ELDORADO NATIONAL FOREST
Amador Ranger District

Biological Evaluation and Assessment

For Terrestrial
Threatened, Endangered, and Sensitive Wildlife Species

Foster Meadow Restoration Project

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I. INTRODUCTION

Forest Service Manual (FSM) 2672.42 directs that a biological assessment (BA) be prepared for all proposed projects that may have effects upon United States Fish and Wildlife Service (USFWS) listed threatened, endangered, and proposed species. In addition, FSM 2670.32 directs that a biological evaluation (BE) be prepared to determine the effects of proposed projects on Forest Service Region 5 designated sensitive species. The purpose of these documents is to ensure that project decisions do not adversely affect species viability or create significant trends towards federal listing. This document will analyze the potential effects of the proposed project for federally listed threatened, endangered, and proposed terrestrial species, and Region 5 listed sensitive terrestrial species.

Federally Listed Endangered (E) and Threatened (T) Species

A species list was obtained from the USFWS on September 6, 2017, identifying that there are no proposed, endangered, or threatened terrestrial species potentially occurring within the project area. Aquatic species are addressed in the Aquatic BE/BA, (Chow 2017).

Table 1.0 – Federally Listed, Candidate or Region 5 Designated Sensitive Species Potentially in the Analysis Area

Federally Listed and Candidate Species

No species identified by USFWS	

Region 5 Designated Sensitive Species

The Regional Forester's Sensitive Species for Region 5 (June 2013), identifies the following sensitive species that may occur on the Eldorado National Forest.

California spotted owl (*Strix occidentalis occidentalis*)	Pacific fisher (*Martes pennanti pacifica*)
Northern goshawk (*Accipiter gentilis*)	California wolverine (*Gulo gulo luteus*)
American bald eagle (*Haliaeetus leucocephalus*)	Pallid bat (*Antrozous pallidus*)
Great gray owl (*Strix nebulosa*)	Townsend's big-eared bat (*Corynorhinus townsendii*)
Willow flycatcher (*Empidonax trailli*)	Fringed myotis (*Myotis thysanodes*)
American marten (*Martes americana*)	Western bumblebee (*Bombus occidentalis*)

Based on current literature for the species listed above, several would not be affected by the proposed project. Table 1.1 identifies these species which will not be receive further analysis in this Biological Evaluation (Appendix A provides further information on the range of these species and their habitat requirements, and references).

Table 1.1: Species Not Affected by the Proposed Project

Species	Reason for No Effect/Impact Determination
Pacific fisher	The project does not occur within the known or suspected range of the species (elevation range), and the species is not present on the Amador Ranger District.
bald eagle California wolverine	The project area does not include suitable habitat for the species; habitat occurring adjacent to the project will not be affected.

Suitable habitat for these species does not occur within the project areas and/or it is not expected that the project will generate any direct, indirect, or cumulative impacts to the species or its habitats. No further analysis will occur for these species.

II. CONSULTATION TO DATE

On September 6, 2017, the Sacramento Field Office of the U.S. Fish and Wildlife Service provided a list was of threatened, endangered, and proposed species that may occur or be affected by activities within the Eldorado National Forest. The list was updated and reviewed on June 26, 2018. The list indicated that there are no proposed, endangered, or threatened terrestrial species potentially occurring within the project area.

III. CURRENT MANAGEMENT DIRECTION

Appendix A describes current management direction that is specific to the individual species addressed in this assessment. General management direction for sensitive species on the ENF can be found in the following documents, available at the Eldorado National Forest Supervisor's Office:

Forest Service Manual and Handbooks (FSM/H 2670)

- As part of the National Environmental Policy Act process, review programs and activities, through a biological evaluation, to determine their potential effect on sensitive species.
- Avoid or minimize impacts to species whose viability has been identified as a concern.
- If impacts cannot be avoided, analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole.
- Establish management objectives in cooperation with the States when a project on National Forest System lands may have a significant effect on sensitive species population numbers or distribution. Establish objectives for Federal candidate species, in cooperation with the FWS and the States.

National Forest Management Act (NFMA), and implementing regulations (CFR 219.19)

- Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area.

Eldorado National Forest Land and Resource Management Plan (LRMP), as amended in January 2001.

- Utilize administrative measures to protect and improve endangered, threatened, rare, and sensitive wildlife species.

Standards and guidelines from the LRMP and the Sierra Nevada Forest Plan Amendment Record of Decision (ROD) that are pertinent to this project are summarized below.

PROJECT DESCRIPTION

Alternative 1 - Proposed Action

The Amador Ranger District, El Dorado National Forest and project stakeholders are seeking to restore the natural hydrologic functions of the Foster Meadow system to provide improved water quality, timing of flows and enhanced aquatic and terrestrial habitats onsite and downstream. Attendant with that objective is to remove barriers to aquatic organism passage in this reach of the Middle Fork Cosumnes River. The Foster Meadow Restoration Project proposes to meet these objectives by filling gullies within the meadow using local fill taken from meadow margins and terraces, and installing an aquatic organism passage structure at Foster Meadow road (9N14) crossing. This will require excavation and placement of approximately 22,533 cubic yards in seven (7) total plugs to eliminate the existing gullies as a conduit for flow. The design of the proposed action applies the principles of fluvial geomorphology and the science of landscapes formed by flowing water, to understand the processes that have governed the development of the meadow through the Holocene period (last 10,000 years). This method also helps determine the possible mechanisms that have led to channel degradation and loss of floodplain connection/ecosystem function. This approach combines quantitative data with qualitative observations and historical overviews of land uses, both onsite and watershed-wide.

Table 2 summarizes the action items proposed to restore the hydrologic functions of Foster Meadow utilizing a modified pond-and-plug restoration technique. The design for Foster Meadow is a near-complete gully fill ("plugs"), with the majority of fill material generated from terrace grading and a smaller amount coming from four small borrow ponds along the margins of the meadow. The purpose of the fill material is to raise/restore the base elevation of surface water flow in the meadow. Generally, surface flows will be re-directed to remnant channel(s) elsewhere in the meadow. Surface flows would only cross the "plugs" during floods. Specific features of the project design are discussed in greater detail in the Meadow Component section, below.

Table 2. Action items of the Foster Meadow Restoration Project

Item Number	Action
1	Fill and stabilize the gullied channel of the Middle Fork Cosumnes River in Foster Meadow through (Figures 2 through 4): • Excavation of approximately 22,500 yd^3 of material from 4 small borrow pits along the margins of the meadow and 4 terrace cuts areas in the meadow. This material will be used to construct the plugs. • Construction of 7 plugs in the meadow to achieve the partial or complete filling or approximately 4,400 feet of channels. The plugs will total approximately 3.1 acres in size. • Construction of 9 in-channel rock riffles in the meadow just down-gradient of the plugs and ponds. It is expected that rock for the riffles will be imported from the Tragedy Pit. Motorized equipment in the meadow would be used in order to accomplish this action item. Approximately 20.72 acres are wet meadow floodplain, 2.20 acres are intermittent and perennial channels, and 4.51 acres are upland.

Item Number	Action
2	Improve aquatic organism passage at Forest Highway 54 crossing by: • Placing rock/soil/vegetation in the channel and floodplain to raise the elevation and eliminate current 'waterfall' at the main culvert. Rock will be imported from Tragedy Pit for this component. • Replacing the existing culvert and adding at least three culverts at floodplain elevation. Motorized equipment would be used in order to accomplish this action item.
3	Plant riparian vegetation throughout portions of the meadow in those areas that are currently deficient in riparian vegetation. Sod and willow transplants would be excavated and placed using heavy equipment. Native seeding, planting of container stock, and willow plantings would be done by hand.

The 27-acre Foster Meadow Project area can be delineated into several reaches of work separated by reaches that are still functional. The functional reaches are at risk from headcuts moving upstream from the degraded reaches. Figure 1 (Vicinity and Project Area Map) shows the relative location of the treatment reaches under the proposed action. At the upstream end of the project, the culvert at the Forest Highway (FH) 54/Foster Meadow Road (9N14) crossing is a fish barrier and a risk for failure. Downstream of the road crossing there are three (3) distinct meadow sections: Pocket 1, Pocket 2, and Main Meadow.

Meadow Restoration Component

Ultimately, the design concept for degraded meadows in the Foster Meadow project areas is to implement near-complete gully fill. The fill material would be excavated from four (4) small borrow ponds along the margins of the meadow and grading four (4) areas of in-meadow terrace down to the design floodplain elevation. This design significantly reduces risk associated with frequent overland flow over plugs and into ponds. Given meadow slopes of 1% -3% and a gully near the center of the meadow, the more traditional pond and plug technique would have some risk.

The principal function of the borrow ponds is to provide native fill material for plug construction. Since the ponds will fill with groundwater and maintain ponded water year-round, habitat features and diversity are incorporated into their construction. These include varying water depths, islands, peninsulas, basking logs, etc., which are determined as fill needs are met. Topsoil is removed and stockpiled adjacent to the plug fill zone to top dress the completed plug. Meadow vegetation such as sod mats and willow wads would be salvaged by excavating and stockpiling the material to use for revegetation of the completed project.

All plugs and borrow ponds are sited and configured to accommodate surface and subsurface through flow as well as adjacent hillslope-generated surface and groundwater inflows. Plugs are constructed with wheel loader(s) to provide wheel compaction of the fill. The compaction levels are intended to match the porosity/transmissivity of the native meadow soils. This allows moisture to move freely within the plug soil profile and support erosion resistant meadow vegetation for long term durability as well as preventing preferential pathways for subsurface flows either in the plug or the native material.

Design features specific to the Pocket Meadows #1 and #2 are as follows (Figure 2). All gully fill for Pocket Meadow #1 will be generated from the one borrow pond excavated into the timbered terrace to the south. Approximately 11 trees (red fir/lodgepole) will be incorporated into the plug fill surfaces and the remnant channel for velocity reduction. This borrow pond will provide an off-channel, in-forest,

perennial surface water habitat feature. The majority of the earth fill for the gully in Pocket Meadow #2 will be generated from cutting terrace features down to floodplain elevation. This will provide more meadow area and floodplain extent, but not open water habitat. One borrow pond will be excavated into the forested terrace to the north. This will be an off-channel, in-forest, perennial surface water habitat feature. Approximately 4 red fir trees would be removed and used for habitat in the pond.

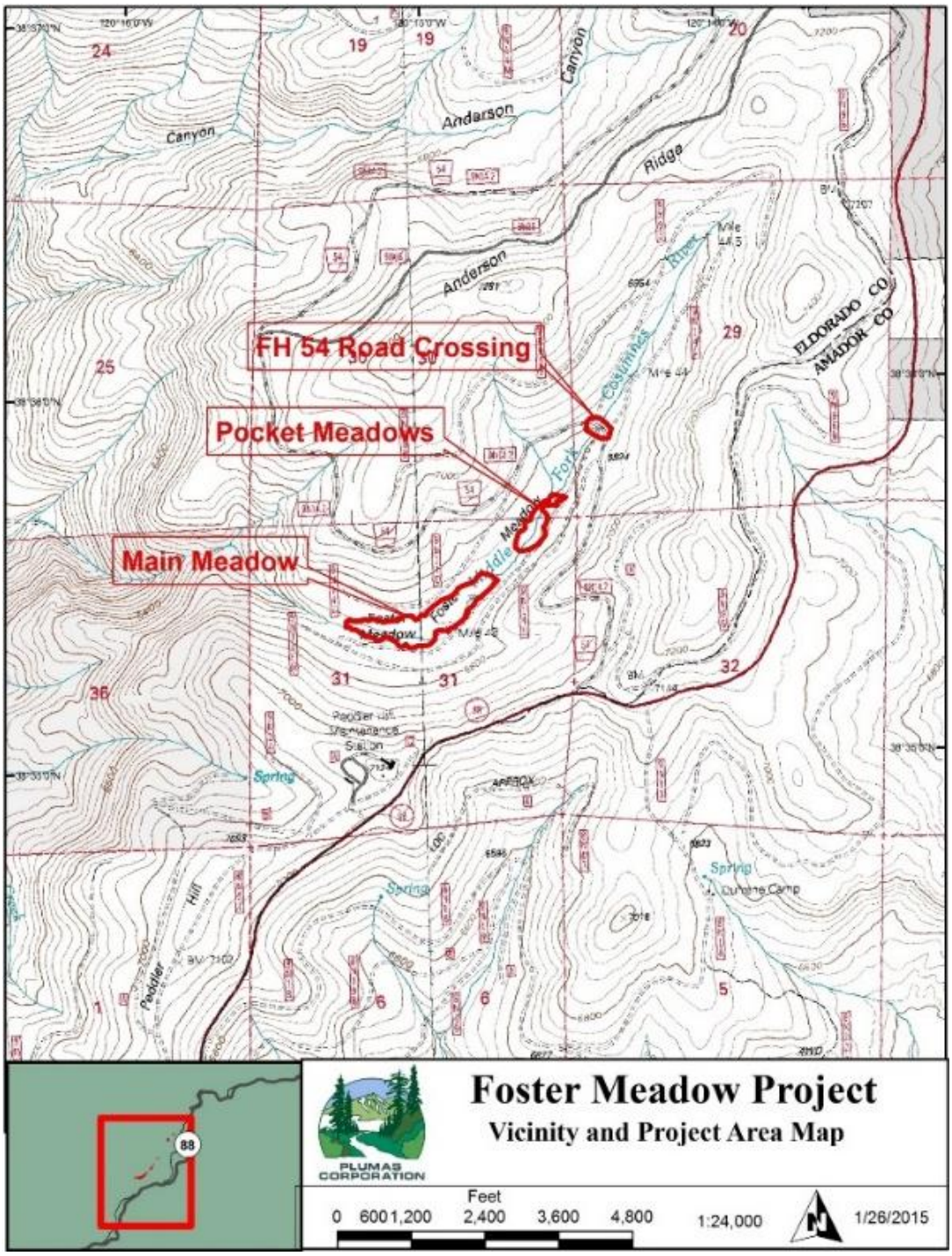

Figure 1. Foster Meadow Restoration Project Treatment Reaches.

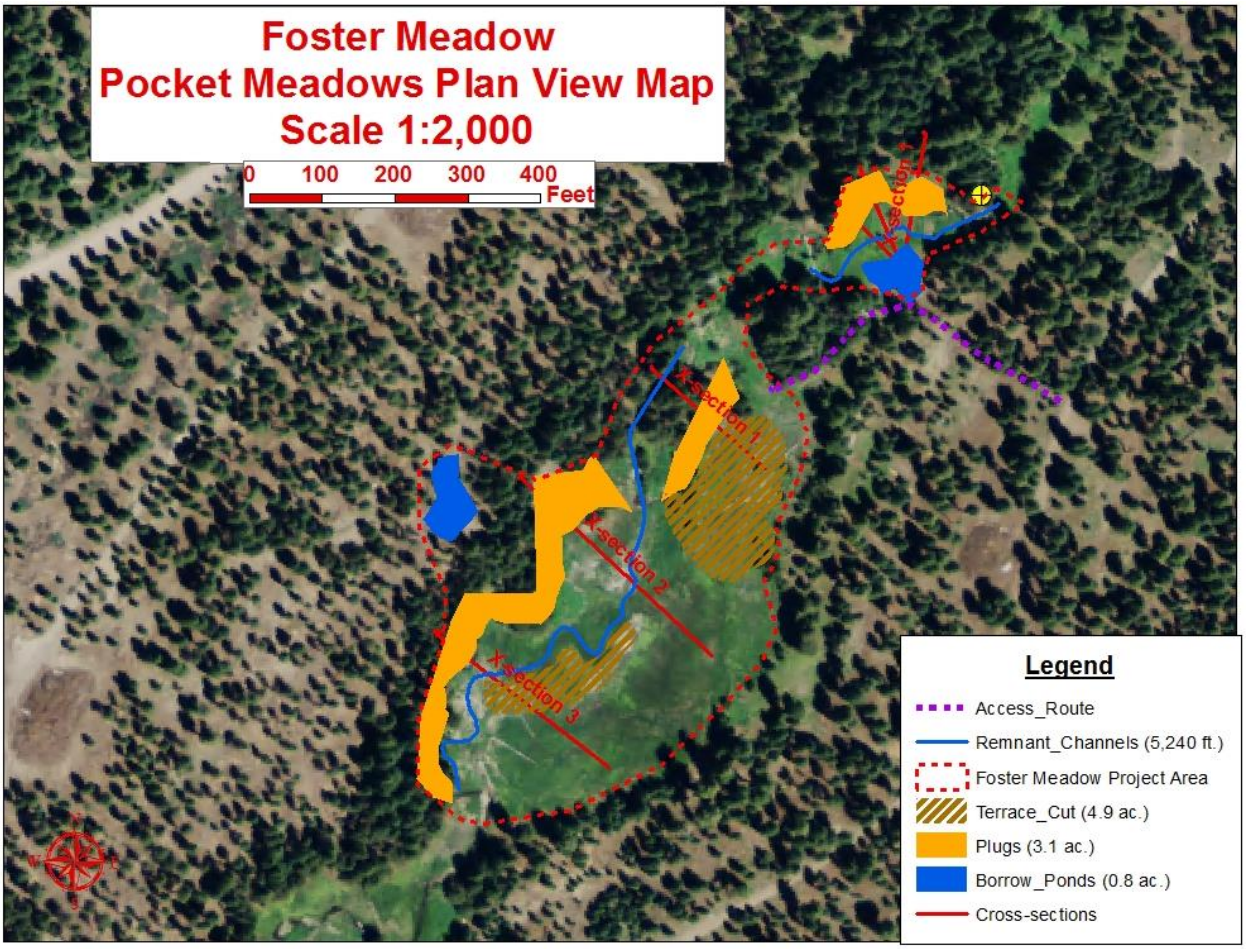

Figure 2. Foster Pocket Meadows Restoration Design Schematic.

Design features specific to the Main Meadow include having the bulk of the gully fill being generated from terrace cut (Figure 3). This will reduce shear stresses on the remnant channel and reverse the xeric trend on approximately 5 acres of wet meadow that are currently transitioning to upland vegetation. The lower end of the project will require using 9 rock riffles to raise the base level of the channel, in lieu of gully fill, in its existing alignment. The installation of riffles in the existing channel will raise the base level at the downstream end of the project, allowing a seamless transition of the new meadow gradient to the existing channel at the downstream end of the project. All access for equipment and materials will be on existing open or closed roads and recent timber harvest skid trails and landings.

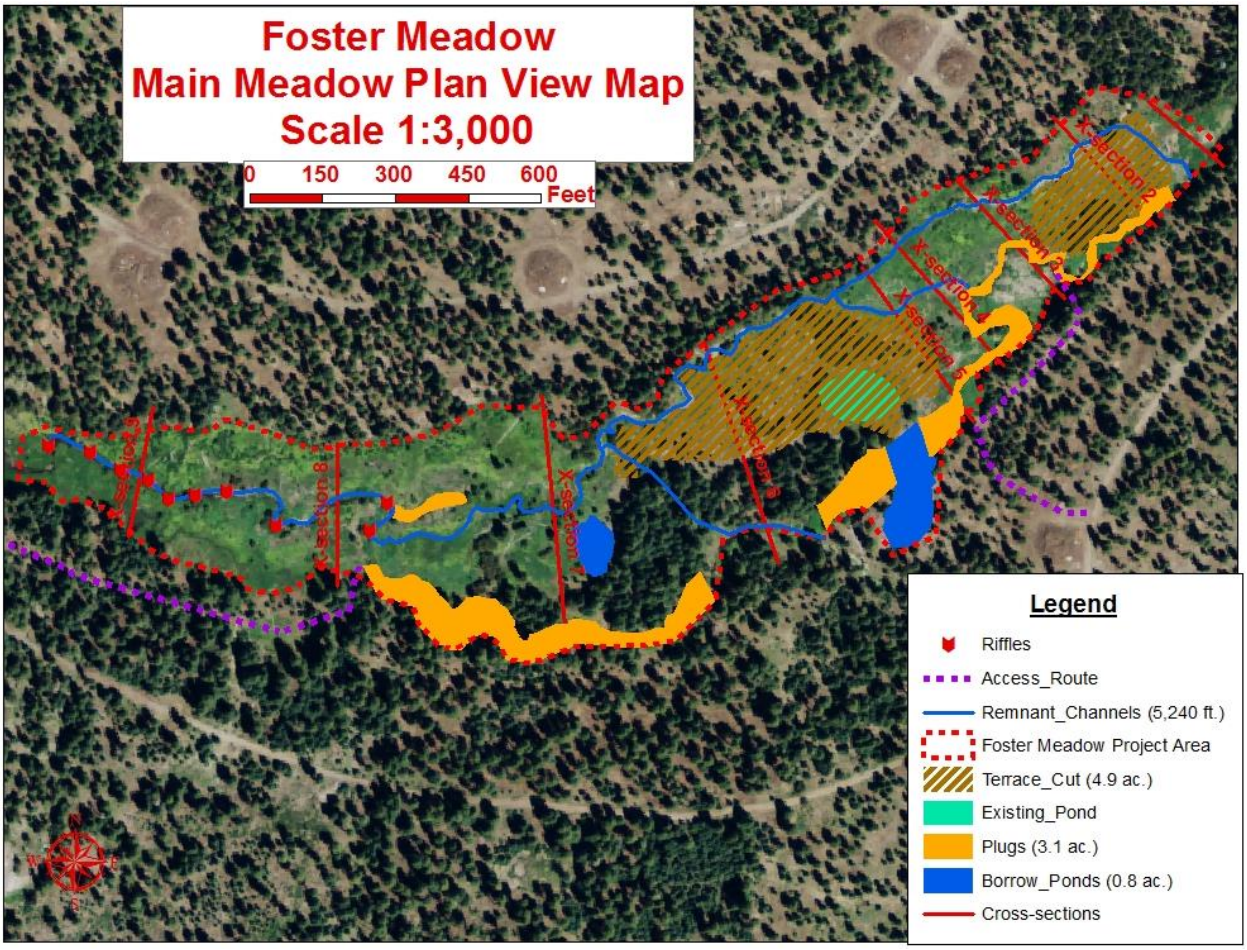

Figure 3. Foster Meadow Main Meadow Restoration Design Schematic.

Aquatic Passage Component

The second phase of the project will be construction of the AOP. The AOP will reduce the backwater effect of high flow from a single culvert with additional culverts set at floodplain elevation. The floodplain culverts would be installed in the road crossing with invert elevations approximately 1 foot above the invert elevation of the channel culvert. Ideally, no less than 3 additional culverts should be installed. These floodplain culverts would be 'squash' type, and set at as close an interval practicable across the floodplain. The AOP also includes the construction of a valley grade structure (VGS). The VGS will provide a durable, aquatic organism-passable channel/floodplain transition reach (125 feet long) between the road crossing elevation and downstream channel elevation, which would eliminate the current "waterfall" at the culvert outlet. Because the project is a forest highway road crossing, the AOP and VGS will be engineered. The VGS will require approximately 500 yds^3 of 2.0-foot minus rock and soil, sourced from the USFS Tragedy Pit (approximately 8 miles from the Project site). A water truck will be required on-site for dust suppression during rock transport. One excavator (36" bucket) and four

rock trucks will be required to load and transport rock to the Project site, and placement of rock at the VGS will require the use of a second excavator.

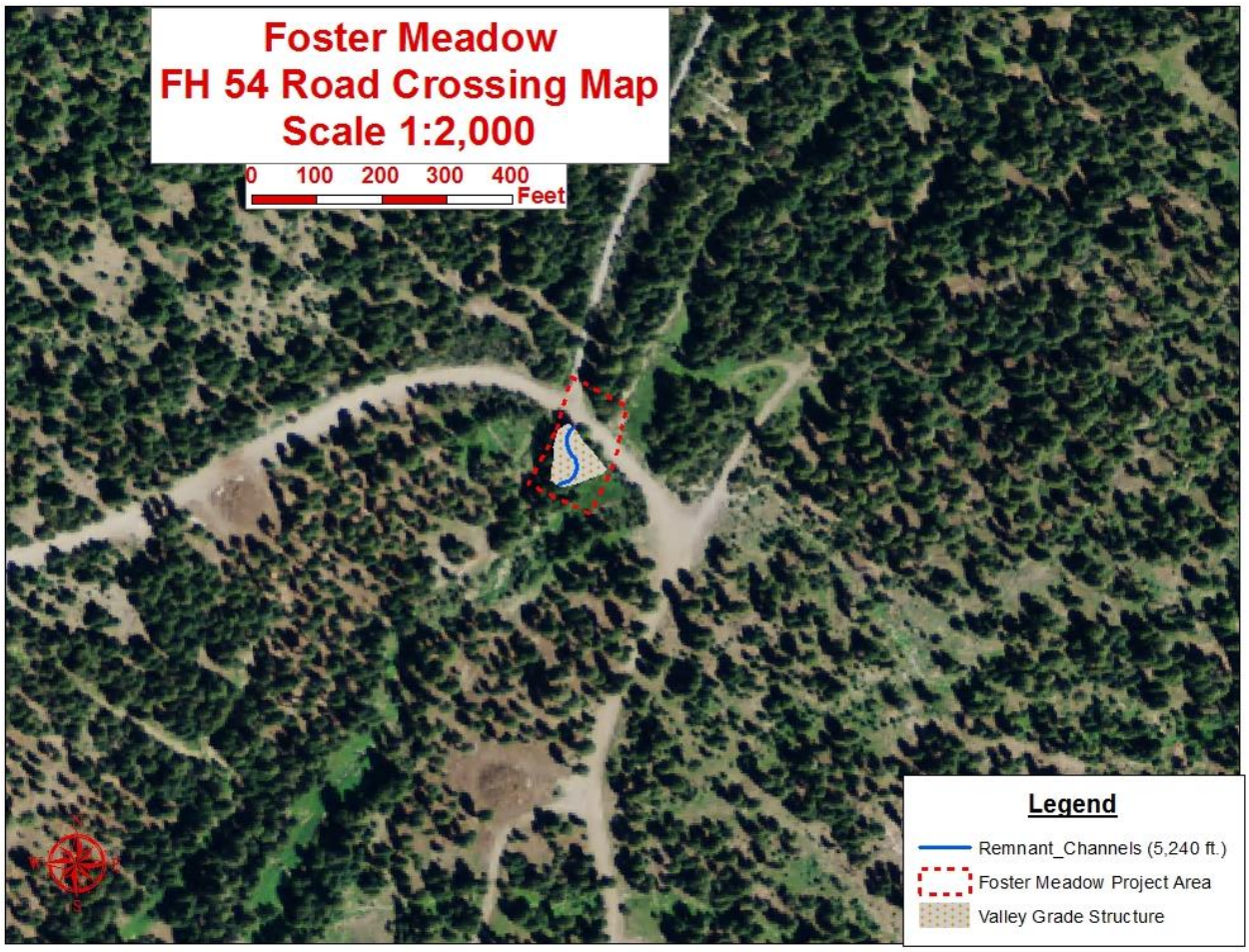

Figure 4. Foster Meadow FH 54/Foster Meadow road (9N14) crossing aquatic passage structure.

Revegetation

Upon completion, all plug surfaces are ripped to a depth of 12" to facilitate rainfall infiltration, dressed with the recovered topsoil, and seeded with native seed. Sod mats, willow wads, and other meadow vegetation from fill and borrow sites will be transplanted to plug edges, terraces and key locations on the remnant channel. Willow stakes will be planted next to stream channels and disturbed areas following construction in the fall to reduce immediate post-project vulnerability to erosion. In the spring following project construction, disturbed areas in the meadow and on graded terraces will be seeded using native seeds collected from Foster Meadow. In key locations during spring seeding, there will also be supplementary willow staking and hand-planting of container stock from locally-sourced material. Container stock will consist of rhizomatous species that can quickly colonize the terrace cuts and plugs. ENF staff will monitor survival of willow cuttings and percent cover of seeded areas for three years following construction. Successful revegetation will be achieved with 70% survival of willow cuttings and 50% cover of seeded areas. Any areas that do not meet the survival or cover area would be replanted.

Project Monitoring

The Foster Meadow Restoration Project is expected to benefit multiple resources by restoring the hydrological and ecological functions of the meadow floodplain system. The purpose of project monitoring is to measure project effectiveness on water quality, timing of flows, and enhancement of wildlife and aquatic habitats. Monitoring parameters and methods that would be utilized are outlined in Table 3.

Table 3. Project Effectiveness Monitoring of the Proposed Action

Monitoring Parameter	Method	Responsible Party
Water Temperature	Water temperature data loggers installed above and below project area May-Sept*	Plumas Corporation**
Aquatic Habitat	California Rapid Assessment Method (CRAM) and Forest Service Stream Condition Inventory (SCI) conducted once pre- and post-project	Plumas Corporation (CRAM); USFS-ENF (SCI)
Groundwater	4 groundwater wells (approximately 6 to 12 ft in depth) made of 3/4" galvanized perforated pipe, measured monthly*	Plumas Corporation**
Stream Flow	Staff gage and pressure transducer installed at the bottom of project area; monthly* manual calibration flow measurements; quarterly* collection of oxygen isotope samples and measurement of electrical conductivity (EC) from inflows, springs, and wells	Plumas Corporation**
Sediment Supply	Channel cross-section surveys; CRAM and SCI	Plumas Corporation (CRAM); USFS-ENF (SCI)
Meadow Vegetation	All revegetation areas would be monitored for three years following project completion. Monitoring will quantify willow survival and percent cover of native meadow vegetation.	USFS-ENF

**As access permits*

***Plumas Corporation has secured funding for monitoring through 2019, and is working with the Cosumnes Coalition so that this group can continue monitoring outside of the existing funding window.*

Design Criteria

The following mitigation measures and coordinating requirements are incorporated into the Proposed Action:

Air Quality - Soil-disturbing activities that generate fugitive dust PM10 emissions that are visible beyond the project property lines would be controlled through the implementation of the following measures as needed:

- Construction fill and cut areas would be watered as necessary to prevent visible emissions from extending more than 100 feet beyond the active work areas unless the area is inaccessible to watering vehicles due to slope conditions or other safety factors.
- Disturbed surface areas would be watered in sufficient quantity and frequency to suppress dust and maintain a stabilized surface.
- At least 80 percent of all inactive disturbed surface areas would be watered on a daily basis when there is evidence of wind driven fugitive dust, excluding any areas which are inaccessible due to excessive slope or other safety conditions.

- All unpaved roads used for any vehicular traffic would be watered at least once per every two hours of active operations.
- A water truck will be available on site. Water will be drafted from Lower Bear River Reservoir, approximately one-quarter mile from the project area. See the aquatic resources design criteria for aquatic resource protection measures to be implemented during drafting activities.

Range – There are no active range allotments in the project area.

Heritage – Management measures, other than avoidance, are not required to protect heritage resources from project activities (Foster Meadow Restoration Design Cultural Resource Report, R2016-05-03-10015, 9/09/2016). Known historic properties will be flagged for avoidance prior to project implementation. This does not fully eliminate the chance of discovering unrecorded sites or subsurface remains within the project boundary. If project ground disturbance should expose a cultural deposit, disturbance activities will be suspended until a qualified archaeologist can examine the area, evaluate the material, and adequate protection measures are incorporated. In the event that human remains are uncovered during project activity, project managers must stop work and contact El Dorado National Forest. If the remains are determined to be of Native American origin, both the Native American Heritage Commission and any identified descendants shall be notified (Health and Safety Code 7050.5, Public Resources Code Section 5097.94 and 5097.98).

Terrestrial Wildlife – Should project activities take place during the nesting/reproductive periods for these species (February 15-September 15), surveys of the project adjacent CA spotted owl, and northern goshawk Protected Activity Centers (PACs) would be conducted in an attempt to determine nesting status and species presence. Based on the survey results efforts will be made to minimize potential disturbance impacts based on recommendations of the project biologist.

Aquatic – There are no LOPs proposed for aquatic and riparian species. The proposed activities meet the standards and guidelines for aquatic and riparian dependent species. Additional design criteria for botanical species, hydrology, and soils provide additional protection measures for aquatic resources.

- The project activities will conform to the conservation measures and terms and conditions requirements in the Biological Opinion (USFWS 12/19/2014), and subsequent letter which appends this and other projects to that document (USFWS 02/08/2018).
- Visual Encounter surveys will be conducted for Sierra Nevada yellow-legged frogs by a qualified forest service biologist within 24 hours of construction at the Foster Meadow Road 9N14 stream crossing and within the entire Foster Meadow project area.
- If the Sierra Nevada yellow-legged frog are found within the project area during project implementation, their safety shall be assessed by qualified personnel and dealt with according to the Terms and Conditions described in the 2014 Programmatic Biological Opinion issued by the US Fish and Wildlife Service.
- Existing waterholes and other aquatic sites including ponds, lakes and streams used for water drafting would be surveyed for Aquatic TES species and flow levels taken prior to use. In the event TES species are found to occur at drafting sites; sites will not be used and future surveys would be conducted by an aquatic specialist to determine presence of potential populations. Dufrene Pond, a nearby manmade pond designated for drafting, contains a small breeding population of SNYLF and will **not** be used for drafting water for dust abatement or other construction needs.
- The use of low velocity water pumps and screening devices for pumps (per S&G 110) will be utilized during drafting for project treatments to prevent mortality of eggs, tadpoles, juveniles,

and adult SNYLF. A drafting box measuring 2 feet on all sides covered in a maximum of 0.25 inch screening is required.

Hydrology – Construction activities in Foster Meadow would occur during the time of year when the flow of the Middle Fork Cosumnes River is at its lowest. This typically occurs between August 1 and October 30. Required permits would be obtained including, at the least, the 404 permit from the U.S. Army Corps of Engineers and the 401 Permit from the Central Regional Valley Water Board. Additionally, construction would be supervised on-site by at least one person who has worked on at least one previous pond and plug project. Watershed mitigation measures also would include the use of Best Management Practices (BMPs) to protect water quality. The following management requirements from the U.S. Forest Service Region 5 *Water Quality Management Handbook* (USDA 2011) would be applied to prevent impacts to on-site and downstream water quality during implementation:

- **BMP 1.18 Meadow Protection –** The objective of this BMP is to avoid damage to ground cover, soil, and the hydrologic function of meadows.
- **BMP 2.5 Water Source Development and Utilization -** The objective of this BMP applies to dust abatement and other management activities requiring the use of water while protecting and maintaining water quality. Water may be needed to assist in construction of structures. Approved drafting sites designated by the district hydrologist would be utilized.
- **BMP 2.8 Stream Crossings** – This BMP minimizes water, aquatic and riparian resource disturbances and related sediment production when constructing, reconstructing, or maintaining temporary and permanent water crossings.
- **BMP 2.11 Equipment Refueling and Servicing -** This BMP prevents pollutants such as fuels, lubricants, bitumens and other harmful materials from being discharged into or near rivers, streams and impoundments, or into natural or man-made channels. Servicing and refueling activities would be located a minimum of 100 feet away from the meadow edge. Site specific locations for equipment fueling would be identified prior to or during project implementation. A non-porous mat or equivalent would be used for the refueling at the staging area.
- **BMP 2.13 Erosion Control Plan -** The requirements of this BMP are met through: 1) the Design Features for hydrology and soil resources that are in the proposed action, 2) the erosion control measures and monitoring that will be contained in the 404 permit (U.S. Army Corps of Engineers) and 401 Permit (State Water Quality Control Board, and 3) other applicable BMP's in the 2011 WQMH as listed in this section.
- **BMP 5.3 Tractor Operation Limitation in Wetlands & Meadows –** The objective of this BMP is to limit turbidity and sediment production resulting from compaction, rutting, run-off concentration, and subsequent erosion by excluding the use of mechanical equipment in wetlands and meadows except for the purpose of restoring wetland meadow and meadow function.
- **BMP 7.1 Watershed Restoration -** The objective of this BMP is to repair degraded watershed conditions and improve water quality and soil stability. Restoration measures described herein reflect state-of-the-art techniques and have been chosen to custom fit the unique hydrologic, physical, biological and climatic characteristics of Foster Meadow. The proposed design for restoration of Foster Meadow restores the meadow condition and hydrologic function to the watershed as described in this document.
- **BMP 7.4 Forest and Hazardous Substance Spill Prevention Control and Countermeasure (SPCC) Plan -** The objective of this BMP is to prevent contamination of waters from accidental spills. BMP 7.4 would be implemented when a total oil product at a site exceeds 1,320 gallons or any single container exceeds 660 gallons. The forest has a SPCC spill plan designed to guide the emergency response to spills during construction.
- **BMP 7.6 Water Quality Monitoring -** The objective of this BMP is to collect representative water data to determine base line conditions for comparison to established water quality

standards, which are related to beneficial uses for that particular watershed. This BMP is implemented through establishment of Stream Condition Inventory (SCI) site prior to project implementation to establish a pre-project condition, and through the requirements of the 401 Water Quality Certification that will be obtained for the project..

BMP 7.8 Cumulative Off-site Watershed Effect - This BMP serves to protect the identified beneficial uses of water from the combined effects of multiple management activities. Beneficial uses and effects have been documented in the Hydrology Report. Impacts of past and present activities including impacts of the proposed future management activities were considered in the evaluation of the analysis area, and summarized in the attached hydrology report.

Botany - Management of botanical resources, special habitats, and noxious weeds would follow the standards and guidelines in the Sierra Nevada Forest Amendment Record of Decision (SNFPA ROD 2004). Specific design criteria and protection measures for the Foster Meadow project include:

- Any new occurrences of sensitive plants identified within the project area would be flagged and avoided when necessary.
- A watchlist species, *Botrychium simplex*, occurs within Foster meadow. All known occurrences will be flagged for avoidance during project implementation. Should any new threatened, endangered, sensitive (TES) or watchlist species be located during the proposed project, available steps will be taken to evaluate and mitigate effects.
- Fens within Foster Meadow would be flagged prior to project implementation for avoidance. Crews conducting repair work at Foster Meadow would be informed of the location of the fen.
- All off-road equipment would be cleaned to insure it is free of soil, seeds, vegetative matter or other debris that could contain seeds before entering the project area.
- Infestations of invasive plants that are discovered during project implementation would be documented and locations mapped. New sites would be reported to the Forest botanist. Rock for riffle construction would be weed free.
- Onsite sand, gravel, rock, or organic matter would be used where possible.
- Any seed used for restoration or erosion control would be from a locally collected source (ENF, Seed, Mulch and Fertilizer Prescription, 2000).

Soil Resources - Standard mitigation measures have been developed under consultation with soil scientists and engineers as an integral component of meadow floodplain restoration. These mitigation measures have been monitored and refined based on previous projects of this type.

- Construction would occur during the low flow period, and coincides with the most favorable moisture conditions to the depth of borrow site excavation. The subsurface soil material excavated is used to plug the adjacent channel incision. This material requires enough moisture to allow for compaction to background condition of the adjacent native soil. The purpose of compaction is to preclude subsidence of the plug material during saturated conditions. Subsidence can lead to the initiation of erosion on the plugs. Utilization of onsite fill material allows the best match of soil types at the least cost. Material too wet to efficiently transport and work would be avoided. The subsurface (compacted) portions of the plug are constructed using the 'layer lift' method, which entails spreading the material in a thin veneer over the general area of the plug with each delivered bucket load of material. This repeated action, with occasional re-cutting of the working surface allows for efficient wheel compaction without supplemental equipment.
- Topsoil, and any organic material, in the area of excavation would be removed to a depth of approximately one foot and stockpiled adjacent to the plugs. When the plugs have been constructed to the design elevation, the plug surface would be cross-ripped to a depth of 12" to restore a deep infiltration capacity. Stockpiled topsoil with associated organics and native seed bank would be spread across the plug with a low ground-pressure track loader. The final pass

with equipment is to dress and roughen the topsoil surface for microclimate roughness and to fully incorporate the topsoil with the surface of the subsoil.

- Equipment travel into the project area would be restricted to existing open or closed roads and recent timber harvest skid trails and landings. During construction, routes from the borrow sites to plug areas with compaction resulting from construction would be scarified perpendicular to expected surface water flow and dressed with scattered organic material.
- Staging areas and temporary haul routes used during the project would be minimized to minimize soil compaction and disturbance to the greatest extent possible. After construction, they would be sub-soiled, perpendicular to surface flow directions, to the full depth of compaction to restore soil porosity. Areas with residual meadow sod would only be lightly scarified to preserve sod integrity. The emphasis is on the least soil disruption while loosening the soil. Extensive mixing or plowing can have a negative effect on soil microorganisms. This technique has been successful in loosening the soil, restoring soil porosity, providing a high infiltration capacity, and thereby reducing cumulative watershed effects.
- The project will require re-vegetation. Access routes are expected to have residual sod, and thus not require seeding, but may receive mulching and possibly seed, depending on the condition of the sod. Revegetation will consist of the following measures:
    - All desirable plant material that would be excavated or buried in plugs, such as sod mats and willow wads, will be removed and transplanted to plugs, terraces and at key locations in the remnant channel. Locations of transplants are prioritized according to need for maximum soil protection in bare areas and areas of potentially high stress.
    - During the spring and summer following project completion, locally collected seeds would be dispersed into terrace cuts, plugs, and other heavily disturbed areas.
    - Container stock from locally-sourced material would be hand planted in the spring and summer in key locations. Container stock will consist of rhizomatous species that can quickly colonize the terrace cuts and plugs.
    - All revegetation areas would be monitored for three years following project completion. Successful revegetation would consist of 70% survival of willow cuttings and transplanted seedlings. Seeded areas would have at least 50% cover of native vegetation. Any areas that do not meet the survival or cover criteria would be reseeded or replanted.
- Erosion control would be accomplished using locally collected materials (wood chips, duff, pine needles, etc.). Straw would not be used.
- Meadow restoration projects include rest from grazing in disturbed areas for up to three years after construction in order to allow the newly planted vegetation to become established. Currently, the project area is not grazed and the allotment will not be re-opened, so this mitigation requires no further action.

Fire/Fuels Management - While the project area is located in a meadow and outside of state identified very fire hazard severity zones, portions of the meadow are expected to be dry, with a risk for wildfire associated with the use of any internal combustion engine. A trash pump and/or water truck will be on site to assist with vegetation transplants and dust control, as well as to reduce the risk of wildfire. In addition, equipment would be re-fueled and serviced at the designated staging area, which is outside of the riparian area and meadow. No fuel would be stored on-site. In the event of an accidental spill, hazmat materials for quick on-site clean-up would be kept at the project sites during all construction activities, and in each piece of equipment.

IV. EFFECTS OF THE PROPOSED PROJECT

No Action/Affected Environement

For the purposes of this analysis the No Action/Affected environment is considered to be the baseline existing data as stated for each species. This information is presented during the effects discussion for the proposed action and is then used to show the effects associated with the proposed action. As no action is the existing condition, there are no impacts or effects associated with taking no action or current condition for these species.

Great Gray Owl

Current Condition-No Action Alternative

The following describes the current condition, also known as the no action alternative. The great gray owl (GGO) is a Forest Service regionally designated sensitive species. Historic sightings are recorded for all counties in the Cascade Range in California and the Sierra Nevada as far south as Tulare Co. The present known population is centered in Yosemite National Park. The current distribution and population of great gray owl is not well known, in recent years a number of breeding pairs have been found at relatively low elevations, in more of an oak/grass ridgetop and associated drainage systems.

Preferred great gray habitat is characterized mixed conifer habitat, with a combination of meadow and other vegetation opening utilized for foraging. Nests are usually in broken topped medium to large trees or snags which provide a protected platform. Hunting perches are used by the owls, 2-20' in height, within 220 feet from open vegetation edge used for hunting.

The habitat surrounding Foster Meadow and the other meadows in the project area are believed to currently provide the structure necessary for this species to utilize the area. Based on incidental survey responses at Foster Meadow, and subsequent follow up broadcast surveys at this location, a great owl, potentially a pair is believed to be using the area. Daytime follow ups were unable to locate individuals or a nest, so no reproductive status has been confirmed to date. There are a few other meadow areas in the project area that might support great gray owls, the nearest detection is approximately 2.5 miles from the project area.

As reproduction has not been confirmed at Foster Meadow, no protected activity center (PAC) has been delineated for great gray owl, but the area where the activity detected has occurred does fall within spotted owl and goshawk PACs, and receives the protection from habitat alteration and disturbance afforded by these species PACs.

Proposed Action- Effects

Direct and Indirect Effects

Suitable Habitat

Direct effects are limited to the area that currently is suitable for great gray owl (GGO) nesting or foraging. Suitable habitat within the project area is suitable foraging habitat, there is no nesting habitat within the project area which would be directly affected as the proposed restoration would treat the stream channel and immediately adjacent areas which do not support nesting trees and snags and associated habitat.

Effects to the foraging habitat would be in the form of soil movement and reduced initial vegetation where soil is excavated (primarily the terrace cuts in the meadow), and the channel fill/plugging takes place. Approximately 13 acres of suitable foraging habitat, of the total 27 acre meadow area, would be directly affected by project activity. Revegetation of this area is expected to be rapid. In previous projects on the Tahoe National Forest, treated areas revegetated to similar or higher levels in one runoff season. The other proposed activities, riffle creation and improving the aquatic passage, are not expected to affect suitable habitat, and will not be further analyzed for this species.

The effect on great gray owl prey from this short term loss of vegetation should be minimal, as there is other meadow vegetation in close proximity to provide prey during this short period. Prey density are expected to increase post project, as the treated stream channel and surrounding vegetation responds to the increased water table and associated changes to vegetation.

Disturbance Effects

Construction activities in Foster Meadow would occur during the time of year when the flow of the Middle Fork Cosumnes River is at its lowest. This typically occurs between August 1 and October 30. This would result in project activities taking place toward the end, or after the nesting season for great gray owls. Noise disturbance resulting from the equipment used in the restoration process would take place primarily in foraging habitat (meadow) away from potential nesting locations. This species foraging behavior would be unlikely to be affected, as the much of the foraging for great gray owls is nocturnal when project activities would not be taking place.

If disturbance did occur, temporary displacement of individuals could occur, but would not be expected to affect reproduction, due to both time of year, and foraging time of day. Presently occupancy of the area is believed to be possible, but reproduction has not been confirmed. With this in mind, project timing, and due to the location of project activities outside of nesting habitat, no limited operating period (LOP) is believed to be needed to protect great gray owl reproduction. Should this species be detected and determined to be reproductive, prior to or during implementation of the project, LOP and/or other mitigation would be considered as appropriate at that time.

Cumulative Effects

Analysis of cumulative effects to great gray owl will consider the impacts of the proposed action when combined with past, present, and foreseeable future actions and events that have affected or may affect the quantity or quality of great gray owl habitat. The cumulative effects analysis area has been established as the Foster Meadow area, including the meadow, and surrounding forested stands. The

geographic scope of the cumulative effects analysis was selected considering the area that would likely be utilized if a great gray owl is present in this area.

The actions contributing to cumulative effects are those past and future actions, which have affected or will affect the quantity or quality of GGO habitat within this analysis area. Within the cumulative affects area past and planned timber harvest, fuels treatments, road construction/use, grazing, and hazard tree removal projects have or will alter the quantity and quality of GGO nesting and foraging habitat, potentially affecting GGO sites within and adjacent to the project area. Past grazing, and current and past road use and construction have affected this meadow and the surrounding area. There currently is no active grazing allotment for the area. There have been past logging and thinning projects, as well as current forest thinning projects which have reduced canopy closure, and some nesting structures in the past and foreseeable future. The cumulative effect of these actions has been a lowering of the water table within portions of the meadow, stream down cutting, changes in availability of nest locations, and changes in vegetation.

The proposed action would not be expected to contribute to past reductions/degradation in the amount or quality of suitable great gray owl habitat. The project is expected to improve habitat quality and quantity of foraging habitat for this species at Foster Meadow. Great gray owl sites are not currently well distributed across the Amador Ranger District, or the Eldorado National Forest, the extent to whether this is related to population or habitat gaps is not known. The proposed action contributes to beneficial effects to this species' habitat quality and quantity, and would therefore reduce adverse cumulative effects.

Effects Summary

Existing past and foreseeable future modification of habitat are not expected to reduce the local great gray owl population. This alternative would have a short term impact on 13 acres or less of existing habitat, and would, post project, improve habitat quality over the project area, approximately 25 acres, by improving the function of the meadow habitat, expected increases in prey species, which would add to the quality of the adjacent nesting habitat. Project generated disturbance effects are not likely, reduced by planned timing of the implementation, late in summer/fall, and design criteria associated with other species, and should there be any, are expected to affect individuals, and not affect long term reproduction.

Determination

The Proposed Action may affect individual great gray owl but is not likely to result in trend toward Federal listing or loss of species viability.

Willow Flycatcher

The willow flycatcher is designated as a sensitive species for the ENF. The most up-to-date and comprehensive information regarding the status and biology of willow flycatcher is summarized in the SNFPA FEIS and is incorporated by reference (USDA 2001b:Vol.3, Ch.3, part 4.4, pages 144-195). Willow flycatcher occur in meadow, aquatic, and riparian habitats (USDA 2001b). It is estimated that there are around 300-400 individuals on National Forest System lands in the Sierra Nevada, with 1 historical and possibly current breeding sites occurring on the ENF (USDA 2001b). The number and distribution of willow flycatcher in the Sierra Nevada is

low and spotty, the species is believed to be at risk of extirpation due to the small population size, and the added risk it faces as a neotropical migrant. The population trend in the Sierra appears to be downward based on a regional demography study for this species (USDA 2001b).

Habitat typically includes moist meadows with perennial streams and smaller spring-fed or boggy areas with willow (*Salix* spp.) or alders (*Alnus* spp.). The presence of water during the breeding season appears to be an important habitat component (Fowler et al. 1991). The minimum size meadow useable for willow flycatchers is assumed to be 0.62 acres (Fowler et al. 1991). Willow flycatchers have also been found in riparian habitats of various types and sizes ranging from small lakes or ponds surrounded by willows with a fringe of meadow or grassland, to willow lined streams, grasslands, or boggy areas.

Suitable habitat has been mapped for willow flycatcher on the forest, based on meadows containing willow, and known breeding locations. Surveys have been conducted for this species in the project area, willow flycatcher have not been detected within Foster Meadow or any nearby habitat. The project area does have willow and a perennial stream and spring system. Presently the downcut condition of the meadow may not be providing sufficient slack water and insect populations to sustain willow flycatcher nesting.

Proposed Action-Effects

Direct and Indirect effects

Suitable Habitat

Presently the area proposed for treatment is not believed to provide high capability habitat due to the downcut stream and little standing water to provide insect prey for foraging, although there is willow present for nesting. The proposed action would result in some habitat alteration. In the short term (during project implementation and into the first summer following project implementation), willow in the treated area and other riparian vegetation would be impacted--reduced in density in some areas, moved and used as part of the revegetation of the project, and cut and used to start willow in areas of the project that need further revegetation work. These impacts would take place after nesting season for the species, so if present, the initial habitat alteration would not be expected to impact nesting or reproduction, as implementation would take place after nesting and fledging for this species. Surveys to date have not detected the species or nesting, so risk of affecting nesting habitat is low.

These reductions in willow vigor and biomass would be short term in nature, recovering to, and providing more habitat within 1-2 growing seasons, based on experience on other similar projects. The planned stockpiling and replanting of vegetation at the end of the plug/channel fill/pond construction should retain most of the structure, although the arrangement and location of plants will be affected. With the increased water table after project implementation, willow habitat would be expected to expand in size and vigor in the years following the project, potentially improve habitat capability and increasing the potential for this area and surrounding habitat to be utilized by this species for nesting. The project is also expected to retain more water throughout the meadow, produce additional slack water habitat, and slow release of the water, resulting in increased amounts of habitat and higher quality habitat longer into, and through the breeding season. This project is expected to improve the future quality of habitat for prey species, insects, in the stream and associated meadow habitat. If this improvement increases prey availability by increasing the size of the prey population, habitat capability would improve for willow flycatcher in the vicinity of the treated area.

Disturbance Effects

Project activities would take place late in or after the nesting season for willow flycatcher. No nesting is known to be, or has taken place in recent years in the project area, based on surveys. Noise disturbance, and potential direct affects to the nest, are unlikely due timing and the project taking place outside of the high capability habitat for this species. Foraging behavior would be unlikely to be affected, and should it occur would be expected to impact individuals, not reproductive pairs. Should foraging behavior be affected, temporary displacement of individuals could occur, but reproduction would be unlikely to be affected, again due timing of project activities, and lack of nesting activity in the meadow. Should this species be detected, prior to or during implementation of the project, other mitigation would be considered as appropriate at that time.

Cumulative Effects

This project would be expected to improve habitat quality for this species, and may provide future nesting expansion for this species as the meadow function improves. The proposed action would not be expected to contribute to past reductions/degradation in the amount or quality of suitable willow flycatcher habitat. The project is expected to improve habitat quality and quantity for this species. Willow flycatcher sites are not currently well distributed on the Amador Ranger District, or the Eldorado National Forest, the extent to whether this is related to population or habitat gaps is not fully known.

Determination

The proposed action may impact individual willow flycatcher, but is not likely to result in trend toward Federal listing or loss of species viability.

CALIFORNIA SPOTTED OWL, NORTHERN GOSHAWK, AND AMERICAN MARTEN

Current Condition-No Action Alternative

The following describes the current condition, also known as the no action alternative. The California spotted owl, northern goshawk, and American marten, are Forest Service regionally designated sensitive species. Based on incidental sightings, recent surveys, and track plate/camera surveys all three species have been detected in close proximity to the project area, and the area is believed to be occupied by all three species.

Preferred habitat for these species is very similar, and for the purposes of this analysis will be analyzed the same way for all three species. Suitable habitat is characterized by dense (50 to 100% canopy), multi storied, multi species late seral coniferous forests with a high number of large (> 24 inch dbh) snags and downed logs. The project area includes this type of habitat, where it surrounds Foster Meadow.

Proposed Action

Dirett Effects and Indirect Effects

Suitable Habitat

The proposed action would have little to no effect on suitable habitat for these species. The project is treating meadow habitat, which has suitable habitat surrounding it, and would remove 11 trees for use in the project implementation. There would be no change in canopy closure, reductions in nesting or

denning trees and snags, in the suitable habitat. As habitat would not be altered only disturbance impacts during implementation are likely to occur and will be analyzed further.

Disturbance Effects

Disturbance impacts are similar for all three species. The project could disturb individuals of any or all of these species, and would be likely to temporarily displace individuals, should they be active near project activities, primarily equipment use.

Immediately adjacent to the project treatment areas there is one spotted owl protected activity centers (PAC), ELD0321, and two goshawk PACs, G3504, and G3506. The timing of the project would minimize potential impacts to these PACs during the reproductive period, as the project would take place when water flow is lowest, typically August to October. The design criteria in the proposed action:

Terrestrial Wildlife –Should project activities take place during the nesting/reproductive periods for these species (February 15-September 15), surveys of the project adjacent CA spotted owl, and northern goshawk Protected Activity Centers (PACs) would be conducted in an attempt to determine nesting status and species presence. Based on the survey results efforts will be made to minimize potential disturbance impacts based on recommendations of the project biologist.

would further reduce, or remove potential for impacting reproduction for either spotted owl or northern goshawk.

Marten have been detected within the project area during past surveys. Denning disturbance effects would not occur due to timing of project activities, late summer-early fall, and crucial denning being winter-spring.

Should disturbance to any of these species occur, disturbance is unlikely to affect more than one or two individuals, due the small scale of the project, timing of the project, and the design features in place to reduce likelihood of impacts to reproduction. Should disturbance occur, during foraging or travel activities, the result could be temporary displacement of individuals. Effects on reproduction and population numbers, or species viability would not be expected to occur for spotted owl, goshawk, or marten.

Cumulative Effects

The proposed action would have no impact on suitable habitat for the species, and is expected to have little likelihood of disturbance impacts to individuals of the three species analyzed here. As the project would have little to no direct or indirect impacts to these species or their habitats, the project would not contribute to adverse cumulative effects for California spotted owl, northern goshawks, or American marten.

Effects Summary

This alternative would not affect habitat suitability for these species. Project generated disturbance effects are not likely, and should there be any, are expected to affect individuals, and would not be expected to affect reproduction for these species.

Determination

The proposed action may affect individuals, but are not likely to lead to a trend towards federal listing or loss of viability for the California spotted owl, northern goshawk, and American marten.

PALLID BAT

Current Condition-No Action Alternative

Pallid bat is a designated sensitive species for the ENF. Throughout California, the pallid bat is usually found in low to middle elevation habitats below 6,000 feet elevation. (ENF 2001), however, the species has been found up to 10,000 feet in the Sierra Nevada (ENF 2001). Pallid bats are most common in open, dry habitats that contain rocky areas for roosting. They are a year-long resident in most of their range and hibernate in winter near their summer roost (Zeiner et al. 1990). Day roosts may vary but are commonly found in rock crevices, tree hollows, mines, caves, and a variety of human-made structures. Tree roosting has been documented in large conifer snags, inside basal hollows of redwoods and giant sequoias, and bole cavities in oaks (ENF 2001). Cavities in broken branches of black oak are very important and there is a strong association with black oak for roosting (ENF 2001).

Pallid bat are known to feed predominantly on ground-dwelling arthropods, such as scorpions and Jerusalem crickets (USDA 2001b). Foraging occurs over open ground, where pallid bats are more often found along edges and open stands, particularly hardwoods (USDA 2001b).

There are no known mine or cave sites within the project area that would provide suitable roosting habitat in rock crevices. The projects elevation is above the elevation at which oaks occur, and above 6,000 feet (where this species is usually found). Large conifer trees and snags are present in the project area. There have been no comprehensive surveys for pallid bat on the ENF. What surveys have been done have not detected the species in the project area. Surveys associated with the SNFPA were conducted in 2001 for pallid bats along the Highway 50 corridor about 20 miles north of the project area. There was a capture of a pallid bat during that survey effort (ENF 2002).

Foster Meadow, the project area, appears to provide potential foraging habitat, and the surrounding conifer forest may provide some roosting habitat, however, the area does not fit the most common roosting habitat for this species as it is above the elevational range for oaks and is not dry and open, with rocky areas for roosting.

Proposed Action-Alternative 1

Direct and Indirect Effects

Pallid bat tends to be both a roosting and foraging generalist. Suitable roost sites include a variety of features, such as large snags, oaks and rock crevices; suitable foraging occurs from grasslands to higher elevation coniferous forests. For this reason all acres within the project area which are proposed for

treatment are considered to be potentially suitable habitat for this species, although not necessarily high capability due to elevation and relatively wet forest/meadow conditions.

This project would have a minimal effect on potential roosting sites, large trees and snags in this case, as the project would not be removing many trees or snags (11 trees total may be used in construction of plugs for this project). As has been previously stated, the project is above the elevation that this species is typically found using, further reducing the likelihood that the tree removal would affect roosting availability for this species.

Foraging habitat could be improved through implementation of the project, as meadow function improves after implementation; the restored meadow should increase insect diversity and quantities, which would make them available to pallid bats to forage on. If there are any short term impacts to foraging habitat, it is expected to be negligible, as the project would take place late in the season, after most insect populations have peaked, and the project would not impact all of the potential foraging habitat in the immediate area, allowing for foraging elsewhere in close proximity to project activities.

Disturbance Effects

Foraging activity and foraging individuals would not be expected to experience disturbance from project activities, due to timing of foraging (night), not coinciding with the project activities (daytime). Disturbance could occur to day roosting bats where roosting location coincides with project activities. The amount of potential disturbance and effect on individuals is expected to be low, as the forest surrounding the meadow is not being altered, which is where roosting would be expected, and noise from work in the meadow would only be expected to minimally impact snags/tree roosts, with only 11 trees planned for removal immediately adjacent to the meadow. This would reduce both the number of potential roosts impacted, and the numbers of bats that could be impacted. Due to the timing, should disturbance occur it would be after the reproductive period for this species, and reproduction would not be impacted. Temporary displacement would be possible where roosting sites and project activities coincide. Due to the wide variety of roosting habitats used, this alternative would not be expected to have any long term population effects on this species, as few individuals would be likely to be affected.

Cumulative Effects

Future actions on National Forest lands are likely to be favorable to the species. Snags and oaks are retained where they exist under current Forest Plan direction, except where they pose a hazard, such as: recreational sites, administrative sites, and along roadways. Cumulative effects to the pallid bat from activities on National Forest lands should therefore be quite limited. Due to the location of project (above common elevational range for the species, and the scale of the project (small acreage impacted), effects of the proposed action would not be of sufficient magnitude to greatly change cumulative effects for this species, the project would improve the quality of habitat for this species, but not change the amount of habitat available to this species.

Effects Summary

Foraging habitat within the project area would be maintained and enhanced by restoring Foster Meadow, which should increase prey species diversity and availability. Roosting habitat would not be greatly impacted, as few large trees and snags would be removed. This project may result in some level of disturbance to a very low number of individuals during implementation. No impacts to reproduction would be anticipated from implementing this project, due to timing of implementation and limited potential impacts. The project would not be expected to affect local population or species viability.

Determination

The proposed action may affect individuals, but is not likely to lead to a trend towards federal listing or loss of viability for the pallid bat.

TOWNSEND'S BIG-EARED BAT

Current Condition-No Action Alternative

Townsend's big-eared bats are associated with a variety of habitats including desert, native prairies, coniferous forests, mid-elevation mixed conifer, mixed hardwood-conifer forests, riparian communities, agricultural lands, and coastal habitats. This species has foraging associations with edge habitats along streams, which the project includes. For this reason, the entire project area is believed to provide suitable foraging habitat. Key habitats for Townsend's big-eared bats are roosts sites. This species is highly selective in their choice of roost locations, which include old buildings, mines, or caves that remain undisturbed. No roosting structures have been identified within the project area.

Proposed Action-Alternative 1

Direct, Indirect and Cumulative Effects

The pallid bat discussion above describes potential affects to Townsend's big-eared bat foraging habitat (as foraging habitat is essentially the same for both species), improved meadow function should translate into better foraging potential for this species. As no roosting habitat is known to occur in the project area, and would not be affected by this project, roosting habitat would not be impacted by the proposed action, and no disturbance impacts to roosting bats would be expected to occur.

Potential for disturbance to foraging bats would be unlikely from the proposed activities, as project activities would take place during daylight hours, when bat foraging activity is not or occurring or is at a minimum (dusk/dawn). The project would not contribute to adverse cumulative effects, and would not expected to impact populations or distribution of this species.

Effects Summary

Foraging habitat within the project area would be enhanced by the proposed action. Roosting habitat would not be affected, and no disturbance to roosting bats would result from implementation. This project is very unlikely to result in any disturbance to foraging Townsend's big-eared bats, and would not affect roosting bats or reproduction.

Determination

The proposed action may affect individuals, but is not likely to lead to a trend towards federal listing or loss of viability for the Townsend's big-eared bats.

FRINGED MYOTIS

Current Condition-No Action Alternative

Fringed myotis is a designated sensitive species for the ENF. The fringed myotis is usually found in low to middle elevation habitats below 6,000 feet elevation, but has been found near sea level and at much higher elevations. There is some evidence that this species may migrate to lower elevations for winter roosts, but does not appear to be a long distant migrant. Day roosts may vary but are commonly found in rock crevices, tree hollows, mines, caves, and a variety of human-made structures. Tree roosting has been documented in large conifer snags. In northern California it appears that male and female *Myotis thysanodes* use tree snags exclusively for day roosts (Weller and Zabel 2001). In areas where tree roosting is the norm, vegetative structural complexity of habitat around roost sites is likely more important than plant species composition or general topographic features in determining local distribution. The best habitat model for predicting bat presence in an area contained only these variables (the number of snags ≥ 30 cm DBH combined and percent canopy cover), where increasing numbers of snags and decreasing canopy cover increased the probability of bat occurrence (Weller 2000).

Fringed myotis are considered to be foraging generalists, but do seem to be tied to day-roost habitat associated with old forest conditions, especially large diameter snags. Fringed myotis often forage in meadows and along secondary streams, in fairly cluttered habitat. (Pierson et al. 2001).

There are no known mine or cave sites within the project area that would provide suitable roosting habitat in rock crevices. Large conifer snags are present in the project area. There have been no comprehensive surveys for fringed myotis on the ENF, but they have been detected on the ENF in the past. The project is above the 6,000 elevation, which may make the project area less suitable for this species, but for this analysis the project area will be analyzed as suitable habitat.

Proposed Action-Alternative 1

Direct and Indirect Effects

The pallid bat and Townsend's bat discussion above describes potential affects to fringed myotis bat foraging habitat; improved meadow function should translate into better foraging potential for this species. Foraging habitat could be improved through implementation of the project, as meadow function improves after implementation, as the restored meadow should increase insect diversity and quantities, which would make them available to the bats to forage on. If there is any short term impacts to foraging habitat, it is expected to fairly small, as the project would take place late in the season, after most insect populations have peaked, and the project would not impact all of the potential foraging habitat in the immediate area.

This project would have little effect on potential roosting sites; only 11 trees are likely to be incorporated into the plug construction, and no rock crevices, mines or caves are found within the proposed treatment area.

Disturbance Effects

Disturbance, should it occur for this species, would be expected to be similar to what was described previously for pallid and Townsend's big-eared bats, including no effects to reproduction and low

chance of individuals being affected, due to timing of activities in the year and the low likelihood of species being present in any numbers in the project area. Temporary displacement would be possible where roosting sites and project activities coincide. Due to the wide variety of roosting habitats used, this alternative would not be expected to have any long term population effects on this species, as few individuals would be likely to be affected.

Cumulative Effects

Effects from this alternative would not be of sufficient magnitude to contribute to adverse cumulative effects for this species, and future actions on National Forest lands are likely to be favorable to the species. Snags are retained in large numbers under current Forest Plan direction, except where they pose a hazard, such as: recreational sites, administrative sites, and along roadways. Cumulative effects to the fringed myotis from activities on National Forest lands should therefore be quite limited. Where this project opens up the understory, speeds development of roost sites, and improves prey availability, it may result in an improvement in fringed myotis habitat and will not contribute to substantial cumulative impacts.

Effects Summary

Foraging habitat within the project area would be enhanced by increasing prey availability. Roosting habitat would be maintained with implementation of this alternative, as large trees and snags, by and large, would be retained. This project may result in some level of disturbance to individuals during implementation, but would not be expected to affect local population or species viability, or distribution.

Determination

The proposed action may affect individuals, but is not likely to lead to a trend towards federal listing or loss of viability for the fringed myotis.

WESTERN BUMBLE BEE

Current Condition-No Action Alternative

Limited surveys have been conducted for this species within the project area; the species has not been detected, and if present, their numbers are likely low. Incidental sightings have detected other bumble bee species, but no western bumble bees have been detected on site; however, the area is believed to provide suitable habitat for the species. Western bumble bees are associated with a variety of habitats; they forage on flowering plants and use rodent boroughs for nesting and overwintering. Early seral habitat with flowering plants may provide habitat for both nest/overwintering and foraging, with later seral, high canopy closure habitat expected to provide some boroughs for nesting/wintering, but little foraging opportunities. Western bumble bee numbers peak in July and into August, foraging individuals are largely absent by the end of September. Foster meadow provides high quality foraging habitat, and the dryer areas and surrounding conifer stands provide nesting and overwintering habitat for the queens.

Alternatives 1-Proposed Action

Direct, and Indirect Effects

Suitable habitat

Within the project area, the meadow habitat provides high quality foraging habitat, and the edge of the meadow and surrounding conifer stands provide nesting and overwintering habitat for this species. The meadow is too wet to provide good nesting/overwintering habitat, as even the areas that dry out late in the year are flooded early season, as the snow melt soaks into the soil early in the bees lifecycle, and rewet in the fall with first rains and snows, which would deter overwintering even the dryer portions of the meadow. Nesting/overwintering would be expected to occur in the dryer soils at the edge of the meadow and into the surrounding conifer stands. For these reasons the proposed project would not be expected to affect nesting and overwintering habitat, to any large extent.

Foraging habitat quality and availability would be impacted by the project activities. In the short term, the season of construction/implementation, there would be a removal of some flowering plants, used for foraging. These impacts are not expected to affect a large number of western bumble bee, as they have not been detected on site, and if present are likely in low numbers to begin with. Should the species be present, the timing of the project late August into October is after the population peaks, most of the flowering has occurred, and only queens would be expected to be in the meadow in any number at that time. For these reasons, during the summer/fall of implementation, only a few individuals would potentially be impacted, and may be displaced to forage outside of the area of treatment. Sufficient habitat outside of the area impacted should be available as 10-15 acres of the meadow would not be altered during the season of treatment.

Longer term effects to suitable habitat, the year following treatments and forward from that time, the foraging habitat quality and quantity should both increase for this species. The improved function of the meadow, wetting of areas of the meadow that presently dry out mid to late summer, would increase the vigor and amount of flower plants that the bees forage on. This may also prolong the availability of high quality foraging habitat as presently dry areas retain moisture and plant vigor later in the year.

Disturbance

In the absence of positive survey results, the area is assumed to be occupied by western bumble bees, but the numbers of bees, if present, is believed to be low, and therefore the number of individuals that would be likely to experience disturbance is also low. Disturbance to this species could occur the year of implementation, during foraging activity where project activities coincide with bee use. As discussed previously the likelihood of disturbance and the number of individuals that might be disturbed is expected to be low, as the time of year, August-October, is after the peak abundance, when most foraging individuals are queens, and few workers and males remain. Were disturbance to occur, the most likely result would be temporary displacement of a limited number of individual bees.

Nest/wintering borough sites are not expected to be impacted, as most of the project activities would take place within areas that are too wet during winter and spring to be used for nesting/wintering by this species. As the nesting and wintering burrows are not expected to impacted, disturbance would be expected to impact few if any foraging queens, primarily due to timing of the project coinciding with low foraging habitat quality, and taking place after peak abundance for this species, reproduction for the

following year is not expected to be greatly altered, as the potential disturbance would not be expected to reduce the number of overwintering queens.

Cumulative Effects

Past activities have had similar effects to bumble bee habitat as described previously. The reduced habitat quality in Foster Meadow from past management and natural causes, have reduced both the quality and quantity of the habitat for this species. The proposed action would reverse and reduce some these adverse impacts, increasing both quality and quantity of habitat.

Effects Summary

Western bumble bee, if present in the project area, are believed to be in low numbers. Existing past and foreseeable future modifications of habitat are not expected to reduce the local western bumble bee population. The short term, likely single season impacts to foraging habitat quality and availability, and temporary displacement to individual bees from disturbance, would not be expected to affect reproduction, or local populations of this species. Longer term, in seasons following implementation, the project would increase both habitat quality and quantity for this species, and may prolong the availability of the habitat as the meadow condition improves.

Determination

The proposed action may affect individuals, but is not likely to lead to a trend towards federal listing or loss of viability for the western bumble bee.

V. Summary of Determinations

The proposed action will have no effect/impact on the following species:

Bald eagle
Pacific fisher
California wolverine

The proposed action may affect/impact individuals but is not likely to result in a trend toward Federal listing or loss of viability for the following species:

Great gray owl
California spotted owl
Northern goshawk
American Marten
Willow flycatcher
Pallid Bat
Townsend's Big-eared bat
Fringed myotis
Western bumble bee

VI. Recommendations

Should any TES species be located prior to, or during implementation, the Amador District Biologist should be notified and appropriate action taken to minimize effects of project activities on TES species.

APPENDIX A

Terrestrial Species Accounts

Bald Eagle

Management Status and Direction

The bald eagle was listed by the U.S. Fish and Wildlife Service (FWS) as a federally endangered species in 1978. On July 12, 1995, this species was reclassified to Threatened status in the lower 48 states. It was proposed for de-listing on July 6, 1999. Following de-listing, the species will be placed on the Region 5 Regional Forester's Sensitive Species List (USDA Forest Service 1999). The species' status as "Sensitive" in Region 5 will be re-evaluated at the end of the five-year monitoring period that is identified in the U.S. Fish and Wildlife Service's Final Rule for de-listing the species, as published in the Federal Register; or if there is a change in the species' status under the ESA during this period (for example, if the FWS initiated re-listing due to information gathered from monitoring).

Bald eagles will continue to be protected under the Migratory Bird Treaty Act of 1918 and the Bald and Golden Eagle Protection Act.

A Pacific Bald Eagle Recovery Plan has been prepared for the Pacific States (U.S. Fish and Wildlife Service 1986), but critical habitat is not currently mapped or proposed for the bald eagle in the Sierra Nevada. The Eldorado National Forest LRMP that nesting and wintering habitats be managed for meeting target populations of threatened or endangered species as specified in the species recovery plan. A Bald Eagle Habitat Management Plan has been prepared for the Eldorado National Forest, identifying nesting and wintering habitats and actions needed to implement the Pacific Bald Eagle Recovery Plan within these habitats (Eldorado National Forest, 1999). The Plan has been submitted but has not yet received review or concurrence from the FWS.

Population Status

Range-wide Distribution: Bald eagles breed from central Alaska and Canada south to the Great Lakes and Maine, and along the Pacific coast from the Aleutians locally to Baja California, interiorly along the Rocky Mountains south regularly to Wyoming and locally to central Arizona and southern Sonora. Bald eagles are also resident along the Gulf coast from Texas east to Florida and North along the Atlantic coast to New Jersey.

Context of the Eldorado National Forest in the Species' Range: Bald eagles breeding sites are distributed across all National Forests in the Sierra Nevada. California's breeding population of bald eagles is resident yearlong in areas where the climate is relatively mild (Jurek 1988). Between mid-October and December, migratory individuals from areas north and northeast of the State arrive in California as well (Ibid). Wintering populations remain in the State through March or early April (Ibid).

Population Trend: Within the continental United States, bald eagle populations are increasing, as evidenced by the FWS decision to down-list the species from Endangered to Threatened status in 1995. On the ENF, both wintering and summer nesting surveys have occurred annually since the early 1980s (Eldorado National Forest 1999). The number of nesting bald eagles has also increased on the Eldorado National Forest over the past couple of decades from a single nesting pair in the mid- 1980's to two nesting pairs documented on National Forest and an additional two pairs on private lands within the National Forest boundary in 2004.

Existing Surveys and Sightings on the Eldorado National Forest: Wintering bald eagles use all major reservoirs on the Forest that remain unfrozen, with the number of individuals fluctuating slightly from year to year. Wintering bald eagle surveys occur annually on the Eldorado National Forest and typically detect a small number of eagles at the following Reservoirs: Sly Park, Slab Creek, Union Valley, Ice House, Stumpy Meadows, Hell Hole, and Lower Bear River, Reservoirs. Suitable nesting habitat has been mapped along Bear River Reservoir, Salt Springs Reservoir, Hell Hole Reservoir, Ice House Reservoir, Sly Park Reservoir, Stumpy Meadows Reservoir, Loon Lake, and Union Valley Reservoir, but nest sites are known only at the latter four sites. Although nesting habitat is also mapped at Silver Lake and Caples Lake, it is likely that the late spring thaw dates at these reservoirs limits opportunities for nesting at these sites. Known bald eagle nest sites are monitored annually on the Forest.

Life History and Habitat Requirements

Breeding Habitat: Nesting territories are normally associated with lakes, reservoirs, rivers or large streams (Lehman 1979). Bald eagle nests are usually located in uneven-aged (multi-storied) stands with old growth components (Anthony et al. 1982). Most nests in California are located in predominantly coniferous stands. Factors such as relative tree height, diameter, species, and position on the surrounding topography, distance from water, and distance from disturbance also appear to influence nest site selection (Grubb 1976, Lehman et al. 1980, Anthony and Isaacs 1981).

Trees selected for nesting are characteristically one of the largest in the stand or at least codominant with the overstory. Nest trees usually provide an unobstructed view of the associated water body and are often prominently located on the topography. Live, mature trees with deformed tops are occasionally selected for nesting. Of the nest trees identified in California, about 71 percent were ponderosa pine, 16 percent were sugar pine, and 5 percent were incense cedar. The remaining 8 percent were distributed among five other coniferous species. Nest tree characteristics in California have been defined by Lehman (1980) as being 41 to 46 inches in diameter at breast height and in excess of 100 feet tall. Snags, trees with exposed lateral limbs, or trees with dead tops are often present in nesting territories and are used for perching or as points of access to and from the nest. Such trees also provide vantage points from which territories can be guarded and defended.

In California, 73 percent of the nest sites were within one-half mile of a body of water, and 89 percent within 1 mile. No nests were known to be over 2 miles from water. Bald eagles often construct several nests within a territory and alternate between them from year to year. Up to five alternative nests may be constructed within a single territory (U. S. Fish and Wildlife Service 1986).

Wintering Habitat: Wintering habitat is associated with open bodies of water, primarily in the Klamath Basin (Detrich 1981, 1982). Smaller concentrations of wintering birds are found at most of the larger lakes and man-made reservoirs in the mountainous interior of the north half of the state and at scattered reservoirs in central and southwestern California. Some of the state's breeding birds winter near their nesting territories.

Two winter habitat characteristics appear to play a significant role in habitat selection in the cold months: diurnal perches and communal night roost areas. Perches are normally located in close proximity to a food source. Most tree perches selected by eagles provide a good view of the surrounding area (USDI Fish and Wildlife Service 1986), often utilizing the highest perch sites available (Stalmaster 1976).

Habitat requirements for communal night roosting are different from those for diurnal perching. Communal roosts are invariably near a rich food resource. In forest stands that are uneven-aged, communal roosts have at least a remnant of old-growth forest components (Anthony et al. 1982). Most communal winter roosts used by bald eagles throughout the recovery areas offer considerably more protection from the weather than diurnal habitat. Keister and Anthony (1983) found that bald eagles used old-growth forest stands as far as 9.6 miles from the food source in the Klamath Basin.

Diet: The most common food sources for bald eagle in the Pacific region are fish, waterfowl, jackrabbits, and various types of carrion (USDI Fish and Wildlife Service 1986). Diurnal perches are used during foraging; these usually have a good view of the surrounding area and are often the highest perch sites available (Stalmaster 1976).

Breeding Cycle: Breeding is initiated as early as January 1 via courtship, pair bonding, and territory establishment, and normally ends by August 31, as the fledglings are no longer attached to the immediate nest site. This time frame varies with local conditions. Incubation may begin in late February to mid-March, with the nestling period extending to as late as the end of June. From June through August, the fledglings remain restricted to the nest until they are able to move around within their environment.

Habitat on the Eldorado National Forest

Bald eagle nesting, wintering and foraging habitat was last mapped on the Eldorado National Forest in 1999, using aerial photography and local knowledge of habitat use. A GIS data layer of bald eagle habitat has been created and continues to be updated as additional information becomes available.

Risk Factors

Conservation Recommendations

Effective breeding area management should avoid a flight response which is typically induced by disturbance at 200 to 300 m (Grubb et al. 1992). In their study of breeding bald eagle responses to human activities, Grubb et al. (1992) recommend a no activity primary zone of 500 to 600 m from nest sites, followed by a secondary zone of 1000 to 1200 m.

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California Spotted Owl

Management Status and Direction

Management Status: The California spotted owl (*Strix occidentalis occidentalis*) is currently managed as a USDA Forest Service Sensitive species (USDA 2013). Habitat descriptions, species population trends, and the status of known or suspected limiting factors are summarized by USDA 2001, 2004, the R5 Sensitive species evaluation form 2012, and Keane 2014 and are incorporated here by reference. On June 14, 2005, the U.S. Fish and Wildlife Service (FWS) announced its 90-day finding that a status review is warranted to determine whether or not the species should be listed as threatened or endangered. The Service intends to complete its 12-month review by March 14, 2006, then decide whether or not to propose listing the species as threatened or endangered. Management direction for the California spotted owl on the Eldorado National Forest is most recently provided in the Record of Decision for the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement (USDA Forest Service 2004).

Population Status

Range-wide Distribution. The range of the California spotted owl extends from the southern Cascades south of the Pit River in Shasta County in the north, to the southern end of the Sierra Nevada mountain range in the south. It includes all mountainous regions of the Southern California Province, and the central coast ranges at least as far north as Monterey County. Populations are continuous throughout the Sierra Nevada range, permitting dispersal among subpopulations and allowing the species to interact as a metapopulation throughout the Sierra Nevada. The Sierra population is disjunct from coastal and southern California populations.

Context of the Eldorado National Forest in the Species Range: The Eldorado National Forest occurs in the central portion of the species range and represents about 16 percent of the known population in the Sierra Nevada. There is a relatively uniform distribution of owl sites across the forest and adjoining the Tahoe National Forest to the north and the Stanislaus NF to the south. The elevational range of owl sites on the forest extends from about 3,000 feet to above 8,000 feet, with most owl activity centers occurring below 6,000 feet in elevation.

Population Trend. The most recent population status and trend information can be found in Keane 2014, Conner et al. 2013, Tempel and Gutiérrez 2013, and Tempel et al. 2014. In summary, the most recent estimate of population size for California spotted owls in the Sierra Nevada reported 1865 owl sites, with 1399 sites on National Forest System lands. Ongoing research of recent population trends indicates increasing evidence for population declines on the three demographic study areas on National Forest System lands and a stable or increasing population on the National Park study area, (Conner et al. 2013, Tempel and Gutiérrez 2013, Tempel et al. 2014). The factors driving these population trends are not known (Keane 2014).

Existing Surveys and Sightings on the Eldorado National Forest. One of the four long-term demographic studies of the California spotted owl population in the Sierra Nevada occurs on the ENF. Demographic parameters have been measured within this study area since 1986. Significant declines in this population over the study period have been detected each year since 1998 (Gutiérrez et al. 2000).

Surveys conducted on the Eldorado National Forest since 1987 have covered an estimated 80 to 90 percent of the suitable spotted owl habitat on the forest, resulting in a current estimate of 207 spotted owl territories on the forest. Survey detections since 1987 are recorded in a forestwide GIS coverage which is updated at the end of each field survey season. Best professional judgement is used to designate groups of detections thought to represent an individual owl territory, and to designate the activity center associated with the territory. Systematic and comprehensive surveys have been conducted only within the portion of the forest from the Rubicon drainage north to the Middle Fork of the American River (within the demographic study). Elsewhere on the forest the

majority of surveys occurred between 1989 and 1992, in response to extensive timber salvage harvest projects. Known owl sites appear to be fairly evenly distributed across the Forest although estimates of crude density (number of owls/total acreage of the study area) within the demographic study area are lower than the mean crude densities reported from other study areas: 0.259 owls per square mile on the ENF demographic study area versus a mean of 0.495 from three other study areas (Verner et al. 1992: 178). Lower densities are likely the result of large amounts of intermixed private land within the study area.

Verner et al. 1992, identified several geographic areas of concern for the California spotted owl, where future problems might be greatest if the owl's population status were to deteriorate. One such area, identified as area #4, was the large area of intermixed private land and checkerboard ownership within the boundaries of the Eldorado NF, primarily on the Georgetown and Pacific Ranger Districts. This was identified as an area of concern because of habitat fragmentation that decreases the density of owl pairs, makes successful dispersal more difficult, and reduces the likelihood of quick replacement of owls in vacated habitat (Verner et al. 1992: 45). In addition, the 1992 Cleveland Wildfire burned 22,500 acres (about 10,000 acres on National Forest land) within and adjacent to this area of concern, resulting in a temporary gap in owl distribution. Changes in habitat condition in this area of concern, should, therefore, be closely evaluated.

Life History and Habitat Requirements

Habitat preferences at the stand scale. California spotted owls utilize mixed conifer, ponderosa pine, red fir and montane hardwood vegetation types on the ENF. The vast majority of owl sites on the Forest occur within the mixed conifer vegetation type. Studies on habitat use by the California spotted owl indicate that it is a habitat specialist which selects for stand characteristics associated with mature forests (Verner et al. 1992).

The EIS for the Sierra Nevada Framework Project (USDA Forest Service, January 2001) provides the following information about California spotted owl habitat preferences based upon information contained in Verner et al. 1992; North et al., in press; Laymon, 1988, Call 1990, Bias and Gutiérrez, 1992, Moen and Gutiérrez, 1997).

Stands preferred by owls for nesting and roosting are characterized by:

- two or more canopy layers
- dominant and codominant trees in the canopy averaging at least 24 inches in dbh
- at least 70 percent total canopy cover (including hardwood component)
- higher than average numbers of very large, old, trees with high crown volume
- higher than average levels of snags and downed woody material

Stands preferred by owls for foraging have:

- at least two canopy layers
- dominant and codominant trees in the canopy averaging at least eleven inches in dbh
- at least 50 percent canopy cover
- higher than average levels of snags and downed woody material

Although spotted owls will forage in stands with 40 percent canopy cover (and possibly as low as 30 percent canopy cover in the red fir type), they appear to be only marginally suitable for foraging (Verner pers. comm. 1999). Recent analysis by Hunsaker et al. (2002) indicated that the threshold between canopy cover values that contribute to or detract from occurrence and productivity is a value near 50 percent (USDA Forest Service, January 2001). Research on the northern spotted owl (North et al. 1999) found snag volume, foliage volume, and canopy layering to be stand attributes significantly associated with owl foraging intensity. Vegetation treatments, such as timber harvest and fuels reduction, which alter these habitat attributes may influence habitat quality for the California spotted owl.

Habitat preferences based upon CWHR habitat classifications. Approximately 84% of 292 California spotted owl nest vegetation plots were classified as CWHR classes 6, 5D, 5M, 4D, and 4M (USDA Forest Service, January 2001). These CWHR types are also rated as providing high and moderate suitability foraging habitat for California spotted owls based on the expert opinion habitat relationship models contained in the CWHR database. Timber strata 4G (similar to CWHR classes 5D and 6) have been documented as being preferentially selected by owls for nesting and foraging (Verner et al. 1992) and the majority of spotted owl nest sites have been documented to occur in CWHR classes 6, 5D, and 5M. It would be expected, therefore, that CWHR classes 6, 5D, and 5M would have the highest probability of providing stand structures associated with preferred nesting, roosting, and foraging (USDA Forest Service, January 2001).

Habitat requirements at the landscape scale: The average breeding season home range size of spotted owl pairs on the Eldorado National Forest, using minimum convex polygon, was about 4,700 acres (Laymon, 1988). Bingham and Noon (1998) found the overused portion of the home range to be about 20 percent (or about 1,000 acres), typically in closest proximity to the nest or primary roost stand.

Studies consistently suggest that some basic amount of suitable habitat is necessary to ensure that a pair of owls can successfully raise a sufficient number of offspring to replace themselves (thus providing for a stable population). Bart (1995) found this amount to be in the range of 30 to 50 percent of an owl home range in a study conducted on the northern spotted owl in the Pacific Northwest. Analysis in the Sierra National Forest demographic study area concluded that canopy cover composition within owl home ranges is significantly correlated with owl occurrence and productivity (Hunsaker et al. 2002). Productivity was positively correlated with the proportion of the analysis area having greater than 50% canopy-cover and negatively correlated with the proportion having less than 50% canopy cover. For those owl sites showing higher productivity, the median value for the portion of a 1,062-acre circular analysis area (surrounding an owl nest location) with greater than 50% canopy cover, was 60 percent (based upon aerial PI).

Information on the desired configuration or patchiness of habitat within a spotted owl's home range is lacking for the California spotted owl. Demographic studies on the northern spotted owl in the Klamath Province have found that birds with access to larger blocks of suitable habitat had slightly lower mortality rates, but those with home ranges that were more patchy had slightly higher fecundity (number of young produced per breeding female). A landscape pattern with some fine-scale fragmentation of old forest (small patches of other habitats with convoluted edges) dispersed within and around a main patch of old forest appeared to provide the optimum balance in promoting both high fecundity and high survival (Franklin et al. 2000).

Diet. Spotted owls occurring above about 4,000 feet in elevation in the Sierra Nevada prey mainly on flying squirrels, while those occurring in the lower mixed conifer and ponderosa pine belt below this elevation rely heavily upon woodrats (Verner et al. 1992). On the Eldorado, greater numbers of spotted owl sites occur in habitat types where flying squirrels dominate, but a substantial number of sites do occur in lower elevation forests. Important ecological linkages for spotted owl prey species include the presence of large, old trees, large snags, denser multi-layered forest canopy, and large decaying logs on the forest floor (Verner et al. 1992).

Habitat Status. Forest ecologists estimate that old forest conditions have declined from 50 to 90 percent compared to the range of historical conditions (USDA Forest Service 2001). The habitat change of greatest concern in the Sierra Nevada has been the rapid disappearance of the large, old and generally decadent trees that are the focus of nesting by spotted owls. Seven additional factors of concern about owl habitat, having resulted from a combination of logging and fire suppression since the turn of the century, were described in Verner et al. 1992: the long recovery period for spotted owl habitat after logging, the ingrowth of shade-tolerant tree species creating unnaturally dense stands with ground-to-crown fuel ladders, excessive build-up of surface fuels, loss of large-diameter logs, disturbance and/or removal of duff and topsoil layers, and change in the composition of tree species (fewer pines and black oaks and more firs and incense cedar).

Spotted owl habitat remains broadly distributed on the Eldorado National Forest, however temporary habitat gaps exists in the areas burned by the Cleveland wildfire on the Pacific Ranger District and the Star Fire on the Georgetown Ranger District. A geographic area of concern, mapped as the large area of intermixed and checkerboard land ownership on the Georgetown and Pacific Ranger Districts, has been identified as an area where suitable habitat appears to be fragmented and in low abundance as the result of past and ongoing timber harvest. Within this area, the lower density of spotted owl pairs increases the uncertainty of successful mate finding and replacement of vacated territories (Verner et al. 1992).

Breeding Cycle. The spotted owl breeding cycle extends from about early March to mid- to late September on the Eldorado National Forest. Egg laying through incubation, when female spotted owl must remain at the nest, extends from early April through mid-to late May. Young owls typically fledge from the nest in mid-to late June and remain near the nest in the weeks following fledging. Adults continue to bring food to the fledglings until mid-to late September. Wasser et al. (1997) measured significantly higher levels of stress hormones in male northern spotted owls whose home range centers were within 0.41 km (0.25 mi.) of major logging roads or recent (10 years to present) timber activity. Forest Service recommendations for reducing direct effects to spotted owls have generally included minimizing disturbances within 0.25 miles of known roosts or nests during the breeding season (March 1 through August 31). Requirements for Limited Operating Periods are described in the Record of Decision for the Sierra Nevada Forest Plan Amendment.

Risk Factors

Timber Harvest and Vegetation Treatments. Much of the current concern regarding California spotted owl population trends is focused on the effects of vegetation management on the distribution, abundance and quality of habitat. Logging since the turn of the century has resulted in a reduction in the amount and distribution of mature and older forests and specific habitat elements such as large trees, snags, and downed logs, used for nesting and foraging by California spotted owls (Verner et al. 1992, Laudenslayer 1990, McKelvey and Johnston 1992, Franklin and Fites-Kaufmann 1996, Beardsley et al. 1999, Bouldin 1999).

Climate. Weather (in particular the effects of heavy late spring precipitation on reproductive output) has been identified as one probable cause of declining California spotted owl populations by several researchers. Widespread reproductive failure has been documented in years with late spring storms (Steger et al. 1999, Gutierrez et al. 1999, North et al., 1999, Franklin et al. in press). North et al. (1999) found a correlation between nest sites with higher productivity and high amounts of canopy volume over the nest (associated with very large, old trees). This indicates the importance of maintaining large old trees and high canopy volume at nest sites in order to buffer against the effects of weather on reproduction.

Wildfire. The ingrowth of shade-tolerant species and the excessive buildup of surface fuels are conditions that have resulted from past forest management and fire suppression, and which increase the risk of high-severity fire. Approximately 39 percent of the known owl sites on national forest lands occur in areas designated as “high fire hazard risk” (USDA Forest Service 2001).

Conservation Strategy

Conservation Strategy in the Sierra Nevada Forest Plan Amendment. The Sierra Nevada Forest Plan Amendment (2004), provides a conservation strategy for the California spotted owl. The CASPO conservation strategy does not identify a target number and distribution of spotted owl sites at the Forest, Sierra Nevada, or range wide scales. Rather, the strategy establishes a set of guidelines for vegetation management projects that are expected to protect habitat components important to the California spotted owl. The strategy includes: 1) identification of protected activity centers (300 acre PACs) and home range core areas (1,000-acre HRCAs) and managing these areas to retain their value as suitable owl habitat; 2) providing direction to retain understory

structure within treated areas; and 3) applying diameter limits and canopy closure considerations to a range of tree size classes.

The primary project design elements of the Conservation Strategy can be summarized as follows:
Vegetation Management:

1) Stand altering activities are limited to reduction of surface and ladder fuels through prescribed fire treatments and hand treatments within 500-foot radius buffer around spotted owl activity centers within a designated PAC.
2) Vegetation treatments are limited to the use of prescribed fire or the removal of material less than 12 inches in dbh in PACs outside the WUI; mechanical treatments may occur in PACs within the WUI, but, outside the defense zone, these treatments must be designed to maintain habitat structure and function of the PAC.
3) Mechanical thinning treatments within HRCAs should be designed to retain at least 50 percent canopy cover averaged within the treatment unit. Where 50% canopy cover cannot be met while adequately reducing ladder fuels, retain at least 40% canopy cover.
4) General guidelines for snag retention are: 4 of the largest snags per acre are retained in mixed conifer forest; 6 of the largest snags per acre are retained in red fir forest.
5) Surveys are conducted in suitable habitat with unknown occupancy, prior to undertaking vegetation treatments.
6) Limited operating periods are applied within a quarter mile of spotted owl activity centers if activities may disturb nesting spotted owls (deviation from LOPs may occur for a small number of prescribed burning projects).

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Project Design Recommendations for the Eldorado National Forest. The Conservation Strategy provided by the Sierra Nevada Forest Plan Amendment addresses important risk factors for the California spotted owl, both range wide and on the Eldorado National Forest. Additional standard project design features have not been identified for California spotted owls on the Eldorado National Forest but would be based on project-specific conditions and analyses. Changes to habitat quality and abundance within geographic area of concern # 4, occurring on the Georgetown and Pacific Ranger Districts, should receive careful analysis at the project level.

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Northern Goshawk

Management Status and Direction

Management Status: The northern goshawk is a Forest Service designated sensitive species and a management indicator species on all Sierra Province National Forests in the Pacific Southwest Region. There is concern that northern goshawk populations and reproduction may be declining in North America and California due to changes in the amount and distribution of habitat or reductions in habitat quality (in USDA Forest Service 2001). In 1998 the U.S. Fish and Wildlife Service (FWS) completed a status review for the northern goshawk and announced its finding that there is no evidence that the goshawk population is declining in the western United States, that habitat is limiting the overall population, that there are any significant areas of extirpation, or that a significant curtailment of the species' habitat or range is occurring" (Federal Register 1998). Further litigation is pending.

Population Status

Context of the Eldorado National Forest in the Species Range: Northern goshawks are distributed throughout forest and woodlands of the Holarctic, extending across the boreal forests of North America, south through the western mountains to Mexico, and in the east, south through the hardwood forest to approximately New York/New Jersey (in USDA Forest Service 2001). The Sierra Nevada, and Eldorado National Forest, therefore, represent a very small portion of this species range. Approximately 588 northern goshawk sites are known to occur within the Sierra Nevada, with about 12 percent of those sites (69) found on the Eldorado National Forest (USDA Forest Service 2001).

Estimated Population Size and Trend in the Sierra Nevada: Approximately 577 northern goshawk territories are known to occur on National Forest lands in the Sierra Nevada (USDA Forest Service 2001). There does not appear to have been a change in the geographic distribution of northern goshawks in the Sierra Nevada relative to the range reported by Grinnel and Miller (1944). Population trends of northern goshawks in the Sierra Nevada are unknown, although numbers are suspected to be declining due to habitat reductions and loss of territories to timber harvest (Bloom et al. 1986). Currently no rigorous research or monitoring efforts are being conducted to assess population trends, demographic rates, or effects of habitat manipulations.

Existing Surveys and Sightings on the Eldorado National Forest: Goshawk sightings recorded on the Eldorado National Forest have been largely opportunistic; surveys have been limited to specific project areas (documented in Ranger District project files) and have not covered a large proportion of the northern goshawk habitat on the forest. Survey detections have been recorded in a forest-wide GIS coverage which is updated at the end of each field survey season. Best professional judgment is used to designate groups of detections thought to represent an individual goshawk territory, and to designate the activity center associated with the territory. Approximately 69 goshawk sites have been located, primarily over the past 10 years, although the current occupancy status remains unknown for some of these sites. The known goshawk sites appear to be fairly well distributed across the Forest, between 4,000 and 7,000 feet in elevation.

Life History and Habitat Requirements

Habitat preferences at the stand scale: Northern goshawks utilize mixed conifer, ponderosa pine, red fir, subalpine conifer, lodgepole pine, montane riparian and montane hardwood vegetation types on the ENF. Nest site habitat characteristics are the best-known aspect of northern goshawk habitat use patterns. Very little information exists regarding foraging habitat use patterns, particularly during winter. No information is available that addresses habitat quality (as measured by survival and fecundity) at any spatial scale (USDA Forest Service, January 2001).

The EIS for the Sierra Nevada Framework Project (USDA Forest Service, January 2001) provides the following information about northern goshawk habitat preferences based upon three studies in the Sierra Nevada (Hargis et al. 1994, Keane 1999, Maurer 2000) and a number of additional studies from other parts of the western United States.

When compared to random plots, stands preferred by northern goshawks for nesting and roosting (in westside vegetation types), are characterized by:

- Greater basal area
- Greater numbers of large live trees (trees > 24" dbh)
- Greater canopy cover (mean of 65 percent and 70 percent in two studies)
- Higher than average numbers of very large, old, trees (mean of 16 and 17 trees/ac > 40" dbh)
- Significantly lower numbers of trees less than 12" dbh

Foraging habitat preferences of northern goshawks are poorly understood, although limited information from studies in conifer forests indicate northern goshawks prefer to forage in mature forests (summarized in Squires and Reynolds 1997) with greater canopy closure and greater density of large (>40" dbh) trees relative to random plots (Bright-Smith and Mannan 1994, Beirer and Drennan 1997, Hargis 1994, Austin 1993).

Habitat preferences based upon CWHR habitat classifications: Classification of nest plot data from 35 nest sites from the Lake Tahoe Region (Keane 1999) resulted in 71 percent of the nest vegetation plots being classified as CWHR classes 6, 5D, or 5M and the remaining 14 percent being classified as 4D, 4M, or 4P (USDA Forest Service, January 2001). These CWHR types (with the exception of 4P) are also rated as providing high suitability nesting habitat for northern goshawks based on the expert opinion habitat relationship models contained in the CWHR database. High feeding habitat capability is found in these same types and within 5P and 5S stands.

Habitat requirements at the landscape scale: The mean breeding season home range size of northern goshawks in the Lake Tahoe region was found to be about 6,700 acres for males and about 5,000 acres for females (Keane, 1999). Mean non-breeding period home ranges exceed 10,000 acres. Conservation strategies proposed for the northern goshawk typically recognize three spatial scales for managing northern goshawk home ranges (Reynolds et al. 1992). The first scale addresses the amount and spatial distribution of nesting habitat, the second addresses the post-fledging area, and the third addresses foraging areas within the remainder of the home range. Limited information is available on habitat patterns at larger and multiple scales and how these patterns affect habitat quality for northern goshawks.

Nest stands: Forest stands containing nests are often small (25 to 250 acres) and territories may contain one to five alternate nest stands (Woodbridge and Detrich 1994). Woodbridge and Detrich (1994) reported that near 100 percent territory occupancy rates were observed in territories with nest stand clusters totaling 150 to 200 acres of nesting habitat; occupancy rates declined as the size of the nest stand declined below 150 acres.

Post Fledging Areas: Post-fledging areas (PFA) surround the nest area and are used by both adults and the young as they learn to hunt from the time of fledging through dispersal (Reynolds et al. 1992). PFAs average about 420 acres (Kennedy et al. 1994). Reynolds et al. proposed guidelines regarding the desired amounts of different forest structural classes within PFAs to provide for protective cover and a diversity of prey species. These guidelines call for 60 percent of the PFA to be in mid-aged and mature forest stages with canopy covers ranging from greater than 50 percent to greater than 70 percent depending upon forest type. The remainder of the PFA is managed to provide young forest and grass-forb stages. No data exists to evaluate these guidelines relative to Sierra Nevada Forests.

Foraging Areas: Understanding how prey availability for northern goshawks varies with stand structure and landscape habitat patterns is essential for understanding how to manage northern goshawk populations by providing suitable habitat for prey. Reynolds et al. (1992) has made recommendations that are applied to national forests in the southwest. These recommendations call for a variety of age classes and canopy cover ranging from greater than 40 percent to greater than 60 percent depending on forest vegetation type.

Diet: Prey availability is a primary limiting factor for raptor populations. Northern goshawks prey on a wide variety of species. Primary prey in the Lake Tahoe region was Douglas squirrels, golden-mantled and Belding's ground squirrels, chipmunks, Steller's jay, flicker, and robin. Species that are active year-round, such as Douglas squirrels may be more important prey species during winter (Keane 1999).

Habitat Status across the Sierra Nevada: Forest ecologists estimate that old forest conditions have declined from 50 to 90 percent compared to the range of historical conditions. The habitat change of greatest concern in the Sierra Nevada has been the rapid disappearance of the large, old and generally decadent trees and increases in the numbers of smaller diameter trees and density of forest understories as a result of fire suppression. These trends suggest there has been a reduction in the amount and distribution of the mature and older forests with large trees and open understories used for nesting by northern goshawks. Greater uncertainty exists regarding changes in foraging habitat although limited knowledge suggests these changes would also have led to a decline in the quantity and quality of foraging habitat.

Habitat Status on the Eldorado NF: Suitable nesting and foraging habitat occurs in patches of varying size and abundance across most of the Eldorado National Forest. Lack of information on the amounts and spatial distribution of vegetation classes associated with high quality territories, limits a meaningful assessment of habitat status on the forest.

Breeding Cycle: The northern goshawk breeding cycle extends from mid- February through mid- September on the Eldorado National Forest. Egg laying through incubation, when female spotted owl must remain at the nest, occurs from mid-April up to mid-June. Young goshawks typically fledge from the nest in early June to mid- July and remain near the nest for a period of 4 to 8 weeks following fledging. Not all pairs of northern goshawks reproduce each year. The proportion of territories with active nests has been documented to range from 14 to 100 percent among years in the Sierra Nevada (Keane 1999). Forest Service recommendations for reducing direct effects to northern goshawks have generally included minimizing disturbances within 0.25 miles of known roosts or nests during the breeding season (March 1 through September 15). Requirements for Limited Operating Periods are included in the Record of Decision for the Sierra Nevada Forest Plan Amendment (January 2004).

Risk Factors

The major threat to northern goshawk at the present time concerns the effects of vegetation management (timber harvest, fuels treatments, etc) and wildfire on the amount and distribution and quality of habitat (Bloom et al. 1986, Keane and Morrison 1994, Kennedy 1997, Squires and Reynolds 1997, Smallwood 1998, DeStefano 1998). Breeding site disturbance from vegetation treatments, human recreation, and falconry harvest is an additional risk factor. Currently legal harvest of northern goshawks is low and does not impact the Sierra Nevada population but the impact of legal and illegal harvest together has the potential to negatively impact individual territories and potentially local populations. This is not known to be a problem on the Eldorado National Forest, however, and is a greater concern on the east side of the Sierra Nevada. Weather patterns, in conjunction with prey dynamics, appear to be a primary factor affecting northern goshawk reproduction and potentially survival (Keane 1999). The effects of climate and chemical pollutants are two potential risk factors that require further investigation (USDA Forest Service, January 2001).

Conservation Strategy

Sierra Nevada Forest Plan Amendment: The Sierra Nevada Forest Plan Amendment (January 2004), does not provide a conservation strategy for the northern goshawk but does provide a number of management guidelines. Specific guidelines are provided for managing goshawk nest stands; foraging habitat needs are expected to be met through the conservation strategy developed for the California spotted owl. The broad distribution and large home range size of the California spotted owl results in a strategy that is likely to provide well-distributed habitat for the northern-goshawk and other old forest-associated species.

The primary project design elements included in the Sierra Nevada Forest Plan Amendment can be summarized as follows:

Stand altering activities are limited to reduction of surface and ladder fuels through prescribed fire treatments and hand treatments within 500-foot radius buffer around goshawk activity centers within a designated PAC.

Vegetation treatments are limited to the use of prescribed fire or the removal of material less than 12 inches dbh in PACs outside the WUI; mechanical treatments may occur in PACs within the WUI, but, outside the defense zone, these treatments must be designed to maintain habitat structure and function of the PAC.

Mechanical thinning treatments within HRCAs should be designed to retain at least 50 percent canopy cover averaged within the treatment unit. Where 50 percent canopy cover cannot be met while adequately reducing ladder fuels, retain at least 40 percent canopy cover.

General guidelines for snag retention are: four of the largest snags per acre are retained in mixed conifer forest; six of the largest snags per acre are retained in red fir forest.

Surveys are conducted in suitable habitat with unknown occupancy, prior to undertaking vegetation treatments.

Limited operating periods are applied within a quarter mile of goshawk activity centers if activities may disturb nesting goshawks (deviation from LOPs may occur for a small number of prescribed burning projects).

Project Design Recommendations for the Eldorado National Forest: The management guidelines provided by the Sierra Nevada Forest Plan Amendment addresses important risk factors for the northern goshawk, both range-wide and on the Eldorado National Forest. Additional standard project design recommendations have not been identified for the Eldorado National Forest but site-specific consideration of habitat distribution and evaluation of post-fledging and/or foraging habitat needs may lead to additional site-specific recommendations. As further information becomes available on how prey availability for northern goshawks varies with stand structure and landscape habitat patterns, project design recommendations will be refined.

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Great Gray Owl

The great gray owl (*Strix nebulosa*) is currently managed as a USDA Forest Service Sensitive species (USDA 2013). Sensitive species are species identified by the Regional Forester where population viability is a concern because of 1) downward population trends and/or 2) diminished habitat capacity that would reduce species distribution. Habitat descriptions, species population trends, and the status of known or suspected limiting factors are summarized by Beck and Winter 2000, USDA 2001, 2004, and the R5 Sensitive species evaluation form of 2012, and are incorporated here by reference.

Great gray owls are regarded as locally rare throughout their range in USFS Region 5 and no more than 100-200 individuals have been estimated in California since 1980, and only 80 were estimated in 2006 (R5 Sensitive species Evaluation Form 2012). Although the great gray owl population in California is small, the Stanislaus National Forest contains more great gray owl sites than any other National Forest in Region 5, or any area outside of Yosemite National Park (Siegel 2001, 2002, NRIS Wildlife database, CNDDB database).

Historic sightings are recorded for all counties in the Cascade Range in California and the Sierra Nevada as far south as Tulare Co. The present known population is centered in Yosemite National Park. It includes nesting activity on the Stanislaus National Forest at five distinct locations, and several recent sightings on the Sierra National Forest. On the Eldorado National Forest a pair of great gray owls utilized Leoni Meadows early in the breeding season in 2002 but did not remain after mid-June. Coordinated inventories for great gray owls have not been conducted on a large scale. There have been other detections near Foster Meadow, on the Eldorado National Forest, but reproduction has not been confirmed at this site. Recent detections have also been reported on private lands, at low elevations associated with oak/grass systems and riparian corridors. These owls are somewhat secretive and difficult to detect. There is a possibility that they will be found occupying additional locations where there is suitable habitat. The California population was estimated at 60-70 birds in 1984 (Winter 1985). Recent sightings in Yosemite National Park and on adjacent National Forests in the Sierra Nevada indicate the actual population could measure 100-200 birds (Tom Beck, pers. comm. 1992).

Habitat requirements of great gray owls in the Sierra Nevada were summarized by Beck and Winter (2000), studied specifically by Greene (1995), Sears (2006), Powers et al. (2011), and Kalinowski et al. (2014), and are currently under additional investigations by PSW research (Keane, pers.comm.).

Great gray owls in the Sierra Nevada inhabit coniferous forest surrounding wet meadows (USDA 2001). Great gray owls typically breed in large flat-topped broken snags located in conifer stands with higher than average levels of large snags and woodland cover in the immediate vicinity of montane meadows (Bull and Duncan

1993, Beck and Winter 2000). Great gray owls may also utilize abandoned nests of other birds of prey, and mistletoe or other broom growths (Ibid).

Recent burns, where they exist in the Sierras, provide some structural similarity to a meadow ecosystem for a few years before the trees or brush shade out the grasses and forbs (Beck and Winter 2000). Such sites can provide foraging areas for nearby breeding great gray owls, but only on a short-term basis (Greene 1995, Beck pers. comm.). Meadows or meadow complexes at least 25 acres in size appear to be necessary for persistent occupancy and reproduction but meadows as small as 10 acres will support infrequent breeding (Beck and Winter 2000). Reproductive sites are associated with high vole abundance and high vole abundance is associated with meadow vegetation height (Beck 1985; Greene 1995; Sears 2006, Kalinowski et al. 2014).

Mean home-range size in the Sierra Nevada during a radio-tagging study was estimated at 148 acres in females and 50 acres in males during the breeding season; great gray owls enlarge their home ranges substantially in winter (Van Riper and Van Wagtendonk 2006).

Management oriented survey work is generally opportunistic depending upon planned activities and funding levels. Research oriented survey work is generally more systematic and focused. Together these efforts have occurred at a level such that inventory information for the analysis area is considered essentially complete (USDA unpublished data, NRIS Wildlife database).

Great gray owl sites receive special management consideration as protected activity centers (PACs). Protected activity centers (PACs) are established and maintained to include the forested area and adjacent meadow around all known great gray owl nest stands. The PAC encompasses at least 50 acres of the highest quality nesting habitat (CWHR types 6, 5D, and 5M) available in the forested area surrounding the nest. The PAC also includes the meadow or meadow complex that supports the prey base for nesting owls (USDA 2010 p.187).

Management Direction

The Regional Forester for the Pacific Southwest Region has listed the great gray owl (GGOW) as a Sensitive species, which means that management of the species is subject to Forest Service policy found in FSM 2672.1. It states: "Sensitive species of native plant and animal species must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for Federal listing."

Current management direction is defined by project-level standards and guidelines from the Forest Plan (USDA 2010) and is based on the desired future condition of land allocations (Robinson 1996). The desired condition for great gray owl PAC described in the Forest Plan Direction focuses on protecting nest sites with a minimum 50 acre buffer and managing meadow habitat for sufficiently large vole populations to provide a food source for great gray owls through the reproductive period (USDA 2010 p187).

Also, there is an emphasis to conduct additional surveys to established protocols to follow up reliable sightings of great gray owls (USDA 2010 p. 43).
The Sierra Nevada Mountains are the southern range of the great gray owl in the western United States. The Eldorado LRMP, as amended in January 2004, provides direction for protection of 50 acres of forested habitat surrounding known nest sites.

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Willow Flycatcher

The Eldorado LRMP, as amended in January 2001, provides direction intended to protect all known occupied willow flycatcher habitat from the effects of livestock grazing. Surveys took place between 2001 and 2004 of meadows greater than 15 acres in size that occur within 5 miles of occupied habitat. There are historic occupied sites documented within the boundary of the Eldorado National Forest, one near Packsaddle Pass and the other from Forni Meadow. Both detections were from the 1980s.

The willow flycatcher is a small passerine neotropical migrant bird that breeds in riparian deciduous shrub habitat in the United States and Canada, primarily in willows. Wet meadows appear to be the most common habitat, but

riparian deciduous shrubs along streams are also used. The willow flycatcher was once a common summer resident throughout California. However, observed declines in breeding populations have been a growing concern for over four decades and it is now limited to scattered meadows of the Sierra Nevada and along the Kern, Santa Margarita, and San Luis Rey Rivers; the statewide population is estimated at about 145 territorial males (Harris et al. 1988).

Most of the remaining breeding populations of willow flycatchers in the Sierra Nevada occur in isolated mountain meadows (up to 8000 feet elevation) and along the Kern River in Kern County (around 2600 feet elevation) (Harris et al. 1988). Small populations have also been detected on the Modoc National Forest and National Wildlife Refuge (Wilson pers. Comm. 1994), Mammoth Lake, Lee Vining Creek and Bridgeport Valley (Gaines 1977), and Lundy Canyon (Gaines 1988). The two largest known populations are the Kern River population and the population in the Perazzo Meadows area of the Tahoe National Forest.

Habitat typically includes moist meadows with perennial streams and smaller spring-fed or boggy areas with willow (*Salix* spp.) or alders (*Alnus* spp.). The presence of water during the breeding season appears to be an important habitat component (Fowler et al. 1991). The minimum size meadow useable for willow flycatchers is assumed to be 0.62 acres (Fowler et al. 1991). Willow flycatchers have also been found in riparian habitats of various types and sizes ranging from small lakes or ponds surrounded by willows with a fringe of meadow or grassland, to willow lined streams, grasslands, or boggy areas.

Willow flycatchers are territorial during the breeding season. Studies on the TNF have found that territory sizes average 0.84 acre (Sanders and Flett 1989). Females may forage outside or at the fringe of the territories defended by males. In addition, after the young fledge the family groups use areas outside of the territories for feeding and cover (M. Flett, pers. comm.). The breeding season begins in late May to early June (Garratt and Dunn 1981) with adults and fledglings generally staying in the breeding areas through August.

Nests are open cupped, usually 3.7 to 8.3 feet above the ground and mostly near the edge of deciduous, riparian shrub clumps (Sanders and Flett 1989, Valentine et al. 1988, Harris 1991).

Willow flycatchers forage by either aerially gleaning insects from trees, shrubs, and herbaceous vegetation, or they hawk larger insects by waiting on exposed forage perches and capturing them in flight (Ettinger and King 1980, Sanders and Flett 1989). In the Perazzo Meadow, willow flycatchers usually flew less than 3.3 feet from a perch when hawking insects, but occasionally flew as far as 33 feet (Sanders and Flett 1989). The selection of nest sites near water appears to be related to increased densities of aerial insects.

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Pacific Fisher

Management Status and Direction

The Pacific fisher is a Forest Service regionally designated sensitive species. On April 8, 2004 the U.S. Fish and Wildlife Service issued a 12-month finding on a petition to list the west coast distinct population segment of the fisher as threatened or endangered. The FWS determined that the listing action is warranted, but precluded by higher priority actions. The Fisher has therefore been added to the list of candidate species.

Population Status

Context of the Eldorado National Forest in Relation to the Species Range: In western North America, fishers once ranged from northern British Columbia into central California in the Pacific Coastal Mountains, and south into Idaho, Montana, and probably Wyoming in the Rocky Mountains. Their present range is reduced, encompassing disjunct pieces of the former range.

Estimated Population Size and Trend in the Sierra Nevada: Fisher populations are presently at low numbers or absent throughout most of their historic range in Montana, Idaho, Washington, Oregon, and California (Heinemeyer and Jones 1994). In recent decades, a scarcity of sightings in Washington, Oregon, and the northern Sierra Nevada may indicate fisher extirpation from much of this area (Zielinski et al. 1996, Aubrey and Raley 1999). The southern Sierra Nevada and northwestern California populations may be the only naturally-occurring, known breeding populations of fishers in the Pacific region from southern British Columbia to California (Powell and Zielinski 1994, Zielinski et al. 1997). Moreover, mortality rates of adult fishers in the southern sierra population appear to be high (Truex et al. 1998).

Existing Surveys and Sightings on the Eldorado National Forest: Several project area surveys have occurred on the Eldorado National Forest in compliance with 1992/1993 Regional survey protocols. All surveys have had negative results. In addition, PSW research station completed surveyed sample points over a 10 km grid spacing aligned with National Forest Inventory vegetation sampling points across the forest (Zielinski et al. May, 1997). The sampling design for this survey effort was designed to provide information about regional distribution and was not intended to meet the sampling design requirements for project-based surveys. Negative results of this survey, nonetheless, provide further indication that fisher, if they occur on the Eldorado National Forest, likely occur at very low densities. Over the past ten years, a number of incidental fisher detections have been reported on the ENF; the following detections have been reported by highly reliable sources (fisher researchers or professional wildlife biologists).

1988	Rubicon River drainage T12N, R13E, Sec. 33
1994	Vicinity of Wrights Lake campground
1995	Vicinity of Stumpy Meadows Reservoir, T12N, R13E, NE1/4, NE1/4, Sec. 9

Life History and Habitat Requirements

Description of Suitable Habitat: In California, pacific fisher most often occur at elevations between 2000 to 5000 feet in the North Coast region and 4000 to 8000 feet in the southern Sierra Nevada (Freel 1991). In general, Pacific fishers use forest or woodland landscape mosaics that include conifer-dominated stands, and avoid entering open areas that have no overstory or shrub cover. They select forests that have multi-storied, dense (60 to 100 percent) canopy cover. Late-successional coniferous or mixed forests provide the most suitable fisher habitat because they provide abundant potential den sites and preferred prey species. Abundant snags and downed logs appear important for their prey species (Buck et al. 1983, Rugierro et al. 1994, Freel 1991). The presence of large conifers and hardwoods is a highly significant predictor of Pacific fisher occurrence in the southern Sierra Nevada.

Patches of preferred habitat and the location of open areas with respect to these patches may be critical to the distribution of fishers in an area. Habitat patches that are interconnected by other forest types will probably receive use whereas habitat patches separated by large open areas are less likely to be used. Riparian corridors and forested saddles between major drainages may provide important dispersal habitat or landscape linkages for the

species. Abundant evidence exists for selective movement patterns along drainages (Rugierro et al. 1994, Buck et al. 1983, Freel 1991).

Fisher apparently use greater percentages of middle to early seral stage habitats for foraging in summer months, although they still appear to need and utilize adjacent mature, old forest stands for denning, especially in areas with high snowfall. Freel (1991) correlates suitable habitat with the following timber strata size and density classes: 3, 4, and 5, N and G. Habitat with less than 30 percent canopy cover is considered unsuitable (Freel 1991).

Numerous and heavily traveled roads are not desirable in order to avoid habitat disruption and/or animal mortality. Roads may decrease prey and food availability for fisher (Allen 1987) due to decreases in prey populations resulting from road kills and/or behavioral barriers to movement.

Diet: Microtine rodents are important prey species for both fisher and marten in many areas of North America. The abundance of a favored prey species, the southern red-backed vole (*Clethrionomys gapperi*) has been positively correlated with abundance of woody debris on the forest floor (Allen 1987). Maser et al. (1978) attributed the elimination of red-backed voles from clearcuts to xerification (drying out) of the habitat, loss of downed woody material and elimination of the vole's primary food, which is mycorrhizal fungi. Elimination of woody debris and loss of understory vegetation can decrease populations of small prey species of mammals in forested habitats and, therefore, similarly affect fisher populations.

Risk Factors

Trapping, with logging, has had a major impact on fisher populations (Ruggiero et al. 1994). In addition, fisher typically avoid humans; thus, increased road access and human activity within fisher habitat may have affected fisher populations. Ruggiero et al. (1994) cite even-aged timber management practices as one of the likely reasons that fisher populations have not recovered in the Pacific Northwest. The assessment found insufficient information to determine the impact of uneven-aged timber management practices (such as those currently in use on Sierra Nevada National Forests) upon Pacific fisher.

Lamberson et al. (2000) describe a number of factors that currently put the Sierra Nevada fisher population at risk of extinction:

population size: Although no population size estimates have been published, the population is likely to be no less than 100 and probably no more than 500 individuals.

population isolation: Fishers in the southern Sierra Nevada appear to be isolated from those in northern California by >350 linear km (Zielinski et al. 1995 and W.J. Zielinski, unpublished data). This distance exceeds the maximum observed dispersal distance for fishers, ~100 km (Arthur et al. 1993, York 1996).

habitat / landscape specificity: Recent surveys have detected fishers from Yosemite National Park south through the Greenhorn Mountains in a variety of habitats ranging from low elevation mixed chaparral habitats on the fringe of the forest matrix into red fir forests. However, most detections have occurred in mid-elevation habitats including montane hardwood, montane hardwood-conifer, mixed conifer and ponderosa pine forests. Radio-telemetry research conducted on Sequoia National Forest has suggested these mid-elevation forests have large trees and logs needed for denning and resting (Zielinski et al., in prep) as well as a diverse prey base (Zielinski et al. 1998). The combination of timber harvest and fire suppression during the 20th century has resulted in a greater prevalence of small diameter trees throughout the Sierra Nevada (McKelvey and Johnston 1992).

Although higher elevation habitats (i.e., red fir forests) may provide ample structures for denning and resting, deep snow during the winter months likely impedes fisher mobility (Krohn et al. 1995); as a result, these forests are of less value to fisher than mid-elevation habitats where snow cover is sporadic

and rarely deep for extended periods. Lower elevation habitats in the southern Sierra Nevada (chaparral and woodlands) lack resting and denning structures, and may not provide thermal regulation during hot summer months.

physiological limitations: The fisher has a relatively low annual reproductive capacity. Fishers are capable of reproducing annually beginning at 2 years old, producing 1-4 young per year ($\bar{x}$ = 2.5, Heinemeyer and Jones 1994).

risk of habitat loss/alteration due to fire and land management: In the southern Sierra Nevada habitat loss due to catastrophic fire is of concern. Fire suppression policies have apparently altered the disturbance regime from one of frequent, low intensity fires of small areal extent to rare, high intensity fires of potentially large extent. While the former played a crucial role in maintaining a landscape where forests with large trees and heterogeneous canopies were more common, the latter can result in large-scale crown fires that result in habitat of little or no value to fishers.

stochastic phenomena: As with any small, isolated population, risks of extinction are enhanced by stochastic factors. Demographic stochasticity, the chance events associated with annual survival and reproduction, and environmental stochasticity, temporal fluctuations in environmental conditions, tend to reduce population persistence (Shaffer 1981, see Boyce 1992 and Beissinger and Westphal 1998 for reviews).

interaction of these factors: The interaction of these factors may move the population from a relatively stable, though numerically small condition, into an irreversible extinction vortex. For example, if demographic stochasticity results in lower than average recruitment of female kits into the population in 3 consecutive years, and this is followed by 2 heavy-snow winters and one large fire, the population may quickly become in jeopardy of local extinction.

Conservation Strategy

Conservation Strategy in the Sierra Nevada Forest Plan Amendment. The network of old Forest emphasis areas and guidelines associated with those areas, the Southern Fisher Conservation Area, as well as the umbrella provided by guidelines associated with maintaining California spotted owl habitat, are all expected to maintain management options for the fisher while a comprehensive conservation assessment and strategy is prepared.

Project Design Recommendations for the Eldorado National Forest. The Sierra Nevada Forest Plan Amendment (2001) includes guidelines that should largely address project design recommendations for fisher on the Eldorado National Forest. In 1994, a habitat network was mapped on the Eldorado NF by identifying areas on the Forest that come closest to providing the amounts of mature forest habitat needed within potential fisher home range areas of 6,000 to 11,300 acres in size. This resulted in a total of 11 areas being mapped as potential "fisher use areas" (FUAs). Movement corridors providing connectivity between FUAs were then mapped using orthophotography. Movement corridors typically followed drainages and saddles. The width of the corridors was 600 to 1200 feet based on information in Freel (1991). This assessment may provide useful information for project planning and for design of habitat connectivity during watershed and landscape analysis.

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American Marten

In California, marten occur in the northern Sierra Nevada at elevations of 3,400 to 10,400 feet, averaging 6,600 feet. In the southern Sierra Nevada, the elevational range is 4,000 to 13,100 feet, averaging 8,300 feet (Freel 1991). On the Eldorado National Forest, marten have not been detected below 5,000 feet in elevation and predominantly occur above 6,000 feet in elevation.

Preferred habitat is characterized by dense (60 to 100 percent canopy), multi storied, multi species late seral coniferous forests with a high number of large (> 24 inch dbh) snags and downed logs (Freel 1991). These areas are often in close proximity to both dense riparian corridors (used as travel ways), and include an interspersion of small (<1 acre) openings with good ground cover (used for foraging). Forest stands dominated by Jeffrey pine did not appear to support marten on the Tahoe National Forest (Martin 1987).

Preferred forest types include mature mesic forests of red fir, red fir/white fir mix, lodgepole pine, and Sierran mixed conifer

Seral Stage	height	dbh	Timber Class	% Crown Closure
3	20-50ft	6-24in		
4 large tree	>50	>24	N	40-69
5 multi-story	>50	>24	G	>69

Marten are known to exist in suitable habitat on all the National Forests in the Sierra Nevada Province. They most often occur at somewhat higher elevations than fisher (Freel 1991).

Numerous and heavily traveled roads are not desirable in order to avoid habitat disruption and/or animal mortality. Roads may decrease prey and food availability for marten as well as fisher (Allen 1987) due to prey population decreases resulting from road kills and/or behavioral barriers to movement. Occasional one and two lane forest roads with moderate levels of traffic should not limit marten movements.

Bennett and Samson (1984) identified three major causes for concern regarding the distribution and abundance of marten in the Rocky Mountains. These causes are generally applicable throughout the range of marten in North America. First, the current distribution of marten is a small portion of their historic range. Secondly, extensive habitat destruction and fragmentation along with trapping and fire are major factors contributing to this contraction of historic range. Finally, large home range sizes combined with low reproductive potential and an affinity for habitats that have decreased dramatically over time result in limited ability for populations to recover from natural or human caused disturbances.

In Utah Hargis and Bissonette (1995) found that marten captures declined as openings in the landscape increased. They also noted declines in marten captures as edge increased and where open areas were more closely spaced. In that study, no captures occurred where openings occupied greater than 35 percent of the landscape or where the average distance between openings was less than 100 meters. They recommend that land managers identify forested areas approximately 2-3 square miles in size that contain structural attributes associated with optimum marten habitat (large diameter conifers, canopy cover > 30 percent, and abundant large diameter logs), and to maintain the landscape so that the percentage of non-forested acreage does not exceed 20 percent of the total (including clearcuts, meadows, and natural openings). They further state that the forested areas need not be closed to timber harvests, but selective cutting methods should be considered over clearcutting when possible. Where clearcutting is used, cut blocks should be separated by forested buffers greater than 650 feet wide.

In Maine, Chapin et al. (1997) indicate that marten may neither prefer nor require conifer-dominated forests or forests with a closed overstory canopy throughout all of their geographic range. In their study, marten selected stands with an abundance of snags, high volume of fallen dead trees and root mounds, and regenerating understory of deciduous and coniferous vegetation, despite canopy closures of mature trees less than 50 percent, and typically less than 30 percent. Rather, vertical and horizontal structure may be more important habitat attributes than age or species composition of the forest overstory (Buskirk and Ruggiero 1994). Chapin et al. (1997) recommend that conservation practices focus on structural attributes that functionally influence the quality of forested habitats for marten, rather than merely age, species composition, and canopy closure of overstory trees, and that these structural requirements could be maintained in a variety of managed and unmanaged stands.

Prey species abundance is a critical component of the habitat and there is some dietary overlap with the Pacific fisher. Both species prey heavily upon squirrels. Marten prey items may vary seasonally however. Simon (1980) found insects dominating the diet in summer and fall, while Douglas squirrels (*Tamiasciurus douglasii*) provided the bulk of winter and spring nourishment. At Sagehen Creek, CA, on the Tahoe National Forest, Zielinski (1983) found microtine rodents the most frequent year-round prey. Chickaree, snowshoe hare, northern flying squirrel, and deer mouse were taken almost exclusively during the winter; and squirrels and chipmunks formed the largest component of the diet from late spring through fall.

Coarse woody debris is an important component of marten habitat, especially in winter, by providing structure that intercepts snowfall and creates subnivean tunnels, interstitial spaces, and access holes. Zielinski et al. (1983) suggested that marten activity varied to allow them to take advantage of subnivean dens utilized by their prey. Sherburne and Bissonette (1994) found marten more likely to utilize subnivean access points that contained more abundant prey. They also found that when coarse woody debris covered a greater percent of the ground, marten use also increased. They state that only older growth forests with accumulated coarse woody debris provide the forest floor structure necessary to enable marten to forage effectively during the winter.

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California Wolverine

Wolverine is a California State Threatened species. The Eldorado LRMP does not provide specific guidelines for this species. However, general guidelines provide for the management of old forest habitat and wilderness guidelines provide for the retention of remote, undisturbed landscapes.

Wolverine are generally considered a solitary species, with adults apparently associating only during the breeding season (Butts 1992). Home ranges of opposite sexes overlap (Powell 1979). However, partial overlap of home ranges of some wolverines of the same sex is common (Ruggiero et al. 1994). Studies indicate that home ranges in North America may vary from less than 38.6 square miles to over 347.5 square miles. Males have larger territories than females. Individuals may move great distances on a daily basis; 15 to 30 miles a day is common for males, and some individuals have moved 60 to 70 miles in a single day. Except for females providing for offspring, or males seeking mates, movement is generally motivated by food (Ruggiero et al. 1994). Although wolverine are primarily nocturnal, diurnal movement is often recorded. During summer, long distance movements appear to be restricted to night when temperatures are cooler (Hornocker and Hash 1976).

Considered a scarce resident in California, the known habitat distribution occurs from Del Norte and Trinity counties east through Siskiyou and Shasta Counties, and south through the Sierra Nevada to Tulare County (Zeiner et al. 1990). Most sightings in the North Coast mountains fall within the 1600 to 4800-foot elevational range. In the northern Sierra Nevada, most sightings fall between 4300 to 7300 feet, and in the southern Sierra Nevada, between 6400 to 10,800 feet. (Zeiner et al. 1990).

In the North Coast region, wolverine have been observed in Douglas-fir and mixed conifer habitats, and probably also use red fir, lodgepole, wet meadow, and montane riparian habitats (Schempf and White 1977, Zeiner et al. 1990). Habitats used in the northern Sierra Nevada include mixed conifer, red fir, and lodgepole pine. The species probably also uses subalpine conifer, alpine dwarf-shrub, wet meadows, and montane riparian (White and Barrett 1979, Zeiner et al. 1990). In the southern Sierra Nevada, habitat preference includes lodgepole pine, red fir, mixed conifer, subalpine conifer, alpine dwarf-shrub, barren, and probably wet meadows, montane chaparral, and Jeffrey pine (Zeiner et al. 1990).

White and Barrett (1979) state that wolverine is highly dependent upon mature conifer forests for survival in winter, and generally moves downslope in winter into heavier timber where food is available.

Wolverine is generally described as an opportunistic omnivore in summer and primarily a scavenger in winter (Ruggiero et al. 1994). In winter, most large prey is carrion, but large snowbound prey such as deer, elk, and moose, may also be killed. Wolverine caches food, and may be able to locate and retrieve prey under deep snow. During the summer, marmots, ground squirrels, gophers, mice, berries, insects, and even porcupines may be taken while foraging in open to sparse tree habitats on the ground, in trees, burrows, among rocks, and sometimes in shallow water (Zeiner et al. 1990, Ruggiero et al. 1994).

At the landscape level, the wolverine's large home ranges need to be considered in forest management planning (Banci 1994). However, what is understood about home range size and use is biased to remote, undeveloped northern habitats (Canada), and generally is not known for the Sierra Nevada.

Little is known regarding wolverine use in forested habitats. Wolverines have a close association with large ungulate mammals, such as deer. However, habitats managed for deer may not necessarily provide for the wolverine's other life needs. The low availability of natal dens may limit reproduction in some areas, and physical structure such as coarse woody debris may be important. According to Banci (1994), management prescriptions that successfully provide for the life needs of species such as the American marten, fisher, lynx and their prey will also provide for the needs of wolverine at the stand level. It is not known whether this will provide for wolverine habitat needs at the landscape or larger scales.

During the winter of 1991/1992, the California Dept. of Fish and Game, University of California Berkeley, and five National Forests conducted a cooperative wolverine study using baited infra-red camera systems at 57 camera stations. Forests involved were the Inyo, Lake Tahoe Basin Management Unit, Shasta-Trinity, Stanislaus, and the Tahoe. No wolverines were detected.

Several incidental sightings of wolverine have been reported on the Eldorado National Forest since 1980, mostly from within the Desolation Wilderness. Sighting confirmed through track or photo identification have not been made, however.

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Pallid Bat

The pallid bat is a California Species of Special Concern. The Eldorado LRMP does not provide specific management direction for this species. However, general guidelines direct the forest to improve habitat capability for hardwood associated species.

Throughout California the pallid bat is usually found in low to middle elevation habitats below 6000 ft. (Philpott 1997), however, the species has been found up to 10,000 ft. in the Sierra Nevada (Sherwin pers. comm. 1998). Populations have declined in California within desert areas, in areas of urban expansion, and where oak woodlands have been lost (Brown 1996).

The status of this species is not well researched, but North American pallid bat populations have declined over the past 50 years (O'Shea and Bogan 2003), and data from California suggest population declines associated with desert and oak woodland habitat loss due to urban expansion (USDA 2001).

A variety of habitats are used, including grasslands, shrublands, woodlands, and coniferous forests (Philpott 1997). Pallid bats are most common in open, dry habitats that contain rocky areas for roosting. They are a yearlong resident in most of their range and hibernate in winter near their summer roost (Zeiner et al.1990). Occasional forays may be made in winter for food and water (Philpott 1997).

Day roosts may vary but are commonly found in rock crevices, tree hollows, mines, caves and a variety of human-made structures. Tree roosting has been documented in large conifer snags, inside basal hollows of redwoods and giant sequoias, and bole cavities in oaks (pers. comm. Sherwin 1998). Cavities in broken branches of black oak are very important, and there is a strong association with black oak for roosting (pers. comm. Pierson 1996). Roosting sites are usually selected near the entrance to the roost in twilight rather than total darkness. The site must protect bats from high temperatures, as this species is intolerant of roosts in excess of 104 degrees Fahrenheit. Pallid bats are also very sensitive to roost site disturbance (Zeiner et al. 1990, Philpott 1997).

Night roosts are usually more open sites and may include open buildings, porches, mines, caves, and under bridges (Philpott 1997, pers. comm. Sherwin 1998, Pierson 1996).

Pallid bats are a gregarious species, often roosting in colonies of 20 to several hundred individuals. Pregnant females gather in summer maternity colonies of up to several hundred females, but generally fewer than 100 (Brown 1996). Parturition occurs between May and July. Young are weaned in mid to late August with maternity bands disbanding between August and October (Pers. comm. Sherwin 1998).

The pallid bat is very maneuverable on the ground and commonly feeds on large ground-dwelling arthropods. Common prey are Jerusalem crickets, longhorn beetles, and scorpions, but they will also forage at low heights of 0.5 to 2.5 meters above the ground on large moths and grasshoppers (Zeiner et al. 1990, Philpott 1997).

Risk Factors:

1. *White Nose Syndrome*- The largest emerging threat to all cave-roosting species is the fungal disease white-nose syndrome (WNS). Massive die-offs result once a colony is infected. Because pallid bats and fringed myotis readily uses caves for roosting, they are considered highly susceptible to contracting WNS. Although not yet documented in California, the disease is moving to the west.

2. *Timber Harvest and loss of snags as roosting sites* - The loss of large diameter snags and live trees for roosts due to fire or harvest activities can affect roost availability. Retention of existing large trees and management of forested habitat will provide short and long-term habitat.

3. *Fire Suppression*- Pallid bats are at risk from loss of open foraging habitat from fire suppression may reduce foraging habitat in the long-term.

4. *Mining*- The resurgence of gold mining in the West potentially threatens mine dwelling bat species such as pallid bats and fringed myotis (Macfarlane and Angerer *draft*). Recreational mining exploration has resulted in an increase in roost disturbance and abandonment. Closure of old mines for hazard abatement or safety can reduce habitat availability if mines aren't closed using bat friendly gates.

5. *Rangeland management*- Pallid bats frequently forage in open areas such as oak woodlands. Overgrazing and trampling may alter meadow hydrology or riparian ecosystems, resulting in reduced insect diversity, productivity, and reducing foraging success (Macfarlane and Angerer *draft*, Ferguson and Azerrad 2004).

Literature Cited (see literature sited Fringed Myotis combined)

Fringed Myotis

The fringed myotis is a California Species of Special Concern. The Eldorado LRMP does not provide specific management direction for this species. However, general guidelines direct the forest to improve habitat capability for hardwood associated species.

The fringed myotis (*Myotis thysanodes*) is a Region 5 Forest Service Sensitive species and is designated as a Species of Special Concern by CDFW. The fringed myotis occurs from southern British Columbia south through the western United States and most of Mexico (O'Shea and Bogan 2003). In California, it occurs from near sea level at the coast to elevations of at least 6,400 feet in the Sierra Nevada and in a variety of habitats

from low desert scrub to high-elevation conifer forest (Philpott 1997). The fringed myotis is a widely distributed species, but it is considered rare (Ibid). Although this species occurs in netting and night roost surveys in a number of localities, it is always one of the rarest taxa (Pierson et al. 1996).

In California, the fringed myotis occurs in valley foothill hardwood, hardwood conifer, and coniferous forested habitats. In mist netting surveys, they are found on secondary streams and ponds (Stanislaus National Forest survey records). They roost in caves, buildings, mineshafts, rock crevices and bridges (O'Farrell and Studier 1980). Studies conducted in California, Oregon, and Arizona, have documented that fringed myotis roosts in tree hollows, particularly in large conifer snags (Chung-MacCoubrey 1996, Rabe et al. 1998, Weller and Zabel 2001, Pierson et al. 2006). Most of the tree roosts were located within the tallest or second tallest snags in the stand and were surrounded by reduced canopy closure (Ibid).
They are gregarious and can be found roosting with other bat species, such as the long eared myotis (M. Baumbach pers. obs.). They exhibit high roost site fidelity, sometimes in different trees but within a small area (O'Farrell and Studier 1980, Weller and Zabel 2001). Fringed myotis are highly sensitive to roost site disturbance (Ibid).

Fringed myotis also breed in the fall, with delayed implantation occurring in the spring. Females give birth to one young per year typically from May to July (Philpott 1997). Maternity colonies may contain up to several hundred individuals. In California in recent years smaller colonies of 25-50 are more typical.

Individual fringed myotis emerge from roost sites to forage approximately 1-2 hours after sunset. They forage in and among vegetation along forest edges and in the overstory canopy. They feed on a variety of insect prey, including small beetles, moths, and fly larvae caught in flight or gleened from vegetation (Ibid). Fringed myotis often forage in meadows and along secondary streams, in fairly cluttered habitat. (Pierson et al. 2001). They are known to fly during colder temperatures and precipitation (Hirshfeld and O'Farrell 1976). Even snow does not appear to affect emergence (O'Farrell and Studier 1975, M. Baumbach pers. obs.). Keinath (2004) found that travel distances from roosting to foraging areas may be up to five miles.

Dispersal patterns are also unknown for fringed myotis. Although known to migrate, little is known regarding the species movement (O'Farrell and Studier 1980). Fringed myotis are year-round residents in California and are known to hibernate but are also capable of periodic winter activity (Philpott 1997).

Risk Factors:

6. *White Nose Syndrome*- The largest emerging threat to all cave-roosting species is the fungal disease white-nose syndrome (WNS). Massive die-offs result once a colony is infected. Because pallid bats and fringed myotis readily uses caves for roosting, they are considered highly susceptible to contracting WNS. Although not yet documented in California, the disease is moving to the west.

7. *Timber Harvest and loss of snags as roosting sites* - The loss of large diameter snags and live trees for roosts due to fire or harvest activities can affect roost availability. In some forested settings, the fringed myotis appears to rely heavily on tree cavities and crevices as roost sites (Weller and Zable 2001), and may be threatened by certain timber harvest practices that result in the removal of snags. Retention of existing large trees and management of forested habitat will provide short and long-term habitat.

8. *Mining*- The resurgence of gold mining in the West potentially threatens mine dwelling bat species such as pallid bats and fringed myotis (Macfarlane and Angerer *draft*). Recreational mining exploration has resulted in an increase in roost disturbance and abandonment. Closure of old mines for hazard abatement or safety can reduce habitat availability if mines aren't closed using bat friendly gates.

9. *Rangeland management*- Fringed myotis frequently forage along riparian corridors or over meadows. Overgrazing and trampling may alter meadow hydrology or riparian ecosystems, resulting in reduced insect diversity, productivity, and reducing foraging success (Macfarlane and Angerer *draft*, Ferguson and Azerrad 2004).

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Townsend's Big-eared Bat

Management Status and Direction. The Townsend's big-eared bat is a FWS Species of Concern and a California Species of Special Concern. The Eldorado LRMP does not provide specific management guidelines for this species. However, general management guidelines address hardwood, riparian, and meadow habitats.

Life History and Habitat Requirements. The Townsend's big-eared bat occurs throughout the west and is distributed from the southern portion of British Columbia south along the Pacific Coast to central Mexico and east into the Great Plains, with isolated populations occurring in the south and southeastern United States (Sherwin 1998).

In California, the species is typically found in low desert to mid-elevation montane habitats, although sightings have been reported up to 10,800 feet (Philpott 1997, Sherwin 1998). Habitat associations include desert, native prairies, coniferous forests, mid-elevation mixed conifer, mixed hardwood-conifer forests, riparian communities, active agricultural areas and coastal habitat types (Kunz and Martin 1982, Brown 1996, Sherwin 1998). The Mother Lode within the Sierra Nevada foothills has been known historically as the "heart of concentrations" (Pierson 1996). Distribution of this species is strongly correlated with the availability of caves and cave-like roosting habitat (Sherwin 1998). Populations have incurred serious declines over the past 40 years in parts of California (Brown 1996).

Townsend's are a year-round California resident. Individuals are very loyal to their natal sites and usually do not move more than 10 kilometers from a roost site (Pierson et al. 1991, Pierson 1996). They roost within caves, abandoned mines, and buildings. Buildings must offer cave-like spaces in order to be suitable. This species is highly sensitive to roost disturbance (Brown 1996). Night roosts may occur in more open settings, including under bridges (Philpott 1997).

Historically, maternal colonies may have contained several hundred individuals. However, maternal colonies at the present usually contain from 35 to 150 individuals (Brown 1996). Maternal colonies select warm parts of the structure, and usually roost in that zone (Kunz and Martin 1982). These colonies form between March and June (may vary by local climate conditions), with a single pup born between May and July (Sherwin 1998). Pups are fully weaned by six weeks (Kunz and Martin 1982). Females usually remain alert and active in maternity roosts. Clusters of females hang on open surfaces, making them readily detectable.

Males remain solitary during the summer. Winter hibernating colonies are composed of mixed-sexed groups and may range from a single individual to several hundred animals (Sherwin 1998). This bat hibernates throughout its range in caves and mines where temperatures are 55 degrees Fahrenheit or less, but generally above freezing. Roost sites are usually in the cooler air near the cave or mine entrance (Barbour and Davis 1969, Kunz and Marten 1982). Individuals may move during winter in response to temperature change (Barbour and Davis 1969).

Foraging usually begins well after dark (Kunz and Marten 1982). Foraging associations include edge habitats along streams and areas adjacent to and within a variety of wooded habitats (Sherwin 1998). In California, the species is shown to forage preferentially in association with native vegetation (Brown 1996). Flight is slow and maneuverable, with the species capable of hovering (Zeiner et al. 1990) and gleaning insects off foliage (Brown 1996). The Townsend's bat is a moth specialist, with over 90% of its diet composed of lepidopterans (Sherwin 1998).

Identification and protection of significant roost sites is still needed in most areas, and significant populations need to be monitored over time (Sherwin 1998).

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Western Bumble Bee

Management Status and Direction. The western bumble bee (*Bombus occidentalis*) is a Region 5 Forest Service sensitive species. Eldorado LRMP does not provide specific management guidelines for this species.

Life History and Habitat Requirements.

Bombus occidentalis currently occurs in all states adjacent to California. Historically, the species was broadly distributed across western North America along the Pacific Coast and westward from Alaska to the Colorado Rocky Mountains (Thorp and Shepard 2005, Koch et al. 2012). Historically, *B. occidentalis* was one of the most broadly distributed bumble bee species in North America (Cameron et al. 2011). Six bumble bee occurrences are known on the Tahoe NF prior to 2000 (www.xerces.org).

Currently, the western bumble bee is experiencing severe declines in distribution and abundance due to a variety of factors, including diseases and loss of genetic diversity (Tommasi et al. 2004, Cameron et al. 2011, Koch et al. 2012).

Bumble bees introduced from Europe for commercial pollination apparently carried a microsporidian parasite, *Nosema bombi*, which has been introduced into native bumble bee populations. Highest incidences of declining *B. occidentalis* populations are associated with highest infection rates with the

Nosema parasite, and the incidence of *Nosema* infection is significantly higher in the vicinity of greenhouses that use imported bumble bees for pollination of commercial crops (Cameron et al. 2011).

Although the general distribution trend is steeply downward, especially in the west coast states, some isolated populations in Oregon and the Rocky Mountains appear stable (Rao et al. 2011, Koch et al. 2012). The overall status of populations in the west is largely dependent on geographic region: populations west of the Cascade and Sierra Nevada mountains are experiencing dire circumstances with steeply declining numbers, while those to the east of this dividing line are more secure with relatively unchanged population sizes. The reasons for these differences are not known.

Bumble bees are threatened by many kinds of habitat alterations that may fragment or reduce the availability of flowers that produce the nectar and pollen they require, and decrease the number of abandoned rodent burrows that provide nest and hibernation sites for queens. Major threats that alter landscapes and habitat required by bumble bees include agricultural and urban development. Exposure to organophosphate, carbamate, pyrethroid and particularly neonicotinoid insecticides has recently been identified as a major contributor to the decline of many pollinating bees, including honey bees and bumble bees (Henry et al. 2012, Hopwood et al. 2012). In the absence of fire, native conifers encroach upon meadows, which also decreases foraging and nesting habitat available for bumble bees.

According to studies done in England (Goulson et al. 2008), grazing during the autumn and winter months may provide excellent bumble bee habitat and prevent the accumulation of coarse grasses. Heavy grazing and high forage utilization can negatively impact bumble bees since flowering plants providing necessary nectar and pollen may become unavailable, particularly during the spring and summer when queens, workers and males are all present and active.

Queens overwinter in the ground in abandoned rodent (i.e. mouse, chipmunk or vole) nests at depths from 6-18 inches and typically emerge about mid-March. The queen then lays fertilized eggs and nurtures a new generation. She first creates a thimble-sized and shaped wax honey pot, which she provisions with nectar-moistened pollen for 8-10 individual first-generation workers when they hatch. The larvae will receive all of the proteins, fats, vitamins and minerals necessary for growth and normal development from pollen. Eventually all the larvae will spin a silk cocoon and pupate in the honey pot. The workers that emerge will begin foraging and provisioning new honey pots as they are created to accommodate additional recruits to the colony. Individuals emerging from fertilized eggs will become workers that reach peak abundance during July and August. Foraging individuals are largely absent by the end of September. Those that emerge from unfertilized eggs become males, which do not forage and only serve the function of reproducing with newly emerged queens. During the season, a range of 50 to hundreds of individuals may be produced depending on the quantity and quality of flowers available. When the colony no longer produces workers, the old queen will eventually die and newly emerged queens will mate with males and then disperse to found new colonies. During this extended flight that may last for up to two weeks she may make several stops to examine the ground for a suitable burrow. Mikkola (1984) reported that bumble bees may forage up to a distance of 80 km in Finland (Heinrich 1979).

Unlike all other bees, bumble bees are large enough to be capable of thermoregulation, which allow them to maintain their foraging activities for longer periods of the day, but also to occupy regions with

more extreme latitudes and temperatures compared to other bees (Heinrich 1979). Bumble bees may continue to forage when temperatures are below freezing even in inclement weather (Heinrich 1979).

Queens end the year by locating a sheltering burrow, where they may spend the winter months under cover. Where nesting habitat is scarce, bumble bee species having queens that emerge early (mid-March) in the season like *B. vosnesenskii* which co-occurs with the later emerging *B. occidentalis*, may be able to monopolize available nest sites and reduce the chances of success for bumble bee species emerging later.

Western bumble bees have a short proboscis or tongue length relative to other co-occurring bumble bee species, which restricts nectar gathering to flowers with short corolla lengths and limits the variety of flower species it is able to exploit. Western bumble bees have been observed taking nectar from a variety of flowering plants, including *Aster* spp., *Brassica* spp., *Centaurea* spp., *Cimicifuga arizonica, Corydalis caseana, Chrysothamnus* spp., *Cirsium* spp., *Cosmos* spp., *Dahlia* spp., *Delphinium nuttallianum, Erica carnea, Erythronium grandiflorum, Foeniculum* spp., *Gaultheria shallon, Geranium* spp., *Gladiolus* spp., *Grindelia* spp., *Haplopappus* spp., *Hedysarum alpinum, Hypochoeris* spp., *Ipomopsis aggregata, Lathyrus* spp., *Linaria vulgaris, Lotus* spp., *Lupinus monticola, Mentha* spp., *Medicago* spp., *Melilotus* spp., *Mertensia ciliata, Monardella* spp., *Nama* spp., *Origanum* spp., *Orthocarpus* spp., *Pedicularis capitata, P. kanei,* and *P. langsdorfii, P. groenlandica, Penstemon procerus, Phacelia* spp., *Prunus* spp., *Raphanus* spp., *Rhododendron* spp., *Salix* spp., *Salvia* spp., *Solidago* spp., *Symphoricarpos* spp., *Tanacetum* spp., *Taraxacum* spp., *Trifolium dasyphyllum, Trichostema* spp., *Trifolium* spp. and *Zea* spp. (Evans et al. 2008).

Predominantly due to the stand-altering fires experienced during the 2008 Westville Fire and the 2013 American Fire, there is a large amount of western bumble bee habitat which exists or will exist in the project area in the near future. Generally low levels of forest canopy cover in the treatment units and adjoining areas have increased the opportunity for flowering plants to become established within the analysis area and may support western bumble bees. Flowering plants such as asters, lupines, monardellas, penstemons, and phacelias may be present nearby or could colonize the treatment units during the 20-year analysis period.

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