Persistence Analysis for Species of Conservation Concern

Inyo National Forest

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Planning record exhibit

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Introduction

2012 Planning Rule Framework for Species Persistence Analysis

The 2012 Planning Rule[1] requires the forest plan to include plan components,[2] to "maintain or restore": (1) "the ecological integrity of terrestrial and aquatic ecosystems and watersheds in the plan area"; and (2) "the diversity of ecosystems and habitat types throughout the plan area."

Under 36 CFR 219.9(b)(1), the responsible official (here the Forest Supervisor for the Inyo National Forest) must determine whether the plan components required by 36 CFR 219.9(a) provide the ecological conditions necessary to "contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern[3] within the plan area." The Planning Rule sets forth three possible outcomes of the responsible official's analysis of plan components with respect to species of conservation concern. Additionally, a fourth outcome may arise when the planning unit has developed a set of ecosystem based plan components it thinks will provide for species persistence, but also provides supplementary species-specific plan components for greater emphasis and clarity (all four determinations are presented in the "Determination" section below).

a. The responsible official may find that the plan components required by 36 CFR 219.9(a) are sufficient to provide the ecological conditions necessary to maintain a viable population of each species of conservation concern within the planning area. 36 CFR 219.9(b)(1).
b. The responsible official may determine that the plan components required by 36 CFR 219.9(a) are insufficient to provide the ecological conditions necessary to maintain a viable population of each species of conservation concern within the planning area, and that "additional, species-specific plan components, including standards or guidelines, must be included in the plan to provide such ecological conditions in the plan area." 36 CFR 219.9(b)(1).
c. The responsible official may determine "that it is 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." If the responsible official makes this determination, it shall: (1) document the basis for the determination; and (2) "[i]nclude plan components, including standards and guidelines, to maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range," in coordination with other Federal, State, Tribal, and private land managers.[4]

This species persistence analysis documents the rationale for the responsible official's determination for each species of conservation concern in the plan area, including: (1) the plan components required by 36 CFR 219.9(a) are sufficient to provide the ecological conditions necessary to maintain a viable population of that species of conservation concern within the planning area; or (2) additional, species-specific plan

[1] 36 CFR 219.9(a)
[2] The 2012 Planning Rule sets forth five required plan components (desired conditions, objectives, standards, guidelines, and suitability of lands) and one optional plan component (goals). 36 CFR. 219.7(e)(1)–(2). 36 CFR 219.7(f)(1)–(2) sets forth other required and optional content in the plan.
[3] A "species of conservation concern" is defined as "species, other than federally recognized threatened, endangered, proposed, or candidate species, that is known to occur in the plan area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species' capability to persist over the long-term in the plan area." 36 CFR 219.9(c).
[4] 36 CFR 219.9(b)(2)

components must be included in the plan to provide the ecological conditions necessary to maintain a viable population of that species of conservation concern within the planning area; or (3) that it is 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 that species of conservation concern in the plan area.

"Viable Population" Defined

The planning rule defines a "viable population" as "[a] population of a species that continues to persist over the long term with sufficient distribution to be resilient and adaptable to stressors and likely future environments."[5]

The Forest Service Handbook 1909.12, section 23.13c (1)(b) notes that the preamble to the proposed Planning Rule[6] addresses the meaning of the word "population" for planning purposes, explaining: "the individuals of a species of conservation concern that exist in the plan area will be considered to be members of one population of that species.".

The Handbook further defines the words and phrases "persist over the long-term," "sufficient distribution," "resilient," and "adaptable," used in the Planning Rule's definition of "viable population," as follows:

> The words "persist over the long-term" means the species continues to exist in the plan area over a sufficiently long period that encompasses multiple generations of the species, the time interval between major disturbance events, the time interval to develop all successional stages of major habitat types, or the time interval needed for the overall ecosystem to respond to management. Understand that confidence in the evaluations of persistence decreases rapidly as the timeframe of projections increases and that the responsible official will change plan components using plan amendments and plan revisions when the responsible official decides plan components need to be changed because of changed conditions (FSH 1909.12 section 23.13c (1)(c)).
>
> Whether there is "sufficient distribution" of a species should be considered in the context of the species' natural history and historical distribution and on the potential distribution of the habitat within the plan area. Recognize that habitat and population distribution are dynamic over time. Sufficient distribution also implies a distribution that permits individuals to interact within the plan area within the constraints of the species' natural history. Sufficient distribution implies that ecological conditions are provided to support redundancy in numbers such that losing one or some without replacement will still support a viable population. It should not be expected that management of National Forest System lands would provide broadly or evenly distributed habitat throughout a plan area for all species. Furthermore, as long as there is enough habitat in the plan area to maintain a viable population, there is no requirement that habitat to maintain all known individuals or the maximum possible number of individuals of a species must be available in the plan area (FSH 1909.12, section 23.13c(1)(d)).
>
> The word "resilient" suggests that when disturbance events or stressors result in the local disappearance of individuals or extirpation from an area, recolonization of suitable habitat may occur in the future to facilitate long-term persistence in the plan area (FSH 1909.12 section 23.13c(1)(e)).
>
> The word "adaptable" means that the species is able to adjust to new conditions. Ecological conditions to support the species are distributed in a way that the species may be represented in a variety of locally adapted ecotypes for increased likelihood of persistence in unknown future environments (FSH 1909.12 section 23.13c (1)(f)).

[5] 36 CFR 219.19
[6] 77 FR 21217, April 9, 2012

Organization of this Species Persistence Analysis

There are several required plan components and optional plan components and plan content in the plan (such as goals and potential management approaches) that serve as an overall foundation for providing the ecological conditions necessary to support the persistence of species of conservation concern within the plan area. This direction, listed in the section immediately below, includes desired conditions that frame the role of providing necessary ecological conditions within the plan area and includes goals to increase the communication, cooperation, and collaboration with all lands partners to further conservation of at-risk species. Species of conservation concern are a subset of at-risk species. At-risk species also include federally recognized threatened, endangered, proposed, and candidate species. Because the forest plan relies heavily upon desired conditions to frame the movement of the Inyo's ecological conditions over time, it also includes standards and guidelines to ensure project-level, site-specific contributions of the plan area meet needs for at-risk species, and are considered early in a project's environmental planning process.

To document the plan components that provide for the key ecological conditions and address any key threats within the plan area, a species-by-species evaluation follows for each terrestrial and aquatic species of conservation concern. A separate evaluation was prepared for botanical species of conservation concern. For each species there is an evaluation of the ecological conditions and threats in the plan area followed by a listing of the relevant plan components that address each of the key ecological conditions and threats identified. For most species, the ecological conditions needed by at-risk species are adequately addressed by ecosystem plan components, and in many cases, additional species-specific plan components were only needed to provide additional clarity and emphasis. In a few cases, species-specific plan components were essential to species persistence and long-term viability in the plan area.

The plan component coding follows a standard format where the first two parts identify the resource and applicable area for the direction and the third part identifies the type of plan component. All plan components are numbered sequentially in the forest plan, but the numbers do not convey a ranking or priority. Goals are optional numbered plan components and potential management approaches are additional plan content and are not numbered.

Forestwide Plan Components for Species At Risk

Several plan components focus on species-at risk and species of conservation concern, but are not necessarily species-specific. They do, however, add additional emphasis to key ecological conditions for many of those species. While generally broad, these plan components provide for ecosystems and habitat conditions that will be resilient to disturbance (both natural and human caused) and the interrelated effects of climate change. They also mitigate site-specific effects that might occur during projects or national forest management activities implemented under the land management plan in riparian areas, watersheds, terrestrial ecosystems, recreation areas, and wilderness. They include the following:

Animals and Plant Species

Desired Conditions (SPEC-FW-DC)

01 Sustainable populations of native and desirable nonnative, plant and animal species are supported by healthy ecosystems, essential ecological processes, and land stewardship activities, and reflect the diversity, quantity, quality and capability of natural habitats on the national forest. These ecosystems

are also resilient to uncharacteristic fire, climate change, and other stressors, which supports the long-term sustainability of plant and animal communities.

02 Habitats for at-risk species support self-sustaining populations within the inherent capabilities of the plan area. Ecological conditions provide habitat conditions that contribute to the survival, recovery, and delisting of species under the Endangered Species Act; preclude the need for listing new species; improve conditions for **species of conservation concern** including addressing threats (e.g. minimal impacts from disease); and sustain both common and uncommon native species.

03 Land management activities are designed to maintain or enhance self-sustaining populations of **at-risk species** within the inherent capabilities of the plan area by considering the relationship of threats (including site-specific threats) and activities to species survival and reproduction.

Goals (SPEC-FW-GOAL)

01 Cooperate with partners and private landowners to encourage resource protection and restoration across ownership boundaries.

03 Work with the California Department of Fish and Wildlife (following the memoranda of understanding), Nevada Department of Wildlife, and U.S. Fish and Wildlife Service to restore and maintain essential habitat for **at-risk species** and implement other recovery actions according to species recovery plans.

04 Communicate and collaborate with other agencies, Tribes, landowners, and partners to maximize opportunities to improve conditions in the plan area for **at-risk species** and the habitats and ecological processes on which they depend for survival.

Standards (SPEC-FW-STD)

01 Design features, mitigation, and project timing considerations are incorporated into projects that may affect occupied habitat for **at-risk species**.

Guidelines (SPEC-FW-GDL)

01 Known nest, roost, or den trees used by **species of conservation concern** or raptors, including surrounding trees that provide beneficial thermal or predatory protection, should not be purposefully removed, with the exception of the unavoidable removal of hazard trees and as required to meet other State or Federal regulatory requirements.

04 Habitat management objectives or goals from approved conservation strategies or agreements should be incorporated, if appropriate, in the design of projects that will occur within **at-risk species** habitat.

05 Water developments (such as a diversion or well) should be avoided near streams or seeps and springs where there is high risk of dewatering aquatic and riparian habitats where **at-risk species** occur.

Terrestrial Ecosystems and Vegetation

Desired Conditions (TERR-FW-DC)

05 Ecological conditions contribute to the recovery of threatened and endangered species, conserve proposed and candidate species, and support the persistence **of species of conservation** concern.

06 The landscape contains a mosaic of vegetation types and structures that provide habitat, movement and connectivity for a variety of species including wide-ranging generalists such as bear, mountain lion, and deer; more localized, semi-specialists such as ground-nesting, shrub-nesting, and cavity-nesting birds and various bats; and specialists such as old forest and sagebrush-associated species.

Conservation Watersheds

Desired Conditions (MA-CW-DC)

01 Conservation watersheds provide high-quality habitat and functionally intact ecosystems that contribute to the persistence of **species of conservation concern** and the recovery of threatened, endangered, proposed, or candidate species.

03 The drainage connections between floodplains, wetlands, upland slopes, headwaters, and tributaries are intact and provide for breeding, dispersal, overwintering, and feeding habitats for **at-risk species.** These areas provide refugia if other areas of the watershed are disturbed by events such as floods, landslides, and fires.

Watersheds

Desired Conditions (WTR-FW-GDL)

01 Minimize the effects of stream diversions or other flow modifications on at-risk species as well as other beneficial uses during relicensing; planning for state and other authorized water use; and water rights. Determine and recommend in-stream flow requirements and habitat conditions that maintain, enhance, or restore all life stages of native aquatic species and that maintain or restore riparian resources, channel integrity and aquatic passage.

All Riparian Conservation Areas

Desired Conditions (MA-RCA-DC)

02 Riparian conservation areas have ecological conditions that contribute to the recovery of threatened and endangered species and support persistence of **species of conservation concern** as well as native and desired nonnative aquatic and riparian-dependent plant and animal species.

Sustainable Recreation

Guidelines (REC-FW-GDL)

01 Avoid locating new recreation facilities within environmentally and culturally sensitive areas, such as **at-risk species** breeding habitat or at-risk plant species habitat.

03 Use integrated resource planning when designing projects to address impacts to **at-risk species habitat** and changing conditions in recreation settings.

Lands

Guidelines (LAND-FW-GDL)

02 Where feasible, bury new or reconstructed power distribution lines (33kV or less) and telephone lines to reduce impacts to resources such as scenery and **at-risk species habitat.**

All Designated Wilderness Areas

Desired Conditions (DA-WILD-DC)

08 Forest system trails that access wilderness are part of a high-quality wilderness experience for visitors. Forest system trails meet national quality standards, with minimal deferred maintenance and adhere to the national trail classification system. Trails in wilderness are located in resilient areas, and do not cause adverse impacts to at-risk species, water quality, soils, hydrologic connectivity, or cultural resources.

Individual Evaluations – Animals

Background

This section summarizes the key ecological conditions and risk factors for each species of conservation concern, and the plan components that mitigate those risk factors, provide for persistence, and contribute to maintaining a viable population of each species of conservation concern within the plan area.

Information on species distribution, ecological conditions, and threats is largely excerpted from the document “Rationales for Animal Species Considered for Species of Conservation Concern, Inyo National Forest (USDA 2018); additional information on each species of conservation concern, the associated selection process, and full references for best available science can be found in that document and will not be repeated here. A supporting crosswalk, providing the full language for each plan component, threats, and species grouped by key ecological conditions was developed to create this summary.

The following 22 wildlife species of conservation concern are addressed in this analysis:

- Mammals: Nelson desert bighorn sheep (*Ovis Canadensis nelsoni),* Sierra marten (*Martes caurina sierra),* Fisher (*Pekania pennanti*)
- Birds: Bald eagle (*Haliaeetus leucocephalus),* bi-state greater sage-grouse (*Centrocercus urophasianus),* California spotted owl (*Strix occidentalis occidentalis),* Great gray owl (*Strix nebulosi),* Mount Pinos sooty grouse (*Dendragapus fuliginosus howardi),* willow flycatcher (*Empidonax traillii*-includes: *Empidonax traillii brewsteri and Empidonax traillii adastus)*
- Amphibians: Black toad (*Bufo exsul);* Inyo Mountains slender salamander (*Batrachoseps campi);* Kern Plateau salamander (*Batrachoseps robustus)*
- Fish: California golden trout (*Oncorhynchus mykiss aquabonita)*
- Terrestrial invertebrates: sierra sulphur (*Colias behrii),* square dotted blue (*Euphilotes battoides mazourka),* Mono Lake checkerspot (*Euphydryas editha monoensis),* Boisduvals blue (*Plebejus icarioides inyo),* San Emigdio blue (*Plebulina emigdioni),* Apache fritillary (Apache silverspot butterfly) (*Speyeria nokomis apacheana),* a cave obligate pseudoscorpion (*Tuberochernes aalbui)*
- Aquatic Insects: Owens Valley springsnail (*Pygulopsis owensensis),* Western pearlshell (*Margaritifera falcate),* Wong’s springsnail (*Pyrgulopsis wongi)*

In addition to the summarized analysis for each species below, table 25 on page 112 provides a crosswalk to show how plan components meet species-specific habitat needs, and is grouped by the key ecological conditions or habitat elements that species share in common. Categories are not mutually exclusive.

Determination Outcomes

In the individual species rationales that follow, determinations for each species will have one of four possible outcomes:

1. The ecosystem plan components should provide the ecological conditions necessary to maintain a viable population of the [SPECIES NAME] in the plan area. No additional species-specific plan components are warranted.
2. The ecosystem plan components should provide the ecological conditions necessary to maintain a viable population of the [SPECIES NAME] in the plan area. Nonetheless, additional species-specific plan components have been provided for added clarity and/or measures of protection.
3. The ecosystem plan components may not provide the ecological conditions necessary to maintain a viable population of the [SPECIES NAME] in the plan area. Therefore, additional species-specific plan components have been provided. The combination of ecosystem and species-specific plan components should provide the ecological conditions necessary to maintain a viable population of the [SPECIES NAME] in the plan area.
4. It is 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 the [SPECIES NAME] in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

For each wildlife species of conservation concern, we describe key ecological conditions and threats that occur on the Inyo National Forest, the plan components that alleviate those threats and a summary of why plan components do or do not provide for viability in the plan area as shown in table 1. Plan components will not, and cannot, prevent all adverse impacts to individuals of the species, and have been designed to provide for viability of the species at the plan-level only. Optional plan language such as goals and potential management approaches are included in the narratives where needed and provide vision and strategy for improving ecological conditions for species that lack viability in the plan area because it is either not within the inherent capability of the land or outside forest service management authority. The narrative that follows each table highlights key issues and plan components intended to provide for persistence.

Table 1. Key to individual elements in the analysis

Element	Description
Key Ecological Conditions	Briefly describes key ecological conditions, including habitat, unique features or requirements for life cycle
Key Threats to Persistence	Key threats identified in the species of conservation concern rationale
Ecosystem plan component that alleviates or eliminates key threats*	Include all ecosystem-level plan components that address the threats
Additional species-specific plan components that alleviate or eliminate key threats*	Include any additional species-specific plan components that address the threats not adequately covered by ecosystem-level plan components, or to provide added emphasis/clarity
Effects Summary	Summarize how plan components, if implemented, provide the ecological conditions necessary to support species persistence and maintain a viable population of each species of conservation within the plan area.

Plan components: DC = desired condition, OBJ = objective, GOAL = goal, STD = standard, GDL = guideline (refer to the Inyo forest plan for individual plan components; 36 Code of Federal Regulations (CFR) § 219.19 (a) and (b))

Assumptions

This document describes and puts into context the current planning regulations and policies that informed the development of the Inyo National Forest environmental impact statement and land and resource management plan (also referred to as the “forest plan”). The regulations and policies themselves, however, are not directly incorporated into these documents.

A core element for the development of ecosystem-based desired conditions for all species, is that management actions that move ecosystem conditions toward the natural range of variation will benefit species persistence. That is, maintaining or restoring ecological conditions and functions similar to those under which native species evolved offers the best assurance against losses of biological diversity and maintains habitats for the vast majority of species in an area, and the further a habitat departs from that historical distribution, the greater the risk to viability of associated species. However, for some species this approach may not be adequate, because the reference condition is not achievable or because of risks not related to habitat. In that case, additional species-specific plan components are added.

For many species, it is currently unknown if a truly viable population does indeed exist on the Inyo National Forest. There may be evidence of individuals, incidental sightings, or species may use the plan area for breeding and dispersal, but it is unclear if there is a breeding population that exists in the plan area over a sufficiently long period that encompasses multiple generations of the species (that is, the number of breeding individuals that may occur on an individual national forest is presumably too small to be considered a viable population). In those instances, the national forest can contribute to ecological conditions that should move toward a desired condition that is within the natural range of variability. This would presumably maintain a viable population to the extent it currently exists or might exist in the future. In addition, for some species, the Forest Service does not have sole management authority over key risk factors. For example, disease spread by animals that wander onto the forest from private land owners, upstream water diversions, or mining activities on adjacent lands. The forest service can contribute to ecological conditions that improve habitat conditions and should support viability in the future once threats outside of forest service control have been addressed.

Determinations – Animal Species of Conservation Concern

Fisher[7]

Determination: It is not within the inherent capability of the plan area to maintain or restore the ecological conditions to maintain a viable population of the fisher in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Mature coniferous forest, typically more mesic than xeric, with supporting features such as large diameter trees and snags, multi-layered canopies, large down wood, high canopy closure, and structurally diverse and complex understory.

Photograph of fisher, photo credit: USDA Forest Service, Pacific Southwest Region, Southern Sierra Nevada Fisher Conservation Strategy website.

Table 2 summarizes key threats, plan components, and expected effects on fisher.

[7] Fisher (*Pekania pennanti*) is currently a proposed threatened species under the Endangered Species Act but a final determination has not yet been made. With this status, it is not on the current SCC list. We retained the persistence analysis here in case the species is not listed and is put back on the SCC list.

Table 2. Key threats, plan components, and expected effects on fisher

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Loss of habitat or habitat connectivity due to management activities such as fuels reduction treatments and timber harvest	TERR-FW-OBJ 01-02 TERR-FW-GDL 01-02 TERR-FW-STD 01 TERR-MONT-DC 01-02 TERR-OLD-DC 01-07 TERR-OLD-GDL 01-02 TIMB-FW-DC 01-03 TIMB-FW-GDL 02-03 DA-WILD-DC 03 INFR-FW-DC 03 FIRE-FW-GDL 01-02 FIRE-FW-STD 02	SPEC-SMPF-DC 01-04 SPEC-SMPF-GDL 01-02 SPEC-FW-DC 01-03 SPEC-FW-STD 01 SPEC-FW-GDL 01, 04	Forestwide ecosystem plan components for Terrestrial Ecosystems, Old Growth, Timber and Animals and Plants provide direction for maintaining habitat in areas where management activities take place by emphasizing heterogeneity, connectivity, and retention of key structural elements including old growth components, snags and trees. A standard for forestwide terrestrial habitat ensures the retention of conifer trees greater than 30 inches in diameter while guidelines ensure fuel reduction treatments minimize mortality of large, old trees and snags and incorporate design features that reduce fire intensity and promote delayed mortality. Objectives provide specific and measureable strategies to move forest composition and structure toward desired conditions, and return natural fire regimes to the landscape further reducing loss of habitat and promoting ecosystem resilience. These restoration based objectives will help keep up with the pace and scale needed to maintain ecological integrity and resist key stressors over time. Species specific guidelines for fisher reinforce ecosystem-level plan components and specifically ensure habitat will be retained during site specific projects; that cover is adequate for fisher prey species, that heterogeneous understory habitat provides denning sites and that project design does not lead to unnatural increases in fisher predation rates. Forest wide standards and guidelines for Animals and Plants promote design features and mitigations that consider needs of all at-risk species during project implementation.
Loss of quality habitat or habitat connectivity due to climate change or other stochastic events (e.g. wildfire) that lead to losses of mature forest conditions.	TERR-FW-DC 01-06,08-09 TERR-MONT-DC 01-02 TERR-OLD-DC 01-07 FIRE-FW-DC 01	SPEC-SMPF-DC 01-04	Ecosystem level plan components that include desired conditions for Terrestrial Ecosystems, Old growth, and Montane zones help to ensure fishers have adequate habitat for movement, dispersal, feeding, and reproduction at multiple scales that may otherwise be lost due to climate change and other stochastic events such as high severity fire and insect outbreaks. Species specific plan components for fisher provide desired conditions that fisher habitat is intact and well distributed.

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Loss of resting/denning habitat and/or disturbance that could lead to denning failure.	TERR-FW-STD 01 TERR-JEFF-DC 04-06 DA-WILD-DC 01,05,08,10	SPEC-FW-GDL 01 SPEC-SMPF-DC 01-04 SPEC-SMPF-GDL 01-03	Plan components ensures species will have large structures and habitat for resting and raising young. Plan components also ensure minimized disturbance to denning female fishers during the breeding season.
Loss of key habitat features such as large diameter trees and snags, multi-layered canopies, large down wood, moderate to high canopy closure and structurally diverse forest.	TERR-FW-STD 01 TERR-RFIR-DC 01-07 TERR-LDGP-DC 01-10 TERR-DMC-DC 01-06 TERR-JEFF-DC 01-03, 07	SPEC-SMPF-DC 04 SPEC-SMPF-GDL 01	Ecosystem level plan components provide for key structural features such as snags and logs and large trees needed for resting and denning. They also provide heterogeneity and complex forest structure, and various seral/structural stages needed to complete different life cycle needs. Fire is maintained as a natural process on the landscape and promotes ecosystem resilience. Species specific plan components ensure that key habitat and habitat elements are broadly distributed in the fisher Core Area.
Insecticide and pesticide use from illegal marijuana growing sites that contaminate prey species and associated forage.	not applicable	not applicable	Already covered under existing law. Not within forest service management authority.

Information on Current Distribution of the Species in the Planning Unit

Spencer et al. (2015) and Spencer et al. (2016) describe seven fisher population core areas in the Southern Sierra Nevada, five of which are occupied, and two of which are currently unoccupied. Fishers on the Inyo National Forest make up a small part of the Core 1 population – or the population on the Kern Plateau. This core is mostly on the Kern Plateau in the southeastern portion of the fisher assessment area and is the only core not on the west slope of the Sierra Nevada. It is largely within Sequoia National Forest, with a small portion on the Inyo National Forest (only 54.5 square kilometers of the 429.5 square kilometers are on the Inyo). The Kern Plateau has unique environmental conditions, due to differences in climate, geology, and vegetation, compared to the west-slope cores (Miles and Goudey 1998). It receives less annual precipitation (about 25-76 centimeters or 10-30 inches) than forests in other cores (about 102-152 centimeters or 40-60 inches), and the vegetation is somewhat more open. Pinyon-juniper woodlands, canyon oak woodlands, and birch-leaf mountain mahogany are a greater component of the vegetation of the Kern Plateau than other portions of the Fisher Assessment Area, and California black oak, an important component of fisher habitat where it occurs, is rare or absent. The lesser accumulation of snow in this core may explain why fishers occupy higher elevations here than elsewhere in the assessment area and why martens (which are more snow-adapted than fishers) are absent (J. Tucker, unpublished data).

Occupancy modeling shows this core area to have the lowest occupancy rates in the region (Zielinski et al. 2014), suggesting lower population densities here than elsewhere. Twenty-six sample units of the Sierra Nevada bioregional carnivore monitoring occur on the Inyo National Forest. Of these 26 sample units, 4 have detected fisher at various times over the last 15 years (J. Tucker, unpublished data). While reproduction has not been confirmed in this area, genetic analysis of hair samples have detected females multiple times, and in 2012 surveyors detected multiple individuals with genotypes consistent with a mother and two offspring (J. Tucker, unpublished data).

Key Ecological Conditions in Plan Area

Fisher Core 1 is the smallest occupied core area, has the lowest predicted habitat value of any core, and appears to lack potential suitable resting and denning habitat (Spencer et al. 2015). Further, Spencer et al. (2016) model the core as containing no currently suitable fisher cells. Fisher occupancy in Core 1 suggests that the current habitat models are unable to capture both the breadth of habitat that fisher will use, as well as the factors determining habitat selection in the Kern Plateau area, an area that is ecologically distinct from the rest of the fisher range in the Southern Sierra Nevada.

Elsewhere in their range in the Southern Sierra Nevada, fisher select for mature coniferous forest, typically more mesic than xeric, with supporting features such as large-diameter trees and snags, multi-layered canopies, large down wood, high canopy closure, and structurally diverse and complex understory. Additional research and monitoring are warranted in Core 1 to better understand fisher habitat selection and population characteristics. Spencer et al. (2016) note that “In the meantime, all [habitat] predictions for Core 1 should be considered unreliable.”

Key Threats to Persistence

Any activities or events such as fuel reduction, vegetation management treatments, high-severity fire, and climate change that negatively affect or remove mature forest or key structural elements such as large live and dead trees (large-diameter snags), logs, and coarse woody debris and or cause canopy cover loss. Key structural elements are important for resting and predator avoidance, as well as for denning and raising young. Higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate and related increases in drought and insect outbreaks can cause significant changes in forest structure, function and composition (Meyer 2013). In general, threats identified in the Conservation Assessment, habitat loss and fragmentation, primarily from large and

severe wildfires and lack of fire as a natural disturbance process is the most relevant threat for fisher in the plan area.

Threats under Forest Service Control

Land management includes the following key threats:

- Habitat loss (especially loss of denning, resting and foraging habitat, large old trees and dense canopy cover) and disturbance from activities such as vegetation management, timber removal, wildfire, or fuels treatment.
- Habitat loss resulting from climate change and disturbance such as wildfire, drought, or insect and disease outbreaks.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and table 2 above.

- Terrestrial Ecosystems and Vegetation (Old Forest, Montane Zones, Red Fir, Jeffrey Pine, Lodgepole Pine, and Mixed Conifer)
- Wilderness
- Fire

Most of the threats for fisher can be addressed through ecosystem-level plan components that emphasize resilient, connected forests containing the complex structural attributes fishers need for survival and reproduction. However, species-specific plan components have been added in a few instances for greater clarity and emphasis. Loss of old growth habitat and key structural attributes for denning and resting are key threats and desired conditions for fisher (SPEC-SMPF-DC 01-04) minimize the risk from high severity fire in fisher Core Area 1, ensure overarching desired conditions from terrestrial and riparian vegetation are met and that fisher habitat is well distributed throughout the landscape providing for foraging, denning and resting habitat and connected large landscapes. Four guidelines (SPEC-SMPF-GDL 01-03; SPEC-FW-GDL 01) specify projects are designed in a way to minimize disturbance, predation, and provide hiding cover and denning habitat and retention of complex forest structure in key fisher habitat.

Only approximately 13,400 acres (seven percent) of the approximately 198,900 acre Core 1 occurs on the Inyo Natiional Forest and most of the ecological conditions for fisher Core 1 area occur within the Golden Trout Wilderness (roughly 71 percent) with the remaining area in the Southern Sierra Inventoried Roadless Area. Portions of the IRA are mapped as Conservation Wildfire Protection Zone or General Wildfire Protection Zone (approximately eighty-one percent total) due to structures around Monache. However, these areas are unlikely to be prioritized for treatment and any treatment that would occur would not include mechanical thinning.

Threats Not Under Forest Service Control

- Poisoning of animals from pesticide and insecticide used by marijuana growers

Illegal rodenticide poisons to protect marijuana plantations is a growing area of concern throughout the Sierra Nevada and poses a threat to numerous mammals, including fisher (Gabriel et al. 2012). The impact presents a detrimental effect to population health, survival and status. Marijuana growing activity is extensive, illegal, and neither authorized, funded, nor carried out by the Forest Service. This activities are not expected in this area on the Inyo Natiional Forest due to the remoteness and generally drier conditions in this area. The proposed action includes an intent to work with local, State and Federal

agencies to remove and remediate poisons and pesticides from marijuana cultivation sites (Potential Management Approach for Animals and Plants).

Summary

Very few fishers currently occur, in a very limited location, on the Inyo National Forest. Connectivity is high between the Inyo and Sequoia National Forests, and between Fisher Core Areas 1 and 2, providing some protection against risks associated with small population numbers. However, the very localized fisher occurrence, combined with loss of larger trees and heterogeneity in pine forests, increased risk to upper montane forest from uncharacteristic stand-replacing fire, insect outbreaks, and warming temperatures create substantial concern about this species ability to persist in the planning unit. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of fisher within its range. However, limited occurrence data for fisher on the Inyo National Forest, coupled with the very different ecological conditions on the Kern Plateau than the rest of the fisher range in the Southern Sierra Nevada, suggest it is not within the inherent capability of land to maintain or restore the ecological conditions to maintain a viable population of fisher in the plan area. The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence.

Nelson Desert Bighorn Sheep

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of the Nelson desert bighorn sheep in the plan area. However, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Found in mid- to higher elevations (6,000 to 12,000 feet) in the White Mountains on the Inyo in areas with steep, rocky cliff or rock faces. Forages on shrubs located near or on these cliff faces and within meadow systems. Requires visually open areas with suitable escape terrain (rock cliff faces).

Photograph of a Nelson desert bighorn sheep, credit: USDA Forest Service

Information on Current Distribution of the Species in the Planning Unit

There is an isolated population of Nelson desert bighorn sheep known to occur in the White Mountain area at elevations ranging from 6,000 to 12,000 feet, within the plan area. This is the most northern population of desert bighorn sheep in California. California Department of Fish and Wildlife has estimated this population to be about 300 sheep and the population appears stable. Most of these animals occur in the White Mountains Wilderness, with approximately 30 animals (or roughly 10 percent of the population) occurring outside this area in Silver Canyon.

Key Ecological Conditions in Plan Area

Habitat for Nelson desert bighorn sheep on the Inyo National Forest is in areas with steep, rocky cliff or rock faces. Shrubs located near or on these cliff faces and within meadow systems are important for foraging. Visually open areas with suitable escape terrain are key ecosystem characteristics. On the Inyo National Forest, these conditions occur in the alpine and subalpine assessment types, primarily within the White Mountains Wilderness which encompasses approximately 230,958 acres. The area is jointly administered by the Inyo National Forest (206,796 acres) and the Bureau of Land Management (about 24,162 acres). It is contiguous, with the Boundary Peak Wilderness along its northeast boundary.

Key Threats to Persistence

Threats to the persistence of all desert bighorn sheep in California include disease transmission from domestic sheep and goats, competition with livestock, loss of genetic diversity, habitat loss and disturbance (U.S. Fish and Wildlife Service 2011). The contact of bighorn sheep with domestic sheep or goats on adjacent private lands can transmit diseases to bighorn sheep and can cause die-offs of the affected bighorn sheep herds. Within the White Mountains, the primary local concern for the continued persistence of Nelson desert bighorn sheep is disease transmission from domestic goats that graze from Chalfant Valley through Hammil Valley, adjacent to the plan area (CDFW 2015). Epizootic pneumonia, caused by *Mycoplasma ovipneumoniae* (*M. ovi*), has been documented to occur in this herd and has caused respiratory disease and die-offs in bighorn sheep in the White Mountain herd (Besser et al. 2008, CDFW 2015). Possible intermingling between this herd and the Lone Mountain and Silver Peak Range Nelson desert bighorn sheep populations in Nevada during the breeding season pose additional risks, since both of these herds have also been documented to carry *M. ovi* (California Department of Fish and Wildlife 2015). To date, there has been one documented case of pneumonia on the Inyo National Forest, an 11-year-old male in 2016 (Nelson 2016).

Table 3 summarizes key threats, plan components, and expected effects on Nelson desert bighorn sheep.

Table 3. Key threats, plan components and expected effects on Nelson desert bighorn sheep

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Respiratory disease (*Mycoplasma ovipneumoniae*) (verified in the White mountains since 2009) and disease transmission from domestic sheep and goats that stray onto the Inyo National Forest.	Not applicable	SPEC-SHP-DC 02 SPEC-SHP-STD 01 SPEC-FW-DC 02	Species specific plan desired conditions alleviate risk from disease transmission and population declines by limiting domestic sheep or goat grazing in areas of bighorn sheep use and ensuring species are minimally impacted from disease. A standard places restrictions on intermingling of goats and domestic sheep where disease risk assessment

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
			models predict a high likelihood of disease exposure.
Habitat suitability/loss from climate change	TERR-ALPN DC 01-03,05 DA-WILD-DC 02-03,05 RCA-MEAD-DC 01-07	SPEC-FW-DC 01-03 SPEC-FW-STD 01 SPEC-FW-GDL 04 SPEC-SHP-DC 01 TERR-FW-DC 05	Ecosystem level plan components promote habitat conditions in alpine ecosystems and wilderness areas that are resilient to climate change and support the role fire plays as a natural disturbance process. Species specific plan components include forestwide guidance for at-risk species that promotes resilient intact ecosystems, balances the needs of at-risk species with other resource uses and ecological processes, and mitigates risk to persistence from land management activities and other disturbance including recreational activities in wilderness that can negatively affect survival and recruitment. Species specific plan components further ensure sheep will have adequate habitat for movement, dispersal, feeding, and reproduction to maintain or increase population levels.
Inadequate or poor forage and habitat loss from conifer encroachment.	RCA-MEAD-DC 07 RCA-MEAD-OBJ 01	SPEC-SHP-DC-01	Ecosystem level plan components ensure meadow areas contain appropriate plant species for forage, that conifer encroachment is minimized, and identify specific and measurable objectives to move habitat toward the desired conditions. Species-specific desired conditions further reinforce these conditions specifically for bighorn sheep and specify adequate habitat with unforested openings and forage support persistent populations of sheep.
Inadequate or poor forage (loss of winter range) from forest activities	WTR-FW-DC 04; RANG-FW-DC 01-03 RANG-FW-STD 01-05	N/A	Forestwide plan components for ensure nutritive forage is available for grazing in upland areas, that healthy wildlife populations are sustained and compatible with other resource values, and that livestock grazing needs are compatible with forage, browse and cover needs of wildlife.
Connectivity (loss of genetic diversity)	TERR-FW-DC 06	N/A	Forestwide plan component provides vegetation to support movement and connectivity of wide-ranging species which should promote genetic flow between populations.

The area in which bighorn sheep occur in the White Mountains is within California Department of Fish and Game Hunt Zone 7 and overlaps with four active cattle allotments. Lack of genetic diversity resulting from limited connectivity is another general concern; however, genetic diversity is not known to be a limiting factor for the White Mountains herd within the plan area.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed ecosystem-level plan components in table 3 above. However, the primary threat from the respiratory disease *Mycoplasma ovipneumoniae* is addressed at the species level.

Threats under Forest Service Control

Land management includes the following key threats:

- competition with livestock for winter range
- connectivity/habitat fragmentation (genetic isolation)
- habitat loss, (conifer encroachment) loss of forage, and disturbance resulting from climate change

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections: Terrestrial Ecosystems and Vegetation (Alpine Zone); Watersheds; Wilderness; Riparian Conservation Areas (Meadows); Rangeland and Livestock Grazing

Competition from livestock and loss of winter range habitat is primarily addressed through plan components for Rangeland and Livestock Grazing (RANG-FW-DC 01-03; RANG-FW-STD 01-05). Desired conditions maintain ecosystems integrity on grazed lands and promote livestock needs that are balanced with available forage and wildlife needs. Habitat loss from climate change is addressed through desired conditions for Alpine and Subalpine systems (TERR-ALPN-DC 01-03, 05) that promote open areas and habitat that is resilient to climate change and related stressors. A desired condition (RCA - MEAD-DC 07) for meadows in upper montane areas limits conifer encroachment and promotes native understory plant composition and cover which should provide for foraging needs and animal movement.

In addition to these ecosystem-level plan components the species-specific desired condition SPEC-SHP-DC 01 also applies to Nelson desert bighorn sheep by ensuring key habitat needs including for foraging, bedding, birthing, and migration are provided for throughout the year. These species-specific plan components add greater emphasis and clarity to the existing ecosystem-level plan components.

Threats Not Under Forest Service Control

- Disease transmission from domestic sheep and goats that stray onto the Inyo National Forest.

There is controversy regarding the literature on disease transmission, as no articles have been published that document a visual observation in the field of nose-to-nose contact between domestic sheep and goats and bighorn sheep which resulted in transmission of this disease. However, studies conducted in research facilities (Foreyt 1989) and literature on the presence of bacteria, such as *M. ovi*, before and after domestic sheep or goats were observed in bighorn habitat (Besser et al. 2012) have shown a correlation between contact and the spread of disease. Further, Besser and others (2012) demonstrated exposure to a single *M. ovi* infected animal resulted in transmission of infection and bronchopneumonia to all bighorn sheep both within the same pen and in adjacent pens located 7.6 to 12 meters apart.

The Inyo National Forest does not currently have active allotments with domestic goats and sheep overlapping with sheep habitat. However, stray animals that may wander onto national forest land still pose a threat and it was necessary to add species-specific plan components (SPEC-SHP-DC 02 and

SPEC-SHP-STD 01) to minimize the spread of disease from domestic sheep and goats within Forest Service authority.

Finally, the following goal encourages an all-lands approach for mitigating the threats and stressors that affect the ecological conditions that would support Nelson desert bighorn sheep and help maintain viability throughout its range:

- SPEC-SHP-GOAL 01: Coordinate with the California Department of Fish and Wildlife and the U.S. Fish and Wildlife Service to conduct a risk assessment of pack goat use on the Inyo National Forest and develop mitigations strategies to manage the risk of disease transmission, if needed.

Summary

The most immediate and primary risk to Nelson desert bighorn sheep persistence on the Inyo National Forest is exposure to disease. The Inyo National Forest limits this threat by restricting goat and sheep use in areas of the White Mountains that overlap with bighorn sheep occupation within Forest Service management authority, but we have limited ability to mitigate co-mingling with diseased animals such as stray domestic sheep and goats from private properties or animals from other bighorn herds in adjacent areas. Future habitat loss due to warming temperatures and climate change, as well as forage competition with livestock are possible risk factors, as is loss of genetic diversity resulting from habitat fragmentation. The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of Nelson desert bighorn sheep within its range. However, the primary risk factor, disease exposure from privately owned livestock that stray onto the Inyo National Forest is beyond Forest Service management authority and for this reason a reduction in viable populations of bighorn sheep can occur because of land use outside National Forest System lands.

Sierra Marten

Determination: It is not within the inherent capability of the plan area to maintain or restore the ecological conditions to maintain a viable population of the Sierra marten in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Mature coniferous forest, typically more mesic than xeric, with supporting features such as large-diameter trees and snags, multi-layered canopies, large down wood, moderate to high canopy closure (more than 30 percent) and structurally diverse and complex understory that is interspersed with riparian areas and meadows. Core patch size and spatial connectivity of patches is also important.

Table 4 summarizes key threats, plan components, and expected effects on Sierra marten.

Table 4. Key threats, plan components and expected effects on Sierra Marten

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Loss of habitat, loss of connectivity/movement corridors due to management activities such as fuels reduction treatments, timber harvest and recreation use.	TERR-FW-OBJ 01-02 TERR-FW-GDL 01-02 TERR-FW-STD 01 TERR-OLD-GDL 01-02 TIMB-FW-DC 01-03 TIMB-FW-GDL 02-03 DA-WILD-DC 02-03, 05-08 MA-RCA-GDL 01-04 RCA-MEAD-OBJ 01 REC-FW-DC 04,08 REC-FW-GLD 01-03 DA-MBGU-DC 02 INFR-FW-DC 03 MA-GRA-GDL 01 FIRE-FW-GDL 01-02 FIRE-FW-STD 02	SPEC-SMPF-DC 01-03 SPEC-SMPF-GDL 01-02 SPEC-FW-DC 01-03 SPEC-FW-STD 01 SPEC-FW-GDL 01, 04	Forest wide ecosystem plan components for Terrestrial Ecosystems, Old Growth, Timber and Animals and Plants provide direction for maintaining habitat in areas where management activities take place by emphasizing heterogeneity, connectivity, and retention of key structural elements including old growth components, snags and trees. A standard for forestwide terrestrial habitat ensures the retention of conifer trees greater than 30 inches in diameter while guidelines ensure fuel reduction treatments minimize mortality of large, old trees and snags and incorporate design features that reduce fire intensity and promote delayed mortality. Objectives provide specific and measureable strategies to move forest composition and structure toward desired conditions, and return natural fire regimes to the landscape further reducing loss of habitat and promoting ecosystem resilience. These restoration based objectives will help keep up with the pace and scale needed to maintain ecological integrity and resist key stressors over time. Desired conditions and guidelines for Wilderness and Riparian Conservation Areas mitigate threats from recreation, fire and livestock and ensure watersheds are functioning properly and that impacts to at-risk species are minimized. Forest wide guidelines for Sustainable Recreation minimize the addition of recreational facilities in at-risk species habitat and ensure at-risk species needs will be integrated into project design in recreation settings. Species specific guidelines for marten reinforce ecosystem-level plan components and specifically ensure core habitat will be retained during site specific projects; that cover is adequate for marten prey species, that heterogeneous understory habitat provides denning sites and that project design does not lead to unnatural increases in marten predation rates that could subsequently lead to population declines. Forest wide standards and guidelines for Animals and Plants promote design features and mitigations that consider needs of all at-risk species during project implementation.
Loss of quality habitat due to climate change or other stochastic events (e.g.	WTR-FW-DC 01 TERR-FW-DC 01-06,08-09	SPEC-SMPF-DC 01-03 MA-RCA-DC 02	Ecosystem level plan components that include desired conditions for Watersheds, Terrestrial Ecosystems, Old growth, Montane and Alpine zones and Riparian areas help to ensure martens

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
wildfire, reductions in snowpack) that lead to losses of mature forest conditions, and or meadow riparian habitat.	TERR-MONT-DC 01-02 TERR-OLD-DC 01-07 TERR-ALPN-DC 01-03 & 05 MA-RCA-DC 01, 05,08-09 RCA-MEAD-DC 01-07 FIRE-FW-DC 01		have adequate habitat for movement, dispersal, feeding, and reproduction at multiple scales that may otherwise be lost due to climate change and other stochastic events such as high severity fire and insect outbreaks. Species specific plan components for marten provide desired conditions that marten core habitat areas are intact and well distributed. Desired conditions for riparian conservation areas support persistence of species of conservation.
Loss of resting/denning habitat	TERR-JEFF-DC 04-06	Not applicable	Plan component ensures species will have structures for resting and raising young.
Loss of habitat connectivity/corridors (genetic diversity).	MA-CBRA-DC 02 TERR-FW-DC 06	Not applicable	Management Area direction for backroad recreation promotes desired conditions that promote species diversity and movement corridors and large wild tracts of land in undeveloped landscapes while forest wide direction for terrestrial ecosystems ensures the landscape contains a mosaic of vegetation types and structures that provide habitat, movement and connectivity for a variety of species including those that are wide-ranging and that use old growth.
Loss of complex early seral habitat.	TERR-CES-DC 01-03 TERR-CES-GDL 01-03,05	Not applicable	Desired conditions ensure complex early seral habitats are distributed across the landscape and key habitat elements such as large diameter snags are available for resting habitat. Guidelines ensure restoration projects maintain ecosystem integrity, important wildlife habitat, and that large fires in potential marten habitat minimize harvest to provide areas of complex early seral habitat for species that need them.
Loss of key habitat features such as large diameter trees and snags, multi-layered canopies, large down wood, moderate to high canopy closure and structurally diverse forest in the red fir, lodgepole pine and mixed conifer ecosystems	TERR-RFIR-DC 01-07 TERR-LDGP-DC 01-10 TERR-DMC-DC 01-06 TERR-JEFF-DC 01-03, 07	Not applicable	Ecosystem level plan components provide for key structural features such as snags and logs needed for resting and denning. Also provide heterogeneity and complex forest structure, and various seral/structural stages needed to complete different life cycle needs. Fire is maintained as a natural process on the landscape and promotes ecosystem resilience.
Insecticide and pesticide use from illegal Marijuana growing sites that contaminate prey species and associated forage.	Already covered under existing law. Not within forest service management authority.	N/A	

Information on Current Distribution of the Species in the Planning Unit

In the plan area, marten locations have been observed in wilderness, almost exclusively west of Highway 395, with only one occurrence east of the highway in the Jeffery pine forest (Kucera, Zielinski and Barrett, 1995). There are 12 records for marten in the NRIS database, located predominantly on the western side of the forest near Mammoth Lakes (Mammoth and Mono Lake RDs) and on the Kern Plateau adjacent to the Sierra National Forest (White Mountain RD). There has been at least one documented denning site where two young were captured and telemetered, (Inyo National Forest unpublished data); however, the current level of abundance/specific population information for this species on the Inyo National Forest is unknown. The Forest does have many years of vegetation survey data and incidental observations show that suitable habitat is available and breeding is presumed, however it is currently uncertain if a viable population does in fact exist. Martens frequently change den locations and surveys for dens are intensive, making it difficult to estimate levels of abundance. Martens may move back and forth between the Inyo National Forest and neighboring Sequoia and Sierra National Forests as well as Yosemite National Park.

Key Ecological Conditions in Plan Area

Mature coniferous forest, typically more mesic than xeric, with supporting features such as large diameter trees and snags, multi-layered canopies, large down wood, moderate to high canopy closure (>30%), structurally diverse and complex understory that is interspersed with riparian areas and meadows for foraging and movement. Core patch size and spatial connectivity of patches are also critical. On the Inyo National Forest, these conditions can be found in the mixed conifer and upper montane forest ecological zone which includes subalpine conifer forest, red fir, lodgepole pine, and mixed conifer forest.

Key Threats to Persistence

Threats to persistence include activities such as fuel reduction, vegetation management treatments, and to a lesser extent, recreation and climate change that negatively affect or remove mature forest and or key structural elements such as large live and dead trees (large-diameter snags), logs, and coarse woody debris or cause losses in connectivity or movement corridors. Key structural elements are important for resting and predator avoidance, as well as for denning and raising young.

Higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate and related increases in drought and insect outbreaks can also cause significant changes in forest structure, function and composition (Meyer 2013).

Threats Under Forest Service Control

Land management includes the following key threats:

- Habitat loss (especially loss of denning, resting and foraging habitat, large old trees and dense canopy cover) and disturbance from activities such as vegetation management, timber removal, wildfire, fuels treatment, and recreation.
- Connectivity and habitat fragmentation, loss of movement corridors and loss of genetic diversity due to isolation.
- Habitat loss resulting from climate change and natural disturbances such as wildfire.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and table 4 above.

- Terrestrial Ecosystems and Vegetation (Subalpine, Alpine and Montane Zones, Complex Early Seral, Red Fir, Jeffrey Pine, Lodgepole Pine, and Mixed Conifer)
- Watersheds
- Wilderness
- Riparian Conservation Areas (Meadows)
- Management Areas (Challenging Backroad, Riparian Conservation)
- Sustainable Recreation

Most of the threats for Sierra marten can be addressed through ecosystem-level plan components that emphasize resilient, connected forests containing the complex structural attributes martens need for survival and reproduction. However, species-specific plan components have been added in a few instances for greater clarity and emphasis. Loss of old growth habitat and key structural attributes for denning and nesting are key threats and desired conditions for Sierra Marten (SPEC-SMPF-DC 01-03) minimize the risk from high-severity fire in marten habitat core areas, ensure overarching desired conditions from terrestrial and riparian vegetation are met and that marten habitat is well distributed throughout the landscape providing for foraging, denning and resting habitat and movement across large landscapes. Three guidelines (SPEC-SMPF-GDL 01-02; SPEC-FW-GDL 01) specify projects are designed in a way to minimize predation, and provide hiding cover and denning habitat and retention of complex forest structure in marten core habitat areas.

Threats Not Under Forest Service Control

- Poisoning of animals form pesticide/insecticide used by marijuana growers
- Large connected landscapes that expand beyond the boundary of the Inyo National Forest

Illegal rodenticide poisons to protect marijuana plantations is a growing area of concern throughout the Sierra Nevada and poses a threat to numerous mammals, including martens (Gabriel et al. 2012). The impact presents a detrimental effect to population health, survival and status. Marijuana growing activity is extensive, illegal, and not authorized, funded, or carried out by the Forest Service.

Sierra marten is a wide-ranging species and large connected landscapes are critical to long-term viability. The ecosystem-level and species-specific plan components are designed to move existing habitat conditions for marten toward a more ecological resilient state than what currently exists. However, ultimate long-term persistence and viability of this species will depend on management actions (or inactions) on adjacent landscapes. Two goals (SPEC-FW-GOAL 01 and 03) encourage cooperative protection and restoration of habitat across ownerships boundaries which should benefit marten throughout its range.

Summary

The fragmented nature of upper montane forests on the Inyo National Forest, coupled with declining and or small population numbers of marten, and reduced snowpack resulting from climate change, may put the species at future risk. This may be of particular concern with regard to range contraction given the Inyo National Forest’s location at the edge of the species southeastern most range. Further, loss of larger trees and heterogeneity in pine forests, increased

risk to upper montane forest from uncharacteristic stand-replacing fire, and insect outbreaks and warming temperatures with reduction of snowpack creates substantial concern about this species ability to persist on the planning unit. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of Sierra marten within its range. However, limited occurrence data for marten on the Inyo National Forest, coupled with its wide ranging-ranging nature suggest it is not within the inherent capability of land to maintain or restore the ecological conditions to maintain a viable population of the Sierra marten in the plan area. The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence.

Bald Eagle[8]

Determination: It is not within the inherent capability of the plan area to maintain or restore the ecological conditions to maintain a viable population of the bald eagle in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Large bodies of water (lakes or reservoirs) or free flowing large rivers with adjacent large live trees or snags.

Table 5 summarizes key threats, plan components, and expected effects on bald eagle.

Information on Current Distribution of the Species in the Planning Unit

Bald eagles have long been known to occur on the Inyo National Forest during winter months, with three nests observed on the national forest since 2004 in the Upper Owens River and June Lake areas. The nest location in the Upper Owens River area may have subsequently been abandoned; only one adult bird has been observed in recent times and nesting activity has presumably stopped in that area. Another potential nest site may be present in the Hilton Lakes area where juvenile and adult bald eagles have been observed. There is limited information on the bald eagle population numbers on the Inyo National Forest. Although nesting bald eagles have been observed and winter bald eagle surveys document wintering habitat use on the forest (Eakle et al. 2015), there is little information on actual population trends or density. Individuals have been observed, but there is uncertainty as to whether a viable population currently exists on the Inyo National Forest.

Table 5. Key threats, plan components and expected effects on bald eagle

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Habitat loss: changes in timing and flow of water and water availability	WTR-FW-DC 01-04, 06-07 WTR-FW-STD 01-03	SPEC-FW-GDL 05	Ecosystem level plan components provide for ecological integrity of aquatic systems so that they are high quality and resilient to climate

[8] Also see Bald and Golden Eagle Protection Act of 1940

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
resulting from climate change, forest management activities, and or hydroelectric power.	DA-WILD-DC 02-03 WTR-FW-OBJ-01	SPEC-FW-STD 01	change and other demands, and provide adequate prey for bald eagles. Species specific guideline for at-risk species minimizes risk of dewatering aquatic/riparian habitat from water developments and a forest wide standard promotes design features to protect all species at-risk during project implementation.
Habitat loss: stream and riverine ecosystems, riparian habitat, ponds and pools	RCA-RIV-DC 01-06 RCA-RIV-OBJ 01-02 RCA-LPP-DC 01 MA-RCA-DC 02-05,08-11 MA-RCA-OBJ 01 MA-RCA-STD 01-06	N/A	Ecosystem level desired conditions and objectives provide for ecological integrity of aquatic systems so that they are resilient to climate change and other demands and can provide the foraging habitat and prey species necessary for bald eagles.
Human Recreation and related disturbance.	WTR-FW-DC 05 MA-RCA-DC 10 DA-MBGU-DC 02 MA-GRA-GDL 01 REC-FW-GDL 01-03 REC-FW-DC-04,08 SPEC-FW-DC 05 DA-WILD-DC 05,08 DA-WILD-REC1-DC 02-05 DA-WILD-REC2-DC (02-05) DA-WILD-REC3-DC (02-05)	N/A	Ecosystem level desired conditions minimize disturbance from recreation related activities and human activities on sensitive resources. Guidelines constrain impacts on resources including at-risk species breeding habitat in recreation areas and ensure the needs of at-risk species will be accounted for during project design.
Loss of roosting and nesting trees.	TERR-FW-DC 05-06 TERR-FW-STD 01 TERR-FW-GDL 01-02 TERR-OLD-DC 03-06 TERR-OLD-GDL 01-02 TERR-DMC-DC 01-06 TERR-JEFF-DC 04-06 TIMB-FW-DC 01-03 TIMB-FW-GDL 02-03 TERR-MONT-DC 01-02	SPEC-FW-GDL 01	Ecosystem level plan components ensure that large trees and snags necessary for nesting and roosting and perching will be retained during project implementation and that large trees and snags are resilient to natural disturbance such as fire, insects and disease. Plan components also help to ensure that a supply of trees in the larger size classes is distributed across the forest at levels that will provide sustainable nest/roost habitat for bald eagles cross the landscape. A species-specific guideline further reinforces the retention of known nest and roost trees used by species of conservation concern or raptors.

Key Ecological Conditions in Plan Area

Bald eagles use large conifer stands (Jeffery pine and mixed conifer) where there is access to open water (for example, lakes or reservoirs) or free flowing rivers for foraging, typically within 1 mile of large trees (about 40 inches diameter) and greater than 98 feet tall, snags, or dead top trees. In northern California, nest territories are typically within conifer stands with most nests in ponderosa pine (*Pinus ponderosa*), Jeffrey pine (*Pinus jeffreyi*) and sugar pine (*Pinus lambertiana*). Nests are generally within one of the tallest trees in the stand, and the majority of nest trees have an unobstructed view to a water body (Lehman 1979). In California, large-diameter trees are used for nesting, with an average of 109 centimeters (43 inches) in diameter (Anthony et al. 1982).

Approximately 479 lakes occur on the Inyo National Forest, totaling about 46,000 acres. Many of the high-elevation lakes support introduced trout species of brook, brown, rainbow and golden trout. There are no lakes in the White, Inyo or Glass mountains. Waterbodies less than 2 acres are considered ponds, of which there are 1,372 on the Inyo National Forest, comprising a total of 662 acres. There are 26 lakes and meadows scattered throughout the lower elevations of the eastern Sierra Nevada foothills. These waterbodies have been enhanced by dams to increase the water holding capacity. Large river systems that provide a consistent, abundant flow of water throughout the year, as well as fish species diversity include the upper Owens River through Long Valley, the South Fork Kern River and the San Joaquin River through Reds Meadow.

The amount of potential nesting habitat on the forest for bald eagles is somewhat limited; however, because there are relatively few forested areas near large bodies of water that offer a suitable prey base.

Key Threats to Persistence

The largest current threat to remaining colonies may be disturbance from recreational activities, such as boating, jet-skiing, fishing and low-flying aircraft, which can cause disturbances to nesting birds (Buehler 2000). Camping within 100 meters of a bald eagle nest can lower the amount of prey consumed (-26 percent) and prey fed to nestlings (-29 percent) relative to activity observed when camping is restricted to at least 500 meters from nests (Steidl and Anthony 2000). Loss of key habitat components such as perches and roosting trees, from natural disturbance events associated with higher fuel loading and changes in forest structure and composition are additional threats likely to be exacerbated by climate change. Fishing opportunities and recreation uses are expected to continue and impacts from those activities will continue to occur. The California Department of Wildlife is expected to continue the fish stocking program in many of the lakes.

Threats Under Forest Service Control

Land management includes the following key threats:

- Recreation and human disturbance
- Habitat loss and loss of key components such as perches and roosting trees

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and table 5 above.

- Riparian Conservation Areas (Rivers, lake and ponds)
- Terrestrial Ecosystems and Vegetation (Old growth, Mixed conifer, and Jeffrey pine)
- Watersheds

- Timber
- Recreation
- Management Areas (riparian conservation area, general recreation)

Most of the threats for bald eagle on the Inyo National Forest can be addressed in the form of desired conditions that emphasize sustainable recreation and that minimize human disturbance. Desired conditions, standards, and guidelines for Riparian Conservation Areas, Terrestrial Ecosystems, Timber and Watersheds minimize habitat loss and emphasize the retention of large trees and snags that provide nest sites and suitable foraging perches for hunting. The following plan components when carried out would protect bald eagle from the key threat of recreation related disturbance:

- A guideline for general recreation areas (MA-GRA-GDL 01) emphasizes direct management techniques to reduce impacts on resources.
- Forestwide desired conditions for recreation (REC-FW-DC 04, 08) minimize impacts and adverse effects on sensitive and natural resources while recreation guidelines (REC-FW-GDL 01-03) minimize construction of recreation facilities in at-risk species habitat and ensure the needs of at-risk species are incorporated into project design.
- In the Ansel Adams and John Muir Wilderness, desired conditions for recreation (DA-WILD-REC1-DC 02-05; DA-WILD-REC2-DC 02-05; DA-WILD-REC3-DC 02-05) seek to minimize impacts from camping with emphasis on riparian, lakeshore and stream channel conditions.
- A forestwide desired condition for all species (SPEC-FW-DC-05) minimizes risk from hunting and fishing that could negatively affect native species including bald eagle.
- A recreation goal (REC-FW-GOAL 06) supports collaborative partnership opportunities to enhance responsible recreation and increase knowledge of related socioeconomic and environmental issues.

In addition to the ecosystem-level components mentioned above, several species-specific plan guidelines (SPEC-FW-GDL-01 and TERR-FW-GDL-02) were added to further emphasize that the retention of key habitat components such as roosting and nesting trees for raptors are considered during project implementation. A forestwide standard SPEC-FW-STD-01 places additional emphasis on the protection of at-risk species habitat by ensuring appropriate design features, mitigation, and project timing considerations are incorporated into projects that may affect their habitat.

Threats Not Under Forest Service Control

- Water development and diversions as well as drought effects from climate change which alter hydrologic regime and affect aquatic habitat and associated species.

Water diversions and water developments can have negative effects on downstream communities by altering habitat function, composition and structure and diminishing ecological integrity. Reservoirs will continue to exist under current management and jurisdiction to fulfill their water storage and hydroelectric needs. No change in management is expected to occur within the next 20 years for reservoirs, but climate change has the potential to exert additional stress on water delivery systems. Ecosystem level plan components for Watersheds (WTR-FW-DC 01-04, 07 and WTR-FW-STD 01-03) provide for healthy riparian and aquatic ecosystems within management authority, but because of growing population demands and off-forest consumption of water resources, these habitats may not realize their full recovery potential, limiting the Inyo National Forest's ability to provide for species viability. However, several goals provide a vision for

working across land boundaries to collectively attain desired conditions. A watershed goal (WTR-FW-GOAL 01) encourages collaborative work between adjacent land owners and agencies to improve watersheds across ownership boundaries while a goal for riparian conservation areas (MA-RCA-GOAL 01) promotes coordination with the State fish and wildlife agencies to address native aquatic species issues, including evaluating management and monitoring needs to address aquatic species requirements across ownership boundaries.

Summary

Bald eagles are currently known to use the Inyo National Forest for wintering with only a couple of nests since 2004. It is not currently known if the national forest habitat maintains a viable population of bald eagle. Habitat loss resulting from high-intensity fires and loss of riparian habitat continues to be a potential threat. Disturbance from recreationists is perhaps the biggest immediate risk factor affecting bald eagles on the Inyo National Forest. It is anticipated this will continue to be a potential risk factor for this species, as human population levels and recreation activity are expected to increase over time. The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of bald eagle within its range. However, due to uncertainty about the species current viability, and potential future threats associated with recreation and climate change, it is not within the inherent capability of the land to maintain or restore the ecological conditions to maintain a viable population of bald eagle within the plan area.

Bi-State Greater Sage-Grouse[9]

Determination: The ecosystem plan components may not provide the ecological conditions necessary to maintain a viable population of the bi-state greater sage-grouse population in the plan area. Therefore, additional species-specific plan components have been provided. The combination of ecosystem and species-specific plan components should provide the ecological conditions necessary to maintain a viable population of the bi-state greater sage-grouse population in the plan area.

General Key Ecological Conditions: Large and contiguous sagebrush stands mixed with areas of wet meadows, riparian, or irrigated agriculture fields.

Table 6 summarizes key threats, plan components, and expected effects on bi-state greater sage-grouse.

Information on Current Distribution of the Species in the Planning Unit

Bi-state greater sage-grouse occur on the Inyo National Forest within designated population management units (PMUs) which are areas delineated around the subpopulation of bi-State sage-grouse. Part or all of the following population management units are contained and designated within the Inyo National Forest as Bodie, South Mono, and White Mountains. While current population estimates for sage-grouse on the Inyo specifically are unknown, three leks are known to occur on Inyo National Forest. Telemetry work conducted from March to May of 2017

[9] The greater sage-grouse Bi-State distinct population segment (*Centrocercus urophasianus*) is currently a proposed threatened species under the Endangered Species Act but a final determination has not yet been made. With this status, it is not on the current SCC list. We retained the persistence analysis here in case the species is not listed and is put back on the SCC list.

identified a total of 42 nests across the Bodie Hills, Long Valley, and Parker Meadows study areas which occur on or near the Inyo National Forest (See Figure 1 in USGS 2017).

The following general population trends have been observed on population management units that include the Inyo National Forest: Bodie population management unit, increasing since 1995; and Long Valley, stable to increasing. In 2016, a mark-recapture study of eight individuals was initiated to assess population trends for the White Mountain Population Management Unit. Recent work by Coates et al. (2014; 2018) concluded that sage-grouse populations within the bi-state area were stable from 2003 to 2015. One exception was the Parker Meadow population in the South Mono Population Management Unit; that subpopulation is at risk of extinction (Coates et al. 2014; Coates et al. 2018).

Table 6. Key[10] threats, plan components and expected effects on bi-state greater sage-grouse population

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Habitat loss: Pinyon-juniper expansion and conifer encroachment into sagebrush habitats, invasive species, and predation by ravens.	TERR-SAGE-DC 01-05 INV-FW-DC 01-02 INV-FW-OBJ 01-02	SPEC-SG-DC 01-09	Plan Components ensure the appropriate habitat components necessary for lekking, nesting, wintering and brood rearing are available and resilient to threats from invading tree and nonnative species and or fire and disturbance events, including climate change. Specific and measurable objective focus on elimination of high priority invasive plants. Species-specific desired conditions 05-06 minimize competition from nonnative plant species that outcompete native species and provide cover and protection from predators.
Habitat loss: Pinyon-juniper expansion and conifer encroachment into sagebrush habitats, invasive species.	TERR-SAGE-GOAL 01 (b-g) TERR-FW-OBJ 01-02 MA-RWLD-SUIT 07	SPEC-SG-STD 01-03 SPEC-SG-OBJ 01 SPEC-SG-GOAL 01-04 SPEC-FW-GDL 04	Ecosystem level plan components incorporate restoration measures that enhance sagebrush communities that have experienced large landscape scale disruptions in composition, structure and function from invading conifers and juniper. Species specific standards and guidelines ensure habitat restoration projects will limit expansion of invasive species like cheatgrass, as well as undesirable pine species while promoting the native plant community, ecologic and hydrologic integrity and improving breeding, brood rearing and wintering habitat. A specific and measurable objective ensures movement toward the desired conditions for sage grouse priority habitat within 10 years of plan approval and species specific goals ensure collaborative conservation approaches for sage-grouse are consistent with the Bi-State Action Plan. A forestwide guideline includes direction to incorporate approved conservation strategy direction as appropriate during site specific projects.
Nest failure and viability; predation (e.g. ravens), weather. Tall structures,	LAND-FW-GDL 02	SPEC-SG-DC 01-04 SPEC-SG-STD 02, 06-07, 10-11 SPEC-SG-GDL 03 SPEC-FW-GDL 01	Species specific desired conditions promote well distributed habitat for breeding, brood rearing, wintering, and dispersal and ensure high quality cover meets species needs for concealment and nutrition.

[10] Key threats in the table are not distinguished by high, medium, and low threat severity. Additional context on threat severity informed by the Bi-State Action Plan is provided in the narrative below.

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
		INV-FW-STD 03	Standards provides mitigation measures to minimize nest losses, predation, and disturbance to breeding sites during project implementation and ensure tall structures are absent near suitable lek habitat Standards also establish limited operated periods during the sage-grouse breeding and nesting season to minimize disturbance and nest failure. Species specific guidelines ensure nest trees that provide cover and protection from predators are protected during project implementation and that power lines do not provide perching sites for avian predators.
Habitat loss: wintering habitat		SPEC-SG-DC 01,04 SPEC-SG-STD 02	Species specific desired condition ensures suitable sage-grouse habitat includes wintering habitats dominated by sagebrush shrubland and sagebrush steppe, with associated mesic habitats. Adequate sagebrush provides nutritional needs through winter. A standard ensures that restoration projects improve suitability of breeding, brood rearing, or wintering habitat.
Habitat loss: Wildfire	FIRE-FW-DC 01 MA-RCA-GDL 04 TERR-SAGE-DC 02, 04 MA-RWLD-SUIT 07	SPEC-SG-DC 06-07 SPEC-SG-STD 15	Ecosystem plan level components minimize habitat loss and promote native vegetation restoration where fire is a threat to meadow riparian and sagebrush habitat. In recommended wilderness, non-conforming projects or activities may be suitable if they are for purposes of ecological restoration for at-risk species habitat. Species specific desired conditions for sage grouse minimize habitat loss from uncharacteristic fire and a standard ensure sagebrush stands will be identified ad protected when possible during wildfires.
Habitat loss: Grazing (Wild horses and Livestock)	TERR-SAGE-DC 02 RANG-FW-DC 01-03 RANG-FW-STD 03-05 RANG-FW-GDL 01 RANG-FW-GOAL 03 MA-RCA-GDL 03 DA-WHT-GOAL 01	SPEC-SG-STD-08,11,12, 13 SPEC-SG-DC 09	Plan Components minimize loss of forage, cover and habitat for lekking and nesting and ensure meadow habitat in active livestock allotments is compatible with sage-grouse habitat needs and trending toward desired conditions. Livestock facilities are prohibited in meadow and riparian areas and a forestwide goal for range emphasizes that impacts to animals will be considered when designing rangeland improvements including structures. Species specific standards establish key meadow or upland areas for sage-grouse in active allotments and ensure fencing is not a barrier to movement near known leks and that permitted watering

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
			facilities are managed in a way to prevent drowning of animals and mitigate disease spread. Supplemental feeding stations, watering and handling facilities do not occur on sage grouse-leks. Desired conditions promote fully functional meadows in allotments that overlap with sage-grouse habitat and standards A goal for designated areas supports collaborative work with other agencies and partners to manage wild horse herds or in the development of wild horse management plans.
Habitat loss: riparian/meadow habitat and hydrologic function.	RCA-MEAD-DC 01-07 RCA-MEAD-OBJ 01 RCA-RIV-DC 03-04 RCA-SPR-DC 01-03 MA-RCA-DC 01 02 MA-RCA-STD 09-11,15 MA-RCA-GDL 01, 03-04 WTR-FW-DC 04	SPEC-SG-DC 09	Ecosystem level plan components for meadows, rivers and streams and riparian conservation areas promote ecosystems that are resilient to disturbance and hydrologically functional. Meadows contain a diversity of grasses and forbs with complex habitat for native plant and animal communities. A desired condition for watersheds ensures nutritive forage is available for grazing and that healthy populations are sustained in upland and riparian communities. Standards constrain livestock grazing activities that impair riparian conservation areas, meadows, and fens and guidelines minimize disruption of hydrologic connectivity of streams, meadows, and wetlands. An objective promotes enhanced meadow conditions. Species specific desired conditions promote healthy riparian and meadow areas necessary for late season brood rearing, promotes hydrologic/ecological integrity and species composition needed for brood rearing habitat.
General population loss/collapse and habitat loss for at-risk species	N/A	SPEC-FW-DC 01-03 SPEC-SG-OBJ 01	Species specific plan components ensure that management activities promote ecological conditions that support the habitat components necessary to sustain healthy, functioning population levels within the inherent capability of the landscape. An objective specifies that within 10 years of the plan approval, up to 14,900 acres of sage-grouse habitat, within and between population management units, will be improved or restored to meet sage-grouse priority habitat desired conditions.

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Habitat loss: loss of connectivity and disturbance from forest management activities.	TERR-SAGE-DC-04 INFR-FW-DC 03 DA-IRA-SUIT 02	SPEC-SG-GDL 01-05 SPEC-SG-STD 04-15 SPEC-FW-GDL 01-05 SPEC-FW-STD 1 NRG-FW-STD 01	Ecosystem level plan components ensure sage brush system are resilient to fire and invasive species and that fire burns within in its natural range to limit encroaching conifers. Habitat provides connectivity for sage-brush dependent species. Species specific plan components help to ensure that site specific projects incorporate mitigation measures and conservation strategies during project implementation to enhance restoration, and reduce project related disturbance and habitat fragmentation that can negatively affect dispersal, breeding and foraging.. Forestwide plan components for infrastructure, inventoried roadless areas, and energy development ensure healthy wildlife movement and mitigate direct mortality through collisions

Key Ecological Conditions in Plan Area

Greater sage-grouse in California are dependent on sagebrush habitats that include a diversity of sagebrush mixed with native forbs and grasses (Schroeder et al. 1999, Hall et al. 2008). Lekking, nesting, molting, and wintering all require different configurations of sagebrush habitat, which increases the species vulnerability (Hall et al. 2008). On the Inyo National Forest, the ecological conditions for greater sage grouse occur in the sagebrush shrub assessment type, which occupies approximately 300,000 acres on the Inyo National Forest. This acreage does not include those areas currently occupied by pinyon-juniper that could potentially be a sagebrush shrub type. The sagebrush shrub assessment type includes all subspecies of big sagebrush (*Artemisia tridentata*), as well as the other woody sagebrush species found on the national forest, and shrub communities where sagebrush is dominant but other species co-occur (such as low sagebrush, sagebrush-bitterbrush, black sagebrush, and silver sagebrush). Sagebrush shrub communities occur from the floor of the Owens Valley on Los Angeles Department of Water Power lands, in disjointed bands all the way up to and including subalpine areas in the Sierra Nevada, and the White, Inyo, and Glass Mountains. Research natural areas that include the sagebrush shrub assessment type include White Mountain, McAfee Meadow, and Indiana Summit, with some small areas of the sagebrush shrub vegetation type within the Whippoorwill Flat and Sentinel Meadow Research Natural Areas. Approximately 30 percent (89,894 acres) of the sagebrush assessment type on the Inyo National Forest is located within designated wilderness. The Inyo National Forest manages approximately 213,670 acres (20 percent) of a total of 1,075,730 acres of priority habitat for the sage-grouse. Primary management units include Bodie, South Mono and White Mountains.

Key Threats to Persistence

High

Because sage-grouse are sagebrush obligates, they are threatened by actions and processes that reduce the extent and integrity of this habitat (Hall et al. 2008; Bi-State Technical Advisory Committee Nevada and California 2012; USFWS 2013) and warrant area specific habitat guidelines (Stringham and Snyder 2017). Western juniper expansion is a major threat to sage-grouse occupation in northeastern California and to a lesser extent in Mono and Inyo Counties. Encroaching juniper displaces sagebrush and other shrubs (Crawford et al. 2004). Juniper also provides additional perches for aerial predators and cover for terrestrial predators. Predation by ravens has the potential to negatively affect sage-grouse and there are some areas documented on the Inyo that have low understory and shrub cover, which could leave nests exposed. However, these areas are within the natural range of variation for the Inyo National Forest. Sage-grouse avoid areas with abundant juniper (SGCT 2004, Hall et al. 2008). Jeffery pine and pinyon/juniper expansion is occurring in the sagebrush shrub assessment type on the Inyo National Forest, possibly the result of fire suppression, livestock grazing and changing climate. Pinyon-juniper expansion has been observed throughout the bi-state area (Bi-State Action Plan 2012) and an estimated 25,261 acres of sagebrush shrublands are undergoing active encroachment by pinyon and juniper trees on the Inyo National Forest, as determined from aerial photography interpretation.

Both prescribed fires and wildfires have the capacity to degrade sage-grouse habitat significantly. Sagebrush is typically slow to reestablish following fire, has poor seed dispersal, and has little ability to naturally reestablish in sites dominated by annual grassland (Shaw et al. 2005; Beck et al. 2009). Fire also facilitates the invasion of cheatgrass, which commonly occupies sites following disturbance, especially burning (Connelly et al. 2000). Frequent (less than 20- to 30-year interval) or late-summer burning favors cheatgrass invasion and may be a major cause of cheatgrass expansion in sagebrush habitats. The Inyo has experienced recent wildfires within sagebrush ecosystems that have led to some cheatgrass expansion. However, these wildfires have not led to complete type conversions or reduced the suitability of these areas for sage-grouse.

Medium to Low

Anthropogenic activity can result in reduced availability and suitability of sage-grouse habitat, usually by fragmenting or removing sagebrush cover, increasing opportunities for predation, or increasing noise disturbance (Holloran 2005; Lammers and Collopy 2007; Bi-State Technical Advisory Committee Nevada and California. 2012; USFWS 2013; Dwyer and Doloughan 2014). Energy development (wind/solar), mining, and livestock range improvements occur to varying degrees on the Inyo National Forest, however, habitat loss from pinyon juniper expansion/conifer encroachment, wildfire and cheatgrass invasion are the most immediate threats.

Development is currently limited on the forest, with most development occurring on private lands adjacent to the forest. Areas where development may impact sage-grouse use or movements include the Chiatovich Creek area on the eastside of the White Mountains in Nevada. Proposals for development of wind, solar and geothermal energy can be expected to increase in the coming years, potentially resulting in additional impacts to sagebrush ecosystems in the future with potential impacts to the sagebrush shrub and Jeffrey pine assessment types. The risk is primarily from an increase of associated infrastructure (e.g., roads, fences and transmission lines). Transmission lines and utility poles may increase predation risk (Lammers and Collopy 2007; Dwyer and Doloughan 2014). In addition to reducing and degrading habitat condition, developments can impact sage-grouse use and movement in habitats, especially winter range use where new roads and private land housing development can fragment habitat.

Although livestock grazing is not identified as a high threat in the Bi-State Action Plan (2012) for any PMU that occurs on the Inyo (i.e. Bodie, White Mountains, South Mono) it can cause disturbance and trampling of nest sites (Reisner et al. 2013) There are 49 cattle and horse and sheep and goat allotments identified on the Inyo National Forest. Of these, 30 occur within priority sage-grouse habitat, with 20 of those being active. Reissuance of grazing permits since 2009 includes design features to reduce impacts to sage-grouse. Related, infrastructure (fences and posts) has been identified as an additional threat to greater sage-grouse because it may increase predation risk (USDI Fish and Wildlife Service 2015; Hall et al. 2008). Prolonged grazing by wild horses can cause plant community changes that can have negative impacts on sage-grouse and other sagebrush-obligate wildlife with effects ranging from limited sagebrush recruitment, reduction in sagebrush density, reduce grass abundance and cover, lower plant species diversity, increase dominance of forbs unpalatable to sage-grouse, and compact surface soil horizons (USDA Forest Service and USDI Fish and Wildlife Service 2015). However, very little of the White Mountain Wild Horse Territory is currently occupied. Horses occupy the north and east foothills of the White Mountain Range along the edge of Fish Lake Valley year around with most impacts occurring on public and private lands outside of these territories and off the national forest.

Threats Under Forest Service Control

Land management can be summarized into the following key threats:

- Habitat loss (meadows) and fragmentation resulting from encroachment of juniper and nonnative invasive weeds such as cheatgrass.
- Habitat loss resulting from wildfire and interrelated effects of cheatgrass invasion (i.e. disruption of natural fire regime).
- Livestock grazing
- Infrastructure which can result in additional habitat fragmentation and or increases in predation by providing suitable perches for predators.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section (specifically TERR-FW-DC 5-6; MA-CW-DC 01, 03) threats are primarily addressed through plan components under the following sections of the forest plan and are

described in table 6 above. However, the primary threat resulting from loss of high quality habitat for nesting, brood rearing and wintering resulting from pinyon juniper invasions and wildfire, is more adequately addressed at the species level.

- Terrestrial Ecosystems and Vegetation (Sagebrush)
- Invasive Species
- Watersheds
- Riparian Conservation Areas (Meadows, Rivers, Streams And Springs)
- Management Areas (Riparian Conservation Areas)
- Rangeland and Livestock Grazing
- Fire
- Lands
- Minerals And Geology
- Energy
- Recommended Wilderness

While ecosystem plan components for the assessment types and program areas include direction (table 6, above) that would address many threats to sage-grouse habitat in some cases, species-specific plan components were added to more specifically address threats relative to the loss of high-quality habitat for nesting, brood rearing and wintering. Desired conditions for sage-grouse (SPEC-SG-DC 01-09) provide high-quality ecological conditions needed for all critical life stage needs. These plan components would minimize overstory trees, limit unwanted fire and cheatgrass (which out-competes native grasses with higher dietary value and alters natural fire regimes), provide nesting cover and optimize brood rearing and wintering habitat conditions in population management units. An objective (SPEC-SG-OBJ 01) to moving towards these desired conditions specifies within 10 years of the plan approval, up to 14,900 acres of sage-grouse habitat, within and between population management units, will be improved or restored to meet sage-grouse priority habitat desired conditions. Standards (SPEC-SG-STD 01-15) place constraints on operating periods specifically within sage grouse habitat during breeding and nesting season, ensure additional structures will not occur near lekking habitat, ensure fences will not provide barriers to movement, and livestock facilities are avoided near sage-grouse leks.

For livestock, this includes no new salting and supplemental feeding locations and water facilities, and that permitted watering facilities are managed to prevent drowning and mitigate the spread of disease. Further, a forestwide goal for range (RANG-FW-GOAL 03) emphasizes that impacts to animals will be considered when designing rangeland improvements including structures. A goal for designated areas for wild horse and burro territories (DA-WHT-GOAL-01) supports collaborative work with other agencies and partners to manage wild horses.

Several standards and guidelines (SPEC-FW-STD 01; SPEC-SG-GDL 01-03, 05; LAND-FW-GDL 02, GEO-FW-STD 01, 04; NRG-FW-STD 01; INFR-FW-DC 03, MA-RWLD-SUIT 03) specifically address the threat of habitat loss and fragmentation resulting from energy and related infrastructure development. These plan components promote practices that minimize additional rights of way, prevent additional energy development in recommended wilderness, and bury utility lines and limit geothermal tower development to reduce impacts to habitat and habitat connectivity. Although the threat to sage-grouse from predation facilitated by fences, powerlines, and roads is thought to be relatively low and localized at this time compared to other threats (USFWS 2012-Bi-state plan) the plan includes several desired

conditions, standards and guidelines (SPEC-SG-STD 10-11;SPEC-SG-GDL 01-03;SPEC-FW-STD 01;NRG-FW-STD 01; INFR-FW-DC 03;DA-IRA-SUIT 02) to address this issue. Similarly, while the use of herbicides may be proposed in some areas to restore sagebrush, they have not been identified as a high viability risk for sage-grouse on the Inyo National Forest. Regardless, the revised plan includes several plan components that would guide herbicide use in sage-grouse habitats. These include desired conditions that emphasize sagebrush and perennial grasses for nesting, brood-rearing, and wintering habitat and limiting nonnative annual grasses (SPEC-SG-DC-01-04, 06, 08). In addition, a standard (INV-FW-STD 03) emphasizing integrated pest management for all projects and activities and several species specific guidelines (SPEC-SG-STD 06-07) that establish limited operating periods during the sage-grouse breeding and nesting seasons. This includes treatments for invasive species and herbicide spraying. In addition, the forestwide invasive plant treatment direction will provide more specific direction for specific herbicides and ecosystems. Collectively these plan components, with project-specific direction adhering to plan components, should mitigate any unintended consequences that might arise from herbicide use in sage-grouse habitat.

Finally, a number of forestwide plan components emphasize consistency with other conservation plans and strategies that should benefit sage-grouse on the Inyo National Forest. These include a broad forestwide guideline for all at-risk species (SPEC-FW-GDL 04) but also species specific goals (SPEC-SG-GOAL 01-04) for sage-grouse that promote partnership coordination and collaboration to support a number of sage-grouse specific conservation measures as recommended by the U.S. Fish and Wildlife Service. This would include relevant guidance outlined in the Bi-State Action Plan (Bi-State Plan 2012), among others. The forest would continue to work with researchers, scientists, and partners to collect quantitative data on sage-grouse habitats which would better inform desired conditions and restoration actions in sage-grouse primary management units, including wintering habitat. Ecological conditions for sage-grouse wintering habitat are addressed through species-specific desired conditions (SPEC-SG-DC 01, 04) and a standard (SPEC-SG-STD-02) that emphasizes restoration activities includes measures to improve wintering habitat, as well as brood and nesting habitat.

The above plan components collectively work to move sage-grouse habitat toward desired conditions that should provide more optimal breeding, nesting, dispersal and wintering habitat in the future by minimizing predation, disturbance, and fragmentation from forest management activities as well as habitat loss resulting from encroachment, altered fire regime, and cheatgrass invasion.

Threats Not Under Forest Service Control

Human development, bouldering/recreation on adjacent BLM lands, nest predation from utilities infrastructure on adjacent lands, changes in timing and flow of water and water availability, and livestock grazing that occurs off-forest.

Summary

The bi-state greater sage-grouse is a sagebrush obligate with highly specific habitat needs. Juniper expansion, fire, and invasive species are primary threats to habitat integrity and long-term persistence of this species in the plan area. The forest plan includes plan components that collectively work to move sage-grouse habitat toward desired conditions that should provide more optimal breeding, nesting, dispersal and wintering habitat in the future by minimizing predation, disturbance, and fragmentation from forest management activities as well as habitat loss resulting from conifer encroachment, altered fire regime and cheatgrass invasion. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of Bi-State greater-sage grouse within the plan area.

California Spotted Owl

Determination: It is not within the inherent capability of the plan area to maintain or restore the ecological conditions to maintain a viable population of the California Spotted Owl in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Forests containing old growth characteristics (dense vegetation and canopy cover, snags, cavities, larger trees and large down woody debris) in coniferous and mixed pine-oak forests. On the Inyo National Forest, these ecological conditions can be found in the mixed conifer and upper montane forest ecological zone which consists of red fir, and Jeffrey and lodgepole pine. Table 7 summarizes key threats, plan components, and expected effects on California spotted owl.

Information on Current Distribution of the Species in the Planning Unit

There are currently no records in ebird, CNDDB, or BISON for California spotted owl (CSO) on the Inyo National Forest. However, forest level surveys have detected owls on the west side bordering the Sequoia National Forest, in wilderness and at the farthest south end of Inyo National Forest. In the past, this area of the Inyo National Forest was managed by the Sequoia National Forest, hence it was considered that there were no spotted owls on the Inyo National Forest. According to the CDFW spotted owl database there are 19 data points for CSO on the Inyo National Forest with 6 positive detections all occurring in the area just northwest of Monache Mountain from 1988-1991. A pair was observed in the area on 2 occasions during that same time frame. At the north end of the Inyo National Forest, there are also two positive detections in the Boundary Creek and Red Meadows area from 1981-1982. Individual owls may persist on the Inyo National Forest, but is unknown if the forest contains a viable population of California spotted owl.

Table 7. Key threats, plan components, and expected effects on California spotted owl[11]

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Loss of quality habitat for nesting, roosting and foraging and loss of connectivity/movement corridors due to management activities such as fuels reduction treatments and timber harvest.	WTR-FW-STD 02 TERR-FW-STD 01 TERR-FW-GDL 01-02 TERR-OLD-GDL 01-02 SPEC-FW-GDL 01, 04 FIRE-FW-STD 02 FIRE-FW-GDL 01-02 TIMB-FW-DC 01-03 TIMB-FW-GDL 02-03	SPEC-CSO-DC 01-02 SPEC-CSO-STD 01-06 SPEC-CSO-GDL 01 SPEC-CSO-SUIT SPEC-FW-DC 01-02 SPEC-FW-GDL 01 SPEC-FW-STD 01	Ecosystem level plan standards and guidelines provide direction for maintaining habitat in areas where management activities take place. Standards and guidelines ensure key old growth components including large trees, snags and structural heterogeneity are maintained during vegetation management activities in old growth forest, roost/nest trees are protected and maintained, and direction from existing habitat conservation strategies is used where applicable. Desired conditions and guidelines for fire and timber management promote ecological restoration practices that will improve forest resilience and maintain spotted owl habitat. Species specific desired conditions, standards and guidelines ensure home range core areas, protected activity centers nest site conditions are provided for during vegetation and fuels treatments and that protected activity centers are not suitable for timber production. . Land management activities support conditions for survival and reproduction of at risk species. Species specific **standards** ensure that in home range core areas strategically placed fuels treatments are designed to avoid high quality habitat and mechanical thinning treatments designed to treat fuels and/or control stand densities in mature forest habitat retain sufficient canopy cover. In protected activity centers fuels and vegetation treatments are limited and avoided near nest stands and are designed to maximize ecological conditions that provide for persistence. Species specific **guidelines** include timing restrictions to mitigate disturbance that might cause breeding failure or nest loss. A forestwide species-specific guideline further reinforces the retention of known nest and roost trees used by species of conservation concern or raptors

[11] Species specific plan components for California spotted owl (SPEC-CSO) reflect Alternative A, the no action alternative (existing forest plan for the Inyo National Forest)

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Loss of quality habitat for nesting, roosting and foraging due to other stochastic events such as wildfire and climate change which can result in a reduction of snowpack and mature forest conditions.	WTR-FW-DC 01-02 TERR-FW-DC 01-06,08-09 TERR-MONT-DC 01-02 TERR-OLD-DC 01-07 TERR-ALPN-DC 01-03 & 05 TERR-DMC-DC 01-06 TERR-JEFF-DC 01-07 TERR-RFIR-DC 01-07 TERR-LDGP-DC 01-10 TERR-FW-OBJ 01-02 FIRE-FW-DC 01 DA-WILD-DC 02-03 TERR-FW-OBJ 01-02	SPEC-CSO-DC 01-02 SPEC-CSO-STD 01 SPEC-FW-DC 01-02 SPEC-FW-GDL 04 TERR-FW-DC 05-06	Ecosystem level plan components ensure species will have adequate habitat for movement, dispersal, feeding, and reproduction that may otherwise be lost due to climate change and other stochastic events and that wildfires are allowed to burn within the natural range of variability and contribute to ecosystem function. Desired conditions emphasize resilience in spotted owl habitat and promote old forest habitat components such as larger trees, snags and coarse woody debris and structures for nesting such as witches' brooms. Species specific **desired conditions** ensure protected activity centers provide high quality habitat essential for nesting and roosting and contribute to successful reproduction. Ecological conditions include high canopy cover with multiple tree layers, many large trees and snags, dense canopy cover; and high levels of snag and down woody material. Home range core areas consist of large habitat blocks that have multiple tree canopy layers, large to very large, old trees, dense canopy cover and higher than average levels of snags and down woody material. A **standard** ensures that within home range core areas, strategically placed fuels treatments are used to modify fire behavior and that treatments promote forest health. Collectively these plan components provide the ecological conditions necessary to support viability and that are resilient to uncharacteristic stand replacing fire events related to climate change, drought and other stressors.
Loss of pine-oak component: large trees over 12 inches in diameter, snags, logs	TERR-OAK-DC 01 TERR-OAK-ST-01	N/A	Ecosystem level desired conditions ensure oak trees, snags, and down logs provide habitat for spotted owls, and that snags and cavities provide shelter, and resting and nesting habitat. A standard ensures that large oaks greater than 12 inches in diameter will be retained during fuel treatment activities.

Key Ecological Conditions in Plan Area

Forests containing old growth characteristics (dense vegetation and canopy cover, snags, cavities, larger trees and large down woody debris) in coniferous and mixed pine-oak forests are critical to California spotted owl. On the Inyo National Forest, these ecological conditions can be found in the mixed conifer and upper montane forest ecological zones that consist of red fir, Jeffrey pine, and lodgepole pine. The mixed conifer assessment type is most prevalent on the Kern Plateau and includes various combinations of white fir, red fir, and one or more pine species, typically with a very sparse understory. The majority of the mixed conifer assessment type (which does not necessarily include all mixed conifer stands) in the core timber management area was included in the Owens River Headwaters Wilderness, designated in 2009. With the exception of Monache Meadow on the Kern Plateau, approximately three-fourths of the mixed conifer assessment type is within wilderness. The majority of the red fir type is located on the Kern Plateau and Reds Meadow Valley areas where a large proportion (80 percent) of the red fir forest type across the southern Sierra is within designated wilderness. The Inyo National Forest has 383,336 acres of subalpine conifer forest (19-20 percent of the national forest), 118,039 acres of red fir (6 percent) and 45,671 acres of mixed conifer (2 percent) for potential use by the owl. However, not all of this habitat may contain the specific ecological conditions needed for nesting and roosting.

Key Threats to Persistence

Loss of prey and nesting habitat that includes features such as logs, snags and adequate understory have been risk factors. Habitat loss, degradation, or loss of connectivity from high severity fire and management activities such as timber harvest; expansion of barred owls and climate change are additional factors.

Threats Under Forest Service Control

Land management includes the following key threats:

- Habitat loss (especially loss of nesting, resting and foraging habitat, large old trees and dense canopy cover) and disturbance from activities such as vegetation management, timber removal, wildfire, and fuels treatment.
- Connectivity and habitat fragmentation, loss of movement corridors and loss of genetic diversity due to isolation.
- Habitat loss resulting from climate change and interrelated effects of natural disturbances such as wildfire.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 7 above. The primary threat from loss of nesting and roosting habitat is addressed at the species level.

- Terrestrial Ecosystems and Vegetation (Old Growth, Mixed Conifer, Lodgepole Pine, Mixed Conifer, Oak, and Jeffrey Pine)
- Watersheds
- Timber
- Fire
- Alpine And Montane Zones

Most of the threats for California spotted owl can be addressed through plan components that emphasize resilient, connected forests characterized by complex structural attributes such as closed canopy, large old trees, snags and coarse woody debris, which owls need for movement, foraging and reproduction. Timber harvest gas been cited as primary threat for spotted owl persistence (Gutierrez et al. 2016); however, most of the area managed for timber on the Inyo National Forest do not currently overlap with the mixed conifer ecosystem type preferred by spotted owls, much of which occurs in wilderness (as noted under ecological conditions above). Several ecosystem-level plan components address this potential threat by promoting restoration based processes that ensure wildlife habitat is considered during project design, connectivity for wildlife is restored, and the removal of key habitat features such as snags, is minimized (TIMB-FW-DC 01-03;TIMB-FW-GDL 02-03). The greater threat to California spotted owl on the Inyo National Forest is habitat loss and fragmentation resulting from high-severity fire. High-severity fires that result in the loss of dense mature forest, large snags and downed logs effectively remove preferred nesting and roosting habitat and can take centuries to regrow. Desired conditions for Fire and Terrestrial Ecosystems (FIRE-DC-01, TERR-FW-DC 02) promote wildfire that functions within its natural range and contributes ecosystem integrity and fire adapted systems that are resilient to climate change and other stressors. Two forestwide objectives (TERR-FW-OBJ 01-02) emphasize the restoration of species composition and structure and low- to moderate-severity fire. Standards and guidelines for fire that should benefit the owl (FIRE-FW-STD 02, FIRE-FW-GDL 01-02) minimize disturbance during fire suppression in wilderness, promote the use of managed wildfire to meet resource objectives and limit high-severity fire effects in old forest habitat.

In addition to the ecosystem-level components mentioned above, several species-specific plan components were retained from the existing plan (Alternative A) with slight modifications, to specifically provide ecological conditions like nesting and roosting habitat that support spotted owl habitat needs. Loss of old growth habitat and key structural attributes such as dense canopy and large trees for nesting and roosting are key threats and desired conditions specifically added for California spotted owl (SPEC-CSO-DC 01) ensure these key structural attributes include multiple canopy layers and an abundance or large trees, snags, and down woody material that provide for and contribute to successful reproduction. Standards and guidelines (SPEC-CSO-DC 01-02; SPEC-CSO-STD 01-06; SPEC-CSO-GDL 01yeah) place constraints on operating periods and activities that might disturb nesting owls in protected activity centers during the breeding season. Management activities focus on surface and ladder fuel removal; mechanical removal of larger trees is limited. Overstory trees and trees greater than 24 inches in diameter are generally retained during forest management activities. Protected activity centers are not suitable for timber production (SPEC-CSO-SUIT).

Other species-level guidance that provides additional emphasis on retention of key nest trees and encourages the use of approved conservation strategies in project design includes SPEC-FW-STD 01 and SPEC-FW-GDL 01, 04.

The ecosystem-level and species-specific plan components are designed to move existing habitat conditions for California spotted owl toward a more ecologically resilient state than what currently exists. However, ultimate long term persistence and viability of this species will depend on management actions (or inactions) on adjacent landscapes. Two goals (SPEC-FW-GOAL 01, 03-04) encourage cooperative protection and restoration of habitat across ownerships boundaries which should benefit the owl throughout its range.

Threats Not Under Forest Service Control

- Habitat competition and hybridization with barred owls
- Climate change

Barred owls are an increasing risk factor for California spotted owls in the Sierra Nevada. Barred owls can hybridize and also outcompete spotted owls. Barred owls were first recorded within the range of the California spotted owl in 1989 on the Tahoe National Forest. Two sparred owls (hybrids of spotted and barred owls) were reported in the Eldorado National Forest during 2003 to 2004 (Seamans et al. 2004). Barred owls were first recorded in the southern Sierra Nevada in 2004 (Steger et al. 2006). Ongoing research has documented 73 records of barred or sparred owls in the Sierra Nevada to date, with the majority of records from the northern Sierra Nevada (Tahoe, Plumas, and Lassen National Forests). Five new records of barred owls were documented in the Stanislaus and Sierra National Forests in 2012, indicating further range expansion of barred owls in the southern Sierra Nevada. In 2017, confirmed barred owls were on the Sequoia National Forest. Barred owl numbers are likely higher than documented in the Sierra Nevada, as there have been no systematic surveys for them to date.

Climate change further exacerbates drought conditions and insect outbreaks, which can lead to uncharacteristically large wildfire. While the Inyo National Forest cannot directly control climate change, ecosystem plan components as mentioned above provide conditions resilient to ecosystem stressors and the interrelated effects of climate change.

Summary

The best available science indicates declining population trends throughout the range of the California spotted owl, low fecundity, high juvenile mortality, and habitat specificity. These life history characteristics combined with relevant threats and stressors, including habitat loss resulting from high-severity fires and the expansion of barred owls, indicate substantial concern about the California spotted owls capability to persist over the long term in the plan area. Climate change and potential drought-related effects will likely continue to exert pressure on the key ecological conditions (as noted above) that this species depends upon. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of California spotted owl within its range. However, limited occurrence data for California spotted owl and the forest’s limited amount of mixed conifer forest (approximately 2 percent) suggest it is not within the inherent capability of the land to maintain or restore the ecological conditions to maintain a viable population of the California spotted owl in the plan area.

Great Gray Owl

Determination: It is not within the inherent capability of the plan area to maintain or restore the ecological conditions to maintain a viable population of the great gray owl in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Meadows and early seral-stage openings that support sufficient prey (such as pocket gophers and voles) which are adjacent to mature coniferous forests. Mature forests, typically more mesic than xeric, with supporting features such as large-diameter trees and snags (greater than or equal to 24 inches in diameter) to provide nesting sites. Dense canopy cover (greater than or equal to 65 percent). Habitat occurs between 3,500 feet and above.

Table 8 summarizes key threats, plan components, and expected effects on great gray owl.

Table 8. Key threats, plan components and expected effects on great gray owl

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Loss of habitat (mature conifer and meadow), along with loss of connectivity/movement corridors due to management activities such as fuels reduction treatments and timber harvest, along with recreational use.	WTR-FW-STD 02 RCA-MEAD-OBJ 01 MA-RCA-GDL 01 TERR-FW-STD 01 TERR-FW-GDL 01-02 TERR-OLD-GDL 01-02 MA-CBRA-DC 02 FIRE-FW-DC 01-02 FIRE-FW-STD 02 FIRE-FW-GDL 01-02 MA-RCA-GDL 04	SPEC-FW-DC 01-03 SPEC-FW-GDL 01,04 SPEC-FW-STD 01	Ecosystem level plan components ensure species will have adequate habitat for movement, dispersal, feeding, and reproduction and provide direction for maintaining key habitat elements such as large conifers in areas where management activities take place and ensure wildfires are allowed to burn within the natural range of variability and contribute to ecosystem function. Specific measureable objectives move meadow habitat toward desired conditions necessary to support adequate prey species. Management Area direction for backroad recreation promotes desired conditions that promote species diversity and movement corridors and large wild tracts of land in undeveloped landscapes. Species specific guidance provides additional emphasis on retention of key habitat features such as nest trees and encourages the use of approved conservation strategies in project design and emphasizes habitat that improves conditions for species of conservation concern.
Loss of quality habitat due to climate change or other stochastic events, which result in a reduction in snowpack and mature forest conditions.	WTR-FW-DC 04 TERR-FW-DC 01-06, 08-09 TERR-MONT-DC 01-02 TERR-OLD-DC 01-07 TERR-ALPN-DC 01-03,05 TERR-DMC-DC 01-06 TERR-JEFF-DC 01-07 TERR-RFIR-DC 01-07 TERR-LDGP-DC 01-10 MA-RCA-DC 01, 05,09 DA-WILD-DC 02-03 TERR-FW-OBJ 01-02	N/A	Ecosystem level plan components ensures species will have adequate habitat for movement, dispersal, feeding, and reproduction that may otherwise be lost due to climate change and other stochastic events. Desired conditions for terrestrial ecosystems support habitat that is complex and supports movement and connectivity for old growth specialists. Desired conditions emphasize resilience and promote old growth habitat components such as larger trees, snags and coarse woody debris and structures for nesting such as witches' brooms

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Loss of quality meadow and other open habitat due to conifer encroachment and or climate change which causes drying/moisture loss.	RCA-MEAD-DC 01-07 RCA-MEAD-OBJ 01	MA-RCA-DC 02	Ecosystem level plan components ensures owls will have adequate meadow and open habitat that supports sufficient prey species like gophers and voles. Conifer encroachment is minimized and specific, measurable objectives move meadow conditions toward desired conditions. Species specific plan components promote riparian conservation areas that contribute to species of conservation concern and support meadows which contain prey species and foraging habitat.
Loss of early seral habitat	TERR-CES-DC 01-03 TERR-CES-GDL 01-03, 05	N/A	Ecosystem level plan components support early seral habitat for prey species. Desired conditions ensure complex early seral habitats are distributed across the landscape and key habitat elements such as large diameter snags are available for resting habitat. Guidelines ensure restoration projects maintain ecosystem integrity, important wildlife habitat, and that large fires minimize harvest to provide areas of complex early seral habitat for species that need them.
Recreation/Vehicle strikes due to low perching behavior.	MA-CBRA-DC 02 DA-WILD-DC 05,08 INFR-FW-DC 03	N/A	Management Area direction for backroad recreation promotes desired conditions that promote species diversity and movement corridors and large wild tracts of land in undeveloped landscapes. Desired conditions ensure recreation will not cause adverse impacts to at-risk-species and desired conditions for infrastructure ensure roads allow for healthy wildlife movement and minimal collisions.

Information on Current Distribution of the Species in the Planning Unit

Great gray owls are thought to occur throughout the Sierra Nevada range though local distribution may be highly variable. There are no records in the NRIS database for great gray owl on the Inyo National Forest; however, there have been incidental sightings. In 2015, an injured bird was retrieved by hikers just north of Lake Mary in Mono County (e-bird data, accessed May 17, 2017). The adjacent Sequoia and Sierra National Forests have 28 and 330 records respectively, with several detections close to the Inyo National Forest boundary (see Figure 4 of Krueger (2016) for a mapped distribution of the great gray owl based on detections). It is important to note, that these areas represent the southeastern most edge of the species' year-round range (Zeiner et al. 1990, Bull and Duncan 1993, Gogol-Prokurat 2016) and only a small portion of the Inyo National Forest is likely to provide suitable habitat for the owl, which may be a factor in their limited distribution. Adult owls were last documented in Inyo and Mono counties by winter (1986) approximately 30 years ago. A review of Sierra-Nevada Avian monitoring Information Network data, a collaborative project between the Forest Service and Point Blue Bird Observatory yielded no recent observation information for great gray owls (Ballard et al. 2008). In eBird, the Inyo National Forest has 1 record of 1 individual great gray owl within the national forest boundary, and 3 records of 3 individuals from within 5 miles of the national forest boundary. The California Natural Diversity Database (CNDDB) has 1 within the national forest boundary, and 3 within a 5 mile buffer of the boundary. Individual owls may persist on the Inyo National Forest, but it is unknown if the Inyo National Forest contains a viable population of great gray owls.

Key Ecological Conditions in Plan Area

Meadows and early seral-stage habitats that support sufficient prey (such as pocket gophers and voles); pine and fir forests adjacent to meadows between 3,500 and 7,000 feet (Wu 2016). Two factors considered most important in determining habitat use by breeding great gray owls are availability of nest sites and availability of suitable adjacent foraging habitat such as meadows (Duncan and Hayward 1994). On the Inyo National Forest, these ecological conditions can be found in the mixed conifer and upper montane forest ecological zone which consists of red fir forest, Jeffrey pine forest, and lodgepole pine, intermixed with meadows that form a patchy mosaic across the landscape. On the Inyo National Forest, the majority of the red fir type is located on the Kern Plateau and Reds Meadow Valley areas (USDA 2013). It is worth noting that a large proportion (80 percent) of the red fir forest type across the southern Sierra is within designated wilderness.

Key Threats to Persistence

Small population size, and loss of meadow habitat and meadow drying related to climate change, conifer encroachment or management activities (such as livestock grazing) that can lead to loss of meadow habitat and cover for small mammalian prey species are all potential threats.

Threats include activities such as fuel reduction treatments that negatively affect or remove mature forest and or key structural elements such as large live and dead trees (greater than 24 inches diameter), logs, and coarse woody debris, and that cause losses in connectivity and movement. Key structural elements are important for roosting, nesting and hunting. Higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate and related increases in drought and insect outbreaks can also cause significant changes in forest structure, function and composition (Meyer 2013).

Additional threats include vehicle strikes, which are considered a significant source of direct mortality because of their use of low perched when hunting (Wu et al. 2016).

Threats Under Forest Service Control

Land management can be summarized into the following key threats:

- Habitat loss (especially loss of nesting/roost habitat (large old trees and dense canopy cover) and foraging habitat (open meadows) and disturbance from activities such as vegetation management (e.g. timber removal, fuels treatment) and recreation.
- Connectivity/habitat fragmentation, loss of movement corridors and loss of genetic diversity due to isolation.
- Habitat loss resulting from climate change and natural disturbance such as wildfire and insect out breaks

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 8 above.

- Terrestrial Ecosystems and Vegetation (Subalpine and Montane Zones, Complex Early Seral, Red Fir, Jeffrey Pine, Lodgepole Pine, and Mixed Conifer)
- Infrastructure
- Watersheds
- Wilderness
- Riparian Conservation Areas (Meadows)
- Management Areas (Challenging Backroad, Riparian Conservation)

Most of the threats for great gray owl can be addressed through ecosystem-level plan components that emphasize resilient, connected forests that contain the complex structural attributes and old growth components owls need for survival and reproduction. However, species-specific plan components have been added in a few instances for greater clarity and emphasis. Loss of nesting and roosting habitat (dense canopy and large trees) attributes for nesting is a key threat for great gray owl and several forestwide components should ensure these attributes are provide for and protected during management activities. Critically, a standard (SPEC-FW-STD 01) specifies that design features, mitigation, and project timing considerations are incorporated into projects that may affect occupied habitat for at-risk species. While two guidelines (SPEC-FW-GDL 01, 04) maintain protection for known roost or nest trees used by species of conservation concern or raptors and that approved conservation strategies will be incorporated into project design where appropriate. Desired conditions (SPEC-FW-DC 01-03) specify that habitats for at-risk species support self-sustaining populations within the inherent capabilities of the plan area and that the ecosystems they depend upon will be resilient to uncharacteristic fire, climate change, and other stressors.

Loss of quality meadow habitat due to drying effects from climate change, conifer encroachment and livestock use is another key threat to great gray owl because loss of meadow habitat decreases foraging opportunities. Decreases in grass complexity and structure decrease optimal habitat for the owl’s small mammalian prey base. A desired condition for riparian conservation areas (MA-RCA-DC 02) maintains ecological conditions that will support persistence of species of conservation concern habitat needs in those areas.

The ecosystem-level and species-specific plan components are designed to move existing habitat conditions for great gray owl toward a more ecologically resilient state than what currently exists. However, ultimate long term persistence and viability of this species will depend on management actions (or inactions) on adjacent landscapes. Two forestwide goals for all species (SPEC-FW-GOAL 01, 03-04) encourage cooperative protection and restoration of habitat across ownerships boundaries which should benefit the owl throughout its range. Additional goals encourage partnerships and collaboration to facilitate restoration in terrestrial ecosystems including for forest-dependent species (TERR-GOAL 01-02) and reduce fuel accumulations and promote and restore more fire-resilient systems (FIRE-FW-GOAL 01-05, 10). Threats Not Under Forest Service Control

- Small population size
- Climate change

The great gray owl population in California is at risk because it is very small (Hull et al. 2010). Small populations are more susceptible to inbreeding, population bottleneck, and founder effects. Retention of maladaptive genes or the loss of adaptive genes can lead to reduced genetic diversity (Shaffer 1981, Lande 1993) and small populations are less able to recover from losses due to environmental events such as large wildfires (Wu et al. 2016). Climate change further exacerbates drought conditions, insect outbreaks, meadow drying and wildfire. While the Inyo National Forest cannot directly control climate change, ecosystem plan components as mentioned above provide conditions resilient to ecosystem stressors and the interrelated effects of climate change.

Summary

The fragmented nature of upper montane forests on the Inyo National Forest, coupled with declining and or small population numbers of the great gray owl, and reductions in meadow habitat from climate change and conifer encroachment may put this species at risk. While the great gray owl is not currently known to breed on the Inyo National Forest, there have been incidental sightings on the national forest as well as detections close to the national forest boundary. Recreation, which is predicted to increase over time, also leads to concern for the species persistence. Species viability of great gray owl on the Inyo National Forest is currently uncertain. Proposed plan components are designed to move habitat conditions to a more desired ecological state than what currently exists. The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. The Inyo National Forest is at the very edge of the species' range and it may not be within the inherent capability of the land to provide for a viable population of great gray owl on the Inyo National Forest. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of great gray owl within its range. However, due to uncertainty about the species current viability, the limited amount of habitat on the Inyo National Forest, and potential future threats associated with climate change, it is not within the inherent capability of the land to maintain or restore the ecological conditions to maintain a viable population of great gray owl within the plan area.

Mount Pinos Sooty Grouse

Determination: It is not within the inherent capability of the plan area to maintain or restore the ecological conditions to maintain a viable population of the Mt. Pinos sooty grouse in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Relatively open coniferous and pine habitat with little understory cover. Woodlands and subalpine forests also provide habitat, large trees.

Table 9 summarizes key threats, plan components, and expected effects on Mt. Pinos sooty grouse.

Information on Current Distribution of the Species in the Planning Unit

The Mount Pinos sooty grouse has likely been extirpated from much of its historic range, which occurred from Kings Canyon south and west to the Mt. Pinos region of Kern and Ventura Counties (Bland 2013, Zeiner et al. 1990). It is now most abundant at the northern limits of its current range, which occur south of 37 degrees north latitude. On the Inyo National Forest, this includes areas south of the town of Independence, in suitable habitat found in Kearsarge Pass, Onion Valley, Mt. Whitney and Mt. Whitney Portal, Olancha Creek, and Haiwee Canyon (Bland 2013, J. Bland Pers. Comm. 2017).

The Inyo National Forest does not currently have information on abundance or population trend for this species on the national forest and viability of this species in the plan area is uncertain. However, incidental sooty grouse sightings are plentiful in eBird (2012) and information on Mount Pinos sooty grouse subspecies locations can be extrapolated from that data using geographical boundaries and phenotypic markers (J. Bland Pers. Comm. 2017). Extant populations south of Kings Canyon and north of Kern Gap (Tulare/Kern Co. line) are *howardi* which can be distinguished from the *sierrae* subspecies primarily by tail measurements and plumage characteristics. In the California portion of the Inyo National Forest, local game bird populations appear healthy but fluctuate drastically from year to year depending on moisture. In Mono County, California Department of Fish and Wildlife does not conduct upland game bird surveys, with the exception of some localized sooty grouse hoot surveys in the spring. These were last conducted in 2012 in the June-Lake area which occurs outside the known range of Mount Pinos sooty grouse. The results of that work are still being assessed, however, the *howardi* subspecies distinction was not made during those surveys (T. Taylor Pers. Comm.). Recent Breeding Bird Survey (BBS) data from the Inyo National Forest Assessment suggest sooty grouse populations were increasing to stable in California overall (BBS data 1966-2010) and stable at moderate levels in NV (1966-2010). There is no distinction made between Sooty grouse and the *howardi* subspecies for those data. However, Shuford and Gardali (2008) note moderate declines for *howardi* throughout its range.

Table 9. Key threats, plan components and expected effects on Mt. Pinos sooty grouse

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Loss of habitat, along with loss of connectivity/movement corridors due to management activities such as fuels reduction treatments and timber harvest, along with allowed hunting.	WTR-FW-STD 02 TERR-FW-STD 01 TERR-FW-GDL 01-02 TERR-OLD-GDL 01-02 DA-WILD-DC 05	SPEC-FW-DC 1-03 & 05 SPEC-FW-GDL 01, 04 SPEC-FW-STD 01	Ecosystem level plan components provide direction for maintaining key habitat elements such as large trees in areas where management activities take place. Species specific plan components for at risk species support intact ecosystems that contribute to sustainable populations. Hunting is in balance with species needs.
Loss of quality habitat due to climate change or other stochastic events, which result in a reduction in snowpack and changes in forest tree species composition.	WTR-FW-DC 01, 04 TERR-FW-DC 01-06, 08-09 TERR-MONT-DC 01-02 TERR-OLD-DC 01-07 TERR-ALPN-DC 01-03 & 05 TERR-DMC-DC 01-06 TERR-JEFF-DC 01-07 TERR-RFIR-DC 01-07 TERR-LDGP-DC 01--10 MA-RCA-DC 05 FIRE-FW-DC 01 FIRE-FW-STD 02 FIRE-FW-GDL 01-02 RCA-MEAD-DC 01-07 RCA-MEAD-OBJ 01 DA-WILD-DC 02-03	SPEC-FW-DC 01-02, 04	Ecosystem level plan components ensure species will have adequate habitat for movement, dispersal, feeding, and reproduction that may otherwise be lost due to climate change and other stochastic events such as uncharacteristic fire.
High endemism/restricted range, taxonomic uncertainty, hunting.	Not within Forest Service management authority.	N/A	

Key Ecological Conditions in Plan Area

Different vegetation types may be used depending on season (breeding/non-breeding). On the Inyo National Forest, high elevation (6000-10,000 feet) pine/fir forests with large trees can be found in the mixed conifer and subalpine assessment types on the Kern Plateau and adjacent areas (where they occur below 37 degrees north latitude). The mixed conifer assessment type includes various combinations of white fir, red fir, and/or one or more pine species, typically with a very sparse understory. The subalpine conifer forest assessment type includes whitebark pine, limber pine, foxtail pine, Great Basin bristlecone pine, lodgepole pine, western white pine, and mountain hemlock. Subalpine forest can have long winter snowpacks and relatively high canopy cover, as well as woodlands, with more open stands and relatively low canopy cover. With the exception of Monache Meadow on the Kern Plateau, approximately three-fourths of the mixed conifer assessment type is within wilderness.

Key Threats to Persistence

Sooty grouse are associated with upper elevation fir forests that may be affected by habitat loss from vegetation management and climate change. In early spring, sooty grouse congregate in open mature stands of conifers near the crests of ridges. These “hooting sites,” or “spring activity centers” are traditional, and are returned to year after year, generation after generation. Loss of large trees from these areas are detrimental to grouse. In late spring and summer through fall, females and their young are associated with meadows and other mesic areas. In winter, sooty grouse seek dense conifer stands at high elevations where they subsist almost entirely on fir needles. Anticipated trends in the mixed conifer forest assessment type include higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate. Subalpine conifer forests are highly vulnerable to climate change and are at risk of substantial future loss (average 85 percent) by the end of the century.

Threats Under Forest Service Control

Land management can be summarized into the following key threats:

- habitat loss (especially loss of subalpine habitat) resulting from wildfire and interrelated effects of climate change
- livestock grazing
- loss of large trees

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, (SPEC-FW-DC 01-03) specify that habitats for at-risk species support self-sustaining populations within the inherent capabilities of the plan area and that the ecosystems they depend upon will be resilient to uncharacteristic fire, climate change, and other stressors, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 9 above.

- terrestrial ecosystems and vegetation (old growth, subalpine, alpine and montane zones, dry mixed conifer, jeffrey fir, lodgepole pine, red fir, meadows.)
- rangeland and livestock grazing
- fire
- watersheds
- riparian conservation areas (meadows)

A primary threat to Mount Pinos sooty grouse is loss of subalpine habitat from climate change, which further exacerbates drought conditions, insect outbreaks, meadow drying and loss, and wildfire. While the Inyo National Forest cannot directly control climate change, ecosystem plan components as mentioned above provide conditions, which should be more resilient to ecosystem stressors and the interrelated effects of climate change. Desired conditions for the subalpine and alpine zone (TERR-APLN-DC 01-03) stress open woodlands with scattered trees to small, dense groves, infrequent small fires, and subalpine woodlands that are resilient to insects, diseases, fire, wind, and climate change. These components provide the key ecological conditions for persistence. A standard (TERR-FW-STD) for all terrestrial ecosystems further ensures large-diameter tress (greater than 30 inches in diameter) will generally be retained during management activities. A forestwide desired condition for hunting (SPEC-FW-DC 05) provides direction for high-quality hunting and fishing opportunities in locations that do not pose substantial risk to native species. However, ultimately sooty grouse hunting is authorized by California Department of Fish and Wildlife and Nevada Department of Wildlife (see information about hunting below).

Threats Not Under Forest Service Control

- small population size/restricted distribution
- taxonomic uncertainty
- hunting

The Mt. Pinos sooty grouse is a highly endemic (possibly relict) species with a restricted distribution in California. The species is at risk because it is very small and susceptible to inbreeding, population bottleneck, and reduced genetic diversity. In addition, there is currently a taxonomic debate about the proper classification for the *howardi* subspecies. Ongoing genetic research suggests all remaining populations recognized as *howardi* possess the same mitochondrial haplotypes as *sierrae* populations further north, and that the now extinct populations south of Kern Gap were once a unique species. This work has not yet been published and resolving any taxonomic uncertainty is critical for future conservation work. Sooty grouse hunting is authorized by California Department of Fish and Wildlife and Nevada Department of Wildlife. California Department of Fish and Wildlife allow hunting on sooty grouse within both Inyo and Mono Counties with a daily take of 2 birds, and a maximum possession of 6 birds (California DFW 2017 Regulations). On the Inyo National Forest, specific hunt zones have been established and interest in hunting sooty grouse has been on the rise. The species continues to be allowed for hunting use suggesting populations of sooty grouse are at least stable. However, accurately differentiating between sooty grouse and the Mount Pinos subspecies in the field could be a potential risk factor. Two goals may help to increase awareness and field identification of the subspecies by working with partners on community and educational outreach (VIPS-FW-GOAL 06) and by providing interpretative outreach to enhance responsible recreation and to increase knowledge of related socioeconomic and environmental issues (REC-FW-GOAL 03).

Summary

Mount Pinos sooty grouse is currently found in a geographically restricted area and may be a relict population of a once more widespread species that occurred in the Southern Sierra Nevada. Due to this limited distribution and a moderate population decline throughout its range, the Inyo National Forest may provide important refugia habitat. However, taxonomic uncertainty about the species may be a potential barrier for conservation action and hunting pressure could be an additive factor if the subspecies is misidentified in the field. In addition, sooty grouse habitat, particularly in the subalpine forest, may be especially at risk from climate change and interrelated

effects of wildfire and drought, further increasing viability risk. Species viability of Mt. Pinos sooty grouse is currently uncertain; however, proposed plan components are designed to move habitat conditions to a more desired ecological state than what currently exists. The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of Mount Pinos sooty grouse within its range. However, due to uncertainty about the species current viability, the limited amount of habitat on the Inyo National Forest, and potential future threats associated with climate change and taxonomic uncertainty, it is not within the inherent capability of the land to maintain or restore the ecological conditions to maintain a viable population of Mount Pinos sooty grouse within the plan area.

Willow Flycatcher

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of the willow flycatcher in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Dense willow or other shrub thickets within large (more than 10 acres) wet meadows between 3,900-7050 feet elevation. Meadows with standing or running water needed for breeding.

Table 10 summarizes key threats, plan components, and expected effects on willow flycatcher.

Information on Current Distribution of the Species in the Planning Unit

Two subspecies of willow flycatcher are known to occur on the Inyo National Forest. The federally endangered southwestern willow flycatcher, *E. t. extimus*, is not known to occur within the plan area. It is not possible to identify the different subspecies apart visually, only genetically. The Institute for Bird Populations synthesized data on willow flycatcher detection sites from numerous Federal, State, and private entities and found that the Inyo National Forest has a total of 32 active flycatcher sites (2,238 acres), constituting 7 percent of all currently used flycatcher habitat in the Sierra Nevada (N= 285 sites, 33,367 acres total). The authors of that study note that post and pre-breeding willow flycatchers in meadow habitat are regularly detected at MAPS stations and during point counts in Yosemite National Park and the Stanislaus, Sierra and Inyo National Forests (Loffland et al. 2014). The Inyo does not currently have forestwide information on population estimates or abundance; however, detailed monitoring data is available for the Rush Creek population, which occurs on the Inyo National Forest and also private lands managed by the Los Angeles Department of Water and Power. Point Reyes Bird Observatory Conservation Science conducted population and habitat studies for the lower Rush Creek population between 2001 and 2010. In 2001 there were two nesting pairs of willow flycatcher in the lower Rush Creek area. In 2004 the population increased to 16 individuals. Starting in 2004, the population decreased annually, to a population of six individuals in 2010 (3 males and 3 females) (McCreedy 2011). Willow flycatcher surveys have been conducted at various other locations on the Inyo National Forest between 1995 and 2012. Several willow flycatchers were detected during these surveys, however these were not thought to be breeding individuals. It is currently unknown if a viable population of willow flycatcher exists on the Inyo National Forest.

Table 10. Key threats, plan components and expected effects on willow flycatcher

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Loss and degradation of riparian and wet meadow habitat (Watersheds and Riparian Conservation Areas)	WTR-FW-DC 01-06 WTR-FW-OBJ 01 WTR-FW-STD 01-03 RCA-MEAD-DC 01-07 RCA-MEAD-OBJ 01 RCA-RIV-DC 01-06 RCA-LPP-DC 01 RCA-SPR-DC 01-03 SPEC-FW-DC 01 FIRE-FW-GDL 04-06	SPEC-FW-DC 02-03 SPEC-FW-STD 01 SPEC-FW-GDL 01, 03,04,05 WTR-FW-DC 07	Ecosystem level plan components for watersheds, meadows and animals and plants provide direction to maintain adequate water flow and availability—supports ecosystem integrity and resilience and maintains riparian vegetation components and structural heterogeneity needed for breeding and sustaining healthy fish and wildlife populations. Specific and measurable objectives will move meadow habitat toward desired conditions. Species specific habitat components promote flow regimes that support healthy habitat specifically for at-risk species and place constraints on project level activities that could affect at-risk species habitat.
Loss and degradation of riparian and wet meadow habitat (Management Areas)	MA-CW-DC 02 MA-CW-OBJ 03 MA-CW-GDL 01-03 MA-RCA-DC 01, 03-10 MA-RCA-OBJ 01 MA-RCA-STD 04-06,09, 10, 13, 17 MA-RCA-GDL 01-04	MA-CW-DC 01, 03 MA-RCA-DC 02	Ecosystem level components for conservation watersheds mitigate loss of stream connectivity from road building/sedimentation in riparian areas and ensure key riparian ecological processes are maintained and protected while being compatible with multiple uses like recreation, vegetation management, or livestock grazing. Desired conditions for riparian conservation areas maintain connectivity and access to food, water, cover, and nesting areas. Species specific components ensure species of conservation concern will have connected habitats and refugia and that riparian conservation areas and conservation watersheds maintain high quality habitat to support persistence of species of conservation concern.
Declining meadow condition due to poorly managed livestock grazing.	RANG-FW-DC 01-03 RANG-FW-STD 04, 07 MA-RCA-GDL 03	N/A	Ecosystem level plan components include desired conditions for rangelands that that promote biological diversity and ecosystem integrity, habitat for wildlife is available and contains diverse species composition and structure. Standards minimize impacts from range management in meadow and riparian locations, and limit disturbance such as trampling so it is compatible with willow flycatcher habitat needs such as species composition and intact hydrologic function and water flow.

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Loss of habitat/habitat disturbance in wilderness.	TERR-FW-DC 01-06, 08-09 DA-WILD-DC-02-03,05 DA-WILD-REC1-DC 01 DA-WILD-REC2-DC 05 DA-WILD-REC3-DC 05	DA-WILD-DC 08	Ecosystem level plan components provide direction to maintain adequate water flow and availability, support ecosystem integrity and resilience and maintain vegetation components and structural heterogeneity needed for breeding, dispersal and foraging. Desired conditions maintain wilderness areas with ecologically sustainable levels of recreation. Species specific plan components minimize disturbance from trails in wilderness that could cause compaction and affect hydrologic connectivity in at-risk species habitat.
Placement of bird feeders in residential areas off forest which attracts brown headed cowbirds leading to increased rates of nest parasitism.	Not within Forest Service management authority.	N/A	

Key Ecological Conditions in Plan Area

Meadows occupied by willow flycatchers typically range in size from less than 1.0 acre to 716 acres, averaging approximately 80 acres, and with high water tables in spring and summer (standing waters and saturated soils). More than 95 percent of breeding meadows are larger than 10 acres, and meadows where multiple territories have fledged young are larger than 15 acres (Green et al. 2003). Breeding habitat consists of riparian stringers and meadow habitats at least 0.4 ha in size with saturated soils and dense shrubs, typically willow thickets 3-7 meters tall within or adjacent to meadows or forest clearings (Green et al. 2003). Migrants occur in a variety of open habitat types and are not as dependent on the integrity of any specific habitat or location.

On the Inyo National Forest, potential habitat can be found in the riparian meadow and riparian nonmeadow ecological assessment types. The largest riparian meadow systems on the Inyo occur on the Kern Plateau (approximately 10 percent) while about 1.5 percent of the land area in the Ansel Adams and John Muir Wildernesses is meadow. Previous project level analyses conducted on four meadows on the Kern Plateau (Tunnel, Tunnel Station, Ramshaw, and Little Whitney) on the Inyo National Forest have shown that elevation and canopy cover with influences of stand height are the most limiting factors in these meadows for flycatcher occupancy. The majority (88 percent) of willow flycatchers will nest between 4,000 and 8,000 feet elevation (Green et al. 2003), however, all of the meadows on the Kern Plateau occur above 8,000 feet. In addition, percent canopy cover was below the minimum percentage (76 percent) for breeding territories and characterized by even aged stands with little structural complexity.

The flycatchers in the lower Rush Creek area below Mono Lake occur in atypical habitat, at roughly 6,500 feet above sea level within a matrix of Great Basin big sagebrush scrub. Willow flycatchers on Rush Creek display preferences for high Wood's rose (*Rosa woodsii*) cover, lower (but still significant) willow cover, and low sagebrush scrub-associated species cover at the territory scale. Through 2010, 118 out of 188 located nests were built in Wood's rose (McCreedy 2011). Contrary to other reports in California, willow flycatchers at lower Rush Creek do not display any significant preference for the presence of surface water. Breeding territories averaged 59 meters from water.

Key Threats to Persistence

Loss and degradation of riparian and meadow habitat is considered the most significant threat to the persistence of willow flycatchers in the plan area. Degradation of habitat from management practices including livestock grazing (historic and present), road construction, and water diversion have resulted in a reduction of willow habitat, as well as compaction and drying of meadows. Drought and climate change are known to influence long-term patterns in meadow condition such as reductions in willow habitat; however, the recent declines in willow flycatcher population numbers and degradation of suitable breeding habitat have likely been accelerated due to anthropogenic factors (Green et al. 2003). Water diversions that result in a reduction of riparian vegetation, particularly willows, from either reduced water availability or inundation of riparian areas effectively degrade habitat quality for willow flycatchers.

Threats Under Forest Service Control

Land management can be summarized into the following key threats:

- loss of meadow riparian habitat due to livestock grazing, conifer encroachment and any activities that cause compaction, meadow drying

- loss of meadow riparian habitat due to drought, and changes in precipitation and snowpack related to climate change

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, which specify that habitats for at-risk species support self-sustaining populations within the inherent capabilities of the plan area and that the ecosystems they depend upon will be resilient to uncharacteristic fire, climate change, and other stressors; threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 10 above.

- watersheds
- terrestrial ecosystems and vegetation
- management areas (riparian conservation areas, conservation watersheds)
- riparian conservation areas (meadows; lakes and ponds; rivers and streams; seeps and springs)
- rangeland livestock grazing
- designated areas (wilderness recreation)
- recreation

Loss of meadow and riparian habitat is a primary risk factor and a number of ecosystem-level plan components mitigate this threat, within forest service authority. This is achieved primarily through desired conditions, standards, guidelines and objectives for watersheds and riparian conservation areas as mentioned above.

Recreation activities near breeding territories including hiking, camping, fishing, and off-road vehicle use can negatively affect flycatchers. Effects may include noise disturbance and increased risk of predation through the attraction of jays and squirrels, known predators, to food scraps and garbage that accompany public use. Roads near meadow and riparian habitat that alter the hydrologic function of these adjacent features can result in degrading habitat through dewatering or drying of meadows and riparian zones (Kattelmann 1996) and increased sedimentation that can have deleterious effects to aquatic invertebrate prey (Erman 1977 *in* (Green et al. 2003)). Potential habitat for willow flycatchers on the Inyo National Forest occurs in wilderness and associated recreation activities could cause compaction and disturbance. A number of desired conditions in wilderness help to mitigate potential impacts caused by recreation and camping in riparian areas and the John Muir and Ansel Adams wilderness. These include DA-WILD-DC-02-03, 05; DA-WILD-REC1-DC 01; DA-WILD-REC2-DC 05 and DA-WILD-REC3-DC 05.

Livestock grazing can negatively affect flycatcher habitat; however, on the Inyo National Forest no known willow flycatcher sites currently co-occur on active livestock allotments (Krueger 2016). Should this become an issue in the future, however, several forestwide plan components (RANG-FW-DC 01-03; RANG-FW-STD 04, 07) will ensure range management that is compatible with flycatcher habitat needs by promoting native species composition and maintaining hydrologic function and water flow, conditions that support nesting and foraging habitat.

While loss of meadow riparian habitat is mitigated by a number of ecosystem-level plan components, several species-specific plan components provide additional clarity and emphasis. For example, WTR-FW-DC 07 provides direction for maintaining habitat for at-risk species where stream diversions or other flow modifications are not regulated by the Federal Energy

Regulatory Commission and SPEC-FW-GDL 05 ensures water developments (such as a diversion or well) should be avoided near streams or seeps and springs where there is high risk of dewatering aquatic and riparian habitats where at-risk species occur. Desired conditions for conservation watersheds and riparian conservation areas (MA-CW-DC 01, 03; MA-RCA-DC 02) provide high-quality habitat and functionally intact ecosystems that contribute to the persistence of species of conservation concern, and provide for breeding, dispersal, overwintering, and feeding habitats for at-risk species.

Threats Not Under Forest Service Control

- water diversions and impoundments, growing water use demands
- nest predation

Outside the national forest, water diversions have impacted willow flycatcher habitat. As stated in Green et al. (2003), riparian vegetation in the Owens Valley located downstream of the intake to the Los Angeles aqueduct has dramatically changed to a more xeric condition due to the lack of water, and no longer provides habitat for nesting willow flycatchers. Increased water demands coupled with more frequent drought events and drying conditions, will continue to act as negative stressors on flycatcher habitat. Water resource management activities, including maintaining perennial water quality, quantity, and timing of flows play a critical role in overall ecological function and sustainability and most of these activities are regulated outside the boundary of the national forest. Although the Inyo National Forest manages what it can in terms of ecological integrity, cumulatively when combined with management activities of other jurisdictions, these actions would not likely be sufficient to maintain the ecological integrity of riparian habitat over time and for this reason it will be difficult for the forest to fully restore this habitat to the reference conditions needed to maintain species persistence and viability.

Nest predation is common and is considered a likely factor most affecting population viability in the Sierra Nevada (Bombay 1999, Cain et al. 2003). Predators include milk snakes, common king snakes, red tailed hawks, weasels, chipmunks, and squirrels. Standing water around nests is considered a deterrent to mammalian predators and nests farther from trees exhibit higher nest success (Cain et al. 2003). Brood parasitism from brown-headed cowbirds is also identified as a threat to willow flycatchers. Brown-headed cow birds have a commensal relationship with domestic livestock. Rates of parasitism are variable and may affect flycatcher productivity at the local level (Green et al. 2003). Placement of bird feeders in residential areas off the national forest is known to attract brown-headed cowbirds, which in turn leads to nest parasitism of willow flycatchers. Brown-headed cowbird nest parasitism has also led to direct loss of nest productivity and recruitment on the national forest, especially in the lower Rush Creek area where it is the primary cause for low productivity (McCreedy and Burnett 2011). Loffland et al (2014) note historic locations on the Inyo National Forest in close proximity of one another, including the area west of Mono Lake in the vicinity of Rush Creek and Lee Vining Creek. These areas may be candidates for meadow restoration efforts; however, it is believed that high cowbird densities in this area resulting from backyard bird feeders and other human-induced attractions (rather than livestock grazing) would need to be addressed before attempting to attract willow flycatchers into those areas. Several goals focused on educational outreach and community stewardship may help mitigate this issue by increasing public awareness through the Partnerships, Volunteers, Interpretation and Stewardship program area (VIPS-FW-GOAL 06) and also by working with State and Federal wildlife agencies to reduce impacts of invasive species that are adversely affecting the persistence of native species populations in Riparian Conservation Areas (MA-RCA-GOAL 02).

Summary

Water use from expanding population pressure and human demands, coupled with increasing temperatures and temporal changes in precipitation and runoff events related to climate change, along with small declining populations that are subject to nest parasitism by brown-headed cowbirds will continue to put this species and its associated habitat components at risk on the Inyo National Forest. Historically, annual flooding was a major disturbance needed to maintain the vegetation levels necessary for many wildlife species that use riparian habitat. Riparian habitat is currently departed from historic conditions due in large part to growing population demands for water that result in stream diversions and impoundments. The watershed is not wholly contained within the national forest and the Inyo National Forest has little control over water management outside national forest boundaries. For this reason, it will be difficult for managers to fully restore this habitat to reference conditions. Species viability of willow flycatcher on the Inyo National Forest is currently uncertain; however, proposed plan components are designed to move habitat conditions to a more desired ecological state than what currently exists. The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence.

Based upon this evaluation, the final set of ecosystem-level plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of willow flycatcher within its range. However, key risk factors including climate change, ground water pumping and water diversions that occur off the national forest are not within Forest Service management authority and will continue to threaten meadow riparian/wet meadow habitat making it difficult to maintain viability in the plan area.

Black Toad

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of the Black Toad in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Perennially wet and moist habitat, usually associated with short plant cover which provides shaded/cooler environments and unobstructed access to still or slowly flowing water, rodent burrows in winter and shallow marsh and pond waters for breeding are all important habitat elements.

Table 11 summarizes key threats, plan components, and expected effects on black toad.

Information on Current Distribution of the Species in the Planning Unit

The natural range of the black toad encompasses approximately 15 hectares (37 acres) of Deep Springs Valley, Inyo County, California, outside of the Inyo national forest boundary. Few records exist for the Inyo Forest. The toad is primarily associated with four spring complexes which lie on either private (Deep Springs College) or public (Bureau of Land Management) lands (Hammerson 2004). Due to the limited number of suitable habitats in the geographic range of the toad, each population is very vulnerable to stochastic events that could result in a local extirpation. The toads are highly aquatic in all seasons except winter, during which they disperse into upland habitats and seek refuge in rodent burrows or other refugia (Schuierer 1961, Kagarise-Sherman 1980, Murphy, et al. 2003).

Table 11. Key threats, plan components and expected effects on black toad

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Drying of microsite conditions that include permanent wet meadow habitat, springs and seeps (groundwater dependent ecosystems) with riparian vegetation and refugia substrate. Loss of habitat due to climate change or other stochastic events.	WTR-FW-DC 01-06 SPEC-FW-DC 01 MA-RCA-OBJ 01 RCA-LPP-DC-01 RCA-SPR-DC 01-03 RCA-RIV-DC 01-03,06 TERR-SAGE-DC 01-05 RCA-MEAD-DC 01-07 TERR-PINY-DC 01-03	SPEC-FW-DC 02,04	Ecosystem level plan components ensure healthy functioning watersheds will continue to supply ground water flow and recharge necessary to maintain spring habitat. Healthy spring and upland habitat is available for species to complete life cycle needs and will be resilient to climate change. Species specific plan components ensure ecological conditions improve conditions for species of conservation concern and that riparian systems contain the appropriate microclimates and small scale habitat elements to provide refugia for at-risk species. Plan components ensure healthy functioning watersheds will continue to supply ground water flow and recharge necessary to maintain spring habitat and that water diversions do not co-occur in at-risk species habitat.
Direct mortality due to water diversions or activities that reduce and alter hydrology regimes, including, mining, suction dredge operations & fire suppression actions from drafting water pumps, and water impoundments that reduce current velocities and allow for sediment deposition, loss of springs and seeps from historic livestock and wild horse grazing.	TERR-SH-DC 01-02 TERR-SH-STD 01 SPEC-FW-STD 01 SPEC-FW-GDL 05 RANG-FW-DC 01-03 RANG-FW-STD 04, 07 MA-RCA-DC 01- 10 MA-RCA-OBJ 01 MA-RCA-STD 01-02, 04-06, 08-09, 10-11, 15 MA-RCA-GDL 01-04 FIRE-FW-GDL 04-06 WTR-FW-STD 01-03 MA-CW-OBJ 03 RCA-RIV-DC 05	SPEC-FW-DC 03 SPEC-FW-STD 01 SPEC-FW-GDL 05 MA-CW-DC 01, 03 WTR-FW-DC 07	Plan components maintain ecosystem integrity for fine-scale refugia habitat for endemic species like the salamander, will ensure forest activities maintain spring/seeps and also manage for and or remove livestock from riparian conservation areas as needed so that special aquatic features are in proper functioning condition. Standards and guidelines constrain site specific activities in riparian areas so habitat is maintained and also ensures no loss of egg masses of individuals from drafting water pumps during fire suppression actions in aquatic habitats Species specific desired conditions ensure land management activities maintain or improve conditions for survival and reproduction of at risk species; that ecological conditions improve conditions for species of conservation concern and that riparian systems contain the appropriate microclimates and small scale habitat elements to provide refugia for at-risk species. A species-specific standard ensures project design incorporates the needs of at-risk species while a guideline constrains water developments that could

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
			dewater seeps and springs and diminish salamander habitat. Desired conditions for conservation watersheds promote high quality habitat for species of conservation concern and habitat for breeding, dispersal, overwintering, and feeding for at-risk species.
Direct mortality and population loss due to the amphibian fungus chytridiomycosis.	INV-FW-DC 01-02 INV-FW-STD 01-02 INV-FW-GDL 01	SPEC-FW-DC 02	Ecosystem level plan components minimize the spread of invasive species between aquatic habitats. A species-specific plan component ensures species of conservation concern are minimally impacted from disease.
High endemism, limited ability to disperse, restricted distribution and localized extinctions.	TERR-SH-DC 01-02 TERR-SH-STD 01	SPEC-FW-DC 04	Ecosystem level plan components ensure special habitats are maintained or improved. Species specific elements provide habitat refugia for at-risk species with restricted distributions.
Water diversions that occur off forest.	N/A	N/A	Not within Forest Service management authority

The BLM manages known black toad populations at Corral Springs, Buckhorn Springs, Bog Mound Springs and Antelope Spring. All but Antelope Spring are immediately adjacent to Deep Springs Lake. Antelope Spring is approximately 3 miles north of these springs and is situated on a hillside adjacent to the boundary of Inyo National Forest (Wang 2009; USDA 2016). Forest level surveys conducted in spring of 2017 following a rain event noted Antelope Spring had at least 10 individual egg masses.

There are 6 records for black toad in the NRIS database with the most recent detections made in 2011 at two springs on the Inyo National Forest (Sam's Spring and an unnamed spring in Birch Creek). Birch Creek, however, was recently affected by alterations in flow regime and follow up surveys has failed to detect this species in that area. An incidental observation was reported in 2016 within the southeastern boundary of the White Mountain Ranger District near Deep Springs but follow up surveys are needed to confirm this sighting (Pearce 2016).

Key Ecological Conditions in Plan Area

Black toad is an aquatic species restricted to wet areas near permanent springs with subpopulations separated by arid desert scrub at least 1.5 km apart. Short plant cover which provides shaded/cooler environments and unobstructed access to still or slowly flowing water, rodent burrows in winter and shallow marsh and pond waters for breeding are all important habitat elements. On the Inyo National Forest, the general area of occurrence is characterized by the Pinyon juniper/sagebrush and desert assessment types. The Antelope Spring BLM habitat differs greatly compared to nearby Sam's Spring Forest Service habitat. Antelope Spring provides higher quality and greater quantity of suitable breeding and dispersal habitat than Sam's Spring. Antelope Springs may get approximately 10-20 percent shade from sedges & reeds. Habitat at the far end of the reach is characterized by open sedge/reed mud breeding grounds with sparse cottonwood, transitioning to rose, and then willow at the source. The edge quickly moves into sage habitat. Sam Spring shows signs of historic water diversions, vegetation encroachment that may contribute to the lack of surface flow/change in suitability. Limited data on Buckhorn Spring has been reported. Forest surveys in spring of 2017 noted very little water at the site despite a recent rain event.

Key Threats to Persistence

Climate change, disease, and high endemism/restricted distribution are the primary threats to the Black toad on the Inyo National Forest and are largely outside of forest service control. Another secondary threat beyond the control of the Forest is the reduction of water flow by diversions and geologic activity. The water source supplying the occupied springs comes from an area within a geologically active area; thereby creating the potential for groundwater interruptions through natural forces should an earthquake with sufficient magnitude occur and interrupt groundwater flow. Any activities or processes that lead to spring drying or disruption of water flow (e.g. water diversions/dams, in-stream mining, stream capping, feral livestock (burros and cattle), upstream water pumping) will lead to direct mortality (desiccation); loss of habitat/ vegetation encroachment into open waters is also a threat (USDA 2013a)

Threats Under Forest Service Control

Land management can be summarized into the following key threats:

- loss of seeps and springs/riparian habitat from diversion of stream flow, and related disturbances such as vegetation management activities or livestock grazing that occur on the inyo national forest

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 11 above.

- Watersheds
- Terrestrial Ecosystems and Vegetation (special habitats, pinyon juniper, sagebrush)
- Management Areas (riparian conservation areas, conservation watersheds)
- Riparian Conservation Areas (meadows; lakes and ponds; rivers and streams; seeps and springs)
- Fire

Loss of seeps and springs in desert riparian habitat is the primary risk factor affecting persistence of black toad and a number of ecosystem-level plan components mitigate this threat, within Forest Service authority. This is achieved primarily through desired conditions, standards, guidelines and objectives for watersheds and riparian conservation areas. In addition, plan components TERR-SH-DC 01-02 and TERR-SH-STD 01 ensure special habitat are maintained or improved, that refugia is provided for species with restricted distributions and that special habitat needs will be incorporated in project design and implementation. A desired condition for Conservation Watersheds (MA-CW-DC 02) mitigates key threats from disturbance events like wildfires, floods and landslides which can reduce hydrologic connectivity and eliminate spring habitat.

Species-specific desired conditions (SPEC-FW-DC 02-04) add additional emphasis and clarity by specifying that habitats for at-risk species support self-sustaining populations within the inherent capabilities of the plan area; that the ecosystems they depend upon will be resilient to uncharacteristic fire, climate change, and other stressors; conditions for species of conservation concern (including minimal impacts from diseases) will be improved; and the structure and function of the vegetation, aquatic and riparian system, and associated microclimate and smaller scale elements (like special features such as carbonate rock outcrops, fens, or pumice flats) exist in adequate quantities within the capability of the plan area to provide habitat and refugia for at-risk species with restricted distributions. Loss of spring habitat is the primary risk factor for black toad and guideline SPEC-FW-GDL 05 is particularly important because it constrains water developments (such as a diversion or well) near streams or seeps and springs where there is high risk of dewatering aquatic and riparian habitats where at-risk species occur. Desired conditions for conservation watersheds and riparian conservation areas (MA-CW-DC 01, 03; MA-RCA-DC 02) provide high-quality habitat and functionally intact ecosystems that contribute to the persistence of species of conservation concern, and provide for breeding, dispersal, overwintering, and feeding habitats for at-risk species. A desired condition for watersheds (WTR-FW-DC 07) provides direction that in-stream flows allow for at-risk species habitat and sustain riparian resources where stream diversions or other flow modifications are not regulated by the Federal Energy Regulatory Commission.

The springs on the Inyo National Forest occur in the Deep Springs Allotment, but cattle use has not been observed in the area, there are no authorized roads to the springs and activities are very limited in the area (USDA 2013a). Sam’s spring is in an active cattle allotment; however, no signs of cattle use have been evident at the site. Livestock can degrade riparian habitat and cause sedimentation and compaction. Should this become an issue in the future several ecosystem-level plan components (RANGE-FW-DC 02; RANGE-FW-STD 04, 07) mitigate this threat by promoting areas with satisfactory soils, functional hydrology, and biotic integrity, minimizing the

addition of new livestock handling facilities in riparian conservation areas, and minimizing soil compaction from livestock disturbance such as trampling and trailing.

Threats Not Under Forest Service Control

Threats not under Forest Service control include:

- water diversions and impoundments that occur outside the national forest boundary, growing water use demands
- loss of seeps, springs, and riparian habitat due to drought, flash floods and changes in precipitation patterns and snowpack related to climate change
- direct mortality and population loss due to the amphibian fungus *chytridiomycosis*

Any impact that affects water supply or riparian values likely limits the amount of habitat available to the species that would possibly reduce population sizes. Climate change and changing precipitation patterns further exacerbate drought conditions and are key threats. Wright et al. (2013) list the black toad as one of the 10 most likely species to be affected by climate change. Under their modeling, the black toad could see a reduction in suitable habitat by up to 80 percent during the forecast period. While the Inyo National Forest cannot directly control climate change, ecosystem plan components as mentioned above in table 11 provide conditions which should be more resilient to ecosystem stressors and the interrelated effects of climate change.

Water resource management activities, including maintaining perennial water quality, quantity, and timing of flows play a critical role in overall ecological function and sustainability and most of these activities are regulated outside the boundary of the national forest. However, any action the Inyo can take to maintain the integrity of spring sources within Deep Springs Valley, such as Sam’s Spring, which may have historic artesian wells that maintain the existing habitat. Ecosystem-level plan components for Watersheds (WTR-FW-DC 01-04, 07 and WTR-FW-STD 01-03) provide for healthy riparian and aquatic ecosystems within management authority, but because of growing population demands, climate change, and consumption of water resources outside the national forest, these habitats may not realize their full recovery potential limiting the Inyo National Forest’s ability to provide for species viability.

The amphibian fungus *chytridiomycosis* has not yet been documented on the Inyo, but if it were to occur, could devastate isolated populations. Murphy et al. (2003) indicate there is serious concern about the fungus *Batrachochytrium dendrobatidis* (Bd) impacting populations of the black toad as it has many other amphibian species around the globe. The forestwide plan component SPEC-FW-DC-02 strives to minimize disease impacts on species of conservation concern and several desired conditions (INV-FW-DC 01-02) minimize the spread of invasive species (which include fungi) into new areas. A standard (INV-FW-STD 01) minimizes the spread of aquatic invasive species when moving between waterbodies and a guideline (INV-FW-GDL 01) constrains ground disturbing management activities that have the potential to spread invasive species in aquatic habitat.

Several goals, provide a vision for working across land management boundaries and these strategies, if implemented should collectively improve habitat for black toad throughout its range. A watershed goal (WTR-FW-GOAL 01) encourages collaborative work between adjacent land owners and agencies to improve watersheds across ownership boundaries while a goal for riparian conservation areas (MA-RCA-GOAL 01) promotes coordination with the State fish and wildlife agencies to address native aquatic species issues, including evaluating management and

monitoring needs to address aquatic species requirements across ownership boundaries. Two goals (SPEC-FW-GOAL 03, 04) encourage a collaborative all-lands approach with other agencies, Tribes, and landowners including the California Department of Fish and Wildlife, Nevada Department of Wildlife, and U.S. Fish and Wildlife Service to restore and maintain essential habitat for at-risk species and to improve habitat in the plan area for at-risk species and the ecological processes they depend on. Goals for invasive species (INV-FW-GOAL 01, 03) encourage cooperation and coordination across jurisdictional boundaries to help manage and control invasive and nonnative species and to evaluate the potential effects of climate change on their spread. This should help to minimize any future potential threats from the chytrid fungus. Finally, several goals for special habitats promote (TERR-SH-GOAL 01-02) promote cooperative partnerships to study, monitor and restore special habitats and to makes sure they are accurately documented within the corporate geographic information system.

Summary

The black toad is a restricted endemic, limited to several isolated populations in Deep Springs Valley in Inyo County within close proximity to and or on the Inyo National Forest. Individuals have been documented on the Inyo National Forest, but it is uncertain if a viable population exists there. The predominant population area is located on adjacent, private land. However, the Inyo will continue to provide additional (ephemeral) fringe habitat for dispersing adults. While the ecological conditions the black toad depends on appear generally stable and or trending in a positive direction based on current management, there is still substantial concern for the species persistence by simple virtue of its rarity and uncertain climate change related effects. As a result of this rarity and its limited distribution, this species is highly susceptible to stochastic events (like flash floods) and drying conditions resulting from increasing temperatures and precipitation events. Its limited dispersal ability and isolated populations put it at further risk for localized extinctions and susceptibility to disease outbreaks. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of black toad within its range. However, because this species primary habitat occurs outside the national forest boundary, and primary threats are not within Forest Service control, it is not within Forest Service authority to maintain or restore the ecological conditions necessary to maintain a viable population of the black toad within the plan area.

Inyo Mountains Slender Salamander

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of the Inyo Mountains slender salamander in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Flowing perennial streams, spring and seeps (non-pool forming) and moist substrates (for egg laying), canyons, solid-rock cliffs, areas where outcrops or talus are in contact with surface flow. In addition, small permanent desert springs and seeps with riparian vegetation. May extend out from riparian areas in canyon bottoms at higher elevations.

Table 12 summarizes key threats, plan components, and expected effects on Inyo Mountains slender salamander.

Table 12. Key threats, plan components and expected effects on Inyo Mountains slender salamander

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Drying and loss of springs and seeps (groundwater dependent ecosystems) from climate change or other stochastic events, flooding events which scour and diminish riparian vegetation.	WTR-FW-DC 01-06 SPEC-FW-DC 01 MA-RCA-DC 01-10 RCA-LPP-DC 01 RCA-MEAD-DC 01-07 RCA-MEAD-OBJ 01 RCA-RIV-DC 01-03,06 RCA-SPR-DC 01-03 TERR-SH-DC 01-02 MA-CW-DC 02 TERR-PINY-DC 01-03 TERR-SAGE-DC 01-05	SPEC-FW-DC 02,04	Ecosystem level plan components ensure healthy functioning watersheds will continue to supply ground water flow and recharge necessary to maintain spring habitat and that water diversions, within forest service management authority, do not co-occur in areas with salamanders. Forest-wide desired conditions for species ensure sustainable populations of animal species are supported by ecosystems that are resilient to fire, climate change and other stressors. Plan components for riparian and spring areas ensure healthy spring habitat is available for species to complete life cycle needs and that it will be resilient to climate change. Species specific plan components ensure ecological conditions improve conditions for species of conservation concern and that riparian systems contain the appropriate microclimates and small scale habitat elements to provide refugia for at-risk species.
Direct mortality due to water diversions and activities that reduce and alter instream flow including mining operations & fire suppression including actions from drafting water pumps. Activities include grazing and water impoundments that reduce current velocities and allow for sediment deposition or loss of springs and seeps from historic livestock and wild horse grazing.	MA-RCA-OBJ 01 TERR-SH-STD 01 WTR-FW-STD 01-03 RANG-FW-DC 01-03 RANG-FW-STD 04,07 MA-RCA-DC 01-08, 10 MA-RCA-OBJ 01 MA-RCA-STD 01-02, 04-06, 08-09,10-11,15 MA-RCA-GDL 01-04 MA-CW-OBJ 03 FIRE-FW-GDL 04-06 RCA-RIV-DC 05	SPEC-FW-DC 03 SPEC-FW-STD 01 SPEC-FW-GDL 05 MA-CW-DC 01,03 WTR-FW-DC 07	Ecosystem level plan components maintain ecosystem integrity for fine-scale refugia habitat for endemic species like the salamander, will ensure forest activities maintain spring/seeps and also manage for and or remove livestock from riparian conservation areas as needed so that special aquatic features are in proper functioning condition, hydrological flow is maintained and sedimentation is minimized. Plan components minimize loss of individuals from drafting water pumps during fire suppression actions in aquatic habitats. Species specific desired conditions ensure land management activities maintain or improve conditions for survival and reproduction of at risk species; ecological conditions improve conditions for species of conservation concern; and riparian systems contain the appropriate microclimates and small scale habitat elements to provide refugia for at-risk species. A species-specific standard ensures project design incorporates the needs of at-risk species while a guideline constrains water developments that could dewater seeps and springs and diminish salamander habitat.

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
High endemism, limited ability to disperse, restricted distribution and localized extinctions	TERR-SH-DC 01-02 TERR-SH-STD 01	SPEC-FW-DC 04	Ecosystem level plan components ensure special habitats are maintained or improved. Species specific elements provide habitat refugia for at-risk species with restricted distributions.
Mining including suction dredge operations	Prohibited under California State Law.	N/A	
Water diversions that occur off forest.	Not within Forest Service management authority	N/A	

Information on Current Distribution of the Species in the Planning Unit

The Inyo Mountains slender salamander is a restricted endemic limited to Inyo County. It has been known to occur on all four ranger districts with the majority of detections occurring on the White Mountains and Mount Whitney Ranger districts. Current population estimates of the species on the Forest are not available, however, it has been detected at 16 locations within the Inyo Mountains and the Inyo National Forest contains all known populations occurring on Forest Service lands in Region 5; figure 10 in Krueger (2016). Sites on the Inyo National Forest where salamanders have been repeatedly detected in recent (last 15) years include Water Canyon, Barrel Springs, and Lead Canyon. Individuals have been observed, but there is uncertainty as to whether a viable population currently exists on the forest.

Key Ecological Conditions in Plan Area

Inyo Mountains slender salamander occur exclusively in isolated springs in largely desert ecosystems comprised of desert scrub with habitat restricted to the Inyo Mountains and along the South Sierra escarpment. Salamanders tend to occupy seeps, a type of spring that does not form a channel or pool. Seeps tend to keep an area moist, but not wet, a condition suitable for salamanders. Many mosses and other plants occupy spring sites, thriving on cool and humid conditions. On the Inyo National Forest these systems occur in nonmeadow riparian areas include shrub- or tree-dominated springs and stream systems, with an estimated acreage of 3,093. Non-meadow riparian areas are present in the Eastern Slopes, Glaciated Batholith, Mono Valley, Owens Valley, and White Mountains subsections, but are not present in significant amounts (those wider than 300 feet) in the remaining subsections, including the Glass and Inyo Mountains. Flowing streams, spring/seeps (non-pool forming) and moist substrates (for egg laying), canyons, solid-rock cliffs, areas where outcrops or talus are in contact with surface flow are all important habitat elements.

Springs occur in most assessment areas throughout the Inyo National Forest. However, it is unknown how many of those springs support meadow or nonmeadow riparian ecosystems. The Inyo has very limited information related to spring flow alterations over time. In some arid portions of the national forest, springs and streams emanating from them are the only water source, and therefore very important for those ecosystems. Seeps on the Inyo can be described as groundwater dependent ecosystems and are supported by groundwater.

Key Threats to Persistence

Habitat alterations due to water diversion, feral livestock, human presence, mining, and climate change can all negatively affect salamander habitat by diminishing hydrological condition and water flow. The Inyo Mountains slender salamander is assumed to be restricted to spring habitats, any impact that influences stream flow (including duration and quantity) would threaten population persistence. If stream flow is reduced, it would be safe to assume that the obligate riparian plant species would decline and surface moisture would diminish. This would lead to a reduction in the habitats in which the salamander is found and could limit population size. Past impacts to stream flow and riparian areas include the capping of springs, diversion of stream flow, in-stream mining, and disturbances to riparian areas from feral livestock (burros and cattle). Several of these stressors are potentially restricted by State and Federal agencies who manage resources. As a Species of Greatest Conservation Need, California Department of Fish and Wildlife indicates *B. campi* is vulnerable to climate change and any changes in precipitation patterns that influence spring discharge would likely result in a decrease in available habitat. Wright, et al. (2013) modeled that up to 50 percent of the suitable habitat could be reduced by

2050 as a result of anticipated changes to climate. Because the Inyo Mountains slender salamander is known from relatively few localities and populations are likely not connected, there is a risk of localized population extinctions.

Habitat in Barrel Canyon on the Inyo has been degraded, and at another location on the national forest, flash flooding in 1985 caused a scouring of the canyon bottom, resulting in complete loss of riparian vegetation.

Threats Under Forest Service Control

Land management can be summarized into the following key threats:

- Loss of seeps and springs/riparian habitat from diversion of stream flow, in-stream mining, and disturbances to riparian areas from feral livestock (burros and cattle).

In addition to the forestwide plan components for animals and plants and terrestrial ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 12 above.

- Watersheds
- Terrestrial Ecosystems and Vegetation (Special habitats, Sagebrush, Pinyon juniper)
- Management Areas (Riparian Conservation Areas, Conservation Watersheds)
- Riparian Conservation Areas (Meadows; lakes and ponds; rivers and streams; seeps and springs)
- Rangeland Livestock Grazing

Loss of seeps and springs in desert riparian habitat is the primary risk factor affecting persistence of Inyo Mountains slender salamander and a number of ecosystem-level plan components mitigate this threat, within Forest Service authority. This is achieved primarily through desired conditions, standards, guidelines and objectives for watersheds and riparian conservation areas. In addition, plan components TERR-SH-DC 01-02 and TERR-SH-STD 01 ensure special habitat are maintained or improved, that refugia is provided for species with restricted distributions and that special habitat needs will be incorporated in project design and implementation. A desired condition for Conservation Watersheds (MA-CW-DC 02) mitigates key threats from disturbance events like wildfires, floods and landslides which can reduce hydrologic connectivity and eliminate spring habitat.

Species-specific desired conditions (SPEC-FW-DC 02-04) add additional emphasis and clarity by specifying that habitats for at-risk species support self-sustaining populations within the inherent capabilities of the plan area—that the ecosystems they depend upon will be resilient to uncharacteristic fire, climate change, and other stressors; conditions for species of conservation concern (including minimal impacts from diseases) will be improved; and the structure and function of the vegetation, aquatic and riparian system, and associated microclimate and smaller scale elements (like special features such as carbonate rock outcrops, fens, or pumice flats) exist in adequate quantities within the capability of the plan area to provide habitat and refugia for at-risk species with restricted distributions. Loss of spring habitat is the primary risk factor for salamander persistence, and guideline SPEC-FW-GDL 05 is particularly important because it constrains water developments (such as a diversion or well) near streams or seeps and springs where there is high risk of dewatering aquatic and riparian habitats where at-risk species occur. Desired conditions for conservation watersheds and riparian conservation areas (MA-CW-DC 01,

03; MA-RCA-DC 02) provide high-quality habitat and functionally intact ecosystems that contribute to the persistence of species of conservation concern, and provide for breeding, dispersal, overwintering, and feeding habitats for at-risk species.

Threats Not Under Forest Service Control

- Water diversions and impoundments that occur outside the national forest boundary, growing water use demands.
- Mining operations including suction dredge that occur outside the national forest boundary.
- Loss of seeps, springs and riparian habitat due to drought and changes in precipitation patterns and snowpack-related to climate change.

The species inhabits limited, fragile spring systems isolated in one of the driest desert habitats in the country (Yanev and Wake 1981). Any impact that affects water supply or riparian values likely limits the amount of habitat available to the species that would possibly reduce population sizes. Climate change and changing precipitation patterns further exacerbate drought conditions and are key threats. While the Inyo National Forest cannot directly control climate change, ecosystem plan components as mentioned above provide conditions, which should be more resilient to ecosystem stressors and the interrelated effects of climate change.

Water resource management activities, including maintaining perennial water quality, quantity, and timing of flows play a critical role in overall ecological function and sustainability and most of these activities are regulated outside the national forest boundary. Multiple municipalities, including the Los Angeles Department of Water and Mammoth Community Water District conduct groundwater pumping near the Inyo, though wells from these two entities do not occur on National Forest System lands. Groundwater pumping affects groundwater-dependent ecosystems such as meadows, springs and seeps, although the extent of those influences on the national forest is not well documented.

Ecosystem-level plan components for Watersheds (WTR-FW-DC 01-04, 07 and WTR-FW-STD 01-03) provide for healthy riparian and aquatic ecosystems within management authority, but because of growing population demands and off-forest consumption of water resources, these habitats may not realize their full recovery potential; limiting the Inyo National Forest's ability to provide for species viability. Several goals, however, provide a vision for working across land boundaries to collectively attain desired conditions. A watershed goal (WTR-FW-GOAL 01) encourages collaborative work between adjacent land owners and agencies to improve watersheds across ownership boundaries while a goal for riparian conservation areas (MA-RCA-GOAL 01) promotes coordination with State fish and wildlife agencies to address native aquatic species issues, including evaluating management and monitoring needs to address aquatic species requirements across ownership boundaries. Finally, several goals for special habitats (TERR-SH-GOAL 01-02) promote cooperative partnerships to study, monitor and restore special habitats and to make sure they are accurately documented within the corporate geographic information system. These strategies, if implemented should collectively improve habitat for Inyo Mountains slender salamander across its range.

Summary

The Inyo Mountains slender salamander is a restricted endemic, limited to several isolated populations scattered throughout a small portion of the Inyo National Forest and the remaining population located outside of the plan area. While the ecological conditions the salamander depends on appear generally stable or are trending in a positive direction based on current

management, there is still substantial concern for the species persistence in the plan area by simple virtue of its rarity and uncertainty regarding climate change-related effects and losses in spring habitat. As a result of this rarity and its limited distribution in the plan area, this species is highly susceptible to events such as flash floods, and drying conditions that may become more frequent with climate change. The Inyo Mountains slender salamander's limited dispersal ability and isolated populations put it at further risk for localized extinctions from these types of events. Further, the watershed is not wholly contained within the national forest and the Inyo has little control over water management outside national forest boundaries. For this reason, it will be difficult for managers to fully restore habitat to reference conditions. Species viability of Inyo Mountains slender salamander on the Inyo National Forest is currently uncertain; however, proposed plan components are designed to move habitat conditions to a more desired ecological state than what currently exists. The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of Inyo Mountains slender salamander within its range. However, key risk factors including climate change, groundwater pumping, and water diversions that occur off national forest and are not within Forest Service management authority will continue to impact spring habitat making it difficult to maintain viability in the plan area.

Kern Plateau Salamander

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of the Kern Plateau Salamander in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Perennially wet and moist habitat, usually associated with rocky outcrops or rock substrate, along the eastern escarpment of the Sierra Nevada Mountains. Wet meadows surrounded by mixed conifer.

Table 13 summarizes key threats, plan components, and expected effects on Kern Plateau salamander.

Information on Current Distribution of the Species in the Planning Unit

The Kern Plateau salamander has been detected at 36 sites, mainly from the Kern Plateau in the Sierra Nevada, but including a few isolated populations from the Owens Valley and the Scodie Mountains in eastern California (Wake, et al. 2002). It is abundant on the Kern Plateau especially in mesic areas, and found in nearly every drainage in the eastern Sierra from Walker Creek (east of Olancha) to Nine Mile Creek (Hansen and Wake 2005). Information on population status and trend is not available, but the species is considered to be common in most of its range and populations stable (Hansen and Wake 2005). It is currently unknown if a viable population exists on the Inyo National Forest.

Table 13. Key threats, plan components and expected effects on Kern Plateau salamander

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Drying of microsite conditions that include permanent wet meadow habitat, springs and seeps (groundwater dependent ecosystems) with riparian vegetation and refugia substrate. Loss of habitat due to climate change related stochastic events (e.g. flooding, fire, and drought).	WTR-FW-DC 01-06 SPEC-FW-DC 01, 04 MA-RCA-DC 01-10 RCA-LPP-DC 01 RCA-MEAD-DC 01-07 RCA-RIV-DC 01-03,06 RCA-SPR-DC 01-03 TERR-SH-DC 01-02 MA-CW-DC 02 MA-RCA-OBJ 01 TERR-SH-STD 01 WTR-FW-STD 01-03 MA-RCA-DC 01-08, 10 MA-RCA-STD 01-02, 06, 08-09,10-11,15 TERR-RFIR-DC 01-07 TERR-LDGP-DC 01-10 TERR-JEFF-DC 07 RCA-MEAD-OBJ 01 DA-WILD-DC 02-03	SPEC-FW-DC 02,04	Ecosystem level plan components ensure healthy functioning watersheds will continue to supply ground water flow and recharge necessary to maintain spring habitat and that water diversions, within forest service management authority, do not co-occur in areas with salamanders. Forest-wide desired conditions for species ensure sustainable populations of animal species are supported by ecosystems that are resilient to fire, climate change and other stressors. Plan components for riparian and spring areas ensure healthy spring habitat is available for species to complete life cycle needs and that it will be resilient to climate change. Species specific plan components ensure ecological conditions improve conditions for species of conservation concern and that riparian systems contain the appropriate microclimates and small scale habitat elements to provide refugia for at-risk species. Plan components ensure healthy functioning watersheds will continue to supply ground water flow and recharge necessary to maintain spring habitat and that water diversions do not co-occur in areas with salamanders.

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Direct mortality due to water diversions that reduce and alter hydrology regimes, including, timber harvest near wet meadows and fire suppression actions (e.g. any activities that reduce hydrologic connectivity and allow for sediment deposition).	MA-RCA-OBJ 01 TERR-SH-STD 01 WTR-FW-STD 01-03 RANG-FW-DC 01-03 RANG-FW-STD 04,07 MA-RCA-DC 01-08, 10 MA-RCA-MEAD-OBJ 01 MA-RCA-STD 01-02, 04-06, 08-09,10-11,15 MA-RCA-GDL 01-04 FIRE-FW-GDL 04-06 RCA-RIV-DC 05 MA-CW-OBJ 03	SPEC-FW-DC 03 SPEC-FW-STD 01 SPEC-FW-GDL 05 MA-CW-DC 01, 03 WTR-FW-DC 07	Ecosystem level plan components maintain ecosystem integrity for fine-scale refugia habitat for endemic species like the salamander, will ensure forest activities maintain spring/seeps and also manage for and or remove livestock from riparian conservation areas as needed so that special aquatic features are in proper functioning condition, hydrological flow is maintained and sedimentation is minimized. Plan component minimize loss of habitat during fire suppression actions in aquatic habitats Species specific desired conditions ensure land management activities maintain or improve conditions for survival and reproduction of at risk species; that ecological conditions improve conditions for species of conservation concern and that riparian systems contain the appropriate microclimates and small scale habitat elements to provide refugia for at-risk species. A species-specific standard ensures project design incorporates the needs of at-risk species while a guideline constrains water developments that could dewater seeps and springs and diminish salamander habitat. Desired conditions for conservation watersheds promote high quality habitat for species of conservation concern and habitat for breeding, dispersal, overwintering, and feeding for at-risk species.
High endemism, limited ability to disperse, restricted distribution and localized extinctions.	TERR-SH-DC 01-02 TERR-SH-STD 01	SPEC-FW-DC 04	Ecosystem level plan components ensure special habitats are maintained or improved Species specific elements provide habitat refugia for at-risk species with restricted distributions.
Water diversions that occur off forest.	N/A	N/A	Not within Forest Service management authority

Key Ecological Conditions in Plan Area

Kern Plateau salamander occurs in perennially wet and moist habitat, usually associated with rocky outcrops or rock substrate, along the eastern escarpment of the Sierra Nevada Mountains. On the Inyo National Forest, these conditions can be found largely on the Kern Plateau. Within this area, the mixed conifer assessment type is most prevalent and includes various combinations of white fir, red fir, and one or more pine species, typically with a very sparse understory. The majority of the red fir type is located on the Kern Plateau and Reds Meadow Valley areas where a large proportion (80 percent) of the red fir forest type across the southern Sierras is within designated wilderness. This area is known for large, open meadows surrounded by forests of subalpine conifers, red fir, lodgepole pine, and pinyon-juniper. Several critical aquatic refuges at the southern portion of the national forest were previously identified by the Sierra Nevada Framework as providing habitat for Kern Plateau salamander. These include Olancha and Haiwee Canyon Critical Aquatic Refuges.

Springs occur in most assessment areas throughout the Inyo National Forest. However, it is unknown how many of those springs support meadow or nonmeadow riparian ecosystems. The Inyo has very limited information related to spring flow alterations over time. In some arid portions of the national forest, springs and streams emanating from them are the only water source, and therefore very important for those ecosystems. Seeps on the Inyo can be described as groundwater-dependent ecosystems and are supported by groundwater.

Key Threats to Persistence

Kern Plateau salamander occurs in areas of permanent or seasonal surface moisture. It is limited to forested high-altitude riparian habitat and has small isolated populations which makes it vulnerable to any changes to the habitat. Activities that limit microsite conditions such as road construction, timber harvesting, fire suppression, and habitat degradation through capping of springs or alterations of spring water or habitat can adversely affect the species. However, on the Inyo National Forest, much of the salamander habitat occurs in designated wilderness, in steep, rocky and inaccessible terrain, which may provide a natural buffer from human interactions and management activities. No threats to Kern Plateau salamander habitat were identified for the analysis of the 2009 Motorized Travel Management Project (USDA Forest Service 2009). Multiple municipalities, including the Los Angeles Department of Water Power and Mammoth Community Water District conduct groundwater pumping near the Inyo, though wells from these two entities do not occur on National Forest System lands. Groundwater pumping affects groundwater-dependent ecosystems such as meadows, springs and seeps, although the extent of those influences on the national forest is not well documented. Water diversions are not a threat on the Kern Plateau where the salamanders use a more general type of habitat influenced by snowmelt; however, in the Indian Wells/Owens Valley areas, environmental conditions are much more arid and water diversions from the occupied springs would likely reduce the extent of the wetted in-channel and riparian areas. Climate change has the potential to impact all populations if snowpack and runoff conditions are significantly altered. Reductions in snowpack could affect the Kern Plateau populations and changes in infiltration that reduce spring flow in the Scodie Mountains or Indian Wells/Owens Valleys would probably reduce the extent and/or duration of spring flow and riparian development. The climate change modeling completed by Wright et al. (2013) indicated a slight reduction (up to 20 percent) in habitat suitability by the year 2050.

Threats Under Forest Service Control

Land management can be summarized into the following key threats:

- Loss of seeps, springs, and riparian habitat from diversion of stream flow, and related disturbances such as vegetation management activities and fire suppression.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 13 above.

- Watersheds
- Terrestrial Ecosystems and Vegetation (Special habitats, Lodgepole pine, Red fir, Mixed conifer)
- Management Areas (Riparian Conservation Areas, Conservation Watersheds)
- Riparian Conservation Areas (Meadows; lakes and ponds; rivers and streams; seeps and springs)
- Fire

Loss of moist habitat and springs is a primary risk factor affecting persistence of Kern Plateau Salamander. A number of ecosystem-level plan components mitigate this threat, within Forest Service authority. This is achieved primarily through desired conditions, standards, guidelines and objectives for watersheds and riparian conservation areas. In addition, plan components TERR-SH-DC 01-02 and TERR-SH-STD 01 ensure special habitat are maintained or improved, that refugia is provided for species with restricted distributions and that special habitat needs will be incorporated in project design and implementation. A desired condition for Conservation Watersheds (MA-CW-DC 02) mitigates key threats from disturbance events like wildfires, floods, and landslides, which can reduce hydrologic connectivity and eliminate spring habitat.

While loss of meadow riparian habitat is mitigated by a number of ecosystem-level plan components, several species-specific plan components provide additional clarity and emphasis. For example, WTR-FW-DC 05, 07 provides direction for maintaining habitat for at-risk species where stream diversions or other flow modifications are not regulated by the Federal Energy Regulatory Commission. SPEC-FW-GDL 05 ensures water developments (such as a diversion or well) should be avoided near streams or seeps and springs where there is high risk of dewatering aquatic and riparian habitats where at-risk species occur. Desired conditions for conservation watersheds and riparian conservation areas (MA-CW-DC 01, 03; MA-RCA-DC 02) provide high-quality habitat and functionally intact ecosystems that contribute to the persistence of species of conservation concern.

Threats Not Under Forest Service Control

- Water diversions and impoundments that occur outside the national forest boundary, growing water use demands.
- Loss of seeps, springs, and riparian habitat due to drought, and changes in precipitation patterns and snowpack related to climate change.

Water resource management activities, including maintaining perennial water quality, quantity, and timing of flows play a critical role in overall ecological function and sustainability of groundwater-dependent ecosystems and most of these activities are regulated outside the national forest boundary. Ecosystem-level plan components for Watersheds (WTR-FW-DC 01-04, 07 and WTR-FW-STD 01-03) provide for healthy riparian and aquatic ecosystems within management authority, but because of growing population demands and off-forest consumption of water resources, these habitats may not realize their full recovery potential, limiting the Inyo National

Forest's ability to provide for species viability. Several goals, however, provide a vision for working across land boundaries to collectively attain desired conditions. A watershed goal (WTR-FW-GOAL 01) encourages collaborative work between adjacent land owners and agencies to improve watersheds across ownership boundaries while a goal for riparian conservation areas (MA-RCA-GOAL 01) promotes coordination with State fish and wildlife agencies to address native aquatic species issues, including evaluating management and monitoring needs to address aquatic species requirements across ownership boundaries. Finally, several goals for special habitats promote (TERR-SH-GOAL 01-02) promote cooperative partnerships to study, monitor and restore special habitats and to makes sure they are accurately documented within the corporate geographic information system.

These strategies should collectively improve habitat for Kern Plateau salamander; although climate change effects coupled with prolonged drought could be an additive risk factor by eliminating the moist microsite conditions needed by salamanders.

Summary

Although this salamander is largely restricted to the Kern Plateau and western portions of Owens Valley, it appears to be well distributed throughout its range. Most populations are not imperiled by ongoing threats or known to be declining. However, habitat on the Inyo National Forest may be naturally limited and increased wildland fire events coupled with subsequent flash-floods that scour habitat are potential risk factors. Springs are sensitive water features due to their relative rarity, their small area, and their ecological importance relative to their size. Any activities that disrupt water flow puts spring ecosystems at risk. In addition, persistence of the salamander populations may be closely tied to climate variations that affect their habitat, especially if they experience extreme drying trends, or stochastic events such as flash floods. Given its endemism, restricted range and susceptibility to these environmental events, there is substantial concern for this species' ability to persist in the plan area. The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of Kern Plateau Salamander within its range. However, key risk factors including climate change, groundwater pumping and water diversions that occur outside the national forest that are not within Forest Service management authority will continue to impact spring habitat making it difficult to maintain viability in the plan area.

California Golden Trout

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of the California Golden Trout in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Rivers and large streams with cold, clean water and where pooling habitat/undercut banks and emergent vegetation is present.

Table 14 summarizes key threats, plan components, and expected effects on California golden trout.

Table 14. Key threats, plan components and expected effects on California Golden Trout

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Human-caused activities include eutrophication due to agricultural runoff and urbanization, sedimentation that smothers pooling habitat and undercut banks. Water diversions that reduce and alter instream flow hydrology regimes, mining, including suction dredge operations. This also includes grazing and water impoundments that reduce current velocities and allow for sediment deposition.	WTR-FW-DC 01-07 WTR-FW-STD 01-03 SPEC-FW-STD 01 SPEC-FW-GDL 05 RANG-FW-GOAL 03 RANG-FW-STD 07 MA-RCA-DC 10 MA-RCA-STD 02, 03, 06-13, 15-16 MA-RCA-GDL 01-03	SPEC-GT-STD MA-RCA-DC 11	Plan components provide direction to maintain adequate water quality and availability—supports ecosystem integrity and resilience and maintains ecosystem conditions needed for life cycle. Plan components also include direction to minimize the impacts of water diversions that reduce water quantity and quality due to management activities.
Introduction of exotic species (non-native trout).	INV-FW-DC 01-02 INV-FW-GOAL 01 & 03 INV-FW-STD 01 MA-RCA-GOAL 01 & 02 INV-FW-GOAL 01 & 03	N/A	Plan components address the issue of exotic species and direction to manage and prevent exotics.
Climate change and changes in stream temperatures due to management activities. Loss of quality habitat due to land management activities that degrade or eliminate habitat.	MA-RCA-DC 10 &11 MA-RCA-STD 01, 04, 05, 07,09-13, 15-16 MA-RCA-GDL 01-03 INV-FW-GOAL 03 RCA-RIV-DC 01-06 RCA-RIV-OBJ 01-02 MA-CW-DC 01-03 MA-CW-OBJ 03 MA-CW-GDL 01-03	SPEC-GT-STD MA-RCA-DC 01-11 MA-RCA-GDL 05, 07	Plan components provide for ecological integrity of aquatic systems so that they are resilient to climate change and other demands, necessary for providing adequate stream habitat.

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
General population loss/collapse Hybridization/Competition	SPEC-FW-DC 01-04 SPEC-FW-GOAL 03, 04 SPEC-FW-GDL 03 MA-RCA-DC 01-08 & 11 MA-RCA-GOAL 01 & 02	SPEC-GT-GOAL MA-RCA-DC 11 MA-RCA-GDL 05, 07	Plan components ensure that management activities promote ecological conditions that support the habitat components necessary to sustain healthy, functioning population levels within the inherent capability of the landscape. Plan components provide direction to work with Federal, State and Tribes and other agencies to collaborate on restoring and maintaining at risk species and their habitat.

Information on Current Distribution of the Species in the Planning Unit

California golden trout are endemic to the South Fork of the Kern River and Golden Trout Creek both located in an area referred to as the Kern Plateau in the Golden Trout Wilderness. A hatchery exists in the Cottonwood Lakes drainage which is used to transplant the golden trout into other lakes within the Sierra Nevada Mountains. According to the NRIS aquatic survey database, golden trout are distributed across all four ranger districts on the Inyo National Forest. They occupy all historic habitat within Golden Trout Creek (which is also a critical aquatic refuge (CAR)) but only occupy about 25 percent of their historic habitat within the South Fork of the Kern River. There is also a population in Mulkey Creek that was transplanted above a natural barrier. Total population size has likely decreased from reference conditions in concordance with decrease in occupied habitat.

Populations of golden trout within Mulkey Meadow indicate densities of fish from three different sections to be relatively high, between 5,336 and 5,667 fish per mile (CDFG 2008). Populations in California golden trout were estimated at 10.39 fish per mile, Siberian Creek estimated at 5,650 per mile and Stokes Stringer estimated at 3,488 per square mile. Populations appear to fluctuate due to width of the stream and quality of habitat. Other estimates from DFW in 1987 and 1988 for population estimates in Templeton and Ramshaw meadows indicated population numbers ranged from 3,278 to 7,332 fish per mile. Further data would need to be collected to correlate stream size (width), habitat condition and annual climate conditions to equalize population estimates with current Forest management and have a better understanding of trends.

Key Ecological Conditions in Plan Area

Key ecological conditions for California golden trout include sufficient water quality (cold water less than 24 degrees Celsius, with pooling habitat, undercut banks and emergent vegetation) and quantity. On the Inyo National Forest, these conditions can be found primarily found in the Golden Trout Wilderness (196,630 acres) on the southernmost portion of the Inyo which is known for large, open meadows surrounded by forests of subalpine conifers, red fir, lodgepole pine, and pinyon-juniper.

All perennial flowing stream reaches within the plan area on the Kern Plateau provide physically suitable habitat for California golden trout. This includes approximately 85,000 acres of land, to include approximately 49 miles of reliable perennial stream, within the South Fork Kern River watershed and 35,000 acres (39 miles of stream) within the Golden Trout Creek watershed.

The North Fork Kern River and South Fork Kern River have been designated as wild and scenic rivers and the Inyo National Forest portion is a ¼-mile-wide corridor on the east side of the North Fork Kern River approximately 11.7 miles long, where it forms the boundary with Sequoia National Park and Sequoia National Forest. The remainder is within Sequoia National Park and Sequoia National Forest. The portion administered by the Inyo National Forest is located within the Golden Trout Wilderness. Approximately 28.2 miles of the South Fork Kern River is within the Inyo National Forest or along the boundary with the Sequoia National Forest.

The Kern Allotment group occurs within the southern portion of the Inyo National Forest within the Sierra Nevada mountain range. Except for a small portion on the Monache Allotment (Monache Meadow), all four allotments in this group occur within the Golden Trout Wilderness.

Key Threats to Persistence

Hybridization and competition with rainbow and brown trout in the South Fork of Kern River is a persistent threat in addition to high levels of endemism which put them at greater risk from events such as flooding, wildfire, and drought. Hybridization has already occurred to some degree in a majority of golden trout populations, but is kept in check by existing barriers. Additional hybridization may occur within fragmented habitats as pure individuals mate with hybrids, but the degree to which this occurs is unknown. Brown trout prey extensively on golden trout below Templeton Barrier which may result in a severe decline of golden trout in this reach.

Overfishing and heavy grazing were primary stressors in the 19th and first half of the 20th century; however, current cattle management on the Inyo focuses on restoring the hydrologic and vegetative function of meadows in golden trout habitat. Fishing opportunities and recreation uses are expected to continue and impacts from those activities will continue to occur. Angling opportunities on the national forest include the chance to catch California Golden Trout in their native habitat of the South Fork Kern River and Golden Trout Creek. A hatchery exists in the Cottonwood Lakes drainage, which is used to transplant golden trout into other lakes within the Sierra Nevada Mountains and the California Department of Fish and Wildlife is expected to continue this fish stocking program.

It is important to note that these potential threats are all addressed by the Conservation Assessment and Strategy for the California Golden Trout (Stephens et al 2004). Additionally, a Comprehensive Management Plan for the North Fork and South Fork of the Kern Wild and Scenic River was completed in September, 1994 (USDA Forest Service 1994) and provides overall management direction for the wild and scenic river segments.

Threats Under Forest Service Control

- Any activities that alter water flow and hydrologic regime (grazing and water impoundments).
- Loss or degradation of habitat due to land management activities within the national forest boundary.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 14 above.

- Watersheds
- Management Areas (Riparian Conservation Areas, Conservation Watersheds)
- Riparian Conservation Areas (Rivers and streams)
- Rangeland Livestock Grazing
- Invasive Species
- Components for Animal and Plant Species

Threats Not Under Forest Service Control

- Any activities that alter water flow and hydrologic regime (grazing and water impoundments) that occur outside the national forest boundary, along with growing water use demands.

- Loss or degradation of habitat due to drought, flash floods and changes in precipitation patterns and snowpack related to climate change.
- General population loss/collapse
- Hybridization with non-natives

Summary

The California golden trout is an endemic fish species, limited to a small portion of suitable habitat on the Inyo National Forest. While the ecological conditions that the trout depends on appear generally stable or are trending in a positive direction based on current management, there is still substantial concern for the species persistence by simple virtue of its rarity coupled with the potential for genetic introgression and competition from nonnative fish species. Uncertainty with regard to climate change-related effects poses an additional longer term threat. As a result of its rarity and limited distribution, this species is highly susceptible to unpredictable events and drying conditions that may result from increasing temperatures and other climate change-related disturbance in the future. Its isolated populations put it at further risk for localized extinctions.

The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of California golden trout within its range. However, due to uncertainty about the species' current viability, the potential for hybridization with nonnatives, general population loss or collapse, the limited amount of habitat on the Inyo National Forest, and potential future threats associated with climate change and ground water use, it is not within the inherent capability of the land to maintain or restore the ecological conditions to maintain a viable population of California Golden Trout within the plan area.

Sierra Sulphur

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of Sierra sulphur in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: High elevation, perennially wet marshes and wet meadows near springs, seeps and riparian areas where host plant *Vaccinium cespitosum* occurs.

Table 15 summarizes key threats, plan components, and expected effects on Sierra sulphur.

Information on Current Distribution of the Species in the Planning Unit

The Sierra sulphur is a high-elevation meadow species of butterfly that is endemic to the Sierra Nevada of California. It occurs mainly in meadows over 9,000 feet in elevation (Schoville et al. 2011, Schoville et al. 2012). The range of the Sierra sulphur is restricted to the following counties in California from the north to the south: Tuolumne, Mono, Mariposa, Madera, Fresno, Inyo, and Tulare (Schoville et al. 2011).
This species is found on the Inyo National Forest, although records are limited to three observations. The northern portion of the range (Mariposa, Mono and Tuolumne counties) appear to be genetically different than the southern portion of the range. For the Inyo National Forest, there appears to be a congregation near Mono Lake and one to the south in Inyo and Tulare

counties. Based on an average dispersal distance of 1.2 kilometers, it is highly unlikely that these two populations interact with one another.

Table 15. Key threats, plan components and expected effects on Sierra sulphur

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Drying of microsite conditions that include permanent wet meadow habitat, springs and seeps (groundwater dependent ecosystems) with riparian vegetation, refugia substrate and host plant species. Loss of habitat due to climate change or other stochastic events. Loss of habitat due to invasive plant species outcompeting native host plants.	WTR-FW-DC 01-03 TERR-SH-DC 01-03 TERR-SH-GOAL 01 & 02 INV-FW-DC 01 & 02 INV-FW-GOAL 01-04 INV-FW-STD 01-03 INV-FW-GDL 01-05 MA-RCA-DC 01-07 MA-RCA-GOAL 02 MA-RCA-STD 06, 08- 09 RCA-MEAD-DC 01-08 RCA-RIV-DC 01-06 RCA-LPP-DC 01 RCA-SPR-DC 01-03	MA-CW-DC 01-03 TERR-SH-DC 02, 03	Plan components ensure healthy functioning watersheds will continue to supply ground water flow and recharge necessary to maintain habitat. Plan components ensure healthy habitat is available for species to complete life cycle needs and will be resilient to climate change.
Direct mortality due to activities that cause a loss of habitat or loss of host plant species, including timber harvest near wet meadows and activities that reduce water in wet meadow habitat or riparian areas. This includes grazing and water impoundments that reduce current velocities and allow for sediment deposition or loss of springs and seeps from historic livestock and wild horse grazing.	WTR-FW-STD 01-04 TERR-SH-STD 01 SPEC-FW-DC 01-04 REC-FW-GDL 01 & 03 RANG-FW-GOAL 03 MA-RCA-DC 04-08, 10 MA-RCA-STD 1-13, 15 & 16 MA-RCA-GDL 01-04, RCA-MEAD-OBJ 01	SPEC-FW-DC 01-04 SPEC-FW-GOAL 01-04 SPEC-FW-STD 01 SPEC-FW-GDL 04 & 05	Plan components maintain ecosystem integrity for fine-scale refugia habitat for this species, will ensure forest activities maintain wet meadow habitat, spring / seeps / marshes and also manage for and or remove livestock from riparian conservation areas as needed so that special aquatic and terrestrial features are in proper functioning condition.

Key Ecological Conditions in Plan Area

The Sierra sulphur is a species endemic to high-elevation wet meadows where *Vaccinium cespitosum* occurs. In addition, this species is dependent upon meadows with unimpaired hydrology; therefore, any factors that result in a lower water table could affect the habitat elements the species relies upon, especially the larval host plant dwarf bilberry (*Vaccinium cespitosum)* and nectaring plants.

Key Threats to Persistence

Threats include drying of microsite conditions, conifer encroachment on meadow habitat, loss of habitat due to human activities, direct mortality due to loss of host plant availability and climate change.

Numerous meadows in the high Sierra have been degraded in the past from a variety of causes including logging, overgrazing, and railroad and road construction (Loheide and Gorelick 2007, Viers et al. 2013). In many cases, the streams in degraded meadows have incised within the meadow and have associated poor streambank stability, headcuts, lack of riparian vegetation, and other factors that make them vulnerable to further degradation. Within the range of the Sierra sulphur, logging and road construction (including railroads) are no longer occurring and grazing is very limited within the range of the species. In meadows with unstable stream channels, poorly managed livestock grazing (overgrazing) has the potential to further degrade the meadow by maintaining streambank instability, thereby making the meadow vulnerable to continued incision and disassociation with the floodplain (Loheide and Gorelick 2007). Livestock browsing on and trampling dwarf bilberry could inadvertently remove individuals from colonized plants and reduce the amount of vegetation available to caterpillars of C. *behrii*.

Conifer encroachment into meadows and climate change are two other threats to the habitats the Sulphur relies upon (Scheingross 2007). Conifer encroachment has been observed in several high-elevation mountainous meadow situations and may be attributed to climatic changes, fire suppression, or grazing (Rochefort et al. 1994, Millar et al. 2004, Halpern et al. 2010). In wet meadows, conditions are generally unfavorable for conifer establishment primarily due to intense competition from obligate meadow species, but as high elevation meadows become drier (for example, periods of drought or lowered water table) and temperatures increase, they become more suitable for conifer encroachment and meadow loss (Millar et al. 2004, Viers et al. 2013). Since the largest populations of the Sierra sulphur are associated with large meadows (and smaller populations in smaller meadows (Schoville 2017)), meadow loss is a threat to the species.

Climate change is potentially the greatest threat to the continued persistence of the Sierra sulphur according to NatureServe. The species is already restricted to the highest elevation meadows in the Sierra Nevada and has a limited amount of upward elevational relief available to use if lower elevation sites become unsuitable through climate change impacts. Potential effects include reduced snowpack, earlier melting of snowpack, greater variability in precipitation, and warmer temperatures (Null et al. 2010, Viers et al. 2013). The amount and persistence of snowpack are important variables in maintaining high water tables and wet meadow conditions. The Sierra sulphur is dependent upon meadows with unimpaired hydrology; therefore, any factors that result in a lower water table could affect the habitat elements the species relies upon, especially the larval host plant (dwarf bilberry) and nectaring plants. Dwarf bilberry growing in drier or degraded meadows may not provide the high quality larval food resource that bilberry growing in wet habitats does (Schoville 2017). Specific to the Sierra sulphur, Scheingross (2007) used BIOCLIM and MAXENT models to predict the range of *C. behrii* based on climate change predictions. The modeling predicted a contraction of range, with most of the suitable habitat remaining in the higher, southern portion of the species' range (Scheingross 2007).

Threats Under Forest Service Control

- Any activities that alter water flow and hydrologic regime (grazing and water impoundments).
- Loss or degradation of habitat due to land management activities within the national forest boundary.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 15 above.

- Watersheds
- Terrestrial Ecosystems and Vegetation (Special Habitats)
- Management Areas (Riparian Conservation Areas, Conservation Watersheds)
- Riparian Conservation Areas (Meadows; lakes and ponds; rivers and streams; seeps and springs)
- Rangeland Livestock Grazing
- Invasive Species
- Components for Animal and Plant Species

Threats Not Under Forest Service Control

- Any activities that alter water flow and hydrologic regime of habitat (grazing and water impoundments) and occur outside the national forest boundary, along with growing water use demands.
- Loss or degradation of habitat due to drought and changes in precipitation patterns and snowpack related to climate change.
- Invasive plant species outcompeting host plant species.

Summary

The Sierra sulphur is a species endemic to high elevation wet meadows where *Vaccinium cespitosum* occurs. In addition, this species is dependent upon meadows with unimpaired hydrology; therefore, any factors that result in a lower water table could affect the habitat elements the species relies upon, especially the larval host plant dwarf bilberry (*Vaccinium cespitosum)* and nectaring plants. This butterfly relies on the dwarf bilberry for larval foraging with the highest quality forage provided by early plant growth from plants growing in wet sites. Dispersal between sites is limited by the distance that adults travel, especially in their alpine environment where numerous barriers to dispersal occur. Some large populations occur; however, many of the southern and lower elevation occurrences have lower population sizes. There also appears to be a dispersal barrier connecting northern and southern populations that will influence gene flow among populations within the range of the species.

Climate change may be the primary impact on the habitat of this species. Any changes in water availability or bloom of the host plant may be restricting the species survival rate. Already restricted to the highest elevation meadows in the Sierra Nevada, there is a limited amount of upward elevational relief available to utilize if lower elevation sites become unsuitable. In addition, water withdrawal or modification and grazing could potentially impact this species habitat.

The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of Sierra sulphur within its range. However, due to uncertainty about the species current viability, the potential for habitat loss/degradation, general population loss or collapse due to direct mortality, the limited amount of habitat and potential for host species plant species on the Inyo National Forest, and potential future threats

associated with climate change, it is not within the inherent capability of the land to maintain or restore the ecological conditions to maintain a viable population of Sierra sulphur within the plan area.

Square Dotted Blue Butterfly

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of square dotted blue butterfly in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: High elevation, scree slopes, barren ridges and pumice fields where host plant *Eriogonum* species (buckwheat plants) occur.

Table 16 summarizes key threats, plan components, and expected effects on square dotted blue butterfly.

Table 16. Key threats, plan components and expected effects on square dotted blue butterfly

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Loss of microsite conditions that include meadow habitat with buckwheat host plant species present due to climate change or other stochastic events. Loss of habitat due to invasive plant species outcompeting native host plants.	WTR-FW-DC 04 TERR-FW-DC 01-05 TERR-SH-GOAL 01 & 02 SPEC-FW-DC 01, 02 & 04 INV-FW-DC 01 & 02 INV-FW-GOAL 03 INV-FW-STD 02 INV-FW-GDL 01-05 RCA-MEAD-DC 01-08	TERR-FW-DC 06 TERR-SH-DC 02, 03 TERR-SAGE-DC 01, 04 & 05 TERR-PINY-DC 01, 03 & 04 TERR-XER-DC 01	Plan components ensure healthy habitat is available for species to complete life cycle needs and will be resilient to climate change.
Direct mortality due to activities that cause a loss of habitat or loss of host plant species, including pumice harvest, other mining activities and off-highway vehicle use.	TERR-SH-DC 01 TERR-SH-STD 01 SPEC-FW-DC 03 SPEC-FW-GOAL 01-04 SPEC-FW-STD 01 SPEC-FW-GDL 04 INV-FW-GOAL 01-04 INV-FW-GDL 01-05 REC-FW-GDL 01 & 03 RCA-MEAD-OBJ 01	TERR-SAGE-DC 02 & 03 TERR-XER-DC 02 TERR-XER-STD 01 TERR-XER-GDL 01	Plan components maintain ecosystem integrity for fine-scale refugia habitat for this species, will ensure forest activities maintain open habitat where host plant and ant species occur. Plan components provide direction to maintain preferred habitat.

Information on Current Distribution of the Species in the Planning Unit

The species has a spotty distribution from Washington south to Baja California Norte, thence west to southern Colorado and New Mexico. However, this subspecies is found at Badger Flat in Inyo Mountains (Davenport 2016) ranging from 8,000 to 13,000 feet on scree slopes, barren ridges, and pumice fields. Geographically close to *Euphilotes battoides hadrochilus* but phenotypically are strikingly different.

Key Ecological Conditions in Plan Area

Key ecological conditions include the food plant *Eriogonum umbelatum subaridum* and the subspecies is univoltine and flies during July (Davenport et. al. 2006). Caterpillar plant host may be various wild buckwheats (*Eriogonum* species) including coastal buckwheat and sulphur-flower. The larvae feed on the flowers and fruits of *Eriogonum* species. The larvae are tended by ants. The species overwinters in its chrysalids in sand or leaf litter. Scree slopes, barren ridges and pumice fields appear to be preferred habitat (Davenport 2016).

Key Threats to Persistence

Threats include loss of microsite conditions, loss of habitat due to human activities, direct mortality due to loss of host plant availability and climate change.

Threats Under Forest Service Control

- Loss or degradation of habitat due to land management activities within the national forest boundary.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 16 above.

- Watersheds
- Terrestrial Ecosystems and Vegetation (Special Habitats, Sage, Xeric, Pinyon)
- Management Areas (Riparian Conservation Areas, Conservation Watersheds)
- Riparian Conservation Areas (Meadows)
- Rangeland Livestock Grazing
- Invasive Species
- Recreation
- Components for Animal and Plant Species

Threats Not Under Forest Service Control

- Any activities that alter habitat and occur outside the national forest boundary.
- Loss or degradation of habitat due to drought and changes in precipitation patterns and snowpack related to climate change.
- Invasive plant species outcompeting host plant species.

Summary

The species is known from only one location on the Inyo National Forest. Any modification to the area that could impact the host plant, the ants, or individuals would have a deleterious effect on the species. Climate change could shift the species range up elevation with would eliminate the host plant, the ant, or the butterfly.

Impacts to the square dotted blue butterfly may arise from human-caused activities that include the use of pesticides and herbicides treating undesirable species and noxious weeds. Off-highway vehicles may enter into this area as there are 4-wheel drive trails in and adjacent to Badger Flats and Mazourka Peak. At the top of Mazourka Peak, there is a radio facility. In addition, numerous

mines are in its vicinity. Potential of harvesting pumice is of concern if any modification to the host plant or the ants would be at risk.

The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of square dotted blue butterfly within its range. However, due to uncertainty about the species' current viability, the potential for habitat loss and degradation, general population loss or collapse due to direct mortality, the limited amount of habitat and potential for host species plant species on the Inyo National Forest, and potential future threats associated with climate change, it is not within the inherent capability of the land to maintain or restore the ecological conditions to maintain a viable population of square dotted blue butterfly within the plan area.

Mono Lake Checkerspot Butterfly

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of Mono Lake checkerspot butterfly in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Perennially wet marshes and wet meadows near springs, seeps and riparian areas where host plant, *Collinsia parviflor*a, may occur.

Table 17 summarizes key threats, plan components, and expected effects on Mono Lake checkerspot butterfly.

Information on Current Distribution of the Species in the Planning Unit

Edith's checkerspot, *Euphydryas editha* is a highly variable species occurring across the western United States, with at least 12 subspecies recognized in California (Crabtree 1998). Populations of subspecies are highly localized and adult butterflies do not disperse much beyond the localized habitats where their larval food plants occur (Baughman and Murphy 1998). Generally, this species is known to occur in wet meadows and pine forests on the east slope of the Sierra Nevada Mountains in Alpine and Mono Counties. Mono Lake Checkerspot occur in scattered colonies on the east side of the Sierras in Great Basin Scrub habitat, from east below Sonora Pass to Big Pine Creek Canyon.

Table 17. Key threats, plan components and expected effects on Mono Lake checkerspot butterfly

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Drying of microsite conditions that include permanent wet meadow habitat, springs and seeps (groundwater dependent ecosystems)	WTR-FW-DC 01-03 TERR-SH-DC 01-03 TERR-SH-GOAL 01 & 02 INV-FW-DC 01 & 02 INV-FW-GOAL 01-04	MA-CW-DC 01-03 TERR-SH-DC 02 & 03	Plan components ensure healthy functioning watersheds will continue to supply ground water flow and recharge necessary to maintain habitat.

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
with riparian vegetation, refugia substrate and host plant species. Loss of habitat due to climate change or other stochastic events. Loss of habitat due to invasive plant species outcompeting native host plants.	INV-FW-STD 01-03 INV-FW-GDL 01-05 MA-RCA-DC 01-07 MA-RCA-GOAL 02 MA-RCA-STD 06, 08-09 RCA-MEAD-DC 01-08 RCA-RIV-DC 01-07 RCA-LPP-DC 01 RCA-SPR-DC 01-03		Plan components ensure healthy habitat is available for species to complete life cycle needs and will be resilient to climate change.
Direct mortality due to activities that cause a loss of habitat or loss of host plant species, including timber harvest near wet meadows and activities that reduce water in wet meadow habitat or riparian areas. This includes grazing and water impoundments that reduce current velocities and allow for sediment deposition or loss of springs and seeps from historic livestock and wild horse grazing.	WTR-FW-STD 01-04 TERR-SH-STD 01SPEC-FW-DC 01-04 REC-FW-GDL 01 & 03 RANG-FW-GOAL 03 MA-RCA-DC 04-08, 10 MA-RCA-STD 1-13, 15 & 16 MA-RCA-GDL 01-04, RCA-MEAD-OBJ 01	SPEC-FW-DC 01-04 SPEC-FW-GOAL 01-04 SPEC-FW-STD 01 SPEC-FW-GDL 04 & 05	Plan components maintain ecosystem integrity for fine-scale refugia habitat for this species, will ensure forest activities maintain wet meadow habitat, spring/seeps/marshes and also manage for and or remove livestock from riparian conservation areas as needed so that special aquatic and terrestrial features are in proper functioning condition.

Mono Lake checkerspot was previously described as having potentially been extirpated. Dr. Kenneth Davenport provided updated information about his collection of 20 specimens from 1979 to 2014, many of which came from the Inyo National Forest, but the exact number is unknown (Davenport 2016, pers. comm). One record also exists on the Inyo and is documented in Butterflies and Moths of North America (www.butterfliesandmoths.org/sighting_details/476786); however, no photograph was included with the record. The range extent is from eastern slope of Sierra Nevada, from Bishop, CA to Schneider Meadow, near Carson City, NV; from pinon-juniper woodland, meadows, mountain slopes; host may be *Collinsia parviflora* based on association of adults.

Key Ecological Conditions in Plan Area

Generally, this species is known to occur in perennially wet marshes, wet meadows near springs, seeps and riparian areas where host plant occurs. Host plant may be *Collinsia parvifloria* based on association of adults (NatureServe 2017).

Key Threats to Persistence

Key threats include drying of microsite conditions, loss of habitat due to human activities or climate change and direct mortality due to loss of host plant availability. Threats may also arise from human-caused activities that include the use of pesticides treating invasive species.

Threats Under Forest Service Control

- Any activities that alter water flow and hydrologic regime of microsite conditions (grazing and water impoundments).
- Loss or degradation of habitat due to land management activities within the national forest boundary.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 17 above.

- Watersheds
- Terrestrial Ecosystems and Vegetation (Special Habitats)
- Management Areas (Riparian Conservation Areas, Conservation Watersheds)
- Riparian Conservation Areas (Meadows; lakes and ponds; rivers and streams; seeps and springs)
- Rangeland Livestock Grazing
- Invasive Species
- Components for Animal and Plant Species

Threats Not Under Forest Service Control

- Any activities that alter water flow and hydrologic regime of habitat (grazing and water impoundments) and occur outside the national forest boundary, along with growing water use demands.
- Loss or degradation of habitat due to drought and changes in precipitation patterns and snowpack related to climate change.
- Invasive plant species outcompeting host plant species.

Summary

Mono Lake checkerspot is an endemic butterfly that ranges from Sonora Pass to Mono Lake. Species have been recently documented on the Inyo National Forest, were a portion of the population was once thought extinct at Mono Lake. Impacts to the Mono Lake checkerspot may arise from human-caused activities that include the use of pesticides to treat invasive species. Habitat loss due to conifer encroachment on meadows and habitat loss due to climate change could also impact this species.

The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of Mono Lake checkerspot within its range. However, due to uncertainty about the species current viability, general population loss or

collapse, the limited amount of habitat on the Inyo National Forest, and potential future threats associated with climate change, it is not within the inherent capability of the land to maintain or restore the ecological conditions to maintain a viable population of Mono Lake checkerspot within the plan area.

Boisduval's Blue Butterfly

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of Boisduval's blue butterfly (*Plebejus icarioides)* in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Forest clearings and edges, prairies, sagebrush, chaparral, coastal dunes and open fields, where host plant species occur (lupine, pussy paws, buckwheat and other composites).

Table 18 summarizes key threats, plan components, and expected effects on Boisduval's blue butterfly.

Information on Current Distribution of the Species in the Planning Unit

Boisduval's blue butterfly has a wide distribution with occurrences from British Columbia east to the western edge of the Great Plains, south to New Mexico, Arizona, southern California, and Baja California. Generally, this species is found in forest clearings and edges, prairie, sagebrush, chaparral, coastal dunes, fields.

Many of the subspecies of Boisduval's blue butterfly are rare to their known locality and do separate by species even at a puddle (Shapiro 2017). From Shapiro (2017), Boisduval's blue butterfly has one brood, from April-June at Gates Canyon, and from June-August (rarely later) at higher elevations. Their host plants are many species of perennial lupines, but tend to have the preferred species varying by locality. Adults visit a great variety of flowers, including pink pussy paws, wild buckwheats, composites, and the like. In Sierra Valley they can often be found with the host plant far out in sagebrush steppe, where nothing (or nothing but lupine, which they do not use as a nectar source) seems to be in bloom.

Very little is known about subspecies *Plebejus icarioides inyo*. They are considered widespread in the Inyo Mountains. Annual surveys from 2005 to 2012 have a total of 1,145 recorded detections of this species throughout the Inyo Mountains (Schlick 2015). Sightings of Boisduval's blue in the Inyo Mountains occur all the way to 2016 in the Biodiversity Information Serving Our Nation (BISON) database. The Inyo Mountains are the only known location for this subspecies.

Table 18. Key threats, plan components and expected effects on Boisduval's blue butterfly

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Loss of habitat due to climate change or other stochastic events. Loss of habitat due to invasive plant species outcompeting native host plants.	WTR-FW-DC 04 TERR-FW-DC 01-05 TERR-SH-GOAL 01 & 02 SPEC-FW-DC 01, 02 & 04 INV-FW-DC 01 & 02 INV-FW-GOAL 04 INV-FW-STD 02 RCA-MEAD-DC 01-08	TERR-FW-DC 06 TERR-SH-DC 02, 03 TERR-SAGE-DC 01, 04, 05 TERR-PINY-DC 01, 03, 04 TERR-XER-DC 01	Plan components ensure healthy functioning watersheds will continue to supply ground water flow and recharge necessary to maintain habitat. Plan components ensure healthy habitat is available for species to complete life cycle needs and will be resilient to climate change.
Direct mortality due to activities that cause a loss of habitat or loss of host plant species. This includes herbicide use, pesticide use, timber harvest, grazing and water impoundments from historic livestock and wild horse grazing that cause direct habitat loss or harm individuals. Recreation use may pose a threat to a loss of habitat or harm to individuals.	TERR-SH-DC 01 TERR-SH-STD 01 SPEC-FW-DC 03 SPEC-FW-GOAL 01-04 SPEC-FW-STD 01 SPEC-FW-GDL 04 INV-FW-GOAL 01 & 02 INV-FW-GDL 01-05 REC-FW-GDL 01 & 03 RCA-MEAD-OBJ 01	TERR-SAGE-DC 02 & 03 TERR-XER-DC 02 TERR-XER-STD 01 TERR-XER-GDL 01	Plan components maintain ecosystem integrity for fine-scale refugia habitat for this species, will ensure forest activities maintain open habitat where lupine occurs. Plan components provide direction to maintain preferred habitat. Remove livestock from areas where there is a risk of losing habitat where lupine occurs.

Key Ecological Conditions in Plan Area

The species only occurs in the Inyo Mountains, in forest clearings and edges, prairies, sagebrush, chaparral, coastal dunes and open fields, where host plant species occur (lupine, pussy paws, buckwheat and other composites). Although the species is wide ranging, most of the subspecies are specific to localized areas.

Key Threats to Persistence

Key threats include drying of microsite conditions, loss of habitat due to human activities, climate change and direct mortality due to loss of host plant availability. In addition, invasive plant species such as cheatgrass may threaten an unknown proportion of the population, especially in areas where cheatgrass limits the establishment and persistence of native plant species. Any use of pesticides to remove invasive species could inadvertently impact the lupine or other nectar plant species. Other activities that could bisect or remove area suitable habitat include recreation development, mining, and road building.

Threats Under Forest Service Control

- Loss or degradation of habitat due to land management activities within the national forest boundary.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 18 above.

- Watersheds
- Terrestrial Ecosystems and Vegetation (Special Habitats, Sage, Xeric, Pinyon)
- Management Areas (Riparian Conservation Areas, Conservation Watersheds)
- Riparian Conservation Areas (Meadows)
- Rangeland Livestock Grazing
- Invasive Species
- Recreation
- Components for Animal and Plant Species

Threats Not Under Forest Service Control

- Any activities that alter habitat and occur outside the national forest boundary.
- Loss or degradation of habitat due to drought and changes in precipitation patterns and snowpack related to climate change.
- Invasive plant species outcompeting host plant species.

Summary

This species is only known on the Inyo Mountains. Impacts to the Boisduval's blue habitat may arise from human-caused activities that include the use of pesticides and herbicides treating undesirable species and noxious weeds, recreational developments, mining, and road building.

The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of Boisduval's Blue within its range. However, due to uncertainty about the species current viability, general population loss or collapse, the limited amount of habitat on the Inyo National Forest, and potential future threats associated with climate change, it is not within the inherent capability of the land to maintain or restore the ecological conditions to maintain a viable population of Boisduval's Blue within the plan area.

San Emigdio Blue Butterfly

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of San Emigdio blue in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Desert scrub habitats that include desert saltbush species (*Atriplex*) and associated scale insects and ants. Other key habitat features include shadescale

scrub in desert canyons and near washes and where the host plant species (*Atriplex canescens*) occurs.

Table 19 summarizes key threats, plan components, and expected effects on Mono Lake checkerspot butterfly.

Table 19. Key threats, plan components, and expected effects on San Emigdio blue butterfly

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Loss of habitat due to climate change or other stochastic events. Loss of habitat due to invasive plant species outcompeting native host plants.	WTR-FW-DC 04 TERR-FW-DC 01-05 TERR-SH-GOAL 01 & 02 SPEC-FW-DC 01, 02 & 04 INV-FW-DC 01 & 02 INV-FW-GOAL 01-04 INV-FW-STD 02 INV-FW-GDL 01-05 RCA-MEAD-DC 01-08	TERR-FW-DC 06 TERR-SH-DC 02, 03 TERR-SAGE-DC 01, 04 & 05 TERR-PINY-DC 01, 03 & 04 TERR-XER-DC 01	Plan components ensure healthy habitat is available for species to complete life cycle needs and will be resilient to climate change.
Direct mortality due to activities that cause a loss of habitat or loss of host plant species. This includes herbicide use, pesticide use, timber harvest, grazing and water impoundments from historic livestock and wild horse grazing that cause direct habitat loss or harm individuals. Recreation use may pose a threat to a loss of habitat or harm to individuals.	TERR-SH-DC 01 TERR-SH-STD 01 SPEC-FW-DC 03 SPEC-FW-GOAL 01-04 SPEC-FW-STD 01 SPEC-FW-GDL 04 INV-FW-GOAL 01 & 02 INV-FW-GDL 01-05 REC-FW-GDL 01 & 03 RCA-MEAD-OBJ 01	TERR-SAGE-DC 02 & 03 TERR-XER-DC 02 TERR-XER-STD 01 TERR-XER-GDL 01	Plan components maintain ecosystem integrity for fine-scale refugia habitat for this species, will ensure forest activities maintain open habitat where host plant and ant species occur. Plan components provide direction to maintain preferred habitat.

Information on Current Distribution of the Species in the Planning Unit

San Emigdio blue butterfly (*Plebejus emigdionis*) is a rare and localized species with collection records from the southern San Joaquin Valley and Mojave Desert south to the Victorville area. Known populations are from only about a dozen locations which are isolated from one another. The San Emigdio blue butterfly has been found on the Angeles, Inyo, Los Padres, San Bernardino, and Sequoia National Forests.

Isolated populations occur in the Owens Valley and it has been reported from Inyo, Kern, Los Angeles, San Bernardino and Ventura counties (Davenport 2004, Emmel and Emmel 1973, Garth and Tilden 1986). It has been collected along the Mojave River near Victorville (north of the San Bernardino National Forest). Isolated colonies have been reported from Bouquet and Mint Canyons near Castaic, in canyons along the north side of the San Gabriel Mountains near the

deserts edge, and in arid areas south of Mount Abel near San Emigdio Mesa (Emmel and Emmel 1973, Murphy 1990). The most concentrated area is around Sand Canyon and Lake Isabella. Pratt (2011) reports concerns of each of the populations are gradually being lost. Penrod *et al.* (2002) and Stephenson and Calcarone (1999) state that the San Emigdio blue populations have been in decline due to urbanization near Victorville and along the Mojave River.

Only known locations occur in the southern portion of the Inyo National Forest in the desert scrub habitats that include desert saltbush species (Atriplex) and associated scale insects and ants. This butterfly is rare and localized species ranging from 3,000 feet to 5,000 feet elevation in washes and alluvial fans (Schlick 2015).

Key Ecological Conditions in Plan Area

Key ecological conditions for this species include the presence of the ant species *Formica pilicornis*, in which this butterfly has a symbiotic relationship. Other key habitat features include shadescale scrub in desert canyons and near washes and where the host plant species (*Atriplex*) occurs.

Key Threats to Persistence

Threats include the drying of microsite conditions, loss of habitat due to human activities or climate change and direct mortality due to loss of host plant availability. Habitat is also subject to destruction due to agricultural and urban development.

The potential expansion of Highway 395 can potentially fragment the existing ecological conditions since the population is very localized. The population at Cartago is unique, and is in great danger of being exterminated if and when Highway 395 is widened at that point. The larval foodplant at Cartago is *Atriplex polycarpa* which is unusual because vast areas of desert are covered with *A. polycarpa* yet *emigdionis* is not found in these areas. At Cartago, the butterfly is able to use the *A. polycarpa* because it is heavily infested with a scale insect, which in turn is heavily tended by ants, and the ants also protect the *emigdionis* larvae. Without the ants, *emigdionis* could not survive. There are also possibly hydrologic factors at the Cartago site which make it favorable for the *emigdionis* larvae which spend most of their time on the *Atriplex* trunks just below soil level (Schlick 2015).

Threats Under Forest Service Control

- Loss or degradation of habitat due to land management activities within the national forest boundary.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 19 above.

- Watersheds
- Terrestrial Ecosystems and Vegetation (Special Habitats, Sage, Xeric, Pinyon)
- Management Areas (Riparian Conservation Areas, Conservation Watersheds)
- Riparian Conservation Areas (Meadows)
- Rangeland Livestock Grazing
- Invasive Species
- Recreation

- Components for Animal and Plant Species

Threats Not Under Forest Service Control

- Any activities that alter habitat and occur outside the national forest boundary.
- Loss or degradation of habitat due to drought and changes in precipitation patterns and snowpack related to climate change.
- Invasive plant species outcompeting host plant species.

Summary

This butterfly is rare and localized (only known locations occur in the southern portion of the Inyo National Forest in the desert scrub habitats that include desert saltbush species (*Atriplex*) and associated scale insects and ants) due in part to its symbiotic relationship with the ant species *Formica pilicornis*. This symbiotic relationship paired with potential habitat fragmentation or loss due to agricultural and urban expansion impact this species' ability to persist. Impacts to the San Emigdio blue habitat may arise from human-caused activities that include the use of pesticides and herbicides treating undesirable species and noxious weeds.

The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of San Emigdio blue butterfly within its range. However, due to uncertainty about the species' current viability; the potential for habitat loss and degradation; general population loss or collapse due to direct mortality; the limited amount of habitat and potential for host species loss due to loss of desert saltbush plant species on the Inyo National Forest; and potential future threats associated with climate change, it is not within the inherent capability of the land to maintain or restore the ecological conditions to maintain a viable population of San Emigdio blue butterfly within the plan area.

Apache Fritillary (Apache Silverspot Butterfly)

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of the Apache Fritillary in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Perennially wet marshes and wet meadows near springs, seeps and riparian areas where host plants occur, primarily violet (*Viola neprhropylla*) and secondarily, bull thistle (*Cirsium vulgare*) and lavender thistle (*Cirsium neomexicanum*).

Table 20 summarizes key threats, plan components, and expected effects on Apache fritillary.

Table 20. Key threats, plan components and expected effects on Apache fritillary

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Drying of microsite conditions that include permanent wet meadow habitat, springs and seeps (groundwater dependent ecosystems) with riparian vegetation, refugia substrate and host plant species. Loss of habitat due to climate change or other stochastic events. Loss of habitat due to invasive plant species outcompeting native host plants.	WTR-FW-DC 01-03 TERR-SH-DC 01-03 TERR-SH-GOAL 01 & 02 INV-FW-DC 01 & 02 INV-FW-GOAL 01-04 INV-FW-STD 01-03 INV-FW-GDL 01-05 MA-RCA-DC 01-07 MA-RCA-GOAL 02 MA-RCA-STD 06, 08, 09 RCA-MEAD-DC 01-08 RCA-RIV-DC 01-06 RCA-LPP-DC 01 RCA-SPR-DC 01-03	MA-CW-DC 01-03 TERR-SH-DC 02 & 03	Plan components ensure healthy functioning watersheds will continue to supply ground water flow and recharge necessary to maintain habitat. Plan components ensure healthy habitat is available for species to complete life cycle needs and will be resilient to climate change.
Direct mortality due to activities that cause a loss of habitat or loss of host plant species, including timber harvest near wet meadows and activities that reduce water in wet meadow habitat or riparian areas. This includes grazing and water impoundments that reduce current velocities and allow for sediment deposition or loss of springs and seeps from historic livestock and wild horse grazing.	WTR-FW-STD 01-04 TERR-SH-STD 01 SPEC-FW-DC 01-04 REC-FW-GDL 01 & 03 RANG-FW-GOAL 03 MA-RCA-DC 10 MA-RCA-DC 04-08, 10 MA-RCA-STD 1-13, 15 & 16 MA-RCA-GDL 01-04, RCA-MEAD-OBJ 01	SPEC-FW-DC 01-04 SPEC-FW-GOAL 01-04 SPEC-FW-STD 01 SPEC-FW-GDL 04 & 05	Plan components maintain ecosystem integrity for fine-scale refugia habitat for species like the fritillary, will ensure forest activities maintain wet meadow habitat, spring/seeps/marshes and also manage for and or remove livestock from riparian conservation areas as needed so that special aquatic and terrestrial features are in proper functioning condition.

Information on Current Distribution of the Species in the Planning Unit

Apache fritillary, *Speyeria nokomis apacheana,* is found on the east slope of the Sierra Nevada Mountains in Alpine, Inyo, and Mono Counties where it occurs in marshes and wet meadows near springs, seeps and riparian areas (Fleishman et al 2002, Britten et al. 2003). The larval food plant is the violet *Viola nephrophylla*. Typical habitats where Apache silverspot adults may be observed from late July to early September (Emmel and Emmel 1973, Davenport et al. 2006) are mountain meadows, forest openings and exposed rocky ridges. Since these habitats are highly localized, minimal migration occurs between populations.

The only known locations occur in Round Valley, Inyo County and Mono Lake area (Natureserve 2017).

Key Ecological Conditions in Plan Area

Key ecological conditions include perennially wet marshes and wet meadows near springs, seeps and riparian areas where host plants, primarily violet (*Viola neprhropylla*) and secondarily, bull thistle (*Cirsium vulgare*) and lavender thistle (*Cirsium neomexicanum*) occur.

Key Threats to Persistence

Threats include loss of meadows and riparian habitat due to changes in water levels, diversions, grazing, meadow drying and conifer encroachment, snowpack and changes in spring precipitation related to climate change. According to Fleishman et al (2002), loss of the violet, lavender thistle or bull thistle due to using pesticides for other species, would be a major threat to the species. In addition, loss of habitat due to invasive plant species outcompeting native host plants is a potential threat to this species.

Threats Under Forest Service Control

- Any activities that alter water flow and hydrologic regime (grazing and water impoundments).
- Loss or degradation of habitat due to land management activities within the national forest boundary.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 20 above.

- Watersheds
- Terrestrial Ecosystems and Vegetation (Special Habitats)
- Management Areas (Riparian Conservation Areas, Conservation Watersheds)
- Riparian Conservation Areas (Meadows; lakes and ponds; rivers and streams; seeps and springs)
- Rangeland Livestock Grazing
- Invasive Species
- Components for Animal and Plant Species

Threats Not Under Forest Service Control

- Any activities that alter water flow and hydrologic regime of habitat (grazing and water impoundments) and occur outside the national forest boundary, along with growing water use demands.
- Loss or degradation of habitat due to drought and changes in precipitation patterns and snowpack related to climate change.
- Invasive plant species outcompeting host plant species.

Summary

The Apache fritillary is known from a small distributional range and is thought to be from a range contraction since the Pleistocene. There are few known locations on the Inyo National Forest. Threats include loss of meadows and riparian habitat due to changes in water levels, diversions, grazing, meadow drying and conifer encroachment, snowpack, and changes in spring precipitation related to climate change. According to Fleishman et al (2002), loss of the violet,

lavender thistle or bull thistle due to using pesticides for other species, would be a major threat to the species.

The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of Apache Fritillary within its range. However, due to uncertainty about the species current viability, general population loss or collapse, the limited amount of habitat on the Inyo National Forest, and potential future threats associated with climate change, it is not within the inherent capability of the land to maintain or restore the ecological conditions to maintain a viable population of Apache Fritillary within the plan area.

A Cave Obligate Pseudoscorpion

Determination: The ecosystem plan components may not provide the ecological conditions necessary to maintain a viable population of this cave obligate pseudoscorpion, a species that is only known from the plan area. Therefore, additional species-specific plan components have been provided. The combination of ecosystem and species-specific plan components should provide the ecological conditions necessary to maintain a viable population of this cave obligate pseudoscorpion in the plan area.

General Key Ecological Conditions: Caves, where environmental conditions remain constant, like temperature and relative humidity.

Table 21 summarizes key threats, plan components, and expected effects on cave obligate pseudoscorpion.

Table 21. Key threats, plan components and expected effects on cave obligate pseudoscorpion

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Loss of habitat or direct mortality due to climate change or other stochastic events. Loss of habitat or direct mortality due to activities such as mining or recreational use in cave habitat.	TERR-SH-DC 01 TERR-SH-GOAL 01 TERR-SH-STD 01 SPEC-FW-DC 02 SPEC-FW-STD 01 SPEC-FW-GDL 04 REC-FW-GDL 03	TERR-SH-DC 02 TERR-SH-GOAL 02 SPEC-FW-DC 03 SPEC-FW-GOAL 01, 06	Plan components ensure healthy habitat is available for species to complete life cycle needs and will be resilient to climate change. Plan components ensure that habitat or known location(s) are protected.

Information on Current Distribution of the Species in the Planning Unit

The widely separated and restricted localities of the two species in this genus *T. aalbui* in California and *T. ubicki* in Arizona strongly suggest that these species are relicts of a formerly widespread ancestral population, fragmented by desertification in the intervening areas. It will not be surprising if additional representatives of this genus are found in other montane or

subterranean refugia in California and Arizona (Muchmore 1997). In the Biodiversity Information Serving Our Country (BISON) database, only two locations are noted but not georeferenced for the Genera.

This species type locality is from Poleta Cave, Westgard Pass, Inyo-White Mountains, Inyo County, California, at about 2,200 meters elevation. This location is on the Inyo National Forest and is behind a locked gate (R. Aalbu Pers. Comm. 2017). An additional endemic species, the beetle *Ptomophagus inyoensis* is also endemic to this cave (R. Aalbu Pers. Comm. 2017) but has no ranking in NatureServe (2017).

Key Ecological Conditions in Plan Area

Key ecological conditions include caves, where environmental conditions remain constant, including temperature and relative humidity.

Key Threats to Persistence

Threats include loss of cave habitat, specifically where known location(s) occurs.

Threats Under Forest Service Control

- Loss or degradation of habitat due to land management activities within the national forest boundary.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 21 above.

- Terrestrial Ecosystems and Vegetation (Special Habitats)
- Recreation
- Components for Animal and Plant Species

Threats Not Under Forest Service Control

- Any activities that alter habitat found in new locations that occur outside the national forest boundary.
- Mining or cave recreation occurring outside of the national forest boundary where new locations may occur.

Summary

This species of pseudoscorpion is only known from one location. Impacts to habitat may arise from human-caused activities that include recreation use and potential mining use. This cave is currently gated and therefore protected. Risk to this species and its habitat could occur if the cave gate is vandalized and loss of habitat occurs.

The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of cave obligate pseudoscorpion on the Inyo National Forest.

Owens Valley Springsnail

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of the Owens Valley springsnail in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Cold spring water sources with perennial flow.

Table 22 summarizes key threats, plan components, and expected effects on Owens Valley springsnail.

Information on Current Distribution of the Species in the Planning Unit

The Owens Valley springsnail is known from only 10 localities according to California Natural Diversity Database (2017), including two localities on the Inyo National Forest. It is very closely associated with springs with relatively high conductivity water supplied by the Owens Valley aquifer (USGS 1998). The species is found along escarpments of the White and Inyo Mountains on the east side of the Owens Valley.

This species is considered very small and categorized as a micro-snail (1mm to 8mm in shell width), thus, detection can be extremely difficult. For this particular species, individuals can more readily detected due to their nature of piling up on to one another or can also be found in clusters.

Key Ecological Conditions in Plan Area

This species occurs in seeps and spring-fed streams of small to moderate size. It can occur on watercress (*Rorippa*), travertine deposits or stones. It is very closely associated with springs with relatively high conductivity water supplied by the Owens Valley aquifer (USGS 1998). This species co-occurs with Wong's springsnail (*P. wongi*) at Batchelder Springs (Krueger 2016). Key ecological conditions for springsnails typically include cold spring water sources with perennial flow.

Key Threats to Persistence

Key threats to the persistence to Owens Valley springsnail include habitat degradation, invasive aquatic species and climate change.

Springs generally have consistent flow and temperature because they have a more integral connection with groundwater. As a result, they serve as refugia during periods of climatic drying especially as demonstrated in the Owens Valley/Death Valley area over the last 10,000 to 15,000 years (Hershler 1998, Hershler and Pratt 1990, Sada and Herbst 2001).

The aquifer of the Owens Valley is primarily supplied by runoff from the Sierra Nevada snowpack (USGS 1998). Springs and seeps in the Owens Valley are typically found near the toes of alluvial fans from the east slope of the Sierra Nevada, along the edges of volcanic deposits, and in areas of geologic faulting (USGS 1998). Groundwater withdrawals are perhaps the greatest threat to spring flows (Sada and Herbst 2001). Most of the flow leading into the area that used to be Owens Lake is now diverted for domestic use to the Los Angeles area. The diversion of water makes the aquifer that supplies the springs more vulnerable to excessive withdrawal (USGS 1998). USGS (1998) discussed the extent of past spring flow reductions during periods of high groundwater extraction, and modeled the potential impact to groundwater levels under different future extraction scenarios. In general, the effects of reduced discharge on springs are primarily

observed when in close proximity to the groundwater wells and there are few wells on the east side of the Owens Valley where most of the occupied *P. owensensis* springs occur. However, the modeled drop in groundwater on the east side of the valley suggests that spring flow is vulnerable to change.

Table 22. Key threats, plan components and expected effects on Owens Valley springsnail

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Human-caused activities include eutrophication due to agricultural runoff and urbanization, sedimentation that degrades habitat. Water diversions that reduce and alter instream flow hydrology regimes, mining, including suction dredge operations. This also includes grazing and water impoundments that reduce current velocities and allow for sediment deposition.	WTR-FW-DC 01-05 WTR-FW-STD 01-03 SPEC-FW-STD 01 SPEC-FW-GDL 04 & 05 RANG-FW-GOAL 03 RANG-FW-STD 07 MA-RCA-STD 01, 04, 06, 07, 08-11, 13 & 17 MA-RCA-GDL 01-03	N/A	Plan components provide direction to maintain adequate water quality and availability—supports ecosystem integrity and resilience and maintains ecosystem conditions needed for host species and life cycle. Plan components also include direction to minimize the impacts of water diversions that reduce water quantity and quality due to management activities.
Introduction of exotic species.	INV-FW-DC 01-02 INV-FW-GOAL 01 INV-FW-STD 01 INV-FW-GDL 01 MA-RCA-GOAL 02	N/A	Plan components address the issue of exotic species and direction to manage and prevent exotics.
Climate change and changes in water temperatures due to management activities. Loss of quality habitat.	MA-RCA-DC 01-10 RCA-MEAD-DC 01-03 RCA-RIV-DC 01-06 RCA-SPR-DC 01-03	N/A	Plan components provide for ecological integrity of aquatic systems so that they are resilient to climate change and other demands, necessary for providing adequate cold water habitat.
General population loss/collapse	SPEC-FW-DC 01-04 SPEC-FW-GOAL 03, 04 SPEC-FW-GDL 03-05 MA-RCA-DC 01-10 MA-RCA-GOAL 01	N/A	Plan components ensure that management activities promote ecological conditions that support the habitat components necessary to sustain healthy, functioning population levels within the inherent capability of the landscape. Plan components provide direction to work with Federal, State and Tribes and other agencies to collaborate on restoring and maintaining at risk species and their habitat.

Water diversion from springs is also a threat to the Owens Valley springsnail (Sada and Vinyard 2002). Any changes in streamflow, particularly if water is extracted from the point of emergence or a constructed springbox can reduce the amount and extent of downstream suitable habitat (including thermal characteristics) and possibly habitat heterogeneity (Sada and Herbst 2001). Springsnails are frequently concentrated near spring sources with declining density downstream (Hershler and Sada 2002); therefore, changes in flow at the spring source could have greater consequences than diversions lower down in a spring system. Livestock grazing has been observed at many sites occupied by springsnails (Sada and Herbst 2001, Sada and Vinyard 2002). However, there is little information available that suggests livestock use of springs adversely impacts springsnail habitat with the exceptions of diversion of water that is not returned to the spring run and the construction of spring boxes at the head of the spring for diversion purposes (Sada and Herbst 2001). Hershler and Sada (2002) indicate springsnails require hard substrates for egg deposition and foraging, so if excessive grazing, or any other factor, creates conditions where hard substrates are inundated by soft sediments, suitable habitat could be detrimentally impacted.

The potential for exotic aquatic mollusk species is another potential threat to the Owens Valley springsnail. The Owens Valley springsnail has a very limited distribution in the Owens Valley, California where it is known from very few localities. These localities are springs that are sensitive to disturbance and the potential of exotic species introduction.

As noted, the underlying hydrology of the springs occupied by the Owens Valley springsnail is driven largely by the aquifer in the Owens Valley, including significant contributions from snowmelt in the Sierra Nevada. If climate change results in reduced snowpack or changes in runoff that affect groundwater recharge, there could be a reduction in water available for spring flow from the aquifer.

Threats Under Forest Service Control

- Any activities that alter water flow and hydrologic regime (grazing and water impoundments).
- Loss or degradation of habitat due to land management activities within the national forest boundary.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 22 above.

- Watersheds
- Management Areas (Riparian Conservation Areas, Conservation Watersheds)
- Riparian Conservation Areas (Meadows; lakes and ponds; rivers and streams; seeps and springs)
- Rangeland Livestock Grazing
- Invasive Species
- Components for Animal and Plant Species

Threats Not Under Forest Service Control

- Any activities that alter water flow and hydrologic regime (grazing and water impoundments) and occur outside the national forest boundary, along with growing water use demands.
- Loss or degradation of habitat due to drought, flash floods and changes in precipitation patterns and snowpack related to climate change.
- General population loss/collapse
- Introduction of exotic aquatic species

Summary

The Owens Valley springsnail is a restricted endemic, with only two known locations on the Inyo National Forest. There is substantial concern for the species persistence due to its rarity and restriction to cold perennial seeps and springs. As a result of this rarity and its limited distribution, this species is also highly susceptible to stochastic events and drying conditions resulting from increasing temperatures and events related to climate change. Activities that reduce water flow can greatly impact this species. In addition, extremely limited dispersal ability of this species and isolated populations put it at further risk for localized extinctions.

The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of Owens Valley springsnail within its range. However, due to uncertainty about the species current viability, the potential for exotic aquatic species introduction, general population loss or collapse, the limited amount of habitat on the Inyo National Forest, and potential future threats associated with climate change and ground water use, it is not within the inherent capability of the land to maintain or restore the ecological conditions to maintain a viable population of Owens Valley springsnail within the plan area.

Western Pearlshell Mussel

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of the western pearlshell in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Rivers and large streams with cold, clean water and where sea-run salmon or native trout persist. Documented host fish species critical to life cycle.

Table 23 summarizes key threats, plan components, and expected effects on western pearlshell.

Information on Current Distribution of the Species in the Planning Unit

The western pearlshell has a broad geographic distribution extending from California north to Alaska and inland to Idaho, Montana, Nevada, and Wyoming. They are most abundant in Idaho, Oregon, Washington, and British Columbia, Canada. The pearlshell most commonly inhabits cool to cold rivers, but can also be found in smaller, cold headwater streams. They typically occupy areas with low velocities, low shear stress, low gradients, and stable substrates (Vannote and Minshall 1982, Toy 1998, Howard and Cuffey 2003, Stone, et al. 2004). Spatial distribution of the mussel reflects these habitat requirements and is non-uniform and aggregated in occupied streams

with aggregations, also known as mussel beds, consisting of hundreds of individuals per square meter (Murphy 1942, Toy 1998).

Table 23. Key threats, plan components and expected effects on western pearlshell

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Human-caused activities include eutrophication due to agricultural runoff and urbanization, sedimentation that smothers mussel beds. Water diversions that reduce and alter instream flow hydrology regimes, mining, including suction dredge operations. This also includes grazing and water impoundments that reduce current velocities and allow for sediment deposition.	WTR-FW-DC 01-07 WTR-FW-STD 01-03 SPEC-FW-STD 01 SPEC-FW-GDL 05 RANG-FW-GOAL 03 RANG-FW-STD 07 MA-RCA-DC 10 MA-RCA-STD 02, 03, 06-13, 15-16 MA-RCA-GDL 01-03	SPEC-GT-STD	Plan components provide direction to maintain adequate water quality and availability—supports ecosystem integrity and resilience and maintains ecosystem conditions needed for host species and life cycle. Plan components also include direction to minimize the impacts of water diversions that reduce water quantity and quality due to management activities.
Introduction of exotic species.	INV-FW-DC 01-02 INV-FW-GOAL 01 & 03 INV-FW-STD 01 MA-RCA-GOAL 01 & 02	N/A	Plan components address the issue of exotic species and direction to manage and prevent exotics.
Climate change and changes in stream temperatures due to management activities. Loss of quality habitat due to land management activities that degrade or eliminate habitat.	MA-RCA-DC 10 &11 MA-RCA-STD 01, 04, 05, 07,09-13, 15 & 16 MA-RCA-GDL 01-03 INV-FW-GOAL 03 RCA-RIV-DC 01-06 RCA-RIV-OBJ 01-02 MA-CW-DC 01-03 MA-CW-GDL 01-03	SPEC-GT-STD MA-RCA-DC 01-11 MA-RCA-GDL 05, 07	Plan components provide for ecological integrity of aquatic systems so that they are resilient to climate change and other demands, necessary for providing adequate stream habitat for Western pearlshell and host species (sea-run salmon and trout). Plan components for Golden Trout provide standards for the WPMU.
General population loss/collapse	SPEC-FW-DC 01-04 SPEC-FW-GOAL 03, 04 SPEC-FW-GDL 03 MA-RCA-DC 01-08 & 11 MA-RCA-GOAL 01 & 02	SPEC-GT-GOAL MA-RCA-GDL 05, 07	Plan components ensure that management activities promote ecological conditions that support the habitat components necessary to sustain healthy, functioning population levels within the inherent capability of the landscape. Plan components provide direction to work with Federal, State and Tribes and other agencies to collaborate on restoring and maintaining at risk species and their habitat.

Despite the broad distribution of this species throughout the western states, its decline has led to limited localities on the Inyo National Forest. On the Inyo National Forest, these ecological conditions can be found in the South Fork Kern River and similar river systems, especially where the host fish species may occur. Although, the South Fork Kern River provides habitat for the western pearlshell, there is little information on actual population trends or density.

A single California Natural Diversity Database record for this species was located on the Inyo National Forest along the South Fork Kern River in Monache Meadows; however, the record dates to 1948. Shells of this species were found on the Inyo at two locations in the South Fork Kern River in 2006, but no current documentation of an extant population was found.

Key Ecological Conditions in Plan Area

Western pearlshell occurs in habitats ranging in size from small creeks, 1 to 2 meters wide, to large rivers, where ever substrates are primarily composed of clean, coarse gravel, cobble and boulders. Optimal habitats for western pearlshell are low gradient (less than 4 percent; Howard 2010) pools with velocities ranging from about 25 to 30 centimeters per second and depths from 20 to 60 centimeters (Howard and Cuffey 2003, Stone et al. 2004).

Key ecological conditions include cold creeks and rivers with clean water and where sea-run salmon or native trout persist. Documented host fishes for *M. falcata* include: cutthroat trout, rainbow/steelhead trout, Chinook salmon, and brown trout, and a number of other fish are considered potential hosts.

Reproduction in freshwater mussels typically involves the female siphoning water containing sperm into the body where the eggs are fertilized. The eggs are moved into specialized structures called marsupia where they develop into tiny immature mussels called glochidia. In *M. falcata*, glochidia are released *en masse* in thousands of glochidial “packets” (called conglutinates) during a short period time, usually when the water is warming in late spring (March to July). Conglutinates resemble decaying fish tissue (O’Brien, et al. 2013) which is apparently consumed by fish, which serve as an intermediate host for the development of the glochidia. All freshwater mussels require a fish host to reproduce and disperse, and salmonids (trout and salmon) are the primary species that serve this role for the western pearlshell. The glochidia prefer to attach themselves to the gills of the host fish where the blood of the host allows for rapid growth and development. Once the glochidia develop into a juvenile mussel, they drop off of the host and begin an independent life in the streambed; however, mortality at this stage is exceedingly high. Once an individual is successfully dropped onto the substrate, it exists by siphoning water into the body to extract suspended materials which serve as a food source. Under certain circumstances, females can produce glochidia hermaphroditically which likely allows them to persist in newly colonized areas or when population density is so low that there is limited viable sperm in the water column.

Individuals can live up to 100 years (Toy 1998). Many populations of the western pearlshell appear to be stable, based on the continued presence of individuals in historic locations. However, many of these populations are no longer recruiting new individuals or the recruitment levels are very low and, in some cases, die offs have been observed (Howard and Cuffey 2006, Hastie and Toy 2008, Howard 2008). NatureServe (2017) has a comprehensive description of the rangewide declines that have been documented. With the exception of few coastal streams that are not impaired by impoundments, population declines have occurred extensively in California (Howard and Cuffey 2006, Howard 2008, Howard 2010, NatureServe 2017).

Key Threats to Persistence

Key threats to the persistence of western pearlshell include habitat degradation, invasive aquatic species, loss of host species and climate change.

Impacts to the western pearlshell from human-caused activities include eutrophication due to agricultural runoff and urbanization, sedimentation that smothers mussel beds, water diversions that reduce and alter instream flow regimes, mining, including suction dredge operations, introduction of exotic species, grazing, and water impoundments that reduce current velocities and allow for sediment deposition (Hovingh 2004, Lydeard et al. 2004, Strayer and Downing 2006, Krueger et al. 2007). Stream habitat degradation caused by historical grazing practices may have reduced the suitability of existing habitat, specifically in the Monache Meadows area, where this species is historically known to have occurred.

This mussel species depends on salmonid fish hosts to sustain and disperse larval clams. Since many salmonid species such as rainbow trout and salmon have experienced severe declines, western pearlshell mussels have declined as well (Krueger 2016).

In addition, climate change may have enhanced drying effects on smaller ephemeral ponds and meadows, changing the timing and intensity of snow melt and spring precipitation, and will also continue to put forests at risk for stand-replacing fire, which can cause sedimentation and negative changes to water quality and flow.

Threats Under Forest Service Control

- Any activities that alter water flow and hydrologic regime (grazing and water impoundments).
- Loss or degradation of habitat due to land management activities within the national forest boundary.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 23 above.

- Watersheds
- Management Areas (Riparian Conservation Areas, Conservation Watersheds)
- Riparian Conservation Areas (Rivers and streams)
- Rangeland Livestock Grazing
- Invasive Species
- Components for Animal and Plant Species

Threats Not Under Forest Service Control

- Any activities that alter water flow and hydrologic regime (grazing and water impoundments) and occur outside the national forest boundary, along with growing water use demands.
- Loss or degradation of habitat due to drought, flash floods and changes in precipitation patterns and snowpack related to climate change.
- General population loss/collapse
- Loss of host species

Summary

The western pearlshell (*Margaritifera falcata*) is a long-lived species (up to 100 years) and has been documented widely in western North America. It has been extirpated from northern Nevada, from most areas in northern Utah, and numerous examples exist documenting the decline of this species in particular streams and rivers throughout its range. In addition, populations of western pearlshell are reported to have not reproduced for decades; populations of such a long-lived species may appear stable, when in fact they are not reproducing. There is a need to document the current distribution and abundance of this species, so that if populations decline in the future, those declines can be documented and protection for vulnerable populations can be provided.

Threats to the species include habitat degradation, invasive aquatic species, loss of host species, and climate change. Agricultural and urbanization activities can cause eutrophication and sedimentation that smoother mussel beds. Water diversions and grazing also degrade or eliminate habitat all together.

Improvements in grazing management and a decision to rest two grazing allotments (USDA Forest Service 2001) have improved stream habitat conditions throughout the South Fork Kern River watershed. The Monache Meadows is likely the only reach on the Kern Plateau where habitat improvement is questionable. An extensive channel downcutting event occurred in the 1980s and habitat conditions will likely remain poor in this reach for some time. Overall, land use practices, including more appropriate grazing strategies aimed at improving fish habitat and streambank conditions, will continue to be implemented, allowing for an upward trend in California golden trout habitat, which will in turn, may allow for improved conditions for western pearlshell mussel.

Aquatic invasive species pose a threat to habitat and known populations. Western pearlshells are particularly specialized in that they rely on a host fish species in the trout and salmonid family to carry out their life cycle; thus, persistence relies not only on suitable habitat, but also another organism to provide an intermediate host for the development of the glochidia (immature western pearlshells). Furthermore, climate change poses an additional threat on habitat. Warming stream temperatures, reductions of snowpack and lose of perennial fast moving streams, also creates substantial concern about this species ability to persist on the planning unit.

The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of western pearlshell within its range. However, due to uncertainty about the species current viability, the potential for host species loss, general population loss or collapse, the limited amount of habitat on the Inyo National Forest, and potential future threats associated with climate change and ground water use, it is not within the inherent capability of the land to maintain or restore the ecological conditions to maintain a viable population of western pearlshell within the plan area.

Wong’s Springsnail

Determination: It is beyond the authority of the Forest Service to maintain or restore the ecological conditions to maintain a viable population of the Wong’s springsnail in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

General Key Ecological Conditions: Cold spring water sources with perennial flow.

Table 24 summarizes key threats, plan components, and expected effects on Wong's springsnail.

Information on Current Distribution of the Species in the Planning Unit

Wong's springsnail has a distribution limited to the Owens Valley and southern Lahontan basin (California) where it is known from approximately 50 localities. These localities are springs that are sensitive to disturbance, especially to impacts occurring at the point of origin. The known threats are relevant to the continued persistence of the species in many locations, with the same impacts resulting in extirpations of entire species in other locations. Populations are apparently stable presently and the known distribution of the species has not recently changed.

This species is known primarily from the Inyo National Forest and has a restricted distribution in the Owens Valley along the eastern escarpment of the Sierra Nevada Mountains. It ranges from Pine Creek south to Little Lake, and along the eastern side of the valley from French Spring to Marble Creek in the Inyo Mountains. It is also found in a few sites in Long, Adobe, and Deep Springs Valleys.

Approximately 20 California Natural Diversity Database records for this species were located on the Inyo National Forest, within six relative sites due to proximity of records. This species is considered very small and categorized as a micro-snail (1 to 8 millimeters in shell width), thus, detection can be extremely difficult. For this particular species, individuals can more readily detected due to their nature of piling up on to one another or can also be found in clusters.

Key Ecological Conditions in Plan Area

This species occurs in seeps and spring-fed streams of small to moderate size. It can occur on watercress (*Rorippa*), travertine deposits or stones. It is very closely associated with springs with relatively high conductivity water supplied by the Owens Valley aquifer (USGS 1998). This species co-occurs with Owens Valley springsnail (*P. wongi*) at Batchelder Springs (Krueger 2016).

Key ecological conditions for springsnails typically include cold spring water sources with perennial flow.

Key Threats to Persistence

Key threats to the persistence to Wong's springsnail include habitat degradation, invasive aquatic species and climate change.

Springs generally have consistent flow and temperature because they have a more integral connection with groundwater. As a result, they serve as refugia during periods of climatic drying especially as demonstrated in the Owens Valley/Death Valley area over the last 10,000 to 15,000 years (Hershler 1998, Hershler and Pratt 1990, Sada and Herbst 2001).

Table 24. Key threats, plan components and expected effects on Wong's springsnail

Key Threats to Persistence	Ecosystem Plan Components that Alleviate or Eliminate Key Threats	Additional Species-specific Plan Components that Alleviate or Eliminate Key Threats	Effects Summary
Human-caused activities include eutrophication due to agricultural runoff and urbanization, sedimentation that degrades habitat. Water diversions that reduce and alter instream flow hydrology regimes, mining, including suction dredge operations. This also includes grazing and water impoundments that reduce current velocities and allow for sediment deposition.	WTR-FW-DC 01-05 WTR-FW-STD 01-03 SPEC-FW-STD 01 SPEC-FW-GDL 04 & 05 RANG-FW-GOAL 03 RANG-FW-STD 07 MA-RCA-STD 01, 04, 06, 07, 08-11, 13 & 17 MA-RCA-GDL 01-03	N/A	Plan components provide direction to maintain adequate water quality and availability—supports ecosystem integrity and resilience and maintains ecosystem conditions needed for host species and life cycle. Plan components also include direction to minimize the impacts of water diversions that reduce water quantity and quality due to management activities.
Introduction of exotic species.	INV-FW-DC 01-02 INV-FW-GOAL 01 INV-FW-STD 01 INV-FW-GDL 01 MA-RCA-GOAL 02	N/A	Plan components address the issue of exotic species and direction to manage and prevent exotics.
Climate change and changes in water temperatures due to management activities. Loss of quality habitat.	MA-RCA-DC 01-10 RCA-MEAD-DC 01-03 RCA-RIV-DC 01-06 RCA-SPR-DC 01-03	N/A	Plan components provide for ecological integrity of aquatic systems so that they are resilient to climate change and other demands, necessary for providing adequate cold water habitat.
General population loss/collapse	SPEC-FW-DC 01-04 SPEC-FW-GOAL 03, 04 SPEC-FW-GDL 03-05 MA-RCA-DC 01-10 MA-RCA-GOAL 01	N/A	Plan components ensure that management activities promote ecological conditions that support the habitat components necessary to sustain healthy, functioning population levels within the inherent capability of the landscape. Plan components provide direction to work with Federal, State and Tribes and other agencies to collaborate on restoring and maintaining at risk species and their habitat.

The aquifer of the Owens Valley is primarily supplied by runoff from the Sierra Nevada snowpack (USGS 1998). Springs and seeps in the Owens Valley are typically found near the toes of alluvial fans from the east slope of the Sierra Nevada, along the edges of volcanic deposits, and in areas of geologic faulting (USGS 1998). Groundwater withdrawals are perhaps the greatest threat to spring flows (Sada and Herbst 2001). Most of the flow leading into the area that used to be Owens Lake is now diverted for domestic use to the Los Angeles area. This diversion of water makes the aquifer that supplies the springs more vulnerable to excessive withdrawal or other groundwater extractions (USGS 1998). The U.S. Geological Survey (1998) discussed the extent of past spring flow reductions during periods of high groundwater extraction, and modeled the potential impact to groundwater levels under different future extraction scenarios. In general, the effect of reduced discharge on springs is primarily observed when in close proximity to the groundwater wells and there are more wells on the west side of the Owens Valley where most of the occupied *P. wongi* springs occur. This scenario of reduced spring flow due to groundwater pumping suggests these populations of Wong's springsnail are vulnerable to changes in habitat that would occur with increased pumping. Anticipated changes in habitat include a reduced volume of cold water discharged from the springs, which would result in a reduced stream length occupied by the snails mainly caused by water being warmed by the air. Very little information is available about the hydrology of the upper portion of the Lahontan drainage where other *P. wongi* populations occur.

A water diversion from springs is also a threat to the Wong's springsnail (Sada and Vinyard 2002). Any changes in streamflow, particularly if water is extracted from the point of emergence or a spring box is constructed can reduce the amount and extent of downstream suitable habitat (including thermal characteristics) and possibly habitat heterogeneity (Sada and Herbst 2001). Springsnails are frequently concentrated near spring sources with declining density downstream (Hershler and Sada 2002); therefore, changes in flow at the spring source could have greater consequences than diversions lower down in a spring system. Water velocity seems to be a key habitat component for some springsnails and spring boxes at the head of the spring would greatly reduce the preferred velocity (USFWS 1998). Livestock grazing has been observed at many sites occupied by springsnails and has been associated with habitat degradation (Sada and Herbst 2001, Sada and Vinyard 2002). However, there is little information available that suggests livestock use of springs adversely impacts springsnail habitat with the exceptions of diversion of water to troughs that is not returned to the spring run and the construction of spring boxes at the head of the spring for diversion purposes (Sada and Herbst 2001). Hershler and Sada (2002) indicate springsnails require hard substrates for egg deposition and foraging, so if excessive grazing, or any other factor, creates conditions where hard substrates are inundated by soft sediments, suitable habitat could be detrimentally impacted.

Threats under Forest Service Control

- Any activities that alter water flow and hydrologic regime (grazing and water impoundments).
- Loss or degradation of habitat due to land management activities within the national forest boundary.

In addition to the forestwide plan components for Animals and Plants and Terrestrial Ecosystems mentioned earlier in this section, threats are primarily addressed through plan components under the following sections of the forest plan and are described in table 24 above.

- Watersheds

- Management Areas (Riparian Conservation Areas, Conservation Watersheds)
- Riparian Conservation Areas (Meadows; lakes and ponds; rivers and streams; seeps and springs)
- Rangeland Livestock Grazing
- Invasive Species
- Components for Animal and Plant Species

Threats Not Under Forest Service Control

- Any activities that alter water flow and hydrologic regime (grazing and water impoundments) and occur outside the national forest boundary, along with growing water use demands.
- Loss or degradation of habitat due to drought, flash floods and changes in precipitation patterns and snowpack related to climate change.
- General population loss/collapse
- Introduction of exotic aquatic species

Summary

The Wong's springsnail is a restricted endemic, with limited locations on the Inyo National Forest. There is substantial concern for the species' persistence due to its rarity and restriction to cold perennial seeps and springs. As a result of this rarity and its limited distribution, this species is also highly susceptible to unpredictable events and drying conditions resulting from increasing temperatures and events related to climate change. Activities that reduce water flow can greatly impact this species. In addition, extremely limited dispersal ability of this species and isolated populations put it at further risk for localized extinctions.

The Inyo National Forest has a number of ecosystem-level and species-specific plan components in place to mitigate risks within its management authority, but cannot mitigate all threats for persistence. Based upon this evaluation, the final set of ecosystem plan components and the additional species-specific plan components, when carried out, would provide the necessary ecological conditions to maintain a viable population of Wong's springsnail within its range. However, due to uncertainty about the species current viability, the potential for exotic aquatic species introduction, general population loss or collapse, the limited amount of habitat on the Inyo National Forest, and potential future threats associated with climate change and ground water use, it is not within the inherent capability of the land to maintain or restore the ecological conditions to maintain a viable population of Wong's springsnail within the plan area.

Crosswalk – Animal Species of Conservation Concern

The following table is a crosswalk that shows how plan components meet species-specific habitat needs grouped by the key ecological conditions or habitat elements that species share in common. Categories are not mutually exclusive. The table does not include all plan components that provide for persistence but rather focuses on key threats and primary plan components that mitigate those threats. More detailed information on individual species contained within groups can be found in the Rationales for Animal Species Considered for Designation as Species of Conservation Concern (USDA 2018)

Table 25. Crosswalk between species of conservation concern and key ecological conditions, threats, and plan components that provide for persistence

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
Large Tree and Snag Dependent: fisher, Sierra Marten, California spotted owl, great gray owl, Mount Pinos sooty grouse, and bald eagle.	Large trees and snags, cavities, downed logs, woody debris, mistletoe brooms-nesting/denning structures.	Vegetation management and fire (both natural and prescribed) and natural disturbance and (e.g. insect outbreaks, drought), climate change.	**Guidelines (SPEC-FW-GDL)** **01** Known nest, roost, or den trees used by species of conservation concern or raptors, including surrounding trees that provide beneficial thermal or predatory protection, should not be purposefully removed, with the exception of the unavoidable removal of hazard trees and as required to meet other State or Federal regulatory requirements. **Desired Conditions (TERR-RFIR-DC)** **03** At the landscape scale, areas dominated by medium and large-diameter trees and low to moderate canopy cover (between 10 and 60 percent) comprise most of the landscape. **Desired Conditions (TERR-LDGP-DC)** **04** In wet lodgepole pine forests, areas dominated by medium and large-diameter trees, comprise more than 45 percent of the landscape (table 1). Tree stocking (basal area) is highly variable, ranging from 50 to 280 square feet per acre, with most less than 150 square feet per acre (table 2). Canopy cover ranges from 20 to 70 percent but is generally 50 percent. **05** In wet lodgepole pine forests, large snag densities are between 5 and 40 snags per 10 acres (table 3). Snags are well distributed, highly irregular in spacing, and provide for future downed logs. Coarse woody debris, including large downed logs in varying states of decay, is well distributed but irregular in spacing and ranges from 1 to 20 tons per acre. **Desired Conditions (TERR-DMC-DC**) **03** At the landscape scale, areas dominated by medium and large-diameter trees comprise more than 60 percent of the landscape. Overstory tree canopy cover is generally 30 percent but ranges widely from 10 to 60 percent at a fine scale. Trees are denser in some locations, such as north-facing slopes and canyon bottoms, but in small patches in limited areas (less than 20 percent of the area). Vigorous shrubs cover 10 percent or more of the area, with density varying by aspect, slope, and soil type. **06** At the mid- to fine scale, snags greater than 20 inches in diameter are at densities between 2 to 20 snags per 10 acres, and are well distributed, but highly irregular in spacing providing for future downed logs. Coarse woody debris, including large downed logs in varying states of decay, is irregularly distributed and ranges from 1 to 5 tons per acre. **Desired Conditions (TERR-JEFF-DC)** **04** At the mid-scale, Jeffrey pine forest is composed predominantly of vigorous trees, but declining trees are an important component, providing wildlife nesting and denning habitat, future production of snags, down logs, and other coarse woody debris. **05** At the mid-scale, insects and pathogens like dwarf mistletoe, Annosus and Armillaria root diseases, and Jeffrey pine beetle, occur at endemic levels and are restricted to individual stands. Witches' brooms caused by mistletoe provide habitat for wildlife species. **06** At the fine scale, size and age class diversity is high within Jeffrey pine stands. Individual large trees or tree groups provide nesting and denning habitat for wildlife. **Desired Conditions (TERR-OLD-DC)**

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
			02 The landscape contains a mosaic of vegetation types and structures that provide foraging and breeding habitat, movement, and connectivity for a variety of old forest-associated species. **03** Between 40 and 80 percent of the forested landscape contains old forest areas. Old forest areas are clumps and patches of old forests components such as old trees, snags and large downed logs. These areas are irregularly distributed across the landscape and interspersed with stands of younger trees, shrubs, meadows, other herbaceous vegetation, and unvegetated patches. **Desired Conditions (TERR-OLD-DC)** **05** Old forests are composed of both vigorous trees and decadent trees. Clumps of large trees, snags, large logs, and decadent older trees are maintained on the landscape in sufficient numbers to benefit wildlife and are distributed throughout the planning area before and after disturbances. **06** Large snags are scattered across the landscape, generally occurring in clumps rather than uniformly and evenly distributed, meeting the needs of species that use snags and providing for future downed logs. **Desired Conditions (SPEC-SMPF-DC)** **02** Within marten core habitat and fisher Core Area 1, vegetation is trending toward desired conditions for terrestrial and riparian vegetation. **03** Marten and fisher habitat are well distributed throughout the marten's range and fisher Core Area 1, providing for foraging, denning, and resting habitat and movement across large landscapes. **04** Essential fisher habitat elements, including large living and dead trees (especially pines and oaks) and structures used by fishers for resting and denning (cavities, deformities), are common and well distributed throughout fisher Core Area 1. **Desired Conditions (SPEC-CSO-DC**) **01** California spotted owl protected activity centers provide high quality habitat that contributes to their successful reproduction. Protected activity centers encompass habitat that is most likely essential for nesting and roosting. The habitat has a high canopy cover with multiple layers of tree canopy and many large trees and snags **Desired Conditions (TERR-OLD-DC)** **01** The composition, structure, and functions of old forests and surrounding landscapes are resilient to fire, drought, insects, pathogens, and climate change. Fire occurs as a key ecological process in forest types that are adapted to fire, creating, restoring and maintaining ecosystem resilience and fire-related composition and structure. **02** The landscape contains a mosaic of vegetation types and structures that provide foraging and breeding habitat, movement, and connectivity for a variety of old forest-associated species. **03** Between 40 and 80 percent of the forested landscape contains old forest areas. Old forest areas are clumps and patches of old forests components such as old trees, snags and large downed logs. These areas are irregularly distributed across the landscape and interspersed with stands of younger trees, shrubs, meadows, other herbaceous vegetation, and unvegetated patches.

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
			07 Coarse woody debris is distributed in patches and the density of large downed logs varies by vegetation type. Surface dead wood levels are sufficient to provide for legacy soil microbial populations. **Guidelines (TERR-OLD-GDL)** **01** When large tree densities meet desired condition levels, thinning to increase heterogeneity and resilience should emphasize retention of the oldest and largest trees, especially pines. Large trees with deformities, broken tops, large branches, and cavities should be retained for wildlife habitat whenever possible. **02** During burning, firing patterns, burn unit layout, and other firing and holding methods should limit mortality of large old trees and loss of very large snags. Consider preventing delayed mortality caused by smoldering at the base of large old trees and consider constructing fireline around large old trees and very large snags to reduce the risk of tree ignition while addressing firefighter safety. Limit fire intensity in areas with large old trees and very large snags where possible. **Standards (TERR-FW-STD)** **01** Retain conifer trees greater than 30 inches in diameter. Exceptions under which trees greater than 30 inches in diameter may be removed, felled for coarse woody debris, or girdled for snag creation include: a. When public or firefighter safety is threatened (relevant to all tree diameters including those exceeding 40 inches). b. When removing trees is needed for aspen, oak, or meadow restoration treatments or for cultural or Tribal importance. c. When required for equipment operability: individual trees less than 35 inches in diameter may be removed when they cannot be reasonably and feasibly avoided. d. In overstocked stands to favor retention or promote growth of even larger or older shade-intolerant trees to more effectively meet tree species composition and forest structure restoration goals. The silvicultural prescription and/or NEPA document will identify when this exception is used and will provide the rationale for why the exception applies and how it is being used at the level of the forest stand, or treatment unit. (See also glossary definitions for “overstocked” and “stocking level”). **Guidelines (TERR-FW-GDL)** **01** Projects facilitate increasing heterogeneity at all scales, from tree clumps to large landscapes. Several treatment strategies can be employed: using landscape topography (slope, aspect, and slope position) to vary stand densities; promoting tree clumps and gaps within a stand, increasing the proportion of large to small trees; retaining important habitat structures such as large trees, snags, and trees with broken tops; and increasing diversity by promoting native plant species. **02** Vegetation treatment projects within forested habitats should include a widely distributed but often clumped distribution of snags and downed logs. Along forest edges and within groups and clumps of large trees, snags and downed logs should be retained to provide habitat and roost sites for wildlife species such as small mammals and cavity-nesting birds. When snags need to be removed, retain larger diameter snags with the longest expected standing longevity.

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
Structural diversity/stand heterogeneity, interlocking canopy: Sierra marten, fisher, California spotted owl, great gray owl	Interlocking canopy, old growth with pockets of denser stands.	Vegetation management and fire (both natural and prescribed) and natural disturbance (e.g. insect outbreaks, drought), climate change.	**TERR-FW-GOAL** **01** Restoration projects following large stand-replacing events (such as wildfire and bark beetle infestations) should be designed to consider: b. the development of restoration strategies that move landscape conditions towards terrestrial and aquatic ecosystem desired conditions; c. fuel loads and the need to restore natural fire regimes to the recovering landscape; d. wildlife habitat, including the restoration of habitat for forest dependent species; f. future projections in climate and their influence on ecosystems in the affected area; and g. long-term maintenance of regional biodiversity; h. opportunities to recover economic value as harvested wood product from dead and dying trees. **Desired Conditions (TERR-FW-DC)** **01** Each vegetation type contains a mosaic of vegetation conditions, densities and structures. This mosaic, which occurs at a variety of scales across landscapes and watersheds, reflects conditions that provide for ecosystem integrity and ecosystem diversity given the inherent capabilities of the landscape that is shaped by site conditions and disturbance regimes. **Desired Conditions (TERR-RFIR-DC)** **07** At the mid- to fine scale, snags greater than 20 inches in diameter are distributed in patches. An average of 5 to 40 snags per 10 acres (table 3) provide for future downed logs. Coarse woody debris, including large downed logs in varying states of decay, is distributed in patches and ranges from 1 to 10 tons per acre. **Desired Conditions (TERR-LDGP-DC)** **07** In dry lodgepole pine forests, areas dominated by medium and large-diameter trees comprise more than 60 percent of the landscape (table 1). Canopy cover is generally 10 to 40 percent but may exceed 40 percent in small patches and moist microsites (table 2). **Desired Conditions (TERR-LDGP-DC**) **03** The distribution and structure of wet lodgepole pine forests are variable, ranging from small patches of even-aged trees, with both closed and open canopies, to uneven-aged, irregular patches. Size and age class diversity is high within wet lodgepole pine stands. Individual trees are variably spaced with some tight groups. Irregularly shaped groups of large and intermediate trees are variably sized, with some overlapping tree crowns. Smaller trees are randomly distributed. **Desired Conditions (TERR-DMC-DC)** **07** At the landscape scale, the dry mixed conifer vegetation type has a mosaic of patches of trees of varied sizes and ages. It is dominated by Jeffrey pine and white fir trees, with white fir densities dependent on climate and fire trends. **Desired Conditions (TERR-JEFF-DC)** **01** At the landscape scale, the Jeffrey pine type is part of a heterogeneous mosaic of shrublands, woodlands or other vegetation types. Forests are dominated by Jeffrey pine trees and are

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
			generally open. Open-canopied stands dominate the landscape, with generally less than 10 percent of the area having more than 40 percent canopy cover. **07** At the fine scale, openings of various shapes surround and are intermixed with the trees. These gaps make up from 10 to 70 percent of the area, are typically less than 0.1 to 0.5 acre in size, and contain herbaceous plants, shrubs and tree regeneration **Guidelines (SPEC-SMPF-GDL)** **01** Within marten core habitat and fisher Core Area 1, retain overtopping and multi-storied canopy conditions, including some shade-tolerant understory trees such as firs, especially in drainages, swales and canyon bottoms and on north- and east-facing slopes. Retain a patchy mosaic of shrubs and understory vegetation, separated by more open areas, to reduce fuel continuity, increase habitat heterogeneity, support prey, and provide hiding cover, with a goal of 10 to 20 percent shrub cover at the home range scale. **02** Maintain or increase understory heterogeneity in marten denning habitat and fisher high value reproductive habitat (see glossary) to promote hiding cover such as shrub patches, coarse woody debris, and slash piles following vegetation treatments. Project design should include non-linear edges that decrease susceptibility to predation. **Desired Conditions TIMB-FW-DC** **03** Salvage of dead and dying trees captures some of the economic value of the wood while retaining key features in quantities that provide for wildlife habitat, soil productivity, and other desired conditions of forest ecosystems
Old growth Dependent: Sierra marten, California spotted owl, great gray owl.	Old growth components including large trees and snags, coarse down woody debris and trees in various stages of decay.	Vegetation management and fire (both natural and prescribed) and natural disturbance (e.g. insect outbreaks and drought), climate change.	**Desired Conditions (TERR-OLD-DC)** **01** The composition, structure, and functions of old forests and surrounding landscapes are resilient to fire, drought, insects, pathogens, and climate change. Fire occurs as a key ecological process in forest types that are adapted to fire, creating, restoring and maintaining ecosystem resilience and fire-related composition and structure. **02** The landscape contains a mosaic of vegetation types and structures that provide foraging and breeding habitat, movement, and connectivity for a variety of old forest-associated species. **03** Between 40 and 80 percent of the forested landscape contains old forest areas. Old forest areas are clumps and patches of old forests components such as old trees, snags and large downed logs. These areas are irregularly distributed across the landscape and interspersed with stands of younger trees, shrubs, meadows, other herbaceous vegetation, and unvegetated patches. **07** Coarse woody debris is distributed in patches and the density of large downed logs varies by vegetation type. Surface dead wood levels are sufficient to provide for legacy soil microbial populations. **Guidelines (TERR-OLD-GDL)** **01** When large tree densities meet desired condition levels, thinning to increase heterogeneity and resilience should emphasize retention of the oldest and largest trees, especially pines. Large trees with deformities, broken tops, large branches, and cavities should be retained for wildlife habitat whenever possible.

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
			02 During burning, firing patterns, burn unit layout, and other firing and holding methods should limit mortality of large old trees and loss of very large snags. Consider preventing delayed mortality caused by smoldering at the base of large old trees and consider constructing fireline around large old trees and very large snags to reduce the risk of tree ignition while addressing firefighter safety. Limit fire intensity in areas with large old trees and very large snags where possible. **Desired Conditions (TERR-ALPN-DC)** **01** Subalpine woodlands are highly variable in structure and composition. Diverse patch types vary from open woodlands with scattered trees to small, dense groves.
Complex Early Seral Habitat Dependent: Sierra marten, great gray owl.	Snags and logs, in varying densities, intermixed with newly re-sprouted or recently regenerated trees, shrubs, herbs and grasses.	Lack of disturbance, salvage logging	**Desired Conditions (TERR-CES-DC)** **01** Complex early seral habitat contains dense and variable patches of snags and other habitat elements characteristic of natural succession that are important to early seral forest-associated species. Variable densities of shrubs are managed in more productive sites depending on site potential. Aspen sprouts are well distributed in areas where they occur. **02** Snags, logs, and live trees are widely and variably distributed in large patches (greater than 100 acres when available) where vegetation has been severely burned (greater than 75 percent mortality) to provide habitat while also considering the need for other resource objectives. **03** Snags that support cavity nesting birds and mammals are sufficiently abundant and well distributed, especially large-diameter snags. Large diameter snags are retained to mimic natural mortality groups. **Guidelines (TERR-CES-GDL)** **02** Post-disturbance restoration projects should be designed to protect and maintain important wildlife habitat. **05** Large fires with more than 1,000 acres of contiguous blocks of moderate and high vegetation burn severity (greater than 75 percent mortality) in forest vegetation types (Jeffery pine, dry mixed conifer, red fir, and lodgepole pine) should retain at least 10 percent of the moderate and high vegetation burn severity area without harvest to provide areas of complex early seral habitat.
Sagebrush Dependent: Sage grouse, Bi-State population segment.	Large and contiguous sagebrush stands mixed with areas of wet meadows, riparian, or irrigated agriculture fields.	Pinyon-Juniper expansion and conifer encroachment, Invasive species (cheatgrass), Vegetation/Fuels Management, Wildfires, Inadequate forage, livestock grazing, energy development and associated	**Desired Conditions (SPEC-SG-DC)** **01** Suitable sage-grouse habitat includes breeding (nesting), brood-rearing, and wintering habitats that are distributed to allow for dispersal and genetic flow, with land cover dominated by sagebrush. Suitable habitat is predominantly sagebrush shrubland and sagebrush steppe, with associated mesic habitats. Specific vegetation conditions are closely tied to local conditions and ecological site potential. **02** High quality sage-grouse nesting cover including shrub and perennial grasses that provide for overhead and lateral concealment, conditions that support high levels of quality pre-laying hen habitat and dietary protein intake needs, and habitat supporting chick-rearing nutritional needs occur throughout breeding habitat in each population management unit based on local conditions and ecological site potential.. **03** Sage-grouse brood-rearing habitat occurs in the population management units and includes an adequate range of shrub cover, perennial grass cover, forb density, and meadows to provide the

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
		infrastructure including tall structures.	necessary overhead and lateral concealment and nutritional needs, with specific desired conditions tied closely to local conditions and based on ecological site potential.04 Sage-grouse winter habitat occurs in the population management units and includes an adequate range of sagebrush cover in sites such as wind swept ridges or tall shrubs that provide necessary cover and nutritional needs during winter. Specific vegetation conditions are closely tied to local conditions and ecological site potential. **05** Sage-grouse habitats do not include overstory trees, such as pinyon pine, juniper, or Jeffrey pine outside the natural range of variability. The extent and dominance of nonnative annual grass species, such as cheatgrass, is limited and does not lead toward reduction in the suitability of sage-grouse habitat. **07** Unwanted fire (more frequent, severe, or larger than the natural range of variation) in sage-grouse priority habitat is limited or prevented. **08** At the stand/site scale (10 to 100 acres), sagebrush and understory cover occur in a mosaic across the site, with 1-acre patches meeting the desired conditions for nest sites and brood-rearing areas, in areas that are consistent with the site and the sagebrush species potential. **09** Meadows within sage-grouse range provide suitable habitat for sage-grouse, including desirable foraging species (insects and plants), have suitable sagebrush cover around the meadows edge, are hydrologically fully functional and vegetation is within mid-seral conditions. Within livestock allotments in sage-grouse range, meadow condition is trending towards or rated at fully functional based on forestwide range utilization standards. **Objective (SPEC-SG-OBJ)** **01** Within 10 years of the plan approval, up to 14,900 acres of sage-grouse habitat, within and between population management units, will be improved or restored to meet sage-grouse priority habitat desired conditions. **SPEC-SG-GOAL** **02** Continue to work with researchers, scientists, and partners to collect data sufficient to establish quantitative desired conditions for sage-grouse habitats in the Bodie, South Mono, and White Mountain Population Management Units specific to sagebrush species and ecological sites. **Standards (SPEC-SG-STD)** **01** Habitat restoration projects for the sage-grouse shall be designed to meet one or more of the following habitat needs: a. Promote the maintenance of extensive, intact sagebrush communities; b. Limit the expansion or dominance of invasive species, including cheatgrass, and the expansion of pine species, including pinyon-juniper and Jeffrey pine; c. Maintain or improve soil site stability, hydrologic function, and biological integrity; and d. Enhance the native plant community. **02** Habitat restoration projects for the sage-grouse must include measures to improve suitability of breeding, brood rearing, or wintering habitat.

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
			03 Within sage-grouse habitat, ensure that habitat restoration activities, vegetation treatments, or other authorized uses on the national forest, maintain or move toward vegetation desired conditions for sage-grouse. Short-term (1 to 10 year) impacts are allowed to deviate from these habitat standards, if the long-term (10 to 30 years) project objective is to achieve desired conditions. **04** Mitigate long-term negative impacts to sage-grouse habitat from activities, to the extent practicable and within agency authority. **05** Require site-specific project mitigation if needed to insure no net loss of habitat within the Inyo National Forest due to project disturbance. **06** Establish a limiting operating period for the sage-grouse breeding season (which current best available science indicates is March 1 to May 15) within suitable breeding habitat for any activities that would cause disturbances during this time. These dates can be adjusted based on current nesting conditions or risk assessment. **07** Establish a limiting operating period for the sage-grouse nesting season (which current best available science indicates is May 1 to June 15) within suitable nesting habitat for any activities that would lead to disturbances during this time. These dates can be adjusted based on current nesting conditions or risk assessment. **08** When conducting livestock grazing allotment assessments, establish key areas in meadow or upland habitats, where absent in occupied sage-grouse habitat. **09** Within sage-grouse priority habitat, use genetically and climatically appropriate native plant and seed material when seeding the area. **10** No new tall utility-type structures (e.g., poles that support lights, telephone and electrical distribution, communication towers, meteorological towers, and high-tension transmission towers, wind or solar generators or other similar infrastructure), which could serve as predator perches, will be authorized within 4 miles of an active lek in suitable habitat except as needed to adequately maintain existing infrastructure and comply with state and federal regulations. If structures are needed within this area protective stipulations (e.g. perch deterrents, guy wire removal) or mitigation will be required to offset the impacts of those structures. During the permit renewal process for such existing structures within 4 miles of an active lek in suitable habitat, protective stipulations or mitigations will be required to offset the impacts of those structures.11 No new tall non-utility structures (e.g. fences, barriers, signs, buildings, water tanks, other structures necessary for resource management) that protrude noticeably above the dominant shrub layer will be installed in suitable sage-grouse habitat within 4 miles of an active lek except where the structure is necessary for safety or improvement of habitat and ecological conditions. All fences and other barriers constructed or replaced within 4 miles of an active lek in suitable habitat must be wildlife friendly with features to reduce impacts to sage-grouse (e.g. let-down fences, marked with fence markers or other fence types such as buck and rail). Installing any new fences within 1.2 miles of an active lek should be avoided whenever possible **12** Within suitable habitat, manage permitted watering facilities to prevent drowning or entrapment and provide mosquito control to reduce the risk of creating a vector for diseases.

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
			13 Do not locate new salting, supplemental feeding locations, livestock watering, and handling facilities on sage-grouse leks. **14** After soil disturbance or seeding, subsequent soil-disturbing management activities shall not occur until desired habitat conditions have been met within sage-grouse habitat unless a resource team determines that disturbance will help achieve desired conditions. **15** Consult a resource advisor during wildfires in sagebrush to identify suitable sage-grouse habitat and to suggest opportunities for retaining and protecting sagebrush stands. When safe and feasible, protect highly valued suitable sage-grouse habitat ahead of burn operations using techniques such as targeted burning and providing direct protection. **Guidelines (SPEC-SG-GDL)** **01** Minimize the creation of new rights-of-way where feasible and less impactful by using existing public or private utility rights-of-way to reduce impacts on other resources. **02** Where feasible and where net impacts to habitat will be less than overhead facilities, bury new or reconstructed utility lines to reduce negative effects on sage-grouse habitat and other resources.03 Subject to valid and existing rights, where there would be a net benefit to habitat conditions, remove tall structures that protrude noticeably above the dominant shrub layer in suitable sage-grouse habitat within 4 miles of an active lek. **04** When agency personnel, contractors, and permit holders are driving off road and working in areas with known noxious weed infestation, the vehicles should be cleaned before entering a different area to reduce the spread of noxious weeds. **05** Vegetation treatments and disturbances that reduce connectivity should be seeded or transplanted with sagebrush to restore patches of sagebrush cover and connect existing patches to improve sage-grouse habitats within and between population management units. **Standards (RANG-FW-STD**) **05** If the results of rangeland condition evaluations indicate the grazing key area is less than fully functional, use an interdisciplinary team to incorporate corrective actions that address specific on-the-ground problems. There may be more than one corrective action needed to achieve a trend towards fully functional watershed condition. Rest of a pasture, meadow, or allotment is a potential corrective action. No adjustments are needed if the results of a rangeland condition assessment indicate that the grazing key area is fully functional and there are no off-site factors that need to be addressed.
All Riparian Dependent Species	Loss in connectivity between habitat patches; declining/drying meadow conditions.	Changes in timing and flow of water and water availability resulting from climate change (e.g. drought) and/or hydroelectric power/water	**Desired Conditions (MA-CW-DC)** **01** Conservation watersheds provide high-quality habitat and functionally intact ecosystems that contribute to the persistence of species of conservation concern and the recovery of threatened, endangered, proposed, or candidate species. **03** The drainage connections between floodplains, wetlands, upland slopes, headwaters, and tributaries are intact and provide for breeding, dispersal, overwintering, and feeding habitats for at-risk species. These areas provide refugia if other areas of the watershed are disturbed by events such as floods, landslides, and fires. **Desired Conditions (WTR-FW-DC)**

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
		diversions and increasing demands for water by humans. Forest management activities (fire, veg, livestock grazing)	**07** Where stream diversions or other flow modifications are not regulated by the Federal Energy Regulatory Commission, at-risk species and beneficial uses are sustained. In-stream flows allow for at-risk species habitat and sustain riparian resources, channel integrity, and aquatic passage. **Desired Conditions (MA-RCA-DC)** **02** Riparian conservation areas have ecological conditions that contribute to the recovery of threatened and endangered species and support persistence of species of conservation concern as well as native and desired nonnative aquatic and riparian-dependent plant and animal species. **Objective (MA-RCA-OBJ)** **01** Restore the structure and composition of at least 400 acres in riparian areas within 10 years following plan approval, emphasizing riparian areas that face the most risk from large-scale high-intensity fire, past fire exclusion, or accelerated flooding events associated with climate change. **Standards (MA-RCA-STD)** **01** Ensure that management activities do not adversely affect water temperatures necessary for local aquatic- and riparian-dependent species assemblages, unless vegetation removal or other actions are required for safety or mandated by state and federal regulations (such as vegetation clearances around utility lines). **05** All new or replaced permanent stream crossings shall accommodate at least the 100-year flood, its bedload, and debris. Estimates for 100-year flood potential will reflect the best available science regarding potential effects of climate change. **06** Locate water drafting sites to minimize adverse effects to instream flows and depletion of pool habitat. **08** Use screening devices for water drafting pumps. (Fire suppression activities are exempt during initial attack.) Use pumps with low entry velocity to minimize removal of aquatic species from aquatic habitats, including juvenile fish, amphibian egg masses and tadpoles. **19** Prohibit or mitigate ground-disturbing activities that cause degradation of fens (e.g. trampling from livestock, pack stock, wheeled vehicles, people, and roads) that and adversely affect hydrologic processes that maintain water flow, water quality, or water temperature critical to sustaining fen ecosystems and the plant species that depend on these ecosystems.. **15** Locate new livestock handling facilities and stock driveways, salting, and supplemental feeding outside of meadows and riparian areas except where there are no other feasible alternatives and where placement is consistent with meeting watershed or water quality best management practices if located in riparian conservation areas. **Guidelines (FIRE-FW-GDL)** **04** When managing wildland fire, allow fire to burn in riparian ecosystems when fire effects are expected to be within the natural range for the ecosystem to improve riparian ecosystem function. **05** Where possible during wildland fire management activities, locate incident bases, camps, helibases, staging areas, helispots and other centers for incident activities outside of riparian conservation areas to avoid impacts to aquatic- and riparian-dependent resources.

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
Seeps and Springs Dependent: Inyo Mountains slender salamander, Kern plateau salamander, Black toad, Willow Flycatcher, Western Pearlshell, Owens Valley Springsnail, Wong's Springsnail	Slow moving water Cold spring water sources with perennial flow	Lowering of the water table, Dewatering or channelization, invasion by nonnative species, Wetland drainage, Spring capping, flood scouring, overgrazing, trampling.	**Guidelines (SPEC-FW-GDL)** **05** Water developments (such as a diversion or well) should be avoided near streams or seeps and springs where there is high risk of dewatering aquatic and riparian habitats where at-risk species occur. **Desired Conditions (RCA-SPR-DC)** **01** Springs provide sufficient water to maintain healthy habitats for native riparian and aquatic species. **02** Springs are resilient to natural disturbances, groundwater diversions, and changing climate conditions. Springs function across the landscape within their type and water availability. **03** Springs and associated streams and wetlands have the necessary soil, water, and vegetation attributes to be healthy and functioning at or near potential. Water flow is similar to historic levels and persists over time, within constraints of climate change.
Wet/Riparian Meadow Dependent: Willow Flycatcher, Sage grouse, Sierra marten, Black toad, Inyo Mountains slender salamander, Apache Fritillary, Mono Lake Checkerspot, Sierra Sulphur	Dense thickets of shrubby vegetation, structural heterogeneity, perennial water source. Perennially wet marshes and wet meadows near springs, seeps and riparian areas where host plant species may occur.	Lowering of the water table, Dewatering or channelization, invasion by nonnative species.	**Guidelines (SPEC-FW-GDL)** **05** Water developments (such as a diversion or well) should be avoided near streams or seeps and springs where there is high risk of dewatering aquatic and riparian habitats where at-risk species occur. **Desired Conditions (RCA-MEAD-DC**) **01** Meadows are hydrologically functional. Sites of accelerated erosion, such as gullies and headcuts are stabilized, recovering, or within the natural range of variation **02** Wetlands and groundwater-dependent ecosystems (including springs, seeps, fens, wet meadows, and associated wetlands or riparian systems) support stable herbaceous and woody vegetative communities that are resilient to drought, climate change, and other stressors. Root masses stabilize stream channels, shorelines, and soil surfaces. The natural hydrologic, hydraulic, and geomorphic processes in these ecosystems sustain their unique functions and biological diversity. **03** Meadows are resilient and recover rapidly from natural and human disturbances. They exhibit a high degree of hydrologic connectivity laterally across the floodplain and vertically between surface and subsurface flows. They provide important ecosystem services such as high-quality water, recharge of streams and aquifers, and moderation of climate variability and change. **04** Soils in wet and headwater meadows are influenced by a shallow water table and function to filter water. These soils also store and release water over an extended period of time, which helps to maintain streamflow during dry summer months. **05** Meadows have substantive ground cover and a rich and diverse species composition, especially of grasses and forbs. Meadows have high plant functional diversity with multiple successional functional types represented. Perennial streams in meadows contain a diversity of age classes of shrubs along the streambank, where the potential exists for these plants. **06** A complexity of meadow habitat types and successional patterns support native plant and animal communities. Meadow species composition is predominantly native, where graminoid (grass-like) species are well represented and vigorous, and regeneration occurs naturally. Healthy stands of willow, alder, and aspen are present within and adjacent to meadows with suitable physical

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
			conditions for these species. Natural disturbances and management activities are sufficient to maintain desired vegetation structure, species diversity, and nutrient cycling. Guidelines (FIRE-FW-GDL) **04** When managing wildland fire, allow fire to burn in riparian ecosystems when fire effects are expected to be within the natural range for the ecosystem to improve riparian ecosystem function. **05** Where possible during wildland fire management activities, locate incident bases, camps, helibases, staging areas, helispots and other centers for incident activities outside of riparian conservation areas to avoid impacts to aquatic- and riparian-dependent resources.
Dry/Non-riparian Meadow Dependent: great gray owl, Nelson desert bighorn sheep, California spotted owl, Sierra marten, Kern Plateau salamander, Mount Pinos sooty grouse, Boisduval's blue, square dotted blue	Native plant composition, openness. Dry meadows, clearings or openings where host plant species may occur.	Invasive plants, conifer/ woodland encroachment, unmanaged grazing.	**Desired Conditions (SPEC-SHP-DC)** **01** An adequate amount of suitable habitat supports persistent populations of bighorn sheep. These habitat patches include unforested openings supporting productive plant communities with a variety of forage species in and near adequate steep rocky escape terrain throughout the elevational range within mountain ranges. These areas meet different seasonal needs for each sex for feeding, night beds, birthing sites, lamb rearing, and migration routes between suitable habitat patches. **Desired Conditions (RCA-MEAD-DC)** **01** Meadows are hydrologically functional. Sites of accelerated erosion, such as gullies and headcuts are stabilized, recovering, or within the natural range of variation **06** A complexity of meadow habitat types and successional patterns support native plant and animal communities. Natural disturbances and management activities are sufficient to maintain desired vegetation structure, species diversity, and nutrient cycling. **07** Meadows in montane and upper montane areas have low to moderate-severity fire restored as an ecological process, especially on meadow edges, limiting conifer encroachment and enhancing native understory plant composition and cover.
Aquatic/Water Dependent: California golden trout, bald eagle, Western pearlshell, Owens Valley springsnail, Wong's springsnail	Large bodies of water (lakes or reservoirs) or free flowing large rivers with adjacent large live trees or snags. Rivers and large streams with cold, clean water and where pooling habitat/undercut banks and emergent vegetation is present.	Lowering or depletion of the water table, sedimentation, changes in water temperature.	**Standard (SPEC-GT-STD)** **01** High quality habitat for all golden trout streams should be managed as best that can be achieved given the incised conditions of the stream channels as defined by accepted methodologies such as proper functioning condition, stream condition inventory, and desired conditions using the greenline method for riparian vegetation habitat. **Desired Conditions (RCA-RIV-DC)** **01** Stream ecosystems, riparian corridors, and associated stream courses sustain ecosystem structure; are resilient to natural disturbances (such as flooding) and climate change; promote the natural movement of water, sediment and woody debris; and provide habitat for native aquatic species or desirable nonnative species. **02** Stream ecosystems, including ephemeral watercourses, exhibit full connectivity where feasible to maintain aquatic species diversity, except where barriers are maintained in good condition to protect native aquatic species. Ephemeral watercourses provide for dispersal, access to new habitats, perpetuation of genetic diversity, and nesting and foraging habitat for riparian and aquatic species.

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
	Cold spring water sources with perennial flow.		**03** Instream flows are sufficient to sustain desired conditions of riparian, aquatic, wetland, and meadow habitats and retain patterns of sediment, nutrients, and wood routing as close as possible to those with which aquatic and riparian biota evolved. The physical structure and condition of streambanks and shorelines minimize erosion and sustain desired habitat diversity. **04** Streams and rivers maintain seasonal water flow over time, including periodic flooding, which promotes natural movement of water, sediment, nutrients, and woody debris. Flooding creates a mix of stream substrates for fish habitat, including clean gravels for fish spawning, large wood structures, and sites for riparian vegetation to germinate and establish. **05** Stream channel conditions exhibit a sediment regime under which aquatic and riparian ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport. The sediment regime should be similar to the natural distribution of reference conditions. **06** Within rivers and streams, the level of coarse large woody debris is within the natural range of variation. **Lakes, Pools, Ponds** **Desired Conditions (RCA-LPP-DC)** **01** Natural lakes and ponds retain necessary attributes, such as adequate vegetation and large woody debris to function properly and support native biotic communities. Attributes include floodwater retention and groundwater recharge, stabilized islands and shoreline features, and diverse characteristics to provide for amphibian production, waterfowl breeding and biodiversity.
Fire Adapted Ecosystems Dependent: Sierra marten, great gray owl, California spotted owl, Mount Pinos Sooty grouse, bald eagle	Large trees, snags, forest structural complexity and connectivity across large landscapes.	Uncharacteristic stand replacing wildlife, climate change, drought, insect and disease outbreaks	**Desired Conditions (TERR-RFIR-DC)** **02** Fire occurs as a key ecological process in red fir forests where it does not pose an unacceptable risk to life and property. Fire as an ecological process creates, restores, and maintains ecosystem resilience and increases understory plant vigor, heterogeneity, and habitat diversity. **Desired Conditions (TERR-LDGP-DC)** **02** Fire occurs as a key ecological process in lodgepole pine forests where it does not pose an unacceptable risk to life and property. Fire as an ecological process creates, restores, and maintains ecosystem resilience and increases understory plant vigor, heterogeneity, and habitat diversity. **Desired Conditions (TERR-DMC-DC)** **02** At the landscape-scale, fire is a key ecological process, creating a diversity of vegetation types, lower surface fuels and diverse understory vegetation. Fires occur frequently, on average every 5 to 15 years, with mostly low and moderate severity. Patches burned at high severity (greater than 75 percent basal area mortality) are rarely greater than 200 acres, and the proportion of areas burned with high severity is generally less than 15 percent. **Desired Conditions (TERR-JEFF-DC)** **02** At the landscape-scale, fire is a key ecological process, creating a diversity of vegetation types, lower surface fuels and diverse understory vegetation. Fires occur frequently, on average every 5 to 15 years, with mostly low and moderate severity. Patches burned at high severity (greater than

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
			75 percent basal area mortality) are rarely greater than 200 acres, and the proportion of areas burned with high severity is generally less than 15 percent. **Desired Conditions (TERR-OLD-DC)** **01** The composition, structure, and functions of old forests and surrounding landscapes are resilient to fire, drought, insects, pathogens, and climate change. Fire occurs as a key ecological process in forest types that are adapted to fire, creating, restoring and maintaining ecosystem resilience and fire-related composition and structure. **Desired Conditions (SPEC-SMPF-DC)** **01** Risk of large high-severity fire is reduced from current conditions in marten habitat core areas and fisher Core Area 1. **Desired Conditions (FIRE-FW-DC)** **01** Wildland fires burn with a range of intensity, severity and frequency that allow ecosystems to function in a healthy and sustainable manner. Wildland fire is a necessary process, integral to the sustainability of fire-adapted ecosystems (see TERR-FW-DC related to fire). **Goals (FIRE-FW-GOAL)** **01** Reduce fuel accumulations, help maintain and protect habitat for a variety of species, reduce smoke from larger fires, provide added protection for communities, and restore fire on the landscape. **02** Base fire management on an all lands risk-based approach in planning and decisionmaking that is responsive to the latest fire and social sciences and is adaptable to rapidly changing conditions, including climate change. **03** Plan restoration and fire management projects for large landscapes (subwatershed or larger) when and where possible to improve economic feasibility of restoration and effectiveness of changing the negative fire effects from large wildfires. **05** Restore ecosystems to a more fire-resilient condition and lessen the threat of wildfire to communities. **10** Coordinate with researchers, partners, and Tribes to help achieve desired conditions in ecosystems that are experiencing (or may experience in the future) more frequent, severe, or large fires than the natural range of variation due to factors such as invasive annual grasses and changing climate. **Guidelines (FIRE-FW-GDL)** See also SPEC-SG-GDL 08. **01** Use naturally ignited and prescribed wildland fires to meet multiple resource management objectives where and when conditions permit and risk is within acceptable limits. **Desired Conditions (TERR-ALPN-DC)** **02** Fires occur infrequently, are mostly very small, and burn with mixed severity. Fire intensity is highly variable, but crown fires are usually limited in size. **Desired Conditions (TERR-FW-DC)**

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
			08 Fire occurs as a key ecological process in fire-adapted ecosystems where it does not pose an unacceptable risk to life and property. Fire occurs within an ecologically appropriate regime of frequency, extent, and severity, and enhances ecosystem heterogeneity and habitat and species diversity. **Desired Conditions (DA-WILD-DC)** **03** Fire is restored as an ecosystem process and natural disturbance agent in wilderness where possible.
Multiple Uses (Hunting/Recreation /Infrastructure: Mount Pinos Sooty Grouse, Bald Eagle, California Golden Trout, Willow Flycatcher, Great Gray owl, Sierra Marten, Sage grouse	Breeding and Foraging Habitat.	Disturbance and direct mortality.	**Desired Conditions (SPEC-FW-DC)** **05** The national forest provides high quality hunting and fishing opportunities. Habitat for nonnative fish and game species is managed in locations and ways that do not pose substantial risk to native species, while still contributing to economies of local communities. **Desired Conditions (DA-WILD-DC)** **05** Each wilderness area accommodates levels of recreation use that are ecologically sustainable. **08** Trails in wilderness are located in resilient areas, and do not cause adverse impacts to at-risk species, water quality, soils, hydrologic connectivity, or cultural resources. **Guideline (MA-GRA-GDL)** **01** Use direct management techniques to reduce impacts on resources. **Desired Conditions (DA-WILD-REC1-DC)** **02** An unmodified natural environment characterizes the area. Ecological and natural processes are minimally affected by the action of users. Environmental impacts are low and restricted to minor losses of vegetation where camping occurs and along travel routes. Most impacts recover on an annual basis and are apparent to few visitors. **03** Campsites are at low-density levels and show minor impacts that will rarely persist year to year. **04** There is very little vegetation loss or alteration of duff and litter layer by human use. **05** Riparian, lakeshore and stream channel conditions show no measurable degradation due to human uses. **Desired Conditions (REC-FW-DC)** **04** Areas of the national forest provide for a variety of activities with minimal impact on sensitive environments and resources. **08** Dispersed recreation occurs in areas outside of high visitation, developed facilities or communities, and does not adversely impact natural or cultural resources. **Goals (REC-FW-GOAL)** **06** Collaborate with a variety of partners to provide stewardship and interpretive services that enhance responsible recreation and increase knowledge of related socioeconomic and environmental issues. **Guidelines (REC-FW-GDL)** **01** Avoid locating new recreation facilities within environmentally and culturally sensitive areas, such as at-risk species breeding habitat or at-risk plant species habitat.

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
			02 Create infrastructure that mimics the natural textures and colors of the surrounding landscape to be consistent with the recreation setting. **03** Use integrated resource planning when designing projects to address impacts to at-risk species habitat and changing conditions in recreation settings. **Desired Conditions (INFR-FW-DC)** **03** Roads allow for safe and healthy wildlife movement in areas of human development. Vehicular collisions with animals are rare. **Guidelines (LAND-FW-GDL)** **02** Where feasible, bury new or reconstructed power distribution lines (33kV or less) and telephone lines to reduce impacts resources such as scenery and at-risk species habitat.
Connected landscapes: Sierra marten, fisher, California spotted owl, Nelson Desert Bighorn sheep, great gray owl.	Large contiguous blocks of habitat providing movement corridors for foraging, breeding, and dispersal.	Forest activities or natural disturbance events (e.g. wildfire, drought) that cause habitat fragmentation.	**Desired Conditions (MA-CBRA-DC)** **02** These areas contribute to ecosystem and species diversity and sustainability, serve as habitat for fauna and flora, and offer wildlife corridors. These areas provide a diversity of terrestrial and aquatic habitats, and support species dependent on large, undisturbed areas of land. **Desired Conditions (TERR-FW-DC)** **06** The landscape contains a mosaic of vegetation types and structures that provide habitat, movement and connectivity for a variety of species including wide-ranging generalists such as bear, mountain lion, and deer; more localized, semi-specialists such as ground-nesting, shrub-nesting, and cavity-nesting birds and various bats; and specialists such as old forest and sagebrush-associated species. **Desired Conditions (DA-WILD-DC)** **08** Forest system trails that access wilderness are part of a high-quality wilderness experience for visitors. Forest system trails meet national quality standards, with minimal deferred maintenance and adhere to the national trail classification system. Trails in wilderness are located in resilient areas, and do not cause adverse impacts to at-risk species, water quality, soils, hydrologic connectivity, or cultural resources. **Guidelines (TIMB-FW-GDL)** **03** On lands not suited for timber production, reforestation of deforested lands should contribute to ecological restoration, while providing benefits such as improving scenic character, restoring connectivity for wildlife, increasing carbon storage and improving watershed condition. **Desired Conditions (TERR-OLD-DC)** **02** The landscape contains a mosaic of vegetation types and structures that provide foraging and breeding habitat, movement, and connectivity for a variety of old forest-associated species. **Desired Conditions (SPEC-SMPF-DC)** **03** Marten and fisher habitat are well distributed throughout the marten's range and fisher Core Area 1, providing for foraging, denning, and resting habitat and movement across large landscapes. **Desired Conditions (SPEC-CSO-STD)**

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
			01 Within California spotted owl home range core areas, use a landscape-scale approach for strategically placing area fuels treatments to modify fire behavior while retaining existing suitable habitat, recognizing that habitat within treated areas may be modified to meet fuels objectives. **Desired Conditions (INFR-FW-DC)** **03** Roads allow for safe and healthy wildlife movement in areas of human development. Vehicular collisions with animals are rare. **Goals (FIRE-FW-GOAL)** **03** Plan restoration and fire management projects for large landscapes (subwatershed or larger) when and where possible to improve economic feasibility of restoration and effectiveness of changing the negative fire effects from large wildfires.
Special habitats and rare endemics/ restricted distributions: Inyo Mountains slender salamander, Black Toad, Kern Plateau Salamander, California Golden Trout, Western Pearlshell, Owens Valley Springsnail, Wong's Springsnail, Apache Fritillary, Boisduval's Blue, Mono Lake Checkerspot, San Emigdio Blue, Sierra Sulphur, Square Dotted Blue, Cave Obligate Pseudoscorpion	Special habitats and or microsite conditions that provide connectivity or refugia. Population collapse.	Direct loss of vegetation, change in species composition, and microsite conditions, inability to disperse due to drought or habitat disturbance, loss of riparian and aquatic habitat Direct mortality from host species loss	**Desired Conditions (SPEC-FW-DC)** **04** The structure and function of the vegetation, aquatic and riparian system, and associated microclimate and smaller scale elements (like special features such as carbonate rock outcrops, fens, or pumice flats) exist in adequate quantities within the capability of the plan area to provide habitat and refugia for at-risk species with restricted distributions. **Desired Conditions (TERR-SH-DC)** **01** The integrity of special habitats is maintained or improved from current conditions. Composition, diversity, and structure are maintained in all areas, including those with multiple-use activities. **02** Microclimate or smaller scale habitat elements provide habitat and refugia for species with a specific geographic or restricted distribution. **03** Conditions remain suitable for long-term sustainability of the suite of native plants adapted to special habitats and their associated insect pollinators. **Goals (TERR-SH-GOAL)** **01** Work cooperatively with researchers and interested parties to study, monitor and assist in appropriate restoration measures of special habitats. **02** Include the location of special habitats in the corporate geographic information system. Standard (TERR-SH-STD) **01** At the project scale, evaluate and incorporate maintenance and enhancement needs for special habitats into project design and implementation. **Guidelines (FIRE-FW-GDL)** **06** During wildfires, avoid fire management activities in special habitats (see Terrestrial section, chapter 2) except when necessary to protect life and property. This includes activities such as line construction, staging areas, safety zones, water drafting, and camps. When conducting fire management activities near special habitats, take extra measures to avoid spread of invasive plants.
Host Species Dependent:	Host species required to	Direct mortality from loss of host species.	**Desired Conditions (SPEC-FW-DC)** 01 Sustainable populations of native and desirable nonnative, plant and animal species are supported by healthy ecosystems, essential ecological processes, and land stewardship activities,

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
Western Pearlshell, Apache Fritillary, Boisduval's Blue, Mono Lake Checkerspot, San Emigdio Blue, Sierra Sulphur, Square Dotted Blue	complete a portion or entire life cycle.		and reflect the diversity, quantity, quality and capability of natural habitats on the national forest. These ecosystems are also resilient to uncharacteristic fire, climate change, and other stressors, which supports the long-term sustainability of plant and animal communities. **02** Habitats for at-risk species support self-sustaining populations within the inherent capabilities of the plan area. Ecological conditions provide habitat conditions that: contribute to the survival, recovery, and delisting of species under the Endangered Species Act; preclude the need for listing new species; improve conditions for species of conservation concern (including minimal impacts from diseases); and sustain both common and uncommon native species. **04** The structure and function of the vegetation, aquatic and riparian system, and associated microclimate and smaller scale elements (like special features such as carbonate rock outcrops, fens, or pumice flats) exist in adequate quantities within the capability of the plan area to provide habitat and refugia for at-risk species with restricted distributions. **Desired Conditions (TERR-SH-DC)** **01** The integrity of special habitats is maintained or improved from current conditions. Composition, diversity, and structure are maintained in all areas, including those with multiple-use activities. **02** Microclimate or smaller scale habitat elements provide habitat and refugia for species with a specific geographic or restricted distribution. **03** Conditions remain suitable for long-term sustainability of the suite of native plants adapted to special habitats and their associated insect pollinators. **Goals (TERR-SH-GOAL)** **01** Work cooperatively with researchers and interested parties to study, monitor and assist in appropriate restoration measures of special habitats. **02** Include the location of special habitats in the corporate geographic information system. Standard (TERR-SH-STD) **01** At the project scale, evaluate and incorporate maintenance and enhancement needs for special habitats into project design and implementation.
Black Toad, Nelson Desert Bighorn Sheep	Population collapse	Direct mortality from disease	**SPEC-SHP-DC** **02** The risk of disease transmission from domestic sheep and goats to bighorn sheep (based upon the best available risk assessment model) is reduced to the maximum extent practicable. **SPEC-SHP-STD** **01** Do not allow domestic sheep or goat grazing or pack goat use adjacent to bighorn sheep populations where relevant bighorn sheep risk assessment models show there is a high risk of contact and spread of disease, unless risks can be adequately mitigated. **02** Manage recreation, or other disturbances, where research has found it to cause bighorn sheep to avoid important habitat as described in the Sierra Nevada Bighorn Sheep Recovery Plan or other guidance from the U.S. Fish and Wildlife Service. **SPEC-SHP-SUIT:** Domestic sheep or goats, including pack goats, are not suitable within the high risk area of disease transmission to Sierra Nevada bighorn sheep identified in the most recent bighorn sheep risk assessment, unless the risk can be mitigated.

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
			SPEC-FW-DC **02** Habitats for at-risk species support self-sustaining populations within the inherent capabilities of the plan area. Ecological conditions provide habitat conditions that: contribute to the survival, recovery, and delisting of species under the Endangered Species Act; preclude the need for listing new species; improve conditions for species of conservation concern, including addressing threats (e.g. minimal impacts from diseases); and sustain both common and uncommon native species. **Desired Conditions (INV-FW-DC)** **01** Terrestrial and aquatic invasive species are controlled or eradicated when possible, and establishment of new populations is prevented. **02** The area affected by invasive species and introduction of new invasive species is minimized. Goal (INV-FW-GOAL) **01** Coordinate and cooperate with local, State and Federal agencies and Tribes to manage and control invasive and nonnative species. **03** Coordinate with research and other organizations to evaluate the potential effects of climate change on the spread of invasive and nonnative species. **Standards (INV-FW-STD)** **01** When working in waterbodies with known aquatic invasive species, clean equipment and vehicles before moving to other waterbodies. **03** Use an integrated pest management approach in the planning and implementation of all projects and activities. **Guidelines (INV-FW-GDL)** **01** Projects should be designed to minimize invasive species spread by incorporating prevention and control measures into ongoing management or maintenance activities that involve ground disturbance, terrestrial or aquatic habitat alteration, or the possibility of spreading invasive species. When feasible, projects should include measures to use invasive species-free gravel, fill, and topsoil; include follow-up inspections as needed and specified in regional or national strategies.
ALL	ALL	Stochastic events causing widespread or complete habitat loss.	**Desired Conditions (SPEC-FW-DC)** **01** Sustainable populations of native and desirable nonnative, plant and animal species are supported by healthy ecosystems, essential ecological processes, and land stewardship activities, and reflect the diversity, quantity, quality and capability of natural habitats on the national forest. These ecosystems are also resilient to uncharacteristic fire, climate change, and other stressors, which supports the long-term sustainability of plant and animal communities. **Guidelines (TIMB-FW-GDL)** **02** On lands suitable for timber production, reforestation should be designed to achieve stocking levels, spatial arrangements, and species composition to allow for long-term resilience of the developing forest, while considering potential future plantation management, carbon carrying capacity, and climate change adaptation. Competing vegetation, fuel levels, and fire risk should

Species or Species Group	Key Ecological Conditions at Risk	Key Threats	Key Plan Components
			be managed to provide for the long-term survival and vigor of reestablishing forests as they move toward maturity. **Goals (FIRE-FW-GOAL)** **02** Base fire management on an all lands risk-based approach in planning and decision making that is responsive to the latest fire and social sciences and is adaptable to rapidly changing conditions, including climate change. **All Riparian Conservation Areas** **Desired Conditions (MA-RCA-DC)** **04** Native fish, amphibians, and other native aquatic species are present within their historic distribution and have adjusted for climate change. **Objective (MA-RCA-OBJ)** **01** Restore the structure and composition of at least 400 acres in riparian areas within 10 years following plan approval, emphasizing riparian areas that face the most risk from large-scale high-intensity fire, past fire exclusion, or accelerated flooding events associated with climate change. **Desired Conditions (TERR-ALPN-DC)** **03** Subalpine woodlands are resilient to insects, diseases, fire, wind, and climate change. **05** Alpine ecosystems are resilient to climate change, and fires are small and occur infrequently. **Desired Conditions (TERR-FW-DC)** **02** Vegetation structure and composition provide ecosystem resilience to climate change and other stressors including altered fire regimes, drought, and flooding in riparian systems. **Desired Conditions (RCA-SPR-DC)** **02** Springs are resilient to natural disturbances, groundwater diversions, and changing climate conditions. Springs function across the landscape within their type and water availability. **03** Springs and associated streams and wetlands have the necessary soil, water, and vegetation attributes to be healthy and functioning at or near potential. Water flow is similar to historic levels and persists over time, within constraints of climate change. **Desired Conditions (RCA-RIV-DC)** **01** Stream ecosystems, riparian corridors, and associated stream courses sustain ecosystem structure; are resilient to natural disturbances (such as flooding) and climate change; promote the natural movement of water, sediment and woody debris; and provide habitat for native aquatic

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Individual Evaluations – Plants

Background

Plant Species of Conservation Concern Categories

The Inyo National Forest has 105 botanical species of conservation concern. Many of these species have very low number of occurrences and/or very limited distribution. Regarding limited distribution, many plant species of conservation concern are endemic (i.e., exist only in one geographic region) to California, the Inyo National Forest, or even a single county. For example, Mono milk-vetch occurs only in Mono County and Ramshaw Meadows abronia occurs only in Tulare County. However, the relative rarity of a species alone does not constitute vulnerability. In analyzing persistence of a species, occurrence and distribution are factors included along with ecological conditions of habitat and the identified threats in the plan area. Because botanical species are non-mobile, identified threats to species with very low numbers of occurrences and/or very limited distribution need to be managed at sites where they exist in order to improve resilience to stochastic events (e.g., wildfire, flooding, and climate change) and provide for persistence over the long term. For these reasons, all Inyo National Forest plant species of conservation concern were categorized into three major groups for the persistence analysis.

Plant Species of Conservation Concern Categories:

- Category 1 botanical species are those species having one or two occurrences in the plan area, with identified threats to persistence, and the species occurs elsewhere.
- Category 2 botanical species are those species having low numbers of occurrences and/or limited distribution, and identified threats to persistence, in the plan area. Although some species are endemic to the plan area, many occur elsewhere but have more than two occurrences in the plan area.
- Category 3 botanical species are those species with sufficient numbers and distribution of occurrences and individuals within occurrences such that inadvertent loss of individuals or occurrences will not threaten population persistence and viability.

The term “occurrences” in this case is used to describe discrete clusters of individuals, tracked as element occurrences, by state natural heritage programs, including within the California Natural Diversity Database and as Natural Resources Manager Threatened, Endangered, Sensitive, and Proposed (NRM-TESP) Site ID’s by the Forest Service. Element occurrences form the basis of quantification that drives global and state rankings of rarity (NatureServe.org)[12]. Protection of occurrences does not imply protection of all individuals within an occurrence.

Determination Outcomes

Determinations for the three categories of botanical species of conservation concern were determined from these possible outcomes as described above in the introduction:

1. The ecosystem plan components should provide the ecological conditions necessary to maintain a viable population of the [Category Number] in the plan area. No additional species-specific plan components are warranted.

[12] See references at the end of this section.

2. The ecosystem plan components should provide the ecological conditions necessary to maintain a viable population of the [Category Number] in the plan area. Nonetheless, additional species-specific plan components have been provided for added clarity and/or measures of protection.
3. The ecosystem plan components may not provide the ecological conditions necessary to maintain a viable population of the [Category Number] in the plan area. Therefore, additional species-specific plan components have been provided. The combination of ecosystem and species-specific plan components should provide the ecological conditions necessary to maintain a viable population of the [Category Number] in the plan area.
4. It is 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 the [Category Number] in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

The finding that a viable population will be maintained should not be construed to mean the agency believes there currently is a viable population for all 105 Inyo species of conservation concern, rather that the plan components should provide the ecological conditions necessary to maintain a viable population to the extent such a population currently exists or exists in the future.

Methodology

Each of the 105 botanical species of conservation concern from the Inyo National Forest are placed into one of three categories of species defined above based on the listed factors, as currently understood and summarized in the species of conservation concern rationales and associated best available scientific information (USDA FS 2018). One of the four persistence determinations then follow for individual species, based on category, and are displayed in Table 26, along with key threats, habitats, and a summary of the plan components that are particularly important for providing for the persistence and viability of each species in the plan area. Plan components will not, and cannot, prevent all adverse impacts to individuals of the species, and have been designed to provide for viability of the species in the plan area. We outline the determination finding for each of the three categories of botanical species below, providing a species-specific example for each category. Persistence determinations are provided as species-specific paragraphs in order to facilitate understanding of the analytical approach used to categorize species and apply persistence determinations. The persistence determinations for each of the 105 plant species of conservation concern are displayed in table 26.

Abronia alpina **(photograph by Sue Weis)**

Category 1 Botanical Species

Determination 4: It is 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 category 1 botanical species in the plan area. Nonetheless, the plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

Category 1 botanical species are those species having one or two occurrences in the plan area, with identified threats to persistence, and the species has more occurrences outside the plan area. These species lack sufficient redundancy of individuals and distribution within the plan area to allow them to easily absorb and recover from adverse impacts of identified threats, including climate change and other stochastic events, and face risk of local extirpation. Since botanical species are non-mobile, they need to be protected at the sites where they exist. For these species, species-specific plan components are key to addressing identified site-specific threats, and for ensuring that plant species of conservation concern are considered during project planning and implementation. For this reason, both forestwide and species-specific plan components should maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of Category 1 species within its range.

Narrative Example - *Potentilla pulcherrima* - beautiful cinquefoil
The only known occurrence of *Potentilla pulcherrima* in California, is on the Inyo National Forest, in Mono County, half a mile up the south fork of Crooked Creek. It occurs in high elevation sagebrush on moist soil over granite. Identified threats include grazing and erosion. Table 26 lists the key ecological conditions and risk factors for *Potentilla pulcherrima,* and summarizes the plan components that support ecological conditions, mitigate for identified threats, and provide for persistence and contribute to maintaining a viable population. In addition, table 27 and displays a general crosswalk of where plan components and other plan content apply to address threats and provide ecological conditions for viable populations of plant species of conservation concern.

Category 2 Botanical Species

Determination 3: The ecosystem plan components may not provide the ecological conditions necessary to maintain a viable population of the category 2 botanical species of conservation concern in the plan area. Therefore, additional species-specific plan components have been provided. The combination of ecosystem and species-specific plan components should provide the ecological conditions necessary to maintain a viable population of these botanical species in the plan area.

Category 2 species have a low number of occurrences and/or very limited distribution in the plan area. Many category 2 plant species of conservation concern are endemic to the Inyo National Forest. Rarity is a factor that is included along with ecological conditions of habitat and identified threats in the plan area, including stochastic events like climate change, wildfire, and flooding. Category 1 and 2 species face high risk of local extirpation because they lack sufficient redundancy of individuals and distribution to allow them to easily absorb and recover from such adverse impacts. For these species, the persistence of all occurrences is important to maintain population viability. Because botanical species are non-mobile, they need to be protected at the sites where they exist. For these species, species-specific plan components are key to addressing identified site-specific threats, and for ensuring that plant species of conservation concern are considered during project planning and implementation. Both forestwide and species-specific

plan components are needed in order to provide the ecological conditions necessary to maintain viable populations of category 2 botanical SCC in the plan area.

Narrative Example - *Allium atrorubens* var. *atrorubens*, the Great Basin onion
Allium atrorubens var. *atrorubens*, the Great Basin onion - three of nineteen CNDDB records are from the Inyo National Forest. This species occurs in mountain mahogany, subalpine, and pinyon-juniper habitats. Identified threats include grazing and mining. Table 26 lists the key ecological conditions and risk factors for the Great Basin onion, and summarizes the plan components that support ecological conditions, mitigate for identified threats, and provide for persistence and contribute to maintaining a viable population. In addition, table 27 displays a general crosswalk of where plan components and other plan content apply to address threats and provide ecological conditions for viable populations of plant species of conservation concern.

Category 3 Botanical Species

Determination 2: The ecosystem plan components should provide the ecological conditions necessary to maintain a viable population of the category 2 species in the plan area. Nonetheless, additional species-specific plan components have been provided for added clarity and/or measures of protection.

Category 3 species have sufficient numbers and distribution of occurrences, and individuals within occurrences, that inadvertent loss of individuals or some occurrences will not threaten population persistence and viability. They have a very low number of occurrences and/or very limited distribution in the plan area. Some category 3 plant species of conservation concern are endemic to the Inyo National Forest. As with Category 1 and 2 species, many species occurrences face site-specific threats. But for these species, ecosystem plan components should provide the ecological conditions necessary to maintain a viable population in the plan area. Nonetheless, additional species-specific plan components have been provided for added clarity and/or measures of protection.

Narrative Example - *Botrychium crenulatum* - scalloped moonwort
Botrychium crenulatum lives on saturated hard water seeps and stream margins, 1500-3600 m elevation in the high Sierra Nevada and eastern Sierra Nevada. Ten of seventy-four CNDDB records are from the Inyo National Forest. Identified threats include hydrologic alteration, trampling, unauthorized off-highway vehicle travel, and severe soil disturbance. Table 26 lists the key ecological conditions and risk factors for the scalloped moonwort, and summarizes the plan components (ecosystem, at-risk species-specific) that support ecological conditions and mitigate for identified threats in order to provide for persistence and contribute to maintaining a viable population. In addition, table 27 displays a general crosswalk of where plan components and other plan content apply to address threats and provide ecological conditions for viable populations of plant species of conservation concern.

Forest Plan Components that Support Persistence

Forest-wide ecosystem plan components support natural ecological processes, functions, and biodiversity, and promote ecological conditions that are resilient to climate change and other stressors. Additional ecosystem plan components provide area-specific desired conditions and management direction, and are tailored to specific ecosystem types or management areas, including providing ecological conditions that support persistence of species of conservation concern in riparian conservation areas; habitat types that host many botanical species of conservation concern. Disturbance processes (such as fire) and management activities (such as grazing and recreation) are addressed by ecosystem and other plan components that consider effects to plant communities and/or species diversity.

Species-specific plan components provide additional forestwide guidance for at-risk species to promote healthy, resilient ecosystems that support functional plant and animal communities and self-sustaining populations of at-risk species. These plan components are particularly important to category 1 and category 2 botanical species of conservation concern because they address site-specific threats in occupied habitat. Species-specific plan components, including for special habitats, mitigate risk to persistence from land management activities, and provide guidance for addressing existing site-specific threats not related to project activities, while balancing the needs of at-risk species with other resource uses and ecological processes. In addition, species-specific potential management approaches suggest development of systematic and programmatic approaches to achieve conservation of species of conservation concern.

Determinations for All Botanical Species of Conservation Concern

Table 26 provides a summary of persistence determinations for Inyo National Forest botanical species of conservation concern as well as key ecosystem habitats and threats. More detailed information on individual species can be found in the Rationales for Plant Species Considered for Designation as Species of Conservation Concern (USDA 2019), accessible on the plan website or at https://www.fs.usda.gov/goto/SCC).

Table 26. Persistence determinations for botanical species of conservation concern, with key habitats, threats, and plan components that provide for persistence

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Abronia alpina	3	2	Subalpine, dry forb, meadow edges (loose granitic gravel and sand)	Conifer encroachment, hydrologic alteration, climate change; very rare	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) FIRE-FW-GDL (06) WTR-FW-DC (01) MA-RCA-DC (02) WTR-FW-DC (01) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Agrostis humilis	3	2	Alpine, meadow	Climate change and related hydrologic alteration; social trails in meadows; packstock	TERR-FW-DC (02, 03, 05) WTR-FW-DC (01) TERR-ALPN-DC (05) RANG-FW-STD (07) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) MA-RCA-DC (02) MA-RCA-GDL (02) MA-RCA-STD (10) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Allium atrorubens var. atrorubens	3	2	Mountain mahogany, subalpine, pinyon-juniper	Grazing; mining	TERR-FW-DC (02, 03, 05) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) GEO-FW-DC (01) TERR-MOMA-DC (01, 02) TERR-ALPN-DC (03) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Astragalus cimae var. sufflatus	3	2	Pinyon-juniper	Invasive species,; one occurrence known in plan area	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) INV-FW-DC (01) INV-FW-GOAL (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Astragalus inyoensis	2	3	Pinyon-juniper	Mining, unauthorized OHV travel	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) GEO-FW-DC (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Astragalus johannis-howellii	3	2	Sagebrush, alkali flat (ash or pumice)	Grazing	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-SH-STD (01) FIRE-FW-GDL (06) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02)
Astragalus kentrophyta var. elatus	3	2	Subalpine, mountain mahogany, pinyon juniper	Climate change, recreation, small occurrence numbers, soil degradation	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) WTR-FW-DC (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) TERR-MOMA-DC (01, 02) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Astragalus lemmonii	3	2	Sagebrush, moist alkaline meadows or lakeshores	Grazing, hydrologic alteration, few occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) FIRE-FW-GDL (06) WTR-FW-DC (01) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) RANG-FW-STD (07) MA-RCA-DC (02) MA-RCA-STD (02) MA-RCA-GDL (02) RCA-MEAD-DC (02) RCA-LPP-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Astragalus lentiginosus var. kernensis	2	3	Subalpine, dry forb, lodgepole, meadows	Unauthorized OHV travel, climate change, drought, grazing	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) TERR-LDGP-DC (01, 02) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) WTR-FW-DC (01) MA-RCA-DC (02) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) FIRE-FW-GDL (06)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Astragalus monoensis	3	2	Jeffrey pine, sagebrush, dry forb, pumice flats	Unauthorized OHV travel, drought, grazing, limited distribution	TERR-FW-DC (02, 03, 05) TERR-MONT-DC (01, 02) TERR-JEFF-DC (01, 02) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) FIRE-FW-GDL (06) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) WTR-FW-DC (01) MA-RCA-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Astragalus ravenii	3	2	Alpine, subalpine	Climate change; very small occurrence numbers; fragile habitat	WTR-FW-DC (01) TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03, 05)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Astragalus serenoi var. shockleyi	3	2	Pinyon-juniper, xeric shrub/blackbrush	Mining, grazing, invasive species	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) TERR-XER-DC (01, 02, 03, 04) TERR-XER-STD (01) TERR-XER-GDL (01) GEO-FW-DC (01) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) INV-FW-DC (01) INV-FW-GOAL (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Astragalus subvestitus	2	3	Subalpine, dry forb	Grazing, OHV	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01) FIRE-FW-GDL (06) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Boechera bodiensis (Arabis b.)	3	2	Pinyon-juniper, sagebrush (granitic, rhyolitic, moisture accumulating microsites)	Climate change	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) FIRE-FW-GDL (06)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Boechera pendulina	3	2	Alpine	Climate change	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (05) WTR-FW-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Boechera pinzliae	3	2	Alpine, subalpine (granitic soils)	Climate change; small occurrences	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03, 05) FIRE-FW-GDL (06)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Boechera shockleyi (Arabis s.)	3	2	Xeric shrub/blackbrush (rock outcrops, gravelly soil (generally dolomite)	Mining, unauthorized OHV travel	TERR-FW-DC (02, 03, 05) TERR-XER-DC (01, 02, 03, 04) TERR-XER-STD (01) TERR-XER-GDL (01) FIRE-FW-GDL (06) GEO-FW-DC (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Boechera tiehmii (Arabis t.)	3	2	Alpine	Climate change	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (05) WTR-FW-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Boechera tularensis	3	2	Subalpine or upper montane coniferous forest, meadow	Grazing, climate change	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) WTR-FW-DC (01) TERR-MONT-DC (01, 02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Botrychium ascendens	3	2	Subalpine, moist meadows, open woodland streams or seeps	Hydrologic alteration, trampling, unauthorized OHV travel, severe soil disturbance	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) WTR-FW-DC (01) MA-RCA-DC (02) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) MA-RCA-DC (02) MA-RCA-GDL (02) RCA-MEAD-DC (02) RCA-SPR-DC (01, 02, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Botrychium crenulatum	2	3	Subalpine, meadow, saturated hard water seeps and stream margins	Hydrologic alteration, trampling, unauthorized OHV travel, severe soil disturbance	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) WTR-FW-DC (01) MA-RCA-DC (02) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) MA-RCA-DC (02) MA-RCA-GDL (02) RCA-MEAD-DC (02) RCA-SPR-DC (01, 02, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Botrychium lineare	3	2	Subalpine, moist meadows	Hydrologic alteration, trampling, unauthorized OHV travel, severe soil disturbance, very small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) WTR-FW-DC (01) MA-RCA-DC (02) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) MA-RCA-DC (02) MA-RCA-GDL (02) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Botrychium minganense	4	1	Subalpine, meadow, open forest along streams or seeps	Hydrologic alteration, trampling, unauthorized OHV travel, severe soil disturbance, small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) WTR-FW-DC (01) MA-RCA-DC (02) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) MA-RCA-DC (02) MA-RCA-GDL (02) RCA-MEAD-DC (02) RCA-SPR-DC (01, 02, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Bruchia bolanderi	4	1	Alpine, subalpine (colonizes organic or mineral soil along stream banks, in and around meadows, springs, and fens)	Hydrologic alteration; recreation impacts in meadow, few occurrences	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03, 05) FIRE-FW-GDL (06) MA-RCA-DC (02) MA-RCA-GDL (02) MA-RCA-STD (09) RCA-MEAD-DC (02) RANG-FW-STD (08) RCA-SPR-DC (01, 02, 03) WTR-FW-DC (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Calochortus excavatus	3	2	Sagebrush, xeric shrub/blackbrush, meadow (moist alkaline soils)	Grazing, hydrologic alteration, small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-XER-DC (01, 02, 03, 04) TERR-XER-STD (01) TERR-XER-GDL (01) FIRE-FW-GDL (06) MA-RCA-DC (02) MA-RCA-GDL (02) MA-RCA-STD (10) WTR-FW-DC (01) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) RANG-FW-STD (07) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Calyptridium pygmaeum	3	2	Alpine, subalpine	Climate change; trampling	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03, 05) WTR-FW-DC (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Carex davyi	4	1	Subalpine, meadow	Hydrologic alteration, grazing; one occurrence	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) WTR-FW-DC (01) MA-RCA-DC (02) MA-RCA-GDL (02) MA-RCA-STD (10) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) RANG-FW-STD (07) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Carex duriuscula	4	1	Sagebrush, subalpine, meadow	Grazing, hydrologic alteration, two occurrences	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) WTR-FW-DC (01) MA-RCA-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Carex idahoa	4	1	Sagebrush, subalpine, meadow	Grazing, climate change, two occurrences	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) WTR-FW-DC (01) MA-RCA-STD (10) MA-RCA-GDL (02) RANG-FW-STD (07) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) MA-RCA-DC (02) MA-RCA-GDL (02) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Carex petasata	4	1	Pinyon-juniper, subalpine, meadow	Grazing, climate change, two occurrences	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) TERR-ALPN-DC (03) WTR-FW-DC (01) MA-RCA-DC (02) MA-RCA-STD (10) MA-RCA-GDL (02) RANG-FW-STD (07) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Carex praticola	4	1	Subalpine, meadow	Grazing, climate change, one occurrence	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) WTR-FW-DC (01) MA-RCA-DC (02) MA-RCA-STD (10) MA-RCA-GDL (02) RANG-FW-STD (07) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Carex scirpoidea ssp. pseudoscirpoidea	3	2	Sagebrush, subalpine	Grazing, climate change, small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) WTR-FW-DC (01) MA-RCA-STD (10) MA-RCA-GDL (02) RANG-FW-STD (07) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Carex stevenii	4	1	Alpine	Climate change; hydrologic alterations; two occurrences	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (05) WTR-FW-DC (01) MA-RCA-DC (02) MA-RCA-DC (02) MA-RCA-GDL (02) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Carex tiogana	3	2	Alpine, subalpine (coarse, wet, limey soils)	Climate change, recreation; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03, 05) WTR-FW-DC (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) FIRE-FW-GDL (06) MA-RCA-DC (02) MA-RCA-GDL (02) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Carex vallicola	3	2	Sagebrush, subalpine	Hydrologic alteration, climate change, small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-ALPN-DC (03) WTR-FW-DC (01) MA-RCA-DC (02) MA-RCA-GDL (02) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Chaetadelpha wheeleri	3	2	Sagebrush, sand dunes	Soil degradation from unauthorized OHV travel and solar energy development; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) FIRE-FW-GDL (06) INV-FW-DC (01) INV-FW-GOAL (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Claytonia megarhiza	3	2	Alpine	Climate change; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (05) WTR-FW-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Cordylanthus eremicus ssp. kernensis	3	2	Alpine, subalpine	Grazing, recreation, climate change; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03, 05) MA-RCA-STD (10) MA-RCA-GDL (02) RANG-FW-STD (07) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) WTR-FW-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Crepis runcinata spp. hallii	3	2	Sagebrush, alkali flat	Grazing, unauthorized OHV travel, hydrologic alteration, small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) FIRE-FW-GDL (06) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) WTR-FW-DC (01) MA-RCA-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Cuniculotinus gramineus (Chrysothamnus g.)	3	2	Mountain mahogany, subalpine, carbonate	Climate change; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-MOMA-DC (01, 02) TERR-ALPN-DC (03) FIRE-FW-GDL (06)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Cymopterus globosus	4	1	Sagebrush	Grazing, hydrologic alteration, very few occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) WTR-FW-DC (01) MA-RCA-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Dedeckera eurekensis	3	2	Xeric shrub/blackbrush, lower pinyon-juniper (carbonate)	Mining, recreation, invasive species; small occurrence numbers and limited distribution	TERR-FW-DC (02, 03, 05) TERR-XER-DC (01, 02, 03, 04) TERR-XER-STD (01) TERR-XER-GDL (01) INV-FW-DC (01) INV-FW-GOAL (01) FIRE-FW-GDL (06) GEO-FW-DC (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Draba californica	3	2	Sagebrush, alpine	Climate change	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) WTR-FW-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Draba monoensis	3	2	Alpine (moist gravel and rock crevices)	Climate change; few occurrences	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (05) WTR-FW-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Draba sharsmithii	3	2	Alpine	Recreation—trail construction and maintenance, trampling by hikers; climate change; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (05) WTR-FW-DC (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Dryopteris filix-mas	3	2	Subalpine	Threatened by climate change; hydrologic concerns due to possible drying of springs; few occurrences	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) WTR-FW-DC (01) WTR-FW-DC (01) MA-RCA-DC (02) RCA-SPR-DC (01, 02, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Ericameria gilmanii	4	1	Pinyon-juniper, subalpine	Invasive species, mining; few occurrences	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) TERR-ALPN-DC (03) GEO-FW-DC (01) INV-FW-DC (01) INV-FW-GOAL (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Erigeron compactus	3	2	Sagebrush, pinyon-juniper, carbonate, alkali flat	Invasive species, climate change, small occurrence numbers and limited habitat	TERR-FW-DC (02, 03, 05) FIRE-FW-GDL (06) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) INV-FW-DC (01) INV-FW-GOAL (01) WTR-FW-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Erigeron uncialis var. uncialis	3	2	Sagebrush scrub, subalpine, carbonate	Climate change; few occurrences and limited distribution	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-ALPN-DC (03) FIRE-FW-GDL (06)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Eriogonum alexandrae (E. ochrocephalum var. ochrocephalum)	3	2	Sagebrush, pinyon-juniper, caliche-covered clay soil mounds	Invasive species, trampling (wild horses/cattle), unauthorized OHV travel; very few populations,	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) FIRE-FW-GDL (06) INV-FW-DC (01) INV-FW-GOAL (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Eriogonum mensicola	3	2	Pinyon-juniper, sagebrush scrub	Mining, recreation, invasive species, small occurrences numbers	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) GEO-FW-DC (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) INV-FW-DC (01) INV-FW-GOAL (01) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Eriogonum wrightii var. olanchense	3	2	Alpine, subalpine (granitic soils)	Climate change; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03, 05) WTR-FW-DC (01) FIRE-FW-GDL (06)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Goodmania luteola	3	2	Sagebrush	Grazing; very small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Greeneocharis circumscissa var. rosulata	3	2	Alpine, dry forb, subalpine	Grazing, livestock trampling, climate change; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03, 05) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) WTR-FW-DC (01) FIRE-FW-GDL (06)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Grusonia pulchella	3	2	Sagebrush, xeric shrub/blackbrush	–Grazing; few occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-XER-DC (01, 02, 03, 04) TERR-XER-STD (01) TERR-XER-GDL (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Hackelia brevicula	3	2	Sagebrush, subalpine	Grazing impacts concentrated in limited habitat; climate change; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-ALPN-DC (03) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) WTR-FW-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Hackelia sharsmithii	3	2	Sagebrush, subalpine	Recreation impacts along trails; small occurrences	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-ALPN-DC (03) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Helodium blandowii	3	2	Alpine, subalpine, wet montane meadows, fens, and seeps, alpine lakes	Hydrologic alteration, grazing, small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03, 05) MA-RCA-DC (02) MA-RCA-STD (09,10) MA-RCA-GDL (02) RANG-FW-DC (01, 02, 03) RANG-FW-STD (07, 08) RANG-FW-GOAL (03) RCA-SPR-DC (01, 02, 03) RCA-LPP-DC (01) WTR-FW-DC (01) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Hesperidanthus jaegeri	3	2	Pinyon-juniper, subalpine, carbonate	Climate change; competition with invasive species; few occurrences and limited distribution	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) TERR-ALPN-DC (03) FIRE-FW-GDL (06) WTR-FW-DC (01) INV-FW-DC (01) INV-FW-GOAL (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Horkelia hispidula	3	2	Sagebrush	Grazing; climate change; limited distribution	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) WTR-FW-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Hulsea brevifolia	3	2	Subalpine, mixed conifer	Trampling, altered fire regime; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) TERR-DMC-DC (01, 02, 03) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-FW-OBJ (01)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Hulsea vestita ssp. inyoensis	4	1	Pinyon-juniper, sagebrush	Mining three occurrences	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) GEO-FW-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Ivesia campestris	2	3	Subalpine, meadow	Grazing	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Ivesia kingii var. kingii	4	1	Sagebrush, alkali flat	Grazing, unauthorized OHV travel, hydrologic alteration; one occurrence	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) FIRE-FW-GDL (06) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) WTR-FW-DC (01) MA-RCA-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Jamesia americana var. rosea	3	2	Alpine, subalpine	Climate change; trampling; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03, 05) WTR-FW-DC (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Kobresia myosuroides (K. bellardii)	3	2	Subalpine, meadow	Historic mining and pack stock activities; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Ladeania lanceolata (Psoralidium lanceolatum)	3	2	Sagebrush, sand dunes	Wild horse, grazing; few occurrences	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) FIRE-FW-GDL (06) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Lomatium foeniculaceum ssp. inyoense	3	2	Sagebrush, subalpine	Soil degradation; climate change	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-ALPN-DC (03) WTR-FW-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Lupinus duranii	2	3	Jeffrey pine, sagebrush, dry forb, pumice flats	Unauthorized OHV travel, grazing, invasive species, road maintenance	TERR-FW-DC (02, 03, 05) TERR-MONT-DC (01, 02) TERR-JEFF-DC (01, 02) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) FIRE-FW-GDL (06) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) INV-FW-DC (01) INV-FW-GOAL (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Lupinus padre-crowleyi	3	2	Sagebrush, Jeffrey pine	Livestock trampling, altered fire regime; few occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-MONT-DC (01, 02) TERR-JEFF-DC (01, 02) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) TERR-FW-DC (08) FIRE-FW-DC (01) FIRE-FW-GOAL (01, 05, 10) FIRE-FW-GDL (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Mentzelia inyoensis	3	2	Pinyon-juniper, sagebrush (calcareous pumice)	Invasives; small occurrence numbers and limited distribution.	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) FIRE-FW-GDL (06) INV-FW-DC (01) INV-FW-GOAL (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Mentzelia torreyi	3	2	Sagebrush, pinyon-juniper, caliche-covered clay soil mounds, alkaline soils	Invasives, unauthorized OHV travel, grazing and trampling and limited distribution	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) FIRE-FW-GDL (06) INV-FW-DC (01) INV-FW-GOAL (01) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Monardella beneolens	3	2	Alpine, subalpine (metamorphic or granitic scree slopes)	climate change; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03, 05) WTR-FW-DC (01) FIRE-FW-GDL (06)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Oreocarya roosiorum (Cryptantha roosiorum)	3	2	Alpine, subalpine (dry, rocky meadows on carbonate substrates in open bristlecone pine-limber pine forest)	Climate change; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03, 05) FIRE-FW-GDL (06) WTR-FW-DC (01) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Oxytropis deflexa var. sericea	4	1	Subalpine, meadow and seeps	Grazing; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) RANG-FW-STD (07) MA-RCA-STD (10) MA-RCA-GDL (02) MA-RCA-DC (02) MA-RCA-GDL (02) RCA-MEAD-DC (02) RCA-SPR-DC (01, 02, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Penstemon calcareus	3	2	Xeric shrub/blackbrush, carbonate	Invasive species, burros, one occurrence on the forest.	TERR-FW-DC (02, 03, 05) TERR-XER-DC (01, 02, 03, 04) TERR-XER-STD (01) TERR-XER-GDL (01) FIRE-FW-GDL (06) INV-FW-DC (01) INV-FW-GOAL (01) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Petrophytum caespitosum ssp. acuminatum (P. acuminatum)	3	2	Mountain mahogany, subalpine, pinyon-juniper (limestone or granite cliffs, in carbonate areas)	Competition by invasives; one occurrence on forest	TERR-FW-DC (02, 03, 05) TERR-MOMA-DC (01, 02) TERR-ALPN-DC (03) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) INV-FW-DC (01) INV-FW-GOAL (01) FIRE-FW-GDL (06)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Phacelia inyoensis	3	2	Sagebrush, meadows, alkaline seeps	Grazing, unauthorized OHV travel, very few occurrences	TERR-FW-DC (02, 03, 05) RCA-SPR-DC (01, 02, 03) FIRE-FW-GDL (06) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) RANG-FW-STD (07) MA-RCA-DC (02) MA-RCA-STD (10) MA-RCA-GDL (02) RCA-MEAD-DC (02) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Phacelia monoensis	3	2	Pinyon-juniper (shrink-swell volcanic clay soils derived from rhyolite)	Hydrologic events; climate change	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) FIRE-FW-GDL (06)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Phacelia nashiana	3	2	Xeric shrub/blackbrush	Invasives; two occurrences	TERR-FW-DC (02, 03, 05) TERR-XER-DC (01, 02, 03, 04) TERR-XER-STD (01) TERR-XER-GDL (01) INV-FW-DC (01) INV-FW-GOAL (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Physaria ludoviciana	4	1	Sagebrush, caliche-covered clay soil mounds	Wild horses; two occurrences	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01) FIRE-FW-GDL (06) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Physocarpus alternans	3	2	Pinyon-juniper, carbonate	Invasive species, climate change; small occurrences	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) FIRE-FW-GDL (06) WTR-FW-DC (01) INV-FW-DC (01) INV-FW-GOAL (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Plagiobothrys parishii	4	1	Xeric shrub/blackbrush, moist meadow	Climate change, hydrological alteration, grazing, small occurrence numbers and limited habitat	TERR-FW-DC (02, 03, 05) TERR-XER-DC (01, 02, 03, 04) TERR-XER-STD (01) TERR-XER-GDL (01) WTR-FW-DC (01) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) RANG-FW-STD (07) MA-RCA-DC (02) MA-RCA-STD (10) MA-RCA-GDL (02) RCA-MEAD-DC (02) RCA-SPR-DC (01, 02, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Polemonium chartaceum	3	2	Alpine	Climate change, grazing, recreation, small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (05) WTR-FW-DC (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) FIRE-FW-GDL (06)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Polyctenium williamsiae	3	2	Sagebrush	Climate change, limited habitat, grazing, unauthorized OHV travel, very small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) WTR-FW-DC (01) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Populus angustifolia	4	1	Pinyon-juniper, sagebrush, riparian-stream	Altered fire flood/tidal/hydrologic regimes; two occurrences	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) WTR-FW-DC (01) MA-RCA-DC (02) MA-RCA-DC (02) MA-RCA-GDL (02) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Potentilla morefieldii	2	3	Alpine, meadow/spring (carbonate)	Climate change, grazing, recreation	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (05) WTR-FW-DC (01) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) FIRE-FW-GDL (06) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) RANG-FW-STD (07) MA-RCA-DC (02) MA-RCA-STD (10) MA-RCA-GDL (02) RCA-MEAD-DC (02) RCA-SPR-DC (01, 02, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Potentilla pulcherrima	4	1	Sagebrush, alpine (moist soil over granite)	Grazing, erosion, one occurrence	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-ALPN-DC (05) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01) FIRE-FW-GDL (06) MA-RCA-DC (02) MA-RCA-GDL (02) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Ranunculus hydrocharoides	4	1	Pinyon-juniper (stream bed)	Drought, diversions, channel clearing off plan area; in plan area, water management and horse trampling identified as potential threats; one occurrence	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) WTR-FW-DC (01) MA-RCA-DC (02) MA-RCA-STD (10) MA-RCA-GDL (02) RANG-FW-STD (07) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Sclerocactus polyancistrus	2	3	Sagebrush, xeric shrub/blackbrush	Horticultural collection; unauthorized OHV travel; grazing; insect herbivory	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-XER-DC (01, 02, 03, 04) TERR-XER-STD (01) TERR-XER-GDL (01) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Solorina spongiosa	4	1	Subalpine (seep)	Grazing, foot traffic/trampling; one occurrence	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) RANG-FW-STD (07) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) MA-RCA-DC (02) MA-RCA-GDL (02) MA-RCA-STD (10) RCA-MEAD-DC (02) RCA-SPR-DC (01, 02, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Sphaeromeria potentilloides var. nitrophila	2	3	Sagebrush, alkali flat, meadow (wetlands)	Unauthorized OHV travel, grazing	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) FIRE-FW-GDL (06) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) RANG-FW-STD (07) MA-RCA-DC (02) MA-RCA-STD (10) MA-RCA-GDL (02) RCA-MEAD-DC (02) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Sphenopholis obtusata	4	1	Sagebrush, pinyon-juniper (alluvial soil associated with riparian birch vegetation or with drier scrub habitat)	Grazing, hydrologic alteration, small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) MA-RCA-DC (02) MA-RCA-STD (10) MA-RCA-GDL (02) RANG-FW-STD (07) WTR-FW-DC (01) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Stipa divaricata	3	2	Sagebrush, pinyon-juniper	Grazing; climate change	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) WTR-FW-DC (01) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Streptanthus gracilis	3	2	Alpine, subalpine (granitic)	Hydrologic alteration, climate change recreational	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03, 05) TERR-MONT-DC (01, 02) WTR-FW-DC (01) MA-RCA-DC (02) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01) FIRE-FW-GDL (06)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Streptanthus oliganthus	3	2	Pinyon-juniper- pine, sagebrush scrub	Grazing, mining, erosion	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) GEO-FW-DC (01) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Taraxacum ceratophorum	4	1	Subalpine (damp, open meadows)	Grazing; hydrologic alteration; three occurrences	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) WTR-FW-DC (01) MA-RCA-STD (10) MA-RCA-GDL (02) RCA-MEAD-DC (02) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) RANG-FW-STD (07)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Tetradymia tetrameres	3	2	Sand dunes, xeric shrub	Threats include invasive species; unauthorized OHV travel; climate change; small occurrence numbers and limited distribution	TERR-FW-DC (02, 03, 05) TERR-XER-DC (01, 02) TERR-XER-STD (01) TERR-XER-GDL (01) INV-FW-DC (01) INV-FW-GOAL (01) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) WTR-FW-DC (01) RCA-LPP-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Thelypodium integrifolium ssp. complanatum	3	2	Pinyon-juniper, sagebrush, wetlands	Grazing and hydrologic alteration; few occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) MA-RCA-DC (02) MA-RCA-STD (10) MA-RCA-GDL (02) RANG-FW-STD (07) RCA-MEAD-DC (02) WTR-FW-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Thelypodium milleflorum	4	1	Sagebrush, xeric shrub/blackbrush, caliche-covered clay soil mounds	Invasive species, wild horse browsing, unauthorized OHV travel, vegetation management, climate change, small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) TERR-XER-DC (01, 02, 03, 04) TERR-XER-STD (01) TERR-XER-GDL (01) FIRE-FW-GDL (06) INV-FW-DC (01) INV-FW-GOAL (01) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03) WTR-FW-DC (01) TIMB-FW-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Townsendia leptotes	3	2	Alpine	Climate change	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (05) WTR-FW-DC (01)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Transberingia bursifolia ssp. virgata	3	2	Pinyon-juniper, subalpine, meadow	Grazing, hydrologic alteration,	TERR-FW-DC (02, 03, 05) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) TERR-ALPN-DC (03) WTR-FW-DC (01) MA-RCA-DC (02) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Species	Determination	Category	Key Habitats	Key Threats	Ecosystem Plan Components	Species-specific Plan Component
Trichophorum pumilum	3	2	Subalpine, wet meadow (calcareous soils)	Hydrologic alteration, grazing,	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03) MA-RCA-DC (02) MA-RCA-GDL (02) MA-RCA-STD (10) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01) FIRE-FW-GDL (06) WTR-FW-DC (01) RANG-FW-STD (07) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) RCA-MEAD-DC (02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)
Trifolium dedeckerae (T. kingii ssp.dedeckerae)	2	3	Alpine, subalpine, sagebrush, pinyon-juniper (granitic soils)	Grazing, road maintenance and climate change;	TERR-FW-DC (02, 03, 05) TERR-ALPN-DC (03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) FIRE-FW-GDL (06) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) WTR-FW-DC (01) TERR-PINY-DC (01, 02, 03) TERR-PINY-GOAL (01, b, g) TERR-MONT-DC (01, 02)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04) TERR-SH-DC (01, 02, 03) TERR-SH-GOAL (01, 02) TERR-SH-STD (01)
Viola purpurea spp. aurea	3	2	Sagebrush	Grazing; unauthorized OHV travel; small occurrence numbers	TERR-FW-DC (02, 03, 05) TERR-SAGE-DC (01, 02, 03, 04, 05) TERR-SAGE-GOAL (01, b, g) RANG-FW-DC (01, 02, 03) RANG-FW-GOAL (03) REC-FW-DC (04, 08, 09, 12) REC-FW-GOAL (02) REC-FW-GDL (01, 03)	SPEC-FW-DC (01, 02, 03, 04) SPEC-FW-GOAL (03, 04) SPEC-FW-STD (01, 02, 03) SPEC-FW-GDL (04)

Crosswalk – Plant Species of Conservation Concern

The following tables are crosswalks to display how plan components meet plant species of conservation concern habitat needs and address threats. Table 27 displays a crosswalk to show how plan components meet plant species of conservation concern habitat needs and address threats. This table does not include all plan components that provide for persistence, but focuses on those that provide for key ecological conditions and mitigate threats.

Table 27. Crosswalk between plant species of conservation concern, and ecosystem and species-specific plan components

Apply to:	Ecosystem plan components	Species-specific plan components
All at-risk plant species	**TERR-FW-DC** **02** Vegetation structure and composition provide ecosystem resilience to climate change and other stressors including altered fire regimes, drought, and flooding in riparian systems. **03** Functioning ecosystems retain their essential components, processes and functions. **05** Ecological conditions contribute to the recovery of threatened and endangered species, conserve proposed and candidate species, and support the persistence of species of conservation concern.	**SPEC-FW-DC** **01** Sustainable populations of native and desirable nonnative, plant and animal species are supported by healthy ecosystems, essential ecological processes, and land stewardship activities, and reflect the diversity, quantity, quality, and capability of natural habitats on the Inyo National Forest. These ecosystems are also resilient to uncharacteristic fire, climate change, and other stressors, and this resilience supports the long-term sustainability of plant and animal communities. **02** Habitats for at-risk species support self-sustaining populations within the inherent capabilities of the plan area. Ecological conditions provide habitat conditions that contribute to the survival, recovery, and delisting of species under the Endangered Species Act; preclude the need for listing new species; improve conditions for species of conservation concern, including addressing threats (e.g. minimal impacts from disease); and sustain both common and uncommon native species. **03** Land management activities are designed to maintain or enhance self-sustaining populations of at-risk species within the inherent capabilities of the plan area by considering the relationship of threats (including site-specific threats) and activities to species survival and reproduction. **04** The structure and function of the vegetation, aquatic and riparian system, and associated microclimate and smaller scale elements (like special features such as carbonate rock outcrops, fens, or pumice flats) exist in adequate quantities within the capability of the plan area to provide habitat and refugia for at-risk species with restricted distributions. **SPEC-FW-GOAL** **03** Work with the California Department of Fish and Wildlife (following the memoranda of understanding), Nevada Department of Wildlife, and U.S. Fish and Wildlife Service to restore and maintain essential habitat for at-risk species and implement other recovery actions according to species recovery plans.

Apply to:	Ecosystem plan components	Species-specific plan components
		04 Communicate and collaborate with other agencies, Tribes, landowners, and partners to maximize opportunities to improve conditions in the plan area for at-risk species and the habitats and ecological processes on which they depend for survival. **SPEC-FW-STD** **01** Design features, mitigation, and project timing considerations are incorporated into projects that may affect occupied habitat for at-risk species. **02** Avoid or mitigate impacts on known and unknown occurrences of at-risk plants and lichens that would limit their persistence or recovery in the plan area. **03** Use information that is current, accurate, and precise enough to avoid or mitigate impacts on at-risk plants and lichens when designing projects. If such information cannot be obtained, assume occupancy of the project area by one or more at-risk species within suitable habitat and apply resource protection measures to avoid or mitigate impacts throughout the project area. In order to promote beneficial effects of fire and other disturbances on some at-risk plants and lichens, this standard does not apply to the following activities: **a.** The fire itself when conducting a prescribed under-burn. **b.** Temporary or light disturbance created by use of hand tools, such as construction of fireline with hand tools or hand piling or scattering of residual woody material. Only scatter residual woody materials when neutral or beneficial to at-risk plants and lichens. **SPEC-FW-GDL** **04** Habitat management objectives or goals from approved conservation strategies or agreements should be incorporated, if appropriate, in the design of projects that will occur within at-risk species habitat.
Alpine	**TERR-ALPN-DC** **05** Alpine ecosystems are resilient to climate change, and fires are small and occur infrequently.	Same as for all
Subalpine	**TERR-ALPN-DC** **03** Subalpine ecosystems are resilient to insects, diseases, fire, wind, and climate change. High-elevation white pines (whitebark pine, Great Basin bristlecone pine, limber pine, and foxtail pine) are healthy and vigorous, with a low incidence of white pine	Same as for all

Apply to:	Ecosystem plan components	Species-specific plan components
	blister rust, and resilient to moisture stress and drought. White pine blister rust-resistant trees are regenerating and populations of high elevation white pines have the potential to expand above the tree line.	
Special habitats	**FIRE-FW-GDL** **06** During wildfires, avoid fire management activities in **special habitats** except when necessary to protect life and property. This includes activities such as line construction, staging areas, safety zones, water drafting and camps. When conducting fire management activities near special habitats, take extra measures to avoid spread of invasive plants.	Same as for all **TERR-SH-DC** **01** The integrity of special habitats is maintained or improved from current conditions. Composition, diversity, and structure are maintained in all areas, including those with multiple-use activities. **02** Microclimate or smaller scale habitat elements provide habitat and refugia for species with a specific geographic or restricted distribution. **03** Conditions remain suitable for long-term sustainability of the suite of native plants adapted to special habitats and their associated insect pollinators. **TERR-SH-GOAL** **01** Work cooperatively with researchers and interested parties to study, monitor and assist in appropriate restoration measures of special habitats. **02** Include the location of special habitats in the corporate geographic information system. **TERR-SH-STD** **01** At the project scale, evaluate and incorporate maintenance and enhancement needs for special habitats into project design and implementation.
Wet/moist habitat	**MA-RCA-DC** **02** Riparian conservation areas have ecological conditions that contribute to the recovery of threatened and endangered species and support persistence of species of conservation concern as well as native and desired nonnative aquatic and riparian-dependent plant and animal species. **MA-RCA-STD** **09** Avoid or mitigate ground-disturbing activities that cause degradation of fens (e.g. trampling from livestock, pack stock, wheeled vehicles, people, and roads) that and adversely affect hydrologic processes that maintain water flow, water quality, or water temperature critical to sustaining fen ecosystems and the plant species that depend on these ecosystems **MA-RCA-GDL**	Same as for all

Apply to:	Ecosystem plan components	Species-specific plan components
	02 Minimize impacts from roads, trails, off-highway-vehicle trails and staging areas, developed recreation sites, dispersed campgrounds, special use permits, grazing permits, and day use sites that have been identified as contributing to degradation of water quality or habitat for aquatic and riparian-dependent species. **RCA-MEAD-DC** **02** Wetlands and groundwater-dependent ecosystems (including springs, seeps, fens, wet meadows, and associated wetlands or riparian systems) support stable herbaceous and woody vegetative communities that are resilient to drought, climate change, and other stressors. Root masses stabilize stream channels, shorelines, and soil surfaces. The natural hydrologic, hydraulic, and geomorphic processes in these ecosystems sustain their unique functions and biological diversity.	
Fens	**RANG-FW-STD (08)** **08** In fen ecosystems, limit disturbance from livestock and pack stock to no more than 15 to 20 percent annually. Reduce disturbance further if a fen is nonfunctional or functional at risk with a downward trend. **RCA-MEAD-DC (02)** **MA-RCA-STD (09)**	Same as for all
Springs and seeps	**RCA-SPR-DC** **01** Springs provide sufficient water to maintain healthy habitats for native riparian and aquatic species. **02** Springs are resilient to natural disturbances, groundwater diversions, and changing climate conditions. Springs function across the landscape within their type and water availability. **03** Springs and associated streams and wetlands have the necessary soil, water, and vegetation attributes to be healthy and functioning at or near potential. Water flow is similar to historic levels and persists over time, within constraints of climate change.	Same as for all
Lakes, ponds	**RCA-LPP-DC** **01** Natural lakes and ponds retain necessary attributes, such as adequate vegetation and large woody debris to function properly and support native biotic communities. Attributes include floodwater retention and groundwater recharge, stabilized islands and shoreline features, and diverse characteristics to provide for amphibian production, waterfowl breeding and biodiversity.	Same as for all

Apply to:	Ecosystem plan components	Species-specific plan components
Sagebrush	**TERR-SAGE-DC** **01** The sagebrush type has a diversity of age classes, stand structure, cover classes and native understory composition. **02** Sagebrush ecosystems are resilient to fire and other disturbances including grazing, recreation, invasive species (including cheatgrass) and climate change. **03** Grazed areas have or are trending toward satisfactory soils condition, functional hydrology and biotic integrity. Sagebrush ecosystems contain all key elements and conditions, including sagebrush regeneration and recruitment, ecosystem productivity, native perennial grass and forb cover, biological soil crusts, and symbiotic fungal associations. **04** Open sagebrush habitat with no overstory trees, such as pinyon pine, juniper or Jeffrey pine, provides habitat connectivity for sagebrush-dependent species. Fire occurs within the natural range of variation, or in small extents, as a natural process, limiting encroaching conifer trees. **05** Where nonnative annual grasses exist in sagebrush vegetation communities, the native species persist with adequate structural and functional diversity including shrubs, perennial bunchgrasses, and forbs. **TERR-SAGE-GOAL** **01** Restoration projects following large-scale changes in sagebrush structure or species composition (type conversion to cheatgrass) from wildfires or other disturbances should consider: b. restoring habitat, including restoring connectivity; g. long-term maintenance of regional biodiversity in disturbed and adjacent undisturbed landscapes.	Same as for all
Pinyon-juniper	**TERR-PINY-DC** **01** Pinyon-juniper types have a mosaic of trees and open areas that provide wildlife habitat, contribute to functional soils, and are resilient to disturbances such as fire, invasive species and climate change. **02** Fire frequency and severity is within the natural range of variation. **03** Plant litter and coarse woody debris are present in sufficient quantity to resist accelerated soil erosion and promote nutrient cycling, water retention, and the microclimate conditions necessary for pinyon seed germination. Biological soil crusts are	Same as for all

Apply to:	Ecosystem plan components	Species-specific plan components
	present to improve nutrient cycling and stabilize soils, especially in sandier soils. **TERR-PINY-GOAL** **01** Restoration projects following large stand-replacing events (such as wildfire or climate change impacts) should consider: b. restoring habitat, including restoring connectivity; g. long-term maintenance of regional biodiversity in disturbed and adjacent undisturbed landscapes.	
Montane forest	**TERR-MONT-DC** **01** At the landscape scale, the Sierra Nevada montane landscape is a heterogeneous mosaic of patches of red fir forest, mixed conifer, lodgepole pine forests, Jeffrey pine forests, meadows and riparian areas. These ecosystem types occur in a complex mosaic of different densities, sizes, and species mix across large landscapes that vary with topography, soils and snow accumulation. The composition, structure, and function of vegetation make them resilient to fire, drought, insects and pathogens, and climate change. The mix of seral stage patches, and open versus closed canopied areas, varies by forest type as described in table 1 and table 2. Large and old trees are common in most seral stages throughout the landscape and in varying densities (see "Old Forest" section below). **02** At the landscape scale, fire is a key ecological process restoring and maintaining patchy fuel loads, and increasing heterogeneity and understory plant vigor, except in Jeffery pine and dry mixed conifer forests (see desired conditions specific to those forest types). Fires occur irregularly, generally every 15 to 100 years, averaging about every 40 years. Fires in this zone burn with low, moderate, or mixed severity with minimal patches of high severity (greater than 75 percent basal area mortality) rarely greater than 300 acres in size. The proportion of areas burned at high severity within a fire is generally less than 10 to 15 percent.	Same as for all
Dry mixed conifer	**TERR-DMC-DC** **01** At the landscape scale, the dry mixed conifer vegetation type has a mosaic of patches of trees of varied sizes and ages. It is dominated by Jeffrey pine and white fir trees, with white fir densities dependent on climate and fire trends. **02** At the landscape scale, fire is a key ecological process, creating a diversity of vegetation types, lower surface fuels and diverse understory vegetation. Fires occur frequently, on average every 5 to 15 years, with mostly low and moderate severity. Patches	Same as for all

Apply to:	Ecosystem plan components	Species-specific plan components
	burned at high severity (greater than 75 percent basal area mortality) are rarely greater than 200 acres, and the proportion of areas burned with high severity is generally less than 15 percent. **03** At the landscape scale, areas dominated by medium and large-diameter trees comprise more than 60 percent of the landscape. Overstory tree canopy cover is generally 30 percent but ranges widely from 10 to 60 percent of the landscape. Overstory tree canopy cover is generally 30 percent but ranges widely from 10 to 60 percent at a fine scale. Trees are denser in some locations, such as north-facing slopes and canyon bottoms, but in small patches in limited areas (less than 20 percent of the area). Vigorous shrubs cover 10 percent or more of the area, with density varying by aspect, slope, and soil type.	
Red fir	**TERR-MONT-DC** **01** At the landscape scale, the Sierra Nevada montane landscape is a heterogeneous mosaic of patches of red fir forest, mixed conifer, lodgepole pine forests, Jeffrey pine forests, meadows and riparian areas. These ecosystem types occur in a complex mosaic of different densities, sizes, and species mix across large landscapes that vary with topography, soils and snow accumulation. The composition, structure, and function of vegetation make them resilient to fire, drought, insects and pathogens, and climate change. The mix of seral stage patches, and open versus closed canopied areas, varies by forest type as described in table 1 and table 2. Large and old trees are common in most seral stages throughout the landscape and in varying densities (see "Old Forest" section below). **02** At the landscape scale, fire is a key ecological process restoring and maintaining patchy fuel loads, and increasing heterogeneity and understory plant vigor, except in Jeffery pine and dry mixed conifer forests (see desired conditions specific to those forest types). Fires occur irregularly, generally every 15 to 100 years, averaging about every 40 years. Fires in this zone burn with low, moderate, or mixed severity with minimal patches of high severity (greater than 75 percent basal area mortality) rarely greater than 300 acres in size. The proportion of areas burned at high severity within a fire is generally less than 10 to 15 percent. **TERR-RFIR-DC** **01** At the landscape scale, the red fir forest type is part of a heterogeneous mosaic of tree species and vegetation structures (tree density, size, age and shrub cover), with patches of Jeffrey pine, lodgepole, other forest types, and meadows. It is	Same as for all

Apply to:	Ecosystem plan components	Species-specific plan components
	dominated by red fir trees, with varying amounts of white fir, Jeffrey pine, western white pine, lodgepole pine and sometimes mountain hemlock. **02** Fire occurs as a key ecological process in red fir forests where it does not pose an unacceptable risk to life and property. Fire as an ecological process creates, restores, and maintains ecosystem resilience and increases understory plant vigor, heterogeneity, and habitat diversity. **03** At the landscape scale, areas dominated by medium and large-diameter trees and low to moderate canopy cover (between 10 and 60 percent) comprise most of the landscape. Trees are denser in some locations such as north-facing slopes and canyon bottoms, near meadows, or where snow accumulates. Early seral vegetation, shrubs, grasses, herbaceous plants, tree seedlings or saplings, mostly occur in very small areas, intermixed within forest stand or patches. **04** At the landscape scale, shrubs, grasses and young trees grow in patches of dead and dying trees with abundant snags and large logs, providing complex early seral habitat.	
Jeffrey pine	TERR-MONT-DC **01** At the landscape scale, the Sierra Nevada montane landscape is a heterogeneous mosaic of patches of red fir forest, mixed conifer, lodgepole pine forests, Jeffrey pine forests, meadows and riparian areas. These ecosystem types occur in a complex mosaic of different densities, sizes, and species mix across large landscapes that vary with topography, soils and snow accumulation. The composition, structure, and function of vegetation make them resilient to fire, drought, insects and pathogens, and climate change. The mix of seral stage patches, and open versus closed canopied areas, varies by forest type as described in table 1 and table 2. Large and old trees are common in most seral stages throughout the landscape and in varying densities. **02** At the landscape scale, fire is a key ecological process restoring and maintaining patchy fuel loads, and increasing heterogeneity and understory plant vigor, except in Jeffery pine and dry mixed conifer forests (see desired conditions specific to those forest types). Fires occur irregularly, generally every 15 to 100 years, averaging about every 40 years. Fires in this zone burn with low, moderate, or mixed severity with minimal patches of high severity (greater than 75 percent basal area mortality) rarely greater than	Same as for all

Apply to:	Ecosystem plan components	Species-specific plan components
	300 acres in size. The proportion of areas burned at high severity within a fire is generally less than 10 to 15 percent. **TERR-JEFF-DC** **01** At the landscape scale, the Jeffrey pine type is part of a heterogeneous mosaic of shrublands, woodlands or other vegetation types. Forests are dominated by Jeffrey pine trees and are generally open. Open-canopied stands dominate the landscape, with generally less than 10 percent of the area having more than 40 percent canopy cover. Open canopies allow shade-intolerant Jeffrey pine tree regeneration. **02** At the landscape-scale, fire is a key ecological process, creating a diversity of vegetation types, lower surface fuels and diverse understory vegetation. Fires occur frequently, on average every 5 to 15 years, with mostly low and moderate severity. Patches burned at high severity (greater than 75 percent basal area mortality) are rarely greater than 200 acres, and the proportion of areas burned with high severity is generally less than 15 percent.	
Lodgepole pine	**TERR-MONT-DC** **01** At the landscape scale, the Sierra Nevada montane landscape is a heterogeneous mosaic of patches of red fir forest, mixed conifer, lodgepole pine forests, Jeffrey pine forests, meadows and riparian areas. These ecosystem types occur in a complex mosaic of different densities, sizes, and species mix across large landscapes that vary with topography, soils and snow accumulation. The composition, structure, and function of vegetation make them resilient to fire, drought, insects and pathogens, and climate change. The mix of seral stage patches, and open versus closed canopied areas, varies by forest type as described in table 1 and table 2. Large and old trees are common in most seral stages throughout the landscape and in varying densities. **02** At the landscape scale, fire is a key ecological process restoring and maintaining patchy fuel loads, and increasing heterogeneity and understory plant vigor, except in Jeffery pine and dry mixed conifer forests (see desired conditions specific to those forest types). Fires occur irregularly, generally every 15 to 100 years, averaging about every 40 years. Fires in this zone burn with low, moderate, or mixed severity with minimal patches of high severity (greater than 75 percent basal area mortality) rarely greater than 300 acres in size. The proportion of areas burned at high severity within a fire is generally less than 10 to 15 percent.	Same as for all

Apply to:	Ecosystem plan components	Species-specific plan components
	TERR-LDGP-DC **01** Lodgepole pine forests are highly variable throughout the landscape, occurring as open forests on dry sites at higher elevations, and as denser stands in pockets around meadows, lakes or where cold air accumulates. The lodgepole pine type is part of a heterogeneous mosaic of tree species with diverse structural conditions. It is dominated by lodgepole pine, with varying amounts of red fir, white fir, aspen, and sometimes white pine. **02** Fire occurs as a key ecological process in lodgepole pine forests where it does not pose an unacceptable risk to life and property. Fire as an ecological process creates, restores, and maintains ecosystem resilience and increases understory plant vigor, heterogeneity, and habitat diversity.	
Mountain mahogany	**TERR-MOMA-DC** **01** Mountain mahogany is composed of native shrub and understory species that reflect the natural range of variation for the site. This vegetation type has varying age classes and densities that protect against accelerated erosion, with 1 to 10 percent of the type in early seral grass and herbaceous cover, 5 to 20 percent in native herbs and early seral shrubs, and 70 to 95 percent dominated by mountain mahogany cover. **02** The fire return interval is appropriate to allow the soil seed bank of native species to be maintained over the short and long terms. Invasive nonnative plants do not dominate between fires.	Same as for all
Xeric shrub/blackbrush	**TERR-XER-DC (01, 02)** **01** Xeric shrub vegetation is a mosaic of diverse ecological types with native shrubs and grasses, commonly blackbrush, sagebrush, saltbush, goldenbush and horsebrush in various age classes and patch sizes. **02** Vegetation conditions are resilient to natural and human disturbances, such as grazing, flooding, fire, invasive species, and climate change. **TERR-XER-STD** **01** Restoration projects in xeric shrub and blackbrush must include design measures to avoid damage to biological soil crusts. **TERR-XER-GDL** **01** Restoration projects in xeric shrub and blackbrush should include islands of untreated vegetation in project design to speed native species regeneration.	Same as for all

Apply to:	Ecosystem plan components	Species-specific plan components
Climate change (threat)	**WTR-FW-DC** **01** Adequate quantity and timing of water flows support ecological structure and functions, including aquatic species diversity and riparian vegetation. Watersheds are resilient to changes in air temperatures, snowpack, timing of runoff, and other effects of climate change.	Same as for all
Hydrological alteration (threat)	**WTR-FW-DC** 01 Adequate quantity and timing of water flows support ecological structure and functions, including aquatic species diversity and riparian vegetation. Watersheds are resilient to changes in air temperatures, snowpack, timing of runoff, and other effects of climate change. **MA-RCA-DC** **02** Riparian conservation areas have ecological conditions that contribute to the recovery of threatened and endangered species and support persistence of species of conservation concern as well as native and desired nonnative aquatic and riparian-dependent plant and animal species. **MA-RCA-STD (09)**	Same as for all
Grazing/riparian (threat)	**MA-RCA-STD** **09** **10** Manage livestock grazing to attain desired conditions in riparian conservation areas. Where livestock grazing is found to be contributing to a decline in the function of riparian systems, modify grazing practices as prescribed in the Inyo Forest Supplement to the R5 Rangeland Analysis and Planning Guide. If adjusting practices is not effective, remove livestock from that area using appropriate administrative authorities and procedures. **MA-RCA-GDL** **02** Minimize impacts from roads, trails, off-highway-vehicle trails and staging areas, developed recreation sites, dispersed campgrounds, special use permits, grazing permits, and day use sites that have been identified as contributing to degradation of water quality or habitat for aquatic and riparian-dependent species. **RANG-FW-STD** **07** Within riparian conservation areas that are properly functioning or functional at risk with an upward trend, limit annual livestock disturbance to streambanks and shorelines of natural lakes and ponds (caused by trampling and trailing) from exceeding 20	Same as for all

Apply to:	Ecosystem plan components	Species-specific plan components
	percent of the stream reach, or natural lake and pond shorelines. Disturbance includes bank sloughing, chiseling, trampling, and other means of exposing bare soil or cutting plant roots. Allow no more than 15 to 20 percent disturbance if the riparian conservation area is functional at risk with a downward trend, as defined in the appropriate technical reports.	
Grazing (threat) - general and only PC's applying to **dry meadows**	**RANG-FW-DC** **01** Rangelands, along with grazable forestlands and woodlands, provide large areas of contiguous space supporting native vegetation that has the potential to be grazed. These grazable landscapes sustain biological diversity and ecosystem integrity and help to preserve the rural landscape and cultural heritage of the central, southern and eastern Sierra Nevada. **02** Forage, browse, and cover meet the needs of wildlife, and authorized livestock are managed in balance with available forage. Areas that are grazed have, or are trending toward having, satisfactory soils, functional hydrology, and biotic integrity. **03** Domestic livestock grazing maintains the desired rangeland vegetation types represented by diverse plant functional groups, species richness and diversity, and structure and condition of plant communities. **RANG-FW-GOAL** **03** Consider the impacts to animals and plants, recreation, watershed, and rangelands when designing rangeland improvements or structures, such as water storage structures.	Same as for all
Altered fire regime	**TERR-FW-DC** **08** Fire occurs as a key ecological process in fire-adapted ecosystems where it does not pose an unacceptable risk to life and property. Fire occurs within an ecologically appropriate regime of frequency, extent, and severity, and enhances ecosystem heterogeneity and habitat and species diversity. **FIRE-FW-DC** **01** Wildland fires burn with a range of intensity, severity and frequency that allow ecosystems to function in a healthy and sustainable manner. Wildland fire is a necessary process, integral to the sustainability of fire-adapted ecosystems. **FIRE-FW-GOAL** **01** Reduce fuel accumulations, help maintain and protect habitat for a variety of species, reduce smoke from larger fires, provide	Same as for all TERR-FW-OBJ Restore species composition and structure on at least 20,000 acres of vegetation within 10 to 15 years following plan approval.

Apply to:	Ecosystem plan components	Species-specific plan components
	added protection for communities, and restore fire on the landscape. These actions are also an integral part of achieving sustainable recreation, particularly by maintaining scenic attractiveness, integrity, and character. **05** Restore ecosystems to a more fire-resilient condition and lessen the threat of wildfire to communities. **10** Coordinate with researchers, partners, and Tribes to help achieve desired conditions in ecosystems that are experiencing (or may experience in the future) more frequent, severe, or large fires than the natural range of variation due to factors such as invasive annual grasses and changing climate. **FIRE-FW-GDL** **01** Use naturally ignited and prescribed wildland fires to meet multiple resource management objectives, where and when conditions permit and risk is within acceptable limits.	
Trampling/recreation (threat)	**REC-FW-DC** **04** Areas of the national forest provide for a variety of activities with minimal impact on sensitive environments and resources. **08** Dispersed recreation occurs in areas outside of high visitation, developed facilities or communities, and does not adversely impact natural or cultural resources. **09** Permitted recreation uses, such as recreation special events or guided activities, are consistent with recreation settings, protect natural and cultural resources, and contribute to the economic sustainability of local communities. **12** Trails provide access to destinations, provide for opportunities that connect to a larger trail system, provide linkage from local communities to the national forest, and are compatible with other resources. **REC-FW-GOAL** **02** Manage dispersed recreation activities when evidence of impacts to natural resources emerge or are causing damage. **MA-RCA-STD (09)**	REC-FW-GDL 01 Avoid locating new recreation facilities within environmentally and culturally sensitive areas, such as at-risk species breeding habitat or at-risk plant species habitat. 03 Use integrated resource planning when designing projects to address impacts to at-risk species habitat and changing conditions in recreation settings.
Mining	**GEO-FW-DC** **01** Mineral resources on National Forest System lands provide for public benefit, while minimizing adverse environmental effects on other forest resources from mineral exploration, development, and extraction.	Same as for all
Invasive species	**INV-FW-DC**	Same as for all

Apply to:	Ecosystem plan components	Species-specific plan components
	01 Terrestrial and aquatic invasive species are controlled or eradicated when possible, and establishment of new populations is prevented. **INV-FW-GOAL** **01** Coordinate and cooperate with local, State and Federal agencies and Tribes to manage and control invasive and nonnative species.	
Invasive species in wet meadows or riparian	**MA-RCA-GOAL** **02** Where invasive species are adversely affecting the persistence of native species, work with the appropriate State and Federal wildlife agencies work to reduce impacts of invasive species to native populations.	Same as for all
Road maintenance	NA	Same as for all
Timber production - vegetation management	**TIMB-FW-DC** **02** Production of timber contributes to ecological, social, and economic sustainability and associated desired conditions. A sustainable mix of forest products is offered under a variety of harvest and contract methods in response to market demand and restoration needs.	Same as for all

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