomposition and nutrient cycling.

Table 5. Erosion Modeling Results Before and After Aerial Herbicide Treatment of an NNIPS Infested Hillslope in the Peavine Treatment Area from the Disturbed Water Erosion Prediction Project (WEPP) Program.

Aerial treatment of NNIPS on 50 percent slope with clay loam soils		Pre-treatment	Immediately Post-treatment	2 Years Post-treatment
Upper Slope	Gradient (top/mid)	50% / 50%	50% / 50%	50% / 50%
	Horizontal length	900 ft.	900 ft.	900 ft.
	Vegetation treatment	Unvegetated	Unvegetated	Good Grass
	Percent Cover	25%	10%	50%
	Percent Rock	20%	20%	20%
Lower Slope	Gradient (top/mid)	25% / 25%	25% / 25%	25% / 25%
	Horizontal length	100 ft.	100 ft.	100 ft.
	Vegetation treatment	Unvegetated	Unvegetated	Good Grass
	Percent Cover	25%	10%	50%
	Percent Rock	20%	20%	20%
Results	Probability of erosion	20%	26%	2%
	Erosion rate (tons/acre): 10-year period	0.10	0.28	0.00
	Probability of sediment delivery	26%	32%	2%
	Sediment delivery (tons/acre): 10-year return period	0.098	0.277	0.000

Soil Contamination and Impacts on Soil Microbes

Impacts on soil resources can occur when chemicals in herbicides attach to surface soil particles during application or during post-application when contaminated water moves through the soil profile. Herbicides can chemically adsorb to soil particles depending on chemical characteristics of the herbicide and soil. Eroded soil may include adsorbed herbicide from treated areas which could potentially enter surface water. Adsorption potential increases with increasing half-life in soil and ionic charge that is opposite to soil particles (which increases attraction). The potential for herbicide adsorption can decrease with increasing water solubility and plant uptake. However, increased solubility can also increase potential for leaching and movement toward groundwater. Herbicide characteristics that determine fate and transport of herbicides in soil and water are summarized in Table 6.

Most herbicides are relatively mobile including nine herbicides that are considered either very mobile or mobile (Table 6). Five herbicides have a half-life in soil that is considered persistent (i.e., exceeds 100 days). Two other herbicides have a moderately persistent to persistent half-life (30 to 100 days). Nine herbicides are considered to be highly soluble (FAO 2000).

Under the Proposed Action, eleven herbicides have low potential for toxicity to soil microbes. The remaining two herbicides have short-term (less than two weeks) toxic potential based on transitory impacts on earthworm growth (Martin 1982) and soil microorganisms (Lliljana et al. 2014). Furthermore, concentrations above the No Observed Effect Concentration (NOEC) of ten parts per million (ppm) for 2,4-D amine (USFS 2006) and five ppm for metsulfuron-methyl (SERA 2005a) are unlikely to occur in soil, based on recommended application rates and design elements.

Table 6. Herbicide Properties Influencing Fate and Transport in Soil and Water Resources.

Herbicide (Active Ingredient)	Half Life in Water (Days)	Water Solubility (mg/L)[a]	Groundwater Movement Rating[b]	Half Life in Soil (Days)[c]	Sorption Coefficient (Soil Koc)[d]	Pesticide Movement Rating (Leach Ability)	Toxicity to Soil Microbes	Degradation Mechanisms
2,4-D amine	45	569	0.9 – 3.7 Ext low to high	6.2 Non persistent	61.7 Mobile	Moderate	Short Term	Soil microbes
Aminocyclo-pyrachlor	1.3	4,200	5.1 Very high	224 – 6932 Persistent	28 Mobile	High	Low	UV light, soil microbes
Aminopyralid	447	205,000	1.8 – 10.1 Low to very high	32 – 533 Mod to persistent	10 Very mobile	High	Low	UV light, soil microbes
Aquatic glyphosate	7	900,000	-0.6 Extremely low	22 – 96 Non persistent to mod. persistent	6,920 Nonmobile	Very Low	Low	Soil microbes
Chlorsulfuron	200	27,900	3.0 – 5.2 Mod to very high	37 – 168 Mod to persistent	40 Mobile	High	Low	Soil microbes
Clopyralid	261	1,000	2.0 – 10.5 Mod to very high	14 – 29 Non persistent	0.4–12.9 Very mobile	Mod–High	Low	Soil microbes
Glyphosate	21	12,000	0 – 6.1 Ext low to very high	5.4 Non persistent	2,000–24,000 Slightly mobile to Nonmobile	Low	Low	Soil microbes
Indaziflam	3.7	2.8	2.3 Moderate	150 - >365 Persistent	605 – 1,094 Mod – Slightly mobile	Intermediate	Low	UV light, soil microbes
Imazapic	30	36,000	0.1 – 8.2 Ext low to very high	113 Persistent	112 Mobile	Low	Low	Soil microbes
Imazapyr	20	11,000	5.2 Very high	210 Persistent	53 Mobile	High	Low	UV light, soil microbes

Herbicide (Active Ingredient)	Half Life in Water (Days)	Water Solubility (mg/L)[a]	Groundwater Movement Rating[b]	Half Life in Soil (Days)[c]	Sorption Coefficient (Soil Koc)[d]	Pesticide Movement Rating (Leach Ability)	Toxicity to Soil Microbes	Degradation Mechanisms
Metsulfuron-methyl	1,213	2,700	2.6–8.1 Mod to very high	120 Persistent	35 Mobile	High	Short Term	Soil microbes, water
Rimsulfuron	10	7,300	2.4 Moderate	5 – 40 Non persistent to mod. persistent	50 Mobile	Intermediate	Low	UV light, soil microbes
Triclopyr butoxyethyl ester	1	23	1.8 Low	46 Moderately persistent	780 Moderately mobile	Intermediate	Low	Soil microbes

Source: Data from USDA Forest Service herbicide risk assessments (BLM 2014, SERA 2004a, 2004b, 2004c, 2004d, 2006, 2007, 2011a, 2011b, 2012, 2016, Kestrel Tellevate 2020)

[a] Pesticide values are categorized as one of the following: insoluble ≤ 0.1 ppm, moderately soluble = 100 to 1,000 ppm, highly soluble ≥10,000 ppm (FAO 2000). As pesticide water solubility increases, greater potential for degraded water quality through runoff and leaching exists.

[b] Groundwater movement rating – groundwater ubiquity score, after Gustafsen (1989). GUS = log (half-life) x (4_log Koc). Based upon the GUS value, the potential to move toward groundwater would be recorded as one of the following categories: extremely low potential = <1.0, low = 1.0 to 2.0, moderate = 2.0 to 3.0, high 3.0 to 4.0, or very high = >4.0.

[c] Pesticides that are considered nonpersistent are those with a half-life of less than 30 days; moderately persistent herbicides are those with a half-life of 30 to 100 days; pesticides with a half-life of more than 100 days are considered persistent. Soil half-life values for some herbicides are from the Herbicide Handbook (Ahrens 1994).

[d] Organic adsorption rating (abbreviated as Koc) is the amount of herbicide that adsorbs to a given amount of organic carbon in the soil. <15 = Very mobile, 15–75 = Mobile, 75–500 = Moderately mobile, 500–4,000 = Slightly mobile, >4,000 = Nonmobile (McCall et al 1981).

Based on the available information, most herbicides under the Proposed Action have relatively more potential for moving into the soil profile than adsorbing to soil particles. Persistence in soil is evident in seven herbicides, indicating potential for contamination for more than 100 days at concentrations equal to when application occurred. However, soil toxicity to microbes is low for nearly all herbicides.

Soil microbes are a critical part of the process of degrading all herbicide chemicals under the Proposed Action. In the absence of actions to control NNIPS, soil microbes will decline in areas where infestation occurs. Most NNIPS produce secondary compounds, which can affect the diversity and abundance of soil microbial populations and mycorrhizal associations (Weidenhamer and Callaway 2010). Decreased abundance of soil microbes can result in decreased decomposition rates and slower rates of nutrient cycling (Olson 1999).

Eradication of NNIPS infestations and reestablishment of native vegetation would allow for the recovery of soil microbes and soil biological crust in the long term. Trevors (1998) has suggested that most effects to soil microbes occur when herbicides are applied at higher than recommended concentrations. Microbial communities in areas where NNIPS monocultures exist are likely already compromised. Any short-term effects cause by herbicide application would ultimately be overshadowed by the long-term benefits of eradicating NNIPS and reestablishing native species. Healthy soil microbes and soil biological crusts help prevent the reestablishment of NNIPS.

Degraded Surface Water Quality

Water quality could potentially decrease in surface water bodies that receive runoff and sediment from exposed areas. The likelihood of surface runoff is primarily due to intense storm events. Erosion is more likely when surfaces are exposed but also occurs when flow is concentrated. Sediment and herbicide adsorbed to sediment can be transported to perennial streams and ponds. These effects and their potential impacts on soil and water quality are expected to be temporary and short term as vegetation cover establishes. The half-life of herbicide in soil and water will likewise limit potential impacts.

The project area includes approximately 9,439 miles of mapped stream channels including perennial and intermittent streams, canals, and pipelines. Intermittent streams are the majority of channel features (7,202 miles) followed by perennial streams (2,041 miles). The project area also includes 5,295 acres of impounded water features in the form of lakes, reservoirs, playas, and marsh (USGS 2023). The Nevada Department of Environmental Protection (NDEP) is charged with protecting surface water by designating beneficial use to each water body, defining standards to protect beneficial use, and monitoring water quality to ensure standards are met. If monitoring data indicates that standards are not met, additional efforts are taken to identify pollutant sources, reduce pollutant loads, and restore beneficial use (NDEP 2022).

Herbicides can enter surface water in several ways including direct application, drift, mobilization in ephemeral streams and channels, and overland flow (Norris et al. 1983).

Although aquatic NNIPS may exist on the HTNF, direct application to surface water bodies would not occur under the Proposed Action. Design elements for aerial application of herbicide require a minimum of 300 feet between open water features and riparian areas including perennial streams, groundwater dependent ecosystems and springs, wetlands, fens, wet meadows, lakes, ponds, and range water developments. These features would be identified prior to application based on best available information. GPS technology would be used to ensure that only the mapped areas are treated. Any pilots or remote drone operators would be certified pesticide applicators and required by law to follow label directions for each herbicide under the Proposed Action. Water features would be avoided by following the prescribed buffer distances and visual identification. Drift monitoring cards would also be placed perpendicular and 300 feet away from perennial water features to monitor the presence of herbicides.

The greatest potential for drift to occur is under the Proposed Action during aerial application. The threat of herbicide drift to water resources is unlikely to occur primarily because of the 300-foot buffer width protecting open water features and riparian areas and additional design elements that address wind speed, direction, weather inversions, droplet size, and interception by vegetation. Some of the more important criteria include:

- No aerial application would occur when sustained wind speeds exceed ten miles per hour or limits that exceed product label directions whichever is less.
- No aerial application during inversions, below minimum relative humidity, or above maximum temperature according to label directions.
- The future weather forecast for the application area must be obtained prior to application to ensure no precipitation or wind events are predicted during or immediately after spraying that could allow runoff or drift into surface water.

The principal factors influencing herbicide drift during aerial application include wind direction, wind speed, presence of inversion, droplet size, and interception by vegetation. Design elements and label direction restrict application to conditions where wind speed is ten mph or less. These conditions would limit the potential for drift to reach surface waters. In the event that drift moves into the 300-foot buffer zone, monitoring with spray cards would identify the impacts and allow applicators to modify practices and prevent any additional impacts. The monitoring protocol specifies how personnel will monitor weather conditions, prepare and deploy drift cards, and determine and report any drift detection.

Several studies have been conducted to measure drift during aerial application with the use of drift card monitoring and water quality monitoring. Gluns (1989) detected no concentrations of glyphosate in surface water draining a harvest unit in British Columbia treated with an aerial application of 1.78 kg/ha of glyphosate, with 100-meter no-spray buffers on water courses. In a study measuring drift of clopyralid during aerial treatments of starthistle in a California grassland, clopyralid was undetectable in surface water following application of 6 ounces per acre of clopyralid with a 30-meter buffer on stream courses and a slight (five mph) breeze toward the sampled aquatic sites (DiTomaso et al. 2004). These studies suggest that drift potential is minimal and that 30-meter buffers (approximately 100 feet) are adequate for protection of adjacent streams. The Oregon Department of Forestry measured herbicide concentrations following aerial herbicide applications in western Oregon using buffers prescribed under the forest practice rules (60 feet or 300 feet, depending on stream type). In that study, herbicide concentrations were not detected in any of the seven samples from three sites after the first runoff event following the aerial application (Dent and Robben 2000). McBroom et al. (2013) conducted herbicide runoff studies in paired watersheds in Texas after aerial and ground application of herbicides. They found that herbicides were only detected in streams during storm events, and the peak concentrations were short lived. In this study, approximately one to two percent of applied imazapyr was measured in the storm runoff.

The Forest Service has monitored aerial herbicide applications in Montana on the Lolo National Forest and the Bitterroot National Forest (USFS 2010). In both settings, no herbicide was detected in surface waters of streams flowing through the application area. Drift cards were also used to monitor drift after application. No herbicides were found on drift cards placed adjacent to streams or within a 300-foot buffer.

If drift occurs beyond the 300-foot buffer, the amount of herbicide reaching surface water is likely to be very low and provide concentrations that are not detectable in surface water. Design elements would minimize the potential for adverse effects to water quality to occur in response to drift.

Aerial application could occur on ephemeral or intermittent streams without flowing water and riparian vegetation. The potential exists for herbicide movement at these locations if runoff occurs, primarily during the first runoff event. The potential for herbicide transport in ephemeral channels would depend on herbicide persistence and other properties influencing fate and transport. Design elements and adherence to label instructions would minimize the potential impact on ephemeral channels.

The timing and magnitude of surface runoff is likely the largest factor influencing herbicide transport to surface water by overland flow (McBroom et al. 2013). The likelihood for surface runoff to occur in the forest is varied, depending on soil properties (primarily infiltration capacity and soil moisture content), topography, and storm intensity. Some herbicides degrade quickly, which results in minor amounts of active chemical remaining for transport by runoff. Herbicide degradation is influenced by microbial activity, ultraviolet light, and water (i.e., solubility and dilution). Herbicide properties such as soil half-life, sorption coefficient, solubility, and capacity to bind to soil and leaves also influence herbicide transport by runoff. The location where herbicide is applied can influence the concentration of herbicide that is transported in streams. Streams draining small watersheds that are treated entirely with herbicide would have relatively higher concentrations than large rivers that receive flow from similar sized areas.

Herbicide transport to streams and ponds were modeled as part of Forest Service risk assessments (BLM 2014; Kestrel Tellevate 2020; SERA 2004a-d, 2006, 2007, 2011a-b, 2012, and 2016). The models that were used to evaluate fate and transport of herbicides include the Groundwater Loading Effects of Agricultural Management Systems (GLEAMS, Leonard et al. 1987) model developed by the USDA and the GLEAMS-Driver model developed by Syracuse Environmental Research Associates Inc. (SERA 2008). The GLEAMS model was primarily used for risk assessments completed prior to 2007 (SERA 2004a-d, 2006). The GLEAMS-Driver model was used in risk assessments completed following 2007 (2007, 2011a-b, 2012, and 2016, and Kestrel Tellevate 2020). The risk assessment for rimsulfuron was completed independently by the BLM (BLM 2014).

The GLEAMS model is a field-scale root zone model that describes the fate of chemicals under various soil types and climatic conditions (Leonard et al. 1987), The GLEAMS-Driver model was developed by SERA for the USDA Forest Service to prepare input files, run the GLEAMS model, and read and process GLEAMS output (SERA 2008).

In each risk assessment, herbicide movement is modeled following application to a square treatment area draining directly to a stream and a square treatment area draining directly into a pond. Model results of GLEAMS and GLEAMS-Driver are shown in Table 7 through 10 expressed as maximum concentrations of herbicide in water. Modeled results for each herbicide are shown for clay, loam, and sandy soils which all exist in the project area. A range of climate conditions were also modeled that span the range of maximum and minimum annual temperature and precipitation values for the HTNF during 1990-2020 (PRISM 2023). Climate conditions that were modeled represent a warm arid lowland site (average annual precipitation of FIVE inches for both GLEAMS-Driver and GLEAMS modeling), a relatively cooler moist upland site (average annual precipitation of 25 inches for GLEAMS and 33 inches for GLEAMS-Driver modeling) and a cool wet upper elevation site (average annual precipitation of 50 inches for GLEAMS model.

Model results suggest that very little herbicide would be delivered to water bodies in arid locations (average annual precipitation 5 inches/year). In locations where precipitation is higher (e.g., 25, 33, or 50 inches per year), the potential for herbicide delivery to receiving water bodies increases. Soil type also influences the presence of herbicide in streams and ponds. GLEAMS modeling suggests that in general, surface runoff is the primary influence for herbicide transport in clay soils while percolation is a primary influence in sandy soils. In general (regardless of soil type), runoff is a stronger influence on herbicide transport than percolation. Design elements that include buffers which prevent application around water bodies and locating sites for mixing and loading herbicides outside of buffers will be followed under the Proposed Action.

Model results are standardized for all herbicides in order to provide meaningful comparisons. The results presented in Table 7 through 10 are for generic site conditions and in response to applied herbicide concentrations (pounds/acre). Actual application rates (lb/acre) will follow label directions under all situations and may be less than those used in model scenarios. Although water quality standards are not available for all herbicides, the EPA drinking water standard for 2,4-D amine is 70 ug/L and 700 ug/L for glyphosate (EPA 2009). Model results for 2,4-D amine concentrations in streams (Table 7) exceed the 70 ug/L water quality standard in areas with clay soil and annual precipitation of 25 inches or more. However, the average application rate for 2,4-D amine is 0.7 lb/ac, which is less than the one lb/ac used in the modeling results. Furthermore, few areas exist on the forest with soil containing a high clay content. Areas of the forest receiving 25 inches of precipitation or more are located at high elevations. It is unlikely that NNIPS in these areas would require herbicide application. Model results for 2,4-D amine concentrations in ponds (Table 9) approach the standard but do not exceed it. Model results for glyphosate concentrations in streams (Table 8) and ponds (Table 10) contribute only a small portion of the water quality standard.

Model results assume direct runoff into a receiving water. In reality, the 300-foot buffer zone required by design elements would capture a portion of the herbicide delivered from the treated area. The model results also assume that precipitation is evenly distributed across the modeled area (SERA 2008). Under this condition, it is possible the model underestimates herbicide delivery from high-intensity thunderstorms. Results from the 50-inch annual average precipitation site and the wet temperate location are assumed to represent these conditions.

In summary, herbicide delivery to water bodies would be minimal in arid locations, including most lower elevation sites on the HTNF, and increase with annual precipitation levels and surface runoff potential. An exception to this would be intense storm events occurring shortly after herbicide application which could occur at any location. Relatively higher amounts of herbicide would be delivered to water bodies where clay or sandy soils are present, depending on the herbicide. In contrast to other herbicides, imazapyr would have the highest potential for transport to water after application on sandy soils because of high leachability and long persistence (Table 6). Model results suggest that concentrations of 2,4-D amine have potential to exceed drinking water quality standards in areas where runoff potential is high (i.e., clay soil) and precipitation is 25 inches or more. As mentioned previously, actual concentrations of herbicides reaching water would likely be lower than model results due to lower application rates (less than one lb/ac) and buffer areas capturing a portion of the herbicide transported by runoff or infiltration.

Leaching Herbicide

Potential for herbicides leaching into to groundwater would exist, depending on chemical properties of herbicides and soil, as well as physical properties of soil that influence infiltration. Impacts could occur if herbicide moves into the soil profile at depths great enough to interact with groundwater.

In general, leaching is not a primary mechanism for herbicide mobility because most herbicides quickly degrade in soil in response to microbial activity. Herbicide decomposition occurs most quickly in conditions that favor microbes such as warm, moist, and nutrient-rich soils (USDA-ARS 1960). In the HTNF, herbicide decomposition likely varies with soil composition, land type, aspect, and elevation. Arid slopes with thin soils would favor photodegradation over microbial decomposition. Valley bottom soils with more organic material loading from vegetation cover in these areas would be more favorable to microbial decomposition.

The greatest potential for groundwater contamination occurs when herbicides are applied over areas with shallow groundwater. Neary and Michael (1996) suggest that forest herbicide use poses little risk to groundwater because the rate, frequency, and extent of application are minimal on a watershed scale. Most land on the HTNF is located in headwater areas. As a result, shallow groundwater is confined to a relatively narrow strip that borders gaining stream channels during spring runoff. In these settings, the 300-foot buffer protecting open water features and riparian areas would eliminate treatments above area of shallow groundwater. The presence of shallow groundwater would also be considered when treatment plans are developed for aerial applications.

Table 7. Summary of Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) and GLEAMS-Driver Modeling Results from USDA Forest Service Herbicide Risk Assessments for Herbicide Application Adjacent to a Stream.

Herbicide	Maximum Concentration of Herbicide in a Stream (ug/L per lb/acre applied)								
	Average Annual Precipitation: 5 inches			Average Annual Precipitation: 25 inches			Average Annual Precipitation: 50 inches		
	Clay	Loam	Sand	Clay	Loam	Sand	Clay	Loam	Sand
2,4-D amine[a]	0	0	0	236	0	9.97 E-08	380	0.251	0.062
Clopyralid[b]	0	0	0	8.50807	0.42790	2.65217	10.55479	7.00034	17.99383
Imazapic[b]	0	0	0	0.15831	0.00000	0.02283	0.49030	0.00660	0.08881
Metsulfuron-methyl[b]	0	0	0	0.46168	0.00992	0.08221	1.19651	0.05440	0.28359

[a] For this herbicide, the GLEAMS-Driver model assumes herbicide treatment of a 10-hectare field with a 60-inch root zone, draining into a 2-meter-wide stream that flows at a rate of 710,000 L/day and with a velocity of 0.08 m/sec. Additional input parameters provided in SERA (2006).

[b] For this herbicide, the GLEAMS model assumes herbicide treatment of a 10-acre-square field with a 60-inch root zone and 4 soil layers that drains directly into a 2-meter-wide, 1-foot-deep stream that flows at a rate of 4,420,000 L/day and with a velocity of 0.08 m/sec. Additional input parameters provided in SERA (2004b, 2004c, 2005a).

Table 8. GLEAMS-driver Modeled Maximum Peak Concentrations of Herbicide in a Stream.

Herbicide	Maximum Peak Concentrations of Herbicide in a Stream (median value of 100 simulations; ug/L per lb/acre applied)								
	Dry Temperate Location[a]			Average Cool Location[b]			Wet Temperature Location[c]		
	Clay	Loam	Sand	Clay	Loam	Sand	Clay	Loam	Sand
Aminocyclopyrachlor[d]	0.4	0.00023	0	17.9	42	90	35	61	129
Aminopyralid[e]	0.087	0	0	30	33	100	43	49	120
Chlorsulfuron[d]	0.29	0	0.004	21	35	85	28.2	44	94
Glyphosate[e]	0.00016	0	0	6.3	0.08	0	5.5	0.08	0
Indaziflam[d]	0.00523	1.91 E-05	0	0.0288	0.00230	0.000534	0.0274	0.00104	0.000725
Imazapyr[d]	2.14	0	0	5.2	0.31	5.3	12.4	15.1	24.6

[a] Standard GLEAMS-Driver site based on climate of Bishop, CA (average annual rainfall 5.34 inches, average annual temperature 56.02 °F).

[b] Standard GLEAMS-Driver site based on climate of Sault Ste. Marie, MI (average annual rainfall 32.94 inches, average annual temperature 40.07 °F).

[c] Standard GLEAMS-Driver site based on climate of Quillayute, WA (average annual rainfall 95.01 inches, average annual temperature 49.14 °F).

[d] For this herbicide, the GLEAMS-Driver model assumes herbicide treatment of a 10-acre-square field with a 36-inch root zone that drains directly into a 2-meter-wide stream that flows at a rate of 710,000 L/day and with a velocity of 0.08 m/sec. Additional input parameters are provided in SERA (2011c, 2012, 2016,) and Kestrel Tellevate 2020.

[e] For this herbicide, the GLEAMS-Driver model assumes herbicide treatment of a 10-acre-square field with a 60-inch root zone that drains directly into a 2-meter-wide stream that flows at a rate of 710,000 L/day and with a velocity of 0.08 m/sec. Additional input parameters are provided in SERA (2007, 2011a).

Table 9. Summary of Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) and GLEAMS-Driver Modeling Results from USDA Forest Service Herbicide Risk Assessments for Herbicide Application Adjacent in a Pond.

Herbicide	Maximum Concentration of Herbicide in a Pond (ug/L per lb/acre applied)								
	Avg. Annual Precip : 5 inches			Avg. Annual Precip : 25 inches			Avg. Annual Precip : 50 inches		
	Clay	Loam	Sand	Clay	Loam	Sand	Clay	Loam	Sand
2,4-D amine[a]	0	0	0	17.8	0.00000	2.37 E-06	50.4	0.0422	0.0208
Clopyralid[b]	0	0	0	4.94710	1.15098	6.41084	6.60086	13.04550	33.11471
Imazapic[b]	0	0	0	0.14009	0.00000	0.00970	0.36630	0.00097	0.05081
Metsulfuron-methyl[b]	0	0	0	0.40388	0.03358	0.46725	0.80931	0.14124	0.60872

[a] For this herbicide, the GLEAMS-Driver model assumes herbicide treatment of a 10-hectare field with a 60-inch root zone, draining directly into a 1-hectare pond with a depth of 2 meters and a 1-centimeter (cm) sediment fraction. Additional input parameters provided in SERA (2006).

[b] For this herbicide, the GLEAMS model assumes herbicide treatment of a 10-acre-square field with a 60-inch root zone and 4 soil layers that drains directly into a 1-acre pond with a depth of 2 meters and a 1-cm sediment fraction. Additional input parameters provided in SERA (2004b, 2004c, 2005a).

Table 10. GLEAMS-driver Modeled Maximum Peak Concentrations of Herbicide in a Pond.

Herbicide	Maximum Peak Concentrations of Herbicide in a Pond (median value of 100 simulations; ug/L per lb/acre applied)								
	Dry Temperate Location[a]			Average Rainfall/Cool Location[b]			Wet Temperate Location[c]		
	Clay	Loam	Sand	Clay	Loam	Sand	Clay	Loam	Sand
Aminocyclopyrachlor[d]	0.13	0.00007	0	31.1	132	330	86	101	222
Aminopyralid[e]	0.03	0	0	100	110	300	70	80	200
Chlorsulfuron[d]	0.11	0	0.0008	110	182	420	83	85	155
Glyphosate[e]	0.00006	0	0	3.5	0.03	0	3.3	0.031	0
Indaziflam[d]	0.00241	5.91 E-06	0	0.0145	0.00116	0.00233	0.0131	0.000581	0.000328
Imazapyr[d]	0.8	0	0	2.12	0.29	9.4	20.3	49	40

[a] Standard Gleams-Driver site based on climate of Bishop, CA (average annual rainfall 5.34 inches, average annual temperature 56.02 °F).

[b] Standard Gleams-Driver site based on climate of Sault Ste. Marie, MI (average annual rainfall 32.94 inches, average annual temperature 40.07 °F).

[c] Standard GLEAMS-Driver site based on climate of Quillayute, WA (average annual rainfall 95.01 inches, average annual temperature 49.14 °F).

[d] For this herbicide, the GLEAMS-Driver model assumes herbicide treatment of 10-acre-square field with a 36-inch root zone that drains directly into a 1-acre pond with a depth of 2 meters and a sediment depth of 2 cm. Additional input parameters are provided in SERA (2011c, 2012, 2016) and Kestrel Tellevate 2020.

[e] For this herbicide, the GLEAMS-Driver model assumes herbicide treatment of 10-acre-square field with a 60-inch root zone that drains directly into a 1-acre pond with a depth of 2 meters and a sediment depth of 2 cm. Additional input parameters are provided in SERA (2007, 2011a).

Table 6 identifies five herbicides with a high rating of pesticide movement (leach ability) including aminocyclopyrachlor, aminopyralid, chlorsulfuron, imazapyr, and metsulfuron-methyl. One pesticide, cloypyralid, has a moderate-high rating for pesticide movement. GLEAMS and GLEAMS-Driver model results estimate the soil depth that herbicide moves into soil, based on annual average precipitation and an application rate of one lb/ac. Depth of movement was lowest for clay soil and greater for silt and sand textured soil. Depth of movement increased with increasing precipitation. For all soil types under dry temperate conditions, depth of movement ranged from 6.5 to 36 inches and increased to 36 to 60 inches for both average cool and wet temperate conditions. Field studies that measured herbicide movement in soil consistently found lower concentrations and less movement into the soil profile compared to model estimates at given annual precipitation levels.

Under the Proposed Action, herbicide applications would be unlikely to enter either surface water or groundwater as part of leaching through soils. With the exception of herbicides applied over areas with shallow groundwater, leaching is an unlikely process for contamination due primarily to limited chemical mobility and relatively short persistence in the environment (Norris et al. 1983). Under the Proposed Action, aerial herbicide application would not occur near perennial streams due to the use of a surrounding 300-foot buffer, which would subsequently protect most areas of shallow groundwater within the project area. Other areas of shallow groundwater would be identified when implementation plans are developed for aerial applications.

Cumulative Effects

The cumulative actions considered in this analysis are described in Cumulative Actions section above. The following section lists those actions and summarizes their cumulative effects on soil and water quality resources addressed in this analysis.

Ongoing Ground-based NNIPS Treatment Program

The ongoing ground-based NNIPS treatment program consists of several methods of treatment including herbicide, manual, biological, and mechanical methods of treatment. As described in the Cumulative Actions section, ground-based treatments are generally small areas scattered across the landscape. The direct effects of these treatments would include localized areas of ground disturbance and low risk of herbicides and sediment entering water bodies. Any adverse effects that would occur in response to these impacts would be followed by long-term beneficial effects to soil and water resources in response to control of NNIPS and reestablishment of native plants in treated areas.

Based on these considerations, this program and the Proposed Action would result in minimal cumulative effects on soil and water resources in the short term followed by long term benefits. Following the recommended design elements and planning requirements for each treatment area would minimize short term impacts and prevent water quality impairment of water bodies located on and downstream of the HTNF.

Forest-wide Prescribed Fire Project

The Forest-wide Prescribed Fire Project has the potential to impact soil and water resources in the short term by removing vegetation through prescribed fire, exposing soil surfaces to raindrop impact, and potentially creating hardened soil surfaces if soil temperatures become extreme. Exposed soil surfaces could erode and transport sediment and ash in surface runoff generated by rain or snowmelt in the first spring season following the fire. If hardened soil is created by fire, additional runoff volumes could scour stream channels and floodplains. However, design elements associated with prescribed fires would minimize the risk of intense fire conditions and impacts on soil surfaces. Impacts on soil and erosion created by precipitation and runoff would be isolated to treatment areas and downstream receiving waters. The location of prescribed fire can also be managed spatially and temporally to minimize impacts to adjoining areas.

Based on these considerations, this project and the Proposed Action could result in minimal cumulative short-term effects on soil and water resources if projects occurred in the same watershed. If projects were separated spatially and would not potentially contribute sediment to water bodies in the same watershed, there would be no cumulative effect. If projects were not separated spatially, the potential exists for a cumulative effect on sedimentation to water bodies in that watershed. Over the long term, prescribed fire would establish a normal fire frequency and reduce fuel loads to prevent extreme wildfire and corresponding impacts to soil and water resources.

Deer Mountain Timber Stand Improvement and Hazardous Fuels Reduction Project

This fuels reduction project would implement silvicultural treatments to areas of the Deer Mountain Timber Stand. The methods used would include hand work, mechanical work, prescribed fire, and prescriptive grazing. Surface disturbance would occur as part of these methods as trees, forbs, and grass are removed. Soils would be exposed in a minor way during these activities. Any impacts from prescribed fire would be similar to those described above for the Forest-wide prescribed fire project.

This project and the Proposed Action would yield minor cumulative effects on soil and water resources in the project area. These effects would last until new surface vegetation or litter covers exposed soil surfaces. Over the long term, the health of timber stands and fuel loads would improve, thus reducing potential future impacts on soil and water resources from catastrophic wildfires.

East Humboldt and Ruby Mountains Fuels Reduction and Landscape Resilience Project

The project would increase the pace and scale of fuels treatments in the East Humboldt and Ruby Mountain project area. The objective of this project is to reduce wildfire risk as well as restore, enhance, and maintain native vegetation communities in a way that improves resilience and resistance to disturbance.

Wildfire risk would be reduced by managing existing fuel loads with mechanical equipment, hand thinning, prescribed fire, and prescriptive and targeted grazing. Vegetation treatments would enhance communities of sagebrush, aspen, and whitebark pine. Any treatments that disturb soil surfaces or temporarily reduce surface cover and expose soil would increase potential for soil erosion and sediment transport to receiving water bodies. Road construction and maintenance can provide additional sources of sediment. Design elements would be used with any treatment to minimize the potential for erosion and sedimentation. Timing and location of treatment areas would minimize impacts on water quality and soil.

Similar to other fuel reduction projects, this project and the Proposed Action would yield minor cumulative effects on soil and water resources in the project area. These effects would last until new surface vegetation or litter covers exposed soil surfaces. Over the long-term, wildfire fuel loads would decrease, and resilience of vegetation would improve, thus reducing potential future impacts on soil and water resources.

Vegetation

Issues and Indicators

Issue Statement VEG1: How would the Proposed Action and alternative affect native vegetation including threatened, endangered, and/or sensitive (TES) plant species?

Indicators: Expected vegetation changes, affected acres, and potential to affect non-target resources within and adjacent to proposed treatment areas. The context and intensity of proposed treatments.

Direct and Indirect Effects

The Proposed Action has the potential to directly impact native vegetation by causing death or damage to native plants by unintentional direct herbicide spray, herbicide drift, wind erosion of contaminated soils, or herbicide transport in water.

Indirect effects include herbicide-caused death to pollinating insects.

The biological assessment (BA) analyzes the effects of the Proposed Action on federally listed Threatened, Endangered, and Proposed species and is included in the NEPA documentation for the project. Two federally listed plant species occur within the project area and are analyzed in the BA. These two species include Webber's ivesia (*Ivesia webberi*) and whitebark pine (*Pinus albicaulis*), both of which are listed as threatened. Table 18 in the Endangered Species Act section below summarizes the findings of the BA by listing the species-specific analyses of direct, indirect, and cumulative effects on federally listed species. See the BA for the complete analyses of Webber's ivesia and whitebark pine, as related to the Proposed Action in the project record.

The botany biological evaluation (BE) analyzes the impacts of the Proposed Action on plant species listed as sensitive in the Intermountain Region (Region 4 [R4]) by the Forest Service Regional Forester. The HTNF currently has 103 plant species listed as regionally sensitive. Of the 103 sensitive plant species, 36 species would not be impacted by the Proposed Action due to one or more of the following reasons: (1) the species are only known to occur in the California portion of the HTNF, and the Proposed Action would only occur on the HTNF in Nevada; (2) the species are only known to occur in designated Wilderness, which also is not included in the project area; (3) the species' habitats (e.g., riparian areas) are protected by the project's design elements; and (4) the habitats of these species (e.g., rock cliffs, scree, and talus) being highly unlikely to be treated with aerial herbicide applications. Table 21 in the Sensitive Species section below summarizes the determinations for the HTNF's sensitive plant species.

The remaining 65 sensitive plant species in Table 21 were given the determination that the Proposed Action may impact individuals but is not likely to cause a trend toward federal listing or loss of viability for the species (referred to as a MINT determination). The range of effects to sensitive plants exposed to aerial herbicide application would vary depending on factors such as the sensitivity of the species to a particular herbicide and the timing or amount of the exposure. Sensitive plant species exposed to herbicides applied aerially under the Proposed Action could be injured or killed.

Implementation plans prepared for each aerial herbicide application authorized under the Proposed Action would include a detailed analysis of sensitive plant species. If sensitive plant species are determined to occur within treatment areas during the implementation plan analysis, the sensitive plant species occurrences would be mapped and buffered in order to prevent any impacts to the sensitive plants from the herbicide.

Cumulative Effects

Webber's ivesia: Future state or private activities, not involving federal actions, that are reasonably certain to occur within the project area and would affect Webber's ivesia and its designated Critical Habitat include off road recreation, road development and maintenance, suburban development, and energy development.

Whitebark pine: Future state or private activities, not involving federal actions that are reasonably certain to occur within the project are and may affect whitebark pine include off road recreation; road development and maintenance; energy development; herbicide spraying on state, county, or private lands; and any type of action that involves habitat loss or alteration and disturbance within the range and habitat of whitebark pine. However, given that whitebark pine inhabits high-mountain terrain within the project area and these sites are primarily administered by the HTNF, the likelihood of these activities to occur and generate cumulative effects is low.

Sensitive plant species with the potential to occur within the project area: Future state or private activities, not involving federal actions that are reasonably certain to occur within the project area and may impact sensitive plant species include off road recreation; road development and maintenance; energy development; herbicide spraying on state, county, or private lands; and any type of action that involves habitat loss or alteration and disturbance within the range and habitat of the sensitive plant species with potential to occur within the project area. Cumulative effects for sensitive plant species with occupied and/or potential habitat within the project area result from grazing, recreational activities, and NNIPS. Grazing and recreational activities are not expected to increase within the project area.

Range

Issues and Indicators

Issue Statement RAN1: How would the Proposed Action and alternative affect rangeland resources and management?

Indicator: Expected vegetation production changes, potentially affected rangelands and allotments or herds, and potential to affect permittees or animals.

Direct and Indirect Effects

Livestock grazing on the Humboldt-Toiyabe National Forest (HTNF) has occurred since before the establishment of the National Forest and is still an important use today. Public lands provide an important source of forage for many ranches and help to support the agricultural component of many communities scattered throughout the west. The HTNF is comprised of six Ranger Districts and a National Recreation Area: Austin-Tonopah, Bridgeport, Carson, Ely, Mountain City-Ruby Mountains-Jarbidge, and Santa Rosa Ranger Districts, and the Spring Mountains National Recreation Area (SMNRA). There are no livestock grazing allotments within the SMNRA. Livestock grazing management activities occur on established active grazing allotments and are permitted by the issuance and administration of grazing permits for a ten-year period. Grazing allotments account for approximately 5,275,176 acres; approximately 94 percent of the total project area.

As of August 2024, there are 148 grazing permits on the HTNF authorizing approximately 325,598 animal unit months (AUMs) of grazing use through the livestock grazing permit system on an annual basis (Table 11). An AMU is defined as the amount of forage required by an animal unit for one month, and an animal unit is defined as one mature cow or the equivalent based upon average daily forage consumption of 26 pounds of dry matter per day (Jacoby 1989). Typically, actual use on the HTNF runs approximately 80 percent of the permitted numbers. Most of that use is by cattle and sheep, with less than one percent by horses. NFS forage is an important, and in many instances, a vital part of the business operations for these livestock producers.

As noted previously, there are approximately 52,000 acres of currently mapped NNIPS occurrences on the HTNF. The mapped infestations of NNIPS account for less than one percent of the lands within the forest boundary. Based on the most recent data from the multi-resolution land characteristics consortium, invasive annual grasses currently occupy approximately 1,536,329 acres within the HTNF (MRLC 2024). Although mapped infestations do not occur in all grazing allotments on the Forest, all allotments have the potential for infestation.

NNIPS degrade rangelands because they crowd out desirable plants and are usually unpalatable for all or a portion of the grazing season. Some NNIPS are toxic to livestock. NNIPS impact rangeland resources by lowering yield and quality of forage, interfering with grazing, poisoning animals, and increasing costs of managing and producing livestock (DiTomaso 2000).

Treatment of rangelands infested by NNIPS could result in a short-term reduction in forage availability for livestock and WHB. The loss of production from noxious weeds would in most cases represent a minor to no loss of available forage because many noxious weeds have limited palatability and/or are poisonous. Over a longer timeframe (more than five years), reduction of NNIPS would improve rangeland conditions and increase forage availability.

Table 11. Allotment and Wild Horse and Burro Territory (WHBT)/Herd Management Area (HMA) Information and Status by Ranger District on the HTNF.

Ranger District	Number of Active Allotments	Total Number of WHBT/HMA	Number of Range Water Developments	Number of Permits	Permitted AUM
Austin	20	9	423	12	29,017
Bridgeport	29*	1*	90*	14*	25,707*
Carson	1*	0*	0*	1*	479*
Ely	30	5	547	18	32,497
Jarbidge	19	0	292	16	42,266
Mountain City	44	0	1,804	25	88,925
Ruby Mountain	54	1	335	38	48,880
Santa Rosa	11	0	484	16	45,751
Tonopah	14	6	140	7	12,076
SMNRA	0	3	2	0	0
Total for HTNF	219	25	4,117	148	325,598

* Bridgeport and Carson Ranger Districts reflect NFS lands in Nevada only, not California.

Aerial herbicide treatment would typically reduce the cover of NNIPS on grazed lands and result in short- and long-term benefits to livestock from increased quality of forage. NNIPS can greatly reduce the land's carrying capacity for domestic livestock (Olson 1999). The success of aerial herbicide treatments would determine the level of benefit of the treatments over the long term.

The Proposed Action would treat areas that have been invaded by NNIPS, including annual grasses. Short-term effects would include a reduction in the area affected by annual grasses, or at least slow their advancement. Some annual grasses (i.e., downy brome) may be used at some times of the year as forage for livestock and WHB. The reduction in annual grass would thus represent a short-term reduction in available forage. Long term, treatment of communities with NNIPS would allow native grass species to increase and provide forage for a longer period of time. Treatment of NNIPS to improve native communities would also reduce the risk of wildfire and the impacts they have on the rangelands.

Aerial herbicide treatment of NNIPS that reduces the risk of future catastrophic wildfire through fuels reduction would benefit rangeland resources. NNIPS represent a fire hazard in rangelands by increasing the frequency of wildfires in these ecosystems (DiTomaso 2000). Uncontrolled, high-intensity wildfires can remove forage from large tracts of rangeland, reducing its suitability for grazing and requiring a mandatory two-to-three-year grazing rest (USFS 1986b, as amended; USFS 1986a, as amended; and USFS 2016).

Aerial herbicide application poses a potential risk to rangeland resources. The Proposed Action includes required design elements to minimize the risk of adverse effects of herbicide application to other resources, including rangeland resources (Appendix A). Design elements will be implemented on a project-specific basis (disclosed in an implementation plan) to minimize adverse effects. Design elements particularly relevant to rangeland resources include the following:

- HH-1 Follow the herbicide label.
- HH-4 Monitor wind speed and direction during herbicide application.
- HH-5 Do not apply herbicide when sustained wind conditions exceed product label directions.
- WR-1 Maintain a 300-foot application buffer around open water, including range water developments.

- PS-2 Provide prior public notification of aerial herbicide applications.
- WH-1 Avoid delineating treatment parcels when WHB are present to minimize behavioral impacts.
- LA-1 Advise permittees of livestock grazing or feeding restrictions.
- LA-2 Coordinate with permittees to make administrative changes to adjust entry times, pasture rotations, alternate forage sites, and non-target food removal (salt, supplement, water haul sites).
- LA-3 Communicate with permittees and adjacent land managers to minimize any potential social/economic impacts.

This analysis assumes that all design elements would be implemented during an aerial herbicide application project. It discloses effects that could occur from aerial herbicide projects authorized under the Proposed Action with all the design elements integrated into aerial herbicide treatments in a project-specific implementation plan.

Herbicide Exposure Risk to Grazing Animals (Livestock and Wild Horses and Burros)

Several herbicides included in the Proposed Action pose a risk to large herbivores (livestock, wild horses, burros) under a scenario of ingestion of food items contaminated by direct spray. Risks to herbivores associated with each herbicide are summarized below in Table 12.

Livestock

If livestock were exposed to herbicide, they could potentially experience short and long-term health consequences, depending on the toxicity of the herbicide and the dose (Table 12). Design elements would mitigate this risk. Design element HH-1 would require aerial herbicide treatments to follow the requirements of the herbicide label. While some herbicides have been determined to be non-toxic to grazing animals at approved application rates, others represent a higher risk due to toxicity (Table 12).

Design element LA-1 requires the Forest Service to advise permittees of any livestock grazing or feeding restrictions. Design element LA-2 requires the Forest Service to coordinate with permittees to make administrative changes to adjust entry times, pasture rotations, alternate forage sites, and non-target food removal (salt, supplement, water haul sites) to avoid herbicide exposure, regardless of label requirements. Herbicide applications would occur when animals would not be present in a treatment area (i.e., prior to initiation of the grazing season or when livestock were in another allotment pasture). If project timing requires livestock removal from the project area, the grazing permittee could be adversely affected as a result of the treatment area being unavailable for grazing. The permittee would need to alter pasture rotation schedule, find alternative pasture, or modify ranching operations to account for the unavailable forage, which could result in increased costs and/or a loss of income.

Herbicide contamination of water sources (i.e., natural streams and ponds and artificial water sources such as stock tanks) used by livestock (and WHB) could result in herbicide exposure. Design element WR-1 would protect water sources from contamination from aerial herbicide application by establishing a 300-foot no-spray buffer around the water sources.

As detailed in the Public Health and Safety analysis below, the risk to the public, which would include livestock managers, from aerial herbicide application is expected to be very low. The risk of exposure to herbicides is considered to be very low with all design elements in place requiring notification of users prior to the project. Because herbicides would be used only as directed on the label, no effects to livestock health or public health from the consumption of the livestock products are expected.

Table 12. Summary of Herbicide Risks to Herbivores.[1,2]

Herbicide	No Risk	Low Risk	Low Acute Risk	Moderate Acute Risk	Low Chronic	Chronic Risk
2,4-D Amine			Small herbivores (typical and maximum application rate)	Large herbivores		Large herbivores
Aminocyclopyrachlor	X					
Aminopyralid	X					
Chlorsulfuron	X					
Clopyralid			Small herbivores		X	
Glyphosate		Small herbivores (maximum application rate)	Large herbivores (typical application rate)	Large herbivores (maximum application rate)		
Imazapic	X					
Imazapyr		Small and large herbivores (maximum application rate)				
Indaziflam				Small herbivores (maximum application rate)	Small and large herbivores	
Metsulfuron-methyl		Small and large herbivores (maximum application rate)				
Rimsulfuron	X					
Triclopyr		Small and large herbivores (typical application rate)		Small and large herbivores (maximum application rate)		

[1] Small herbivores include sheep and goats. Large herbivores include cattle and horses (including WHB).

[2] See Rangeland Resources Report in the project record.

Wild Horse and Burro

Aerial application of herbicides would allow for much larger areas to be treated compared to ground-based treatments. Wild horse and burro (WHB) could experience increased levels of herbicide exposure (dermal, inhalation, oral/ingestion) under the Proposed Action. According to the SERA Human Health and Ecological Risk Assessment reports, 12 of the 13 herbicides proposed for use under the Proposed Action have low toxicity to mammals, including aminocyclopyrachlor, aminopyralid, chlorsulfuron, clopyralid, glyphosate, aquatic glyphosate, imazapic, imazapyr, indaziflam, metsulfuron-methyl (SERA 2004a, 2004b, 2005a, 2005b, 2006, 2007, 2011a, 2011c, 2012, 2016 and Kestrel Tellevate 2020), rimsulfuron (BLM 2014), and triclopyr butoxyethyl ester (SERA 2011b). Only 2,4-D amine is classified by the EPA as moderately toxic to mammals (SERA 2006).

Aerial herbicide applications on ranges with WHB would be scheduled when animals would not be using the treatment area, if possible. If WHB are not present in the treatment area, impacts to WHB would not be expected, either due to herbicide exposure or displacement due to aircraft or UAV operations. If WHB are present during aerial herbicide treatment, they would likely be displaced from the area during the treatment. If WHB re-enter the treatment area post application, they could be exposed to herbicide, the effects of which would depend on the herbicide toxicity (Table 12) and the timeframe post application.

Under the Proposed Action, staging areas and aerial application of herbicides may cause short-term disturbance and/or displacement to WHB. The Proposed Action would locate staging areas in areas with previous disturbance. Increased noise and human presence at staging areas could result in temporary avoidance of the area. Animals would likely avoid treatment areas while weed crews are in the area. Aerial application methods could cause visual and noise disturbance. These effects are expected to be temporary and short duration.

Invasive plant treatment methods described in the Proposed Action could result in short term effects to habitat. Aerial application of herbicides would allow for larger areas to be treated with herbicides than ground-based treatments. It is likely that non-target native vegetation would be sprayed by herbicides. The use of herbicides without restoration and reseeding could reduce both native and invasive plants, and thus be detrimental to WHB by reducing forage availability and habitat quality (Baker et al. 2009, Crone et al. 2009, Skurski et al. 2013). Where invasive plants occur in large, dense patches, treatments could temporarily result in reduced plant cover (Baker et al. 2009). The removal of invasive plants could, in the short-term, decrease the amount of available forage. While the vegetation is recovering, some areas could be less valuable to WHB. However, removal of invasive plants would be expected to increase the diversity of native plant species in treated areas, improving habitat quality over the long-term (Eddington 2006, Arathi and Hardin 2021). When used properly, the proposed herbicides can target invasive species and leave native species largely unharmed (Clements et al. 2013).

Livestock and WHB are herbivores. Although the potential effects of exposure to herbicides summarized above would be similar, there are differences in how livestock and WHB would be affected by the Proposed Action. These differences stem from the fact livestock exposure can be controlled through management tools, such as pasture rotation and on and off dates, while WHB are difficult to manage due to their wild status. The design elements discussed above would preclude most impacts to livestock from aerial herbicide application, while WHB would be more likely to be affected.

Cumulative Effects

The cumulative actions considered in this analysis are described in Cumulative Actions section above. The following section lists those actions and summarizes their cumulative effects on rangeland resources addressed in this analysis.

Ongoing Ground-based Invasive Plant Treatment Program

The ongoing ground-based invasive plant treatment program consists of several methods of treatment including herbicide, manual, biological, and mechanical. As described in the Cumulative Actions section, ground-based treatments are generally small areas scattered across the landscape. The direct effects of these treatments would include localized areas affected by the project. Any adverse effects that would occur in response to these impacts would be followed by long-term beneficial effects to rangeland resources response to control of invasive plants and reestablishment of native plants in treated areas.

Based on these considerations, this program and the Proposed Action would result in minimal cumulative effects on rangeland resources in the short-term followed by long-term benefits.

Following the recommended design elements and planning requirements for each treatment area would minimize short-term impacts and prevent rangeland resource impacts.

Forest-wide Prescribed Fire Project

The Forest-wide Prescribed Fire Project has the potential to impact rangeland resources in the short term by removing vegetation through prescribed fire, temporarily reducing forage availability. Design elements associated with prescribed fires would minimize the risk of intense fire conditions and impacts on rangeland resources. Impacts to vegetation would be isolated to treatment areas. The location of prescribed fire can be managed spatially and temporally to minimize impacts to adjoining areas.

Based on these considerations, this project and the Proposed Action could result in minimal cumulative short-term effects on rangeland resources, particularly if the projects occurred in the same allotment. If projects were separated spatially, any potential cumulative effects would be less noticeable to rangeland users. If projects were not separated spatially, the potential exists for a cumulative effect on rangeland management and use. Over the long term, prescribed fire would establish a normal fire frequency and reduce fuel loads to prevent extreme wildfire and corresponding impacts to rangeland resources.

Deer Mountain Timber Stand Improvement and Hazardous Fuels Reduction Project

This fuels reduction project would implement silvicultural treatments to areas of the Deer Mountain Timber Stand. The methods used would include handwork, mechanical work, prescribed fire, and prescriptive grazing. Vegetation disturbance would occur as part of these methods as trees, forbs, and grass are removed. Any impacts from prescribed fire would be similar to those described above for the Forest-wide prescribed fire project.

This project and the Proposed Action would result in minor cumulative effects on rangeland resources in the project area. These effects would last until new vegetation establishes. Over the long term, the health of timber stands and fuel loads would improve, thus reducing potential future impacts on rangeland resources from catastrophic wildfires.

East Humboldt and Ruby Mountains Fuels Reduction and Landscape Resilience Project

This project would increase the pace and scale of fuels treatments in the East Humboldt and Ruby Mountain Project area. The objective of this project is to reduce wildfire risk as well as restore, enhance, and maintain native vegetation communities in a way that improves resilience and resistance to disturbance.

Wildfire risk would be reduced by managing existing fuel loads with mechanical equipment, hand thinning, prescribed fire, and prescriptive and targeted grazing. Vegetation treatments would enhance communities of sagebrush, aspen, and whitebark pine. Any treatments that disturb vegetation would affect rangeland resources. Design elements would be used with any treatment to minimize the potential for adverse impacts. Timing and location of treatment areas would minimize impacts on rangeland resources.

This project and the Proposed Action would yield minor cumulative effects on rangeland resources in the project area. These effects would last until new vegetation becomes established. Over the long term, wildfire fuel loads would decrease, and resilience of vegetation would improve, thus reducing potential future impacts on rangeland resources.

Fish and Aquatic Wildlife

Issues and Indicators

Issue Statement FW1: How would the Proposed Action and alternative affect special-status fish and aquatic wildlife species?

Indicator: The IPaC database, Nevada Natural Heritage Program database, habitat-based assessments, and records of occurrence will determine which of the federally listed species, Forest Service sensitive species, and other species of concern have the potential to occur within proposed treatment areas. A full assessment of the potential impacts listed above will be disclosed in the EA, BA, and/or aquatics BE. Determinations of effect and compliance with applicable laws and regulations will also be disclosed.

Direct and Indirect Effects

The Proposed Action has the potential to affect aquatic habitat and wildlife in serval ways including:

- Direct application,
- Drift,
- Mobilization in ephemeral streams and channels,
- Overland flow,
- Leaching, and
- Spills and leaks.

In addition to herbicides, the adjuvants and surfactants may pose a risk to aquatic wildlife. Table 18 and Sensitive Species (FSM 2670)

The pertinent specialists reviewed the Proposed Action and made the following determinations for sensitive species (Tables 20 and 21):

Table 20 in the Endangered Species Act section below details the species-specific analyses of direct and indirect effects. Additionally, the BA and BEs contain further information on species-specific effects analyses. The Proposed Action requires a 300-foot buffer for aerial application on all live water (e.g., perennial streams, flowing intermittent streams, lakes, ponds, springs, and wetlands) and during appropriate atmospheric conditions. Because of this, the potential for direct application, spills, leaks to water would be highly unlikely to occur and will not be analyzed.

Direct Application

The Proposed Action does not include the direct application of herbicides to live water. The Proposed Action requires a 300-foot buffer for aerial application on all live water (e.g., perennial streams, flowing intermittent streams, lakes, ponds, springs, and wetlands) and during appropriate atmospheric conditions, because of this buffer, the potential for direct application to water would be highly unlikely to occur and will not be analyzed. Label requirements would be followed, applications would only be performed by or under the direct supervision of licensed Nevada professional herbicide applicators, pilots are required to be certified applicators, all live water within proposed units (e.g., perennial and intermittent streams, perennial seeps, ponds, springs, and wetlands) will be identified prior to spraying using GPS systems and will be used in all aircraft to ensure that only areas marked for treatment are treated (Appendix A). Drift monitoring cards will be placed out to 300 feet from and perpendicular to perennial streams to monitor herbicide presence as required by Nevada Department of Environmental Protection (NDEP).

Drift

The primary factors influencing drift are wind direction, wind speed, presence of inversion, droplet size, and interception by vegetation. Drift from aerial applications is unlikely to enter surface water because of the following design elements : the 300-foot buffer widths on all live water; no aerial herbicide treatments when sustained wind speeds exceed ten miles per hour or in any wind conditions exceeding product label directions; no aerial herbicide treatments during inversions, below minimum relative humidity, or above maximum temperature, as stated on the label; and requirements to obtain a weather forecast for the area prior to initiating an application to ensure no precipitation or wind events are predicted to occur during or immediately after spraying (Appendix A). In the unlikely event that drift does occur into the 300-foot buffer, monitoring using drift cards within 300 feet of perennial streams or other waterbodies would detect the herbicide, allowing applicators to modify practices and prevent any additional impacts. The implementation plan at the project level will identify where and how drift cards are placed near waterbodies, drift card locations and mapped buffer locations will be digitized using GPS technology and will be provided to pilots to ensure that only marked areas are treated.

A number of studies have been conducted to monitor the amount of drift that has occurred during aerial applications through drift card and water quality monitoring. Gluns (1989), detected no concentrations of glyphosate in surface water draining a harvest unit in British Columbia that had been treated with an aerial application of 1.78 kg/ha of glyphosate, with 100-meter (approximately 300-foot) no-spray buffers on water courses. During aerial treatments of starthistle in a California grassland, clopyralid was undetectable in surface water following application of six ounces per acre of clopyralid with a 30-meter buffer on stream courses and a slight (approximately five mph) breeze toward the sampled aquatic sites (DiTomaso et al. 2004). These studies suggest that drift potential is minimal and that 300-foot buffers are adequate for protection of adjacent streams. In western Oregon, the effects of drift to water quality on 26 stream sites were examined for the aerial application of several herbicides including: glyphosate, triclopyr, clopyralid, using prescribed buffers (60-foot and 300-foot buffers, depending on stream type); post-spray results showed no detectable concentrations of herbicides at or above one part per billion (ppb). The buffers prescribed effectively protected water quality during aerial herbicide applications (Dent and Robben 2000). In agricultural applications, Riley et al. (1989) concluded that a 100-meter buffer zone “would ensure at least a ten-fold decrease” when compared to the edge of the treatment area, even when winds exceed the maximum recommended wind speed. Bird et al. (1996) showed herbicide deposition at 30 meters downwind of treatment to be five percent of the rate within the treatment area. This value was 0.5 percent at 150 meters downwind.

Droplet size is the variable with the largest effect on off-target drift, even more so than wind speed. The use of a coarse spray (volume median diameter of 500 μm) could result in a ten-fold decrease in off-target drift as compared to a fine spray (volume median diameter of less than 200 μm) (Bird et al. 1996).

The potential exists for herbicide drift to occur beyond the 300-foot buffer specified in the Proposed Action, however, the amount of herbicide reaching these areas is likely to be very low and the herbicide amounts are not likely to result in detectable concentrations of herbicide in surface water.

Mobilization in Ephemeral Streams and Channels

Aerial application of herbicide would not occur within 300 feet of any live water. However, aerial application could occur on ephemeral or intermittent stream channels that do not have flowing water at the time of treatment. In this situation, herbicide could potentially be mobilized during the first runoff event following application, depending on the persistence and other properties of the herbicide. Design elements requiring weather forecasting to ensure no precipitation events are occurring or are imminent (within 24 hours of application), would minimize this risk. This is further discussed in the Overland Flow section below.

Overland Flow

Overland flow is the most likely mechanism for herbicides to reach surface water under the Proposed Action. Overland flow occurs when the rate of precipitation or snowmelt exceeds the rate of infiltration. Within the project area, this occurs occasionally during spring runoff and high-intensity summer thunderstorms. Aerial herbicide applications are capable of covering large areas with a uniform cover of herbicide. Rainfall can mobilize herbicide applied to plants or soil, depending on the herbicide properties.

Herbicides such as clopyralid, which has high water solubilities and low sorption coefficients, have been shown to be mobilized by overland flow; while herbicides, such as glyphosate, with high sorption coefficients are unlikely to be mobilized by overland flow. Mobilization by overland flow is also dependent on the occurrence of rainfall, which varies spatially and temporally. Rates of herbicide uptake by plants, breakdown by soil microbes or ultraviolet light, and bonding with soil particles vary by herbicide. In most cases, the levels of remaining herbicide would be very small by the time the first runoff occurs after treatment because of design elements specifying that no herbicide application would occur if rain is forecast immediately after treatment, which decreases the potential for herbicide mobilization from runoff (Appendix A). However, herbicides with long persistence in soil have the potential to be mobilized by overland flow occurring weeks or even months after application. It is also important to note that herbicide concentrations in runoff would be diluted in most situations because of the limited amount of herbicide that would be applied to the ground, as compared to the area contributing to runoff.

Aerial herbicide applications following label requirements are not likely to impair surface waters (Dent and Robben 2000). In western Oregon, the effects of drift to water quality on 26 stream sites were examined for the aerial application of several herbicides including: glyphosate, triclopyr, clopyralid, using prescribed buffers (60-foot and 300-foot buffers, depending on stream type); herbicide concentrations were not detected in any of the 7 samples from 3 sites after the first runoff event following the aerial application (Dent and Robben 2000). McBroom et al. (2013) conducted herbicide runoff studies in paired watersheds in Texas after aerial application of herbicides finding that herbicides were only detected in streams during storm events, and the peak concentrations were short lived. In this study, approximately one to two percent of applied imazapyr were measured in the storm runoff and that the timing and magnitude of runoff is the largest factor influencing herbicide dispersal (McBroom et al. 2013).

The mobility of herbicide after aerial treatment will vary greatly with the herbicide being used, the location, and environmental factors. Delivery of herbicides to surface water via overland flow is dependent on a number of chemical and environmental factors. Prior to any aerial application of herbicide, an implementation plan will be created for specific treatment areas, where design elements will be laid out (Appendix A).

Leaching

Leaching of herbicides through the soil could potentially result in contamination of surface water or groundwater. Herbicides with a low sorption coefficient and a long half-life, such as chlorsulfuron and metsulfuron-methyl, have the greatest ability to leach through soils and reach groundwater or surface water. Once in the soil, the persistence of many herbicides can be relatively short, as they break down quickly. Herbicide persistence in soil depends on a number of factors including microbial decomposition, hydrolysis, photodegradation, and volatilization. A variety of organisms can contribute to decomposition, including bacteria, actinomycetes, and fungi. Herbicide decomposition occurs most quickly in conditions that favor these organisms, such as warm, moist, and nutrient-rich soils (Flinders et al. 2009). In the proposed project area, herbicide decomposition varies with soil composition, land type, aspect, and elevation. Arid slopes with thin soils would favor photodegradation over microbial decomposition. Riparian valley bottom soils would be more favorable to microbial decomposition.

Herbicides with low sorption coefficients and moderate leachability, such as 2,4-D amine, have a much lower potential for leaching through soils. Radosevich and Winterlin (1977) studied the persistence of 2,4-D amine and 2,4,5-T in soil after application and found that 50 percent of the recovered herbicide was found on the soil surface litter, only 0.1 to 0.2 percent of the recovered herbicide was found in the soil, no herbicide was found below five centimeters soil depth, and herbicide residues decreased rapidly within 30 days following treatment.

Spill or Leaks

The Proposed Action requires a 300-foot buffer for aerial application on all live water (e.g., perennial streams, flowing intermittent streams, lakes, ponds, springs, and wetlands) including for staging herbicide. Because of this, spills or leaks directly to water would be highly unlikely to occur and will not be analyzed. Label requirements would be followed, applications would only be performed by or under the direct supervision of licensed Nevada professional herbicide applicators, pilots are required to be certified applicators, all live water within proposed units (e.g., perennial and intermittent streams, perennial seeps, ponds, springs, and wetlands) will be identified prior to spraying and staging areas will be outside the 300-foot buffer.

Adjuvants and Surfactants

While limited research has been conducted on both adjuvants and surfactants, there may be an effect to the riparian and/or aquatic habitats adjacent to the project area. Despite the 300-foot buffer, effects to the aquatic ecosystem may be similar to that of herbicides in the water way.

Chronic and Acute Exposures

A fundamental difficulty in characterizing environmental exposures arises due to constantly changing contaminant concentrations in flowing water and an ever-increasing spatial scale as herbicides disperse downstream. Once a contaminant reaches moving water, contaminants begin to disperse and become more diluted with increasing time or distance from the contaminant source. Consequently, the highest

contaminant concentrations are likely to occur for brief periods of time in the immediate area surrounding the point of entry. As contaminants become dispersed over large areas such as a stream reach or an entire drainage, they become diluted by mixing with less contaminated water. As contaminants move downstream, they affect an ever-increasing area with ever-increasing durations, but the concentrations become substantially reduced from the initial concentrations where they first entered the stream.

Two types of exposure scenarios emerge from the effects of dispersal and dilution: acute exposures that affect a small area for a short duration, with relatively high concentrations (but still within or well below application concentration allowed on label direction); and chronic exposures that affect a large area for a long duration, with relatively low concentrations (well below application concentration). In addition, acute exposures may often involve only those chemicals sprayed at a single location and tend to occur only when chemicals are applied close to a stream or within connected pathways to a stream. Chronic exposures are more likely to contain a mixture of chemicals sprayed at a variety of locations anywhere in the watershed. Since acute exposures affect a small area and chronic exposures affect a large area, the majority of organisms exposed to herbicides will experience chronic exposures.

Exposure of Aquatic Life to Contaminants in Water

In spite of efforts to minimize water contamination from the Proposed Action, herbicides cannot be kept entirely out of the water as described above in the discussion of fate and transport of herbicides in the Soils and Water Quality section. Peak water concentrations of each herbicide have been estimated in the Forest Service risk assessments (SERA) with the primary mechanism being surface runoff. The central limit of the peak concentrations estimated in the SERA assessments (See BA and BEs) are used to evaluate the maximum severity of water contamination that might occur from the Proposed Action, but these concentrations are unrealistically high because: 1) The use of data from agricultural models generally provides an extreme upper estimate of water contamination in a forest setting, except where herbicides are applied to ditches that drain directly into streams; 2) herbicide concentrations estimated at the point where runoff first enters a stream may reach concentrations that approach the peak concentrations, but as spatial scale increases beyond the point of entry, mixing and dilution causes herbicide concentrations in the water column to converge on an average concentration reflective of the total amount of herbicide applied in the watershed and the size of the drainage area; and 3) the peak concentration levels do not take design elements into account.

For aerial application, herbicides could be applied in large upland application units resulting in both acute and long-term exposures. Delivery of herbicides from aerial application to surface water via overland flow is dependent on a number of chemical and environmental factors. Prior to any aerial application of herbicide, an implementation plan is created with all the applicable design elements.

Effects on Aquatic Macrophytes, Microphytes and Invertebrates

Herbicides present an indirect risk to fishes through the potential alteration of primary productivity (aquatic plant life) and invertebrate communities if incidental water contamination occurs from runoff or other transport mechanisms discussed previously. A reasonable amount of certainty exists that significant changes in the food web would not occur under the Proposed Action, based on several corroborating field studies that generally failed to detect changes in community attributes when herbicides such as those proposed are applied in similar settings (e.g., Mayack et al. 1981, Michael et al. 2006). None of the herbicides listed are known to have high hazard quotient (HQ) toxicity to macroinvertebrates (See BA and BEs).

Effects of Reduced Ground Cover

The reduction of terrestrial vegetation due to herbicide treatments in affected areas may exacerbate sedimentation into nearby streams. Sedimentation can have multifaceted adverse effects, including physical damage to aquatic habitats, alterations in habitat conditions, and disruptions in food availability.

The physical presence of sediment can smother streambed substrates, alter channel morphology, and disrupt critical spawning areas. Additionally, sedimentation alters habitat conditions by reducing water clarity and light penetration, hindering the growth of aquatic vegetation, and affecting the composition of macroinvertebrate communities (forage base). Furthermore, fine sediment particles entering the waterway may clog the gills of fish and macroinvertebrates, impairing their respiratory function and leading to suffocation of juveniles, adults, and eggs. Increased sedimentation may prompt various responses, including displacement, active avoidance of sediment-laden areas, or even abandonment of affected habitats within the project area.

Summary

Herbicide applications under the Proposed Action have the potential to affect concentrations of herbicide in surface water and groundwater, depending on a number of factors including the type of herbicide, the amount of herbicide applied, the size of the treatment area, proximity of the application to water, the characteristics of the water body, soil characteristics such as infiltration, environmental factors such as rainfall, runoff, and wind, and chemical properties of the herbicides as they interact with soil. The Proposed Action includes design elements (Appendix A) that minimize the likelihood of appreciable water contamination. For aquatic wildlife species, it is unlikely that there will be direct mortality from herbicides and only a temporary reduction in upland vegetation cover. There is a potential for localized and short-term sublethal effects at all life stages such as reduction in food base, decreased water quality, reduced growth and fecundity, delayed sexual maturity, reproductive failure, and avoidance/displacement from the stream reach.

Cumulative Effects

The cumulative actions considered in this analysis are described in Cumulative Actions section above. The following section lists those actions and summarizes their cumulative effects on the special status aquatic wildlife species addressed in this analysis.

Ongoing Ground-based NNIPS Treatment Program

This project has the potential to impact special status aquatic wildlife species through increased sedimentation and exposure to herbicides and sublethal effects to individuals within the project area due to reduction in food base, decreased water quality, reduced growth and fecundity, delayed sexual maturity, reproductive failure, and avoidance/displacement from within a stream reach. The scale of the ground-based NNIPS treatment program is very small so any effects would be extremely localized and short-term.

The ongoing ground-based NNIPS treatment program and the Proposed Action would yield very minor cumulative effects on the species addressed in this analysis. However, these cumulative effects would not threaten the continued existence of populations in the area.

Forest-wide Prescribed Fire Project

This project has the potential to impact special status aquatic wildlife species through increased sedimentation and ash, potentially lethal effects to individuals within thinning and prescribed fire treatment areas, and secondary effects due to habitat loss and alteration and subsequent changes in forage or prey species. The long-term effects of this project would be largely beneficial, as it would decrease the likelihood of largescale high-intensity wildfires and would restore a more natural fire regime.

Increased sedimentation and/or exposure to ash associated with treatments could cause individuals to leave the area, or increased sedimentation could suffocate individuals or eggs and/or the forage base for the species present. This disturbance could result in increased energy expenditure and/or cause spawning/reproductive failure, which could lead to individuals being in poorer condition during critical times and a reduction of the population.

Aquatic wildlife within prescribed fire treatment areas may experience lethal or sub-lethal impacts because of prescribed fire or fuel reduction treatments. Additionally, habitat loss and alteration and subsequent changes in forage or prey species may cause individuals to abandon treatment areas.

The Forest-wide prescribed fire project and the Proposed Action would yield minor cumulative effects on the species addressed in this analysis. However, these cumulative effects would not threaten the continued existence of populations in the area.

Deer Mountain Timber Stand Improvement and Hazardous Fuels Reduction Project

This project has the potential to impact special status aquatic wildlife species through increased sedimentation and ash, potentially lethal effects to individuals within thinning and prescribed fire treatment areas, and secondary effects due to habitat loss and alteration and subsequent changes in forage or prey species. The long-term effects of this project would be largely beneficial, as it would decrease the likelihood of largescale high-intensity wildfires and would restore a more natural fire regime.

Increased sedimentation and/or exposure to ash associated with treatments could cause individuals to leave the area, or increased sedimentation could suffocate individuals or eggs and/or the forage base for the species present. This disturbance could result in increased energy expenditure and/or cause spawning/reproductive failure, which could lead to individuals being in poorer condition during critical times and a reduction of the population.

Aquatic wildlife within proposed treatment areas may experience lethal or sub-lethal impacts because of prescribed fire or fuel reduction treatments. Additionally, habitat loss and alteration and subsequent changes in forage or prey species may cause individuals to abandon treatment areas.

This project and the Proposed Action would yield minor cumulative effects on the species addressed in this analysis. However, these cumulative effects would not threaten the continued existence of populations in the area.

East Humboldt and Ruby Mountains Fuels Reduction and Landscape Resilience Project

This project has the potential to impact special status aquatic wildlife species through increased sedimentation and ash, potentially lethal effects to individuals within thinning and prescribed fire treatment areas, and secondary effects due to habitat loss and alteration and subsequent changes in forage or prey species. The long-term effects of this project would be largely beneficial, as it would decrease theta likelihood of largescale high-intensity wildfires and would restore a more natural fire regime.

Increased sedimentation and/or exposure to ash associated with treatments could cause individuals to leave the area, or increased sedimentation could suffocate individuals or eggs and/or the forage base for the species present. This disturbance could result in increased energy expenditure and/or cause spawning/reproductive failure, which could lead to individuals being in poorer condition during critical times and a reduction of the population.

Aquatic wildlife within proposed treatment areas may experience lethal or sub-lethal impacts because of prescribed fire or fuel reduction treatments. Additionally, habitat loss and alteration and subsequent changes in forage or prey species may cause individuals to abandon treatment areas.

This project and the Proposed Action would yield minor cumulative effects on the species addressed in this analysis. However, these cumulative effects would not threaten the continued existence of populations in the area.

Terrestrial Wildlife

Issues and Indicators

Issue Statement TW1: How would the Proposed Action and alternative affect special status terrestrial wildlife species?

Indicators: The IPaC database, species status assessments, habitat-based assessments, and records of occurrence will determine which of the federally listed species, Forest Service sensitive species, migratory bird species, and other species of concern have the potential to occur within proposed treatment areas. A full assessment of the potential impacts listed above will be disclosed in the EA, BA, and/or wildlife BE. Determinations of effects and compliance with applicable laws and regulations will also be disclosed.

Direct and Indirect Effects

The Proposed Action has the potential to affect terrestrial wildlife through the following:

- Visual or noise disturbance of individuals associated with staging areas or aerial application methods and associated displacement.
- Secondary effects upon habitat.
- Toxicity from exposure to herbicides.

Table 18 and Sensitive Species (FSM 2670)

The pertinent specialists reviewed the Proposed Action and made the following determinations for sensitive species (Tables 20 and 21):

Table 20 in the Endangered Species Act section below details the species-specific analyses of direct and indirect effects. Additionally, the BA and BEs contain further information on species-specific effects analyses.

Disturbance or Displacement

Under the Proposed Action, staging areas and the use of aerial application methods may cause short-term disturbance and/or displacement to wildlife. The Proposed Action includes several design elements that limit disturbance to some wildlife species during treatments and locates staging areas in areas with previous disturbance. Increased noise and human presence at staging areas could result in temporary avoidance of the area by some wildlife species. Staging areas may generate noise sufficient to flush birds from a nest or interfere with feeding of nestlings if conducted in proximity to nests. Other wildlife such as bighorn sheep may avoid treatment areas while weed crews are in the area. However, because staging areas would be located in previously disturbed areas, these locations are already subject to visual and noise disturbance. Aerial application methods could cause visual and noise disturbance. Additionally, wind generated from certain aerial herbicide application techniques could impact insect species, moving them outside of their suitable habitat and into other areas. These effects are expected to be temporary and short duration.

Habitat Alteration

NNIPS treatment methods described in the Proposed Action can result in short term effects to habitat. Aerial application of herbicides would allow for a much larger landscape to be treated with herbicides than ground-based treatments. Therefore, it is likely that non-target native vegetation would be sprayed by herbicides. The use of herbicides without restoration and reseeding efforts can cause damage to both native plants and NNIPS and can be detrimental to wildlife by reducing native species and habitat quality (Baker et al. 2009, Crone et al. 2009, Skurski et al. 2013). Where NNIPS occur in large, dense patches, treatments can temporarily create bare ground by reducing plant cover (Baker et al. 2009). The removal of NNIPS can, in the short-term, decrease the amount of vegetative cover available to wildlife. While the vegetation is recovering, which could occur over a period of one to five years, the area would likely provide limited value to wildlife. However, removal of NNIPS generally can increase the diversity of native herbaceous and shrub species within treated areas, improving habitat quality over the long-term (Eddington 2006, Arathi and Hardin 2021). When used properly, the proposed herbicides can target NNIPS and leave native species largely unharmed (Clements et al. 2013).

Herbicide Toxicity

Terrestrial wildlife species could be exposed to increased levels of exposure to herbicides (direct spray, dermal, inhalation, oral/ingestion) under the Proposed Action. Aerial application of herbicides would allow for a much larger landscape to be treated with herbicides than ground-based treatments. Therefore, it is likely that special status wildlife species would be directly exposed to herbicides. According to the SERA Human Health and Ecological Risk Assessment reports, 12 of the 13 herbicides proposed for use under the Proposed Action are considered to have low toxicity to mammals and birds, including aminocyclopyrachlor, aminopyralid, chlorsulfuron, clopyralid, glyphosate, aquatic glyphosate, imazapic, imazapyr, indaziflam, metsulfuron-methyl ((SERA 2004a, 2004b, 2005a, 2006, 2007, 2011a, 2011c, 2012, 2016), Kestrel Tellevate (2020)), rimsulfuron (BLM 2014), and triclopyr butoxyethyl ester (SERA 2011b). Only 2,4-D amine is classified by the EPA as moderately toxic to mammals and birds.

Cumulative Effects

The cumulative actions considered in this analysis are described in Cumulative Actions section above. The following section lists those actions and summarizes their cumulative effects on the special status terrestrial wildlife species addressed in this analysis.

Ongoing Ground-based NNIPS Treatment Program

This project has the potential to impact special status terrestrial wildlife species through visual and noise disturbance, direct exposure to herbicides, and secondary effects due to habitat alteration and subsequent changes in forage or prey species.

Disturbance associated with treatments could cause adults to leave young or nests in the treatment area, leaving them at a greater risk of predation. Disturbance could result in increased energy expenditure caused by displacement, which could lead to individuals being in poorer condition during critical times such as the breeding season or winter. This disturbance and subsequent displacement could cause terrestrial wildlife species to be at a higher risk of predation as they leave their known habitat.

Direct exposure to herbicides is possible in this project, but the levels to which wildlife would be exposed are much lower than the levels which cause toxic effects to wildlife. The associated EA (USFS 2001b) states that the herbicides used in this project are quickly excreted and do not accumulate in body tissues or organs, and that the direct and indirect impacts to wildlife from herbicide applications are negligible. Mechanical treatment methods may result in injury to wildlife that cannot move from the site. However, these impacts are expected to be rare and mechanical treatments only account for 0.4 acre of the project area. While this project may result in some habitat loss and alteration, the project is expected to ultimately increase available habitat for terrestrial wildlife species.

Based on these considerations and the relatively small scale of this project, this project and the Proposed Action would yield minor cumulative effects on the species addressed in this analysis. However, these cumulative effects would not threaten the continued existence of populations in the area.

Forest-wide Prescribed Fire Project

This project has the potential to impact special status terrestrial wildlife species through visual and noise disturbance, potentially lethal effects to individuals within prescribed fire treatment areas, and secondary effects due to habitat loss and alteration and subsequent changes in forage or prey species. However, design elements would protect many species during critical periods such as breeding and nesting.

Disturbance associated with treatments could cause adults to leave young or nests in the treatment area, leaving them at a greater risk of predation. Disturbance could result in increased energy expenditure caused by displacement, which could lead to individuals being in poorer condition during critical times such as the breeding season or winter. This disturbance and subsequent displacement could cause terrestrial wildlife species to be at a higher risk of predation as they leave their known habitat.

Wildlife within prescribed fire treatment areas may experience lethal or sub-lethal impacts as a result of prescribed fire. Additionally, habitat loss and alteration and subsequent changes in forage or prey species may cause individuals to abandon treatment areas. However, design elements limit the size of the treatment areas within certain species habitat, such as bighorn sheep and Sierra Nevada red fox. Migratory bird nests would receive a no-treatment buffer, as would California spotted owl, bald eagle, greater sage-grouse, butterflies, and other species. The long-term effects of this project would be largely beneficial, as it would decrease the likelihood of largescale high-intensity wildfires and would restore a more natural fire regime.

Based on these considerations, this project and the Proposed Action would yield minor cumulative effects on the species addressed in this analysis. However, these cumulative effects would not threaten the continued existence of populations in the area.

Deer Mountain Timber Stand Improvement and Hazardous Fuels Reduction Project

This project has the potential to impact special status terrestrial wildlife species through visual and noise disturbance, potentially lethal effects to individuals within thinning and prescribed fire treatment areas, and secondary effects due to habitat loss and alteration and subsequent changes in forage or prey species. The long-term effects of this project would be largely beneficial, as it would decrease the likelihood of large scale high-intensity wildfires and would restore a more natural fire regime. Additionally, snag retention will occur to support wildlife habitat.

Disturbance associated with treatments could cause adults to leave young or nests in the treatment area, leaving them at a greater risk of predation. Disturbance could result in increased energy expenditure caused by displacement, which could lead to individuals being in poorer condition during critical times such as the breeding season or winter. This disturbance and subsequent displacement could cause terrestrial wildlife species to be at a higher risk of predation as they leave their known habitat.

Wildlife within prescribed fire treatment areas may experience lethal or sub-lethal impacts as a result of prescribed fire or fuel reduction treatments. Additionally, habitat loss and alteration and subsequent changes in forage or prey species may cause individuals to abandon treatment areas.

This project would yield minor cumulative effects on the species addressed in this analysis. However, these cumulative effects would not threaten the continued existence of populations in the area.

East Humboldt and Ruby Mountains Fuels Reduction and Landscape Resilience Project

This project has the potential to impact special status terrestrial wildlife species through visual and noise disturbance, potentially lethal effects to individuals within thinning and prescribed fire treatment areas, and secondary effects due to habitat loss and alteration and subsequent changes in forage or prey species. The project is designed to mitigate wildfire risk to communities and resources while increasing ecosystem resilience-resistance and improving wildlife habitat across the landscape. This project intends to reduce the risk of catastrophic fire and improve vegetation community resilience and resistance.

Disturbance associated with treatments could cause adults to leave young or nests in the treatment area, leaving them at a greater risk of predation. Disturbance could result in increased energy expenditure caused by displacement, which could lead to individuals being in poorer condition during critical times such as the breeding season or winter. This disturbance and subsequent displacement could cause terrestrial wildlife species to be at a higher risk of predation as they leave their known habitat.

Wildlife within prescribed fire treatment areas may experience lethal or sub-lethal impacts as a result of prescribed fire or fuel reduction treatments. Additionally, habitat loss and alteration and subsequent changes in forage or prey species may cause individuals to abandon treatment areas.

This project and the Proposed Action would yield minor cumulative effects on the species addressed in this analysis. However, these cumulative effects would not threaten the continued existence of populations in the area.

Cultural Resources

Issues and Indicators

Issue Statement CR1: How would disturbance from aerial herbicide application affect cultural resources?

Indicator: Number of known cultural resources with potential to be impacted by the project.

Direct and Indirect Effects

Overview

The National Park Service (NPS) (2022) defines cultural resources as "aspects of a cultural system that are valued by, or significantly representative of, a culture or that contain significant information about a culture. A cultural resource may be a tangible entity or a cultural practice. Tangible cultural resources are categorized as districts, sites, buildings, structures, and objects for the National Register of Historic Places and as archeological resources, cultural landscapes, structures, museum objects, and ethnographic resources for [federal] management purposes."

For the purposes of analysis under NEPA, cultural resources encompass *historic properties* as defined in the NHPA, *archaeological resources* as defined in the Archaeological Resources Protection Act (ARPA), and *cultural items* as defined in the Native American Graves Protection and Repatriation Act (NAGPRA). *Historic properties* defined by the NHPA are "any prehistoric or historic district, site, building, structure, or object included in, or eligible for, the [NRHP]" (36 CFR 800.16(l)(1)). Historic properties may include cultural resources of traditional religious and cultural importance to Native American Tribes (hereafter Tribes). NEPA requires an overarching consideration of the human environment to address these cultural, historic, and archaeological resources, properties, and items (collectively referred to as "cultural resources" herein).

Because the proposed project would be federally funded and located on public land managed by the HTNF, the project constitutes a federal undertaking pursuant to Section 106 of the NHPA and its implementing regulations, as amended (36 CFR 800). Pursuant to NEPA and Section 106

compliance, as the lead agency for the project, the HTNF is required to consider effects on cultural resources from the undertaking. The HTNF will utilize the National Phasing Programmatic Agreement (Phasing NPA) to comply with Section 106 of the NHPA. The HTNF will develop a Heritage Implementation Plan (HIP) under the Phasing NPA in consultation with Tribes, the State Historic Preservation Office (SHPO), and other consulting parties that will define how the Forest Service will consider effects to historic properties during implementation of the project. Compliance efforts conducted in the future will follow stipulations of the HIP. Per project design elements (Appendix A), the HTNF will require a coordination period to begin at least six months prior to finalization of treatment plans to ensure compliance with Section 106 and the Phasing NPA stipulations.

Analytical Framework

The analysis area for the cultural resource issues is the area of potential effects (APE) for direct, indirect, and cumulative effects on cultural resources, as defined by the HTNF (pursuant to 36 CFR 800.16(d)). The APE includes NFS lands in Nevada except for designated Wilderness and Wilderness Study Areas and RNAs. Direct and indirect effects on cultural resources could include disturbance from project activities, such as ground-based support equipment, application of herbicide and adjuvants to sensitive rock art sites, rotor wash from low-level helicopter flights, and visual or auditory changes to the setting of historic properties during application. Cultural resources susceptible to visual and auditory effects include those historic properties, where, under Section 106 review, integrity of setting, feeling, or association contributes to the resource's NRHP eligibility. Impacts on the viewshed of such resources could be adverse if the Proposed Action included a permanent impact. Due to the project's nature, audible noise from aerial vehicles during herbicide application would be temporary and transient, lasting only during implementation of individual treatments. Rotor wash from low-level helicopter flights has the potential to introduce dust into the atmosphere, potentially resulting in visual impacts to historic properties. These impacts would also be temporary, and transient in nature, lasting only during implementation of individual treatments. Additionally, Design Elements included in the Proposed Action require early coordination with a Forest Service archaeologist, where avoidance and minimization measures can be developed where temporary and transient audible and visual effects may still result in an adverse effect to cultural resources. Based on these factors, audible and visual effects to cultural resources are not analyzed in further detail. Rotor-wash also has the potential to physically affect a resource through displacement of artifacts and features; the physical effects from rotor-wash are analyzed in more detail below. If not avoided, the impact duration for effects to cultural resources is long-term because cultural resources are non-renewable resources. Physical effects, such as destruction or displacement of artifacts or features, would be permanent.

The analysis area for this issue is the APE, where project activities could directly or indirectly alter or destroy cultural resources in part or in whole. Data sources evaluated for impacts to cultural resources include the HTNF database for archaeological and architectural resources and inventories.

Native American Resources

Native American Resources, for the purposes of this EA, refers to cultural resources or artifacts created by Native American Tribes or cultures, places, and landscape features of significance to Tribes, and to natural resources (such as plants, animals, and minerals, or geographic features such as mountain ranges, buttes, springs, or caves) that are spiritually or culturally significant to Tribes, including resources for which Tribes have treaty-protected rights. Culturally significant resources may include traditional cultural properties (TCP) as defined in National Register Bulletin 38 (NPS 1998). Due to the sensitive nature of such places, they often remain undocumented for confidentiality reasons. As a result, all TCPs known by Tribes in the area may not be identified in this assessment.

The HTNF acknowledges all resource concerns expressed by the Tribes and will consider each concern as appropriate under NHPA Sections 106, and 110, American Indian Religious Freedom Act (AIRFA), EO 13007, NAGPRA, ARPA, NEPA, and other applicable requirements.

Native American resource concerns for the project, based on Tribal consultation to date, include the potential for impacts to native vegetation and cultural resources. However, more specific resource concerns related to individual treatment plans will be addressed during the coordination period as required by the project design elements.

Tribal Treaty Rights can include a variety of subjects, including rights reserved by Tribes in relation to natural resources (i.e., the right to hunt, fish, and gather on land ceded by or land retained by Tribes (ACHP 2021) (see also 36 CFR 800.2(c)(2)(ii)(B)). EO 13175 directs departments to uphold special trust responsibilities and consult with sovereign Tribal governments. JSO 3403 (Fulfilling the Trust Responsibility to Indian Tribes in the Stewardship of Federal Lands and Waters) ensures that the U.S. Department of Agriculture (USDA) and the Department of Interior (DOI) and their component bureaus are managing federal lands and waters in a manner that seeks to protect the treaty, religious, subsistence, and cultural interests of federally recognized Indian Tribes (DOI 2021). The Proposed Action is consistent with and not in violation of any active treaties (including the Treaty of Ruby Valley 1863, Treaty of Guadalupe 1848, and the Treaty with the Shoshone-Goship 1863) due to project design elements, consultation requirements in the project implementation plan, and analysis of impacts to traditionally harvested resources (i.e., plants and animals). Based on these factors, potential impacts to Tribal Treaty Rights are not analyzed further.

Existing Condition

The HTNF lands in Nevada have an extended history of human use beginning shortly after the most recent glacial retreat during the late Pleistocene to early Holocene; roughly 13,000 to 10,000 years before present. Archaeological and historic sources suggest a rich history of extended use of the area by ancestral Native Americans and Euro-American mineral prospectors, loggers, homesteaders, and land managers.

A comprehensive synthesis of the culture history of the HTNF is contained in the HTNF Bridgeport Ranger District Heritage Overview (Hamilton and Dale 2011), the Historic Context and Research Design for the BLM Carson City District Office (Orvald and Young 2014), the Heritage Overview of HTNF Austin and Tonopah Ranger Districts (Scoggan 2009), the Historic Context of the HTNF Ely District (Branigan and Whiting 2007), the HTNF Jarbidge Ranger District Heritage Overview (Kumiega 2005), the Mountain City Ranger District Heritage Overview (Kumiega 2007), the In-The-Black Archaeological Studies, Volume 5: Santa Rosa District, Historical Studies (Northwest Archaeological Associates, Inc. 2004), the Santa Rosa Range Management Project Report (Kuehn 2021), the Class III Heritage Resource Inventory for the Ruby Lake Estates Hazardous Fuels Project (Ramirez 2020), The following affected environment, except where otherwise cited, is summarized from these sources; and the discussion is organized by ranger district.

Across the HTNF ranger districts, Paleoindian Period (>10,500 to 7,000 BP) assemblages are marked by the presence of leaf-shaped, lanceolate, fluted, and stemmed projectile point types (including Clovis and Great Basin Stemmed Point types). The Period is also characterized by assemblages indicating high residential mobility and a broad range of adaptive strategies. The Early Archaic Period (7,000 to 3,500 BP) sites are identified by Northern Side-Notch, Humboldt series, Gatecliff series, and Pinto projectile point types. Site types from this period often include hunting features such as rock walls, rings, and cairns. Previous research within the Bridgeport Ranger District indicates a shift to higher elevation task-specific sites during the Early Archaic, mostly related to specialized hunting in the area. Middle Archaic (3,500 to 1,500 BP) Period assemblages indicate an increase in cultural diversity, including such things as textiles, baskets, bone and horn tools, incised stones, and stone sculptures. There was also a steadier increase in residential bases, more diverse subsistence patterns, increased population density, and a shift towards resource procurement in higher elevations. Middle Archaic Period sites are also identified by Humboldt series, Elko series, and Rosegate projectile point types. By the Late Archaic Period (1,500 BP to Contact) the movement of the ethnographic Western Shoshone and Southern Paiute people into the Great Basin (also known as the “Numic Expansion”) appears in the archaeological record by presence of Desert Side-notched and Cottonwood Triangular projectile point types, brownware pottery, increased plant processing technology, and a decrease in quantity of, and a change in style to, Great Basin rock art.

The lands now considered part of the HTNF in Nevada were traditionally the territories of the *Newe*, or Western Shoshone people, the Northern Paiute, the Southern Paiute, the Washo, and the Me-Wuk people. These peoples were some of the last to come into continued contact with Anglo-European cultures after the completion of the Transcontinental Railroad in 1869 secured the settlement of northeastern Nevada and much of the Great Basin. By that time, traditional resources were already depleted due to the overexploitation of fur trappers who entered the region around 1821. The traditional lifeways of Native Americans were severely disrupted and ultimately controlled by outside forces, leading to increased hostilities between settlers and Native American groups during the late 1800s.

Modern mining began in Nevada in 1849 after placer gold was discovered by Mormon 49ers near the Carson River. That discovery eventually led others into the Virgina Range where croppings of the Comstock Lode were found in 1859. However, other mining activities occurred centuries before the Comstock discovery. Oral histories regarding the discovery of some mining districts, including the Robinson and White Pine Mining Districts, describe prospectors being led to the sites by Native guides, indicating the Native population previously located those resources (Tingley et al. 1993). Historically significant mining districts were established across the HTNF.

To support the mining boom, transportation of lumber and charcoal, and in response to the Civil War, railroads became abundant across the Great Basin. The Central Pacific Railroad was completed in May of 1869, and as the first transcontinental railroad to pass through Nevada, it was a major catalyst for economic development in the region. The line runs through northern Nevada near the Ruby Mountains Ranger District and south of the Santa Rosa, Mountain City, and Jarbidge ranger districts. Secondary lines and stagecoach roads connected the main line of the Central Pacific Railroad to the various mining communities. The Nevada Central Railroad was established in 1880 and ran through portions of the Austin and Tonopah ranger districts. The advent of the transcontinental railroad also brought advantages to the ranching and agricultural communities across Nevada. The first agricultural community was founded in Carson Valley by Mormon John Reese in the 1850s. For the next two decades, ranching and farming were mostly associated with the expansion of mining towns in the western portion of the Great Basin. The transcontinental railroad, by allowing ranges to be stocked by rail rather than trail and increasing access to the free and open ranges of Nevada, allowed for the rapid expansion of the ranching and farming industries.

By the early 1900s, or the Progressive Era, the federal government established National Forest Reserves in Nevada to address the management of water and range resources. Local land-owning ranchers petitioned the government to establish those reserves to protect watersheds and prevent overgrazing by roving bands of stock, specifically sheep. As a result, several reserves were established across Nevada, including the Ruby Mountain Forest Reserve (which later became part of the Humboldt National Forest); the Toiyabe Forest Reserve; and the Toquima and Monitor Forest Reserves. In 1908, the Toiyabe, Toquima, and Monitor Forest reserves were consolidated into the Toiyabe National Forest. Over the years, the splitting and consolidation of forest reserves has resulted in the HTNF. Similarly, ranger districts have also been split and consolidated over the years, and the history of these changes (and the establishment of the forest itself) is represented by the presence of historic administrative sites and ranger stations across the HTNF.

Approximately 17 percent of the APE has received previous cultural inventory, and 9,550 cultural resources have been recorded, encompassing a wide range of site types. Precontact resources include permanent and semi-permanent habitations, limited activity areas such as lithic scatters, lithic and tool scatters, campsites, and rock features consisting of cairns, stone circles, alignments, hunting blinds, rockshelters (e.g., Gatecliff Shelter, Triple T Shelter, and Pie Creek Rock Shelter), or areas used for gathering and processing specific resources. Historic resources include artifact scatters/dumps, farmsteads, homesteads, logging camps, mining camps, and mining related infrastructure (i.e., railroads, roads) homestead locations, early Forest Service administrative buildings, bridges, and linear features (i.e., transmission lines, ditches, canal/segments, and irrigation related features). Multicomponent resources include a combination of the site types mentioned above.

According to the HTNF Cultural Resource Records Database, of the 9,550 resources previously recorded within the APE, 614 are NRHP-eligible; 16 are listed in the NRHP; 7,787 remain unevaluated for the NRHP; and 1,119 have either been recommended or determined not eligible for listing in the NRHP. Fifteen previously recorded resources did not include discussions of eligibility, and for the sake of this analysis, are henceforth considered unevaluated, bringing the total of unevaluated resources to 7,802. Although no designated TCPs have been previously recorded within the APE, data sources indicate that known resources could have potential traditional cultural significance to Native Americans.

The cultural resource records also indicate that of the 16 NRHP-listed sites, two are pre-contact sites, 12 are historic, and two were either listed as “unknown” or the information was unavailable. Of the 614 NRHP-eligible resources, 320 are pre-contact sites, 246 are historic, and 48 were either listed as “unknown” or the information was not available. Of the 7,802 unevaluated resources, 4,734 are pre-contact sites, 2,198 are historic, and 870 were either listed as “unknown” or the information was unavailable. Finally, of the 1,119 resources either recommended or determined ineligible, 519 are precontact sites, 483 are historic, and 117 were either listed as “unknown” or the information wasn’t available. Table 13 summarizes the results of the file search.

Table 13. Results of File Record Search of the HTNF Cultural Resources Database.

	Pre-Contact	Historic	Unknown/Not Available**
Eligible	320	246	48
Not Eligible	519	483	117
Unevaluated/Undetermined	4,734	2,197	856
Listed	2	12	2
Unknown/Not Available**	0	1	14

Existing and Future Trends and Actions

Existing and future trends and actions have likely impacted or may continue to impact cultural resources within the APE. Existing actions by the Forest Service considered in this analysis include any reasonably foreseeable actions where ground-based herbicide applications may occur and where other projects may have temporally or spatially overlapping impacts to cultural resources. These actions include: the Ongoing Ground-based NNIPS Treatment Program, Forest-wide Prescribed Fire Project, Deer Mountain Timber Stand Improvement and Hazardous Fuels Reduction Project, Ruby Mountains Resilience Project, and the East Humboldt and Ruby Mountains Fuels Reduction and Landscape Resilience Project. See the Cumulative Actions section above for more information on existing actions.

Any existing or future trends and actions on federal lands, under federal funding or permitting, would be subject to cultural resource identification and assessment of effects in compliance with ARPA and NHPA Section 106. Where federal permitting or law does not apply, such as state or private lands, cultural resource inventories might not occur, and impacts may go unmitigated.

Effects Analysis

Under the Action Alternative, project activities such as the use of ground-based support equipment, application of herbicide and adjuvants, and rotor-wash from low-level helicopter flights could directly affect cultural resources. Resources that could be impacted by those project activities include cultural resources listed in the NRHP, those eligible to be listed, and those left unevaluated. As such, 8,432 previously recorded resources across HTNF lands in Nevada could be affected by the Proposed Action. Project Design Elements (mentioned in detail below) would avoid or minimize some effects such as the requirement for ground-based support equipment to be staged outside of listed, eligible, or unevaluated site boundaries; and the utilization of less-impactful application methods to avoid or minimize effects from the application of herbicide and adjuvants.

Direct effects determined to be adverse under NEPA and NHPA would necessitate avoidance, minimization, or mitigation. Pursuant to 36 CFR 800.8(c), the HTNF will scope and time future cultural resource surveys with the implementation of treatment activities within the APE. At such time, the HTNF will address the need for further identification of cultural resources, ensure consideration of effects on historic properties within the APE, and direct the avoidance, minimization, and mitigation measures to resolve any potential adverse effects. Design Elements supporting the avoidance and minimization of effects to cultural resources include:

- Staging of associated ground-support equipment [for aerial application] will be located outside of known historic property boundaries (including unevaluated resources) and will not cause new disturbance or be located outside of previously disturbed areas (i.e., existing roads and pull-outs, developed sites).

- Coordination with the appropriate Forest Service archaeologist prior to aerial application to allow for Section 106 consultation and inventory. Coordination should begin at least six months prior to finalizing treatment plans.
- Utilization of less-impactful application methods where sensitive cultural resources are located. As part of the early coordination efforts, the appropriate Forest Service archaeologist will determine whether an alternative application method is more appropriate for the project.

When implemented, these design elements can avoid or minimize direct effects to cultural resources within the APE. Other measures for avoidance, minimization, and mitigation for resolving adverse effects will be addressed prior to implementation of individual treatment projects, as described in the decision record.

Cumulative Effects

As noted above, future and existing trends and actions have occurred or would occur in the APE; therefore, cumulative effects to cultural resources could result from the project when added to those actions. Potential effects from the Proposed Action would be additive to the effects of those future actions where they occur on the same cultural resources. The cumulative actions considered in this analysis include any reasonably foreseeable actions where ground-based herbicide applications may occur and where other projects may have temporally and spatially overlapping impacts on cultural resources. Three additional Forest Service projects fall into this category: the Forest-wide Prescribed Fire Project, Deer Mountain Timber Stand Improvement and Hazardous Fuels Reduction Project, and East Humboldt and Ruby Mountains Fuels Reduction and Landscape Resilience Project. These cumulative actions, particularly the ground-based application of herbicide, the use of prescribed fire, and fuel reduction activities such as hand-thinning, use of mechanical tools, and prescriptive grazing, encompass areas across HTNF lands in Nevada and could result in cumulative effects to cultural resources.

As described in the Direct and Indirect Effects section above, 8,432 previously recorded NRHP-listed, NRHP-eligible, and unevaluated cultural resources are within the APE and subject to direct effects if not avoided by the project. As such, those 8,432 resources could be subject to cumulative effects when the Proposed Action occurs to the same resources.

Public Health and Safety

Issues and Indicators

Issue Statement PHS1: Would the Proposed Action or alternative have the potential to affect human health through the aerial application of herbicides?

Indicators: The toxicity potential of herbicides being used on herbicide application workers, the sensitive populations, and general public. The adequacy of design elements to protect human health.

Direct and Indirect Effects

For the purpose of this Public Health and Safety analysis, design elements are defined as safety, human health, and environmental protection standards that were developed and/or specified to minimize or eliminate exposures of concern to workers and the public. Design elements include the design elements and implementation plan that are part of the Proposed Action, as well as the adherence to herbicide labels and stringent safety measures and the use of personal protective equipment (PPE). The Effects Summary section below further describes specific design elements for the project.

Risk Assessments

Exposure scenarios are developed for workers and members of the general public. For each group, two types of exposure scenarios are generally taken into consideration: general exposure and accidental/incidental exposure. These exposure scenarios are part of the risk assessments, which are specific to an individual herbicide and are primarily produced by Syracuse Environmental Research Associates (SERA) through contracting with the Forest Service (SERA 2014). The SERA risk assessments evaluate human health and ecological effects of herbicides using EPA studies and other peer-reviewed articles from the open scientific literature.

Effects Analysis

Safety standards for herbicide use are set by the EPA, Occupational Health and Safety Administration (OSHA), Code of Federal Regulations (40 CFR, Part 170), and individual states.

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). established the U.S. system of pesticide regulation to protect applicators, consumers, and the environment. The Forest Service is authorized by FIFRA and by the Cooperative Forestry Assistance Act to use pesticides for multiple-use resource management and maintenance of the quality of the environment, as long as the actions comply with the NEPA and the Council on Environmental Quality (CEQ) regulations. In addition, several sections of the Forest Service Manual (FSM) and Forest Service Handbook (FSH) (FSM 2150; FSM 2150, R4 supplement; FSH 2109.14; FSM 6709.11) provide guidance to the safe handling and application of herbicides.

Toxicity tests required by the EPA for pesticide registration include acute (short-term) and chronic (longer term) exposures. Herbicides are subjected to long-term animal studies that test for effects and compliance with federal safety standards for human health. Acute toxicity is a function of the amount of toxicant received, the route of administration, and/or the type of animal tested. Acute reactions tested include oral, dermal, and inhalation toxicity, along with eye and dermal (skin) irritation.

The study data for each herbicide are used to make inferences relative to human health. Table 14 displays the categories under human hazards based on acute toxicity for the herbicides proposed for use in aerial applications. Data supporting these classifications are in the respective SERA reports (SERA 2004a, 2004b, 2004c, 2004d, 2006, 2007, 2011a, 2011b, 2011c, 2012, 2016) and the following additional sources: NPIC (2002), Gervais et al. (2008), Henderson et al. (2010), EPA (2010), and Kestrel Tellevate (2020).

Table 15 summarizes human hazards based on chronic toxicity for the herbicides proposed for aerial application. Chronic toxicity results from repeated exposures or prolonged or continuous exposure to a chemical, typically at levels lower than those causing acute toxicity. Chronic toxicity often demonstrates a delayed response. Public concerns toward herbicides generally focus on potential chronic toxicity. Sublethal poisoning or exposure may be expressed by any of the following: skin/eye irritations; nervous system disorders; reproduction system disorders; damage to other organ systems (e.g., liver, kidney, and lungs); birth defects; mutations; and cancer. During the herbicide registration process, the EPA evaluates carcinogenicity, teratology (birth defects), endocrine-system disruption, and mutagenicity studies of herbicide effects to animals.

All herbicide applicators must follow the label directions for application rate and usage. The herbicide label is the primary communication for safe handling and use of the product. The label reflects the numerous scientific studies and regulatory reviews generated by the EPA registration process, which provides reasonable assurance that the potential benefits of use outweigh any potential risks. Thus, when used according to label directions, the herbicide will not cause unreasonably adverse effects on humans, fish, and wildlife, or on the environment. The law requires herbicide users to read and follow label specifications. FIFRA, as currently amended, allows use of an herbicide at rates up to those approved on the label.

In addition to following label directions, the Forest Service requires an additional level of risk assessment. The inherent hazard (toxicity) of the herbicide, an estimate of exposure, and the response of the individual organism under consideration to that exposure (dose-response) are modeled to generate an estimate of risk (HQ) for each scenario. The herbicides in this analysis are evaluated based on the HQ, which is the ratio between the estimated dose (the amount of herbicide received from a particular exposure scenario) and the RfD. When a predicted dose is less than the RfD, and the HQ (estimated dose per RfD) is less than 1.0, which is below the LOC, then significant toxic effects are unlikely for that specific herbicide application. Table 16 displays where HQs were exceeded.

Table 14. Human Hazards Based on Acute Toxicity Categories.

Herbicide	Acute Oral Toxicity	Acute Dermal Toxicity	Acute Inhalation Toxicity	Primary Eye Irritation	Primary Skin Irritation
2,4-D amine	Moderate	Moderate	Low	High	Very Low
Aminocyclopyrachlor	Very Low	Very Low	Very Low	Low	Very Low
Aminopyralid	Very Low	Very Low	Very Low	Very Low	Very Low
Chlorsulfuron	Very Low	Low	Low	Low	Very Low
Clopyralid	Low[a]	Low	Low	Moderate	Very Low
Glyphosate	Low	Low	Low	Low	Very Low
Imazapic	Very Low	Very Low	Low	Low	Very Low
Imazapyr	Very Low	Very Low	Low	Low	Very Low
Indaziflam	Low	Low	Low	Low	Low
Metsulfuron-methyl	Very Low	Low	Moderate	Low	Low
Rimsulfuron	Low	Low	Low	Low	Low
Triclopyr: butoxyethyl ester (BEE)	Low	Low	Low	High	Low

[a] Low for technical grade, which is not used by the Forest Service; very low for formulation used by the Forest Service.
[b] Moderate for technical grade; very low for formulation used by the Forest Service.

Table 15. Human Hazards Based on Chronic Toxicity Categories.

Herbicide	Carcinogen	Teratogen	Reproductive	Mutagen	Endocrine Disruptor
2,4-D amine	Not Classifiable	Unlikely	Unlikely	Unlikely	Little or no impact
Aminocyclopyrachlor	Not Likely to Be Carcinogenic	No Evidence	No Evidence	No Effects	No Evidence
Aminopyralid	Not Likely to Be Carcinogenic	No Effects	No Effects	No Effects	No Evidence
Chlorsulfuron	Evidence of Noncarcinogenicity	No Effects	No Evidence	No Effects	No Evidence
Clopyralid	Evidence of Noncarcinogenicity	No Effects	No Effects	No Effects	No Evidence
Glyphosate	Not Likely to Be Carcinogenic	Unlikely	Unlikely	No Effects	Unlikely
Imazapic	Evidence of Noncarcinogenenicity	No Effects	No Effects	No Effects	Unknown

Herbicide	Carcinogen	Teratogen	Reproductive	Mutagen	Endocrine Disruptor
Imazapyr	Evidence of Noncarcinogenicity	No Effects	No Effects	No Effects	No Evidence
Indaziflam	Not Likely to Be Carcinogenic	No Evidence	Unlikely	No Effects	Unknown
Metsulfuron-methyl	Not Likely to Be Carcinogenic	No Effects	No Effects	No Effects	No Evidence
Rimsulfuron	Not likely to be carcinogenic	No Effects	No Effects	No Effects	No Effects
Triclopyr: bytoxyethyl ester (BEE)	Not Classifiable	No Effects	No Effects	No Effects	No Evidence

Note: Not Classifiable = Inadequate evidence of carcinogenicity or for which no data are available; Unlikely = Inconsistent or isolated effects have been shown in laboratory tests; not considered a hazard to humans at expected exposure levels; Unknown = Laboratory tests are inconclusive or further testing is required; No Effects = No effects have been shown in laboratory tests; not considered a hazard to humans.

Table 16. Scenarios in Which Hazard Quotients (HQs) were Exceeded.

Herbicide	Workers		Public	
	Acute	Chronic	Acute	Chronic
2,4-D amine	Yes	Yes	Yes	Yes
Aminocyclopyrachlor	No	No	No	No
Aminopyralid	No	No	No	No
Chlorsulfuron	No	Yes	Yes	No
Clopyralid	No	No	Yes	No
Glyphosate	No	No	Yes	No
Imazapic	No	No	Yes	No
Imazapyr	No	No	No	No
Indaziflam	No	Yes	No	Yes
Metsulfuron-methyl	No	No	No	No
Rimsulfuron	No	No	No	No
Triclopyr: butoxyethyl ester (BEE)	Yes	Yes	Yes	Yes

For the four herbicides (e.g., 2,4-D amine, chlorsulfuron, indaziflam, and triclopyr) that produced worker exposure HQs exceeding the LOC value of 1.0, such results only occurred when the typical application rates were exceeded. Additionally, chronic worker exposure is defined as exposure to the same herbicide over 90 continuous days. Such a scenario is improbable for the potential aerial application work conducted under the Proposed Action.

Potential techniques for minimizing human exposures to herbicides include selecting herbicides with low toxicity and using them at the lowest effective application rate to achieve the project's objective; using application methods that minimize off-target movement and nontarget exposures; using buffer areas around hydrological features such as streams; providing herbicide applicators with appropriate PPE; and posting signs at treatment areas to inform the public. Under the Proposed Action, aerial herbicide applications would be accomplished according to strict safety and health standards as required by EPA pesticide regulations, which are rendered on herbicide labels through the instructions for appropriate use. Herbicide labels are laws and, thus, must be followed. Additionally, all herbicide applicators working under the Proposed Action would be required to be Certified

Herbicide Applicators in the State of Nevada and must also follow the herbicide use regulations of the state.

The exposure scenario results summarized in Table 16 are further explained for each herbicide in the Public Health and Safety Report, which is part of the NEPA documentation for this project.

Effects Summary

Risks of herbicide use depend on the toxicity of the herbicide, the level of exposure to that herbicide, duration of exposure, and sensitivity to exposure. The aerial application of herbicides has the potential to affect human health when:

- Application workers come into contact with herbicides being used;
- Forest users are unintentionally exposed to herbicides during aerial application, come into contact with recently sprayed vegetation, or gather and consume forest products that have been recently treated with herbicide;
- Sprays, dusts, and/or vapors are carried by the wind and deposited on unintended areas, particularly when the unintended areas are sensitive (e.g., homes, schools, playgrounds, agricultural areas, unintended vegetation and streams and other water bodies); or
- Herbicides infiltrate into ground water or surface water systems that feed drinking water supplies.

Worker exposure to herbicides is affected by the application rate of the herbicide, the number of hours per day the herbicide is applied, the number of acres treated per hour, hygiene used, and personal protective equipment worn. For aerial application, these risks occur to herbicide handlers when transporting and mixing herbicides and surfactants, disposing of containers, and loading aircraft. Exposure risks also occur for pilots of aircraft and UAVs when herbicides are applied. The Forest Service will contract aerial applications with qualified applicators and will require applicators to follow design elements for protecting workers. Licensed professional herbicide applicators will be required to supervise all applications; and, in doing so, must:

- Be familiar with and following product label directions;
- Have product labels, material safety data sheets, spill prevention plans, and cleanup kits available to workers;
- Conduct visual and physical inspection to ensure properly functioning equipment and that PPE is appropriate and used correctly;
- Have spill kits readily available in ground support vehicles; and
- Transport only the quantity of herbicide and adjuvants needed for a project.

The risks of worker exposure to herbicides from aerial applications will be minimal with these design elements.

Public exposure scenarios assume that a person has contact with the herbicide from direct spray, skin contact with sprayed vegetation, or consumption of contaminated plants, fruit, water, or fish. Public exposure risks would be mitigated by design elements that require licensed herbicide applicators to:

- Conduct public notification through press releases in local newspapers and social media and websites that identify the potential treatment windows for specific areas;
- Perform signing and on-site layout one to two weeks prior to actual aerial treatment;
- Use temporary area, trail, and road closures to ensure public safety during aerial spray operation; and

- Avoid aerial herbicide applications within 300 feet of residential areas and developed recreation areas.

The implementation plan for the project includes procedures for closing treatment areas to public access and to post signage at public access points notifying the public of planned and recently treated areas. Risks of public exposure to herbicides from aerial applications will be minimal with implementation of the implementation plan.

Potential for herbicides to affect nontreatment areas through drift, mobilization in streams and channels, and overland flow and appropriate mitigation measures to minimize these risks are evaluated in the Soil and Water Quality Section of this EA. Design elements to minimize these unintentional exposure risks include requiring licensed herbicide applicators to:

- Obtain a weather forecast for the area prior to initiating a spraying project to ensure weather forecasts during and following treatment are within prescription (winds less than ten mph) during treatment and no rain for several days following prescription;
- Avoid aerial application when sustained wind speeds exceed ten mph or label recommendations, whichever is less;
- Avoid aerial application during inversions, below minimum relative humidity, or above maximum temperature, as stated on label;
- Avoid aerial application and staging operations within a 300-foot buffer to all open water features and riparian areas;
- Place drift monitoring cards out to 300 feet from and perpendicular to perennial streams to monitor herbicide presence;
- Obtain water used for mixing from designed developed/municipal source prior to going into the field;
- Exclude municipal watersheds or areas of known domestic water supply from aerial herbicide treatment project areas; and
- Use a GPS system in spray aircraft and map each treatment unit before the flight to ensure that only areas marked for treatment are treated.

Risks of public exposure to herbicides from aerial applications due to drift, mobilization, or overland flow would be minimal with implementation of these design elements.

In conclusion, when considering the acute and chronic toxicity characteristics of the proposed herbicides and the proposed plans for aerial applications, risks to humans associated with the project would be minimal when the design elements are followed.

Cumulative Effects

With the Proposed Action, aerial applications of herbicide would be added to the overall HTNF program to control NNIPS across the forest. Where appropriate, ground-based NNIPS treatments would continue to be utilized and applied using established practices to maximize worker safety and minimize potential worker and public health risks of exposure to herbicides. In addition to herbicide applications completed under the HTNF program, herbicide use and other methods of NNIPS treatments are likely to be ongoing by other public and private landowners adjacent to the Forest Service treatment areas to an unknown degree. The potential for cumulative human health effects from any herbicide use proposed in this EA, combined with other potential herbicide applications in the analysis area, are likely to be encompassed in the health risk estimates for chronic exposure scenarios in EPA studies. The proposed herbicides for use in aerial applications do not bio-accumulate in people and are rapidly eliminated from the body. Chronic (i.e., over 90 continuous days) worker exposure was considered in SERA risk assessments and did not result in exceedance of thresholds for any likely scenario.

None of the herbicides analyzed exhibit obvious cumulative adverse effects when used in combination with other herbicides. Effects from repeated exposures are discussed earlier in this report and can be largely mitigated by proper use of PPE, good hygiene practices, and adherence to the instructions in each herbicide label. Given the relatively small proportion of treatment across the landscape, the inclusion of protocols in the implementation plan designed and utilized to protect workers and the public, and the use of label guidelines for proper application, cumulative adverse effects to human health are not expected from the implementation of any of the action alternatives.

In combination with ground-based NNIPS control and the HTNF hazardous fuels reduction projects (i.e., Forest-wide Prescribed Fire Project, Deer Mountain Timber Stand Improvement Project, and East Humboldt and Ruby Mountains Fuel Reduction Project), aerial application of herbicides would reduce the cover of NNIPS, which could reduce the coverage of fine, flashy fuels across the landscape and mitigate the risk of large-scale wildfires that threaten public safety across the State of Nevada.

Recreation

Issues and Indicators

Issue Statement REC1: How would the Proposed Action or alternative affect developed and dispersed recreation opportunities within and/or adjacent to proposed treatment areas?

Indicator: Qualitative assessment of potential effects of the Proposed Action or alternative on developed and dispersed recreation activities.

Direct and Indirect Effects

Overview

The area considered in analyzing direct and indirect effects on recreation resources includes approximately 5.6 million non-contiguous acres on the HTNF in Nevada. The existing landscapes within the project area include rugged mountains, sagebrush basins, deep canyons, scenic vistas, dry riverbeds, conifer forests, pinyon pine, mountain mahogany, and juniper stands. The classic western Basin and Range landscape character draws many recreational visitors each year. Recreational opportunities across the HTNF in Nevada include hunting, fishing, wildlife viewing, snowmobiling, snowshoeing, cross-country skiing, driving for pleasure, picnicking, hiking, and camping. The proliferation of NNIPS populations is displacing native plants, decreasing resources for native plant populations, and is altering physical and biological properties of the existing landscape in some areas.

According to the 2016 National Visitor Use Monitoring (NVUM) study, an estimated 1,228,000 people visited the HTNF, with approximately 80 percent of visitors stating that recreation was the main reason for their visit (USFS 2016). The project area includes 24 federally designated Wilderness areas with a total of approximately 1,126,095 acres, seven RNAs with a total of approximately 9,438 acres, over 2,755,000 acres of Inventoried Roadless Areas, and approximately 51 miles of eligible or designated Wild and Scenic Rivers.

Developed recreation sites which are areas that have been improved or developed for recreation as defined in the Forest Service *Code of Federal Regulations, 42 FR 2957,* include campgrounds, group picnicking, and other amenities including but not limited to parking facilities, restrooms, day-use areas, and overlook areas, but not trails or trailheads. The Forest Service defines “dispersed recreation” as activities that take place outside of developed camping or concessionaire-operated facilities, excluding motorized recreation. This may include dispersed camping in designated sites or areas that lack substantial improvements. These dispersed recreation sites have limited amenities with minimal signs and constructed features, as determined by the Forest Plan direction. They are typically in areas with access to camping, hiking, horseback riding, mountain-bike riding, rock climbing, wildlife viewing, and hunting and fishing opportunities. There are a total of 67 inventoried developed and dispersed recreation sites in the project area (Table 17). Recreational trails and roads within the project area include 4,405 miles of motorized recreational road and 2,407 miles of NFS trails (Table 17).

Table 17. Inventoried Developed and Dispersed Recreation Opportunities in the HTNF.

Inventoried Developed and Dispersed Recreation Sites	
Recreation Site	**Quantity**
Overlook	1
Campground Camping	26
Dispersed Camping	4
Group Picnicking	3
Picnicking	7
Trailhead	26
Total Sites *	**67**
Inventoried Motorized Vehicle Use	
Road Type	**Sum of Miles**
Dirt Road, Suitable for Passenger Car	521
Gravel Road, Suitable for Passenger Car	18
Paved Road	33
Road, Not Maintained for Passenger Car	3,833
Total Miles *	**4,405**
Inventoried Trails	
Non-Motorized Trail	940
Motorized Trail	1,449
Total Miles *	**2,407**

* Totals were calculated using GIS data.

Areas which do not meet the Proposed Action design elements criteria (i.e., designated Wilderness and Wilderness Study Areas and RNAs) were not considered because these areas will not be identified for treatment using aerial application of herbicide per the project implementation plans.

Dispersed Recreation (recreational use away from developed sites) opportunities such as recreation sites, motorized vehicle use roads, and motorized and non-motorized trails on the HTNF are considered recreational resources under this EA and were analyzed for potential effects from the implementation of the Proposed Action.

The Proposed Action would have no direct effect on developed recreation opportunities because these areas would not be treated with aerial herbicide application.

The Forest Plan established Recreational Opportunity Spectrum (ROS) classifications, which are used as an analysis tool for recreation on NFS lands and can be used as a metric for loss of recreation opportunity. However, for this analysis, effects to existing ROS classifications are not evaluated because the Proposed Action would have no permanent effect on recreational opportunities on the HTNF in Nevada. Instead, we are using a qualitative assessment based on professional judgement to assess potential indirect effects to recreation users form activities related to the Proposed Action.

No-Action Alternative

Under the No-Action alternative, ground-based herbicide treatments would continue with no aerial herbicide application authorized. This alternative would likely have no permanent direct or indirect effects on developed or dispersed recreation sites because recreation use would continue as is currently managed under the Forest Plan. The adverse effects on recreational experiences are anticipated to be brief and minor. These may include limited access or temporary displacement of visitors during ground-based herbicide treatments. While some visitors might be inconvenienced, others may not be significantly affected. Overall, these indirect impacts on recreational opportunities are expected to be sporadic and temporary, thus remaining minor.

Proposed Action Alternative

Aerial herbicide treatment areas occurring at the same time and place that visitors are recreating could result in a short-term loss of recreation opportunity. Temporary adverse impacts would likely occur to visitor satisfaction where visitors are directly exposed to the noise and human activity associated with the aerial herbicide treatment operations. No treatment would occur where visitors are present in the treatment areas. Treatments would be suspended until all visitors have moved out of the area.

Aerial herbicide application would not be used within 300 feet of developed recreation sites. However, where planned treatment sites and recreational activities occur in proximity, developed recreation site visitors may be adversely impacted by the presence of workforce crews and equipment engaged in NNIPS treatment activities. During treatment activities, visitors may encounter workforce crews or temporary recreational area closures as well as low flying aircraft and associated noise. While some visitors might relocate due to these impacts, others may not be bothered. Overall, these indirect impacts on opportunities for developed recreation experiences are expected to be minimal, sporadic, and temporary, and therefore minor.

Dispersed recreation is most common in forested areas and near waterbodies where aerial herbicide application treatments would likewise be restricted or not used. The Proposed Action design elements require news releases and signage at forest portals and trailheads informing visitors of the planned treatments. This would give dispersed recreation visitors an opportunity to schedule their visits to avoid treatment areas. In treatment areas near heavily traveled roads and trails, design elements (Appendix A) also include the potential for temporary road and trail closure during air operations to protect forest visitors. While recreation activities in areas adjacent to proposed treatment areas may be temporarily disrupted, the disruption would be short-term, not exceed one week, and similar recreation opportunities would continue to be available in adjacent locations outside of proposed treatment areas.

Negative impacts to the recreational experience would be short term and minimal, including the potential for limiting access or displacing visitors during treatment activities.

There would be no effect to the existing landscape characteristics or features on the HTNF because the Proposed Action activities are temporary and will recover as treatment sites revegetate.

The Proposed Action, along with the specific design elements, complies with the management direction for recreation provided in the respective Land and Resource Management Plans (Forest Plans) for the HTNF (USFS 1986a, as amended; USFS 1986b, as amended).

Cumulative Effects

The cumulative actions considered in this analysis include any proposed action that could have temporal and/or spatial impacts to dispersed recreation resources and opportunities that are affected directly or indirectly with implementation of the alternatives. The reasonably foreseeable actions considered in aggregate with the Proposed Action and alternative include projects of ongoing ground-based NNIPS treatments, forest-wide prescribed burning, timber stand improvements, and hazardous fuels reduction.

The ongoing vegetation treatment projects occurring at the same time and place that visitors are recreating could result in a short-term loss of recreation opportunity. Temporary adverse impacts due to road closures, proximity to workforce crews and equipment, would likely occur to visitor satisfaction where visitors are directly exposed to the noise and human activity associated with vegetation treatment operations. While some forest recreational visitors might choose to relocate due to these impacts, others may not be significantly affected. Overall, these indirect impacts on opportunities for developed recreation experiences are anticipated to be minimal, sporadic, and temporary, and thus minor. While recreation activities within and adjacent to proposed vegetation treatment areas may experience temporary disruptions, these disturbances would be short-term. Moreover, comparable recreation opportunities will remain accessible in nearby locations outside of proposed vegetation treatment areas. Although certain activities, such as prescribed burning and hazardous fuel reduction, might necessitate the relocation of some recreation visitors for one to five years while the landscape recovers, this impact is still considered temporary. Additionally, the designated recreation avoidance areas would be spatially limited when viewed in the context of the entire HTNF in Nevada.

Based on the activities outlined in the on-going projects listed above and in the Proposed Action implementation plan, no specific conditions have been proposed that would contribute to cumulative long-term loss of recreation opportunities, including maintenance of these recreation systems. Negative impacts to the existing developed recreation resources including campgrounds, trails and trailheads, and dispersed recreation sites would be short term and minimal, including the potential for limiting access or displacing visitors during vegetation treatment activities. As such, there would be no additional effects associated with past, present, or reasonably foreseeable future projects contributing to cumulative effects for these recreation resources. The combined effects of the Proposed Action with past, present, and proposed actions in the analysis area in and of themselves do not combine to produce cumulative effects to recreation resources that exceed Forest Plan objectives, standards, and guidelines. The effects of existing and proposed vegetation treatment projects would not cumulatively result in loss of recreation opportunities across the HTNF in Nevada.

Air Quality

Issues and Indicators

Issue Statement AQ1: How would the Proposed Action affect air quality in proposed treatment areas?

Indicator: State and federal air quality standards in locations within and adjacent to proposed treatment areas. Qualitative discussion of potential emissions from equipment and aircraft associated with aerial application of herbicides at proposed treatment areas.

Direct and Indirect Effects

Mobile Emissions

Forest Service and contractor vehicles used for ground transportation of personnel and equipment to and from aerial application sites and airfields would depend on the types of vehicles in the respective fleets at a given time but would likely involve light duty trucks or large sport utility vehicles (SUVs).

Emissions from these vehicles would depend on the age of vehicles used and the emission standards under which the respective vehicles were manufactured and would also depend on the available fuel blends where these vehicles are refueled. Emissions generated by vehicles would contribute incrementally to vehicle emissions within the state but would not in themselves be sufficient to cause violation of NAAQS. When traveling in urban areas and on rural highways, Forest Service and contractor vehicles would be operating on roads that are subject to air quality transportation conformity; it is the responsibility of the state or metropolitan planning organizations to make air quality conformity determinations for emissions associated with these roadways and the traffic that these roadways generate (EPA 2024a). Because Clark County is a nonattainment area for ozone, vehicles registered in Clark County would be required to meet emissions testing and permitting requirements as required by the County's regulations and Ozone Attainment Plan (Clark County 2024).

In 2022, EPA issued particulate matter emissions standards applicable to certain classes of aircraft engines. These standards apply to civil subsonic jet airplanes such as commercial passenger and freight aircraft and larger business jets. EPA also has emission standards for nitrogen oxide emissions from aircraft gas turbine engines with rated thrusts greater than 26.7 kilonewtons; these engines are primarily used on commercial passenger and freight aircraft. In 2009, EPA also provided an organic gas speciation profile for emission inventories of aircraft equipped with turbofan, turbojet, and turboprop engines fueled with kerosene-based jet-A fuel (EPA 2024b). None of these standards would apply to the types of smaller, fixed-wing or rotary-wing aircraft and UAVs used for aerial application of herbicides.

Volatile Organic Compounds and Ozone (Smog)

Herbicides used in aerial applications may contain VOCs. VOCs contribute to the creation of ozone, though pesticides and herbicides are not major sources of atmospheric VOCs compared to combustion of fossil fuels, industrial emissions, and wildfires. Aerial application of herbicides would release VOCs into the atmosphere, but application would be localized and infrequent. Generally, pesticides and herbicides are not large contributors to atmospheric VOCs, which primarily originate from consumption of fossil fuels, industrial production, and forest fires. Aerial application of herbicides would not constitute a new, ongoing source of VOC emissions. Additionally, project design elements include requirements to not apply herbicides using aerial application when sustained wind speeds exceed ten to 12 mph (or as indicated in label recommendations), to not apply during inversions, and to obtain a weather forecast prior to initiating a spraying operation. As such, aerial application of herbicides would not contribute in a measurable or quantifiable way to the formation of ozone for any location and would not affect the ability of the State of Nevada, Clark County, or Washoe County to achieve or remain within ozone standards.

Particulate Matter (Dust)

Treatment with aerial application of herbicide may create areas of exposed soil prior to re-establishment of vegetation. This may create a temporary source of particulate matter (dust) that could become airborne during high-wind events. However, while vegetation would be temporarily removed from an area, soils would not be disturbed (e.g., tilled) by the aerial herbicide application, minimizing the potential quantity of particulate matter that could become airborne from a treated area. Aerial spraying using a helicopter or UAV may generate temporary fugitive dust near the application area due to rotor wash (downdraft). Because aerial applications would not occur proximate to urbanized areas and would be done infrequently, the Proposed Action is not likely to have a measurable effect on particulate matter air quality monitoring in PM10 maintenance areas and would not affect the ability of the State of Nevada, Clark County, or Washoe County to remain within particulate matter air quality standards.

Regional Haze

The Jarbidge Wilderness Class I airshed would not be directly or indirectly affected by adding aerial application to the weed control program, because aerial application would not add any new, on-going emissions point sources that would require State of Nevada emissions permitting.

Cumulative Effects

The Forest Service vehicle fleet is expected to include more electric vehicles in the future by implementing Executive Order 14057 (86 FR 70935, December 8, 2021), which directs federal agencies to achieve 100 percent zero-emission vehicle acquisitions by 2035, including 100 percent zero-emission light-duty vehicle acquisitions by 2027. As this transition occurs, emission contributions associated with ground-based vehicles used to support the aerial herbicide application program would decline.

Cumulatively, in combination with other forest habitat improvement projects, aerial application of herbicides would contribute toward improving resiliency of landscapes. If successful, reduced areas of NNIPS monocultures will contribute toward reduction in wildfire incidence and intensity. In addition to contributing particulate matter and VOC pollution to the atmosphere, wildfires are a major source of reduced visibility in the Jarbidge Wilderness Class I airshed (USFS 2024). Therefore, reduced wildfire incidence and intensity in Nevada would support achievement of improved visibility conditions and trends. To the extent that aerial application of herbicides contributes toward reduced wildfire occurrence and intensity in the future, the Proposed Action will have had a beneficial effect for Nevada's objectives to improve visibility for the airshed. Monitoring the recovery of areas receiving aerial application of herbicides, including recovery of vegetation to prevent fugitive dust, would be accomplished under HTNF Forest Plan direction for respective management units where aerial spraying would occur.

Climate Change

Issues and Indicators

Issue Statement CC1: How would the effects of climate change affect the ability of the HTNF to meet NNIPS treatment objectives under the Proposed Action or alternative?

Indicator: Qualitative discussion and literature review of potential climate change effects as part of the cumulative effects analysis.

Direct and Indirect Effects

The assessment of direct and indirect impacts includes consideration project effects related to carbon storage capacity on the HTNF and potential project effects on the ability of the Forest Service and the State of Nevada to meet greenhouse gas (GHG) reduction targets.

Project Effects Related to Carbon Storage

NNIPS are a major threat to the health, sustainability, and productivity of native ecosystems. Impacts from NNIPS in terrestrial ecosystems include alterations to species abundance and distribution, fire regimes, belowground biotic and abiotic process, and availability of resources to native species. NNIPS also impact primary productivity and nutrient cycling and frequently accelerate carbon cycling. NNIPS effects on ecosystem carbon stem from traits of the invading and resident species as well as environmental conditions (Poland et al. 2021).

In rangelands, removal of NNIPS, especially annual species, can enhance soil and plant carbon stocks. Annual NNIPS typically have very shallow root systems that store less carbon than that of the native vegetation. By outcompeting native species in rangelands, the presence of annual NNIPS may result in decreased species diversity, lower ecological productivity, fewer soil carbon inputs, and shifts in SOC from lower (i.e., more protected) to higher soil horizons (Germino et al. 2016, Rau et al. 2011, Reeves et al. 2020). Both aboveground carbon stocks and SOC stocks have been found to be significantly lower following transitions to cheatgrass from shrublands or sagebrush steppe vegetation (Bradley et al. 2006a, Meyer 2012, Reeves et al. 2020). Native and diverse grassland species, therefore, are critical in maintaining the health and carbon sequestration capacity of rangelands.

Therefore, a NNIPS management program inclusive of aerial applications of herbicide would support carbon sequestration by reducing NNIPS coverage at larger landscape scales that can be achieved through ground-based methods alone. Over the longer term, this will contribute to releasing native vegetation from competition and improving rooting material. The degree to which this will occur depends on site-specific soil conditions and other factors. In general, degraded areas have the greatest potential to sequester additional carbon, which is likely to include many of the areas on the HTNF that would be treated using aerial application of herbicides. However, at the regional scale the overall capacity of grasslands and shrublands to store additional carbon (more than they already do) is constrained for several reasons. First, most soils in the Intermountain Region are presently at SOC saturation for the existing climate. Even degraded areas that have converted from shrublands to grasslands are not likely to have a large amount of additional SOC storage potential because the shift from lower depth SOC to higher depth SOC occurs very slowly. Second, while in principle it has been observed that the carbon storage capacity of soils could be increased with lower soil temperatures and higher soil moisture, most climate models predict warmer soil temperatures and varied soil moisture changes in the Intermountain Region (Reeves et al. 2017).

Overall, this information suggests that aerial application of herbicides would contribute to reducing existing degradation and further degradation of landscapes, helping to prevent eventual release of additional carbon that may occur in absence of improved habitat conditions for grassland and shrubland ecosystems. However, restoration of these ecosystems may not contribute much to additional carbon storage capacity of NFS lands due to the constraints noted. Reeves et al. (2017) concluded that contributions of forest units in the Intermountain Region for managing soil carbon will be best achieved through management of above ground vegetation and forest floor organic material. These actions may include providing and maintaining a diversity of plant species, keeping forest floor resources intact during vegetation management operations, and limiting losses through catastrophic fires. These actions would not be directly related to the use of aerial application of herbicides. The extent to which aerial application of herbicides would indirectly affect subsequent land management decisions is dependent on site-specific circumstances and is not quantifiable for the current assessment.

Fossil Fuel Emissions Associated with Project Implementation

Except for UAVs that are battery powered, aircraft and ground support vehicles that would be used in making aerial herbicide applications would burn fossil fuels and would contribute incrementally to GHG emissions originating in the State of Nevada. A forward projection for the current project using available GHG estimation tools would depend heavily on assumptions regarding the vehicle fleet involved, the number of miles traveled by various vehicles, fuel types (gasoline, diesel) consumed, types of fuel-burning aerial vehicles used (fixed-wing or helicopter) and flying time that would occur for each aerial vehicle type. Any such estimation would be expected to constitute a small portion of total vehicle miles traveled and flying time for similar aircraft originating in the State of Nevada.

In 2016, EPA finalized findings that GHG emissions from aircraft contribute to the air pollution that causes climate change, endangering public health and welfare under Section 231(a) of the Clean Air Act (EPA 2016). EPA has also proposed but not yet finalized rulemaking for a process for setting carbon dioxide emissions standards for aircraft (EPA 2024c). Aircraft covered by the proposed rulemaking would be subsonic jet aircraft with a maximum takeoff mass greater than 5,700 kilograms and subsonic propeller driven aircraft (turboprops) with a maximum takeoff mass greater than 8,618 kilograms. Smaller aircraft and helicopters, such as those that would be used for aerial herbicide application, would not be covered under EPA's proposed GHG emission standards.

Cumulative Effects

In combination with other forest projects to improve forest health, successful aerial application and reduction of NNIPS would contribute to more resilient landscapes, reducing flashy fire risks and occurrences. In this respect, aerial application would contribute incrementally and cumulatively toward reduced wildfire-associated carbon emissions. The degree to which this would occur is not presently known and would depend upon the success of aerial application to reduce NNIPS as well as any necessary subsequent efforts following aerial application to restore native vegetation at landscape scales. Other planned projects, including the Forest-wide Prescribed Fire Project, the Deer Mountain Timber Stand Improvement and Hazardous Fuels Reduction Project, and the East Humboldt and Ruby Mountains Fuels Reduction and Landscape Resilience Project are likely to make the greatest contributions toward maintaining and improving long-term carbon storage benefits of NFS lands in Nevada.

Both the Forest Service and the State of Nevada will be making efforts to reduce GHG emissions during the implementation time frame of the aerial herbicide application program. Executive Order 14057 (86 FR 70935, December 8, 2021) directs federal agencies to achieve 100 percent zero-emission vehicle acquisitions by 2035, including 100 percent zero-emission light-duty vehicle acquisitions by 2027. Nevada Senate Bill 254, signed in 2019, sets state GHG emission reduction goals of 28 percent by 2025, 45 percent by 2030, and net-zero by 2050 (Nevada Legislature 2019). Nevada's State Climate Strategy, released in 2021, aims to provide framework for reducing Nevada's GHG emissions across all economic sectors, lay the groundwork for climate adaptation and resilience, and establish a structure for continued, ongoing climate action across the state (Nevada Legislature 2021).

Forest Service conversion of a greater proportion of its vehicle fleet to zero-emissions vehicles over the implementation time frame of the aerial application program will reduce GHG emissions from ground support activities necessary for aerial herbicide applications. Also, the types and capabilities of UAVs that can be utilized for aerial applications are likely to continue to improve technologically over the project implementation time frame; additional use of these battery-powered vehicles over time would reduce GHG emissions generated by aerial applications. The extent to which this would occur cannot be known or quantified at this time.

National Forest Management Act (NFMA) – Land Management Plan Consistency

The pertinent specialist has reviewed the Proposed Action including design elements and provided supporting analysis and rationale for determinations in the project record. The following are specialist determinations regarding project consistency with applicable land management plan direction, standards, and guidelines:

Botany: Consistent

Cultural/Heritage: Consistent

Engineering: Consistent

Fisheries: Consistent

Fuels: Consistent

Hydrology: Consistent

Lands and Special Uses: Consistent

Minerals: Consistent

Range: Consistent

Recreation: Consistent

Scenic Resources: Consistent

Soils: Consistent

Silviculture: Consistent

Special Management Areas: Consistent

Wildlife: Consistent

Other Resources: Consistent

Other Law, Regulation, and Policy Consistency

Endangered Species Act

Threatened, Endangered, Proposed, and Candidate Species and Critical Habitat

The pertinent specialists reviewed the Proposed Action and made the following determinations for threatened, endangered and/or proposed species (Table 18):

Table 18. Threatened, Endangered, Proposed or Candidate Species and Critical Habitat Effect Determinations.

Species/Habitat	Status	Proposed or Designated Critical Habitat Present?	Determination[1]	Brief Rationale (or refer to other project documentation)
Threatened, Endangered, Proposed, and Candidate Species				
Sierra Nevada red fox – Sierra Nevada DPS (*Vulpes vulpes necator*)	Endangered	No	LAA	The western portion of the project area contains approximately 5,552 acres of suitable habitat in high-elevation areas. These habitats are not commonly associated with NNIPS infestations (Anderson et al. 2015, Alexander et al. 2016). Additionally, there are no signs of any established territories or denning activities (FWS 2018, SCAT 2022); therefore, interactions between the Sierra Nevada DPS of the Sierra Nevada red fox and aerial application activities are expected to be a rare event. Effects from the Proposed Action include visual and noise disturbance from staging areas and aerial application methods and sub-lethal effects from the direct exposure to herbicides. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. Given the dearth of NNIPS in their habitat, this alternative would likely have no effect on Sierra Nevada red fox. The cumulative actions and the Proposed Action may yield minor cumulative effects on the Sierra Nevada red fox. However, these cumulative effects would not threaten the continued existence populations in the area.
North American wolverine – contiguous U.S. DPS (*Gulo gulo luscus*)	Threatened	No	NE	While potential habitat for the wolverine does exist in the high-elevation areas in the western portion of the project area, there have not been any observations in the state of Nevada or within the HTNF. Therefore, the Proposed Action and the No-Action alternative would have no effect on the North American wolverine.

Species/Habitat	Status	Proposed or Designated Critical Habitat Present?	Determination[1]	Brief Rationale (or refer to other project documentation)
Greater sage-grouse - bi-state DPS (*Centrocercus urophasianus*)	Proposed Threatened	Yes	No Jeopardy (LAA)	The bi-state DPS of the greater sage-grouse (bi-state sage-grouse) depends on large, interconnected expanses of sagebrush with healthy, native understories for their entire life cycle. The project area contains 295,031 acres of proposed critical habitat for the bi-state sage-grouse, located on the western portion of the state. NNIPS are common in this habitat and are identified as a major threat to the species (Bi-State 2012). Design elements included in the Proposed Action would restrict herbicide use within a four-mile buffer of active leks during breeding, nesting, and early brood rearing activities. The majority of sage-grouse breeding habitat is found within four miles of leks (Holloran and Anderson 2005, Coates et al. 2013). Effects from the Proposed Action could include visual and noise disturbance from staging areas and aerial application methods, sub-lethal effects from the direct exposure to herbicides, and changes in habitat and diet composition. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. NNIPS are considered a major threat to the bi-state sage-grouse (Bi-State 2012), and this alternative may result in increased NNIPS presence in their habitat within the HTNF. The cumulative actions and the Proposed Action may yield minor cumulative effects on the bi-state sage-grouse. However, these cumulative effects would not threaten the continued existence populations in the area.
California spotted owl – Sierra Nevada DPS (*Strix occidentalis occidentalis*)	Proposed Threatened	No	No Jeopardy (LAA)	Suitable habitat for the Sierra Nevada DPS of the California spotted owl (Sierra Nevada CSO) is found in the western portion of the project area. Their habitat consists of dense, mature, heterogeneous forests with complex structure and large amounts of coarse woody debris. Additionally, one nest and its associated protected activity center (PAC) is found within the project area. Design elements included in the Proposed Action limit aerial application of herbicides and any associated staging operations within a quarter mile of active or unknown status Sierra Nevada CSO nests or identified PACs during the nesting season (March 1 to August 31). Effects from the Proposed Action include visual and noise disturbance from staging areas and aerial application methods and sub-lethal effects from the direct exposure to herbicides. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative.

Species/Habitat	Status	Proposed or Designated Critical Habitat Present?	Determination[1]	Brief Rationale (or refer to other project documentation)
Southwestern willow flycatcher (*Empidonax traillii extimus*)	Endangered	No	NE	While potential habitat does exist in the project area, they are not known to occur in the HTNF. Therefore, the Proposed Action and the No-Action alternative would have no effect on the southwestern willow flycatcher.
Yellow-billed cuckoo – western DPS (*Coccyzus americanus*)	Threatened	No	NE	While potential habitat does exist in the project area, they are not known to occur in the HTNF. Therefore, the Proposed Action and the No-Action alternative would have no effect on the western DPS of the yellow-billed cuckoo.
Desert tortoise (*Gopherus agassizii*)	Threatened	No	NE	The species is not known to occur in the HTNF. Therefore, the Proposed Action and the No-Action alternative would have no effect on the desert tortoise.
Northwestern pond turtle (*Actinemys marmorata*)	Proposed Threatened	No	NE	The species is not known to occur in the HTNF. Therefore, the Proposed Action and the No-Action alternative would have no effect on the northwestern pond turtle.
Mt. Charleston blue butterfly (*Icaricia shasta charlestonensis*)	Endangered	Yes	LAA	The Mt. Charleston blue butterfly (MCBB) is endemic to the Spring Mountains in the southern portion of the project area. There is 1,454 acres of designated critical habitat within the project area. Habitat for the MCBB consists of flat ridges with exposed soil and rock substrates with limited or no canopy cover or shading above 8,200 feet elevation in the Spring Mountains within the HTNF (Boyd and Murphy 2008, FWS 2023). These areas are not commonly associated with NNIPS infestations (Anderson et al. 2015, Alexander et al. 2016). Design elements limit aerial application of herbicides and staging operations within known occupied habitat for the MCBB. However, individuals or populations that are outside of these areas would be subject to aerial herbicide application. Effects from the Proposed Action include excess wind disturbance from aerial application methods and direct exposure and lethal and sub-lethal effects from the direct exposure to herbicides. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. Given the dearth of NNIPS in their habitat, this alternative would likely have no effect on the MCBB. The cumulative actions and the Proposed Action may yield minor cumulative effects on the MCBB. However, these cumulative effects would not threaten the continued existence populations in the area.

Species/Habitat	Status	Proposed or Designated Critical Habitat Present?	Determination[1]	Brief Rationale (or refer to other project documentation)
Carson wandering skipper (*Pseudocopaeodes eunus obscurus*)	Endangered	No	NE	While potential habitat does exist in the project area, they are not known to occur in the HTNF. Therefore, the Proposed Action and the No-Action alternative would have no effect on the Carson wandering skipper.
Monarch butterfly (*Danaus plexippus*)	Candidate	No	NLAA	Monarch butterflies and their host plant, milkweed (*Asclepias* spp.) occur throughout the project area. The Proposed action would authorize the aerial application of herbicide in suitable and occupied habitat of the monarch butterfly. Design elements included in the Proposed Action protect monarch butterflies and the nectar producing plants they rely upon by not treating areas when nectar producing plants are metabolically active. Effects from the Proposed Action include excess wind disturbance from aerial application methods, secondary habitat alteration, and potentially lethal and sub-lethal effects from the direct exposure to herbicides. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative. The cumulative actions and the Proposed Action may yield minor cumulative effects on the monarch butterfly. However, these cumulative effects would not threaten the continued existence populations in the area.
Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*)	Threatened	No	LAA	On the HTNF in Nevada, there are 327 km of occupied LCT habitat. Within the project area specifically, there are 29 HUC12 occupied watersheds with a total of 233 km of occupied habitat. There is a 300-foot buffer that will minimize the interaction between LCT and herbicides, however, there is a potential for herbicide drift within the buffer and potential runoff/overland flow/leaching of herbicides into streams. It is unlikely that there will be direct mortality from herbicides and only temporary reduction in upland vegetation cover. There is a potential for sublethal effects at all life stages such as reduction in food base, decreased water quality, reduced growth and fecundity, delayed sexual maturity, reproductive failure, and avoidance/displacement from the stream reach. Any effects described above are expected to be short in duration through dilution, bio- absorption, and through the natural half-life of the herbicides in the environment.

Species/Habitat	Status	Proposed or Designated Critical Habitat Present?	Determination[1]	Brief Rationale (or refer to other project documentation)
				The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative. The cumulative actions and the Proposed Action may yield minor cumulative effects on LCT and would not add to the effects in a measurable way.
Bull trout (*Salvelinus confluentus*)	Threatened	Yes	LAA	This project area supports bull trout, a species federally listed as threatened. The Jarbidge bull trout population is part of the Upper Snake Recovery Unit. The Jarbidge River bull trout population represents the southernmost extant population of bull trout. In the HTNF, there are 85 km of bull trout critical habitat. Within the project area specifically, there are three HUC12 watersheds with a total of 31.4 km of critical habitat occurs with 24.5 km of those being FMO and 6.8 km being SR. There is a 300-foot buffer that will minimize the interaction between bull trout and herbicides, however, there is a potential for herbicide drift within the buffer and potential runoff/overland flow/leaching of herbicides into streams. It is unlikely that there will be direct mortality from herbicides and only a temporary reduction in upland vegetation cover. There is a potential for localized sublethal effects at all life stages such as reduction in food base, decreased water quality, reduced growth and fecundity, delayed sexual maturity, reproductive failure, and avoidance/displacement from the stream reach. Any effects described above are expected to be short in duration through dilution, bio-absorption, and through the natural half-life of the herbicides in the environment. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative. The cumulative actions and the Proposed Action may yield minor cumulative effects on LCT and would not add to the effects in a measurable way.
Railroad Valley springfish (*Crenichthys nevadae*)	Threatened	No	NLAA	Currently there are two populations of Railroad Valley springfish in the project area; in Hot Creek Canyon a total of 0.7 km of habitat is available for the species. Within the HTNF the habitat is bounded by Hot Creek Canyon. Hot Creek Canyon is bound by bare rock cliffs with riparian vegetation across the valley floor. Due to this configuration, it is likely that the nearest aerial treatment will occur well outside the 300 ft buffer. Because of the life history of Railroad Valley

Species/Habitat	Status	Proposed or Designated Critical Habitat Present?	Determination[1]	Brief Rationale (or refer to other project documentation)
				springfish and its thermal requirements it is unlikely that there will be any interaction with herbicide form runoff/overland flow/ leaching. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative. The cumulative actions and the Proposed Action may yield minor cumulative effects on LCT and would not add to the effects in a measurable way.
Webber's ivesia (*Ivesia webberi*)	Threatened	Yes	LAA	Webber's ivesia has a narrow distribution in a relatively concentrated area of the HTNF within four HUC12 watersheds. Design elements require avoidance of aerial herbicide application and staging areas in occupied habitat. Unknown occurrences of Webber's ivesia could occur. Potential habitat of Webber's ivesia occurs in plant communities where NNIPS are likely to be present. Thus, such habitat may be selected for treatment with aerial herbicides and unknown occurrences could be treated. Known occurrences of Webber's ivesia could be affected by unintentional application of herbicide, aerial drift, and volatilization. Design elements would limit the likelihood of these impacts. Some herbicides that adhere to soil particles may also move from areas where they are applied by blowing dust. Future state or private activities, not involving federal actions, that are reasonably certain to occur within the project area and would affect Webber's ivesia and its Critical Habitat include off road recreation, road development and maintenance, suburban development, and energy development.
Whitebark pine (*Pinus albicaulis*)	Threatened	No	LAA	Whitebark pine occurs in the project area within 112 HUC12 watersheds. Design elements require avoidance of aerial herbicide application and staging areas in occupied habitat. Additionally, whitebark pine's higher elevation habitat is typically less susceptible to NNIPS infestation. However, due to its wide distribution across the HTNF, unidentified whitebark pine individuals or small occurrences may exist and could be treated with aerial herbicide applications. However, such unintentional treatments would be unlikely. The likelihood of activities to occur that could generate cumulative effects on whitebark pine is low.

Species/Habitat	Status	Proposed or Designated Critical Habitat Present?	Determination[1]	Brief Rationale (or refer to other project documentation)
Critical Habitat				
Critical Habitat for the greater sage-grouse - bi-state DPS	Proposed	Yes	Will not destroy or adversely modify proposed Critical Habitat (LAA)	The total area of proposed critical habitat for the bi-state sage-grouse is 1,868,017 acres in California and Nevada. Of that, 248,674 acres (13 percent) occur within the project area boundary. Aerial application of herbicides would likely take place within proposed critical habitat. However, treatment areas would likely be degraded or on the verge of NNIPS infestation and subsequent degradation. Effects from the Proposed Action could include lethal and sub-lethal impacts on native vegetation. However, when used appropriately, the proposed herbicides could target NNIPS leaving native species largely unharmed. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative. The cumulative actions and the Proposed Action may yield minor cumulative effects on the proposed critical habitat for the bi-state sage-grouse. However, the cumulative actions analyzed would likely yield long-term benefits on this habitat.
Critical Habitat for the Mt. Charleston blue butterfly	Designated	Yes	LAA	Designated critical habitat for the MCBB is approximately 5,214 acres in size (80 FR 37404). Of this critical habitat, 1,454 acres (28 percent) is within the project area, while another 3,760 acres occur on designated wilderness areas that are not subject to aerial herbicide application. Aerial application of herbicides may take place within designated critical habitat in areas where MCBB are not known to occur. However, treatment areas would likely be degraded or on the verge of NNIPS infestation and subsequent degradation, and treatments would be likely to improve the overall quality of the habitat. Effects from the Proposed Action could include lethal and sub-lethal impacts on native vegetation required for the life cycle of MCBB, which could have adverse impacts on the larval host plants and nectar plants MCBB rely on. These impacts are expected to be short-term and result in improved habitat in the long-term, nevertheless, direct application on unoccupied critical habitat and chemical drift from application into occupied critical habitat could result in a reduction of quantity and quality of native vegetation that constitute the essence of critical habitat. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative.

Species/Habitat	Status	Proposed or Designated Critical Habitat Present?	Determination[1]	Brief Rationale (or refer to other project documentation)
				The cumulative actions and the Proposed Action may yield minor cumulative effects on the designated critical habitat for the MCBB. However, the cumulative actions analyzed would likely yield long-term benefits on this habitat.
Critical Habitat for bull trout	Designated	Yes	LAA	There are 31.4 km of critical habitat within three HUC12 watersheds within the project area that are available for the aerial application of herbicide. There are 6.8 km of SR habitat within two HUC12 watersheds and there are 24.5 km of FMO habitat within three HUC12 watersheds. There is a 300-foot buffer around (language from design element) that will minimize the interaction between bull trout critical habitat and herbicides, however, there is a potential for herbicide drift within the buffer and potential runoff/overland flow/leaching of herbicides into streams. There is a potential for temporary and localized effects to water quality, migration and spawning/rearing habitats, and food base. Any effects described above are expected to be short in duration through dilution, bio-absorption, and through the natural half-life of the herbicides in the environment. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative. The cumulative actions and the Proposed Action may yield minor cumulative effects on bull trout critical habitat and would not add to the effects in a measurable way.
Critical Habitat for Webber's ivesia	Designated	Yes	LAA	On the HTNF, there are 669 acres of critical habitat for Webber's ivesia in four HUC12 watershed, all of which is within the project area. NNIPS represent a major threat to the critical habitat for Webber's ivesia. Design elements exclude aerial herbicide treatment within 300 feet of critical habitat. Aerial herbicide application in non-designated habitat adjacent to critical habitat could protect or slow the encroachment and establishment of invasive species in critical habitat. Aerial herbicide treatment in this situation could have beneficial effects for critical habitat.

[1] **NE** – no effect; **NLAA** – may affect, not likely to adversely affect; **LAA** – may affect, likely to adversely affect; **No Jeopardy** - not likely to jeopardize the continued existence or adversely modify critical habitat.

Supporting Project Documentation

Table 19. Applicable Project File Documentation to Support Analysis.

Documentation Type	File Name (if applicable/needed)
Biological Assessment	HTNF_BA_06172024_Final.pdf

Sensitive Species (FSM 2670)

The pertinent specialists reviewed the Proposed Action and made the following determinations for sensitive species (Tables 20 and 21):

Table 20. Sensitive Wildlife Species Impact Determinations.

Species	Determination[1]	Rationale (or refer to project documentation)
Bighorn Sheep Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) California bighorn sheep (*O. c. californiana*) Desert bighorn sheep (*O. c. nelsoni*)	MIIH	These three subspecies of bighorn sheep are found throughout the project area, in a variety of habitats including desert, sagebrush habitat, pinyon-juniper woodlands, and mountain sagebrush with a grassy understory. NDOW bighorn distribution (2022) shows a total of 730,937 acres of bighorn sheep habitat across the project area boundary. California bighorn sheep distribution occurs across 162,123 acres in the northern portion of the project area. Desert bighorn sheep distribution occurs across 510,027 acres across the southern and western portions of the project area, and Rocky Mountain bighorn sheep distribution occurs across 58,787 acres in the eastern portions of the project area. Effects from the Proposed Action could include visual and noise disturbance from staging areas and aerial application methods, sub-lethal effects from the direct exposure to herbicides, and changes in habitat and diet composition. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative. The cumulative actions and the Proposed Action may yield minor cumulative effects on bighorn sheep. However, these cumulative effects would not threaten the continued existence populations in the area.
Pygmy rabbit (*Brachylagus idahoensis*)	MIIH	Pygmy rabbits depend on dense stands of big sagebrush for foraging and breeding habitat. While the majority of pygmy rabbit observations occur outside of HTNF lands, there are 14 observations across the project area boundary, indicating that suitable habitat for pygmy rabbits exists across the project area. Effects from the Proposed Action could include visual and noise disturbance from staging areas and aerial application methods, sub-lethal effects from the direct exposure to herbicides, and changes in habitat and diet composition. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. NNIPS are considered a major threat to pygmy rabbits (Rottler et al. 2015), and this alternative may result in increased NNIPS presence in their habitat within the HTNF. The cumulative actions and the Proposed Action may yield minor cumulative effects on the pygmy rabbit. However, these cumulative effects would not threaten the continued existence populations in the area.
Bats Spotted bat (*Euderma maculatum*) Townsend's western big-eared bat (*Corynorhinus townsendii townsendii*)	MIIH	Spotted bats and Townsend's western big-eared bats are found in a variety of habitat types including desert, native prairies, coniferous forests, mid-elevation mixed conifer, and riparian communities. Both of these species occur within the project area. There are fewer than 20 known observations of spotted bats throughout the state and 54 observations of Townsend's western big-eared bat (Bradley et al. 2006b). Effects from the Proposed Action could include visual and noise disturbance from staging areas and aerial application methods, sub-lethal effects from the direct exposure to herbicides, and changes in habitat and diet composition.

Species	Determination[1]	Rationale (or refer to project documentation)
		The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative. The cumulative actions and the Proposed Action may yield minor cumulative effects on bats. However, these cumulative effects would not threaten the continued existence populations in the area.
Mountain quail (*Oreortyx pictus*)	MIIH	In Nevada, mountain quail typically occur at elevations above 5,000 feet. They can use a variety of habitat types including old growth coniferous forest, mixed montane shrub communities, regenerating clear-cuts and old burned areas (Brennan et al. 1987). Mountain quail have a limited range extent in Nevada, with the majority occurring on the western and northern sides of the state. NDOW distribution maps from 2013 show that approximately 285,241 acres of occupied mountain quail habitat occur within the project area boundary. The NRM database (USFS 2023b) shows nine observations of mountain quail on the western side of the project area. Effects from the Proposed Action could include visual and noise disturbance from staging areas and aerial application methods, sub-lethal effects from the direct exposure to herbicides, and changes in habitat and diet composition. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative. The cumulative actions and the Proposed Action may yield minor cumulative effects on mountain quail. However, these cumulative effects would not threaten the continued existence populations in the area.
Greater sage-grouse (*Centrocercus urophasianus*)	MIIH	The greater sage-grouse is found throughout the sagebrush ecosystems of North America, relying on sagebrush for every part of their life cycle. In Nevada, they are found across the majority of the state except for southern Nevada and the high elevation portions in western Nevada. The bi-state sage grouse (analyzed above in Table 18) is found on the western side of the state, south of Reno, along the Nevada-California border. Greater sage-grouse population management units (PMUs) are developed by NDOW and are based on aggregations of leks, understanding of habitats, and potential boundaries to populations. PMUs are found throughout the majority of the project area, except for southern Nevada and the high elevation portions in western Nevada. PMUs for the greater sage-grouse excluding the bi-state sage-grouse encompass over 3.5 million acres within the project area boundary. Additionally, there are over 500 observations of greater sage-grouse across the project area (USFS 2023a). Design elements included in the Proposed Action would restrict herbicide use within a four-mile buffer of active leks during breeding, nesting, and early brood rearing activities. The majority of sage-grouse breeding habitat is found within four miles of leks (Holloran and Anderson 2005; Coates et al. 2013). Effects from the Proposed Action could include visual and noise disturbance from staging areas and aerial application methods, sub-lethal effects from the direct exposure to herbicides, and changes in habitat and diet composition. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. NNIPS are considered a major threat to the greater sage-grouse (West and Young 2000, Knick et al. 2003), and this alternative may result in increased NNIPS presence in their habitat within the HTNF. The cumulative actions and the Proposed Action may yield minor cumulative effects on greater sage-grouse. However, these cumulative effects would not threaten the continued existence populations in the area.

Species	Determination[1]	Rationale (or refer to project documentation)
Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*)	MIIH	Columbian sharp-tailed grouse require low-elevation native shrub-grassland year-round. Abundant grass composition appears to be important within shrub/grassland communities during all life stages. Columbian sharp-tailed grouse are uncommon in Nevada and are generally found in the low-elevation shrub-grassland habitats of the state. Translocation efforts have mostly targeted the northern portion of the state (Matthews et al. 2021, Matthews et al. 2022). While there are no observations of Columbian sharp-tailed grouse in the state (USFS 2023a, GBIF 2023), suitable habitat for Columbian sharp-tailed grouse exists throughout the project area boundary. Effects from the Proposed Action could include visual and noise disturbance from staging areas and aerial application methods, sub-lethal effects from the direct exposure to herbicides, and changes in habitat and diet composition. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. NNIPS are considered a major threat to the Columbian sharp-tailed grouse (Wisdom et al. 2000), and this alternative may result in increased NNIPS presence in their habitat within the HTNF. The cumulative actions and the Proposed Action may yield minor cumulative effects on Columbian sharp-tailed grouse. However, these cumulative effects would not threaten the continued existence populations in the area.
Raptors Northern goshawk (*Accipiter gentilis*) Bald eagle (*Haliaeetus leucocephalus*) Golden eagle (*Aquila chrysaetos*) Flammulated owl (*Psiloscops flammeolus*) Great gray owl (*Strix nebulosa*) Peregrine falcon (*Falco peregrinus anatum*)	MIIH	Several raptor species are found in the project area. Northern goshawks, flammulated owls, and great gray owls breed in a variety of montane forest types. Golden eagles and peregrine falcons use a variety of habitat types and generally nest in cliffs, while bald eagles typically nest in large trees adjacent to water bodies. There are several observations for all raptor species within the project area, except for great gray owls. However, habitat for all species exists within the project area. Design elements included in the Proposed Action restrict aerial herbicide application within 0.25 miles of any active and likely active but unknown status raptor nests during the breeding season. Effects from the Proposed Action could include visual and noise disturbance from staging areas and aerial application methods, sub-lethal effects from the direct exposure to herbicides, and changes in habitat and prey species composition. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative. The cumulative actions and the Proposed Action may yield minor cumulative effects on raptors. However, these cumulative effects would not threaten the continued existence populations in the area.
Woodpeckers American three-toed woodpecker (*Picoides dorsalis*) White-headed woodpecker (*Dryobates albolarvatus*)	MIIH	Woodpecker species are found in mature coniferous forests within the project area. The American three-toed woodpecker is rare in Nevada; the range of the American three-toed woodpecker in Nevada is limited to the coniferous forests on the eastern side of the state (NatureServe 2024). There are no observations within the project area, but there are several nearby. The white-headed woodpecker is uncommon in Nevada; its range in Nevada is limited to the coniferous forests on the western side of the state (NatureServe 2024). The majority of observations within the project area have been around Reno and Lake Tahoe (GBIF 2023). Effects from the Proposed Action could include visual and noise disturbance from staging areas and aerial application methods, sub-lethal effects from the direct exposure to herbicides, and changes in habitat and prey species composition.

Species	Determination[1]	Rationale (or refer to project documentation)
		The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative. The cumulative actions and the Proposed Action may yield minor cumulative effects on woodpeckers. However, these cumulative effects would not threaten the continued existence populations in the area.
Butterflies Spring Mountain checkerspot (*Chlosyne acastus robusta*) Spring Mountains dark blue butterfly (*Euphilotes ancilla purpura* and *cryptica*) Morand's checkerspot (*Euphydryas anicia morandi*)	MIIH	These three butterfly species are endemic to the Spring Mountains in the southern portion of the project area. Habitat for the Spring Mountains checkerspot butterfly includes pinyon-juniper communities at lower elevations and white fir-ponderosa pine communities at higher elevations. Habitat for the dark blue butterflies includes open conifer woodlands above 5,250 feet in the Spring Mountains that contain their larval host plants, sulphur-flowered buckwheat *(Eriogonum umbellatum*). Morand's checkerspot butterfly has four main requirements for suitable habitat – the presence of their larval host and nectar plants, open areas with little tree canopy cover, and low grass cover (Thompson et al. 2014). The Spring Mountains encompass 243,983 acres within the project area boundary, and there is suitable habitat and observations of all three species throughout this portion of the project area. Design elements limit aerial application of herbicides and staging operations within known occupied habitat for these butterfly species. However, individuals or populations that are outside of these areas would be subject to aerial herbicide application. Effects from the Proposed Action include excess wind disturbance from aerial application methods and direct exposure and lethal and sub-lethal effects from the direct exposure to herbicides. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative. The cumulative actions and the Proposed Action may yield minor cumulative effects on butterflies. However, these cumulative effects would not threaten the continued existence populations in the area.
Migratory Birds	May impact individuals but will not affect the population across the forest	Migratory birds are found throughout the project area in every habitat. During aerial herbicide application, migratory birds would likely experience short-term impacts including visual and noise disturbance and sub-lethal effects from the direct exposure to herbicides. Migratory birds would likely avoid treatment areas during project implementation and be displaced to nearby habitat. Long-term impacts may include habitat loss and alteration and subsequent changes in forage or prey species. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. NNIPS are reducing habitat and forage quality and quantity for some migratory birds, and this alternative may result in increased NNIPS presence in their habitat within the HTNF. The cumulative actions and the Proposed Action may yield minor cumulative effects on migratory birds. However, these cumulative effects would not threaten the continued existence populations in the area.
Bonneville cutthroat trout (*Oncorhynchus clarkia utah*)	MIIH	The Bonneville cutthroat trout (*Oncorhynchus clarkii utah*) is a subspecies of cutthroat trout native to the Intermountain West (Bonneville Basin) of the United States, primarily found in Utah, Wyoming, Idaho, and Nevada. However, like many native trout species, its range has been significantly reduced due to habitat degradation, overfishing, and competition with non-native species. In Nevada the current distribution is a fraction of the historic distribution and is thought to be located only in White Pine County. The species is listed a sensitive species by the Forest Service.

Species	Determination[1]	Rationale (or refer to project documentation)
		Bonneville cutthroat trout occur in isolated populations within its historic range. Efforts have been made to restore and conserve populations through habitat restoration, stocking programs, and conservation efforts. Within the project Area, Bonneville cutthroat trout are isolated to four streams in eastern Nevada approximately 20 miles north of Baker, NV, White Pine County, NV. The species is native to the Bonneville Basin, located in much of western Utah, southern Idaho, and eastern Nevada. Currently the species is thought to be located in the eastern portion of White Pine County, Nevada. Bonneville cutthroat trout are thought to inhabit approximately 20 river kilometers (rkm) of habitat within the project Area. They are found in four streams including: Silver (~9.3 rkm), Smith (~4.8 rkm), Hampton (~3.1 rkm), and Hendrys (~2.5 rkm) creeks. Effects from the Proposed Action could include increased sedimentation and herbicide exposure, sub-lethal effects from the direct exposure to herbicides, and changes in habitat and diet composition. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative. The cumulative actions and the Proposed Action may yield minor cumulative effects on Bonneville cutthroat trout. However, these cumulative effects would not threaten the continued existence Bonneville cutthroat trout populations in the area.
Columbia spotted frog (*Rana luteiventris*)	MIIH	The Columbia spotted frog (*Rana luteiventris*) is a semi-aquatic frog species native to western North America. The Columbia spotted frog historically inhabited a range of habitats, including wetlands, ponds, lakes, streams, and riparian areas. It occurs from southern British Columbia and Alberta in Canada, southward through Washington, Oregon, Idaho, western Montana, and into Nevada. The species is found in Nye and Elko counties, Nevada within the project area. Columbia spotted frog are found within 46 watersheds within the project area. Columbia spotted frog occurred in 297 km of occupied habitat in the project area. Effects from the Proposed Action could include visual and noise disturbance from staging areas and aerial application methods, sub-lethal effects from the direct exposure to herbicides, and changes in habitat and diet composition. The No-Action alternative would not authorize aerial application of herbicides, but ground-based herbicide treatments would continue. There is likely to be no effect from the No-Action alternative. The cumulative actions and the Proposed Action may yield minor cumulative effects on Columbia spotted frogs. However, these cumulative effects would not threaten the continued existence Columbia spotted frog populations in the area.

[1] **NI** – no impact; **MIIH**- may impact individuals or habitat but will not likely contribute to a trend towards federal listing or loss of viability to the population or species; **WIFV** - will impact individuals or habitat with a consequence that the action may contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Table 21. Summary Determinations for Region 4 Sensitive Plant Species with the Potential to Occur Within the Project Area.

Species Scientific Name (Common Name)	Affected by Project?	Determination
Angelica scabrida (Rough angelica)	No [2]	NI
Antennaria arcuata (Meadow pussytoes)	Yes	MINT
Antennaria soliceps (Charleston Mountain pussytoes)	Yes	MINT
Arenaria kingii ssp. *rosea* (Rosy King's sandwort)	Yes	MINT
Asclepias eastwoodiana (Eastwood milkweed)	Yes	MINT
Astragalus aequalis (Clokey milkvetch)	Yes	MINT
Astragalus jejunus var. *jejunus* (Starveling milkvetch)	Yes	MINT
Astragalus johannis-howellii (Long Valley milkvetch)	Yes	MINT
Astragalus lentiginosus var. *kernensis* (Kern milkvetch)	No [2,3,4]	NI
Astragalus lentiginosus var. *latus* (Broad-pod freckled milkvetch)	Yes	MINT
Astragalus oophorus var. *clokeyanus* (Lee Canyon milkvetch)	Yes	MINT
Astragalus oophorus var. *lavinii* (Lavin's egg milkvetch)	Yes	MINT
Astragalus remotus (Spring Mountain milkvetch)	Yes	MINT
Astragalus robbinsii var. *occidentalis* (Lamoille Canyon milkvetch)	Yes	MINT
Astragalus toquimanus (Toquima milkvetch)	Yes	MINT
Astragalus uncialis (Currant milkvetch)	Yes	MINT
Boechera bodiensis (Bodie Hills rockcress)	Yes	MINT
Boechera nevadensis (Spring Mountains rockcress)	No [4]	NI
Boechera ophira (Ophir rockcress)	Yes	MINT
Boechera rectissima var. *simulans* (Washoe tall rockcress)	Yes	MINT
Boechera rigidissima var. *demota* (Galena Creek rockcress)	Yes	MINT
Boechera tiehmii (Tiehm rockcress)	No [3]	NI
Botrychium ascendens (Upswept moonwort)	No [2]	NI
Botrychium crenulatum (Scalloped (or dainty) moonwort)	No [2]	NI
Botrychium lineare (Slender moonwort)	Yes	MINT
Botrychium tunux (Moosewort)	No [4]	NI
Bryum calobryoides (Bryum moss)	No [5]	NI
Carex tiogana (Tioga Pass sedge)	No [5]	NI
Claytonia panamintensis (Panamint spring beauty)	Yes	MINT
Cusickiella quadricostata (Bodie Hills cusickiella)	Yes	MINT
Cymopterus goodrichii (Goodrich biscuitroot)	No [4]	NI
Draba arida (Arid draba)	No [4]	NI
Draba asterophora var. *asterophora* (Star draba)	No [4]	NI

Species Scientific Name (Common Name)	Affected by Project?	Determination
Draba brachystylis (Wasatch draba)	No [4]	NI
Draba jaegeri (Jaeger draba)	No [3,4]	NI
Draba paucifructa (Charleston draba)	No [3,4]	NI
Draba pennellii (Pennell draba)	No [2,3,4]	NI
Draba serpentina, Draba oreibata var. *serpentina* (Serpentine draba)	No [4]	NI
Epilobium nevadense (Nevada willowherb)	Yes	MINT
Epipactis gigantea (Giant helleborine)	No [2]	NI
Eremogone kingii var. *glabrescens* (King's sandwort)	Yes	MINT
Ericameria compacta (Spring Mountain goldenweed)	Yes	MINT
Erigeron uncialis var. *uncialis* (formerly *Erigeron cavernensis*) (Limestone daisy)	No [3,4]	NI
Eriogonum douglasii var. *elkoense* (Sunflower Flat buckwheat)	Yes	MINT
Eriogonum esmeraldense var. *toiyabense* (Toiyabe buckwheat)	Yes	MINT
Eriogonum heermannii var. *clokeyi* (Clokey buckwheat)	Yes	MINT
Eriogonum lewisii (Lewis' buckwheat)	Yes	MINT
Eriogonum luteolum var. *saltuarium* (Goldencarpet buckwheat)	No [5]	NI
Eriogonum ovalifolium var. *eximium* (Brownmargin buckwheat)	Yes	MINT
Eriogonum robustum (Altered andesite buckwheat)	Yes	MINT
Eriogonum rosense var. *beatleyae* (Beatley's buckwheat)	Yes	MINT
Erythranthe carsonensis (Carson valley monkeyflower)	Yes	MINT
Glossopetalon clokeyi (Clokey greasebush)	No [2,4]	NI
Glossopetalon pungens var. *glabra* (Smooth dwarf greasebush)	No [2,4]	NI
Ipomopsis congesta ssp. *nevadensis* (Toiyabe gilia)	Yes	MINT
Ivesia aperta var. *aperta* (Sierra Valley ivesia)	Yes	MINT
Ivesia aperta var. *canina* (Dog Valley ivesia)	Yes	MINT
Ivesia cryptocaulis (Charleston ivesia)	No [2,3]	NI
Ivesia jaegeri (Jaeger ivesia)	No [2,4]	NI
Ivesia sericoleuca (Plumas ivesia)	No [5]	NI
Jamesia tetrapetala (Basin jamesia)	No [3,4]	NI
Lathyrus grimesii (Grimes' vetchling)	Yes	MINT
Lewisia maguirei (Maguire bitterroot)	Yes	MINT
Meesia triquetra (Three-ranked hump-moss)	No [2]	NI
Orthotrichum shevockii (Shevock rockmoss)	No [4]	NI
Orthotrichum spjutii (Spjut's brittle-moss)	No [5]	NI
Penstemon arenarius (Dune penstemon)	Yes	MINT
Penstemon concinnus (Tunnel Springs beardtongue)	Yes	MINT

Species Scientific Name (Common Name)	Affected by Project?	Determination
Penstemon fruticiformis ssp. *amargosae* (Death Valley beardtongue)	Yes	MINT
Penstemon leiophyllus var. *keckii* (Charleston beardtongue)	Yes	MINT
Penstemon moriahensis (Mount Moriah beardtongue)	Yes	MINT
Penstemon palmeri var. *macranthus* (Scented beardtongue)	Yes	MINT
Penstemon pudicus (Bashful beardtongue)	Yes	MINT
Penstemon rhizomatosus (Rhizome beardtongue)	No [3,4]	NI
Penstemon rubicundus (Wassuk beardtongue)	Yes	MINT
Penstemon thompsoniae ssp. *jaegeri* (Jaeger beardtongue)	Yes	MINT
Phacelia inconspicua (Inconspicuous scorpion-weed)	Yes	MINT
Phacelia minutissima (Small-flower phacelia)	Yes	MINT
Phacelia monoensis (Mono phacelia)	Yes	MINT
Physaria hitchcockii ssp. *confluens* (Quinn Canyon bladderpod)	Yes	MINT
Physaria hitchcockii ssp. *hitchcockii* (Hitchcock bladderpod)	No [3,4]	NI
Plagiobothrys glomeratus (Altered andesite popcorn flower)	Yes	MINT
Poa abbreviata ssp. *marshii* (Marsh’s bluegrass)	No [3,4]	NI
Polemonium chartaceum (White Mountain sky pilot)	Yes	MINT
Polemonium nevadense (Nevada Jacob's ladder)	Yes	MINT
Polyctenium williamsii (Williams combleaf)	Yes	MINT
Potentilla johnstonii (Sagebrush cinquefoil)	Yes	MINT
Primula capillaris (Ruby Mountain primrose)	Yes	MINT
Primula nevadensis (Syn. *Primula cusickiana* var. *nevadense*) (Nevada primrose)	Yes	MINT
Senecio pattersonensis (Mono ragwort)	Yes	MINT
Silene clokeyi (Clokey silene)	No [3,4]	NI
Silene nachlingerae (Nachlinger’s catchfly)	Yes	MINT
Sphaeralcea caespitosa var. *williamsiae* (Jones’ globemallow)	Yes	MINT
Sphaeromeria compacta (Charleston sphaeromeria)	No [3,4]	NI
Streptanthus oliganthus (Masonic Mountain jewelflower)	Yes	MINT
Synthyris ranunculina (Charleston kittentails)	No [3]	NI
Tonestus alpinus (Alpine goldenweed)	Yes	MINT
Townsendia jonesii var. *tumulosa* (Charleston ground daisy)	Yes	MINT
Trifolium andinum var. *podocephalum* (Currant Summit clover)	Yes	MINT
Trifolium leibergii (Leiberg clover)	Yes	MINT
Trifolium rollinsii (Rollins clover)	Yes	MINT
Viola charlestonensis (Charleston violet)	Yes	MINT
Viola lithion (Lithion violet)	No [3]	NI

[1] NI Determination: No impact to individuals or populations of this species. MINT Determination: May impact individuals but not likely to cause a trend to federal listing or loss of viability for this species.

[2] Occur in habitats protected by design elements.

[3] Only known to occur in designated wilderness areas.

[4] Occur in habitats unlikely to be treated with aerial spraying.

[5] Only known to occur on the HTNF in California.

Supporting Project Documentation

Table 22. Applicable Project File Documentation to Support Analysis.

Documentation Type	File Name (if applicable/needed)
Biological Evaluations	HTNF_BE_Wildlife_Final.pdf HTNF_BE_Aquatics_Final.pdf HTNF_BE_Botany_Final.pdf

National Historic Preservation Act – Section 106 Review

The pertinent specialist has reviewed the Proposed Action and made the following determination regarding Section 106 compliance:

Other - See explanation of other determination in comments section.

Comments

The Proposed Action constitutes a federal undertaking pursuant to Section 106 of the NHPA and its implementing regulations, as amended (36 CFR 800). Pursuant to NEPA and Section 106 compliance, as the lead agency for the project, the HTNF is required to consider effects on cultural resources from the undertaking. While general effects are considered within this document, more detailed analysis is necessary as implementation areas are designed. In order to phase analysis and compliance with the periodic development of implementation projects, the HTNF will utilize the Phasing NPA to comply with Section 106 of the NHPA. The HTNF will develop a HIP under the Phasing NPA in consultation with Tribes, SHPO, and other consulting parties that will define how the Forest Service will consider effects to historic properties during implementation of the project. Compliance efforts conducted in the future will follow stipulations of the HIP.

Direct effects determined to be adverse under NEPA and NHPA would necessitate avoidance, minimization, or mitigation. Upon development of implementation projects, the HTNF will address the need for identification of cultural resources, ensure consideration of effects on historic properties within the APE, and direct the avoidance, minimization, and mitigation measures to resolve any potential adverse effects as per the project HIP. Design elements supporting the avoidance and minimization of effects to cultural resources include:

- Staging of associated ground-support equipment [for aerial application] will be located outside of known historic property boundaries (including unevaluated resources) and will not cause new disturbance or be located outside of previously disturbed areas (i.e., existing roads and pull-outs, developed sites).
- Coordination with the appropriate Forest Service archaeologist prior to aerial application to allow for Section 106 consultation and inventory. Coordination should begin at least six months prior to finalizing treatment plans.
- Utilization of less-impactful application methods where sensitive cultural resources are located. As part of the early coordination efforts, the appropriate Forest Service

archaeologist will determine whether an alternative application method is more appropriate for the project.

When implemented, these design elements can avoid or minimize direct effects to cultural resources within the APE. Other measures for avoidance, minimization, and mitigation for resolving adverse effects will be addressed prior to implementation of individual treatment projects, as determined by the HIP or described in the FONSI.

Consultation with Federally Recognized Tribes

Consultation with federally recognized tribes was conducted as follows:

Government-to-Government Tribal Consultation

Federal agencies, including the HTNF, are required by statute and regulation to consult with Native American Tribes on a Government-to-Government basis on federal actions or undertakings that may affect cultural and natural resources of concern to Tribes. Government-to-Government consultation requires agencies to seek, discuss, and consider Tribes' views on policies, undertakings, and decisions such as this EA. Formal Government-to-Government consultation will commence as individual projects are proposed for implementation and in accordance with project-specific implementation plans.

Consultation and Coordination

The HTNF is required to prepare this EA in coordination with analyses required by the NHPA. In accordance with Section 106 of the NHPA, the HTNF is required to conduct meaningful consultation with SHPOs, tribal historic preservation offices, Native American Tribes, and other consulting parties during all phases of the Section 106 process.

The HTNF contacted Native American Tribes to provide information on the project and to initiate coordination on the EA analysis. A list of Tribes contacted by the HTNF are included in Table 23.

The HTNF has received correspondence from the following Tribes regarding potential effects from the Proposed Action: Battle Mountain Shoshone Tribe, Fort Independence Indian Reservation, Summit Lake Tribe, Walker River Paiute Tribe, and the Washoe Tribe of Nevada and California. Currently, the Tribes have expressed interest in the analysis of pesticide and herbicide use, including the potential impacts on insects, wildlife, and/or water sources; the potential for impacts to pinenut harvesting; and the safety levels of herbicides for native versus non-native consumption. Additionally, the Walker River Paiute Tribe requested a 300-foot buffer be applied to pinyon gathering zones to avoid overspray. The Tribe also requested an exposure pathway study be conducted for hunters in the area.

Table 23. Native American Tribes Contacted for Consultation and Coordination.

Antelope Valley Indian Community—Coleville Paiute Tribe	Las Vegas Paiute Tribe
Battle Mountain Shoshone Tribe	Lone Pine Paiute-Shoshone Reservation
Benton Paiute Tribe	Lovelock Paiute Tribe
Big Pine Paiute Tribe of Owens Valley	Moapa Band of Paiute
Bishop Paiute Indian Tribe	Mono Lake Kutzadikaa Tribe
Bridgeport Paiute Indian Colony	Mooretown Rancheria of Maidu Indians
California Indian Basketweavers Association	Paiute Indian Tribe of Utah

Cedar Band of Paiute Indians of Utah	Pyramid Lake Paiute Tribe
Chemehuevi Tribe	Reno-Sparks Indian Colony
Chicken Rancheria Tribal Council	Shivwits Band of the Paiute Indian Tribe of Utah
Colorado River Indian Tribes	Shoshone-Bannock Tribes
Duck Valley Shoshone-Paiute Tribe	South Fork Band Council
Duckwater Shoshone Tribe	Summit Lake Paiute Tribe
Elko Band of Shoshone	Susanville Indian Rancheria
Ely Shoshone Tribe	Te-Moak Tribal Council
Fallon Paiute-Shoshone Tribe	Timbisha-Shoshone Tribe
Ft. McDermitt Paiute-Shoshone Tribe	Tuolumne Band of Me-Wuk Indians
Fort Mojave Tribe	Walker River Paiute Tribe
Ft. Independence Community of Paiute Indians	Washoe Tribe of Nevada and California
Indian Peaks Band of Paiute Indians of Utah	Wells Band Indian Colony
Kaibab Band of Paiute Indians	Winnemucca Indian Colony
Kanosh Band of the Paiute Indians of Utah	Yomba Shoshone Tribe

Supporting Project Documentation

Table 24. Applicable Project File Documentation to Support Analysis.

Documentation Type	File Name (if applicable/needed)
Scoping Report	HTNF_Aerial_Herbicide_Draft_Scoping_Report_11-29-2023.pdf

Special Management Areas

The pertinent specialist has reviewed the Proposed Action and made the following determinations based on special management area presence, proximity, or lack of (Table 25):

Table 25. Special Management Area Compliance Determinations.

Management Area Type (Wilderness, Roadless, Wild and Scenic Rivers, etc.)	Applicable Law / Regulation to Demonstrate Compliance With	Rationale for Compliance
Wilderness	The Wilderness Act (16 U.S.C. 1131-1136)	Wilderness areas will not be identified for treatment using aerial application of herbicide per the project design elements.
Inventoried Roadless Areas	2001 Roadless Rule	Project design elements govern that the use of ground support vehicles would be limited to designated NFS roads or previously disturbed locations adjacent to designated NFS roads. No new roads will be built.
Wild and Scenic Rivers	The Wild and Scenic Rivers Act (Public Law 90-542 October 2, 1968)	Lands within 0.25 miles of eligible and designated Wild and Scenic Rivers will not be identified for treatment using aerial application of herbicide per the project implementation plans.

Management Area Type (Wilderness, Roadless, Wild and Scenic Rivers, etc.)	Applicable Law / Regulation to Demonstrate Compliance With	Rationale for Compliance
Forest Service Research Natural Areas	Forest Service Manual (FSM) 4063	Research Natural areas will not be identified for treatment using aerial application of herbicide per the project design elements.
Developed Recreation Areas	Forest Service Manual (FSM) 2100, Chapter 2150	Lands within 300 feet of developed recreation areas will not be identified for treatment using aerial application of herbicide per the project design elements.

Supporting Project Documentation

Table 26. Applicable Project File Documentation to Support Analysis.

Documentation Type	File Name (if applicable/needed)
Applicable design elements	Appendix A of the EA

Clean Air Act

The pertinent specialist has reviewed the Proposed Action and made the following determinations regarding the Clean Air Act:

The Clean Air Act (1970) is the comprehensive federal law that regulates all sources of emissions. The Clean Air Act authorized the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment. The Clean Air Act places much of the responsibility for preventing and controlling air pollution on the states. Each state must adopt a state implementation plan to administer certain air quality programs, and have it approved by the EPA, which ensures consistency among state programs and compliance with federal regulations. The state implementation plan focuses on the six criteria air pollutants: ground-level ozone, particulate matter, lead, nitrogen dioxide, carbon monoxide, and sulfur dioxide. In 1977, amendments were added to the Clean Air Act that set more rigorous requirements for reducing emissions in areas that do not meet the NAAQS and established “prevention of significant deterioration” regulations for areas meeting the NAAQS.

Additional amendments to the Clean Air Act in 1977 identified and defined Federal Class I Areas which are national parks over 6,000 acres, memorial parks over 5,000 acres, and designated wilderness areas. Class I Areas have the greatest regulatory protection against man-made degradation of air quality (regional haze). The 1977 amendments gave federal land managers an “affirmative responsibility” to protect air quality related values, including visibility, in Class I areas from the adverse impacts of air pollution. EPA’s Regional Haze Rule (July 1, 1999) requires states to establish goals that provide for reasonable progress towards achieving natural visibility conditions for each Class I area within a state by 2064.

Aerial application of herbicides would not affect the ability of the State of Nevada, Clark County, or Washoe County to achieve or remain within NAAQS for criteria pollutants. While vehicles used for the treatment program would contribute incrementally to vehicle emissions within the state, the emissions would not be sufficient in themselves to cause violation of NAAQS. Herbicides that would be applied through aerial application are not large contributors to atmospheric pollutants and design elements would prevent application during sustained wind events and inversions. Aerial application would not add any new, on-going emissions point sources that would require State of Nevada emissions permitting for sources that have the potential to affect Class I airsheds. For these reasons, the Proposed Action complies with the Clean Air Act.

The air quality impact assessment in the EA provides additional details.

Clean Water Act

The pertinent specialist has reviewed the Proposed Action and made the following determination:

The Clean Water Act (CWA) is the primary Federal law that regulates the protection of the nation's water. The CWA (33 USC. 1251 et seq.) regulates the discharge of pollutants into the waters of the United States and sets quality standards for surface waters. The primary objective of the Act is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The United States Environmental Protection Agency (EPA) and state's enforce violations of the Clean Water Act through civil enforcement and criminal prosecution. A stated goal of the CWA is to eliminate discharge of pollutants into navigable waters as the term is defined in CWA S 502(7) and corresponding case law.

A 2007 Memorandum of Agreement (MOA) between the EPA and the Forest Service formalized the working relationship to protect water quality on National Forest System lands. The MOA outlined roles and responsibilities for addressing point and non-point sources of pollution, implementing best management practices, and ensuring compliance with water quality standards. It also agreed that agencies would jointly monitor water quality and report on water quality progress (USFS 2007).

The project proposes to manage NNIPS using aerial application of herbicides. NNIPS are currently replacing native species and subsequently degrading soil health and reducing the amount of protective surface cover. Use of herbicide to remove NNIPS would temporarily decrease protective cover over the short term and subsequently increase potential for erosion and sedimentation to occur. Potential for water quality pollution from herbicides would exist, although design elements, manufacturer recommendations, and computer modeling all indicate this risk would be very low. The long-term benefit of reestablishing native species would include improvements in soil chemistry, microbial populations, and surface vegetation cover.

GLEAMS modeling shows a violation of the drinking water standard for 2, 4_D amine in areas with clay soil and precipitation levels of 25 inches or greater (SERA 2006). However, few areas exist on the Forest that have soils with high clay content. Areas receiving 25 inches of precipitation or more are located at high elevations that do not have communities of NNIPS that require herbicide application. Therefore, it is unlikely these areas would receive aerial herbicide treatment.

Supporting Project Documentation

Table 27. Applicable Project File Documentation to Support Analysis.

Documentation Type	File Name (if applicable/needed)
Risk Assessment Report	SERA 2006_2,4-D_HumanHealthAndEcoRiskAssessment.pdf

Pertinent Executive Orders

The responsible official and/or applicable specialist(s) have determined the Proposed Action is in compliance with the following Executive Orders (EO), which were deemed pertinent based on the nature of the project:

EO 11593, Protection and Enhancement of the Cultural Environment – This EO, signed in 1971, furthers the National Environmental Policy Act of 1969 (NEPA), the NHPA of 1966, and the Antiquities Act of 1906 by requiring federal agencies to administer cultural properties under their control and direct their policies so that federally owned sites, structures, and objects of historical, architectural, or archeological significance are preserved, restored, and maintained. To achieve this goal, federal agencies must review properties under their jurisdiction and nominate properties that qualify for listing on the NRHP. If any Federal action planned will substantially alter or demolish a property listed on the NRHP, federal agencies must make detailed records of the property and deposit those records in the Library of Congress for future use. Federal agencies must annually prepare and submit to the Secretary of the Interior and the ACHP procedures to provide for the maintenance, preservation, and restoration of federally owned sites. The EO also enumerates responsibilities of the Secretary of the Interior regarding such properties.

EO 11988, Floodplain Management – Guides management and project planning on Forest land that may impact floodplains. Agencies are required to avoid adverse impacts on floodplains unless there are no practicable alternatives. Floodplains would be determined using a HUD floodplain map or a more detailed map if available. Design elements require a buffer of 300 feet between application areas and all surface water features including lakes, ponds, springs, rivers, streams, and wetlands. Based on the location and type of surface water features on the Forest, the potential for floodplains to extend beyond the buffer is unlikely. Herbicide treatment plans will be adjusted to avoid any floodplains that exceed 300 feet from live water.

EO 11990, Protection of Wetlands – Avoid actions within wetlands unless there are no practical alternatives, and the action includes all practicable means to minimize harm to wetlands. Design elements require a 300 ft. buffer between application areas and wetland areas.

EOs 12898, 13985, 14008, and 14096, plus the 2023 CEQ Climate Change Guidance, Environmental Justice – identify and address disproportionately high and adverse effects on minority and low-income populations.

The Forest Service identified locations potentially affected by its activities where the population may be described in part by underserved, disadvantaged, or over-burdened characteristics which exist primarily within communities that have lower incomes or higher proportions of people of color. Because these communities with environmental justice (EJ) concerns already experience disproportionate and adverse human health or environmental burdens, federal agencies are tasked with meaningfully involving them in decision-making and avoiding or minimizing adverse effects to them.

For this evaluation, minority refers to people who identified themselves in the census as Black or African American, Asian, Hawaiian or Pacific Islander, American Indian or Alaskan Native, other non-White races, or as being of Hispanic or Latino origin. Persons of Hispanic and Latino origin may be of any race (CEQ 1997). The CEQ identifies these groups as minority populations when either (1) the minority population of the affected area exceeds 50 percent or (2) the minority population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or the geographic region of comparison (most often the State in which the affected area is part of). The geographical unit for comparison in this analysis is the State of Nevada. Project area covers 13 counties out of a total of 17 counties in the state of Nevada. Counties where project implementation are likely to occur are Humboldt, Washoe, Carson, Douglas, Elko, White Pine, Lander, Eureka, Nye, Clark, Lyon, Lincoln, and Mineral counties.

According to most recent Census estimates, 51 percent of the population of the state of Nevada is White (Table 28). Persons of Hispanic or Latino origin were identified as the single largest minority group, accounting for 28 percent of the total population. Much of the other counties within the project area share similar demographics except for Clark County which shows that only 40 percent of the population is white (Table 28). Persons of Hispanic or Latino origin were also identified as the single largest minority group at 32 percent of the total population. The total minority share of the population within Clark County combine to equal 60 percent of the total population therefore meeting the definition of a minority population. American Indian reservation lands and tribal communities exist near and adjacent to the project area. To respect Tribal sovereignty and self-government and to fulfill Federal trust and treaty responsibilities to Tribal Nations, lands within the boundaries of Federally Recognized Tribes are considered disadvantaged communities for the purposes of the Justice40 Initiative. Lands of Federally Recognized Tribes exist within the boundaries of all 13 counties in the project area.

Table 28. Minority Population and Persons Living Below Poverty Level in and Adjacent to the Humboldt-Toiyabe National Forest within Nevada (EPA EJScreen 2020).

Location	Minority persons (% of entire population) (EPA EJScreen 2020)	Persons living below poverty level (% of entire population) (US Census Bureau)
Carson City County	36	11.2
Clark County	60	13.1
Douglas County	22	7.5
Elko County	36	10.4
Eureka County	17	17.6
Humboldt County	36	14.3
Lander County	31	10.8
Lincoln County	16	7.2
Lyon County	28	10.4
Mineral County	43	18.5
Nye County	29	15.3
Washoe County	40	10.2
White Pine County	29	9.2
State of Nevada	49	12.5
United States	38	12.6

Poverty and Income Demographics (US Census Bureau)

The estimated total households below the poverty level in Nevada is 12.8 percent. Median income within the state is $72,333. Mineral County is identified as a low-income population due to higher poverty rates at 18.5 percent and a lower median household income of $46,625 which is 46 percent less than the state median. Nye County is identified as a low-income population due to higher poverty rates at 15.3 percent (Table 28) and a lower median household income of $53,602 which is 37 percent less than the state median. Clark County is identified as a low-income population due to higher poverty rates than the state at 13.1 percent and a lower median household income of $70,797 which is only three percent less than the state median. Some counties like Humboldt and Eureka experience higher poverty rates than the state but also have higher median household incomes. Carson, White Pine, Lyon, and Lincoln counties have lower median household incomes than the state but also have lower poverty rates.

The Cultural Resource and Native American Resource sections of this EA discuss potential impacts of the project to Tribal populations and impact reduction actions are described in the design elements (Appendix A) and will be further analyzed through implementation plans (see the Implementation Plan Template in Appendix C). The Public Health and Safety section of this EA discusses the potential impacts of the project to herbicide application workers, sensitive populations, and the general public. Design elements are actions and practices designed into the Proposed Action to reduce negative impacts of the proposed project activities on humans and the environment. Impacts due to herbicide exposure from the Proposed Action would be minimal when the design elements are followed.

Tribal consultation and coordination have been conducted for this project and will continue to be conducted throughout the treatment implementation plan creation process as described in the design elements. Public meetings and other forms of coordination with the public for this Project have been open to all interested parties regardless of their race, ethnicity, and income. Treatment implementation plan creation will involve coordination with the public on a local scale.

EO 13007, Indian Sacred Sites – This EO directs federal land-managing agencies to accommodate Native Americans' use of sacred sites for religious purposes and to avoid adversely affecting the physical integrity of sacred sites. Federal agencies managing lands must implement procedures to ensure reasonable notice where an agency's action may restrict ceremonial use of a sacred site or adversely affect its physical integrity.

EO 13175, Consultation and Coordination with Indian Tribal Governments – This EO establishes regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, to strengthen the United States Government-to-Government relationships with Indian tribes, and to reduce the imposition of unfunded mandates upon Indian tribes. This order revokes the preceding EO 13084 – Consultation and Coordination with Indian Tribal Governments.

EO 13186, Migratory Birds – Under the National Forest Management Act (NFMA), the Forest Service is directed to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives.” (P.L. 94-588, Sec 6 (g) (3) (B)). Direction for integrating migratory bird conservation into forest management and planning includes the January 2000 USDA Forest Service Landbird Conservation Strategic Plan; the Partners in Flight (PIF) Landbird Conservation Plans; and the 2001 EO13186.

According to the 2008 “Memorandum of Understanding between the USDA Forest Service and the U.S. Fish and Wildlife Service to Promote the Conservation of Migratory Birds,” the Forest Service shall “consider approaches, to the extent practicable, for identifying and minimizing take that is incidental to otherwise lawful activities” (USFS & USFWS 2008). Within the National Forests, migratory bird conservation focuses on providing a diversity of bird habitats at multiple spatial and temporal scales over the long term.

This project focuses on reducing the levels of NNIPS populations, which are decreasing habitat and forage quantity and quality for wildlife and increasing fire frequency. During aerial herbicide application, migratory birds would likely experience short-term impacts including visual and noise disturbance and direct exposure to herbicides. Migratory birds would likely avoid treatment areas during project implementation and be displaced to nearby habitat. Long-term impacts may include habitat loss and alteration and subsequent changes in forage or prey species. However, the Proposed Action would likely result in long-term benefits to migratory bird habitat by reducing NNIPS populations and reducing fire frequency.

No significant adverse effects to migratory bird habitat are expected. Overall, the long-term benefits of Proposed Action on wildlife habitat for migratory bird populations would outweigh short term adverse effects to a small number of individuals.

Supporting Project Documentation

Table 29. Applicable Project File Documentation to Support Analysis.

Documentation Type	File Name (if applicable/needed)
Executive Order	Executive Orders 11988 Floodplain Management.pdf
Executive Order	Executive Order 11990 Protection of Wetlands.pdf
Executive Order	Executive Order 11593 Protection and Enhancement of the Cultural Environment.pdf

Documentation Type	File Name (if applicable/needed)
Executive Order	Executive Order 13007 Indian Sacred Sites.pdf
Executive Order	Executive Order 13175 Consultation and Coordination with Indian Tribal Governments
CEQ Guidance	Ej_guidance_nepa_ceq1297.pdf
US Census Bureau Report	Selected Economic Characteristics – DP03.pdf
US Census Bureau Report	Income in Past 12 months – S1901.pdf
US Census Bureau Report	Total Population – P1.pdf
US Census Bureau Report	Hispanic or latino and not hispanic or latino by race – P9.pdf
EPA Environmental Justice Screening Tool County Reports	Carson City, Clark, Douglas, Elko, Eureka, Humboldt, Lander, Lincoln, Lyon, Mineral, Nye, Washoe, White Pine (PDFs)

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NEPA: Finding of No Significant Impact (FONSI)

The Finding of No Significant Impact documents the reasons why an action, not otherwise categorically excluded, will not have a significant effect on the human environment and for which an environmental impact statement therefore will not be prepared. The Finding of No Significant Impact discussion considers all information included in the EA, including the Potentially Affected Environment, as well as documentation in the project record. Pertinent specialists have reviewed the proposal and based on their input, the responsible official made the following determinations with regards to the potentially affected environment and degree of effects considered for a Finding of No Significant Impact.

Degree of Effect

The following effects (or impacts) discussions focus on changes to the human environment from the Proposed Action (or alternative) that are reasonably foreseeable and have a reasonably close causal relationship to the Proposed Action or alternative, including those effects that occur at the same time and place as the Proposed Action (or alternative) and may include effects that are later in time or farther removed in distance from the Proposed Action or alternative.

1. Both Short- and Long-term Effects; Beneficial and Adverse Effects

The interdisciplinary team participated in development of the Proposed Action, including design elements (Appendix A) and implementation plans (Appendix C), to ensure that the project complies with law, regulation, policy, and the Forest Plan (as documented in the sections above). As described in the previous sections, the effects would be within standards set forth by the forest plan, and consistent with applicable environmental laws.

The analyses documented in the Other Law, Regulation, and Policy Consistency section of the EA describe the short- and long-term, beneficial and adverse direct, indirect, and cumulative effects of the Proposed Action. The short-term effects associated with the Proposed Action would occur at the treatment area level. In general, the adverse effects stem from the introduction of increased amounts of herbicides across the HTNF, while beneficial effects stem from limiting or eradicating the spread of non-native invasive plant species (NNIPS) across the HTNF. The disclosures in the EA are framed to show the potential impact of aerial application of herbicides on the resources. These impacts include soil contamination and erosion, degraded water quality, damage to native vegetation, direct exposure of wildlife and livestock to herbicides, disturbance to wildlife and livestock, terrestrial and aquatic habitat alteration, exposure of application workers and the public to herbicides, temporary recreation closures, temporary air quality impacts, and increased greenhouse gas emissions.

Applying herbicide to treat NNIPS has the potential to affect the human environment in several different ways. Contamination of water is a concern as are the potential impacts to terrestrial and aquatic species. Public comments expressed concern for human health and safety. The Nevada State Historic Preservation Office expressed concerns regarding the impacts on the setting and feeling at unevaluated and potentially significant historic properties. In addressing these concerns, the HTNF developed design elements (Appendix A) to minimize or avoid impacts during implementation.

After disclosing these potential impacts, the EA continues to describe how elements of the Proposed Action, including design elements, reduce the intensity of potential impacts by limiting disturbance of sensitive areas, avoiding aerial application of herbicides in areas with vulnerable wildlife species and livestock, preventing exposure of application workers and the public to herbicides, avoiding degradation of water quality, and protecting native vegetation and cultural resources. Implementation plans (Appendix C) will further reduce potential adverse effects by evaluating specific aerial herbicide application treatment at a smaller site-specific scale within the project area, considering the specific environmental conditions and the resources therein that could be affected by each aerial herbicide application treatment, and including procedures for closing treatment areas to public access and to post signage at public access points notifying the public of planned and recently treated areas.

NNIPS treatment projects intended to contain and control large infestations would over time reduce the size of infestations and allow native species to compete for water, nutrients, and light. In the long-term, as more areas are treated across the Forest, the cumulative beneficial effects of multiple treatments across the Forest will reduce the availability of the fine flashy fuels which support large, uncharacteristic wildfires, restore ecological health and diversity to vegetation communities and wildlife habitats degraded by NNIPS.

Of the 5.6 million acres that encompass the potentially affected environment, it is likely that during any given year no more than 10,000 to 20,000 acres would be treated, and fewer than five treatments would be conducted per year across the Forest. Taking the high range as an example, 20,000 acres of 5.6 million acres represents less than one half of one percent of the area available for treatment. Aerial herbicide application would increase the forest's ability to treat NNIPS infestations, but progress would be measured in very small increments. The potential short- and long-term effects of implementation would as a result be small and limited to discreet areas across the very large landscape of the National Forest.

The number of acres treated over the life of this decision will always be far exceeded by the number of NFS lands that are available for treatment but not treated because NNIPS populations may not be present, there are high priority areas elsewhere on the Forest, or resource concerns outweigh the need to conduct aerial herbicide application.

2. Effects on Public Health and Safety

The analysis documented in the Public Health and Safety section of the Environmental Impacts in the EA describes the potential impact of the Proposed Action on public health and safety. No treatment would occur where visitors are present in the treatment areas. Treatments would be suspended until all visitors have moved out of the area. Implementation plans would close treatment areas to the public and notify the public before treatments. However, it is possible that some adverse impacts could occur to the public or herbicide application workers as a result of the Proposed Action. Implementation plans and design elements would limit the scale and intensity of these effects. These effects could include application workers coming into contact with herbicides being used, forest users unintentionally exposed to herbicides during aerial application, coming into contact with recently sprayed vegetation, or gathering and consuming forest products that have been recently treated with herbicide, sprays, dusts, and/or vapors carried by the wind and deposited on unintended areas, particularly when the unintended areas are sensitive (e.g., homes, schools, playgrounds, agricultural areas, unintended vegetation and streams and other water bodies), and herbicides infiltrating into ground water or surface water systems that feed drinking water supplies.

When considering the acute and chronic toxicity characteristics of the proposed herbicides and the proposed implementation plans for aerial applications, risks to humans associated with the project would be minimal when the design elements are followed.

3. Effects that Would Violate Federal, State, or Local Law Protecting the Environment

The Proposed Action, along with the specific design elements, complies with the management direction for recreation provided in the respective Land and Resource Management Plans (Forest Plans) for the HTNF (USFS 1986a, as amended, USFS 1986b, as amended). The Proposed Action has been considered for compliance with applicable federal, state, tribal and local laws. See determinations above, including in Other Law, Regulation, and Policy Consistency section.

Mitigation

Implementation plans and design elements would reduce the scale and intensity of the adverse effects detailed above.

The Proposed Action, along with the specific design elements, complies with the management direction for recreation provided in the respective Land and Resource Management Plans (Forest Plans) for the HTNF (USFS 1986a, as amended; USFS 1986b, as amended).

Implementation Plans

Due to the large size and long timeframe of this project, the Proposed Action activities would include implementation plans, which would evaluate specific aerial herbicide application treatment at a smaller site-specific scale within the project area and would occur over a defined timeframe. Implementation plans for the project includes procedures for closing treatment areas to public access and to post signage at public access points notifying the public of planned and recently treated areas. Risks of public exposure to herbicides from aerial applications will be minimal with implementation of the implementation plan.

The implementation plan would consider the specific environmental conditions and the resources therein that could be affected by each aerial herbicide application treatment. Such considerations would be evaluated by an interdisciplinary team of experts that would contribute to the completion of the Implementation Plan Template (Appendix C). The implementation plan would need to be completed prior to the initiation of any and all aerial application treatments. The objectives of the implementation plan are to consider the impacts of an aerial herbicide application on natural resources and human health and safety in order to promote the native ecosystem functions of a landscape through the removal of NNIPS, while also mitigating any potential adverse impacts through adherence to herbicide label requirements, stringent safety measures, and design elements developed for specific resource protections.

Specific management prescriptions involved aerial herbicide applications would be identified and refined through the completion of the implementation plans and will incorporate direction from the forest-level NEPA decision and consultation with the United States Fish and Wildlife Service (USFWS) and the Nevada State Historic Preservation Officer. Each implementation plan would include an objective, timeline, treatment(s), management strategy, and potential partners (if applicable). A monitoring section will be incorporated into each implementation plan to determine herbicide effectiveness and compliance with design elements (Appendix C).

Design Elements

Design elements (Appendix A) would be used to govern how, when, and where aerial application would be used to treat NNIPS in a treatment area. The design elements provide additional parameters that would protect physical, biological, and social/cultural resources of concern.

Ground support vehicles would be limited to previously disturbed locations adjacent to designated NFS roads and outside of known historic property boundaries. For fixed-wing aircraft, that could include several standard pick-up trucks and individuals to serve as spotters and to help control traffic in the treatment area. Ground support for refilling tanks and refueling would occur at a landing strip near the treatment area. For the use of rotary-wing aircraft, a service vehicle with or without a landing pad, water, pre-mixed herbicide, and fuel for servicing the aircraft would be located near the treatment area in previously disturbed areas along NFS designated roads and at least 300 feet from water. UAV support vehicles would also be located near the treatment area along designated NFS roads and at least 300 feet from water.

Monitoring and Reporting

Under the Proposed Action, NNIPS treatments would be recorded, monitored, and reported annually. Detailed, accurate record keeping, and effectiveness monitoring are and would continue to be fundamental components of a successful condition-based management program. Record keeping provides a historical record of activities and helps map out future treatment activities. Monitoring and surveying are necessary to determine whether treatments are effective and meet management objectives. Annual reporting is important and required for program accountability and includes inventorying NNIPS treated and documenting specifics of each treatment annually. Global Positioning System (GPS) devices or other methods are used to map and document NNIPS occurrences and treatment activities.

Supporting Project Documentation

Table 30. Applicable Project File Documentation to Support Analysis.

Documentation Type	File Name (if applicable/needed)
Implementation Plans	Appendix C of the EA
Design Elements	Appendix A of the EA

Administrative Review

This action is subject to the predecisional administrative review process outlined in Title 36 of the Code of Federal Regulations (CFR), Part 218, Subparts A and B. A final decision will not be made until after the requirements of 36 CFR 218.12, Timing of Project Decision, have been met. The review process is explained in more detail in the Draft Decision Notice below.

Draft Decision Notice

Aerial Application of Herbicide on the Humboldt-Toiyabe National Forest

U.S. Forest Service

All Districts in Nevada, Humboldt-Toiyabe National Forest

Carson City, Clark, Douglas, Elko, Eureka, Humboldt, Lander, Lincoln, Lyon, Mineral, Nye, Washoe, and White Pine counties, Nevada

The Decision Notice incorporates all previous information in the Environmental Assessment and Finding of No Significant Impact (FONSI), as well as information included in the project record.

Decision and Rationale

Based on the analysis in the EA and supporting documentation in the project record, I have decided to authorize aerial application of herbicides as described in the Purpose and Need and Proposed Action sections of the EA, which include any modifications identified during environmental analysis and review of legal and regulatory compliance.

My decision is based on the need to manage the spread of non-native invasive plant species (NNIPS) into areas that the Forest is incapable of treating using the current ground-based methods. The aerial application of herbicide will allow the Forest to contain and control this spread of infestations and, in some cases, reverse those that are trending toward or have already become monocultures. Using this tool, in conjunction with ground-based methods, will help make our efforts to manage NNIPS infestations more effective. Specifically, the Forest will be better equipped in treating these infestations following wildfires where seeds of NNIPS can sprout, take root, and outcompete native species. Once established, the NNIPS disrupt natural ecosystems, increase fire frequency, and create larger and faster fires. Upon establishment, our ability to reverse conditions is significantly reduced and the natural ecosystem dynamics are lost along with any ecological services the landscape once provided. My decision to incorporate the use of aircraft in the application of herbicides, where appropriate, across the HTNF in Nevada is an effort to use every available means to counter the threat to Forest resources posed by these NNIPS. After reviewing the analysis in the EA, I am comfortable in making my decision. Some design elements (Appendix A) reduce the potential impacts from aerial herbicide application to terrestrial and aquatic wildlife species, surface waters, and native plant species. Others restrict the use of aerial application near water bodies, developed recreation sites, and forested areas to reduce potential impacts on health and human safety and the environment. Design elements (and herbicide label requirements) also reduce the risk of herbicide drift into areas that we do not want it to be.

My goal in authorizing the use of aerial herbicide application is to be efficient in the treatment of NNIPS and maintain the health and safety of the public, our cooperators, and our employees. This tool will also be used in a way that minimizes impacts to our environmental resources (such as soil, water, vegetation, and wildlife) and cultural/historical resources as well as the plant materials important to members of tribes and the public while maintaining the Forest Service goals and objectives of multiple-use land management. To put this into practice, my staff has developed the Aerial Application Implementation Plan. This will help planning teams identify and adhere to the design elements in the EA and ensure that they can be met before, during, and after implementation. As part of this decision, I am requiring the use of this implementation plan for each aerial herbicide application project.

Summary of Public Involvement

June 7, 2023, the HTNF issued a public scoping notice associated with the Aerial Application of Herbicide on the Humboldt-Toiyabe National Forest in Nevada Project, inviting comments regarding the scope of the associated NEPA review. The Proposed Action description, the public notice, and other information were made available for review at https://www.fs.usda.gov/project/?project=64139, or at the HTNF Supervisor's Office (Humboldt-Toiyabe National Forest, 1200 Franklin Way, Sparks, NV 89431). The 30-day scoping period formally began on June 7, 2023, when a legal notice was published in the Reno Gazette Journal (#5726852).

The HTNF utilized the NEPA scoping process in lieu of public involvement requirements found in 36 CFR Part 800, the regulations implementing Section 106 of the NHPA (54 U.S.C. 306108). During the 30-day comment period, comment letters were received from two agencies, one organization, and five individuals. The scoping notice, comment letters, and scoping report are included in the project record.

Based on scoping comments received and input from the Forest Service Interdisciplinary Team, resource issue statements and indicators were developed to be analyzed in this EA (see Issues Considered for Analysis and Environmental Consequences section).

A list of agencies, organizations, and persons consulted regarding this proposal is also provided in the Agencies and Persons Consulted section of this EA.

Findings Required by Other Laws and Regulations

Findings required by other laws and regulations applicable to the proposal can be found in the Environmental Impacts section. Resource specialists completed a thorough review of the Humboldt National Forest Land and Resource Management Plan (USFS 1986a, as amended) and the Toiyabe National Forest Land and Resource Management Plan (USFS 1986b, as amended) and found that the Proposed Action and design elements (Appendix A) are consistent with the relevant plan components.

Implementation

I intend to sign this decision in December of 2024 and begin implementation in the Spring of 2025.

Administrative Review and Objection Opportunities

This action is subject to the predecisional administrative review process outlined in Title 36 of the Code of Federal Regulations (CFR), Part 218, Subparts A and B. A final decision will not be made until after the requirements of 36 CFR 218.12, Timing of Project Decision, have been met.

Eligibility to File Objections

Objections can be accepted only from individuals and entities who have submitted timely, specific written comments regarding a proposed project or activity subject to these regulations during any designated opportunity for public comment, per the regulations at 36 CFR 218.5(a). Additional eligibilities are established in 36 CFR 218.5(b) through (f). Issues raised in objections must be based on previously submitted timely, specific, written comments regarding the proposed project unless based on new information arising after designated opportunities for comment. A connection to previous comments must be demonstrated in the objection.

Individual members of organizations must have submitted their own comments to meet the requirements of eligibility as an individual. Objections received on behalf of an organization are considered as those of the organization only. If an objection is submitted on behalf of several individuals or organizations, each individual or organization listed must meet the eligibility requirement of having previously submitted comments on the project (36 CFR 218.5). Names and addresses of objectors will become part of the public record.

Contents of an Objection

Incorporation of documents by reference in the objection is permitted only as provided for at 36 CFR 218.8(b). Minimum content requirements of an objection as identified in 36 CFR 218.8(d) include:

- Objector's name and address with a telephone number if available; with signature or other verification of authorship supplied upon request.
- Identification of the lead objector when multiple names are listed, along with verification upon request.
- Name of project, name and title of the responsible official, and national forest/ranger district where project is located.
- Sufficient narrative description of those aspects of the proposed project objected to, specific issues related to the project, how environmental law, regulation, or policy would be violated, and suggested remedies which would resolve the objection.
- A statement demonstrating the connection between prior specific written comments on this project and the content of the objection unless the objection issue arose after the designated opportunities for comment.

Filing an Objection

Objections must be postmarked (if sent via postal mail), faxed, or submitted electronically via the project webpage at https://www.fs.usda.gov/project/?project=64139 within 45 days following publication of the opportunity to object legal notice in the newspaper of record (Reno Gazette Journal). Mailed objections should be sent to Objection Reviewing Officer, HTNF Aerial Application of Herbicide, USFS Intermountain Regional Office, 324 25th Street, Ogden, UT 84401. Objections may be faxed to 801-625-5365. Electronic objections must be submitted in a format such as Portable Document Format (pdf), plain text (.txt), or Word (.doc or .docx); and electronic file names must be less than 85 characters long (including spaces). Hand delivery of written objections can be made during normal working hours to the Intermountain Regional Office, Hansen Federal Building, Room 4003, 324 25th Street, Ogden, UT 84401. It is the responsibility of objectors to ensure their objection is received in a timely manner (36 CFR 218.9).

The publication date in the Reno-Gazette Journal, newspaper of record, is the exclusive means for calculating the time to file an objection to this project. Those wishing to object to the draft DN/FONSI should not rely upon dates or timeframe information provided by any other source.

Contact

For additional information concerning this decision, contact:

Heidi Guenther, Botanist/Invasive Plant Program Manager
1200 Franklin Way
Sparks, NV 89431
heidi.guenther@usda.gov
p: 775-352-1223
f: 775-355-5399

DRAFT/ Signature for Final Decision Notice　　　　Select date

Jon Stansfield

Forest Supervisor, Humboldt-Toiyabe National Forest

Appendix A. Design Elements

Design elements are actions and practices designed into the Proposed Action to reduce impacts of proposed activities on the human environment and sensitive natural resources. They include requirements that must be complied with by law, regulation, or policy, best management practices (BMPs), forest plan standards and guidelines, standard operating procedures, and best available information. Legal requirements related to the storage, transportation, mixing, application, and disposal of herbicides are presented in this appendix. These requirements are currently followed for all HTNF treatments using herbicides and will continue to be adhered to under the Proposed Action. Both the No-Action Alternative and Proposed Action share the herbicide application guidelines found in in this appendix. Design elements specific to the aerial application of herbicide are only applicable to the Proposed Action as that is the only alternative that includes that application method.

Design elements identified in this section are to be considered in conjunction with the treatment methods and application rates described in Table 1 of the EA document. Where a conflict between the design elements described below and the application methods or rates described in Table 1 exists, the design element is the dominate direction to be followed unless the method or rate in Table 1 is more limiting. The Forest will adhere to all Health and Human Safety requirements for the general use, transport and application of herbicides, the protection of the public and its employees, and the protection of physical, biological, and cultural resources.

#	Design Element	Activity: Activity to be modified	Where: Applicable area. (Geographic features, forest management areas).	When: Specific time action is applicable.	Why: Issue, law, regulation, or policy addressed.
	Herbicide Handling				
HH-1	To ensure worker safety and avoid potential impacts to the environment, individuals working with herbicides or surfactants will read and follow label directions, including instructions for herbicide use, surfactant use, application rates, equipment and techniques, personal protective equipment (PPE) for applicators and mixers, and container disposal.	Before and during transportation, mixing and application of all herbicides and surfactants.	All treatment areas	Before, during, and after treatment	Compliance with Forest Service policy and guidelines (FSH 2109 and FSM 2150); National Pollutant Discharge Elimination System (NPDES) permit requirements, and with EPA; Nevada State regulations; USDA FS 990a National Core Best Management Practices (BMPs) Chem-2. Follow label directions (USFS FSH 2109.14, Chapter 50)
HH-2	Make product labels, safety data sheets, safety plans, spill prevention plans, and cleanup kits available to applicators and mixers, per the requirements of FSH 2109.	Before and during transportation, mixing and application of all herbicides and surfactants.	All locations	Always	FSH requirement; USDA FS 990a National Core BMPs Chem-1; Chemical Use Planning (FSM 2153; FSH 2109.14, Chapter 10)

#	Design Element	Activity: Activity to be modified	Where: Applicable area. (Geographic features, forest management areas).	When: Specific time action is applicable.	Why: Issue, law, regulation, or policy addressed.
HH-3	Perform herbicide applications by or under the direct supervision of a licensed professional herbicide applicators for forest and contract crews.	All activities	All locations	Daily	Nevada Department of Agriculture (NDA) Rules Governing Pesticide and Chemigation Use and Application; USDA FS 990a National Core BMPs Chem-2; Follow label directions (FSH 2109.14, Chapter 50)
HH-4	To prevent misapplication, wind speed and direction will be monitored throughout an herbicide application.	During treatment.	All treatment locations	Before and during treatment	EPA and label instructions; USDA FS 990a National Core BMPs Chem-2; Follow label directions (FSH 2109.14, Chapter 50)
HH-5	Do not apply herbicide when sustained wind conditions exceed product label directions.	Prior to treatment check wind speed for go-no go determination.	At treatment areas	Before and during treatment	EPA and label instructions; USDA FS 990a National Core BMPs Chem-2; Follow label directions (FSH 2109.14, Chapter 50)
HH-6	Conduct equipment and personnel inspections and equipment maintenance and equipment calibration, make repairs, and replace parts promptly.	Visual and physical inspection to insure properly functioning equipment, and appropriate and correct PPE.	At treatment areas	Daily during operation	Health and safety protocols; USDA FS 990a National Core BMPs Chem-2; Follow label directions (FSH 2109.14, Chapter 50)
HH-7	A spill cleanup kit will be readily available whenever herbicides are transported or stored.	Ground support crews will have spill kits readily available in their vehicles.	Staging areas	Always	USDA FS 990a National Core BMPs Chem-1; Chemical Use Planning (FSM 2153; FSH 2109.14, Chapter 10)
HH-8	Transport only the quantity of herbicide and adjuvants needed for a project. Transport secured containers in such a way as to prevent the likelihood of spills and make periodic checks enroute to help avoid spillage.	Transportation of herbicides and adjuvants.	Travel route and staging areas.	During treatment	USDA FS 990a National Core BMPs Chem-5; Chemical Handling and Disposal (FSH 2109.14, Chapter 40)
			Water Resources		
WR-1	Aerial application of herbicides, and any associated staging operations will not occur within a 300-foot buffer to all open water features and riparian areas: including but not limited to perennial streams, groundwater dependent ecosystems and springs, wetlands, wet	All activities - Identify and map these special features during Aerial Application Implementation Plan, share with applicators prior to field activities.	Activities occurring adjacent to hydrologic features. Buffer would extend from the edge of the feature or riparian vegetation, whichever is greater.	During application	To protect sensitive riparian and aquatic resources, protect water quality and comply with CWA, protect floodplains and wetlands and comply with EOs 11988 and 11990; USDA FS 990a National Core BMPs Chem-3: Chemical Use Near Waterbodies. To minimize the contamination of water

#	Design Element	Activity: Activity to be modified	Where: Applicable area. (Geographic features, forest management areas).	When: Specific time action is applicable.	Why: Issue, law, regulation, or policy addressed.
	meadows, lakes, ponds, and range water developments.				sources for livestock and WHB (FSH 2109.14 Chapters 10, 50)
WR-2	Place drift monitoring cards out to 300 feet from and perpendicular to perennial streams to monitor herbicide presence.	Monitoring application of herbicide	All project areas.	Prior to application	USDA FS 990a National Core BMPs Chem-6: Chemical Application Monitoring and Evaluation (FSM 2150.1; FSH 2109.14, Chapter 50)
WR-3	Water used for mixing will be obtained from designated developed/municipal source prior to going into the field.	Filling water tanks.	NFS lands.	Always	To protect water resources and avoid contamination of water sources. USDA FS 990a National Core BMPs Chem-5; Chemical Handling and Disposal (FSH 2109.14, Chapter 40)
			Public Safety		
PS-1	Exclude municipal watersheds or areas of known domestic water supply from aerial herbicide treatment project areas.	Identify and map these special features during project development, include in applicators contract package and prior to field activities.	All project areas.	Mapped as part of IDT project development. Prior to treatment applicators maps and GIS files will be checked to ensure these features have been buffered.	Protect public drinking water and comply with Safe Drinking Water Act; USDA FS 990a National Core BMPs Chem-1; Chemical Use Planning (FSM 2153; FSH 2109.14, Chapter 10)
PS-2	Conduct public notification through press releases in local newspapers and social media and websites that identify the potential treatment windows for specific areas. Perform signing and on-site layout one to two weeks prior to actual aerial treatment.	Prepare press release and get to media outlets. Post on social media and Forest Website.	All project areas.	At least one to two weeks prior to treatment.	Humboldt National Forest Land and Resource Management Plan (HNF LRMP) (IV-24); Toiyabe National Forest Land and Resource Management Plan (TNF LRMP) (IV-4; IV-31)
PS-3	Use temporary area, trail, and road closures to ensure public safety during aerial spray operations.	Post news release at trailheads and campgrounds.	All tailheads and campgrounds in vicinity of treatment area.	At least one-two weeks prior to treatment.	TNF LRMP (IV-31)
PS-4	Do not use aerial herbicide applications within 300 feet of residential areas and developed recreation areas.	Aerial application of herbicide.	When proposed treatment area is in close proximity to residential areas.	Before and during treatment.	Herbicide label requirements for safety
PS-5	Do not aerially apply herbicide within 100 feet of woodlands containing pinyon pine (*Pinus monophylla*) with mature cones/seeds.	Aerial application of herbicide.	Woodlands containing pinyon pine with mature cones/seeds.	Before and during treatment for woodlands containing pinyon pine in the second year of cone/seed production.	To avoid potential contamination of culturally significant and commercially valuable pinenut crop.

#	Design Element	Activity: Activity to be modified	Where: Applicable area. (Geographic features, forest management areas).	When: Specific time action is applicable.	Why: Issue, law, regulation, or policy addressed.
			Wild Horse and Burro		
WH-1	Avoid delineating treatment parcels when wild horse and burros are present to minimize behavioral impacts.	All activities – coordinate during development of Aerial Application Implementation Plan to identify WHB territories are included in treatment area.	WHB territories	Once treatment area is identified and at least 30 days prior to project implementation	TNF LRMP (IV-26; IV-31) Wild Free-Roaming Horses/Burro; Wild Free Roaming Horses and Burros (FSH 2260.3, Section 8)
			Livestock Administration		
LA-1	Advise permittees of livestock grazing or feeding restrictions.	During the development of Aerial Application Implementation Plan and during Implementation	Range grazing allotments authorized to graze livestock in/near treatment areas.	Once treatment area is identified and at least two weeks prior to operations verify label requirements related to livestock	To reduce impacts to livestock and WHB, applicable grazing restrictions on the herbicide label, which is considered law; CFR Title 40, Chapter 1, Subchapter E, Part 156, Subpart A 156.10 Labeling Requirements
LA-2	Coordinate with permittees to make administrative changes to adjust entry times, pasture rotations, alternate forage sites, and non-target food removal (salt, supplement, water haul sites).	During development of Aerial Application Implementation Plan identify which grazing allotments are included in treatment area; and coordinate with permittees before and during project implementation.	Range allotments and permittees authorized to graze livestock in/near treatment areas.	Once treatment area is identified and at least 30 days prior to project implementation	TNF LRMP (IV-28); Grazing Permit Administration (FSH 2209.13)
LA-3	Communicate with permittees and adjacent land managers regarding application timeframes and site selection to minimize any potential social/economic impacts.	All activities – coordinate during development of Aerial Application Implementation Plan to identify which grazing allotments included in treatment area.	Range allotments and permittees authorized to graze livestock in/near treatment areas.	Once treatment area is identified and at least 30 days prior to project implementation	Grazing Permit Administration (FSH 2209.13)
			Aircraft Operation		
AO-1	Use a GPS system in spray aircraft and map each treatment unit before the flight to ensure that only areas marked for treatment are treated.	Include contract specification that GPS guidance and GIS systems are used in	All treatment areas	Prior to the application of herbicide.	USDA FS Pesticide-use Management and Coordination Handbook (FSH 2109.14); USDA FS Invasive Species Management (FSM 2900)

#	Design Element	Activity: Activity to be modified	Where: Applicable area. (Geographic features, forest management areas).	When: Specific time action is applicable.	Why: Issue, law, regulation, or policy addressed.
		aircraft to guide herbicide application.			
AO-2	Obtain a weather forecast for the area prior to initiating a spraying project to ensure weather forecasts during and following treatment are within prescription (winds less than ten mph) during treatment and no rain for several days following prescription.	Prior to treatment make a go-no go call if forecast indicates a 20 percent or greater chance of rain within two days following application and or winds greater than ten mph during the application period.	On site	Begin watching weather one week prior to operations. Prior to the application of herbicide.	USDA FS 990a National Core BMPs Chem-3: Chemical Use Near Waterbodies (FSH 2109.14, Chapters 10, 50); To prevent transport of material to waterbodies
AO-3	Do not aerially apply herbicide treatments when sustained wind speeds exceed ten mph or label recommendations, whichever is less.	Check before initiating treatment and prior to refilling throughout the day.	On site	Prior to the application of herbicide.	USDA FS 990a National Core BMPs Chem-3: Chemical Use Near Waterbodies (FSH 2109.14, Chapters 10, 50)
AO-4	Do not aerially apply herbicide treatments during inversions, below minimum relative humidity, or above maximum temperature, as stated on label.	Check weather forecast during week prior to implementation date. Adjust plans to meet design element.	On site	Prior to the application of herbicide.	USDA FS 990a National Core BMPs Chem-2; follow label directions (FSH 2109.14, Chapter 50)
AO-5	Locate staging areas in areas with previous disturbance (i.e., roads, intersections, and turn outs) to avoid resource damage.	Before and during transportation, mixing and application of all herbicides and surfactants.	All treatment areas	Prior to treatment NFS employees will conduct site visit to identify staging areas and provide visual inspection of the treatment area.	HNF LRMP; TNF LRMP
			Special Area Avoidance		
SA-1	Do not aerially apply herbicide in Research Natural Areas (RNAs) or Designated Wilderness.	Identify and map these special features during project development, share with applicators prior to field activities	Always	All projects	Wilderness Act; HNF LRMP; TNF LRMP
SA-2	Do not aerially apply herbicides within 0.25 mile of a Future Designated Wild and Scenic River (includes the Recreation classification) and rivers	Identify and map these special features during project development, share with applicators prior to field activities	Along Eligible Wild and Scenic River Corridors	All treatments	Wild and Scenic River Act, FSH, USDA FS 990a National Core BMPs Chem-3: Chemical Use Near Waterbodies (FSH 2109.14 Chapters 10, 50)

#	Design Element	Activity: Activity to be modified	Where: Applicable area. (Geographic features, forest management areas).	When: Specific time action is applicable.	Why: Issue, law, regulation, or policy addressed.
	determined to be eligible for inclusion in the Wild and Scenic River System.				
			Native Vegetation Protections		
NV-1	Do not aerially apply herbicide in Phase III pinyon-juniper woodlands.	Identify and map these special features during project development, share with applicators prior to field activities.	Phase III pinyon-juniper woodland	Before and during treatment.	Trees are the dominant vegetation and the primary plant layer influencing ecological processes in Phase III pinyon-juniper stands (Tausch et al. 2009). The tree canopy in Phase III stands would greatly reduce the effectiveness of sprayed herbicide by intercepting it and preventing it from reaching the understory or ground surface Additionally, Phase III pinyon-juniper woodlands are defined by their lack of understory vegetation and are not highly susceptible to NNIPS invasion due to competition of dominating trees (Miller et al. 2019). Phase III pinyon-juniper woodlands also provide resources commonly used by the public and tribal communities.
NV-2	Do not use aerial application of herbicide within 300-foot buffer of Webber's ivesia (*Ivesia webberi*) known occurrences and critical habitat and whitebark pine (*Pinus albicaulis*) known occurrences or Region 4 Forest Service Sensitive plant occurrences.	Identify and map these special features during project development, share with applicators prior to field activities.	Webber's ivesia occurrences and critical habitat and whitebark pine occurrences or Region 4 Forest Service Sensitive plant occurrences.	Six months prior to finalizing treatment plans.	Endangered and Threatened Wildlife and Plants; Threatened Species Status for *Ivesia webberi*
NV-3	No mixing and loading of herbicides would occur in Webber's ivesia (*Ivesia webberi*) known occurrences or designated critical habitat; whitebark pine (*Pinus albicaulis*) known occurrences; or Region 4 Forest Service Sensitive plant occurrences.	Identify and map these special features during project development, share with applicators prior to field activities.	Webber's ivesia occurrences and critical habitat, whitebark pine occurrences, and Region 4 Forest Service Sensitive plant species occurrences.	Before and during treatment.	Endangered and Threatened Wildlife and Plants; Threatened Species Status for *Ivesia webberi*; Endangered and Threatened Wildlife and Plants; Threatened Species Status for *Pinus albicaulis* (Whitebark Pine) With Section 4(d) Rule

#	Design Element	Activity: Activity to be modified	Where: Applicable area. (Geographic features, forest management areas).	When: Specific time action is applicable.	Why: Issue, law, regulation, or policy addressed.
Wildlife					
WL-1	Apply a four-mile buffer around active or pending sage-grouse leks to protect against disturbance to breeding, nesting, and early brood rearing activities.	Identify and map active and pending leks during Aerial Application Implementation Plan development, share with applicators prior to field activities.	All treatment areas. Buffer sizes and shapes may be modified depending on site-specific conditions (e.g., suitable habitat, timing of implementation activities, aircraft type, and topography).	March 1 – June 30	Greater Sage-grouse Plan Amendment: GRSG-GEN-ST-006-Standard; GRSG-GEN-GL-007-Guideline; Bi-State Plan Amendment: AA-S-11, AA-S-05, Weed-S-02; FSM Chapter 2670 - Threatened; Endangered and Sensitive Plants and Animals, Section 2670.3 – Policy, 2670.31 - Threatened and Endangered Species Act; FSH 2670.32 - Sensitive Species; 3
WL-2	Apply a 0.25-mile buffer to active and likely active, but unknown status, eagle nests to prevent disturbance.	Identify and map these special features during Aerial Application Implementation Plan development, share with applicators prior to field activities.	All treatment areas. The buffer distance and shape may be modified based on the implementation activity timing, nest activity, topography, and aircraft type.	December 15 – July 31	Bald and Golden Eagle Protection Act; USFWS 2022; FSM Chapter 2670 - Threatened, Endangered and Sensitive Plants and Animals, Section 2670.3 – Policy, 2670.32 - Sensitive Species; 3
WL-3	Apply a 0.25-mile buffer around active northern goshawk nests, Protected Activity Centers (PACs), or any or likely active, but unknown status nest.	All activities - Identify and map these special features during Aerial Application Implementation Plan development, share with applicators prior to field activities.	All treatment areas. Buffer distances and shapes may be modified based on timing of the implementation activity, nest activity, topography, and aircraft type.	February 15 - September 15	Sierra Nevada Framework Forest Plan Amendment #76; FSM Chapter 2670 - Threatened; Endangered and Sensitive Plants and Animals; Section 2670.3 – Policy, 2670.32 - Sensitive Species; 3
WL-4	Apply a 0.25-mile buffer around active great gray owl nests or any or likely active, but unknown status nest.	All activities - Identify and map these special features during Aerial Application Implementation Plan development, share with applicators prior to field activities.	All treatment areas within the Sierra Nevada Framework Forest Plan Amendment area. Buffer distances and shapes may be modified based on timing of the implementation activity, nest activity, topography, and aircraft type.	March 1 – August 15	Sierra Nevada Framework Forest Plan Amendment #83; FSM Chapter 2670 - Threatened, Endangered and Sensitive Plants and Animals, Section 2670.3 – Policy, 2670.32 - Sensitive Species; 3
WL-5	Apply a 0.25-mile buffer around active California spotted owl nests, Protected Activity Centers, or any or likely active, but unknown status nest.	All activities - Identify and map these special features during Aerial Application	All treatment areas within the Sierra Nevada Framework Forest Plan Amendment area. Buffer	March 1 – August 31	Sierra Nevada Framework Forest Plan Amendment #75; FSM Chapter 2670 - Threatened, Endangered and Sensitive Plants and Animals, Section

#	Design Element	Activity: Activity to be modified	Where: Applicable area. (Geographic features, forest management areas).	When: Specific time action is applicable.	Why: Issue, law, regulation, or policy addressed.
		Implementation Plan development, share with applicators prior to field activities.	distances and shapes may be modified based on timing of the implementation activity, nest activity, topography, and aircraft type.		2670.3 – Policy, 2670.31 - Threatened and Endangered Species. 4. 2670.32 - Sensitive Species; 3
WL-6	Apply a 0.25-mile buffer to active and likely active, but unknown status, raptor nests to prevent disturbance.	All activities - Identify and map these special features during Aerial Application Implementation Plan development, share with applicators prior to field activities.	All treatment areas. Buffer sizes and shapes may be modified depending on site-specific conditions (e.g., suitable habitat, timing of implementation activities, aircraft type, and topography).	March 1 – July 31	Migratory Bird Treaty Act (MBTA) and agency implementing direction in Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds
WL-7	Do not aerially apply herbicides or locate associated staging operations in known occupied habitat of Mt. Charleston blue butterfly, Spring Mountain checkerspot, dark blue, and Morand’s checkerspot.	All activities - Identify and map these special features during Aerial Application Implementation Plan development, share with applicators prior to field activities.	Occupied habitat of Mt. Charleston blue butterfly, Spring Mountain checkerspot, dark blue, and Morand’s checkerspot.	Before and during treatment	Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). Section 2, Section 7, FSM Chapter 2670 - Threatened, Endangered and Sensitive Plants and Animals, Section 2670.3 – Policy, 2670.32 - Sensitive Species; 3
WL-8	Do not aerially apply herbicides within 500 feet of Mt. Charleston blue butterfly critical habitat or occupied habitat outside of critical habitat.	All activities	Designated Mt. Charleston blue butterfly critical habitat and occupied habitat outside of critical habitat.	During treatment	Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). Section 2, Section 7, FSM Chapter 2670 - Threatened, Endangered and Sensitive Plants and Animals, Section 2670.3 – Policy, 2670.32 - Sensitive Species; 3
WL-9	To protect monarch butterflies and the native nectar producing plants they rely upon, do not treat areas when nectar producing plants are metabolically active. Timeframes of metabolically active nectar plants will vary by latitude, elevation, and ecoregion. These timeframes can be adjusted based on local conditions.	All activities	All treatment areas	At least one week prior to planned treatments, coordinate with Forest Service botanist to determine native plant metabolic status within project area and adjust implementation timing based on plant phenology to limit damage to	BMPs for conserving monarchs (Xerces Society 2018); Western Monarch Butterfly Conservation Recommendations (USFWS 2021) FSM Chapter 2670 - Threatened, Endangered and Sensitive Plants and Animals, Section 2670.3 – Policy, 2670.32 Sensitive Species; 3

#	Design Element	Activity: Activity to be modified	Where: Applicable area. (Geographic features, forest management areas).	When: Specific time action is applicable.	Why: Issue, law, regulation, or policy addressed.
				metabolically active native plants. Carson RD (Sierra Nevada near Lake Tahoe): June 1-September 30 Mountain City & Jarbidge RDs: May 15-September 30 SMNRA: March 15-November 30 All remaining areas: May 1-October 31	
			Cultural Resources		
CR-1	Coordinate with Forest Service archaeologist prior to aerial application. This consultation should include a timeline that is sufficient to allow for Section 106 compliance and subsequent communication with consulting parties, SHPO and THPOs.	Treatment planning	All treatment areas	Six months prior to finalizing treatment plans	NHPA Section 106
CR-2	Staging of associated ground-support equipment will be located outside of known historic property boundaries (including unevaluated resources) and will not cause new disturbance or be located outside of previously disturbed areas (i.e., existing roads and pull outs and developed sites).	Staging of ground support activities during application	All treatment areas	During treatment	NHPA Section 106
CR-3	Utilize less-impactful application methods where sensitive cultural resources are identified. Coordinate with Forest Service archaeologist to determine appropriate application method.	Determining application tool within sensitive areas during treatment planning	Sensitive areas in any treatment location	Six months prior to finalizing treatment plans	NHPA Section 106

Appendix B. Effects from Inert Ingredients and Adjuvants

Adjuvants are specially designed chemicals that are added to an herbicide solution to modify the performance of the total spray mixture. Adjuvants are not regulated by the EPA in the same way that herbicides are. The EPA does not register or approve the labeling of spray adjuvants. Field testing is generally completed by the adjuvant manufacturer (Bakke 2007). Labels accompanying adjuvants describe their properties and prescribe use rates. Information on types of adjuvants to use can also be found on herbicide labels and in publications by university extension services (Prather et al. 2011, Zollinger 2012).

Adjuvants perform various functions, including: enhanced plant uptake of the herbicide; better mixing of otherwise incompatible herbicides; increased adhesion of the spray to plant surfaces; and reduced spray drift. In many herbicide products, adjuvants are included as part of the pre-mixed formulation as purchased. Applicators can also add adjuvants to spray mixtures prior to application.

For many herbicide products containing adjuvants as part of the formulation, the compounds are not explicitly identified on the label or the Material Safety Data Sheet. Unless they are on one of EPA's lists of more toxic chemicals, they do not have to be identified. The identity of these ingredients in an herbicide or adjuvant product is legally protected from full disclosure as "Confidential Business Information."

At least one adjuvant is known to pose hazards to aquatic wildlife—the surfactant used in the original formulation of RoundUp®, polyoxyethyleneamine (POEA). This surfactant is more toxic to aquatic life than the active ingredient glyphosate. The POEA adjuvant (Roundup Pro) will only be used in uplands where there is no potential for movement into aquatic systems. Within or near aquatic systems, only products labelled for aquatic application would be used. Recommended adjuvant types by herbicide that may be used for aerial spraying on the forest are identified below in Table B-1. Adjuvant types, class, product, and product manufacturer are shown on Table B-2. Standard mammalian acute toxicity testing results for adjuvants are shown in Table B-3.

Adjuvants with low toxicity to wildlife include modified seed oils, alkyl ethoxylates, and silicones. The most commonly used adjuvant is marker dye and is analyzed in *Use and Assessment of Marker Dyes Used With Herbicides* (Pepling et al. 1997).

"Activator" adjuvants enhance activity of an herbicide's active ingredient, while "special purpose or utility modifier" adjuvants offset common problems occurring during application, including poor water quality or foam produced during agitation of the spray mixture. Many adjuvants have properties that place them on a continuum between these two definitions and function both as activators and utility modifiers. Special purpose or utility adjuvants are used to offset or correct certain conditions associated with mixing and application such as impurities in the spray solution, extreme pH levels, and drift. These adjuvants include acidifiers, buffering agents, water conditioners, anti-foaming agents, compatibility agents, and drift control agents. Acidifiers enhance absorption of weak acid type herbicides. Drift reduction agents will generally increase the average droplet size. Defoamers reduce foaming that occurs during agitation of the spray mixture. Colorants or dyes help applicators determine what area was treated. This helps to prevent skips and overlaps and treatment of non-target areas. They reduce the chance of human exposure to recently treated vegetation (Bakke 2007).

Surfactants (surface active agents) are a broad category of activator adjuvants designed to improve or facilitate the dispersing/emulsifying, absorbing, spreading, sticking and/or pest-penetrating properties of the spray mixture. Pure water will stand as a droplet, with a small area of contact with the waxy leaf surface. Water droplets containing a surfactant will spread in a thin layer over a waxy leaf surface (Bakke 2007).

Table B-1. Recommended Adjuvant Type by Herbicide.

Herbicide	Recommended Adjuvant Types
2,4-D amine	Non-ionic surfactants (NIS), fertilizer, crop oil concentrate
Aminocyclopyrachlor	Seed oil, crop oil concentrate, NIS
Aminopyralid	NIS
Chlorsulfuron	NIS, seed oil, organosilicone
Clopyralid	NIS, crop oil concentrate
Glyphosate	NIS
Imazapic	NIS, seed oil, organosilicone
Imazapyr	NIS, seed oil
Indaziflam	None recommended
Metsulfuron methyl	NIS, seed oil, organosilicone
Rimsulfuron	Petroleum Crop Oil Concentrate (COC) or Modified Seed Oil (MSO); NIS; ammonium nitrogen
Triclopyr triethylamine salt (TEA)	NIS

Table B-2. Adjuvant Type, Class, Product, and Product Manufacturer.

Adjuvant Type	Category	Product Name	Manufacturer	Principal Functional Elements	Use Range	Signal Word	Comments
Activator	Non-ionic surfactant (NIS)	Activator 90	Loveland	Alkylphenol ethoxylate, alcohol ethoxylate and tall oil fatty acid	0.125–0.5%	Caution	Low foam, biodegradable, non-flammable
		R-11	Wilbur-Ellis	Alkylphenol ethoxylate, butyl alcohol, dimethylpolysiloxane	0.063–1%	Warning	Spreader, activator
		Spreader 90	Loveland	Alkylpolyethoxy ethers and ethoxylated derivatives	8–64 oz/100 gal	Warning	Spreader
		Super Spread 90	Wilbur-Ellis	Alkyl aryl polyoxyethylene glycols and free fatty acids	0.25–0.5%	Caution	Spreader
Activator	Basic blend *and* methylated or ethylated vegetable oil *and* nonionic surfactant	Renegade	Wilbur-Ellis	Modified vegetable oil, ammonium solution, nonionic surfactant	1–2.5%	Warning	Unique blend, high load of Nitrogen

Adjuvant Type	Category	Product Name	Manufacturer	Principal Functional Elements	Use Range	Signal Word	Comments
	and nitrogen source						
Activator	Methylated or Ethylated Vegetable Oil	MSO with Leci-Tech	Loveland	Methylated seed oils plus emulsifying surfactants	1–2 pt/A	Caution	MSO and non-ionic
Activator	Methylated or ethylated vegetable oil *and* organo-silicone surfactant	Syl-tac	Wilbur-Ellis	Organosilicone/ modified vegetable seed oil	0.125–0.375%	Caution	
		Phase	Loveland	Methylated seed oil plus organosilicone surfactant	0.125–0.5%	Caution	
Activator *and* Utility Modifier	Nonionic surfactant *and* buffering agent or acidifier	Super Spread 7000, LI 700	Wilbur-Ellis	Alkyl aryl polyoxyethylene, ethoxylated alcohols, aliphatic polycarboxylate	0.25–4 pt/100 gal	Caution	
Utility Modifier	Colorant	Hi-Light	Becker-Underwood	Proprietary blue colorant	6–32 oz/100 gal	Caution	
		Bullseye	Milliken Chemical	Proprietary blue colorant	0.5 oz/gal	None	
Utility Modifier	Water conditioning agent *and* buffering agent or acidifier	Bronc Max	Wilbur-Ellis	AMS/ammonium alkyl aryl sulfonates, polycarboxylic acid	0.125–1%	Caution	Ammonium sulfate (AMS) replacement
Utility Modifier	Water conditioning agent	Choice Weather Master	Loveland	Blend of salts of polyacrylic, hydroxy carboxylic, propionic acids, phosphate ester, ammonium sulfate	0.25–0.5%	Caution	AMS, water conditioner

Table B-3. Standard Mammalian Acute Toxicity Testing Results.

Name	Oral LD50	Dermal LD50	Inhalation LC50
Ethoxylated fatty amines			
Entry™ II, POEA	1.2 to 14 g/kg (III)	NA	NA
Alkylphenol ethoxylate-based wetter/spreaders			
R-11®	>3.7 g/kg (NPEO) (III)	>2 g/kg (NPEO) (III)	>25 mg/L (est.) (IV)
Activator 90	3.87 to 5.0 g/kg (III)	>2 g/kg (III)	>1.33 mg/L in males (lowest) (III)
X-77®	3.87 to 5.0 g/kg (III)	>2 g/kg (III)	>1.33 mg/L in males (lowest) (III)
Pro-Spreader Activator	>3.3 g/kg (III)	>2 g/kg (III)	NA
Latron AG- 98® (N)	>5 g/kg (NPE) (IV) 0.79 g/kg (butanol) (III)	>3 g/kg (NPE) (III) 3.4 g/kg (butanol) (III)	NA
Latron AG- 98®	2 g/kg (III)	3 g/kg (III)	NA
Alcohol ethoxylate-based wetter-spreader			
Activator N.F.	NA	NA	NA
Silicone-based wetter/spreaders			
Sylgard® 309	>2 g/kg (III)	>2 g/kg (III)	NA
Freeway®	>2 g/kg (III)	>2 g/kg (III)	NA
Dyne-Amic®	>5.05 g/kg (IV)	>2.02 g/kg (III)	NA
Silwet L-77®	>2.0 g/kg (III)	>2 g/kg (III)	NA
Kinetic	3.3 g/kg (III)	>2 g/kg (III)	NA
Sticker/Spreaders			
Bond®	>5 g/kg (IV)	>2 g/kg (III)	4.73 mg/L (III)
Tactic™	>5 g/kg (IV)	>2 g/kg (III)	>0.19 mg/L (4 hr)
R-56®	NA	NA	NA
Cohere®	NA	NA	NA
Oils			
MSO®	>5 g/kg (IV)	> 4 mg/kg (III)	NA
Hasten®	>5 g/kg (IV)	>5 g/kg (III)	5.79 ml/L (III)
Improved JLB Oil Plus	>5 g/kg (IV)	>3.16 g/kg (III)	NA
Cide-Kick®	>5 g/kg (IV)	NA	>5.16 mg/L (III)
Cide-Kick® II™	>5 g/kg (IV)	>2 g/kg (III)	>90.04 mg/L (IV)
Cygnet Plus	NA	NA	NA
Blends of vegetable oils and silicone-based surfactants			
Syl-tac™	>5 g/kg (IV)	>5 g/kg (III)	>2.07 ml/L (III)
Phase™	>5 g/kg (IV)	>2 g/kg (III)	>0.19 mg/L
Crop Oils and Crop Oil Concentrates			
Kerosene	28 g/kg (IV)	>2 g/kg (III)	NA

Name	Oral LD50	Dermal LD50	Inhalation LC50
Agri-dex®	>5.01 g/kg (IV)	>2.02 g/kg (III)	NA
Mor-Act®	>5 g/kg (IV)	NA	NA
Herbimax®	>5 g/kg (IV)	>2 g/kg (III)	NA
Fertilizer/Surfactant Mixtures			
First Choice® Exciter	NA	NA	NA
Magnify	NA	NA	NA
Class Act® Next Generation	NA	NA	NA
Intensify	NA	NA	NA
Acidifiers			
LI-700®	>5 g/kg (IV)	>5 g/kg (III)	>6.04 mg/L (III)
Tri-Fol	NA	NA	NA
Drift Reduction Agents			
In-Place®	NA	NA	NA
Sinker	>9.8 g/kg	>9.8 g/kg	NA
Defoamers			
Foaminator™	NA	NA	NA
No Foam	NA	NA	NA
No Foam Dry	NA	NA	NA
No Foam® B	>5 g/kg (IV)	NA	NA

Post-emergence herbicide effectiveness depends on spray droplet retention and herbicide absorption by weed foliage. Adjuvants and spray water quality influence post-emergent herbicide efficacy (USFS 2006). Because post-emergence herbicide effectiveness is greatly influenced by plant factors such as age, size and the growing conditions encountered before application, herbicide performance can vary. A way to minimize the variations in post-emergence herbicide performance is to use an adjuvant or surfactant in the spray solution. Surfactants generally improve the effectiveness of post-emergence herbicides. Typically, surfactants are not added to herbicides that are soil applied (pre-emergence) (Zollinger 2012). Surfactants used on the HTNF include non-ionic surfactants, methylated or ethylated vegetable oils, nitrogen sources, and organosilicone/silicone surfactants.

Non-ionic surfactants (NIS) are all-purpose surfactants comprised of linear or nonyl-phenol alcohols and/or fatty acids. This class of surfactant reduces surface tension of water and improves spreading, sticking and herbicide uptake (USFS 2006). Often, non-ionic surfactants will have additional additive properties, as described on their label.

Methylated or Ethylated vegetable (seed) oils (MSO) are produced by reacting fatty acids from seed oils (corn, soybean, sunflower, and canola) with an alcohol to form esters. The methyl or ethyl esters produced by this reaction are combined with surfactants/emulsifiers to form esterified seed oil. These surfactants reduce surface tension of water and improve herbicide uptake by improving herbicide distribution on the leaf surface (USFS 2006). Adverse environmental conditions such as low humidity, hot weather, lack of rain, drought-stressed weeds, or weeds not actively growing due to some environmental stress favor the use of MSO. These oils are more effective than non-ionic surfactants as an adjuvant to post-emergence herbicides (Zollinger 2012).

Nitrogen sources typically consist of premixed combinations of various forms of nitrogen and surfactants. They generally are used with herbicides recommending the addition of ammonium sulfate or 28 percent nitrogen. These surfactants reduce surface tension of water and improve leaf surface spreading (Miller and Westra 1998). They are used primarily with broadleaf herbicides. Fertilizers containing ammonium nitrogen have increased the effectiveness of herbicides like glyphosate, and 2,4-D amine. Fertilizer applied with other herbicides may reduce weed control or cause crop injury. Some fertilizers enhance non-target plant growth to stimulate competition from weed species re-establishing. Fertilizers should be used with herbicides only as indicated on the label or where experience has proven acceptability (USFS 2006).

Organosilicones and silicone surfactants are two types of nonionic surfactants. Organosilicone surfactants drastically reduce surface tension of water to the point where the herbicide droplets thin and coalesce to form a thin layer on the leaf surface (known as “superspreading”). In addition, this class of surfactant provides improved effectiveness through maximum rainfastness (Tu et al. 2001).

Appendix C. Implementation Plan Template

Humboldt-Toiyabe National Forest

Aerial Application of Herbicide on the Humboldt-Toiyabe National Forest in Nevada

Implementation Plan

Project Name

Project Date

***Directions**: To complete this implementation plan, read the instructions carefully throughout the document. Text written in black should remain in the implementation plan and included in the finalized version. Text written in blue and italicized serves only as instructions for completing the plan and should be removed before the implementation plan is finalized.*

HTNF Aerial Application Implementation Approval Checklist

Decisions that cover large areas frequently defer evaluation of site-specific conditions and effects. This checklist documents that site-specific factors have been considered (as required by law, regulation, and policy) before implementation occurs. Once the items in the checklist below are completed, check them off to verify the completion of this implementation plan.

I. Introduction/ Invasive Plant Treatment Prescription

- ☐ Treatment area described.

II. Treatment Plan and Schedule

1. Selected treatment method: ____
2. Selected herbicide(s): ____
3. Restoration needs described.
4. Number of treatments planned with scheduled application dates: ______________________

   ____
5. Project start and end dates (month and year): ______________________________

III. Resource Considerations and Areas of Exclusion

- ☐ Design Elements Checklist completed.
  - ○ Required coordination with program areas completed per project Design Elements.
- ☐ All resources considered and mapped appropriated.
  - ○ (If necessary) surveys conducted for TES species, site-specific mitigation measures developed, and USFWS consultation completed.
- ☐ Tribal consultation and coordination completed, and any concerns resolved or addressed.
  - ○ Tribes consulted with date of each consultation meeting:

    ____

    ____

    ____
- ☐ Coordination with range permit holders completed (if necessary).

IV. Health and Safety Checklist

- ☐ Project is compliant with health and safety criteria in the checklist.

V. Monitoring and Evaluation Plan

- ☐ Drift detection cards for the project obtained.
- ☐ Post-treatment monitoring techniques to be implemented described.

VI. Communication Plan

- ☐ Notification List completed.
- ☐ Press releases written and ready for distribution.

VII. Go/No-Go Checklist

- ☐ Go/No-Go Checklist completed.

VIII. Plan Approval

- ☐ Plan signed and dated by all required HTNF officials.

IX. Appendices

- ☐ Required maps completed.
- ☐ Pesticide use supporting documentation completed.
- ☐ Flight supporting documents completed.

Introduction/Invasive Plant Treatment Prescription

During the implementation of this plan, the Humboldt-Toiyabe National Forest (HTNF) will be authorized and guided by the Forest Plan and direction described in the Decision Notice (DN) for the Aerial Application of Herbicide on the Humboldt-Toiyabe National Forest in Nevada Environmental Assessment (EA). This plan further documents how the project meets the requirements for treatment and ensures site specific mitigation measures are implemented as described in the EA and DN.

Location

Broadly describe the general area in which the proposed project will occur, including the subwatershed, and its associated 12-digit Hydrologic Unit Code (HUC 12). For example: The project occurs in the Dry Creek Subwatershed (HUC 160600050602) on the eastside of the Monitor Range, north of McCann Canyon on the Austin-Tonopah Ranger District (RD).

Current Condition

Describe the current ecological condition in the proposed treatment area. Include descriptions of the vegetation community, current native plant assemblage, types of invasives species (i.e., weeds) present, extent of the invasive infestation, as well as any other pertinent information that would aid in clearly understanding conditions on the ground (e.g., current year climate [rainfall, drought index, etc.], topography, access and infrastructure, soils, and any known previous disturbance).

1. Project Area Acreage:
2. Current Year Climate *(rainfall, drought index, etc.)*:
3. Topography:
4. Access and Infrastructure:
5. Soils *(from NRCS Web Soil Survey)*:
6. Vegetation Description:
7. Existing Invasive Plant Data:
8. Previous Disturbance:

Treatment Plan and Schedule

Treatment Methods

- Application Methods
  - *Fixed wing, helicopter, or unmanned aerial vehicle (UAV)*
  - *Other details*
- Aerial Treatment Units
  - Herbicides: *Selection Rationale*
  - Timing:
- Accompanying Ground-Based Treatment Areas (if applicable)
  - Herbicides:
  - Methods:
  - Timing:

Restoration Needs

Describe restoration needs specific for each treatment polygon.

Treatment Timeframes/Seasons

Identify the time of year that the treatments will occur (i.e., spring, summer, fall, and/or winter). Explain why the identified time of year would be the ideal time for application. Include the life stage of the target weed that is optimal for treatment and the season in which this life stage occurs.

Project Duration

Describe the location(s) and acreage that will be treated daily, and the number of days that treatment will occur. Note: Weather dependent.

Resources Considerations and Areas of Exclusion

Table 1: Design Element Checklist

Complete the Design Element Checklist for the project by filling in the information in the second and fourth columns. Examples are provided for the first Design Element listed in the table.

Design Element	Is the Design Element applicable to the treatment area? YES/NO If YES, where?	When?	Reviewing Resource / Specialist Title
Livestock			
Advise permittees of livestock grazing or feeding restrictions.	*EXAMPLE: Yes, project is within the Silver Creek Allotment which has 50,000 acres within the project area. Permitted to graze 6/25 - 10/10. Grazing authorization may be impacted during October use date range. Permittee will be advised during annual operating instructions (AOI) meeting and prior to application.*	Once treatment area is identified and at least 30 days prior to project implementation	*EXAMPLE: District Rangeland Management Specialist*
Coordinate with permittees to make administrative changes to adjust entry times, pasture rotations, alternate forage sites, and non-target food removal (i.e., salt, supplement, and water haul sites).		Once treatment area is identified and at least 30 days prior to project implementation	
Communicate with permittees and adjacent land managers regarding application timeframes and site selection to minimize any potential social/economic impacts.		Once treatment area is identified and at least 30 days prior to project implementation	
Wild Horse and Burro			
Avoid delineating treatment parcels when wild horse and burros are present to minimize behavioral impacts.		During layout/planning (at least 30 days prior to treatment)	

Design Element	Is the Design Element applicable to the treatment area? YES/NO If YES, where?	When?	Reviewing Resource / Specialist Title
Water Resources			
Aerial application of herbicides and any associated staging operations will not occur within a 300-foot buffer to all hydrologic features that physically contain surface water or shallow groundwater at the time of treatment and includes but is not limited to perennial streams as well as intermittent and immediately connected ephemeral drainages, which are transmitting surface water at the time of application; groundwater dependent ecosystems; and springs, wetlands, wet meadows, lakes, ponds, and stock watering facilities.		Pre-field preparation and during treatment	
Place drift monitoring cards out to 300 feet from and perpendicular to perennial streams to monitor herbicide presence.		During treatment	
Water used for mixing will be obtained from designated developed/municipal source prior to going into the field.		Pre-field preparation	
Public Safety			
Exclude municipal watersheds or areas of known domestic water supply from aerial herbicide treatment project areas.		Prior to finalizing project boundaries	
Do not use aerial herbicide applications within 300 feet of residential areas and developed recreation areas.		Before and during treatment	
Conduct public notification through press releases in local newspapers and social media and websites that identify the potential treatment windows for specific areas. Perform signing and on-site layout 1-2 weeks prior to actual aerial treatment.		Pre-field preparation	
Use temporary area, trail, and road closures to ensure public safety during aerial spray operations.		During treatment	
Do not aerially apply herbicide within 100 feet of woodlands containing pinyon pine (*Pinus monophylla*) with mature cones/seeds.		Before and during treatment for woodlands containing pinyon pine in the second year of cone/seed production	

Design Element	Is the Design Element applicable to the treatment area? YES/NO If YES, where?	When?	Reviewing Resource / Specialist Title
Special Avoidance Areas			
Do not aerially apply herbicide in Research Natural Areas (RNAs) or Designated Wilderness.		Always	
Do not aerially apply herbicides within 0.25 mile of a Future Designated Wild and Scenic River (includes the recreation classification) and rivers determined to be eligible for inclusion in the Wild and Scenic River Systems.		All treatments	
Native Vegetation			
Do not aerially apply herbicide in Phase III pinyon-juniper woodlands.		Before and during treatment	
Do not use aerial herbicide applications within 300 feet of Webber's ivesia (*Ivesia webberi*) occurrences and their critical habitat and whitebark pine (*Pinus albicaulis*) occurrences.		Six months prior to finalizing treatment plans	
Do not mix or load herbicides within whitebark pine sites, Webber's ivesia sites, Webber's ivesia designated critical habitat, or Forest Service (FS) Region 4 (R4) Sensitive plant sites.		Before and during treatment	
Wildlife			
Apply a 4-mile buffer around active or pending sage-grouse leks to protect against disturbance to breeding, nesting, and early brood rearing activities.		March 1 - June 30	
Apply a 0.25-mile buffer to active and likely active, but unknown status, eagle nests to prevent disturbance.		December 15 - July 31	
Apply a 0.25-mile buffer around active northern goshawk nests, Protected Activity Centers (PACs), or any or likely active, but unknown status nest.		February 15 - September 15	
Apply a 0.25-mile buffer around active great gray owl nests or any or likely active, but unknown status nest.		March 1 - August 15	

Design Element	Is the Design Element applicable to the treatment area? YES/NO If YES, where?	When?	Reviewing Resource / Specialist Title
Apply a 0.25-mile buffer around active California spotted owl nests, Protected Activity Centers, or any or likely active, but unknown status nest.		March 1 - August 31	
Apply a 0.25-mile buffer to active and likely active, but unknown status, raptor nests to prevent disturbance.		March 1 - July 31	
Do not aerially apply herbicides or establish associated staging operations in occupied habitat of Mt. Charleston blue butterfly, Spring Mountain checkerspot, dark blue, and Morand's checkerspot.		Before and during treatment	
Do not aerially apply herbicides within 500 feet of Mt. Charleston blue butterfly critical habitat or occupied habitat outside of critical habitat.		During treatment	
To protect monarch butterflies and the native nectar producing plants on which they feed, do not treat areas when nectar producing plants are metabolically active. Timeframes of metabolically active nectar plants will vary by latitude, elevation, and ecoregion. These timeframes can be adjusted based on local conditions.		At least one week prior to planned treatments, coordinate with FS Botanist to determine native plant metabolic status within the project area and adjust implementation timing based on plant phenology to limit damage to metabolically active native plants. Carson Ranger District (RD) (Sierra Nevada near Lake Tahoe): June 1 - September 30 Mountain City & Jarbidge RDs: May 15 - September 30 SMNRA: March 15 - November 30 All remaining areas: May 1 - October 31	

Design Element	Is the Design Element applicable to the treatment area? YES/NO If YES, where?	When?	Reviewing Resource / Specialist Title
Cultural Resources			
Coordinate with FS Archaeologist prior to aerial application. This consultation should include a timeline that is sufficient to allow for Section 106 compliance and subsequent communication with consulting parties, SHPO, and THPOs.		Six months prior to finalizing treatment plans	
Staging of associated ground-support equipment will be located outside of known historic property boundaries (including unevaluated resources) and will not cause new disturbance or be located outside of previously disturbed areas (i.e., existing roads and pull-outs and developed sites).		During treatment	
Utilize less-impactful application methods where sensitive cultural resources are identified. Coordinate with FS Archaeologist to determine appropriate application method.		Six months prior to finalizing treatment plans	

Human Health and Safety

Describe areas where human health and public safety may be at risk and the mitigation measures that will be implemented to reduce the risk.

Livestock Administration (Grazing)

Describe the presence, type (i.e., cattle/horse or sheep/goat), and status (i.e., active or vacant) of any grazing allotments in the treatment area. Discuss the communication and coordination plans that are being implemented with permittees. Include pertinent rotation plans and/or other efforts to avoid, minimize, or mitigate impacts to livestock.

List any areas of exclusion within or near the treatment area that will be enforced to mitigate impacts to livestock.

Wildlife, Fisheries, and Plants

List all federally listed TEP species and all FS R4 Sensitive species that have known presence or potential habitat in the treatment area. Describe the status of all coordination and consultation efforts that have occurred with the appropriate agencies (e.g., United States Fish and Wildlife Service [USFWS], Nevada Department of Wildlife [NDOW], and Nevada Division of Natural Heritage [NDNH]). If federally listed species are present or have potential to occur in the treatment area, review the Biological Opinion (BO) for each species to determine how and if the aerially herbicide treatment can proceed. Describe any additional (beyond those described in existing Design Elements below) avoidance, minimization, and/or mitigation efforts that will be employed during application to reduce impacts to these species.

List any exclusion areas within or near the treatment area that will be enforced to mitigate impacts to federally and regionally listed species.

Cultural Resources

Describe what consultation has occurred with the State Historical Preservation Office (SHPO) and/or Tribal Historical Preservation Office (THPO) to date. Has consultation been fully completed? Are there any resources identified as a concern? Describe any additional (beyond those described in existing Design Elements below) avoidance, minimization, and/or mitigation efforts that will be employed during application to reduce impacts to these resources.

List any exclusion areas within or near the treatment area that will be enforced to mitigate impacts to cultural resources.

Tribal Consultation

List any exclusion areas within or near the treatment area that will be enforced to protect resources identified during tribal consultation.

Wild Horses and Burros

Identify any wild horse and burro territories that occur in the treatment area. Describe any additional (beyond those described in existing Design Elements below) avoidance, minimization, and/or mitigation efforts that will be employed during treatment to reduce impacts to wild horses or burros that may be present in the treatment area.

List any exclusion areas in the treatment area that will be enforced to protect wild horses and burros.

Developed Recreation Sites and National Scenic and Historic Trails

Identify any developed recreation sites, and/or national scenic and/or historic trails in the treatment area. Describe any additional (beyond those described in existing Design Elements below) avoidance, minimization, and/or mitigation efforts that will be employed during application to reduce impacts to these resources.

List any exclusion areas within or near the treatment area that will be enforced to protect developed recreation sites and national scenic and historic trails.

Hydrology/Soils

Identify water features that will be avoided during implementation. Such features should include but not limited to perennial streams, groundwater dependent ecosystems and springs, wetlands, wet meadows, lakes, ponds, and range water developments. Additional features to avoid are intermittent and ephemeral drainages during snowmelt or forecasted precipitation events, as they would likely serve as conduits to perennial systems. Where mapped and identified, avoid treating municipal watersheds or source water protection areas. Where detailed information does not exist, but a watershed has been identified for domestic use, ensure minimum buffers and Design Elements are used, or apply more restrictive measures if needed. Avoid treating erosive soils when runoff conditions exist, or precipitation events are forecasted. Where impaired water bodies exist and have been identified, apply minimum buffers and Design Elements, or apply more restrictive measures as needed to avoid further degradation or impairment of water quality conditions. Describe any additional (beyond those described in existing Design Elements below) avoidance, minimization, and/or mitigation efforts that will be employed during application to reduce impacts to soil and water resources.

List any exclusion areas within the treatment area that will be enforced to protect soil and water resources.

Health and Safety Checklist

Herbicide Handling

- ☐ To ensure worker safety and avoid potential impacts to the environment individuals working with herbicides or surfactants will read and follow label directions, including instructions for herbicide use, surfactant use, application rates, equipment and techniques, personal protective equipment for applicators and mixers, and container disposal.
- ☐ Make product labels, Safety Data Sheets (SDSs), Safety plans, Spill Prevention Plans, and cleanup kits available to applicators and mixers, per the requirements of FSH 2109.
- ☐ Perform herbicide applications by or under the direct supervision of a licensed professional herbicide applicators for forest and contract crews.
- ☐ To prevent misapplication wind speed and direction will be monitored throughout an herbicide application.
- ☐ Do not apply herbicide when sustained wind conditions exceed product label directions.
- ☐ Conduct equipment and personnel inspections and equipment maintenance and calibration and make repairs and replace parts promptly.
- ☐ A spill cleanup kit will be readily available whenever herbicides are transported or stored.

- ☐ Transport only the quantity of herbicide and adjuvants needed for a project. Transport secured containers in such a way as to prevent the likelihood of spills and make periodic checks enroute to help avoid spillage.

Aircraft Operations

- ☐ Use a Global Positioning System (GPS) in spray aircraft and map each treatment unit before the flight to ensure that only areas marked for treatment are treated.
- ☐ Obtain a weather forecast for the area prior to initiating a spraying project to ensure weather forecasts during and following treatment are within prescription during treatment and no rain for several days following prescription.
- ☐ Do not aerially apply herbicide treatments when sustained wind speeds exceed 10 - 12 mph or label recommendations, whichever is less.
- ☐ Do not aerially apply herbicide treatments during inversions, below minimum relative humidity, or above maximum temperature, as stated on label.
- ☐ Locate staging areas along in areas with previous disturbance (i.e., roads, intersections, and turnouts) to avoid resource damage.

Monitoring and Evaluation Plan

This monitoring and evaluation plan is designed to provide feedback to planners. It will provide HTNF staff with information primarily on plan implementation and the effects of implementation. Various types of monitoring may be used to determine success.

- **Drift Monitoring:** During application indicator cards will be placed within buffer zones to determine percent drift into off-target sites.
- **Post-Treatment Monitoring**
  - **Herbicide Effectiveness:** Evaluate the performance of the herbicide on the target species (short-term) post treatment. Data will help determine the schedule for retreatment and impact to off-target species.
  - **Native Plant Recovery / Infestation Reduction:** Repeat monitoring at key sites and weed occurrence mapping will help evaluate success of meeting objectives (long-term).

Drift Monitoring

Drift monitoring also known as buffer monitoring: Water sensitive drift detection cards (or drift cards) can be placed as needed within the buffer zones to document herbicide placement. The number of drift card lines should be determined by the sensitivity of the resource and the size of the area. The number of card lines should be considered carefully because they are time intensive and require additional project staff. Cards should:

- Be placed equidistance between the buffer from the sensitive resource to the boundary of the treatment area.

- Have the line number and location on the line recorded on each card at the time of placement.
- Be placed ten feet to ten yards apart depending on the width of the buffer area.
  Be placed on drift cardholders.
- Be placed immediately before application and picked up and stored in waterproof bags immediately after treatment.
- Not be placed the day or evening before early morning applications due to dew, fog, or humidity contamination.
- Be laid out in a dry office setting in the order they were placed and interpreted as soon as practical. (Cards often come with interpretation information and sampling square templates.)
- Filed in waterproof bags in the project file.

It is critical that those placing drift cards understand the correct methods for handling, placement, contamination, collection, and storage of the cards. While placing and picking up drift cards, each card should be examined, and any non-herbicide contamination should be noted. Contamination can include fog, high humidity, dew droplets off leaves, moisture on your hands, improper card handling, rodent urine or footprints, wildlife or insect moisture, and/or feeding on the cards.

If drift cards are used, card lines should also be placed in treatment areas under full spray conditions to serve as a reference for determining percentage of full spray on cards in buffer areas that have detection. Detection of herbicide within buffers may be acceptable as long as the herbicide does not reach the internal sensitive areas that the buffers are meant to protect.

Post-Treatment Monitoring

Are key monitoring sites already established within the project area? Do new key areas need to be established? What actions need to be taken to meet objectives? What are some suggested restoration actions that can be taken based on outcome?

This monitoring will determine:

- If the HTNF is achieving the long-term goals and objectives of the plan as predicted.
- If the effects of implementation are as predicted.

Components:

1. *Activity, Practice, or Effort: a specific statement of what will be monitored.*
2. *Intent of Monitoring: a specific statement of monitoring goal.*
3. *Monitoring Technique: description of the technique and sources of information to be employed. (Reference the Range Monitoring Handbook.)*
4. *Responsibility: the identification of the office(s) responsible for monitoring implementation.*
5. *Measurement Frequency: the schedule of samples stated in parts of a year or years. Includes some measurement of sample size.*
6. *Reporting Period: the reoccurring interval between reports summarizing monitoring results for a particular activity or practice. The sampling period should be long enough for specialists to capture*

significant information.

7. *Level of Monitoring/Size: a specified amount of examination needed to provide the required level of precision and reliability.*
8. *Variation Eliciting Further Evaluation/Standard: a statement describing the tolerance limits within which actual performance can vary from predicted performance. When these limits are exceeded, further evaluation is needed.*

Post-treatment monitoring includes:

- Monitoring and recording daily rainfall for up to a week after treatment.
- Scheduled reading of monitoring plots between one growing season and one year post-treatment.
- Drift card reading and submitting results to the HTNF Invasive Plant Program Manager.
- Compiling a treatment project file that can be used as a reference for future retreatment(s) (if necessary).
- Inputting data into the Threatened, Endangered, Sensitive, Proposed - Invasive Species / Forest Service Activity Tracking System (TESP-IS/FACTS) federal databases.
- Picking up flagging and any other unit markings.
- Completing contract daily diary and submitting original to the Contracting Officer (CO).
- Completing a Post-Treatment Evaluation (FSH 2109.14 Ch 72.1).
- Completing effectiveness monitoring and inputting the results in the federal FACTS database.

Communication Plan

Table 2: Notification List

Contact	Office Phone Number	Cell Phone Number
XXX District Office		
HTNF Supervisor's Office	775-331-6444	N/A
XXXX Dispatch		
Forest Supervisor		
XXXX District Ranger		
XXXX Deputy District Ranger		
XXXX District Project Lead		
HTNF Invasive Plant Program Manager		
Forest Public Information Officer (PIO)		
XXXX District Fire Management Officer (FMO)		
Forest Aviation Officer		

Contracting Officer's Representative (COR)		
Contracting Officer (CO)		
Add as necessary. Examples: grazing permittees, adjacent landowners, partners, and news outlets.		

Go/No-Go Checklist

Table 3: Go/No-Go Checklist

Questions	Circle YES or NO
Has the Pesticide Use Proposal (PUP) been approved by the Forest Supervisor?	YES NO
Have ALL the required notifications been made?	YES NO
Have ALL flight considerations and preparation work identified in the treatment plan been completed or addressed and checked (e.g., flight plan, radio frequencies, and safety plan)?	YES NO
Are ALL certified personnel and equipment on-site, available, and operational?	YES NO
Have ALL required current and projected weather forecast been obtained and are they favorable throughout the scheduled aerial applications? (Spot Weather Forecast, temperature, wind speed, and precipitation are checked and compliant with the herbicide label instructions.)*	YES NO
Are ALL best management practices (BMPs), applicable Design Element specifications, and health and safety checks met?	YES NO
Have all public information / area closure alerts been sent out prior to operation?	YES NO
Have ALL personnel been briefed on the treatment objectives, their assignment, and safety hazards (e.g., worker protection standards, early re-entry interval requirements, and safety and spill plans)?	YES NO
Has the Pesticide Use Proposal (PUP) been approved by Forest Supervisor?	YES NO
If all the questions were answered "YES" proceed with a treatment and document the current conditions. If any questions were answered "NO", DO NOT proceed with the treatment: Implementation is not allowed.	

* NOTE: A project-specific Spot Weather Forecast from the National Weather Service must be obtained prior to treatment, for each day that treatment continues, or when conditions adversely affecting the aerial application are predicted in the general forecast.

A Spot Weather Forecast is required prior to flights for each day aerial treatment will occur until total treatment area across the treatment area is complete. This Spot Weather Forecast will be obtained the day of the treatment, prior to flight.

Weather observations will be taken daily before and during active treatments and during holding (as needed) within a representative location of the treatment area. Weather will be taken manually by ground personnel during flights to confirm accuracy of the Spot Weather Forecast.

Local weather projected beyond the aerial treatment operation and the need for additional Spot Weather Forecasts should be considered in order to minimize the risk of misapplication and safety.

Plan Approval

The implementation plan for *project name* on the *Ranger District(s)* has been reviewed and approved by the following HTNF staff. This implementation plan will remain valid until objectives are met or conditions have changed. Any changes will be reviewed and approved by the HTNF staff before execution.

Prepared By: ____ Date: _______________

Approved By: ____ Date: _______________

Invasive Plant Program Manager: ______________________________ Date: _______________

Line Officer: ____ Date: _______________

Appendices

*The following appendices are **REQUIRED** components of the plan unless designated as optional.*

- *Appendix A: Implementation Plan Maps: Treatment Area and Vicinity, Project/Treatment Block(s), Resource Protection/Avoidance Areas.*
    - *Optional Maps: Range Allotments, Wild Horse and Burro Territories (if applicable), and additional maps as needed.*
- *Appendix B: Pesticide use supporting documentation (PUP(s), FS Spill Plan / Risk Analysis Worksheet, Nevada Division of Environmental Protection (NDEP) permit, safety plan, herbicide labels, SDS, application and monitoring forms, etc.)*
- *Appendix C: Flight supporting documents (flight plan, Risk Analysis Worksheet, emergency response and safety plan, Law Enforcement Officer (LEO) Plan, etc.)*
- *Appendix D: Photos (Optional)*