Sent via email and certified mail.

August 31, 2016

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RE: Draft Plan

Dear Ms. Korhman,

Please accept the following comments submitted on behalf of the Center for Biological Diversity and Defenders of Wildlife in response to the draft plan released by the Cibola National Forest. The Cibola National Forest stated that comments received by August 31, 2016 would be most useful, making these comments timely.

The **Center for Biological Diversity** is a national, nonprofit conservation organization with more than 1.1 million members and online activists dedicated to the protection of endangered species and wild places. The members and activists of the Center are concerned with the management of our federal public lands, including our national forests, especially as that management relates to the recovery and viability of native species and habitat. While we maintain members and supporters within the counties where ranger districts of the Santa Fe National Forest are located, our national public lands are to be managed for the benefit of all Americans, and we therefore speak for all our members and supporters throughout the United States.

Defenders of Wildlife is a national non-profit conservation organization founded in 1947 focused on conserving and restoring native species and the habitat upon which they depend. We submit the following on behalf of our more than 1,200,000 members and supporters nationwide, including more than 15,000 in New Mexico.

We intend for these comments to be comprehensive and easily understandable, however, if the Forest Service requires additional information about a recommendation or proposed course of action, the Center requests the opportunity to elaborate and provide additional information.

Please note that relevant scientific documents cited within these comments have been included with the copy of our comments sent on via certified mail in electronic form. We request that all references and documents submitted be incorporated into the administrative record for this project.

Table of Contents

I. Introduction

a. Legal Requirements

Under the National Forest Management Act of 1976 (NFMA), the Forest Service was required to develop guidelines to ensure forest management plans "provide for the diversity of plant and animal communities based on the suitability and capability of the specific land area."[1] In 2012, the Forest Service published final regulations, pursuant to its NFMA mandate, to guide the development of land and resource management plans of all national forests throughout the United States.[2] We are concerned that the Cibola National Forest's Preliminary Draft Land and Resource Management Plan (PDLRMP 2016) may be misinterpreting the requirements of the 2012 Rule and is thus not in compliance with NFMA. We provide details of our concerns below.

Within the 2012 Rule, the Forest Service reiterated and elaborated on NFMA's stated goals for providing for and protecting species diversity. Specifically, the 2012 Rule requires that plans ensure that forests "consist of ecosystems and watersheds with ecological integrity and diverse plant and animal communities," and provide ecological benefits including "habitat for fish, wildlife, and plant communities."[3] To achieve this, the 2012 Rule adopted "a complementary ecosystem and species-specific approach to maintaining [plant and animal diversity]."[4] This approach requires the Forest Service to develop forest "plan components, including standards and guidelines, to maintain or restore the ecological integrity of terrestrial and aquatic ecosystems and watersheds," as well as the "the diversity of ecosystems and habitat types."[5] Required plan components include only: desired conditions, objectives, standards, and guidelines.[6] The rule states, "[t]he set of plan components must meet the requirements set forth in this part..."[7] such as for sustainability[8] and plant and animal diversity.[9] In cases where plan components developed using this ecosystem-approach fail to adequately contribute to the recovery of federally listed species or maintenance of viable populations of species of conservation concern, species-specific components must be developed to achieve these goals.[10]

In all cases, plan components must be developed using "the best available scientific information."[11] And the Forest Service must document how the best available science was used to formulate the plan and the monitoring program.[12] This type of documentation specifically requires the Forest Service to: "Identify what information was determined to be the best available scientific information, explain the basis for that determination, and explain how the information was applied to the issues considered."[13]

The dual ecosystem- and species-specific approaches called for in the 2012 Rule have the potential to lead to the improvement of all ecosystems and habitats within the Cibola National Forest. The Center supports the development of ecosystem-level plan components to achieve greater ecosystem resiliency, watershed health, habitat connectivity, and greater protection of the region-wide ecosystem of western New Mexico. However, the Center also finds that based on the best available science, the Cibola's own assessment of

[1] 16 U.S.C. § 1604(g)(3)(B) (2012).
[2] *See generally* 36 C.F.R. § 219.1 et seq. (2014) (hereinafter 2012 Rule).
[3] 36 C.F.R. § 219.1(c).
[4] *Id.* § 219.9.
[5] *Id.*
[6] *Id.* § 219.7(e).
[7] *Id.* § 219.7(e)(3).
[8] *Id.* § 219.8.
[9] *Id.* § 219.9.
[10] *Id.*
[11] *Id.* § 219.3.
[12] *Id.*
[13] *Id.*

forest conditions, and the manageable specific threats facing species within the forest, species-specific plan components for listed and species of conservation concern are also required to meet the Forest Service's mandates under NFMA and the 2012 Rule.

II. General Comments on Preliminary Draft Land and Resource Management Plan Components

Many plan components are not specific enough nor sufficiently mandatory or regulatory to provide the certainty needed to meet legal requirements.

The 2012 Rule stresses the importance of establishing desired conditions toward which the resources of the national forest should be managed. Many agency staff believe that the intent was to substitute these more "aspirational" landscape-scale plan components for mandatory limits on individual projects (primarily standards). While, under the planning rule, projects must be consistent with desired conditions and objectives, as well as standards, guidelines and suitability[14], the ability of desired conditions to limit project impacts the way that standards have in the past is untested. It is important to identify which plan components are expected to benefit at-risk species and ensure that there is sufficient certainty that those benefits will occur. This means that desired conditions alone are not sufficient and some mandatory project-specific components are needed to limit effects.

Additionally, the Forest Service cannot rely only on the identification of desired conditions to meet the requirements of the 2012 Rule or provide sufficient management direction for the forest plan. This is especially true in the context of ensuring the protection of resources, as required under NFMA and the 2012 Rule. Therefore, while identification of desired conditions is an important element to forest planning, standards and guidelines must also be established and must provide for sufficient certainty for future management actions in order for the Forest Service to avoid violating legal requirements under federal statutes and regulations.

a. Problematic Plan Components

Throughout the PDLRMP, there are draft plan components that likely do not meet the definitions of desired condition, standard, and guideline articulated in the planning rule. We highlight a few examples below, but some problems highlighted in these examples apply to several draft plan components in the DPLRMP.

1. Desired Conditions

Subjective terms for desired conditions: adequate, sufficient, resilient, healthy, sustainable, typically, satisfactory, necessary, properly, occur throughout the PDLRMP. Failing to include objective measurable conditions means that the public cannot know what the Forest Service is planning or what the effects will be. Such desired conditions also do not meet the requirement that they be specific enough to allow progress toward their achievement to be determined.[15] They would more appropriately be defined as goals, which are optional and not plan components under the 2012 Rule. For at-risk species, the lack of desired conditions that describe the ecological conditions that are necessary for viable populations of the species, and that are scientifically supported, would result in violating NFMA's diversity requirement. We point out a few examples, below.

Pg. 52, line 39: Watersheds are functioning properly, in satisfactory condition.

[14] *Id.* § 219.15(d).
[15] *Id.* § 219.7(e)(1).

This desired condition does not include indices to allow measurable progress toward its achievement. The terms "functioning properly" and "satisfactory" are too vague and subjective to determine when ecological integrity is being achieved.

Pg. 21, lines 13-23: In forested vegetation communities, the area occupied by grass, forb, or shrub interspace is at or above the range given in the vegetation community desired conditions. Trees within groups may be more widely spaced with less interlocking of crown than what would be considered desirable otherwise. Interspaces between tree groups are of sufficient size to discourage isolated group torching from spreading as a crown fire to other groups. The tree basal area in the wildland-urban interface is on the lower end of the range given in the vegetation community desired conditions. Where the wildland-urban interface intersects vegetation types with a mixed- or high-severity fire regime, such as spruce-fir, characteristic ecosystem function is modified to promote low-intensity surface fires. In shrublands, fuel loading in the wildland-urban interface is on the lower end of the range given for the vegetation community desired conditions. There is adequate cover to meet the needs of a variety of wildlife species.

Subject terms are used throughout this desired condition. The meaning of, "[t]rees within groups may be more widely spaced with less interlocking of crown than what would be considered desirable otherwise" is unclear. What is "the range" specifically in reference to "the lower end of the range"? What are the thresholds and indices for "adequate cover" for the various at-risk species that depend on the forested vegetation communities?

2. Standards

Many, if not most, standards in the PDLRMP are written more like objectives or desired conditions. While the PDLRMP includes the definition of a standard in its introductory text, the Forest may be misinterpreting this definition. Standards set constraints on "project and activity decisionmaking," but many are too vague and broad to identify the constraints that should be imposed. Several standards reference applying unspecified "best management practices" (BMPs) (see problems with this approach below).

Pg. 53, lines 2-3: Cost-effective, reasonable, and effective best management practices will be prescribed for every project that has a potential effect on watershed condition, including water quality.

This standard is so broad and vague that it provides no direction. It seems to defer decision-making that should occur at the plan level to the project level. Though BMPs for water quality are referred to in the 2012 Rule, the rule is specific that these are BMPs established by the Chief in Forest Service directives.[16] The standard refers on unspecified BMPs that would defer decision making to the project-level, when these decisions are more appropriately plan-level decisions.

Pg. 63, lines 8-10: Consistent with existing water rights, development of surface waters for consumptive uses will include provisions that support the associated ecosystem such as managing the point of diversion, return flows, or other methods to ensure that water resource features are protected.

This standard is not specific enough to provide direction that is clear. What are the provisions? These should be specified somewhere in plan components. What does "protection" mean in this context?

[16] *Id.* § 219.(a)(4).

3. Guidelines

There are several guidelines that should probably be mandatory standards. Other guidelines do not appear to meet the planning rule definition for guideline.

Pg. 24, lines 35-36: Project design should manage for continuous representation of all age classes over time and create opportunities to develop underrepresented age classes.

This does not fit the definition of a guideline under the planning rule.[17] It is too vague to meet definition of any plan component definition.

Pg. 26, lines 1-3: Planning and design development for vegetation management projects should incorporate input from all resource areas in early planning stages to include opportunities and consideration for multi-resource management.

It is unclear how this guideline provides guidance. What does "incorporate input from all resource areas" mean? When is "early in the planning stages"? This guideline is confusing.

b. Reliance on Management Approaches and Best Management Practices

"Management approaches" are not plan components, may not be used to comply with requirements for plan components, and should not be used to avoid including direction in plan components. The most reliable means of ensuring harmful activities do not occur is by using mandatory standards and/or determinations that lands are not suitable for such activities. There are few such mandatory requirements in the Cibola PDLRMP. Management approaches are often used where standards are more appropriate. These management approaches are often written as if they were standards, and again recommend that many management approaches be reconsidered and rewritten as standards, and there is no rationale provided for why they are not. The result is confusion over what the plan requires and what is entirely optional. Some of the potential management approaches may need to be plan components in order to meet the requirements for plan components to provide for diversity. We realize that more plan standards beneficial to federally protected species and Species of Conservation Concern (SCC) may be forthcoming (PDLRMP 2016), but we can only judge the preliminary draft plan on its current content. We do not oppose the use of management approaches where they provide additional guidance for the execution of plan components.

"Best Management Practices" that are referenced in many plan components have not yet been developed, and therefore, it is unclear how they provide direction. By failing to provide criteria for these future determinations, this approach amounts to including no plan components that would meet species-diversity requirements. A similar result occurs when the plan component applies "as needed," but fails to provide guidance for when it would be needed. Such plan components retain unlimited discretion for project decisions. It is unlikely that a plan component that defers to guidance outside of the plan (e.g., unspecified BMPs) that allows maximum discretion at the project level may be used to meet the diversity requirements at the plan level.

[17] *Id.* § 219.7(e)(1)(iv)

III. Vegetation Management Comments

a. General Management of All Vegetation Types

Post-fire logging removes structural legacies of the pre-disturbance forest (Franklin et al. 2000, Swanson et al. 2011), and it physically disturbs naturally recovering burned soils (McIver and McNeil 2006, McIver and Starr 2000). Multiples lines of research positively correlate post-fire logging with increased fire hazard and severity (Donato et al. 2006, Thompson et al. 2007). Post-fire logging increases the likelihood of a "catastrophic" reburn at short timescales (Odion et al. 2004). Soil disturbance and movement of vehicles, equipment and personnel on burned sites also increases the likelihood of weed invasion, with potentially significant impacts to ecosystem function and disturbance regime (Brooks et al. 2004). Untreated logging slash may inhibit plant growth, and logging operations may virtually eliminate nitrogen-fixing shrub and forb species (Donato et al. 2006). Inhibited regeneration of early-successional species may lead to localized extinctions of other species that restore site productivity after fire.

Salvage logging has no ecological or scientific justification and should not be permitted within the Cibola. Where post-fire vegetation management is necessary, for instance in the case of hazard trees within recreational areas, such management should be done with the least possible physical manipulation of the surrounding area, so as to not interrupt or disturb natural post-fire ecological processes.

The following management approach must be removed (pg. 27, lines 6-8):

"When salvaging timber where high-severity fire occurred, an adequate number of trees for snag recruitment and coarse woody material would be left to maintain long-term soil productivity and to meet wildlife needs."

The following standard should be inserted (pg. 23):

"**No salvage logging shall occur in the Cibola National Forest.**"

b. Mixed Conifer with Aspen

In general, this section presents good desired condition statements that recognize the importance of maintain diversity in forest structure and disturbance within mixed-conifer forest. However, many of the management prescriptions for aspen are not supported by best available science.

Aspen is a disturbance-dependent species, primarily in response to fire on the forest landscape. Aspen stands contribute to forest biodiversity and structural heterogeneity. Multiple studies have shown higher plant and bird species richness in mixed conifer aspen stands than in mixed conifer without aspen. (Bartos 2000; Griffis-Kyle and Beier 2003). It is therefore important to maintain aspen across the forest landscape to maintain and promote species diversity on the Cibola. Unfortunately, studies of plant diversity trends have pointed to large-scale decline of aspen across the Western landscape (50-96% decline) since European settlement. (Bartos 2000: 10). The primary causes of this decline are believed to be overgrazing (past and current) by livestock, browsing by elk populations (lacking sufficient natural predation pressures), and fire suppression. (Griffis-Kyle and Beier 2003: 375). All of these causes lend themselves well to specific changes in forest management that can be accomplished or facilitated through the forest planning process.

However, management to sustain and promote aspen on the landscape should not become an excuse to engage in large-scale landscaping requiring intensive, mechanical strategies. The current guidelines for aspen in the draft plan are designed to facilitate and allow large-scale mechanical intervention, even

though this is both a high-cost and high-risk strategy. Simply removing conifers or moving herbivore water sources will not achieve landscape-scale aspen diversity, as desired: "Aspen occurs as a shifting mosaic across its range." (Pg. 33, line 14). Management must emphasize the facilitation of surface disturbance through natural fire regimes (which will promote the spread and reproduction of aspen, as well as stand opening disturbance), preceded and followed by removal of livestock grazing pressure in and near mixed conifer.[18] Other strategies may achieve small, local increases of aspen, but will fail to create the landscape-scale diversity necessary for aspen to regenerate across forest districts.

The following guidelines should be modified (suggested modifications in **bold**):

Pg.33, lines 30-32: "Aspen sprouting should be simulated in areas ~~**that have or previously had aspen by clearcutting, confer removal, or fire, has reasonable assurance of successful regeneration, and should take into account desired conditions for other resources**~~ **of mixed conifer forest through natural fire and removal of livestock grazing pressure from this vegetation type.**"

Pg. 33, lines 33-34: This guideline is not supported by best available science and should be removed.

Pg. 33, lines 35-37: "To preclude concentrated herbivore impacts, new surface water development should not be constructed near aspen stands (approximately a quarter of a mile) ~~**unless this is the only developable area for water in the planning area**~~."

Pg. 33, lines 38-40: This guideline does not provide clear management direction and should be removed.

c. Mixed Conifer-Frequent Fire

The desired conditions appropriately capture the need and desirability for landscape and local-level disturbance regimes to maintain heterogeneous forest conditions. However, two important pieces of the management framework needed for frequent fire mixed conifer ecosystems are missing from the current draft plan. The first is explicit adoption of a fire-based restoration strategy. The second is the lack of standards to maintain large, old trees and old growth characteristics within this ecosystem if mechanical or non-natural means of restoration are used.

Natural fire process is centrally important to restoration of ponderosa pine and mixed conifer forests, which are the primary elements of Southwestern forests (Allen et al. 2002, Cortina et al. 2006, Falk 2006). Conservation of large trees is also fundamentally important to restoration. "In general . . . removal of large, old trees is not ecologically justified and does not reduce fire risks" (DellaSala et al. 2004: 982).

The following standards should be inserted (pg. 36):

"**Utilize and enhance existing forest structure by retaining the largest trees and groups of larger trees with interlocking crowns. Larger diameter trees, in VSS 4, 5, and 6 should be retained to replace the structure and function of old growth trees that were removed by logging.**"

The following management approaches should be inserted (pg. 36):

[18] Note also that according to the Assessment, the Cibola currently has 0% late seral stage mixed conifer with aspen and mechanical thinning or removal of conifers will not facilitate recruitment of additional late-stage conifer, which can only be restored long-term by retention of both conifers and aspen. Assessment at pg. 56

"**Fire is recognized as a natural process in fire-adapted mixed conifer ecosystems and is the primary tool used to achieve resource and management objectives. Both naturally occurring fire and human caused fires are used as management tools, as appropriate.**"

d. Ponderosa Pine Forest

Large ponderosa pine trees possess autecological characteristics such as relatively thick bark and insulated buds that promote resistance to heat injury (Weaver 1951). Mature ponderosa pines have a high capacity to survive and recover from crown scorch (McCune 1988). Thus, the existence of large tree structure enhances forest ecosystem resilience to wildland fire (Arno 2000, Pollett and Omi 2002). Moreover, large trees are the most difficult of all elements of forest structure to replace once they are removed (Agee and Skinner 2005). This scientific background underscores the need to approach forest restoration with plan components that will retain large, old trees, while reintroducing fire and maintaining heterogeneity to benefit the complete host of species that rely on our forested ecosystems.

The following standards should be inserted (pg. 39):

"**Utilize and enhance existing forest structure by retaining the largest trees and groups of larger trees with interlocking crowns. Larger diameter trees, in VSS 4, 5, and 6 should be retained to replace the structure and function of old growth trees that were removed by logging.**"

e. Pinyon-Juniper

Pinyon-juniper woodlands support high avian abundance and diversity, with many obligate and semi-obligate species, and with a low level of avian community similarity to other forest habitats[19]. (Sieg 1991) found higher bird abundance in pinyon-juniper woodlands in Utah during every season than were found in adjacent grasslands. An estimated 1,000 species are associated with pinyon pines in the southwest (Whitham et al. 2003), and pinyon pines hold cultural significance (i.e., pine nut gathering). Slow-growing pinyons are extremely drought sensitive (Mueller et al. 2005; Breshears et al. 2009).

Recent reviews of pinyon-juniper literature have concluded that human activities and management activities over many decades have negatively impacts this ecosystem-type. These practices include livestock grazing, which removes understory plants, grasses and forbs, contributing to decreased fire frequency and disruption of natural fire regimes; chaining and commercial logging; and traditional range improvement projects. (Kyllo 2016[20]). "Restoration" treatments or projects, especially projects that include reduction in tree density, can no longer be justified based on the best available science: "Encouraging natural migration into previously unoccupied landscapes may be the only way we see [pinyon]-juniper woodlands survive." (Kyllo 2016: 33). Importantly, pinyon-juniper "range contractions and expansions are a natural response to climate change," which should be accepted, even if it comes at the expense of livestock grazing. (Kyllo 2016: 33).

The following standards should be inserted (pg. 43):

"**Chaining is not used as a management strategy or tool within the Cibola National Forest.**"

[19] USDA. 1999. Forest Service Proceedings RMRS-P-9. Paulin, K.M., J.J. Cook, and S.R. Dewey. Pinyon-juniper woodlands as sources of avian diversity. Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.540.1579&rep=rep1&type=pdf.

[20] Pinon-Juniper Woodlands of the Western United States: Are we on the Brink of Pinon Oblivion? https://nau.edu/CEFNS/Forestry/_Forms/MF-Professional-Papers/2016-RonaldKyllo-PinonJuniperWoodlandsWesternUS/

The following management approaches should be inserted (pg. 44):

"**Migration of pinyon-juniper woodlands into grasslands is monitored and managed as an appropriate natural process occurring in response to changing climatic conditions.**"

" **Pinyon-juniper ecosystems exhibit a diversity of patch sizes and canopy cover, the structure and function of which are maintained using fire as primary management tool.**"

f. Grassland Vegetation Types

A significant problem with the current draft plan is the lack of any management guidance for grassland ecosystems. Desired conditions focus on seral-stage conditions but following this single plan component would not support maintaining or restoring the key characteristics for ecological integrity. What are the compositional, functional, and connectivity characteristics that must be met to achieve integrity? These must be incorporated into plan components. Grasslands support a wide variety of native species, including the pronghorn, Gunnison's prairie dog, burrowing owl, ferruginous hawk, mountain plover, and badger. Additional management direction, supported by best available science, is needed within the plan to restore or maintain the integrity of grassland ecosystems.

Most importantly, however, is the inclusion of specific standards and guidelines that approach grassland management from the species viability and recovery framework. Grassland health is dependent on functioning animal population dynamics, which means ecological management strategies should be focused on restoring and maintaining populations of Gunnison's prairie dogs, keystone or highly interactive species of the Cibola's forest district grassland systems.

We encourage the Forest Service to consider Gunnison's prairie dog colonies as important, rare grassland communities or ecosystems that should be more common on the Cibola; colonies provide habitat for a range of grassland species. The Forest Service has carried forward the Gunnison's prairie dog as a species on its potential SCC list (CNF 2016 [July 15]). The prairie dog's keystone role in grassland ecosystems of the Great Plains and Intermountain West has been well documented by a multitude of studies (c.f., Miller et al. 1994; Kotliar et al. 1999; Bangert and Slobodchikoff 2000; Kotliar et al. 2000; Miller et al. 2000; Davidson and Lightfoot 2006). Gunnison's prairie dog habitat and behavior help shape the structure and functional ecology of grassland ecosystems, giving rise to greater biodiversity in grasslands where they are present (Bangert and Slobodchikoff 2000). Like all ecosystems, grasslands are dynamic and benefit from heterogeneity at the landscape level. Prairie dogs contribute to this heterogeneity, manipulating their environment to create areas devoid of grass, which can benefit insects, areas of tunnels and burrows, which benefit burrowing owls and other small mammals, and areas of concentrated prairie dogs, which serve as prey source for larger mammals, such as badgers, foxes, and raptors.

It is hard to overstate the importance of prairie dogs to the ecosystems of the Intermountain grasslands of the U.S. Prairie dogs qualify under multiple categories of keystone species—as prey and for their modification of habitat (Mills et al. 1993). Keystone species enrich ecosystem function uniquely and significantly through their activities, and their impact is larger than predicted relative to their biomass (Paine 1980; Terborgh 1988; Mills et al. 1993; Power et al. 1996; Kotliar et al. 1999; Miller et al. 1998/1999). Kotliar (2000: 1715). Prairie dogs are functionally unique; they perform roles within their ecosystem not performed by other species or processes.

Prairie dog activities and the changes made by these activities create a unique ecological system known as the "prairie dog ecosystem" (Clark 1989). Over 200 vertebrate species have been observed on prairie dog colonies (Kotliar et al. 1999). Some of these species appear to depend on prairie dog colonies for their

survival and many appear to benefit, at least seasonally or opportunistically, from their existence (Kotliar et al. 1999).

Prairie dogs and other animals inhabiting prairie dog colonies represent a rich prey patch for a large number of predators (Plumpton and Anderson 1997; Berry et al. 1998; Kotliar et al. 1999). A variety of predators, including rattlesnakes (*Crotalus viridis*), golden eagles (*Aquila chrysaetos*), great horned owls (*Bubo virginianus*), weasels (*Mustela frenata*), bobcats (*Lynx rufus*), coyotes (*Canis latrans*), and others, prey on prairie dogs and small mammals that have a higher abundance on prairie dog colonies (Agnew et al. 1986). Some predators, especially black-footed ferrets (*Mustela nigripes*), are completely dependent on prairie dogs (Clark 1989). Other species, such as badgers (*Taxidea taxus*) and ferruginous hawks (*Buteo regalis*), benefit substantially from the presence of prairie dogs as prey (Allison et al. 1995; Plumpton and Andersen 1997, 1998; Berry et al. 1998; Goodrich and Buskirk 1998).

The benefits of prairie dogs extend well beyond simply being food for predators (Reading et al. 1989; Ceballos et al. 1999; Kotliar et al. 1999). Prairie dogs also substantially alter their environment. Since prairie dogs excavate more burrows than they regularly utilize[21], they create hibernacula, dens, and nests for many animals, such as black-footed ferrets, badgers, cottontails (*Sylvilagus* spp.), burrowing owls, shrews, other rodents, and several species of reptiles and amphibians (Sharps and Uresk 1990; Plumpton and Lutz 1993; Desmond et al. 1995; Kretzer and Cully 2001). These species and more also use the burrows as refugia from predators or temperature extremes. As a result, researchers have found that desert cottontails (*S. audonbonii*), thirteen-lined ground squirrels (*Spermophilis tridecemlineatus*), and northern grasshopper mice (*Onychomys leucogaster*) exist in higher numbers on prairie dog colonies than in surrounding grasslands (O'Meilia et al. 1982).

Prairie dogs also have a large effect on grassland structure, composition, and function (Coppock et al. 1983; Detling and Whicker 1988; Whicker and Detling 1993; Weltzin et al. 1997a). The activities of prairie dogs, especially their grazing and clipping of tall vegetation, result in changes in plant composition (Bonham and Lerwick 1976; Coppock et al. 1983, Detling and Whicker 1988; Whicker and Detling 1988a, b; 1993, Weltzin et al. 1997a; Detling 1998). In general, the vegetation on prairie dog colonies is characterized by lower biomass and a greater preponderance of annual forbs and short grasses compared to tall grasses and shrubs, but is higher in nitrogen content than vegetation from surrounding areas (Bonham and Lerwick 1976; Coppock et al. 1983, Weltzin et al. 1997a; Detling 1998). Prairie dogs negatively impact some plant species, reducing the prevalence and controlling the spread of taller grasses and several shrubs, such as mesquite (*Prosopis* spp.), sagebrush (*Artemisia* spp.), and longleaf jointfir (*Ephedra trifurca)* (Bonham and Lerwick 1976; Coppock et al. 1983; Weltzin et al. 1997b). Ironically, prairie dogs are poisoned for livestock interests, but these shrubs reduce grass available for cattle, and mesquite makes roundups more difficult (Miller 1991; Weltzin et al. 1997b).

Prairie dog burrowing activities modify ecosystem function such as water, mineral and nutrient cycling. Prairie dogs turn over approximately 225 kg of soil per burrow system, which translates to several tons of soil per hectare (Whicker and Detling 1993). By mixing in nutrient-rich urine and manure, prairie dog digging can change soil composition, chemistry, and microclimate, facilitate below-ground herbivory, increase porosity of soil to permit deeper penetration of precipitation, and increase the incorporation of organic materials into the soil (Ingham and Detling 1984; Whicker and Detling 1988 a,b; Munn 1993; Outwater 1996). As a result, prairie dog colonies support higher numbers of nematodes and higher levels of soil nitrogen (Ingham and Detling 1984; Detling 1998). All of these processes contribute to aboveground plants with a higher nutritional content, greater digestibility, and a larger live plant to dead plant ratio, creating favorable feeding habitat for other herbivores (Whicker and Detling 1993). Indeed,

[21]Despite the common belief that there are several prairie dogs per burrow entrance, there are actually several burrow entrances per prairie dog (Biggins et al. 1993; Hoogland 1995).

pronghorn and bison preferentially graze on prairie dog colonies (Coppock et al. 1983; Krueger 1986; Detling and Whicker 1993, Detling 1998). Foraging models predict that bison can gain weight faster by grazing on pastures with prairie dog colonies than on grasslands without prairie dogs (Vanderhyde 1985 in Whicker and Detling 1993).

Kotliar et al. (1999: 177) concluded that collectively these functions are large, not wholly duplicated by other species (either in form or extent), and that the loss of prairie dogs would lead to "substantial erosion of biological diversity and landscape heterogeneity across the prairie." They concluded that the prairie dog therefore fulfills the definition of keystone species (see also Kotliar 2000). Through the structure, form, and function of their colonies, prairie dogs play a keystone role in the prairie, and the role is large. Existing evidence indicates prairie dogs (and other associated species) provide important prey to predators, and their grazing and burrowing activities modifies the environment in a manner beneficially used by other prairie organisms (Whicker and Detling 1993; Kotliar et al. 1999). Most importantly, those grazing and burrowing activities affect vegetative composition, vegetation quantity and quality, productivity, nutrient cycling, and soil quality (Bonham and Lerwick 1976; Coppock et al. 1983; Detling and Whicker 1988; Whicker and Detling 1988 a, b; 1993).

Gunnison's prairie dogs are not only indicators of grassland integrity but grassland restoration management tools and should be considered as focal species for monitoring. Burrowing owls can also serve as focal species (Sheffield 1997; Alverson and Dinsmore 2014).

Prairie dog populations have declined by over 95%. The loss of prairie dogs throughout their historic range brought the black-footed ferret close to extinction. The species depends on prairie dogs for up to 95% of its dietary needs. Ferruginous hawks and golden eagles decline locally when prairie dog populations decline (Kotliar et al. 1999). Burrowing owls have suffered declines in suitable habitat, which has directly led to steep declines in the owl populations as well (Sheffield 1997). These are just a few examples how prairie dog population declines affect other species.

Maintaining and restoring Gunnison's prairie dog colonies and complexes and population numbers will require species-specific plan components. Please see below for a discussion of plan components necessary to recovery and maintain viability for the species.

IV. Riparian Ecosystems and Watershed Resources

The Forest Service should develop riparian and watershed ecosystem plan components that protect sensitive riparian areas through the use of a firm buffer in which restoration of functional and structural connectivity is prioritized and damaging activities, such as motorized use or livestock grazing, are prohibited. These riparian buffer areas must have special management direction. Watersheds that are found to be at-risk or degraded should be managed specifically for restoration and prevention of further degradation, which may require limitation on activities permitted within those areas.

Riparian ecosystems are incredibly rare, host a diverse array of specialized species, and are highly at-risk from the impacts of climate change. Maintenance of watershed health is a primary legal mandate for the Forest Service. Given this reality, we recommend that the Forest Service prioritize mitigation and prevention of impacts from human uses within riparian areas, while protecting species and habitat through the use of firm standards and guidelines for watershed and riparian resources forest-wide. We advocate for the use of an aquatic conservation strategy, as outlined below, to achieve these goals. Standards and guidelines should be developed that conform with these recommendations:

a. Riparian and Water Resource Buffers

Under the 2012 Rule, areas managed to benefit riparian resources are referred to as "riparian management zones." They are required for ecological sustainability (219.8(a)(3)). This designation should extend to all riparian areas within the Cibola and be designed so that all riparian areas offer the highest quality aquatic habitat and where recovery of at-risk aquatic organisms would have the greatest likelihood of success. Riparian management areas have special management direction and are deemed generally unsuitable for timber production, minerals extraction, and motorized recreation. These management areas should extend no less than 300 feet from each side of a watersource, but may need to be much wider, for instance in cases of extreme slopes or canyons, or where heavy degradation is already occurring.

The benefits of riparian buffers in grazing management are numerous and include: "stabilization of streambanks, the filtering of runoff, the reduction of peak floods, and the enhancement of habitat by controlling water temperatures and providing shelter to wildlife" (Agouridis et al. 2005: 598). While many studies and researchers have questioned the effectiveness of fixed-width boundaries in achieving the most desired function and structure for riparian ecosystems, the general premise of maintaining vegetation and impact buffers for sensitive riparian areas remains grounded in science and the most easily achievable management strategy given budget limitations and uncertainties related to best management practices (Richardson et al. 2012; Kuglerova et al. 2014). Management approaches, especially in areas with numerous imperiled species that have a high-likelihood to be significantly affected by climate change, should follow the precautionary principle. In other words, the Forest Service should impose management buffers around riparian areas, while implementing an adaptive management and monitoring plan that measures key riparian functions and wildlife trends to determine future course of action and even more effective management strategies.

b. Maintenance/Restoration of In-Stream Flows

When the United States reserved public lands for national forests, it also implicitly reserved sufficient water to satisfy the purposes for which the lands were reserved. *See Winters v. United States*, 207 U.S. 564 (1908); *Arizona v. California*, 373 U.S. 546 (1963). The date of priority for a reserved water right is the date the land was reserved. The reserved rights doctrine serves as a tool for protecting flows in rivers and streams on public lands. The Forest Service can and should protect flows in rivers and streams on public lands by asserting rights under the reserved rights doctrine. The Forest Service must engage on the state level for the water rights to be recognized in each states water rights system. However, reserved rights are not subject to the diversion and beneficial use requirements under state law and cannot be lost by non-use. The reserved rights are also limited by the "primary purpose" and "minimal needs" of the reserved lands.

Tracking, application for, and obtaining in-stream flow rights for the Cibola an important and necessary management practice to ensure continued stream flows that support aquatic and riparian ecosystems. The Cibola should create substantive guidance on tracking streamflow and identifying streams requiring instream flow rights as an objective within the forest plan.

c. Maintenance and Restoration of Aquatic Connectivity

Maintaining and restoring connectivity between and among watercourses must be a desired condition for aquatic ecosystems. Fish and aquatic obligate species in the Southwest, including in the Cibola, cannot be adequately protected without connectivity between water sources that allows for movement between distinct populations and maintenance of genetic diversity. Aquatic species are most resilient when connectivity is maintained and restored, because natural disturbances will inevitably impact water sources, and a functional ecosystem depends on long-term resiliency.

d. Conservation of Watershed and Riparian Function and Structure

Removal and restoration of roads and motorized trails

Road density and watershed sentence. More important, roads intrinsically bring a host of harms to water quality and wildlife habitat (e.g., Trombulak and Frissell 2000, Gucinski et al. 2001), hence reconfiguration of existing forest road networks has been long recognized by the Forest Service and the scientific community as absolutely central for restoration and recovery of a broad range of ecosystem values and species (Switalski et al. 2004).

Allowing for natural disturbance

Disturbances of vegetation, soils, and hydrologic processes, whether they are expressed as fine-grained, smaller scale dynamics, or as coarse-grained influences at larger scales of the landscape, are known to be vital in contributing to and sustaining the long-term structural and functional complexity of physical and biological systems in riparian areas and streams (PRC 2012, Rhodes 2007, Bisson et al. 2003, Minshall et al. 1997).

Potential need for active restoration

Many, perhaps most of these habitats are moderately to severely degraded by past multiple forest uses including grazing, mining, logging, roads, changes in wildlife and associated herbivory and trophic influences, and in some cases, fire suppression. Therefore "retention" of their present values and functions is far from sufficient; management must be designed to passively and, where needed, actively *restore* these values and functions.

e. Long-term, Detailed Monitoring Plan

The scope and objectives of monitoring need to be identified relative to assuring that desired conditions are being attained and standards are being met, but it is equally important to identify triggering criteria that tie monitoring results to decisions on agency actions. The feedback loop from monitoring results to action decisions must essentially recognize the intrinsic time lags and potentially irreversible harms can result from some actions and conditions, and therefore they should be specifically structured to avoid the accrual of time-lagged and catchment-wide cumulative impacts.

V. Species

As discussed above, the 2012 Rule requires the Forest Service to ensure species diversity and viability through specific plan components. Ecosystem-level plan components are appropriate to manage ecosystems, watersheds, and species habitat. Specifically, such plan components must be developed to maintain or restore "structure, function, composition, and connectivity" of ecosystems and watersheds.[22]

In the context of at-risk species, a desired condition must meet a two part test: 1) "a description of specific…ecological characteristic," and 2) "that must be described in terms that are specific enough to allow progress toward their achievement to be determined."[23] For at-risk species, the ecological characteristic must be the ecological condition necessary to meet the requirements of 219.9. It is very important to note that desired conditions within a plan area must not work against each other and must be

[22] 36 C.F.R. § 219.9(a).
[23] *Id.* § 219.7(e)(1)(i).

mutually achievable. In addition, all of the other plan components must be based on desired conditions and must be integrated with each other.[24]

Furthermore, the rule requires standards or guidelines for at-risk species. And without such standards and guidelines, any assertion or finding that forest plan direction will lead to better outcomes, including increased population numbers, greater genetic diversity, maintenance and restoration of relevant habitat characteristics, long-term viability, and other measureable goals, will be arbitrary and capricious.

However, in many cases, these top-level plan components will be insufficient to ensure the recovery of listed species or the viability of species of conservation concern. In these cases, the Forest Service must develop species-specific plan components, including standards and guidelines, to ensure ecological conditions will support recovery and viability.[25]

The distinguishing characteristic of species-specific plan components in the planning rule is that they are designed for species not otherwise fully provided for by ecosystem plan components. Species-specific components may tend to be project components: standards and guidelines that provide mitigation for certain activities known to cause adverse effects on the species or its habitat. They may also be desired conditions for species populations or for conditions at a finer scale relevant to a species' needs. Plan components to address ecological conditions related to human uses and structures may also tend to be directed at the needs of specific species.

A "coarse filter strategy" that relies heavily on ecosystem components is appealing because of the apparent efficiency of addressing multiple species in an integrated manner, and because it can be developed using familiar available metrics for vegetation attributes. However, a single, generalized characterization of habitat is unlikely to provide a reliable basis for multi-species conservation efforts (Cushman et al. 2008). Reliance on habitat characteristics can be expected to conserve a species only if the following assumptions are met (Noon et al. 2003):

- The selected characteristics are adequate as surrogates for the species.
- The selected characteristics include those threatening the species' persistence.
- The spatial resolution of the coarse filter matches the scale at which the species responds to environmental heterogeneity.

The likelihood of these assumptions being valid for most species is low (Noon et al. 2003), and therefore some or most at-risk species are likely to require species-specific plan components

For species, the DEIS should provide a connection between the species requirements and plan components to facilitate the species evaluation. If necessary ecological conditions for at-risk species (identified in the assessment) have been incorporated into plan components that describe habitat needs and address the most important stressors, and if components furthering competing uses of the plan area have been integrated with those for species, a plan should meet species persistence and viability requirements.

The species evaluation should use appropriate models to project effects and use BASI to interpret those effects on the at-risk species. In some cases a formal population viability analysis of future conditions may be appropriate. In others, the BASI may consist of professional opinions. This species evaluation is a

[24] See NFMA Section 6(f)(1) (16 U.S.C. § 1604(f)(1)), which requires "one integrated plan," as described in 219.1(b) and 219.2(b) in the rule. The rule describes all of the other required plan components in terms of the desired condition in 219.7(e).
[25] *Id.* § 219.9(b).

key step where outside scientific review of conclusions about ecological conditions and species persistence will be extremely important because substantial credibility is required to demonstrate compliance with legal requirements for species at risk under NFMA and ESA, especially where there is a high degree of potential controversy.

It needs to be recognized that this species evaluation is probabilistic, depends on assumptions, and therefore may be highly uncertain. The assumptions should be clearly documented, as should the assignment of risk using the precautionary principle. Monitoring related to these assumptions will be extremely important.

If the necessary ecological conditions have not been provided for one or more species, the responsible official must add, remove or change plan components, and reevaluate the effects of the plan. Components to provide ecological conditions for individual species at a fine scale may be needed, including project plan components, especially standards.

The following displays would facilitate the process of selecting plan components and evaluating their effects:

- Matrix showing which key ecological conditions are relevant to which species
- List of key ecological conditions, their stressors and trends, and the plan components that will address them
- List or matrix of species and plan components that may adversely affect each species
- List or matrix of species and plan components designed for or expected to benefit those species

The final product within the DEIS will be an evaluation of the effects of the complete set of plan components on each species, including a discussion of efforts made to integrate ecosystem and species-specific plan components with plan components for multiple uses. The documentation of effects includes two main conclusions. The first is about the effects of the plan components on the trend and status of key ecological conditions for each species. This should be included for public review as part of the effects disclosure in the NEPA documents. The second is a determination of whether those effects demonstrate that plan components provide the necessary ecological conditions for species at risk. This finding must be based on the effects analysis and documented in the decision document.

In addition, other jurisdictions may have adopted conservation strategies for some species and coordination of such direction across jurisdictions facilitates "all-lands," landscape-level conservation planning. These strategies include existing recovery plans for species listed under the Endangered Species Act (ESA), which may lead to plan components for species that are not currently present in the plan area. Conservation measures identified in prior project-level consultation should also be considered for application as plan components. Forest plans should also incorporate strategies that include regulatory mechanisms designed to avoid listing of proposed or candidate species or SCC.[26]

a. Federally Protected Species

The 2012 Rule establishes an affirmative regulatory obligation that forest plans "provide the ecological conditions necessary to: contribute to the recovery of federally listed threatened or endangered species."[27] The provision supports NFMA's "diversity requirement."[28] Forest planning regulations and forest plans

[26] The responsible official should consider consulting the U.S. Fish and Wildlife Service's Policy for Evaluation of Conservation Efforts When Making Listing Decisions when designing strategies to conserve listed and at-risk species (68 Fed. Reg. 15100).
[27] 36 C.F.R. § 219.9(b)(1).
[28] 16 U.S.C. § 1604(g)(3)(B).

make conservation decisions and are vehicles to demonstrate compliance with NFMA, as well as the ESA.

The ESA requires the Forest Service and other federal agencies to, "utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation4 of (listed species)."[29] Therefore the ESA requires that the Forest Service must use its authorities, including NFMA and its planning process and resulting plans, in furtherance of recovery of listed species. Moreover, the preamble to the planning rule specifically links this requirement to its responsibility under the ESA for recovery of listed species, stating, "[t]hese requirements will further the purposes of § 7(a)(1) of the ESA, by *actively* contributing to threatened and endangered species recovery and maintaining or restoring the ecosystems upon which they depend" (emphasis added).[30] Under section 7(a)(2) of the ESA, the Forest Service must "insure that any action authorized, funded, or carried out [by the Forest Service] is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical habitat]."[31]

Under the ESA, delisting or preventing listing requires adequate regulatory mechanisms, which courts have determined forest plans can provide—if plan components are legally binding (*Greater Yellowstone Coalition v. Servheen*). Consequently, when developing plan components to provide ecological conditions for plant and animal diversity in accordance with 219.9, planners should avoid vague or discretionary plan components.

Standards (and determinations of unsuitability) should be encouraged as a means of meeting requirements to provide "necessary" ecological conditions for listed species. Using standards to meet this diversity requirement in 219.9 is consistent with the rule's emphasis on using standards when mandatory constraints are needed to meet legal requirements (219.7(e)(1)(iii)). The threat of species extinction, or extirpation, from the Cibola is something the Forest Service needs to take seriously and address with increased specificity within the forest plan.

A forest plan should provide ecological conditions necessary for a recovered population. The Forest Service Planning Handbook recognizes recovery plans by stating that their "conservation measures and actions" should be considered.[32] The Handbook also suggests consideration of "limiting factors" and "key threats" (which should include those that were the basis for listing the species). Finally, the Handbook states that the planning team should, "Engage with the U.S. Fish and Wildlife Service and National Marine Fisheries Service, as appropriate, in the evaluation of existing conditions for threatened and endangered species. The direct use of recovery plans for forest planning should be a goal, and more than a "consideration," but it is unlikely that recovery plans would provide complete answers to what the necessary ecological conditions are in the plan area.

1. Mexican Gray Wolf (*Canis lupus baileyi*)

The Cibola provides the biophysical elements necessary to support Mexican gray wolves; however, other "conditions" exist that hinder their ability to establish and recover in the Forest. After 18 years of reintroduction to the Southwest, high rates of human-wolf conflict have led to significant animal mortality or removal from the landscape, undermining the establishment of a viable population. In 2015, the wild population declined by 12 percent, from 110 to 97. Thirteen adult wolves were found dead during this period. The majority of wolf losses were the result of illegal killing, one of the primary factors the U.S.

[29] 16 U.S.C. § 1536(a)(1).
[30] 77 Fed. Reg. 21215.
[31] 16 U.S.C. § 1536(a)(2).
[32] FSH 1909.12, Ch. 20 § 23.13a.

Fish and Wildlife Service cited in its determination that the species warranted listing under the ESA (80 Fed. Reg. 2488).

Mexican wolves are native to New Mexico and historically were present within the boundaries of the Cibola National Forest. Additionally, the Cibola National Forest's proximity to the Gila National Forest (where Mexican wolves are already present), means that the Cibola is likely to be one of the first forests re-inhabited by wolves under the new recovery regime. The FWS has stated that the reintroduced population of Mexican wolves, at least one pack of which previously inhabited the Cibola, is "fundamentally necessary" for Mexican wolf recovery.[33] Under a new rule regarding the experimental population of wolves that is managed by the FWS, the Magdalena Ranger District of the Cibola National Forest is now designated as Zone 1 area where initial releases of Mexican wolves into the wild can occur.[34] Other ranger districts within the Cibola fall within Zone 2 of the reintroduction program, which means wolves are "allowed to naturally disperse and occupy" and can be translocated into these ranger districts.[35]

The Forest Service has a responsibility to tailor land management plans to support recovery of endangered species, even if those species are controversial or only partially impacted by management within a particular forest. Recovery of the Mexican wolf in Southwest will "depend on establishment of a metapopulation or several semi-disjunct but viable populations spanning a significant portion of its historic range in the region" (Carroll et al. 2006). The US Supreme Court held in *TVA v. Hill* 437 U.S. 153 (1978) that the Endangered Species Act is the highest priority for all federal agencies, and Forest Service guidance, as well as NEPA requires the agency to use the best science available when making its decisions.[36] Establishment of packs and lone individuals within the Cibola National Forest must be supported and planned for as part of this plan revision process, particularly because the Cibola is itself a disjunct forest whose non-contiguous units can help support a metapopulation including the permeability to wolf genetic exchange that is fundamental to conservation of Mexican wolves, which suffer from inbreeding.

Killing or removing live Mexican wolves for the purposes of remediating livestock depredations is unnecessary and unproductive (Harper et al. 2008), and is acutely inhumane given wolves' intelligence, understanding, and close social ties. Management removals have also played a significant role in retarding recovery of the Mexican wolf.

The Forest Service's current approach to permitting and authorizing livestock grazing operations does not incorporate planning or requirements for using best practices or maintain operating flexibility to minimize wolf-livestock interactions. The Forest Service has the authority to adapt Annual Operating Instructions to respond to conditions on the ground, which includes the presence of wolves within an allotment or pasture. Working with state and federal wildlife agencies, the Forest Service could take a proactive approach to addressing the needs of both wolves and livestock permittees before conflicts arise, rather than after. Part of this will be placing restrictions on permitted operations, but another component will be to retain management flexibility to respond to and prevent conflicts.

Ultimately, it is the responsibility of the Forest Service to ensure that policy and practice in the permitting and management of livestock do not threaten the existence of native wildlife. Placing reasonable

[33] 78 Fed. Reg. at 35732-35733 (June 13, 2013).
[34] 80 Fed. Reg. at 2523.
[35] *Id*. at 2559.
[36] See Forest Service Handbook 1909.12, 42.1 (2013), see also National Environmental Policy Act 40 C.F.R. § 1500.1(b); See also Executive Order 13563 (2011), affirming Executive Order 12866 (1993); See also Endangered Species Act 16 U.S.C. 1533 (b)(1)(A).

requirements on the activities and permits of livestock grazers is appropriate and necessary. Specifically, the 3-year review for Mexican grey wolves recommended requiring livestock owners to take responsibility for carcass removal disposal.[37] Failure to take management action to prevent a significant threat the Mexican grey wolf on our public lands would be unacceptable.

Conflicts between wolves and livestock producers are especially pernicious. This is an area where strategic and proactive management and guidance to forest users can significantly help to minimize conflicts to reduce wolf mortality. The best available science suggest that greater emphasis on livestock management strategies could further reduce wolf losses (Musiani et al. 2005). Human related stressors threaten the ecological condition of *security* for wolves on the Forest. Achieving an ecological condition for recovery necessitates crafting measurable desired conditions that provide for security, as well as standards and guidelines that support these desired conditions. One among many tools to reduce human-wolf conflict includes mechanisms to enable voluntary grazing permit retirement and the closure of vacated allotments to livestock grazing that are included as management plan components. Additionally, the Forest Service should put standards and/or guidelines in the forest plan that allow for Annual Operating Instructions (AOIs) for grazing allotments and permits to acknowledge the potential presence of wolves and shall outline specific adaptive management strategies to prevent or minimize wolf depredations on livestock.

Also, road closures and road density standards should be developed to ensure wolf persistence. Studies of roads impacts on wolf habitat in the northern Great Lakes region are likely to be applicable to the Mexican wolf, as well. Mladenoff et al. (1995) found that few portions of any wolf pack territory throughout this region were located in areas of road density greater than 0.45 km/km2. Core areas (defined as 40 percent use) did not exceed road densities of 0.23 km/km2 and no portion of any pack area was in an area of road density greater than 1.0 km/km2 (Mladenoff et al. 1995). Thiel (1985) reported that wolves in Wisconsin could not survive in areas with road densities higher that 0.6 km/km2. Jensen et al. (1986) documented a maximum road density for wolf occupancy of 0.6 km/km2 on the Ontario-Michigan border. Mech et al. (1988) found wolves absent in northern Minnesota areas with road densities above 0.58 km/km2. Mech (1989) later reported that wolves persisted in areas with road densities greater than 0.58 km/km2 if they were adjacent to extensive roadless areas.

Some recommended species-specific plan components:

<u>Desired Conditions</u>

- Mexican grey wolves establish wide-ranging and viable populations within the Cibola National Forest.
- Conflicts between livestock permittees and wolves are prevented and when they occur, wolves are permitted to stay on the forest instead of being removed.
- Re-establishment of wolves into the Cibola National Forest results in the restoration of natural food webs and ecosystem interactions, facilitating the improvement of all habitat types.
- Local economies are boosted by the increase in visitors to the Cibola National Forest who wish to see and experience wolves in the wild.

<u>Standards</u>

- Owners of livestock must remove or render inedible (through lime, fire, explosives or other authorized means consistent with public safety) in a timely manner the carcasses of stock that are not killed by wolves.
- Feeding of wolves or attracting them with food is prohibited.

[37] *Id*. at 69.

- Annual Operating Instructions (AOIs) for grazing allotments and permits shall acknowledge the potential presence of wolves and shall outline specific adaptive management strategies to prevent or minimize wolf depredations on livestock.

Guidelines

- Grazing permit terms and conditions should include measures designed to facilitate the rapid and effective removal of livestock carcasses.

Objectives

- Working with wildlife experts and state and federal agencies, the Forest Service shall develop a program to train livestock permittees in non-lethal and preventative methods for protecting livestock from wolf depredation.

2. Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

Southwestern willow flycatchers have small breeding populations that are widely dispersed across the southwest (Sogge et al. 2003). Because of these population dynamics, populations of flycatcher and habitat patches "are highly susceptible to loss due to natural events and human activities" (Sogge et al. 2003: 10).

The Cibola should focus on creating standards and guidelines for riparian habitat occupied or suitable for flycatchers that prohibits or mitigates disturbances that can be caused by human or forest management activities.

3. Zuni Bluehead Sucker (*Catostomus discobolus yarrowi*)

Threats to the Zuni bluehead sucker include:

Threats to habitat include water withdrawals, logging, livestock grazing, water impoundments, road construction, subdivision development, and long-term drought. In New Mexico, water withdrawals, subdivision development, livestock grazing, road construction, logging, and drought threaten Zuni bluehead suckers and their habitat. The changes in the flow regimes and loss of habitat from water withdrawals, sedimentation, and impoundments have reduced and eliminated populations of Zuni bluehead sucker in both New Mexico and Arizona. These conditions, in combination with the predicted worsening drought conditions due to climate change, will continue to degrade and eliminate Zuni bluehead suckerhabitat. (NatureServe 2015, citing USFWS 2013).

Black grub (a parasite) has been documented throughout the range of the species and is known to adversely affect or kill fish. In addition, nonnative predatory fish, particularly green sunfish, have contributed to the displacement or elimination of the species throughout its range, and nonnative crayfish are likely preying upon Zuni bluehead sucker eggs. USFWS (2013) concluded that disease may be a threat to the Zuni bluehead sucker and predation is a documented threat to the species. These threats are already occurring, they affect the species throughout its range, and they result in the reduced viability of the species because of the reduced range and low population numbers rangewide. (NatureServe 2015, citing USFWS 2013)

According to the FWS, "[t]he only Zuni bluehead sucker population on Federal land is in Agua Remora, on the Cibola National Forest" (79 Fed. Reg. 43156). Additionally,

The 1985 Cibola National Forest Plan includes a discussion of protection of the Zuni bluehead sucker. The plan indicated that fencing would protect Zuni bluehead sucker riparian habitat, but improved range

management was needed to restore the entire watershed. The Forest Service has made minor progress in protecting the habitat at Agua Remora by fencing the area to prevent grazing, but as discussed above, fencing has not been completely effective due to inadequate maintenance of the fences. Continued monitoring and maintenance of this fence is necessary to provide sufficient protection to the Zuni bluehead sucker population in Agua Remora from the effects of livestock grazing. (79 Fed. Reg. 43156)

Along with ecosystem, coarse-filter plan components, at a minimum, species-specific components necessary for recovery include removal of detrimental non-native species, such as crayfish and green sunfish, from Zuni bluehead sunfish occupied and potential recovery habitat. Livestock grazing must be restricted from occupied and potential habitat, and as indicated above, fencing must effectively keep livestock from habitat.

4. Chiricahua Leopard Frog (*Rana chiricahuensis*)

According to NatureServe (2015):

USFWS (2012) determined that the most significant threats to the Chiricahua leopard frog include the effects of the disease chytridiomycosis, which has been associated with major die-offs in some populations of Chiricahua leopard frogs, predation by nonnative species (e.g., centrarchids, bullfrogs, tiger salamanders, crayfish; USFWS 2000, 2002), and drought (though some sites are buffered from the effects of drought by wells or other anthropogenic water supplies; USFWS 2011). Additional factors affecting the species include degradation and loss of habitat as a result of water diversions and largescale groundwater pumping, livestock management practices (such that grazing is not in accordance with approved allotment management plans or otherwise considered adverse to maintaining natural habitat characteristics), altered fire regimes due to fire suppression, mining, contaminants, agricultural development, and other human activities; and inadequate regulatory mechanisms regarding introduction of nonnative bait species (USFWS 2012).

Along with ecosystem, coarse-filter plan components, the Cibola should develop plan components that would support establishing new populations and eliminating the threat of non-native predators.

5. Alamosa Springsnail (*Pseudotryonia alamosae*)

NatureServe describes the following threats to the Alamosa springsnail:

Primary threats include local/regional ground water depletion, water pollution, direct habitat alteration, poor watershed management and stream diversion and impoundment (Bison-M 1996). Of these, ground water depletion is a significant threat, but not imminent. Water diversion by the water users association probably is not a high threat as long as the species is listed, because they probably could not afford a diversion without federal funding which would not be available under the ESA. The watershed is poorly managed for grazing, including former alterations to the western springs to improve flow (Taylor 1987). … Potential introduction of exotic fishes or other aquatic organisms pose an additional threat due to predation or competition.

The Alamosa springsnail recovery plan is over 20 years old and the Forest should work with the FWS at its earliest opportunity to develop up-to-date conservation measures that would contribute to the recovery of the species.

6. Zuni Fleabane (*Erigeron rhizomatus*)

One of the primary threats to this species throughout its range is historical, current, and proposed uranium mining. As the 5-year review for this species put it, "removing the threat of uranium mining from occupied Zuni fleabane habitats is the most salient criterion for recovery of this species."[38] Additional concerns for this species stem from off-road vehicle use on sensitive soils and slopes where the Zuni fleabane is known to thrive, however, that concern is primarily historical.[39]

Occurrence of Zuni fleabane must be protected from uranium mining, road construction, cattle grazing, oil and gas activities and other habitat disturbances by, for example, fencing exclosures, along with ecosystem, coarse-filter plan components.

Some suggested plan components:

Desired Conditions

- Zuni fleabane habitat is protected from human disturbance.
- Zuni fleabane is found throughout its historical range within the Cibola National Forest.

Standards

- No uranium mining activity, or other activities associated with uranium mining, can occur in areas occupied by Zuni fleabane.
- No motorized or recreational activity shall be allowed within occupied Zuni fleabane habitat.

b. Potential Species of Conservation Concern

Though the Cibola's list of species still being considered as SCC was not included in the DPLRMP or among the DPLRMP appendices, we are taking this opportunity to comment on the Cibola National Forest Mountain Districts Forest Plan Revision: At-risk Species Determination Process and Rationale (CNF 2016 [July 15]). We have concerns about the process for removing species from consideration as SCCs that we articulate below. We are particularly concerned that the Forest Service rejected species from consideration based on "insufficient information" and "uncertainty" which a) are not a criteria for rejection in the planning rule or directives, and b) are arbitrary.

1. Determinations of Species Occurrence on the Forest

The directives are clear that species may be excluded if they are "accidental" or "transient," or are "well outside the species' existing range." Under 219.9(b)(2)) of the planning rule, "being migratory" is not a justifiable basis for not considering a species as an SCC or removing a species from consideration. The Forest Service apparently applied this criterion to the American Goldfinch, Bank Swallow, and Yellow Warbler (CNF 2016 [July 15]: 34). A species can meet the criteria for SCC status and be, according to the responsible official, "beyond the authority of the Forest Service or not within the inherent capability of the plan area to maintain or restore the ecological conditions to maintain a viable population of a species of conservation concern in the plan area…" 219.9(b)(2)). The responsible official must document the rationale for making such a determination (219.9(b)(2)(i)). This is supported by the directives (FSH 1909.12, ch. 20, sec. 23.13c(2)(c), 23.13c(3), and 23.13c(4)). In such cases, the Forest Service is obligated to, "[i]nclude plan components, including standards or guidelines, to maintain or restore

[38] U.S. Fish and Wildlife Service. 2005. *Zuni Fleabane 5-Year Review: Summary and Evaluation*. New Mexico Ecological Services Field Office. Albuquerque, NM at pg. 4, *available at* http://www.fws.gov/southwest/es/arizona/Documents/SpeciesDocs/ZuniFleabane/Zuni%20fleabane%205-year%20review.pdf.
[39] *Id*. at 10.

ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range" (219.9(b)(2)(ii)).

Where occurrence records are old, this could substantiate the decline of the species and suggest potential recovery and restoration needs. Age of occurrence records should not be a justification for ignoring a species in the planning process without demonstrating that the likelihood of future occurrence is remote. The Forest Service apparently used the year 1998 as a watershed and included species found to occur after 1998 and excluded those not found to occur after 1998 (CNF 2016 [July 15]: 7, Table 2), which is arbitrary and not supported by the planning rule or directives. This justification seemed to be used to exclude: Spotted Bat, Allen's Big-eared Bat, Merriam's Shrew, Dwarf Shrew, White Mountain Ground Squirrel, Manzano Mountain Cottontail, Cebolleta Southern Pocket Gopher, Bank Swallow, Banded Rock Rattlesnake, Rio Grande Chub, Rio Grande Sucker, Magdalena Mountainsnail, Oscura Mountain Land Snail, Ribbed Pinwheel, and Rocky Mountainsnail.

2. Judgements of Substantial Concern about Persistence

With regard to SCC, documentation must explain how the BASI indicated or did not indicate "substantial concern about the species' capability to persist over the long-term in the plan area." This is referring to scientific concern that has been expressed that is applicable to species persistence in the plan area, not a subjective perception of concern by the regional forester.

The directives make an important distinction between species of broader-scale concern and those where there is local conservation concern. All but one of the categories in the directives address the former by encompassing concerns expressed by NatureServe or government agencies about viability of the species at a broader scale than the plan area. The overall approach is to cast a wide net so that the Regional Forester can consider species where concern about persistence is indicated for either or both of these reasons. Local conditions in a plan area are relevant at the SCC identification stage as a basis for including additional species for which there might not be broader concern; *not as a sole basis for rejecting species for which there is a broader concern*.

In several cases, the Forest Service used "uncertainty" as a justification to reject species where BASI indicate substantial concerns. For example, the Forest Service stated in its Spotted Bat justification, "[t]his species was initially considered as an SCC because it was identified as a species of greatest conservation need (SGCN) by NMDGF, because it is on the Regional Forester's Sensitive Species list (RFSS), and because it has been identified as endangered by the state of New Mexico" (CNF 2016 [July 15]: 32). The Forest Service *is citing the best available scientific information in this justification*, which demonstrates that there is a substantial concern about the species' persistence. This is actually a *justification for* including the Spotted Bat on the SSC list. Using the uncertainty instead of BASI as the decision standard for make substantial concern determinations is not supported by the planning rule or directives. The Forest Service has used the rationale of "uncertainty" where BASI exists (even if it is scant) in almost every case where it has removed a species from SCC consideration.

Given the use of arbitrary criterion that are unsupported by the planning rule or directive in decision making about SCC, we recommend the Forest Service reconsider the following species for SCC designation:

- Spotted Bat (*Euderma maculatum*)
- Allen's Big-Eared Bat (*Idionycteris phyllotis*)
- Merriam's Shrew (*Sorex merriami*)
- Dwarf Shrew (*Sorex nanus*)

- White Mountains Ground Squirrel (*Spermophilus tridecemlineatus monticola*)
- Manzano Mountain Cottontail (*Sylvilagus cognatus*)
- Cebolleta Southern Pocket Gopher (*Thomomys bottae paguatae*)
- American Goldfinch (*Spinus tristis*)
- Bald Eagle (*Haliaeetus leucocephalus*)
- Black-throated Gray Warbler (*Dendroica petechia*)
- Brown-capped Rosy-finch (*Leucosticte australis*)
- Ferruginous Hawk (*Buteo regalis*)
- Lincoln's Sparrow (*Melospiza lincolnii*)
- Pinyon Jay (*Cymnorhinus cyanocephalus*)
- Wilson's Warbler (*Wilsonia pusilla*)
- Yellow Warbler (*Setophaga petechia*)
- Banded Rock Rattlesnake (*Crotalus lepidus klauberi*)
- Rio Grande Chub (*Gila Pandora*)
- Rio Grande Sucker (*Catostomus plebeius*)
- Magdalena Mountainsnail (*Oreohelix magdalenae*)
- Nokomis Fritillary (*Speyeria nokomis nitocris*)
- Oscura Mountain Land Snail (*Oreohelix neomexicana*)
- Ribbed Pinwheel (*Radiodiscus millecostatus*)
- Rocky Mountainsnail (*Oreohelix strigose depressa*)

3. Concerns about Expanding the List of Species to Consider as SCC

Overall, the process developed by the Forest Service is very expansive and inclusive in identifying SCC. The actual needs of these species related to management of the national forest may then be determined when plan components are being developed. Having a large number of SCC does not necessarily lead to pages of plan components if their necessary ecological conditions can be provided by ecosystem plan components.

c. The Forest Service's Wildlife Management Authority

It is a common misconception that states represented by their wildlife agencies have ultimate management authority over wildlife. The courts have consistently upheld that the federal government has supremacy over its lands under Property Clause of the United States Constitution (Article IV, Section 3), which grants Congress the "Power to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States." In *Kleppe v. NewMexico* (426 U.S. 529: 541 (1976)), the Court stated, ''the 'complete power' that Congress has over public lands necessarily includes the power to regulate and protect the wildlife living there,'' and *Kleppe* clearly limited state powers, ''those powers exist only in so far as [their] exercise may be not incompatible with, or restrained by, the rights conveyed to the Federal government by the Constitution.'' (426 U.S. 529: 545 (1976)). While the Forest Service clearly has the authority to manage wildlife habitat it also has the power to manage species populations (Schultz 2012).

d. Analysis of Plan Components for Selected At-risk Species and Recommendations

1. Gunnison's Prairie Dogs and Grassland Ecosystems

Stressors and threats to Gunnison's prairie dogs include shooting, poor range condition, energy and mineral development, plague and tularemia, poisoning, poor habitat connectivity, and destruction of habitat through motorized use and other activities (Sheffield 1997; Seglund and Schnurr 2010). Several of these cannot be addressed with coarse-filter, ecosystem plan components. Thus, it is important to incorporate fine-filter plan components to maintain and restore viable populations of prairie dogs and well-distributed prairie dog colonies to promote grassland integrity on the Cibola.

Preservation of prairie dog colonies and associated ecological benefits, however, cannot be limited to merely protection of existing colonies. Studies of population dynamics of prairie dog towns have resulted in the following management recommendation: creation and preservation of "a network of native prairie reserves strategically located across the historical range of this species," which would include "clusters ('complexes') of large towns, as well as large, but isolated prairie dog towns" (Lomolino and Smith 2003). This approach necessitates a landscape-level approach to grassland conservation and habitat, including the elimination of barriers to prairie dog movement and expansion that may exist.

Gunnison's prairie dogs are not only indicators of grassland integrity but grassland restoration management tools and should be considered as focal species for monitoring. Burrowing owls can also serve as focal species (Sheffield 1997; Alverson and Dinsmore 2014).

We recommend the following plan components as a starting point (see also Seglund and Schurr 2010).

Desired Conditions

At least one desired condition should be developed that is specific to maintaining and restoring occupied prairie dog colonies. It should include, at a minimum, providing for viable populations of prairie dogs and an increasing trend in populations; maintaining and restoring colonies that are well-distributed throughout the Cibola's grasslands; establishing sufficient prairie dog numbers and colonies to enable the persistence of obligate prairie dog species including burrowing owls, ferruginous hawks, kit foxes, and mountain plovers, with the goal of creating the capacity to support a self-sustaining population of black-footed ferrets; and enabling connectivity between colonies and complexes to maintain genetic diversity. Set a specific goal for increasing occupied acreage on the Forest within this desired condition that will be monitored.

Objectives

- Work with other public land agencies and stakeholders to identify management emphasis areas where intensive management can focus on landscape scale conservation for the entire prairie dog ecosystem. (adapted from Seglund and Schnurr 2010)
- Reintroduce and translocate prairie dogs to augment Cibola populations on the forest ranger district grasslands.

Standards

Standards should be developed that incorporate the following conservation measures.

- Ban recreational shooting of prairie dogs.
- Ban lethal control of prairie dogs.
- Close and obliterate roads and motorized activity in and around prairie dog colonies and re-introduction sites.
- Prevent plague by implementing a plague management and reduction programs that includes the use of dusting and vaccination. (see Seglund and Schnurr 2010)
- Minimize impacts of energy and/or mineral development on prairie dogs. (adapted from Seglund and Schnurr 2010)

Guidelines

- Do not apply insecticides to known burrowing owl nest burrows.

Management Approaches

- Manage grassland ecosystems at the landscape-level, restoring habitat connectivity, both structurally and functionally. Eliminate or reduce human pressures on grassland ecosystems, including motorized activity, recreational shooting, and impacts from livestock operations infrastructure.
- Identify and implement feasible and effective techniques to assist in prairie dog population recovery following plague epizootic events. (adapted from Seglund and Schnurr 2010)

Monitoring

- Designate the Gunnison's prairie dogs as a focal species for grassland integrity.
- Designate the burrowing owl as a focal species for prairie dog ecosystem and grassland integrity.
- Conduct prairie dog population monitoring.
- Develop a plague surveillance program to enable immediate management of plague outbreaks (adapted from Seglund and Schnurr 2010)
- Track burrowing owl nesting trends.

2. Mexican Spotted Owl and Mixed-Conifer and Ponderosa Pine Ecosystems

The Mexican Spotted Owl (MSO) is listed as threatened under the ESA The species is iconic and has been at-risk in the southwest for many decades. The PDLRMP indicates that vegetation types and ecosystems most associated with MSO habitat: mixed-conifer with aspen, mixed conifer – frequent fire, Madrean pinyon-oak woodland, ponderosa pine, and riparian habitat are generally moderately to highly departed from NRV, particularly related to structural characteristics measured by seral stage proportions, fire regimes, and climate risk. Some habitat requirements of the MSO, including the presence of snags and woody debris, are within reference conditions, according to the Assessment.

Our biggest concern is that the PDLRMP does not provide an overall framework for assuring that the planning rule's recovery requirement will be met. For example, the PDLRMP provides a fairly comprehensive set of desired conditions for ecosystems used by MSOs that appear to be written to move vegetation types toward NRV at least related to structure, composition, and function, if not connectivity. However, plan standards that may impact the MSO are often written more like objectives and do not contain language that puts mandatory constraints on projects and activities as required by the planning rule at 219.7(e)(1)(iii). It is the near complete lack of enforceable standards to curtain activities known to be stressors to owl habitat and threats to the owls that is most troubling. As is also thematic in the PDLRMP, management approaches are often used where standards are more appropriate. These management approaches are often written as if they were standards, and again recommend that many management approaches be reconsidered and rewritten as standards. We realize that more plan standards beneficial to MSOs may be forthcoming (PDLRMP 2016: 73), but we can only judge the preliminary draft plan on its current content.

We also recognize that the PDLRMP includes the standard:

Pg. 73, lines 30-32: Project activities and special uses occurring within federally recognized species habitat shall integrate habitat management objectives and species protection measures from the most recent approved recovery plans.

We recommend that FWS recovery plans that are still considered up to date by species experts should serve as a baseline or starting point for forest management plan standards. Forest planners should consider modifying, strengthening, and substituting recovery plan provisions when developing plan components in order to meeting the planning rule, NFMA, and ESA requirements. The Mexican Spotted Owl Recovery Plan (First Revision) (USFWS 2012) may be a good start for developing species-specific plan components, but the actions outline for the Forest Service must be considered along with new BASI. See more on this below.

The PDLRMP's emphasis on promoting active management, recreation, multiple uses, and restoration must be carefully considered when activities affect MSO habitat. The owls are sensitive to human intrusion, for example, and the DEIS must take a hard look at the effects of stressors, including activities, to MSOs and their habitat.

Restoration is a significant theme, though not a designated theme, throughout the PDLRMP. Restoration of ecological conditions, such as restoring natural fire regimes, toward NRV could benefit owls that are adapted to these conditions. Yet, owls do not always respond well to restoration techniques such as mechanical thinning. The PDLRMP's theme 3 "Management Holistically for Watershed and Ecosystem Health" that embraces bolstering a "restoration economy" introduces a tension between precautionary restoration and creating an unsustainable demand for the products and services of the restoration economy. We appreciate the inclusion of the following standard:

Pg. 24, lines 26-27: Harvesting systems shall be selected based on their ability to meet desired conditions and not strictly on their ability to provide the greatest dollar return.

While written more broadly than a typical standard, the plan component underscores a need for balance.

We outline our critique of the PDLRMP and make recommendations below.

Ecological conditions necessary for Mexican spotted owl recovery

Areas where the MSO can usually nest/roost include forests with large trees, a high canopy cover and other old-growth characteristics; they are also known to inhabit canyons with perpendicular cliffs with numerous caves or ledges (USFWS 2012). Due to extensive research into the needs of this species, we know that the critical elements of MSO habitat include the following primary constituent elements for MSO critical habitat outlined in the Mexican Spotted Owl 5-Year Review (USFWS 2013: 6) and numbered below.

1. A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 to 45 percent of which are large trees with diameter at breast height ([dbh]) 4.5 ft above ground)) of 12 inches or more. (USFWS 2013)
2. Large, dead trees (snags) with a dbh of at least 12 inches (USFWS 2013)
3. High volumes of fallen trees and other woody debris (USFWS 2013)
4. A wide range of tree and plant species, including hardwoods (USFWS 2013)
5. Adequate levels of residual plant cover to maintain fruits and seeds, and allow plant regeneration (USFWS 2013)

The Mexican Spotted Owl 5-Year Review (USFWS 2013: 9) also provided the following set of desired conditions for key habitat variables:

1. A diversity of patch sizes with minimum contiguous patch size of 1 ha (2.5 ac) with larger patches near activity center; mix of patch sizes towards periphery, and between-patch heterogeneity (Peery et al 1999; Grubb et al 1997; May and Gutiérrez 2002). (USFWS 2013)
2. Contiguous patches consisting of trees of all sizes, unevenly spaced, with interlocking crowns and high canopy cover (Ganey et al. 2003). (USFWS 2013)
3. Patches with a diversity of tree species, especially containing a mixture of hardwoods and shade-tolerant species (Willey 1998b), and a diverse composition of vigorous native herbaceous and shrub species for prey habitat. For example, Gambel oak provides important habitat for woodrats and brush mice (Block et al. 2005, Ward 2001). (USFWS 2013)
4. Openings in forest patches between 0.04 - 1 ha (0.1 - 2.5 ac) in size. Small canopy gaps within forested patches provide for prey habitat diversity. Openings should be small in nest/roost patches and may be larger throughout the rest of the PAC. (USFWS 2013)
5. A minimum canopy cover within forest stands of 40% in pine-oak and 60% in mixed conifer (Ganey et al. 2003). (USFWS 2013)
6. A diversity of tree sizes, with the goal of having trees ≥16" dbh contributing ≥50% of the stand basal area (Willey 1998, May and Gutiérrez 2002, Ganey et al. 2003, May et al. 2004). (USFWS 2013)

Recovery plan obligations and necessary modifications

We agree that the recovery plan actions for the MSO (USFWS 2012) must apply to projects and special uses as the starting point for plan standards to manage forest activities (CNF PDLRMP: 73). However, the provisions in the recovery plan require modification based on new scientific information, especially related to fire, and are not sufficiently comprehensive to advance MSO recovery.

Scientists have historically believed severe fires could be detrimental to spotted owls. The MSO recovery plan acknowledges this (USFWS 2012: 263). But new research is showing that the birds may be able to tolerate even high severity fires (Lee et al. 2013). Research suggests that burned areas provide important habitat for MSOs due to increased prey abundance in areas after mixed-severity fire (Ganey et al. 2014). Studies have also found that post-fire salvage logging can be detrimental to spotted owl habitat and have negative effects on spotted owl reproduction (Tempel et al. (2014).

The Forest Service also has information – based on recent monitoring of MSOs in the area of the Nuttall-Gibson Fire of 2004 in the Coronado National Forest – that MSOs appear to survive and thrive in a post-fire environment. See "Occupancy and Reproductive Success of Mexican Spotted Owls in the Pinaleno Mountains, Safford Ranger District, Arizona: 2011" ("the owl population in the Pinaleno Mountains has demonstrated the capability of reproducing well, despite of or even with the aid of effects promulgated by the large, and in some areas, severely burning Nuttall-Gibson fire of 2004").

This information directly undercuts the 2012 MSO revised Recovery Plan's assumptions with respect to MSO fire response and, more importantly, the conclusion that the risk to MSO habitat posed by the threat of fire justifies large-scale "restoration" forestry which is itself associated with significant negative effects to the MSO and its habitat. Indeed, the evidence suggests that wildfire may actually promote the recovery of the MSO despite the 2012 Revised Recovery Plan's suggestion to the contrary.

The Cibola's management plan should include LRMP standards that reflect new information about the species' response to fire that has become available since the publication of the Mexican Spotted Owl Recovery Plan.

Retaining 1996 Forest Plan Amendments plan components

The 1996 Forest Plan Amendment included standards and guidelines incorporated into the current Cibola LRMP and accepted by the FWS no-jeopardy biological opinion as reasonable and prudent measures, that:

(1) required survey of suitable MSO habitat and designation of PAC where owls are found;
(2) forbade vegetation treatments in MSO nest cores and allow only limited treatments in PAC;
(3) required selection of an equal number of PAC as untreated control areas when treatments are done;
(4) prohibited harvest of trees larger than 9-inches diameter in PAC;
(5) maintained a portion of "target/threshold" habitat suitable for nesting/roosting behaviors and retain at least 150-170 ft^2/acre basal area and 20 trees/acre larger than 18-inches diameter at breast height;
(6) retained trees larger than 24-inches diameter at breast height in suitable nesting/roosting habitat (*i.e.*, "restricted areas"); and
(7) required monitoring of MSO habitat and population trends.

The LRMP should maintain existing standards and guidelines in the current forest plan, incorporated as part of the 1996 Forest Plan Amendments, that support MSO recovery.

Recommended Management Direction for Mexican Spotted Owl

The Forest Service should retain and develop species-specific plan components for the MSO. In general, the Forest Service should 1) incorporate relevant conservation measures from current recovery plan (except where contradicted by BASI, such as MSO fire response as discussed above) into forest plan, 2) include any subsequent information, including recent information in project analysis, 3) maintain existing standards and guidelines in the current forest plan, incorporated as part of the 1996 Forest Plan Amendments. Those include "standards and guidelines," as defined by the 1996 Forest Plan Amendments and accepted by the FWS no-jeopardy biological opinion as reasonable and prudent measures, that: (1) required survey of suitable MSO habitat and designation of PAC where owls are found; (2) forbade vegetation treatments in MSO nest cores and allow only limited treatments in PAC; (3) required selection of an equal number of PAC as untreated control areas when treatments are done; (4) prohibited harvest of trees larger than 9-inches diameter in PAC; (5) maintained a portion of "target/threshold" habitat suitable for nesting/roosting behaviors and retain at least 150-170 ft^2/acre basal area and 20 trees/acre larger than 18-inches diameter at breast height; (6) retained trees larger than 24-inches diameter at breast height in suitable nesting/roosting habitat (*i.e.*, "restricted areas"); and (7) required monitoring of MSO habitat and population trends. Landscape-scale planning and protection of MSO habitat components is necessary, including the protection of critical habitat from specific activities that have been identified as detrimental to the recovery of owls. Ongoing MSO studies, monitoring results, and information should be analyzed to create specific plan components that will guide forest restoration projects, which should be created with the goal of contributing to the species' recovery.

<u>Standards</u>

- Habitat restoration projects within MSO habitat must incorporate standards, guidelines, and recommendations from the most recent recovery plan developed by the U.S. Fish and Wildlife Service.
- Before initiation of any forest restoration project or removal of trees over 12" dbh, MSO surveys must be conducted and the results included as part of the publically accessible project record.
- Projects within mixed conifer, pine-oak, and riparian forest types occupied by MSO must incorporate the following management prescriptions:
    - Large trees with diameter at breast height of 12 inches or more are retained, unless removal is supported by on-the-ground ecological evidence and there is no documented potential for destruction of MSO occupied habitat;
    - Large, dead trees (snags) with a dbh of at least 12 inches are retained;

    - Adequate levels of residual plant cover must be maintained to allow for plant regeneration.
- Pre- and post-treatment monitoring must be conducted in all protected activity centers treated for fire risk abatement.
- Forest restoration and other human activities will not take place during MSO breeding season (March 1-August 31).
- Livestock grazing shall not be permitted within riparian management zones designated as MSO critical habitat or that MSO are known to occupy.

Guidelines

- Prescribed fire is the primary method of forest restoration used within MSO habitat, except in cases where best available science and on-the-ground surveys indicate that mechanical or hand thinning must occur to avoid destruction of occupied habitat.
- Road or trail building in protected activity centers should be avoided to minimize human disturbance.

Objectives

- Complete a forest-wide MSO population survey within 5 years of plan implementation to guide future management decisions.
- Develop a species-specific monitoring program that includes specific timelines and trigger points that would require additional analysis of or changes in management.

VI. Range Management

Recent studies into livestock grazing management have identified ways to reduce negative impacts, primarily through changes in agency management of forage resources and grazing to reflect best available science. Recommended management changes include: (1) eliminating areas with sensitive or high-erosion soils from capacity, suitability, or stocking rate calculations; (2) updating stocking rates based on conservative forage utilization rates (25-30 percent); (3) managing livestock by herding rather than fencing or water developments; (4) provide for rest, in some cases, several years, to allow for recovery of vegetation within allotments; (5) closure of areas with degraded soil or plant communities (Carter et al. 2011).

Recent studies of riparian populations of animal and plant populations have also found significant improvement in biodiversity and ecosystem structure and function after the removal of grazing (Krueper et al. 2003). The good news is that previous damage or degradation caused by livestock grazing can be remedied through the very simple action of removing livestock from an area. Especially in areas with critical habitat or known populations of listed species or species of conservation concern, removal of livestock grazing pressure or re-classification as unsuitable for grazing through the forest planning process must be incorporated as a guideline.

VII. Fire and Fuels

In the background section of the Fire and Fuels section, (pg. 77-78) the Cibola includes human caused fires in the definition of "wildfires" (pg. 77, line 24) and states that "Wildfire (managed for multiple resource objectives) and prescribed fire are the most cost-effective way to reduce the likelihood of severe fire" (pg. 77, lines 41-42). We agree. However, the draft plan then includes a standard that calls for immediate suppression of any human-caused wildfire.

These statements are inconsistent, and that standard needs to be revised (pg. 78, lines 17-18):

"Initial action on human-caused wildfire will be to **identify resource goals that can be met through active management of the fire, but where resource goals cannot be met or risk to human health and safety is too high,** suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety."

VIII. Connectivity

The forest planning rule *includes explicit requirements for managing for ecological connectivity on national forest lands and facilitating connectivity planning across land ownerships*—the first such requirements in the history of U. S. public land management. The pending revisions of most forest plans provide a significant opportunity to protect and enhance the diversity of habitat and wildlife on national forest lands by developing forest plans that promote the conservation and restoration of ecological connectivity (Defenders et al. 2015: 3). Defenders et al. (2015: 3) summarizes the role of connectivity within the conservation framework of the rule and offers guidance and examples of how to conduct connectivity planning in the land management planning process. The guide is intended to add value to official agency policies developed to support implementation of the rule (Defenders et al. 2015: 3).

The 2012 Rule defines connectivity as:

> Ecological conditions that exist at several spatial and temporal scales that provide landscape linkages that permit the exchange of flow, sediments, and nutrients; the daily and seasonal movements of animals within home ranges; the dispersal and genetic interchange between populations; and the long distance range shifts of species, such as in response to climate change (219.19).

The planning rule definition reflects both structural and functional aspects of connectivity. The rule's reference to spatial scales and "landscape linkages" suggests a structure of connected patches and ecosystems. Functional connectivity is also part of the definition: water flows, sediment exchange, nutrient cycling, animal movement/dispersal, species climate adaptation and genetic interchange are all ecological processes that are sustained by connectivity (Defenders et al. 2015 2015: 5).

Connectivity plays a key role in the rule's conservation approach (see Table 2, (Defenders et al. 2015:8). As a key characteristic of ecosystems, connectivity may also be an "ecological condition" needed by individual species, and so forest plans may need to address connectivity at the species level. For example, a recent amendment to forest plans in Wyoming protects migration corridors between seasonal habitats for pronghorn (Ament et al. 2014).

There is an additional requirement in NFMA that is particularly important to developing plan components for connectivity. It is a procedural requirement that the planning process be "coordinated with the land and resource management planning processes of State and local governments and other Federal agencies" (16 USC § 1604(a)). One of the purposes of the planning rule was to "[e]nsure planning takes place in the context of the larger landscape by taking an 'all-lands approach'" (77 Fed. Reg. 21164).[40] To accomplish

[40] Compare with the NPS (2011) "big-picture" approach, replacing short-term, single species management with multi-species, long-term and large-scale approaches…[to] ensure not only the survival of species and scenic vistas, but also allow these systems to continuously evolve and change;" and the first goal of the President's *National Fish, Wildlife, and Plants Climate Adaptation Strategy*: to "build or maintain ecologically connected network of terrestrial, coastal, and marine conservation areas that are likely to be resilient to climate change and support a broad range of fish, wildlife, and plants under changing conditions" (Council 2014:19-20).

this, forest plans should consider how habitat is connected across ownership boundaries (Defenders et al. 2015:11).

The planning rule accounts for this type of "all lands" connectivity by (Defenders et al. 2015:11):

- Requiring assessments to evaluate conditions, trends and sustainability "in the context of the broader landscape" (219.5(a)(1))
- Recognizing that sustainability depends in part on how the plan area influences, and is influenced by, "the broader landscape" (219.8(a)(1)(ii), (iii)).
- Requiring coordination with other land managers with authority over lands relevant to populations of species of conservation concern (219.9(b)(2)(ii)).
- Requiring coordination with plans and land-use policies of other jurisdictions (219.4(b)).
- Requiring consideration of opportunities to coordinate with neighboring landowners to link open spaces and take joint management objectives into account (219.10(a)(4)).

Achieving the broader scale "all-lands" goals of the planning rule requires partnerships and compatible management across landscapes among multiple landowners and jurisdictions. In particular, there is a need for a landscape-scale strategic approach to conserving connectivity. NFMA has established that the way to communicate a long-term and reliable management commitment for National Forest System lands is through forest plan decisions for specific areas.

There is a significant commitment to connectivity conservation within Forest Service policy and from many agency partners. Examples of coordinated multi-agency planning efforts that specifically address connectivity and can guide the Forest Service as it seeks to implement the new rule are summarized in Defenders et al. (2015: Appendix A).

Regardless of the management agency, we suggest that management plans include explicit, achievable desired conditions as well as other plan components that significantly contribute to wildlife connectivity. We provide the following framework as a starting point for developing plan components that support habitat connectivity.

<u>General</u>

- Designate wildlife corridors so they contain sufficient ecologically effective habitat to facilitate wildlife movement for daily, seasonal or long-term needs in a relatively safe manner (modified from BLM 2012:2-55).
- Maintain functioning wildlife habitats and migration and dispersal corridors that allow free movement and use of habitats (BLM 2008: 2-45,47).
- Manage area to conserve crucial habitats and protect migration and movement routes for mule deer, other big game, and other wildlife, such as carnivores modified from BLM 2015: 881; Section 4-49.2).
- Evaluate proposed activities, including recreational use, for their potential to adversely affect important and relevant wildlife values in the corridor. Do not permit any activities that interfere with protection of those values (modified from BLM 2006: 21).
- Activities currently authorized by the agency in this corridor shall coexist with wildlife movement, migration and dispersal. Changes to current activities and infrastructure may be required if found incompatible with the corridor's wildlife values.
- Close to renewable energy developments.

<u>Retain Public Ownership</u>

- Retain public land in federal ownership allowing for the protective management of crucial habitat and movement corridors for mule deer, other big game, and other wildlife, such as carnivores.

- Allow for the acquisition of non-federal lands within the corridor through purchase from willing sellers, exchange, transfer or donation. Acquired lands are to be managed consistent with the corridor's standards and guidelines.
- Where possible, augment wildlife values through purchase from willing sellers, exchange, transfer or donation of additional acreage of crucial wildlife habitat for their migration, movement and dispersal (modified from BLM 2015: 882; Section 4-49.2.1; BLM 2006: 21).
- Establish and implement in a timely manner mitigation measures for fencing and structures to allow the safe movement of wildlife.

Right of Way

- Establish an exclusion area for large-scale utility transmission and energy development and exploration. Preclude the granting of new Right-of-Ways (ROWS) for energy development that would negatively impact wildlife, their habitat and its connectivity. Impacts to be avoided by new access roads include fragmentation of habitats and an increase potential for vehicle-related wildlife injuries and mortalities (modified from BLM 2015: 882;
- Establish and implement in a timely manner mitigation measures for fencing and structures to allow the safe movement of wildlife.

Mining

- Close the corridor to fluid mineral leasing and to mineral materials sales (BLM 2015: 882,883; Section 4-49.2.2).
- Close the corridor to all locatable and leasable minerals exploration and development (including geothermal and sodium), and mineral material disposals.
- Withdraw the corridor from location and entry under the Mining Law, subject to valid existing rights.
- Close to recreational placer mining outside of active mining claims.
- Prohibit surface occupancy and surface-disturbing activities.

Road Management

- Manage motorized vehicular use as Limited to Designated Roads and Trails.
- Establish road and motorized trail density standards within the management area to conform to the best scientific recommendations, generally less than one mile per square mile (Lyon 1979; Van Dyke et al. 1986a,b; Fox 1989. Trombulak and Frissell 2000; Reed et al. 1996; Stritholt and DellaSala 2001; Davidson et al. 1996). Ensure that there will be no net increases in road densities above a scientific credible threshold to maintain the security of core habitat areas (Forest Service 2012: unpaginated, Tables 16b-9 and 16b-10).
- Existing and/or designated roads and/or trails will be subject to closures if conflicts with wildlife cannot be mitigated (BLM 2012:2-55).
- Establish and implement in a timely manner mitigation standards for existing roads and primitive roads or highways crossing public land to facilitate movement of wildlife including a reduction in mortality of wildlife from vehicle collisions (modified from BLM 2012: 2-55).
- Do not authorize new permanent roads within the corridor in order to maintain unfragmented habitat for wildlife migration and dispersal (BLM 2006: 21).

Grazing

- Evaluate any proposed changes in grazing Fencing Guidelines for Wildlife [g, such as timing and intensity of use, for impacts on relevant wildlife values. Implement those changes that benefit wildlife (modified from BLM 2006: 21).
- Minimize fencing for livestock and make all fences wildlife friendly (i.e., Landowners Guide to Wildlife Friendly Fences (MDFWP 2012; CDW 2009; Paige 2012).

Vegetation Treatments

- Only allow vegetation treatments determined beneficial by the best available science of the identified relevant and important values

IX. Conclusion

In summary, we recommend the Forest Service take a species and habitat protection and restoration approach within the revised Cibola National Forest land and resource management plan. This includes incorporating both ecosystem-level and species-specific planning components, and inclusion of specific and binding standards and guidelines for all management actions. There are numerous problems and negative impacts occurring due to current management, as well as significant progress and knowledge that has been made in the field of natural resource, wildlife, and forest management since the last plan was developed. The Forest Service has an incredible opportunity to create a more sustainable, science-based, and restoration-focused plan, and we look forward to working with you to do so.

Sincerely,

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Scientific References

Agee, James K., and Carl N. Skinner. "Basic principles of forest fuel reduction treatments." *Forest ecology and management* 211.1 (2005): 83-96. Available at: http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1142&context=barkbeetles.

Agnew, W., D. W. Uresk, and R. M. Hansen. 1986. Flora and fauna associated with prairie dog colonies and adjacent ungrazed mixed-grass prairie in western South Dakota. Journal of Range Management. 39: 135-139.

Agouridis, Carmen T., Stephen R. Workman, Richard C. Warner, and Gregory D. Jennings. 2005. Livestock grazing management impacts on stream water quality: a review. *Journal of the American Water Resources Association* (June): 591-606.

Allison, P. S., A. W. Leary, and M. J. Bechard. 1995. Observations of wintering ferruginous hawks (*Buteo regalis*) feeding on prairie dogs (*Cynomys ludovicianus*) in the Texas panhandle. Texas Journal of Science. 47(3): 235-237.

Alverson, K.M. and S.J. Dinsmore. 2014. Factors affecting burrowing owl occupancy of prairie dog colonies. The Condor. 116: 242-250.

Ament, R., R. Callahan, M. McClure, M. Reuling, G. Tabor. 2014. Wildlife Connectivity: Fundamentals for Conservation Action. Center for Large Landscape Conservation. Bozeman, MT.

Arno, Stephen F. "Fire in western forest ecosystems." (2000): 97. Available at: http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1040&context=barkbeetles.

Berry, M. E., C. E. Bock, and S. L. Haire. 1998. Abundance of diurnal raptors on open space grasslands in an urbanized landscape. Condor. 100(4): 601-608.

Bisson, P. A., Rieman, B. E., Luce, C., Hessburg, P. F., Lee, D. C., Kershner, J. L., ... & Gresswell, R. E. (2003). Fire and aquatic ecosystems of the western USA: current knowledge and key questions. *Forest Ecology and Management*,*178*(1), 213-229.

Bureau of Land Management. 2006. Record of Decision and Approved Dillon Resource Management Plan. February 2006. http://www.blm.gov/style/medialib/blm/mt/field_offices/dillon/rmp/rod.Par.10875.File.dat/ApprovedPlan.pdf

BLM (Bureau of Land Management). 2008. Record of Decision and Approved Pinedale Resource Management Plan. http://www.blm.gov/style/medialib/blm/wy/programs/planning/rmps/pinedale/rod.Par.45058.File.dat/05_Record_of_Decision_and_Approved_Pinedale_RMP.pdf

BLM (Bureau of Land Management). 2012. Lower Sonoran and Sonoran National Monument Proposed Resource Management Plan and Final Environmental Statement. June 2012. https://www.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=21457. Accessed 04/11/2016.

BLM (Bureau of Land Management). 2015. Draft Resource Management Plans: Beaver Dam Wash National Conservation Area, Red cliffs National Conservation Area; and Draft Amendment to the St. George Field Office Resource Management Plan; and Draft Environmental Impact Statement. Chapter 4—Environmental Consequences. http://www.blm.gov/style/medialib/blm/ut/st__george_fo/planning/rmp-eis_5-8.Par.98394.File.dat/5-Chapter4-Environmental%20Consequences.pdf

Bonham, C. D., and A. Lerwick. 1976. Vegetation changes induced by prairie dogs on shortgrass range. Journal of Range Management. 29: 221-225.

Brooks, M.L., C.M. D'Antonio, D.M. Richardson, J.B. Grace, J.E. Keeley, J.M. DiTomaso, R.J. Hobbs, M. Pellant and D. Pyke. 2004. Effects of invasive alien plants on fire regimes. *BioScience* 54: 677-88.

Carter, John, Julie Chard, and Brandon Chard. "Moderating Livestock Grazing Effects on Plant Productivity, Nitrogen and Carbon Storage." *Natural Resources and Environmental Issues* 17.1 (2011): 23. Available at: http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1768&context=nrei.

CDW (Colorado Division of Wildlife). 2009. Fencing with Wildlife in Mind. http://www.ext.colostate.edu/sam/dow-fencing.pdf.

Ceballos, G., J. Pacheco, and R. List. 1999. Influence of prairie dogs (*Cynomys ludovicianus*) on habitat heterogeneity and mammalian diversity in Mexico. Journal of Arid Environments. 41: 161-172.

Clark, T. W. 1989, Conservation biology of the black-footed ferret, *Mustela nigripes*: Philadelphia, Wildlife Preservation Trust International, Special Scientific Report No. 3. 175 p.

Coppock, D. L., J. K. Detling, J. E. Ellis, and M. I. Dyer. 1983a. Plant-herbivore interactions in a North American mixed-grass prairie. I. Effects of black-tailed prairie dogs on intraseasonal aboveground plant biomass and nutrient dynamics and plant species diversity. Oecologia. 56: 1-9.

Coppock, D. L., J. K. Detling, J. E. Ellis, and M. I. Dyer. 1983b. Plant-herbivore interactions in a North American mixed-grass prairie: II. Responses of bison to modification of vegetation by prairie dogs. Oecologia. 56: 10-15.

Davidson, Diane W., William D. Newmark, Jack W. Sites, Jr., Dennis K. Shiozawa, Eric A. Rickart, Kimball T. Harper, and Robert B. Keiter. 1996. Selecting Wilderness Areas to Conserve Utah's Biological Diversity. Great Basin Naturalist 56(2):95-118.

Defenders et al. 2015. Planning for Connectivity: A Guide to Connect and Conserve America's Wildlife Within and Beyond the National Forest System. Yellowstone to Yukon; Wildlands Network; The Center for Large Landscape Conservation; and Defenders of Wildlife. http://www.defenders.org/publication/planning-connectivity.

Desmond, M. J., J. A. Savidge, and T. F. Seibert. 1995. Spatial patterns of burrowing owls (*Speotyto cunicularia*) nests within black-tailed prairie dog (*Cynomys ludovicianus*) towns. Canadian Journal of Zoology. 73: 1375-1379.

Detling, J. K. 1998. Mammalian herbivores: Ecosystem-level effects in two grassland national parks. Wildlife Society Bulleting. 26: 438-448.

Detling, J. K. and A. D. Whicker. 1988. A control of ecosystem processes by prairie dogs and other grassland herbivores. Proceedings of the eighth Great Plains wildlife damage control workshop. Rapid City SD: U. S. Forest Service. pp. 23-29.

Donato, D.C., J.B. Fontaine, J.L. Campbell, W.D. Robinson, J.B. Kauffman and B.E. Law. 2006. Post-wildfire logging hinders regeneration and increases fire risk. *Science* 311:352.

Fleischner, Thomas L. "Ecological costs of livestock grazing in western North America." *Conservation Biology* 8.3 (1994): 629-644.

Forest Service, Flathead National Forest. 2012. Forest Plan Monitoring and Evaluation Report, Fiscal Years 2008-2010: Item #16b: Grizzly Bear Habitat. (April 2012). Available at www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5365012.pdf.

Franklin, J.F., T.A. Spies, R. Van Pelt, A.B. Carey, D.A. Thornburgh, D.R. Berg, D.B. Lindenmayer, M.E. Harmon, W.S. Keeton, D.C. Shaw, K. Bible and J. Chen. 2000. Disturbances and structural development of natural forest ecosystems with silvicultural implications, using Douglas-fir forests as an example. *For. Ecol. Manag.* 155: 399-423.

Ganey, Joseph L., et al. "Relative abundance of small mammals in nest core areas and burned wintering areas of Mexican Spotted Owls in the Sacramento Mountains, New Mexico." *The Wilson Journal of Ornithology* 126.1 (2014): 47-52. (referred to as Ganey et al. 2014, *Ornithology*)

Ganey, Joseph L., et al. "Use of Protected Activity Centers by Mexican Spotted Owls in the Sacramento Mountains, New Mexico." *Journal of Raptor Research* 48.3 (2014): 210-218. (referred to as Ganey et al. 2014, *Raptor*).

Gucinski, H., M. J. Furniss, R. R. Ziemer, and M. H. Brookes. 2001. Forest roads: a synthesis of scientific information. Gen. Tech. Rep. PNWGTR-509. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR.

Garfin, G., A. Jardine, R. Merideth, M. Black, and S. LeRoy, eds. 2013. Assessment of Climate Change in the Southwest United States: A Report Prepared for the National Climate Assessment. A report by the Southwest Climate Alliance. Washington, DC: Island Press.

Gillson, Lindsey, et al. "Accommodating climate change contingencies in conservation strategy." *Trends in ecology & evolution* 28.3 (2013): 135-142.

Goodrich, J. M. and S. W. Buskirk. 1998. Spacing and ecology of North American badgers (*Taxidae taxus*) in a prairie-dog (*Cynomys leucurus*) complex. Journal of Mammalogy. 79: 171-179.

Harper, E.K., W.J. Paul, L.D. Mech, and S. Weisberg. 2008. Effectiveness of lethal, directed wolf-depredation control in Minnesota. Journal of Wildlife Management 72(3):778-784.

Harsch, M. A., Hulme, P. E., McGlone, M. S., & Duncan, R. P. (2009). Are treelines advancing? A global meta-analysis of treeline response to climate warming. *Ecology letters*, *12*(10), 1040-1049.

Ingham, R. E. and J. K. Detling. 1984. Plant-herbivore interactions in a North American mixed-grass prairie. III. Soil nematode populations and root biomass on Cynomys ludovicianus colonies and adjacent uncolonized areas. Oecologia. 63: 307-313.

Jensen, W.F., T.K. Fuller, and W.L. Robinson. 1986. Wolf (*Canis lupus*) distribution on the Ontario-Michigan border near Sault Ste. Marie. *Canadian Field-Naturalist* 100:363-366.

Kattelmann, Richard. "A review of watershed degradation and rehabilitation throughout the Sierra Nevada." *Watershed Restoration Management. American Water Resources Association, Bethesda, MD* (1996): 199-207.

Kondolf, G. Mathias, et al. "Status of riparian habitat." *Sierra Nevada Ecosystem Project: Final report to Congress*. Vol. 2. 1996. Available at: http://www.sierraforestlegacy.org/Resources/Conservation/FireForestEcology/ThreatenedHabitats/Riparian/AquaticRiparian-Kondolf96.pdf.

Kotliar, N. B. 2000. Application of the new keystone-species concept to prairie dogs: How well does it work? Conservation. Biology. 15: 1715-1721.

Kotliar, N. B., B. W. Baker, A. D. Whicker, and G. Plumb. 1999. A critical review of assumptions about the prairie dog as a keystone species. Environmental Management. 24: 177-192.

Kretzer, J. E and J. F. Cully. 2001. Effects of Black-Tailed Prairie Dogs on Reptiles and Amphibians in Kansas Shortgrass Prairie. The Southwestern Naturalist, Vol. 46, No. 2 (Jun., 2001), pp. 171-177

Krueger, K. 1986. Feeding relationships among bison, pronghorn, and prairie dogs: an experimental analysis. Ecology. 67(3): 760-770.

Kuglerová, Lenka, et al. Towards optimizing riparian buffer zones: Ecological and biogeochemical implications for forest management. *Forest Ecology and Management* 334 (2014): 74-84.

Lyon, L. J. 1979. Habitat Effectiveness for Elk as Influenced by Roads and Cover. *Journal of Forestry*, October, 658-660.

McIver, J.D. and L. Starr. 2000. Environmental Effects of Postfire Logging: Literature Review and Annotated Bibliography. USDA For. Serv. PNW-GTR-486. Portland, OR.

Minshall, G.W., C.T. Robinson, and D.E. Lawrence. 1997. Postfire response of lotic ecosystems in Yellowstone National Park U.S.A. Canadian Journal of Fisheries and Aquatic Sciences 54:2509-2525

Montana Fish, Wildlife, and Parks [MFWP]. 2012. A Landowner's Guide to Wildlife Friendly Fences: How To Build Fence with Wildlife in Mind. http://fwpiis.mt.gov/content/getItem.aspx?id=34461.

Mladenoff, D.J., T.A. Sickley, R.G. Haight, and A.P. Wydeven. 1995. A regional landscape analysis and prediction of favorable gray wolf habitat in the Northern Great Lakes region. Conservation Biology 9: 279-294.

McCune, Bruce. "Ecological diversity in North American pines." *American Journal of Botany* (1988): 353-368.

Mech, L. D., & Seal, U. S. (1987). Premature reproductive activity in wild wolves. *Journal of Mammalogy, 68*(4), 871-873.

Mech, L. D., Fritts, S. H., Radde, G. L., & Paul, W. J. (1988). Wolf distribution and road density in Minnesota. *Wildlife Society Bulletin (1973-2006), 16*(1), 85-87.

McIver, J.D. and R. McNeil. 2006. Soil disturbance and hill-slope sediment transport after logging of a severely burned site in northeastern Oregon. *Western Journal of Applied Forestry* 21:123-133.

Miller, B., G. Ceballos and R. P. Reading. 1994. The prairie dog and biotic diversity. Conservation Biology. 8: 677-681.

Miller, B., R. Reading, J. Hoogland, T. Clark, G. Ceballos, R. List, S. Forrest, L. Hanebury, P. Manzano, J. Pacheco, and D. Uresk. 2000. The role of prairie dogs as keystone species: Response to Stapp. Conservation Biology. 14: 318-321.

Miller, B., R. Reading, J. Strittholt, C. Carroll, R. Noss, M Soulé, O. Sánchez, J. Terborgh, D. Brightsmith, T. Cheeseman, and D. Foreman. 1998/99. Focal species in design of reserve networks. Wild Earth. 8(4): 81-92.

Miller, J. A. 1991. Research updates. BioScience. 41: 750-753.

Mills, L. S., M. E. Soulé, and D. F. Doak. 1993. The history and current status of the keystone species concept. BioScience. 43: 219-224.

Mladenoff, D. J., Sickley, T. A., Haight, R. G., & Wydeven, A. P. (1995). A regional landscape analysis and prediction of favorable gray wolf habitat in the northern Great Lakes region. *Conservation Biology*, *9*(2), 279-294.

Munn, L. C. 1993. Effects of prairie dogs on physical and chemical properties of soils. Management of prairie dog complexes for the reintroduction of the black-footed ferret. J. L. Oldemeyer, D. E. Biggins, and B. J. Miller (Eds.). Washington, DC: US Department of the Interior. pp. 11-17.

Musiani, M., T. Muhly, C.C. Gates, C. Callaghan, M.E. Smith, and E. Tosnoni. 2005. Seasonality and reoccurrence of depredation and wolf control in western North America. Wildlife Society Bulletin. 33: 876-887.

NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://explorer.natureserve.org. (Accessed: August 31, 2016).

Noss, Reed F., et al. "Managing fire-prone forests in the western United States." *Frontiers in Ecology and the Environment* 4.9 (2006): 481-487.

Odion, D.C., E.J. Frost, J.R. Strittholt, H. Jiang, D.A. DellaSala and M.A. Moritz. 2004. Patterns of fire severity and forest conditions in the western Klamath Mountains, northwestern California. *Conservation Biology* 18:927-936.

O'Meilia, M. E., F. L. Knopf, and J. C. Lewis. 1982. Some consequences of competition between prairie dogs and beef cattle. Journal of Range Management. 35: 580-585.

Outwater, A. 1996. Water: A natural history. Basic Books, New York, NY.

Paige, C. 2012. A Landowner's Guide to Fences and Wildlife: Practical Tips to Make Your Fences Wildlife Friendly. Wyoming Land Trust, Pinedale, WY. 52 pp. http://tetonconservation.org/perch/resources/wy-fence-guidefinal.pdf.

Paine, R. T. 1980. Food webs: Linkage, interaction strength and community infrastructure. Journal of Animal Ecology. 49: 667-685.

Plumpton, D. L. and D. E. Andersen. 1997. Habitat use and time budgeting by wintering ferruginous hawks. The Condor. 99: 888-893.

Plumpton, D. L. and D. E. Andersen. 1998. Anthropogenic effects on winter behavior of ferruginous hawks. Journal of Wildlife Management. 62: 340-346.

Plumpton, D. L. and R. S. Lutz. 1993. Nesting habitat use by burrowing owls in Colorado. Journal of Raptor Research. 27: 175-179.

Pollet, Jolie, and Philip N. Omi. "Effect of thinning and prescribed burning on crown fire severity in ponderosa pine forests." *International Journal of Wildland Fire* 11.1 (2002): 1-10. Available at: http://www.sierraforestlegacy.org/Resources/Conservation/FireForestEcology/FireScienceResearch/PrescribedFire/Prescribed-Pollet99.pdf.

Power, M. E., D. Tilman, J. A. Estes, B. A. Menge, W. J. Bond, L. S. Mills, G. Daily, J. C. Castilla, J. Lubchenco, and R. T. Paine. 1996. Challenges in the quest for keystones. BioScience. 466: 9-20.

PRC (Pacific Rivers Council). 2012. Conservation of Freshwater Ecosystems on Sierra Nevada National Forests: Policy Analysis and Recommendations for the Future. Pacific Rivers Council, Portland Oregon, report prepared for Sierra Forest Legacy. 156pp.

Reed, Rebecca A., Julia Johnson-Barnard, and William L. Baker. 1996. Contribution of Roads to Forest Fragmentation in the Rocky Mountains. Conservation Biology 10(4):1098-1106.

Richardson, John S., Robert J. Naiman, and Peter A. Bisson. "How did fixed-width buffers become standard practice for protecting freshwaters and their riparian areas from forest harvest practices?." *Freshwater Science* 31.1 (2012): 232-238.

Rhodes, J.J., McCullough, D.A., and F.A. Espinosa, Jr. 1994. A coarse screening process for evaluation of the effects of land management activities on salmon spawning and rearing habitat in ESA consultations. Columbia River Intertribal Fish Comm. Tech. Rept. 94-4, Portland, OR.

Rhodes, J.J. 2007. The watershed impacts of forest treatments to reduce fuels and modify fire behavior. Report prepared for the Pacific Rivers Council, Eugene (now Portland), OR.

Seglund, A.E. and P.M Schnurr. 2010. Colorado Gunnison's and white-tailed prairie dog conservation strategy. Colorado Division of Wildlife, Denver, Colorado, USA.

Sogge, M. K., Sferra, S. J., McCarthey, T. D., Williams, S. O., & Kus, B. E. (2003). Distribution and characteristics of Southwestern Willow Flycatcher breeding sites and territories: 1993-2001. *Studies in Avian Biology, 26*, 5-11

Swanson, M.E., J.F. Franklin, R.L. Beschta, C.M. Crisafulli, D.A. DellaSala, R.L. Hutto, D.B. Lindenmayer and F.J. Swanson. 2011. The forgotten stage of forest succession: early-successional ecosystems on forest sites. *Frontiers Ecol. Env*. 9: 117–25.

Switalski, T. A., Bissonette, J. A., DeLuca, T. H., Luce, C. H., & Madej, M. A. (2004). Benefits and impacts of road removal. *Frontiers in Ecology and the Environment*, *2*(1), 21-28.

Terborgh, J. 1988. The big things that run the world -- a sequel to E. O. Wilson. Conservation Biology. 2: 402-403.

Thompson, J.R., T.A. Spies and L.M. Ganio. 2007. Reburn severity in managed and unmanaged vegetation in a large wildfire. *PNAS* 104: 10743-48.

Trombulak, S. C., and C.A. Frissell. 2001. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities. *Conservation Biology* 14(1):18-26.

Weaver, Harold. Fire as a continuing ecological factor in perpetuation of ponderosa pine forests in western United States. Advancing Frontiers of Plant Sciences. 18 (1967): 137-154.

Weltzin, J. F., S. L. Dowhower, and R. K. Heitschmidt. 1997a. Prairie dog effects on plant community structure in southern mixed-grass prairie. Southwestern Naturalist. 42: 251-258.

Weltzin, J. F., S. Archer, and R. K. Heitschmidt. 1997b. Small-mammal regulation of vegetation structure in a temperate savanna. Ecology. 78(3): 751-763.

Whicker, A. and J. K. Detling. 1993. Control of grassland ecosystem processes by prairie dogs. Management of prairie dog complexes for the reintroduction of the black-footed ferret. J. L. Oldemeyer, D. E. Biggins, and B. J. Miller (Eds.). Washington, DC: U.S. Department of the Interior, pp. 18-27.

Whicker, A. D. and J. K. Detling. 1988a. Ecological consequences of prairie dog disturbances. BioScience. 38: 778-785.

Whicker, A. D. and J. K. Detling. 1988b. Modification of vegetation structure and ecosystem processes by North American grassland mammals. Plant form and vegetation structure: Adaptation, plasticity and relation to herbivory. J. J. A. Werger, P. J. M. van der Aart, H. J. During, and J. T. A. Verhoeven (Eds.). SPB Academic Publishing, the Hague, the Netherlands. pp. 301-316.

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