ELDORADO NATIONAL FOREST
Amador Ranger District

Biological Evaluation and Assessment

For Terrestrial
Threatened, Endangered, and Sensitive Wildlife Species

Scottiago Forest Health and Fuel Reduction 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 February 21, 2019, identifying the following terrestrial proposed, endangered, or threatened species as potentially occurring within the project area.

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

Federally Listed and Candidate Species

No terrestrial species identified by USFWS List February 21, 2019	

Region 5 Sensitive Species

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).

Table 1.1: Species Not Affected by the Proposed Project

Species	Reason for No Effect/Impact Determination
American bald eagle **Great gray owl** **Willow flycatcher** **California wolverine** **American Marten**	The project area does not include suitable habitat for the species, no effects to individuals or habitat would be anticipated from any of the proposed action.

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 February 21, 2019, the web site for the Sacramento Field Office of the U.S. Fish and Wildlife Service was reviewed for a list of threatened, endangered, and proposed species that may occur or be affected by activities within the Eldorado National Forest. This list of species is described the Introduction Section above, and has been evaluated to determine which species potentially occur within the Scottiago Forest Health and Fuel Reduction Project area or are potentially affected by activities within the project area. No USFWS listed terrestrial wildlife species are expected to be affected by this project, based on the list obtained.

III. CURRENT MANAGEMENT DIRECTION

The Sierra Nevada Forest Plan Amendment Final Supplement was approved and signed in January 2004. This document amends all Forest plans across the Sierra Nevada range. It also includes revised and new Forest-wide standards and guidelines for management of forest lands. Standards and guidelines from the Eldorado National Forest Land and Resource Management Plan (LRMP) and the Sierra Nevada Forest Plan Amendment Record of Decision (ROD) that are pertinent to this project have been summarized below for species potentially affected by the project.

Federally Listed Threatened, Endangered, Proposed and Candidate Species

Current Forest Species policy (FSM 2670) is to manage National Forest system lands so that the special protection measures provided under the Endangered Species Act are no longer necessary and threatened or endangered species will become de-listed. The LRMP for the Eldorado National Forest provides general direction for the management of threatened and endangered species. The LRMP directs that the Forest utilize administrative measures to protect and improve habitat for endangered species, and to prepare local management plans to meet recovery objectives. Additionally, the LRMP provides direction to maintain and enhance populations of threatened and endangered species.

Region 5 Listed Sensitive Species

Direction to maintain the viability of Region 5 sensitive species is provided by the National Forest Management Act, the Code of Federal Regulations (219.19), the Forest Service Manual (2672), and the Eldorado National Forest Land Management Plan (LRMP). The Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplementary Environmental Impact Statement (SEIS) Record of Decision (USDA 2004) amends the Eldorado National Forest LRMP.

Forest Service Manual and Handbooks (FSM/H 2670) include the following:

- 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 and January 2004.

- Utilize administrative measures to protect and improve endangered, threatened, rare, and sensitive wildlife species.
- General management directs to avoid or minimize impacts to species whose viability has been identified as a concern, and to manage fish and wildlife habitat to maintain viable populations of existing native and desired non-native vertebrate species in the planning area.

Specific standards and guidelines from the LRMP and the Sierra Nevada Forest Plan Amendment record of Decision (ROD) that are pertinent with regard to terrestrial sensitive species potentially affected by the project are described below.

Region 5 Listed Sensitive Species

<u>California Spotted Owl</u>

- Conduct surveys in compliance with the Pacific Southwest Region's survey protocols during the planning process when proposed vegetation treatments are likely to reduce habitat quality in suitable California spotted owl habitat with unknown occupancy. Designate California spotted owl protected activity centers (PACs) where appropriate based on survey results (SNFP SEIS ROD Appendix A-54).
- Limited operating periods are applied within a quarter mile of spotted owl activity centers, from March 1 through August 15, if activities may disturb nesting spotted owls (SNFP SEIS ROD Appendix A-60). *Note: change in LOP from August 31 to August 15, based on a letter from Regional Office based on owl demographic study results in regards to owl fledgling times in the Sierra Nevada.*
- California spotted owl protected activity centers (PACs) are delineated surrounding each territorial owl activity center detected on National Forest System lands since 1986. Owl activity centers are designated for all territorial owls based on: (1) the most recent documented nest site, (2) the most recent known roost site when a nest location remains unknown, and (3) a central

point based on repeated daytime detections when neither nest or roost locations are known (SNFP SEIS ROD Appendix A-37).

- PACs are delineated to: (1) include known and suspected nest stands and (2) encompass the best available 300 acres of habitat in as compact a unit as possible. The best available habitat is selected for California spotted owl PACs to include: (1) two or more tree canopy layers; (2) trees in the dominant and co-dominant crown classes averaging 24 inches dbh or greater; (3) at least 70 percent tree canopy cover (including hardwoods); and (4) in descending order of priority, California Wildlife Habitat Relationships (CWHR) classes 6, 5D, 5M, 4D, and 4M and other stands with at least 50 percent canopy cover (including hardwoods). Aerial photography interpretation and field verification are used as needed to delineate PACs (SNFP SEIS ROD Appendix A-37).
- As additional nest locations and habitat data become available, boundaries of PACs are reviewed and adjusted as necessary to better include known and suspected nest stands and encompass the best available 300 acres of habitat (SNFP SEIS ROD Appendix A-37).
- When activities are planned adjacent to non-national forest land, available databases are checked for the presence of nearby California spotted owl activity centers on non-national forest lands. A 300-acre circular area, centered on the activity center, is delineated. Any part of the circular 300-acre area that lies on national forest lands is designated and managed as a California spotted owl PAC (SNFP SEIS ROD Appendix A-37).
- PACs are maintained regardless of California spotted owl occupancy status. However, after a stand-replacing event, evaluate habitat conditions within 1.5-mile radius around the activity center to identify opportunities for re-mapping the PAC. If there is insufficient suitable habitat for designating a PAC within the 1.5-mile radius, the PAC may be removed from the network (SNFP SEIS ROD Appendix A-37).
- Desired conditions in each PAC are: (1) at least two tree canopy layers; (2) dominant and co-dominant trees with average diameters of at least 24 inches dbh; (3) at least 60 to 70 percent canopy cover; (4) some very large snags (greater than 45 inches dbh); and (5) snag and down woody material levels that are higher than average (SNFP SEIS ROD Appendix A-37).
- For California spotted owl PACs: Conduct vegetation treatments in no more than 5 percent per year and 10 percent per decade of the acres in California spotted owl PACs in the 11 Sierra Nevada national forests. Monitor the number of PACs treated at a bioregional scale. (ROD 2004, page 37).
- Breeding season limited operating period restrictions may be waived, were necessary, to allow for use of early season prescribed fire in up to 5 percent of California spotted owl PACs per year per forest (ROD 2004, page 37).
- California spotted owl home range core areas (HRCAs) are established around each territorial spotted owl activity center detected after 1986. The core area amounts to 20 percent of the area described by the sum of the average breeding pair home range plus one standard error. Home range core area sizes are 1,000 acres for the Eldorado National Forest (SNFP SEIS ROD Appendix A-39). Desired conditions in each HRCA are (1) at least two tree canopy layers; (2) at least 24 inches dbh in dominant and co-dominant trees; (3) a number of very large (greater than 45 inches dbh) old trees; (4) at least 50 to 70 percent canopy cover; and (5) higher than average levels of snags and down woody material (SNFP SEIS ROD Appendix A-40).
- Aerial photography is used to delineate the core area. Acreage for the entire core area is identified on national forest lands. Core areas encompass the best available California spotted owl habitat in the closest proximity to the owl activity center. The best available contiguous

habitat is selected to incorporate, in descending order of priority, CWHR classes 6, 5D, 5M, 4D, and 4M and other stands with at least 50 percent tree canopy cover (including hardwoods). The acreage in the 300-acre PAC counts toward the total home range core area. Core areas are delineated within 1.5 miles of the activity center (SNFP SEIS ROD Appendix A-39).

- Within California spotted owl Home Range Core Area: Where existing vegetative conditions permit, design projects to retain at least 50 percent canopy cover averaged within the treatment unit. Exceptions are allowed in limited situations where additional trees must be removed to adequately reduce ladder fuels, provide sufficient spacing for equipment operations, or minimize re-entry. Where 50 percent canopy cover retention cannot be met for reasons described above, retain at least 40 percent canopy cover averaged within the treatment unit (SNFP SEIS ROD A-51).
- Outside of California spotted owl Home Range Core Areas: Where existing vegetative conditions permit, design projects to retain at least 50 percent canopy cover within the treatment unit. Exceptions are allowed where project objectives require additional canopy modification (such as need to adequately reduce ladder fuels, provide for safe and efficient equipment operations, minimize re-entry, design cost efficient treatments, and/or significantly reduce stand density). Where canopy cover must be reduced below 50 percent, retain at least 40 percent canopy cover averaged within the treatment unit (SNFP SEIS ROD A-51).
- Mitigate impacts where there is documented evidence of disturbance to the nest site from existing recreation, off highway vehicle route, trail, and road uses (including road maintenance). Evaluate proposals for new roads, trails, off-highway vehicle routes, and recreational and other developments for their potential to disturb nest sites (SNFP SEIS ROD Appendix A-38).

Northern Goshawk

Conduct surveys in compliance with the Pacific Southwest Region's survey protocols during the planning process when proposed vegetation treatments are likely to reduce habitat quality in suitable northern goshawk nesting habitat that is not within an existing California spotted owl or northern goshawk PAC. Suitable northern goshawk nesting habitat is defined based on the survey protocol (SNFP SEIS ROD Appendix A-38).

- Limited operating periods are maintained, prohibiting vegetation treatments within approximately ¼ mile of the nest site during the breeding season (February 15 through September 15) unless surveys confirm that northern goshawks are not nesting. If the nest stand within a protected activity center is unknown, either apply the LOP to a ¼ mile area surrounding the PAC, or survey to determine the nest stand location (SNFP SEIS ROD Appendix A-60).
- The LOP may be waived for vegetation treatments of limited scope and duration, when a biological evaluation determines that such projects are unlikely to result in breeding disturbance considering their intensity, duration, timing and specific location. When a biological evaluation concludes that a nest site would be shielded from planned activities by topographic features that would minimize disturbance, the LOP buffer distance may be modified (SNFP SEIS ROD Appendix A-54).
- Northern goshawk protected activity centers (PACs) are delineated surrounding all known and newly discovered breeding territories detected on National Forest System lands. Northern goshawk PACs are designated based upon the latest documented nest site and location(s) of alternate nests. If the actual nest site is not located, the PAC is designated based on the location of territorial adult birds or recently fledged juvenile goshawks during the fledgling dependency period (SNFP SEIS ROD Appendix A-38).

- PACs are delineated to: (1) include known and suspected nest stands and (2) encompass the best available 200 acres of forested habitat in the largest contiguous patches possible, based on aerial photography. Where suitable nesting habitat occurs in small patches, PACs are defined as multiple blocks in the largest best available patches within 0.5 miles of one another. Best available forested stands for PACs have the following characteristics: (1) trees in the dominant and co-dominant crown classes average 24 inches dbh or greater; (2) in westside conifer and eastside mixed conifer forest types, stands have at least 70 percent tree canopy cover; and (3) in eastside pine forest types, stands have at least 60 percent tree canopy cover. Non-forest vegetation (such as brush and meadows) should not be counted as part of the 200 acres (SNFP SEIS ROD Appendix A-38).
- As additional nest location and habitat data becomes available, PAC boundaries are reviewed and adjusted as necessary to better include known and suspected nest stands and to encompass the best available 200 acres of forested habitat (SNFP SEIS ROD Appendix A-38).
- When activities are planned adjacent to non-national forest lands, available databases are checked for the presence of nearby northern goshawk activity centers on non-national forest lands. A 200-acre circular area, centered on the activity center, is delineated and managed as a northern goshawk PAC (SNFP SEIS ROD Appendix A-38).
- PACs are maintained regardless of northern goshawk occupancy status. PACs may be removed from the network after a stand-replacing event if the habitat has been rendered unsuitable as a northern goshawk PAC and there are no opportunities for re-mapping the PAC in proximity to the affected PAC (SNFP SEIS ROD Appendix A-38).
- It is desired that PACs have: (1) at least two tree canopy layers; (2) dominant and co-dominant trees with average diameters of at least 24 inches dbh; (3) at least 60 to 70 percent canopy cover; (4) some very large snags (greater than 45 inches dbh); and (5) snag and down woody material levels that are higher than average (SNFP SEIS ROD Appendix A-38).
- For northern goshawk PACs: Conduct vegetation treatments in no more than 5 percent per year and 10 percent per decade of the acres in northern goshawk PACs in the 11 Sierra Nevada national forests (SNFP SEIS ROD Appendix A-38).
- Breeding season limited operating period restrictions may be waived, where necessary, to allow for use of early season prescribed fire in up to 5 percent of northern goshawk PACs per year on a forest (SNFP SEIS ROD Appendix A-38).
- Mitigate impacts where there is documented evidence of disturbance to the nest site from existing recreation, off highway vehicle route, trail, and road uses (including road maintenance). Evaluate proposals for new roads, trails, off-highway vehicle routes, and recreational and other developments for their potential to disturb nest sites (SNFP SEIS ROD Appendix A-38).

American Marten and Pacific Fisher

American marten is associated with large patches of late seral stage forests. Management direction for Old Forest Emphasis Areas in the SNFP are intended to maintain suitable habitat well distributed throughout the Sierra Nevada Range for species dependent on late seral forest.

- The Sierra Nevada Forest Plan Amendment includes a conservation strategy for the Pacific fisher. The direction includes the following guidelines for den sites: den sites will have 100-acre buffers consisting of the highest quality habitat in a compact arrangement surround the den site, have at least two conifers per acre greater than 24" dbh w/ denning cavities, canopy closure exceeds 60%, more than 10 tons per acre of course woody debris, and an average of 6 snags per acres. (CWHR 6, 5D, 5M, 4D and 4M) (SNFP SEIS ROD Appendix A-39).

- Protect marten den sites from disturbance with a limited operating period (LOP) from May 1 through July 31st for vegetation treatments (SNFP SEIS ROD Appendix A-62).
- Mitigate impacts where there documented evidence of disturbance to the den site from existing uses. Evaluate proposals for travel routes for the potential to disturb den sites.(SNFP SEIS ROD Appendix A-62).
- Minimize old forest habitat fragmentation. Assess potential impacts of fragmentation on old forest associated species in biological evaluations (SNFP SEIS ROD Appendix A-53).
- Assess the potential of projects on the connectivity of habitat for old forest associated species (SNFP SEIS ROD Appendix A-54).
- Consider retaining forested linkages (with canopy cover greater than 40 percent) that are interconnected via riparian areas and ridgetop saddles during project-level analysis (SNFP SEIS ROD Appendix A-54).
- Identify areas for acquisition, exchange, or conservation easements to enhance connectivity of habitat for old forest associated species (SNFP SEIS ROD Appendix A-54).

Pallid Bat, Townsend's Big-Eared Bat and Fringe-Tailed bat

Pallid bats, Townsend's big-eared bats and fringe-tailed bats are associated with oak woodlands, snags, rock outcrops, caves, bridges, abandoned mines, and riparian habitat. Forest-wide Standards and Guidelines are expected to provide habitat to support viable populations of these species. Restoration of hardwood ecosystems is accomplished through standards and guidelines requiring retention of large live hardwood trees and snags and recruitment of young hardwood trees.

The LRMP or SNFP do not provide specific guidelines for the management of these three bat species. Standards and guidelines for hardwoods, snag and down logs, and riparian conservation areas (USDA 1988, USDA 2004), address some of the habitat elements important to these species. Riparian Conservation Objectives (RCOs) under the Sierra Nevada Framework aid in sustaining riparian habitat. In addition, Best Management Practices (BMPs), designed to reduce the amount of sediment and erosion created by project activities, are implemented to protect water quality. Adult stages of aquatic insects are used as forage by all three bat species.

Western Bumblebee

The western bumble bee was added to the Regional Forester's Sensitive Species List for Region 5 in 2013; there are no current standards and guidelines for this species at the time this document was written. Current management guides, primarily developed by the Xerces Society in association with other agencies, including the Forest Service, will be used in assessing existing conditions, effects, and mitigations for this species in regards to this project.

IV. PROJECT DESCRIPTION

In order to improve stand resilience to insect and disease pressures and to reduce the risk of a catastrophic wildfire, the Scottiago Project will reduce stand density, competing vegetation, and treat fuels on approximately 6,000 acres of National Forest System lands within the Sopiago Creek, Middle Fork Cosumnes River, and Scott Creek watersheds.

Commercial Harvest

- Treat approximately (up to) 3,000 acres of natural stands and commercial sized plantations by cutting and removing trees between 10 inches and 30 inches diameter breast height (dbh) using ground-based commercial logging methods including whole tree yarding (2,950 acres) and skyline logging systems (38 acres). Where feasible, tree tops would be removed to landings as part of skyline logging. Recently killed trees (snags) within commercial harvest units would be cut and removed concurrently with logging operations without restriction on dbh. Feller bunchers or equivalent type of ground based equipment may be used for cutting and pre-bunching of logs that would be removed using a skyline logging system. Use of equipment in skyline units would generally be limited to 45% slope the exception of using a winch assist system. Winch assisted logging equipment would not be slope limited.
- Snags would be retained consistent with forest LRMP standards. The 4 largest snags will be retained per acre, averaged over the entire project area. Snags will not be evenly spaced across the landscape, but would vary by land allocation and landscape position, such as near roads, ridgetops and streams. Snag positions may be based on desired future conditions. Any snag posing a hazard to life, injury, or property may be removed.
- Remove small trees (4 inches to 10 inches dbh) to landings, or other designated disposal sites, on the mechanically thinned acres.
- Pile tree tops and small trees (biomass) at landings to be made available for either biomass power generation or public fire wood cutting. Material remaining at landings (if not removed by previous methods) would be burned.
- Conduct post-harvest treatments, including grapple or tractor piling of existing and activity fuels, followed by prescribed fire, including both broadcast burning and lighting of piles.

Silvicultural prescriptions will incorporate recommendations from PSW-GTR-220, and meet Forest Plan direction (LRMP 1988, SNFPA 2004). Prescriptions will be designed to meet the following goals:

- Improve forest resiliency by reducing stand densities by thinning. In general, lowest residual stand densities would occur on upper slopes, ridges and southern and western aspects. Targeted residual density would range from 100-140 square feet/acre basal area or approximately 25-30 feet tree spacing (50-70 trees per acre). Although canopy cover would average 50% over treatment units, lower canopy cover would exist in these less dense areas. On lower slopes and transitioning into Riparian Conservation Areas (RCA), as well as on north facing aspects, residual stand densities may be higher with a corresponding increase in canopy cover. Targeted residual density would range from 140-180 square feet/acre basal area or 20-25 feet tree spacing (70-110 trees per acre). Canopy cover in RCAs of perennial and intermittent streams would see the least overall reduction and would likely average closer to 60%.
- Reduce shading and competition around oaks to improve growing conditions.
- Increase the percentage of shade intolerant pine and hardwoods. Maintain a mix of species in pine dominated areas to reduce impacts from western bark beetle.
- Retain clumps of large trees. Clumps may vary in shape and size and range from a group of 4-5 trees up to an acre in size. In general, clumps would be located in the mid to lower slope positions. Preference will be given to clumps comprised of mixed species. Clumps would focus on trees exhibiting characteristics such as multi-top especially in firs and cedars, trees provide nesting structure, large snag inclusions, cavities, and other signs of use by wildlife.

- Within CSO Home Range Core Areas (HRCAs), and in areas identified as high quality habitat and having potential as future nesting sites for CSO, the management focus will be on retaining areas with highest density of tall trees and denser canopy cover. These areas generally will occur in forest patches >2 acres in size dominated by large trees (generally greater than 150 ft tall) and having >55% canopy cover. Within the project area these areas are generally located on north facing slopes and in riparian conservation areas. Commercial harvest in these areas will be limited to removing trees acting as ladder fuels. Retention areas will focus on clumps of large trees and key features used by CSO as stated in above bullet.
- Manage the intermediate size class (20 to 30 inch DBH), thinning this class primarily by species (shade tolerant) and growth form (those acting as ladder fuels).
- Increase stand variability. Target stand structure would consist of a mixture of clumps, gaps and a matrix of variably spaced trees. Small (.25 acre or less) gaps will be created or enlarged in low productivity sites and where natural openings in the canopy exist. These small gaps will not be evaluated for regeneration.

Fuel Reductions and Management Strategy

- Create and maintain a fuel treatment network to reduce extent and severity of wildfires based on the below listed locations:
  - Barney Ridge/Omo Ranch Road and Roads 8N61 and 8N62
  - Goldnote Ridge/ Roads 8N55 and 8N48
  - Big Mountain Ridge/ Road 8N49
  - North-South Road
- Using these locations, create evacuation routes for public egress and emergency responder safety by thinning trees less than 30"dbh within 35' of the centerline of roads. Trees would be selectively removed that are currently impeding the ability for safe access as well as fire suppression activities. (107 acres)

- Beyond the 35' and extending out to 200' from above listed strategic locations, trees up to 18" will be thinned and surface and ladder fuels will be removed. (749 acres) Post-treatment, these stands will retain their larger trees with minimal modification to overstory canopy. Plantations contained within and adjacent to the above-described fuel break would be treated as part of the fuel break design.

- Conduct additional treatments in 200' roadside areas, including grapple or tractor piling of existing and activity fuels, prescribed fire, including both broadcast burning and lighting of piles.

- On an additional approximately 2,132 acres, low intensity prescribed fire will be implemented at any time of year when conditions allow for consumption of surface fuels and low (<15% averaged across the unit; 5-10% averaged in PACs) overstory tree mortality. Reduction or rearrangement of fuel concentrations using hand cutting, piling, chipping and/or other mechanical treatment may also occur on these acres to supplement or complement prescribed burning.
- Install hand or dozer line to limit the extent of prescribed burns
- Use hand and aerial ignition techniques for pile and understory burning

- Reduce fuels and fire hazard 300 feet from key OHV staging areas (Barney, Five Corners, Goldnote, Goldnote East, 36 Tie). Trees up to 18" will be thinned and surface and ladder fuels will be removed to increase utility of these areas for fire suppression and staging of equipment.
- Reoccurring maintenance of treatments listed above using fire, hand or mechanical methods.
- Following harvest or fuel reduction activities, the desired surface fuel loading would be less than 20 tons per acre.
- Thinning of stands near Armstrong Hill lookout tower to enable detection and management of wild and prescribed fires in the Cosumnes and North Fork Mokelumne River watersheds. Thinning will be focused on providing a clear view and will include removal of tall trees. Some trees may exceed 30" dbh. Install a fire detection camera in the existing fire detection lookout tower. Reoccurring maintenance of trees and vegetation (promoting oaks for example) to allow continued effective fire detection.

Treatments for Protection of California Spotted Owl Habitat

Fuels treatments listed in the "Fuels Reduction and Management Strategy" section (above) would occur in portions of spotted owl and goshawk PACs. These areas are designated Wildland Urban Intermix (WUI) Defense and Threat Zones. Treatments would be designed to facilitate prescribed burning, reduce stand mortality effects from both prescribed and wildland fire, and would be expected to improve efficiency of suppression of wildfires. Effective management of prescribed fire and wildfire may help reduce loss of or damage to key CSO and northern goshawk habitat. PACs were selected for treatment based on necessity to ensure the overall effectiveness of the landscape fire and fuel strategy. Design features to protect habitat and nesting status are listed below.

Transportation System

Roads and trails within the project area will be managed consistent with the 2008 Eldorado National Forest Public Wheeled Motorized Travel Management Environmental Impact Statement (Travel Management EIS) and compliant with applicable standards. Roads not identified as open to public use may be blocked by gates, barricades, rocks, other barriers or by signage. In addition to the seasonal closure identified by the Travel Management EIS, roads identified as open for public use may be temporarily closed during inclement weather or during logging operations to protect reconstruction investments and for public safety.

There are approximately 12 miles of road maintenance, 60 miles of road reconstruction, and 1 mile of new temporary road construction within the project boundary area. Road maintenance will be performed according to Eldorado's Standard Road Maintenance Specifications and applicable design criteria. Maximum clearing limit will be 200 feet from centerline of road in either direction. It is anticipated that some trees will fall an additional 150 feet beyond the designated clearing width. Ground disturbing project activities must stay within 350 feet from the centerline of road. Felled trees will be transported to nearby landings via skid trails. New skid trails may be created depending on the distance of felled trees to nearby landing. Ground disturbance will be minimized as much as possible. Existing landings and/or deck areas will be used to process the logs to prepare them for loading onto log trucks. New deck areas may be created if location of existing deck area and/or landing is impractical. Slash from hazard trees will be lopped and scattered, side casted, chipped or hand piled and burned.

Temporary roads will be obliterated upon project completion. Road maintenance and reconstruction will provide safe access for project activities as well as for fire suppression purposes. No changes to the Motor Vehicle Use Map are proposed and no permanent roads are proposed to be decommissioned.

General road maintenance activities may include:

- Removal of roadside vegetation,
- Repair of the road running surface and shoulder,
- Drainage structure maintenance,
- Removal of hazard trees,
- Sign repair or replacement,
- Maintenance or replacement traffic gates and barriers, and
- Other similar activities.

General road reconstruction activities may include:

- Replacement of inadequate drainage crossings,
- Installation of water bars and dips on roads with inadequate runoff control,
- Out sloping the road where possible,
- Slope stabilization,
- Widening of traveled way,
- Gate installation to control seasonal use, and
- Other similar activities.

Drainage structures will be designed for 100-year storm events. Water will be used to abate dust during maintenance and reconstruction and from logging traffic with water selected from water drafting sites that have suitable stream flow and access. There are two water holes within the project area which will also be maintained as part of the project. In the event water holes are not suitable for drafting, magnesium chloride will be used for dust abatement.

Design Criteria

1. Terrestrial Wildlife

All Activities
Standard LOPs would be adhered to, for all activities, for both the California spotted owl and northern goshawk, unless surveys conclusively ascertain that nesting/reproduction would not be affect in that particular breeding season by the treatments. The LOP periods are March 1 through August 15th for the California spotted owl, and February 15th through September 15th for the northern goshawk.

Where surveys and biological assessment determine that impacts would not affect reproduction for these species, the LOP may be lifted, or the area affected by the LOP reduced. Based on nesting status, additional mitigation measures, such as (but not limited to): exclusion of portions of the proposed treatment areas until after the breeding season, additional fire lines, and different treatment techniques (lighting techniques, postponing slash work), may be implemented to reduce potential effects to nesting spotted owls and goshawks.

Snags (≥15" dbh) would be retained, except where they pose a threat to human health and safety, or

perimeter control risk for containment of the fire, and will not be actively lit during burning operations.

Fuel Reduction Treatments
Where possible, mechanical treatments (including commercial and non-commercial as described in the "Fuels Reduction and Management Strategy" section, above) would occur in lower quality habitat inclusions in the PAC (ridge tops, lava caps, small diameter dominated treed stands, plantations).

The district wildlife biologist would be involved in the burn planning, and notified prior to implementation of the prescribed burning and fuel reduction treatments in PACs. When possible, the biologist and/or staff would be onsite to take part in, and/or monitor burning and associated effects.

Prescribed burning would be undertaken in relatively small proportion of the PACs within the project area. No more than two PACs within the Scottiago project area would be burned in a 12 month period. Burning would avoid direct impacts to known nest stands by either not burning through them, or clearing material from around known nest and roost trees and other trees/snags > 30" dbh in the nest stands.

Fuel reduction treatments would be designed to ensure retention of highly suitable habitat (less than 5-10% change in canopy closure within treated area inclusive of all treatments) by reducing ladder fuels 12" dbh and smaller.

Mechanical rearranging of existing fuels in the PACs (mastication, chipping, piling) would only occur within relatively short distances from roads and property lines (200 feet or less).

Additional hand treatments, including handline construction, tree pruning, and cutting of small trees (less than 6 inches dbh), may be conducted within a 1 to 2 acre area surrounding known nest trees, to the extent necessary, to protect nest trees and trees in their immediate vicinity.

In Summary, CSO and northern goshawk PAC Treatments would:

- Maintain canopy closure at or above 90% of starting canopy closure (pre-treatment of any kind),
- Outside of 35' treatment on roads listed above in the "'Fuel Reductions and Management Strategy", retain large trees (>=24" dbh) near current levels (less than 5% reduction numerically across treatment area),
- Retain snags (≥15" dbh) during burn preparation, except where they pose a threat to human health and safety, or perimeter control risk for containment of the fire, and will not be actively lit during burning operations,
- Retain downed logs greater than 30" diameter (large end) by not be actively lighting during implementation of the burn, and
- Result in small openings (generally ≤ 1/4-1/2 acre in size), with the total area of openings created less than 5% of treated area. There may be instances where larger openings are created, but these should be limited in both number and size (openings over and acre in size are not desirable in PACs.

Where these design criteria standards cannot be met, no prescribed burning would occur within these PACs, or these portions of PACs.

2. Aquatic Wildlife

Table 1. Operating requirements for sky-logging and mechanical equipment in Riparian Conservation Areas (RCAs) for the Scottiago Forest Health and Fuels Reduction Project.

Habitat Type[1]	**RCA Zone**	**Width** (feet)	**Equipment Requirements**	**Operating Requirements**
[1]Perennial/ Intermittent Streams and Special Aquatic Features (SAFs)	Exclusion Zone	0 to 100 feet from stream or SAF edge; or 0 to 25 feet beyond riparian vegetation, whichever is greater	Prohibited: Sky-logging Mechanical Harvesting/ Shredding[2] and Skidding[3]	Equipment reach in may be allowed upon consultation with RCA team[4]. Sky-logging is allowed within 50 feet from perennial/ intermittent streams or SAF edge if full suspension is utilized.
Perennial Streams and SAFS	Partial Treatment	100 to 300 feet from stream edge; or 25 feet beyond riparian vegetation to 300 feet	Allowed: Sky-logging Mechanical Harvesting/ Shredding[2] and Skidding[3]	Ground based equipment operations prohibited on slopes greater than 25%. Use existing skid trails except where unacceptable impact would result. Do not construct new primary skid trails or landings within RCA zones without consultation of RCA team[4].
Intermittent Streams	No Restrictions	100 to 150 feet from stream edge; or 25 feet beyond riparian vegetation to 150 feet	Allowed: Sky-logging Mechanical Harvesting/ Shredding[2] and Skidding[3]	
Ephemeral Streams	Exclusion Zone	0 – 25 feet	Prohibited: Sky-logging Mechanical Harvesting/ Shredding[2] and Skidding[3]	Equipment reach in may be allowed upon consultation with RCA team[4].

	Partial Treatment	25 – 150 feet	Allowed: Sky-logging Mechanical Harvesting/ Shredding[2] and Skidding[3]	Ground based equipment operations prohibited on slopes greater than 25%. Use existing skid trails except where unacceptable impact would result. Do not construct new primary skid trails or landings within RCA zones without consultation with the RCA Team[4].

[1] Perennial streams flow year long. Intermittent streams flow during the wet season but dry by summer or fall. Ephemeral streams flow only during or shortly after rainfall or snowmelt. Special aquatic features (SAFs) include lakes, ponds, meadows, bogs, fens, wetlands, vernal pools and springs
[2] Low ground pressure track-laying machines such as feller bunchers and masticators
[3] Rubber-tired skidders and track-laying tractors
[4] RCA team is one or more of the following: Forest Service hydrologist, botanist, or aquatic biologist

Design Criteria Specific to Aquatic Resources
Design Criteria are measures taken as part of the Proposed Action to ensure meeting purpose and need while minimizing the potential for adverse effects. This document lists the Design Criteria which support the effects analysis for aquatic species and their habitat.

For the applicable Design Criteria discussed below:

Potential breeding habitat for the California red-legged frog (CARLF) occurs below 4,000 feet in elevation, and in ponds and lakes, or perennial and intermittent stream reaches with less than 2% gradient. Potential non-breeding habitat for CARLF includes all land and water within 1-mile of potential breeding habitat. Overland migration occurs during the wet season (defined as starting with the first frontal rain system that deposits a minimum of 0.25 inches of rain after October 15 and ending April 15), which creates a Limited Operating Period (LOP) for certain activities.

General Measures
Protection measures may be altered on the ground for a specific site based on recommendations by relevant specialists (soil scientist, aquatic biologist, botanist, or hydrologist).

- If a sensitive or listed amphibian or turtle is sighted within the Action Area, cease operations in the sighting area, and inform a Forest Service aquatic biologist of the sighting immediately. Before commencing activities, consultation may need to be re-initiated with USFWS for listed species.
- Protect any seeps, springs, bogs and wet areas not located on map found in the field during treatment, with same criteria for Special Aquatic Features (SAFs).
- Do not use tightly woven fiber or monofilament netting (or similar materials) for erosion control or other purposes when netting is left exposed.
- An emergency response plan shall be created and implemented to prevent the contamination of waters from accidental spills of hazardous materials (per BMP 7.4).

Specific Measures

Commercial Harvest Operations

- Off-road mechanical equipment and sky-logging equipment operations would not occur within 1-mile of areas identified as suitable CARLF breeding habitat during the wet season (defined as starting with the first frontal rain event that deposits a minimum of 0.25 inches of rain after October 15 and ending April 15).; however, sky-logging and mechanical equipment operations is allowed within 1-mile of CRLF suitable habitat (review Table 1 for exclusion zones) after a 72-hour dry period.
- Mechanical operations off existing roads within RCA zones, as defined by Table 1, would utilize low ground pressure equipment per S&G 113 (SNFPA 2004).
- If sale administrator identifies situation where it appears that a log or portion of tree should be removed from the RCA exclusion zones (0-100 ft. from perennial/ intermittent streams and SAF), no activity would commence without approval of the RCA team.
- Use existing skid trails and landings to the extent use would avoid impact from new trails and landings. Do not construct new primary skid trails or landings within 100 to 300 feet of perennial streams or SAFs, within 100 to 150 feet of intermittent streams, or within 25 to 150 feet of ephemeral streams unless approved by a hydrologist or aquatic biologist. When expanding or constructing landings or skid trails in the RCA outside these zones utilize guidelines outlining special situations that require consultation with RCA team.

- Minimize construction of skid trails or temporary roads for access into RCAs for fuel treatments, harvest, or hazard tree removal per S&G 113 (SNFPA 2004).

    - Where practical, cover primary skid trails within an RCA zone with slash or wood chips as trails are developed, thereby crushing slash, protecting soil mantle and reducing fuel piles to be burned.
    - Rehabilitate skids trails within an RCA zone using de-compaction, back-blading berms, building water bars, and covering with any displaced or available slash.

- Locate new log landings or reuse old landing in such a way as to avoid watershed impacts and associated water-quality degradation (BMP 1.12; USFS 2011). Log landings, new or reused, would be situated outside of RCA zones to the maximum extent possible. If new log landings are needed within RCAs a site-specific review by RCA team would occur prior to construction.

    - Reuse of existing landings within an RCA may occur where creation of a new landing is likely to result in more resource damage than use of the landing within the RCA.
    - Re-used landings within the RCA would be rehabilitated using a combination of de-compaction and slash coverage.
    - Consult with RCA team if new landing construction is needed within 300 feet of perennial streams and SAFS, or within 150 feet of intermittent streams, or 25 feet of ephemeral streams

- Where reach-in is used within an RCA zone, grooves and bare soil created would be mitigated with hand-built water bars and/or slash placement.

Burning

- Slash and cull logs accumulated on landings would be piled and/or decked.
- Ignition of fire would not occur within 50 feet of the edge of the channel of perennial streams and special aquatic features or 50 feet from the edge of riparian vegetation, whichever is greater. Ignition would be limited to non-riparian vegetation. Fire creep will be allowed all the way to edge of streams.
- Ignition of fire would not occur within 25 feet of the edge of the channel of intermittent streams and ephemeral streams or within 25 feet of riparian vegetation, whichever is greater. Fire creep will be allowed to the edge of stream channels. Existing down logs which lie in or across all stream channel types would not be intentionally ignited.

CARLF Specific Criteria

- Piles that lie within the RCA (outside of the CARLF buffer) can be burned, but would, to the extent practicable, be ignited in a manner that allows any organisms to flee from the pile (for example, light on the leeward side so that fire moves as a front through the pile).
- No piling/burning would occur within meadows, fens or springs.
- No fuel storage would take place within any of the RCA zones. Refueling would take place in RCAs only where there is no other alternative.
- Piles would not be located within 300 feet of potential CARLF breeding habitat, and 100 feet of all other aquatic habitat.
- Burning may take place year-round to reduce fuels. However, between October 15 and April 15, a Limited Operating Period shall be applied for the California red-legged frog (CARLF) so that, starting with the first frontal system that deposits a minimum of 0.25 inches of rain, prescribed fire activities may only resume after a 72-hour drying period.
- Magnesium chloride will not be used within 100-ft of all stream crossings.

Water Drafting

- The development of water drafting sources shall follow all applicable guidelines under BMP 2.5 (USFS 2012). Locate water drafting sites to avoid adverse effects to in-stream flows and depletion of pool habitat.
- Water drafting sites would be assessed or surveyed for TES species prior to use and periodically during use depending on operation duration and seasonality. If sensitive, threatened, or endangered species are identified at a potential water drafting site, that site would not be used for water drafting.
- In perennial and intermittent streams, pump intake screens shall have openings not exceeding 3/32-inch (0.09375 inch) and be sized according to the pump intake capacity. Place hose intake into bucket in the deepest part of the pool. Use a low-velocity water pump and do not pump natural ponds to low levels beyond which they cannot recover quickly (approximately one hour).
- For water drafting on fish-bearing streams: do not exceed 350 gallons per minute for stream flow greater than or equal to 4.0 cubic feet per second (cfs); do not exceed 20% of surface flows below 4.0 cfs; and, cease drafting when bypass surface flow drops below 1.5 cfs.
- For water drafting on non-fish-bearing streams: do not exceed 350 gallons per minute for stream flow greater than or equal to 2.0 cfs; do not exceed 50% of surface flow; and, cease drafting when bypass surface flow drops below 10 gallons per minute.
- In-channel water drafting locations would include rocking of approaches and barriers of rock or sloping of drafting pads away from water source to prevent spillage at vehicle from returning to

the watercourse.

3. Soil and Water Quality

- Single track and skid trails that are at risk of altering and concentrating flow after implementation would be back-bladed or smoothed to obliterate potential hillslope channels and downslope berms.
- Where feasible and within fuel criteria, leave uncut downed wood adjacent to roads and trails, to discourage unauthorized OHV travel.
- Where feasible, place enough excess biomass at the outlet of waterdips and waterbars to dissipate runoff energy and trap sediment.
- Once skid trails are decommissioned, construct earth berms and/or place logs and/or rocks to discourage unauthorized motor vehicle use.
- Use a very high erosion hazard rating when considering application of erosion control on skid trails unless subsoil if feasible.
- Place slash or biomass material on skid trails between landings at a distance of 100 feet from landings. A 25-foot-wide slash mat would also be placed on the downslope portion of landings. All slash mats would be crushed either by equipment treads or equipment heads. Slash mats should be placed far enough away from the pile to allow for dozer lines around piles.
- Although 100% soil cover is considered ideal for soil stabilization, the following minimum values should be retained to the extent practical and allowable by fuel loading limits: 50% on slopes less than 25%; and 70% on slopes greater than 25%.
- Existing skid trails would be used, if appropriate, to limit the extent of new areas of compacted ground within the Action Area.

4. Riparian Conservation Areas

- Hazard trees within the mechanical exclusion zone (Table above) may be hand felled away from stream channels and SAFs. If logs can't be removed with reach in, they would be left in place. Any portion of a felled tree outside of the RCA exclusion zones may be bucked and removed. Coordination would occur with the RCA Team for specific site exceptions.
- Within the RCAs, 70% post-implementation soil cover would be maintained when possible and dominated by material less than 3 inch in diameter. Application methods could include cutting and lopping, or mastication of pre-commercial material, cutting and scattering of activity material, non-whole tree harvesting methods, or mulch applications. Utilize on site biomass to generate mulch materials wherever possible.
- Trees that are within the RCA zones and felled into the road prism would be removed as necessary to allow safe vehicle use and permit proper maintenance of the road.
- Skidding and loading equipment would remain outside of RCA exclusion zones, except in those instances where the safe falling of hazard trees requires the control that lining by equipment may provide. In the rare instances where equipment would need to enter the RCA exclusion zones, a member of the RCA team, would review the circumstances and work with the sale administrator.

The removal of dead and unstable live trees (hazard trees) of all sizes would occur along timber haul roads and landings to provide for safety of woods worker and public throughout project implementation, except where restrictions for removal apply.

5. Botany

User created routes off of Omo Ranch Road and 8N62 will be blocked using rock, bollards, or other native material barriers. These routes are not on the MVUM and currently impact lava cap plant communities and FS Sensitive plants.

Sensitive and watchlist plant populations within the project area would be flagged for avoidance. All ground disturbing activities, landing, skid trails, burn piles, hazard tree removal, brushing, and mechanical equipment, would be excluded from sensitive plant protection areas. Where it is necessary to remove trees or conduct roadside brushing from within site boundaries, the project botanist would be consulted to mitigate impacts. All thinning of trees adjacent to site boundaries would be directionally felled away from the site. If new sensitive plant occurrences are discovered during project implementation the project botanist would be notified to develop necessary protection measures.

Burning operations within Sensitive and watchlist plant populations would be designed to produce a low intensity fire. No ignition within occupied habitat would occur unless required to moderate fire intensity.

All potential habitat for Sensitive Plants would be surveyed prior to project implementation. Any unsurveyed potential habitat would be flagged for avoidance.

Prior to new fire line construction and mechanical thinning of non-commercial burn units, fireline and thinning locations would be evaluated by the FS botanist and surveyed as needed. Sensitive and Watchlist plant occurrences in burn units would be re-flagged for avoidance during fireline construction, thinning, and ignition.

Lava caps, which support unique plant communities in the project area, would be protected from motorized equipment and vehicles. Skid trail and Line construction through lava cap communities would be avoided when feasible.

Application of Magnesium Chloride for dust abatement will not occur within 100 feet of roadside occurrences of Sensitive or Watchlist plants.

Eldorado National Forest Priority 1 and 2 invasive plant infestations within the project area would be flagged for avoidance and treated using integrated pest management techniques as a part of the project for up to 5 years after implementation. Treatments under the project will tier to the Forest invasive plant treatment EA and may include a combination of techniques including tarping, manual removal, string trimming, and targeted herbicide application. If new infestations develop as a result of project activities (i.e. within landings, areas of road reconstruction, within harvest units) treatment strategies would be developed under the Eldorado National Forest Invasive plant EA and would be implemented as part of the project.

Invasive plant surveys would occur within fuel break for five years following project implementation. If found, newly detected invasive plant species would be treated using methods covered by the Eldorado NF Forest-wide invasive plant management EA.

All equipment and vehicles (Forest Service) used for project implementation must be free of invasive plant material before moving into the project area. Equipment will be considered clean when visual

inspection does not reveal soil, seeds, plant material or other such debris. Cleaning shall occur at a vehicle washing station or cleaning facility before the equipment and vehicles enter the project area.

Known invasive plant sites along roads in the project area will be flagged prior to implementation and will be avoided as much as possible. If infestation cannot be avoided contact a Forest Service Botanist.

To the extent possible, work would be completed in infested areas last. Otherwise, equipment would be cleaned prior to moving from a weed- infested unit to a weed-free unit.

Where proposed work occurs in known invasive plant infestations equipment would be cleaned prior to leaving infested areas.

All gravel, fill or other materials would to be weed free. On-site sand, gravel, rock, or organic matter from uninfested areas would be used where possible.

Any straw or mulch used for erosion control would be certified weed-free. A certificate from the county of origin stating the material was inspected is required.

Any seed used for erosion control or restoration would be from a locally collected source (ENF Seed, Mulch and Fertilizer Prescription, March 21, 2000). Plant taxa proposed for re-vegetation would be approved by the project botanist.

6. Archeology/Heritage

The Scottiago project will comply with Section 106 of the National Historic Preservation Act of 1966, as amended in accordance with provisions of the "Programmatic Agreement among the U.S.D.A. Forest Service, Pacific Southwest Region (Region 5), the California State Historic Preservation Officer, the Nevada State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding Processes for Compliance with Section 106 of the National Historic Preservation Act for Management of Historic Properties by the National Forest of the Pacific Southwest Region" (Regional PA 2013).

Fuel reduction using hand tools and other activities may be permitted within the boundaries of known Historic Properties, if approved by the District Archaeologist. Sites that are at risk from fire will be flagged and avoided during prescribed understory burning. Sites that are not considered at risk or have previously burned at moderate or high intensity may be included in the prescribed burn at the discretion of the District Archeologist. Construction of fire lines will occur outside of the cultural resource site boundaries unless directed by the District Archaeologist. All machine and hand piles will be placed away from site boundaries at a distance such that site features will not be affected by flames and heat. Hazard tree removal on or in the vicinity of cultural resource sites will be coordinated with the District Archaeologist.

Sites within harvest units or near road maintenance/reconstruction projects will be identified with flagging and avoided during ground disturbing project activities. All thinning of trees adjacent to site boundaries will be directionally felled away from the site. Non-merchantable trees and brush may be removed by hand, within site boundaries, at the direction of the District Archaeologist. Road reconstruction may require the use of Standard Protection Measures or mitigation as per the *Regional PA 2013*.

Should any previously unrecorded cultural resources be encountered during implementation of this project, all work should immediately cease in that area and the District Archaeologist be notified immediately. Work may resume after approval by the District Archaeologist; provided any recommended Standard Protection Measures are implemented. Should any cultural resources become damaged in unanticipated ways by activities proposed in this project; the steps described in the *Regional PA 2013* for inadvertent effects will be followed.
The District Archaeologist will be kept informed of the status of various stages of the project, so that subsequent field work can proceed in a timely fashion. Monitoring of the area may occur after the project has been completed. This work will be documented in amendments to the Archaeology Specialist Report, as appropriate

V. EFFECTS OF THE PROPOSED PROJECT

EFFECTS TO CALIFORNIA SPOTTED OWL (CSO)

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). Causation factors are not known. Threats to spotted owls are identified as: continued forest management on both private and public lands, large scale stand replacing fire, invasion of barred owls, potential climate change direct effects on owl populations, and climate driven vegetation type conversions and increased fire activity, and increasing human population growth and development. There are two additional potential threats, illegal rodenticide use, and West Nile Virus (*Current State of Knowledge*, USDA 2017, FS pp 182-183).

Suitable CSO habitat in the Sierra Nevada consists of dense, multi-layered mature forested stands with greater than 70 percent canopy closure preferred for nesting and roosting, and greater than 50 percent canopy cover for foraging (Verner et al. 1992). Spotted Owl Core Habitat includes structural heterogeneity and areas of lower canopy cover (e.g. 40-70 percent, Call et al. 1992; 30-50 percent, Tempel et al. 2014). Recent studies suggest that moderate canopy cover, in tall/large diameter trees (40-70 percent canopy cover) is as or more important than high canopy cover in determining territory occupancy for some CSO populations (North et. al. 2017), including the Eldorado population (Tempel et. al. 2016). Another interpretation of this data is that all dense canopied habitat is not equally suitable, especially for nesting, and roosting. This data indicates that large/tall treed (CWHR 5 and greater) habitat is of higher value, especially for nesting and nest stands than medium sized treed (CWHR 4) even when canopy closure is similar or the same. Also important is availability of large snags and down logs, which are utilized for nesting and support the owl's prey base of mainly flying squirrels and woodrats (Laymon 1988). On the ENF, spotted owls are known to occur between 2,000’ and 7,200’ in elevation, with most of the nesting pairs found in the Sierran mixed conifer habitat type. The reproductive season for spotted owls occurs between mid-February and August with most young fledging by August 31 (Verner et al. 1992).

Collectively, studies indicate that the presence of large trees and high and moderate over story canopy cover are the most important conditions associated with spotted owl survival and site occupancy at both core area and home range scales (Blakesley et al. 2005, Seamans and Gutierrez 2008, Seamans 2005, Dugger et al. 2016, Tempel et al. 2016). On the Eldorado National Forest, Seamans (2005) found that within 0.7 miles of spotted owl territory centers, the total forest area comprised of large and medium-

sized trees (≥ 12" dbh) and high canopy cover (≥ 70% canopy cover) was positively correlated with survival and territory colonization and negatively related to territory extinction. Since this study considered only the two broad canopy cover classes (≥70% and 30 to 69%) it is unclear whether other canopy cover classes within the 30 to 69% range might also be correlated with increased survival and occupancy.

Recent research indicates that a combination of moderate canopy closure (40-69%) and high canopy closure (>70%) were the most important predictors of territory occupancy (Temple et al. 2016). There is some evidence that California spotted owls may benefit from some amount of heterogeneity within their territories, using pole sized stands and edges for foraging (Williams 2008), but recent studies of California spotted owl habitat associations consistently reinforce the importance of large/tall trees and high canopy cover at the stand, core area, and home range scales. Given current information, maintaining high canopy cover stands (≥70%) stands within PACs, and a mix of moderate and high canopy closure stands at the HRCAs/Territory scale, may be important for promoting survival and occupancy at existing spotted owl sites.

Studies to date suggest continued occupancy of California spotted owl territories in areas treated with prescribed fire or sites that have experienced low intensity wildfire (Roberts et al. 2011, Bond et al. 2002). This is in contrast to initial results from the Plumas-Lassen Administrative study indicating that mechanical thinning DFPZ treatments, may result in changes to spotted owl home ranges and reduced occupancy of owl sites (PLAS 2010). Studies also suggest that timber harvest within territories has no significant effect on territory occupancy, or CSO productivity and in fact showed a non-significant positive effect at one study site (Tempel et al. 2016).

Finally, fire that significantly reduces vegetation cover has been shown to have a negative effect on both CSO survival and territory occupancy (Jones et al. 2016). Recent analyses suggest that under projected trends, within the next 75 years, the cumulative amount of CSO nesting habitat burned at moderate to high severity will exceed the total existing habitat in the absence of significant progress towards ecological restoration (Stephens et al. 2016).

Current Condition

The following describes the current condition, also known as the no action alternative. The current condition or taking no action is used as the baseline to compare effects of the action alternatives. Pertinent current management practices such as fire suppression, hazard tree abatement, and public firewood cutting would take place in the project area at his time. None of the fuels management, forest health, or road maintenance activities proposed in the project, or objectives would be accomplished by continuing current management, taking no action.

The current condition is used as the baseline to compare effects of the proposed actions, and as such is assumed to have no direct, indirect, or cumulative effects associated with it. The California spotted owl (CSO) is a Forest Service designated sensitive species and a management indicator species (MIS on all Sierra Province National Forests in the Pacific Southwest Region. The California spotted owl has been petitioned for listing and is currently under review. The U.S. Fish and Wildlife Service (Service) completed a positive 90-day finding on September 18, 2015. The listing decision is due by September 30, 2019. The Eldorado National Forest (ENF) is located in the central portion of the species range and represents about 16 percent of the known population in the Sierra Nevada based upon data presented in Verner et al (1992). There is a relatively uniform distribution of owl sites across the forest and the adjoining Tahoe National Forest to the north and Stanislaus National Forest to the south. The SNFP

FEIS, Volume 3, Chapter 3, part 4.4, pages 69-82, summarizes information regarding the biology and status of this species and is hereby incorporated by reference (USDA 2001b). More recently the *The California Spotted Owl: Current state of Knowledge* ,GTR-PSW-254 was released in 2017 which is the latest compilation regarding status, biology for this species (USDA 2017).

Suitable Habitat in the Project Area

Suitable habitat has been mapped for spotted owl on the forest, based on vegetation meeting the suitable habitat as described in the Sierra Nevada Forest Plan Amendment (USDA 2001). Habitat is represented by California Wildlife Habitat Relations (CWHR) types 4M, 4D, 5M, 5D and 6). There are approximately 9, 490 acres of habitat which meets these criteria within project area. Approximately 2,480 acres of what is considered high quality nesting habitat (CWHR size class 5 or greater and ≥ 70% canopy cover) and an additional 7,010 acres of suitable habitat (CWHR size class 4 & 5 and 50-69% canopy cover).

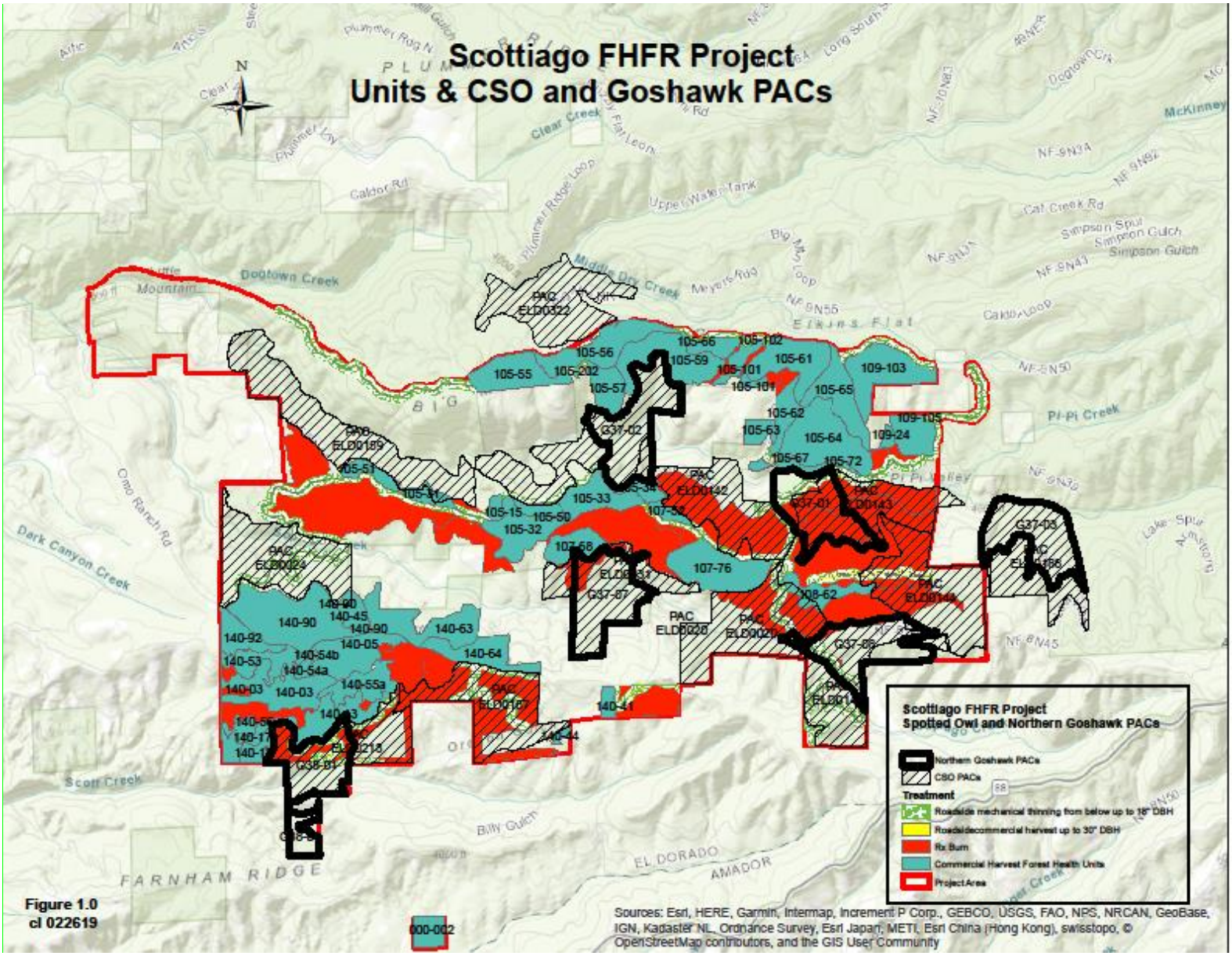
The Scottiago FHFR project area is somewhat different than previous recent projects on the district in that, in the last 20 years much of the area that is not within either CSO PACs or northern goshawk PACs has been commercially thinned, retaining, and speeding growth of the large/tall tree components of the stands, and reducing canopy closure within these treated areas to an average of 55% canopy cover. This is in contrast to the PACs which contain habitat that ranges more commonly between 70-100% canopy cover, and contains mostly large/tall treed CWHR size class 5 stands.

Within and surrounding the project area, suitable habitat was surveyed for spotted owl using the approved Region 5 survey protocol. Surveys were conducted to update roost and nest information for known PACs (established in 1990's), and survey habitat of unknown occupancy outside of the PACs. Surveys were completed in 2018, no new territories or pairs were located. Home range core areas (HRCAs) and PACs within the project area were not adjusted based on this survey information, as they were consistent with the past mapping efforts.

PACs (approximately 300 acres or greater)

There are eleven spotted owl Protected Activity Centers (PACs): ELD020, ELD023, ELD024, ELD031, ELD142, ELD143, ELD144, ELD145, ELD159, ELD167, and ELD218. Figure 1 shows the spotted owl, and goshawk PACs relative to proposed treatment units. Two additional PACs, ELD188 and ELD322, occur outside the project boundary but are immediately adjacent to the project area.

Figure 1.0 Spotted Owl and Goshawk PACs and Project Treatments



Home Range Core Area (HRCA)

The project could affect the 11-13 PACs and associated home range core areas (HRCAS). The SNFPA ROD directs that (HRCAs) be delineated surrounding and including all PACs. HRCAs are delineated by selecting the best 1,000 acres within 1½ mile radius of the activity center, including the PAC. The HRCAs were drawn to provide at least of 1,000-acres of suitable habitat within each of the HRCAs. There is substantial overlap in acreage between HRCAs, due to the dense configuration of PACs within the project area.

Cumulative Effects at the Landscape Scale

Under current management, the existing conditions and associated risks of wildfire and habitat trends in the project area would remain unchanged. There would be no increased capacity for fire suppression within the project area, and spotted owl PACs, HRCAs and other suitable habitat could suffer more intense and/or larger wildfires, than would be expected to occur with the proposed project implementation. Stands would remain untreated by forest health thinning, and habitat may be more susceptible to future insect and disease impacts, similar to the recent tree mortality event. Taking no action would, therefore, provide less protection for existing high quality habitat, and could in the longer term result in loss of habitat that might be retained with the implementation of the proposed project.

With no action, only current management practices such as fire suppression, road hazard tree and road maintenance activities, and public firewood cutting would take place in the project area. None of the fuels management, forest health, or project related road maintenance objectives described under the Proposed Action would be implemented under this alternative.

Proposed Action

Direct and Indirect Effects

The proposed action was developed to retain and protect existing CSO habitat in the project area (from wildfire, insect and disease stand impacts), while meeting the project needs related to forest health and fuels reduction. As part of this process, Protected Activity Centers (PACs), and associated Home Range Core Areas (HRCAs) were considered with the existing landscape, potential wildfire threats, best locations for suppressing wildfire, future habitat needs, and the recent draught related tree mortality which occurred in the project area.

It has been acknowledged by species experts in both the *Draft Interim Recommendations for the Management of California Spotted Owl Habitat on National Forest System Lands*, 2015 (IR2015), and *The California Spotted Owl: Current State of Knowledge,* (USDA 2017) "There is no single approach that can eliminate risk to the spotted owl population given the complex nature of the current situation: declining population trends, severe drought, fire suppressed forests, and high risks of high intensity wildfire." (IR 2015). Both documents discuss the importance of high canopy cover in medium to large treed forest types as being important for the species conservation. In light of the more recent North et. al. 2017 research, tall/large treed dense canopied habitat appears to be very important for nesting and nest stands and is used in this analysis to indicate impact to high quality habitat for spotted owls.

Effects to Suitable Habitat

Table 1.0 Acres of suitable California spotted owl habitat that would be affected by implementation of the Proposed Action

Proposed Treatment	Total Suitable Habitat pre-treatment CWHR 4M&D, 5M&D Acres	Pre-Treatment Habitat CWHR 4M, 5M, & 4D Acres	Post Treatment Habitat CWHR 4M, 5M, & 4D Acres	Pre-Treatment Habitat CWHR 5D Acres	Post Treatment Habitat CWHR 5D Acres	Change in Habitat
Commercial Harvest	2,350	2,350	2,350	0	0	Canopy closure reduction in treated stand 10-15%, but maintained at or above 50%.
Fuel Reductions and Management Strategy	2,400	1,445	1,545	955	855	100 acres reduced from 5D to 5M (dense canopy to moderate canopied large/tall tree stands).*
Road Maintenance and Reconstruction	0	0	0	0	0	0
Total Acres in treatment units	**4,750**	**3,795**	**3,895**	**955**	**855**	Retention of all habitat, with some modification as described above to canopy
Total Acres in Project Area	**9, 490**	**7,010**	**7,110**	**2,480**	**2,380**	**100 acres shift from 5D to 5M***

***- estimated fuels treatment acres move, start 70-85% canopy, reduced to 50—69% by project treatments**

The proposed action may remove recently killed trees (snags) that occur in project area. In both treatment areas, commercial thinning and the strategic fuel break treatments, the project would retain snags at or above the forest plan standard (4-6 largest snags per acre), averaged throughout the project

area. Trees over 30"dbh would be retained, and as a result, foraging habitat and roosting habitat would remain intact as the snag, down log, and canopy cover levels would remain suitable for California spotted owl. Both categories of treatments would have some impacts to canopy closure, tree densities, opening creation, which will be discussed below.

Mechanical Thinning/Commercial Harvest- As has been previously described, the commercial harvest units have been treated within the last 20 years, using mechanical thinning prescriptions, resulting in stands that retained the largest/tallest trees, but generally reduced canopy closure to an average estimated now of at 55% across the units (Young 2019). Stands range between 50-65% canopy closure presently, and have inclusions of higher canopy closure areas (≥65%).

Mechanical thinning and commercial harvest would reduce canopy cover on approximately 2, 350 acres of existing suitable spotted owl habitat (CWHR 4M, and 5M). The proposed commercial harvest would remove trees primarily from the intermediate and codominant component of the stand, and a limited number of these, which would reduce canopy closure between 0-15%, depending on the stand. Commercial treatments would result in an estimated post treatment average canopy cover of 50% averaged over units (Young 2019).

Post-harvest pile and/or understory burning may occur in these units, but due to the present semi-open stand conditions, and relatively low ground and fuel loading, little additional mortality to the remaining stand would be anticipated, and little additional impact to tree densities and canopy closure would occur. The general effect to owl habitat would be to further open the canopy, and simplify the stands. These stands would be healthier, post treatment, and may be more likely to survive insect, disease, and wildfire adverse effects in the future, retaining habitat for this species into the future.

The habitat would be expected to support foraging in both the short and longer term, but the nesting habitat potential would be relatively low, except as discussed below in retention pockets. There are areas where both large/tall trees, and denser canopy presently exists within the larger units, and these are the areas have been accounted for in the design features in the proposed action:

- Retain clumps of large trees. Clumps may vary in shape and size and range from a group of 4-5 trees up to an acre in size. In general, clumps would be located in the mid to lower slope positions. Preference will be given to clumps comprised of mixed species. Clumps would focus on trees exhibiting characteristics such as multi-top especially in firs and cedars, trees provide nesting structure, large snag inclusions, cavities, and other signs of use by wildlife.

- Within CSO Home Range Core Areas (HRCAs), and in areas identified as high quality habitat and having potential as future nesting sites for CSO, the management focus will be on retaining areas with highest density of tall trees and denser canopy cover. These areas generally will occur in forest patches >2 acres in size dominated by large trees (generally greater than 150 ft. tall) and having >55% canopy cover. Within the project area these areas are generally located on north facing slopes and in riparian conservation areas. Commercial harvest in these areas will be limited to removing trees acting as ladder fuels. Retention areas will focus on clumps of large trees and key features used by CSO as stated in above bullet.

These design features would retain important CSO habitat for future nesting/roosting habitat. Due to the past treatments in the units, there are limited places in the proposed units where this habitat presently exist. These retention areas would be surrounded, post treatment by habitat that remains suitable for

foraging habitat, retains the majority of the large/tall tree component, and retains canopy closure at 50% averaged over the treatment units. These retention areas should be less susceptible to both adverse wildfire effect, and may also benefit from some of the stand health benefits that the treated acres surrounding them are expected to demonstrate.

Canopy cover would rise in treatment units over the next 10-15 years, and these acres would be expected to return to 55-65% canopy cover within 20 years. As the reductions in canopy cover would not take place within PACs, and given the density of high-cover habitat within the PACs, the increased heterogeneity, diversity of structure and openings may provide improved foraging habitat within the affected HRCA's. Further discussion of impacts more specifically to both PACs and HRCAs follows this discussion. The creation of, or enlargement of openings, small and scattered across the treatment units/project area (≤ .25 acres) proposed in this alternative would add heterogeneity to the habitat for this species, and my increase prey numbers and thus benefit the CSO.

The commercial thinning would have a limited effect on the quality of future spotted owl habitat and length of time required for its establishment. North et al. (2000) found that stands with high foraging use by northern spotted owls typically included many 'legacies' (large trees and snags) that survived a fire or windstorm that destroyed much of the previous stand. In more recent research North et al (2017) related to canopy closure, tree height, and owl use, indicates that tall trees, which are essentially the same as large diameter trees, may be of greater importance than dense canopy, especially the further from the nest stand one goes. Another take away is that smaller diameter/shorter tree height, dense canopied stands may not be as important to spotted owls as moderate canopied, large/tall treed stands, outside of nest/roost stands. Blakey et al (2019) indicates that both moderate to dense canopy, and large/tall tree habitat is selected for. The proposed treatment would primarily remove the intermediate and a few codominant trees, leaving behind most of the larger/taller and older trees to provide for future legacy habitat structure. Remaining green trees in the project area would be a valuable resource for spotted owls, since they would provide the supply of large decadent trees and snags within the forested habitat into the future.

Fuel Reductions and Management Strategy- Approximately 2,400 acres of the proposed fuel treatment areas overlap existing suitable habitat. Approximately 955 acres of this area currently has dense canopied, CWHR size class 5D (dense canopied, large/tall treed habitat) which is most likely to be selected for nesting and nest stands by the owl. Much of this habitat is within PACs, which has not been treated to any large extent for over 20 years. Impacts to PACs and HRCAs, will be further discussed later in this analysis. The remaining 1,445 acres is a mix of small sized trees (CWHFR size 4) both dense and moderate canopy cover, and moderate canopy cover size class 5 stands (CWHR 4M, 4D, and 5M).

The fuel treatments may use a variety of tools, ranging from mechanical treatments, hand treatment, and prescribed burning but the desired conditions, regardless of the tool used are the same. These areas would see a reduction in small trees, some simplification of canopy structure, and the changes would move treated areas towards a vegetation type of lower fuel volume, flame height, and flammability. Along the key roads and ridges areas would be treated more heavily, harvesting trees up to 30 inch dbh immediately adjacent to roads and up to 18 inch dbh within 200 feet of the roads and similar at key staging areas. Outside of the road corridor treatments thinning in preparation for burning would be limited to ≤ 12 inch dbh within PACs, as necessary, and rearrangement of fuels through piling, chipping and hand treatment, these activities are not expected to affect habitat quality or quantity. These areas are

planned to be used and maintain as fuel break, and for emergency evacuation, and swifter, safer deployment of suppression resources, in the event of a wildfire.

Generally, where prescribed burning occurs, mortality to large/tall overstory trees is expected to be minimal 5-15%. Where this moves habitat from a dense canopied large treed stand to moderate canopy closure, there would be reduction in habitat quality, but the overall quantity of habitat is expected to remain essentially the same. An estimate of ≤ 5% of the total suitable habitat to be treated area may fall into this category, and is accounted for in Table 1 above, showing a move of an estimated 100 acres from dense canopied habitat, into the moderate canopied habitat categories. These would be the areas, which are few, where current canopy levels are in the 70-85% class presently, and see the upper end, 15% of the over story mortality affected by the burning.

Lower mortality in the over story trees is designed for within PACs and discussed in the PAC analysis later. It is expected that there would be some areas of small scale torching and pockets of mortality, these areas would be scattered through the burned areas, and are not expected to exceed 1-2 acres in size, and not more that 5% of any treatment unit. These areas, similar to the openings discussed in the commercial harvest discussion, would not greatly change habitat quality as they would be small enough to provide some diversity but not eliminate habitat from suitability to any large extent. Where the openings are on the larger end of the spectrum, ½ acre to 2 acres in size, the localized effect at these locations would reduce potential for foraging/roosting, and these large openings are not expected to exceed 50 acres total across the project area. Given the small size and scattered nature would not be expected to remove habitat acreage from owl suitability.

Depending on the tools used for maintenance treatments, maintenance would occur at varying intervals. Hand treatments and mechanical treatments would require re-entry every 3-5 years, and prescribed burning would be required twice in a 10 year period. These treatments would have little to no impact on habitat for the spotted owl in the short term, but reintroduction of fire into the area could benefit the species and habitat over time. Providing small scale heterogeity, increase prey numbers, and healthier more vigorous trees.

The fuel break/road corridor treatments would target snags for removal, where they compromise the fuel break integrity, are a hazard to road use and firefighter safety. In addition the proposed targeted removal of recently killed trees (snags), may further reduce snag numbers within the fuel break/road corridor units. These reductions would reduce habitat quality within the fuel break units, but as these areas tend to be of lower quality, ridges and road sides, and snags would be retained averaged across the project area at or above forest standard, which be expected to maintain habitat suitability across the project area.

In summary, these strategic fuel treatments, both initial treatments and follow up treatments, would have limited impacts to canopy cover, and large tree habitat elements, snags, would maintain habitat quality for spotted owls near its current capability, and provide for better protection and possibly longer-term retention of high-quality spotted owl habitat.

Road Maintenance and Reconstruction/Armstrong Camera Thinning- These activities would have no impact on spotted owl suitable habitat, as the areas proposed for maintenance and reconstruction and temporary road construction do not provide suitable habitat for this species. The No Effect determination is appropriate for all scales of analysis for this alternative, and will not be revisited at each scale.

Effects on Spotted Owl PACs

Project design, and Design Criteria applicable to the PACs were designed to reduce potential impacts and facilitate achieving project desired conditions are described in the Proposed Action (Pages 7-20).

These design criteria would limit canopy cover changes, impacts to down logs, snags, reduce impacts to nests and nest stands, and large trees. The limited operation period LOP, applied to both commercial treatments and fuels treatments, and other design criteria would make impacts to spotted owl reproduction unlikely for the known territorial owls, and due to the surveys and density of PACs, it is unlikely that there are more spotted owl pairs within the project area which would be impacted. The limited operating period (LOP), described in the design features, would eliminate the potential disturbance to reproducing owls, reducing potential disturbance to temporary displacement of individuals outside of LOP's.

Mechanical Thinning/Commercial Harvest - No commercial harvest units overlap spotted owl PACs, so no direct habitat impacts to the PACs would occur, and the LOP design criteria would eliminate potential for nesting/reproductive disturbance, no direct impacts would result to PACs from the harvest. Indirect impacts of the harvest have been capture above in the suitable habitat discussion at the project level and at the HRCA scale for this project later in this section.

Where these treatments retain habitat through time adjacent to PACs they would be beneficial to long term occupancy of the PACs.

Fuel Reductions and Management Strategy- Treatments would facilitate prescribed burning, reduce stand mortality effects from both prescribed and wildland fire, and would be expected to improve efficiency of suppression of wildfires. Effective management of prescribed fire and wildfire may help reduce loss of or damage to key CSO and northern goshawk habitat. PACs were selected for treatment based on necessity to ensure the overall effectiveness of the landscape fire and fuel strategy.

Approximately 1,430 acres of fuel break treatments overlap suitable habitat within PACs in the project area. Of these, approximately 750 acres are highly suitable habitat (CWHR size class 5, dense canopy cover) with 680 acres being moderate-quality habitat (CWHR 4M and 4D), less than 30 acres of which is 4M. Table 1.1 below breaks the habitat down by PAC ID, and shows best results of latest survey effort by PAC.

Table 1.1 Acres of existing California spotted owl PACs, habitat in PACS that could be affected by the Proposed Action Fuel Treatments habitat, and recent survey results,

PAC ID	Suitable habitat, pre-treatment CWHR 4M&D, 5M&D Acres	CWHR 4M, 4D, and 5M Acres	CWHR 5D Acres	Best Recent PAC Status Status/Year
ELD020	140	65	75	Resident Single/2018
ELD023	17	11	6	Pair Status/2018
ELD024	74	58	16	Pair Status/2018
ELD031	46	28	18	Species Detected/ 2017 No Detections/ 2018
ELD142	215	70	145	Resident Single/2017
ELD143	295	40	255	Reproductive Pair/2018
ELD144	170	85	85	Resident Single/2018
ELD145	93	61	32	Reproductive Pair/2016
ELD159	<2	<2	0	No Detections/2017 and 2018
ELD167	225	135	90	Reproductive Pair/2017
ELD218	155	125	30	Reproductive Pair/2017

The design of the project, and terrestrial wildlife design criteria would limit canopy cover changes, impacts to down logs, snags, impacts to nests and nest stands, and large trees, and the size and amount of openings created. Generally habitat is not expected to be altered, with the design features in place, within PACs to an extent that would change habitat quality or quantity, and affect future occupancy. The effects are further discussed based on the treatment below.

The limited operating period (LOP), described in the design features, would eliminate the potential disturbance to reproducing owls, reducing potential disturbance to temporary displacement of individuals outside of LOP's.

Road Corridor Treatments

The areas within PACs that would see greatest alteration would the road corridor fuels treatments. With the area immediately adjacent (35ft centerline) to the roads having the greatest reduction in both canopy closure, due to more and larger trees being removed, up to 30 inch dbh. This would likely affect about 15 feet of the stand as 10 feet or a little more is already road or shoulder. These impacts would have little effect on the PACs overall capability as the strip is narrow, and due to the proximity to these highly used road, see less use for foraging and daytime roosting, and are usually not selected for nesting due to the baseline disturbance levels. The remainder of the 200 treatment area (300 feet from key OHV staging areas) would be limited in the canopy change, as trees and ladder fuels would only be removed up to 18 inches in diameter, and completely coming from the suppressed on intermediate tree classes of the stand, which contribute very little to canopy closure. These treatments are also likely to be graduated, with more treatment closer to the road, and less treatment as the interior of the corridor is approached.

Snags and hazard trees would be removed in these area, to make them safe for both operations and use as fuel breaks and evacuation routes. As stated above due to the proximity to the road, this habitat is of lower value than the interior habitat of the PAC, and the expectation is that the PAC would still contain in excess of the forest standard of the 4 largest snags per acre, averaged over the PAC.

Prescribed Burning

Due to the proposed fuels treatments and prescribed burning included in the fuels management strategy for this project falling in WUI, both hand, and mechanical treatments are allowed to occur under the forest plan. One of the goals of the project is to protect existing and future PACs and habitat from wildfire by using prescribed burning. To facilitate this activity it will be necessary to conduct either, or both hand and mechanical work to reduce some of the ladder/understory fuels in PACs before prescribed fire can be safely implemented. The design criteria for PAC Fuel Reduction Treatments:

Where possible, mechanical treatments would occur in lower quality habitat inclusions in the PAC (ridge tops, lava caps, small diameter dominated treed stands, plantations).

The district wildlife biologist would be involved in the burn planning, and notified prior to implementation of the prescribed burning and fuel reduction treatments in PACs. When possible, the biologist and/or staff would be onsite to take part in, and/or monitor burning and associated effects.

Prescribed burning would be undertaken in relatively small proportion of the PACs within the project area. No more than two PACs within the Scottiago project area would be burned in a 12 month period. Burning would avoid direct impacts to known nest stands by either not burning through them, or clearing material from around known nest and roost trees and other trees/snags > 30" dbh in the nest stands.

Fuel reduction treatments would be designed to ensure retention of highly suitable habitat (less than 5-10% change in canopy closure within treated area inclusive of all treatments) by reducing ladder fuels 12" dbh and smaller.

Mechanical rearranging of existing fuels in the PACs (mastication, chipping, piling) would only occur within relatively short distances from roads and property lines (200 feet or less).

Additional hand treatments, including handline construction, tree pruning, and cutting of small trees (less than 6 inches dbh), may be conducted within a 1 to 2 acre area surrounding known nest trees, to the extent necessary, to protect nest trees and trees in their immediate vicinity.

These were designed to:

- Maintain canopy closure at or above 90% of starting canopy closure (pre-treatment of any kind),
- Outside of 35' treatment on roads listed above in the "'Fuel Reductions and Management Strategy", retain large trees (>=24" dbh) near current levels (less than 5% reduction numerically across treatment area),
- Retain snags (≥15" dbh) during burn preparation, except where they pose a threat to human health and safety, or perimeter control risk for containment of the fire, and will not be actively lit during burning operations,
- Retain downed logs greater than 30" diameter (large end) by not be actively lighting during implementation of the burn, and
- Result in small openings (generally ≤ 1/4-1/2 acre in size), with the total area of openings created less than 5% of treated area. There may be instances where larger openings are created, but these should be limited in both number and size (openings over and acre in size are not desirable in PACs.

As there would be little change in canopy closure, large tree numbers, snags and logs would be retained to a large extent, and openings created would small in size, number and percentage of the PACs, prescribed fire and associated treatments would have little short term impact on habitat capability and would pay longer term benefits.

The effect of these treatments, when combined with the road corridor treatments would retain habitat suitability, minimize impacts to reproduction and the local spotted owl population from disturbance and habitat alteration, and maintain and protect the existing PACs now and into the future. The reintroduction of fire into these areas may improve prey habitat, and reduce the potential future loss of these areas to stand replacing wildfire. Suppression of wildfires should be faster, and safer for firefighters. This would be expected to translate to the amount of habitat (especially PACs) burned being lower in both impact and size than without treatment. Which would aid in maintaining the local owl population and contribute to conserving the species. Initial and follow up strategic fuel break treatments, both initial treatments, and follow up treatments would have limited impacts to canopy cover and large tree habitat elements, and would maintain habitat quality for spotted owls near its current capability while protecting PACs from future potential loss to severe fire.

Home Range Core Areas (HRCAs)

Commercial Thinning- The commercial thinning that would occur within the HRCAs, and effects of this thinning have been described earlier for the commercial thinning effects to habitat as a whole. These affects, and the amount of habitat affected in HRCAs is more directly accounted for here, in relation to the HRCAs. The HRCAs would be treated by the commercial mechanical thinning over a total of approximately 1,540 acres (out of the approximately 3,000 acres of commercial harvest units) of 50-65% canopy closure habitat, within HRCAs would be treated by the project. Of this total habitat affected, approximately 200 acres is CWHR size class 5M habitat, with the remainder being size class 4M. Due to the relatively recent thinning (last 20 years) previously discussed in these units, canopy closure was reduced from the denser 70% and greater untreated state, but stands retained the large/tall tree component. The size class 5 stands provide higher quality habitat, and are most likely to produce future nesting habitat for spotted owl in the next 10-30 years, as they have retained the larger/taller trees, and have inclusions of dense canopies, smaller scale stands within them (1-3 acres in size). These areas would be retained for future nesting habitat under the proposed action, and due to proximity to existing PACs, may be more likely to be colonized, should the current nest or nest stand be lost to a fire, insect attack, or disease. The surrounding habitat as well as the size class 4 stands within units, would see canopy reduced from its present state 50-65% average across the units, to 50% or slightly above, averaged over the treatment unit. This should retain this habitat as foraging habitat, and potentially for nesting habitat at a later date.

Table 1.2 below gives a breakdown, by individual HRCA of the habitat that would be affected by the commercial thinning units. It is important to note that there is a large amount of overlap from HRCA to HRCA, and the numbers in the table cannot be added to reach the 1,540 acres of total HRCA suitable habitat that would be impacted by this treatment. There would be a conversion from medium to large/tall treed, medium canopy cover class ≥50<70% habitat to the same size class medium 50-60% canopy cover habitat ranging from 0-650 acres (0-65% of suitable HRCA habitat), within HRCAs, depending on which PAC home range is looked at, see Table 1.2. HRCA ELD024 and ELD145 would see the greatest modification of the HRCA at 65%-67% respectively of the suitable habitat being affected. The remaining HRCAs would see less than 33% of the HRCA affected. The habitat effected would remain suitable, and where there canopy and size class allow in accordance with the project design, the retention of future nesting habitat in ≥ 2 acre stands should provide future nesting habitat and continue to provide foraging/roosting habitat.

Table 1.2 Acres of existing designated California spotted owl habitat at the Home Range Scale that would be affected by Commercial Treatments

PAC ID/HRCA ID	Suitable habitat, pre-treatment[1] Acres	Size class 4M Acres	Size Class 5M Acres	% of 1,000 acres suitable habitat w/ in HRCA Proposed for Treatment
ELD020	175	154	21	18%
ELD023	180	169	11	18%
ELD024	650	565	85	65%
ELD031	233	217	6	23%
ELD142	222	209	13	22%
ELD143	211	193	18	21%
ELD144	153	144	9	15%
ELD145	67	57	10	67%
ELD159	17	17	0	17%
ELD167	300	283	17	30%
ELD218	315	285	30	32%
ELD188	0	0	0	0%
ELD322	38	32	6	4%

[1] Suitable habitat CWHR 4M&4D, 5M&5D, however in commercial units only CWHR Size class 4M and 5M currently exist, as these areas have been previously treated, there are only scattered small sized patches that contain dense canopy within moderate canopied units.

The proposed commercial harvest is expected to create or expand existing openings, small in size 1/4 acre or smaller, scattered throughout the treatment area, dictated by releasing oaks through conifer harvest and where openings occur presently. As these openings would not be created in the PACs, nest stands, and are small in size and scattered, they would not be expected to adversely affect habitat quality for spotted owls, and may improve prey habitat capability and therefore availability to spotted owls foraging in the HRCAs. Where the treatments improve forest health, and with the retention of large tree clumps and high quality patches of CSO habitat (future nesting habitat), these treatments should protect the existing HRCA habitat, and contribute to the retention of PAC occupation and reproduction through time

Fuel Reductions and Management Strategy

The effects to habitat for the fuel reduction treatments were described in the PAC discussion and would be essentially the same in the HRCA. The slight differences for the portion of the HCRA outside of the PAC will be discussed in this section. The HRCAs would be impacted by the fuels management strategy over a total of approximately 1,540 acres (out of the approximately 3,000 acres of fuels treatment units). Of the 1,540 acres of habitat within HRCAs and treatment units, approximately 935 acres falls into high quality nesting habitat (CWHR 5D) much of which is within the embedded PACs, and the balance 1,100 acres falling into moderate capability (CWHR 4M&D, and 5M) habitat. Table 1.3 below shows how much habitat is potentially affected by HRCA.

Table 1.3 below gives a breakdown, by individual HRCA of the habitat that would be affected by the fuels treatments. As has previously been discussed there is a large amount of overlap from HRCA to HRCA, and the numbers in the table cannot be added to reach the previously stated 1,540 acres of total HRCA suitable habitat that would be impacted by this treatment. There would treatment of suitable habitat within HRCAs ranging from 0-565 acres (0-57% of suitable HRCA habitat), within HRCAs, depending on which PAC home range is looked at, see Table 1.5. HRCA ELD143 and ELD144 would see the greatest modification of the HRCA at 43%-57% respectively of the suitable habitat being affected.

The habitat effected would generally remain suitable, with HRCAs having identical effects within the embedded PACs, and similar impacts from the treatments outside of the PACs within HRCA boundaries. There would be an allowance for a bit higher mortality in the over story, an averaged 15% or less in areas outside of PACs, but within the HRCA as compared to the 5-10% or less within the PACs. As previously described there is an estimated 100 acres of habitat some of which will likely fall into a number of HRCAs, which would move from dense canopied habitat into a moderate canopied class, where reductions at the upper end of the over story reduce canopy in border line 70-85% canopy closure stands. As described these reductions are not expected to greatly influence habitat quantity or quality enough to effect HRCAs, or associated PAC occupancy or reproduction.

Table 1.3 Acres of existing California spotted owl habitat within HRCAs that would be affected by Fuels Reduction treatments

PAC ID/HRCA ID	Suitable habitat, pre-treatment Acres	CWHR Size Class 4M, 4D and 5M Acres	CWHR Size Class 5D Acres	% of 1,000 acres suitable habitat w/ in HRCA Proposed for Treatment
ELD020	445	193	252	45%
ELD023	265	102	163	27%
ELD024	160	136	24	16%
ELD031	330	164	166	33%
ELD142	365	130	235	37%
ELD143	565	227	378	57%
ELD144	430	265	165	43%
ELD145	375	215	160	38%
ELD159	110	101	9	11%
ELD167	360	251	109	36%
ELD218	400	280	120	40%
ELD188	0	0	0	0
ELD322	<1	<1	0	<.1%

Initial and follow up strategic fuel break treatments would have limited impacts to canopy cover and large tree habitat elements, and would maintain habitat quality for California spotted owls near its current levels. The proposed fuel treatments would maintain the existing habitat suitability while enhancing the resilience of the stands to wildfire, and result in faster more efficient suppression efforts which should translate into better retention of habitat quality at the home range scale through time, by reducing fire size when ignitions occur. As these treatments would not substantially impact canopy cover 0-15% reduction, very little habitat would not be expected move from the ≥70% canopy cover class to the ≥50-69% canopy cover class as the vast majority of these dense canopied stands are on the upper end of the canopy range 85-100% presently, as they have not seen recent thinning or other treatments. The exception to this would be the openings that may be created 1/4-1/2 acre in size, but the scattered nature of these and small size should have little detrimental effect to habitat, and provide benefits through prey availability and small scale habitat diversity.

The effect of these treatments, when combined with the road corridor treatments would retain habitat suitability, minimize impacts to reproduction and the local spotted owl population from disturbance and habitat alteration, and maintain and protect the existing HRCAs now and into the future. The reintroduction of fire into these areas may improve prey habitat, making the outer portions of the HRCA more valuable to the spotted owls associated with a given PAC/HRCA and reduce the potential future loss of these areas to stand replacing wildfire.

Suppression of wildfires should be faster, and safer for firefighters. This would be expected to translate to the amount of habitat (including HRCAs) burned being lower in both impact and size than without treatment. Which would aid in maintaining the local owl population and contribute to conserving the species. Initial and follow up strategic fuel break treatments, both initial treatments, and follow up treatments would have limited impacts to canopy cover and large tree habitat elements, and would maintain habitat quality for spotted owls near its current capability while protecting HRCAs from future potential loss to severe fire, and providing potential for future nesting in areas of the HRCAs outside of present and historical nesting locations.

Cumulative Effects and Landscape Scale Analysis

The geographic scope, described below, of the cumulative effects analysis was selected considering the affects to the local spotted owl population (affected HRCAs and PACs), and landscape view for the potentially affected local population. This analysis is intended to provide an evaluation of the project's cumulative effects upon the owl PACs, and Home Range Areas (designated habitat)/HRCAs most likely to see effects, and the suitable habitat near them through changes to habitat capability and dispersal capabilities of spotted owls within and adjacent to the project area.

This cumulative effects analysis 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 spotted owl habitat within the proposed treatment area, and associated Home Range Area designated habitat/HRCAs which have been analyzed for direct or indirect effects from proposed units across the project area. The eleven spotted owl Protected Activity Centers (PACs) within the project area: ELD020, ELD023, ELD024, ELD031, ELD142, ELD143, ELD144, ELD145, ELD159, ELD167, and ELD218.

Two additional PACs, ELD188 and ELD322, occur outside the project boundary but are immediately adjacent to the project area and are consider for cumulative effects analysis.

This equates to approximately 15,150 acres, including both Federal and privately owned lands, includes recorded treatments which have affected habitat going back to records from 1951 to the present and foreseeable future.

Within the cumulative effects area, wildfire, timber harvest, fuels treatments, and hazard tree removal projects have altered the quantity and quality of spotted owl habitat within and adjacent to the project area (Table 1.4). These impacts have resulted in the current condition of the cumulative effects area, as has been described for effects to habitat, PACs and HRCAs.

Effects Table 1.4 Relevant Past, Present and Reasonably Foreseeable Actions within the Panther Fuels Reduction and Forest Health spotted owl cumulative analysis area.

Past Actions
- Forest Service: Timber harvest/Stewardship Projects, and prescribed burning: • **Lower Middle Fork Timber Sale, Tie Die Timber Sale, Sopiago Timber Sale, Simpson Timber Sale, Scott Creek Fuels Reduction Project, and Gold Fingers Timber Sale** • **Fuels burning and prescribed burning associated with the previously listed projects** • **Omo Ranch Fuel Break periodic burning and maintenance** • **Salvage logging late 1980's early 1990's** • **Regeneration Harvest, including group select/clearcuts and seed tree/shelterwood harvests (1970s)** • **Road hazard tree removal (past, ongoing and planned including the Scottiago Hazard Tree Abatement decision, and Forest Wide Road Hazard Tree decision).** • **Various Reforestation Treatments (pre-commercial thinning etc…)** **Private Lands** • **Commercial Timber Harvest** • **Thinning** • **Reforestation Treatments** **Other Activities:** • **Road construction/maintenance** • **Recreation (dispersed recreation, camping, OHV use, firewood removal, etc.)**

• **Grazing**
Present Actions:
• **Road construction/maintenance** • **Recreation (dispersed recreation, camping, OHV use, firewood removal, etc.)** • **Grazing**
Foreseeable Future Actions:
• **Commercial, and Non-Commercial hazard tree and fuels treatments (associated with the recent tree mortality event, Scottiago Hazard Abatement decision)**

The intensity of impacts were estimated from the USDA Forest Service existing vegetation data (2008) and the FACTS database, which record spatial and disturbance type data for activities on the Eldorado National Forest, and the Calfire (formerly California Department of Forestry) Timber Harvest Plan GIS database located at ***http://www.fire.ca.gov/resource_mgt/resource_mgt_forestpractice_gis.php***.

Past and future activity in the analysis area have/will have resulted in approximately 4,270 acres, about 28%, of the 15,150 acre cumulative effects analysis area being highly impacted beyond what is proposed here. Approximately 820 acres of high impact habitat alteration (long term reductions , up to 30 year plus duration of effects, or loss of habitat capability) affecting approximately 5% of the analysis area; 2,670 acres of moderate alteration treatments (10-15 years of effects), usually reductions in habitat capability, but not loss of suitable habitat affecting approximately18% of the analysis area; and 80 acres low (1-10 years of effects, may or may not reduce habitat capability slightly) affecting approximately <1% of the analysis area.

The proposed action would result in approximately 2,400 acres of low-impact habitat alteration, or an additional 16 % added cumulative impact from the fuel treatments. The mechanical/commercial thinning would normally be characterized as moderate habitat alteration of approximately 2,350 acres. However, as the habitat in being discussed has previously been treated and is accounted for above in the past treatment acreage, for this analysis it is realistically an additional impact to already moderately-impacted habitat. For this reason no additional acreage of impact to cumulative effects is counted here as the area is already accounted for at a greater modification level than would occur under this entry, and as discussed the treatment would retain the current moderate capability habitat levels for this commercially thinned treatment on these acres.

The majority of the past and foreseeable future alterations have been moderate to low in impact, and have/would generally reduce some of the nesting/roosting (high quality) habitat, but retain foraging

(moderate quality) habitat for spotted owl, at a minimum. Much of the remaining area would remain suitable for spotted owls over time, barring a large scale natural or man caused event such as: wildfire, or wide spread insect and disease events.

As time passes, early treatments in the analysis area tend to have less of an effect, depending on the type of treatment. The proposed action contributes to these cumulative effects, mainly through reductions of in canopy cover by adding approximately a 16% increase in treated area, the fuel treatments, in areas not recently treated. The road maintenance activities would result in little to no habitat alteration, they would not contribute to cumulative effects for this species. The above combined with the commercial thinning treatments which were designed outside of PACs, and are within areas that have previously been treated, and considering recent research on California spotted owls and habitat use, and given design criteria to minimize impacts from the treatments, cumulative effects associated with this project are not expected to reduce the number of spotted owls that can be supported in the analysis area and are likely to increase long-term sustainability of owl habitat through increased resilience to both wildfire and insect and disease.

Based on current trends in habitat and climate, without treatment habitat is at great risk to wildfire, Stephens et al (2016), estimated that within 75 years, the cumulative amount of nesting habitat burned by wildfire, at resulting in high tree mortality, could exceed the total existing habitat. To the degree that this alternative increases fire resiliency, improves stand (habitat) health, and protects PACs, Home Range/HRCAs, and suitable habitat from future wildfire impacts, when considered with other present and foreseeable projects, the activities may increase the amount of habitat that remains available to spotted owls in the long-term. A review of forest data indicates that spotted owl PACs are currently well distributed across the cumulative effects analysis area, and the Amador Ranger District, without evidence of population or habitat gaps, and should continue to be into the foreseeable future.

Effects Summary

The proposed action, and specifically the fuels treatment units would reduce 100 acres of higher quality (CWHR 4D &5D) habitat to moderate capability habitat primarily through canopy cover reductions. Commercial treatment units would see a 0-15% reduction in canopy cover, but would retain canopy cover at level that would sustain foraging habitat (≥ 50% canopy cover) where it currently exists. Based on the existing canopy cover within the commercial harvest units (50-65%), the fact that no commercial treatment units fall within the PACs, and the relatively small reduction in existing canopy cover, the commercial harvest treatment would not be expected to greatly impact either the untreated PACs, or HRCAs and local owl population.

The forest health treatments (commercial thinning) should reduce potential for large scale reductions in habitat quantity and quality for spotted owl, and retain key legacy features such as: large trees, snags, and downed logs. The retention of the 2 acre plus nest stand habitat in the commercial treatments, should provide for future nesting habitat for the species in a stand that will have a better chance of persisting intact due to the forest health treatments.

Treatments in PACs are limited to fuel reduction treatments, would retain 90% of existing canopy cover, limited impacts to overstory (large/tall tree) 5%-10% or less, and retain most of the snags and logs (no active lighting, or removal beyond safety concerns.

Project generated disturbance effects would be low, would be reduced by design criteria, and are expected to affect individuals, but not long term reproduction potential.

The proposed removal of recently killed snags is not expected to change habitat suitability for this species, as snag retention will be maintained on average across the project area, and no snags would be removed from the PACs.

The potential opening generation by both the commercial treatments and fuel treatments are expected to be small in size and scattered, may improve overall habitat quality by increasing small scale heterogeneity, increasing prey availability, and forest resilience.

Wild fire is a known threat to spotted owl habitat, and without some pro-active treatments could be greatly reduced in extent in this next 75-100 years (Stephens et. al. 2016). Implementation of this project would reduce the likelihood of a large scale, high-intensity wildfire within the project area, would allow more efficient suppression should fire occur within California spotted owl habitat, and would increase the likelihood that the high-quality habitat would persist given a wildfire event.

Existing past and foreseeable future modification of habitat are not expected to reduce the local California spotted owl population. The project would be expected to provide protection of existing suitable habitat from stand replacing wildfires, by reducing the size of high mortality patches, and providing for faster suppression of fires should they start, by reducing fire behavior and allowing safer access by fire suppression personnel.

Determination

The Proposed Action, may affect/impact individual California spotted owls but is not likely to result in trend toward Federal listing or loss of species viability.

NORTHERN GOSHAWK

Current Condition

The northern goshawk is designated as a sensitive species for the ENF. The most up-to-date and comprehensive information regarding the status and biology of northern goshawk is summarized in the SNFP FEIS and is incorporated by reference (USDA 2001b:Vol.3, Ch.3, part 4.4, pages 113-124). Northern goshawks occur in forested habitats throughout the northern hemisphere (USDA 2001b). It is estimated that there are around 600 known goshawk territories on National Forest System lands in the Sierra Nevada, with about 70 territories occurring on the ENF (USDA 2001b). The territories appear to be well distributed across the Sierra; however occupancy of many territories is unknown. The known goshawk sites appear to be fairly well distributed across the Forest, between 4,000 and 7,000 feet in elevation. The population trend in the Sierra is unknown due to the lack of wide-spread demography studies for this species (USDA 2001b).

Goshawks utilize mixed conifer, ponderosa pine, red fir, subalpine conifer, lodgepole pine, montane riparian and montane hardwood vegetation types on the ENF. Suitable nesting habitat generally includes over story trees greater than 24 inches dbh with a canopy closure greater than 60 percent on gentle north to east facing slopes. Keane (1999) found that in the Lake Tahoe region, goshawk nest sites had greater numbers of large live trees (greater than 40" dbh) and canopy cover (70 percent), and lower numbers of shrub/sapling cover and small live trees (less than 12 inches dbh) than in random plots in the area (Keane 1999 In USDA 2001b). Goshawks tend to build multiple nests within a given area, and may alternate between these sites from year to year. Habitat patches surrounding nest locations are known to range from 25 to 250 acres in size, therefore, the SNFP recommended a 200-acre PAC around all known goshawk sites (Fowler 1988, Woodbridge and Detrich 1994, USDA 2001b). The northern goshawk breeding cycle extends from mid-February through mid-September on the ENF.

Suitable Habitat

Suitable habitat for northern goshawk overlap with suitable habitat for California spotted owl when nesting and foraging habitat is combined; nesting habitat for goshawk is more inclusive of vegetation types but generally the analysis of habitat effects are very similar to the spotted owl effects analysis. Suitable habitat has been mapped for northern goshawk on the forest, based on California Wildlife Habitat Relations (CWHR) types 4M, 4D, 5 M and 5D representing vegetation which is believed to provide suitable foraging and nesting habitat. Key habitat is designated as northern goshawk protected activity centers (PACs) which include the best 200 acres of suitable habitat surrounding a known goshawk activity centers, and habitat with highest nesting habitat capability (CWHR type 5D). Surveys were completed 2018, and goshawk PACs were reviewed and revised based on these surveys and other habitat analysis.

There are approximately 9, 490 acres of habitat which meets these criteria within project area. Approximately 2,480 acres of what is considered moderate to high quality nesting habitat (CWHR size class 4 or greater and ≥ 70% canopy cover) and an additional 7,010 acres of suitable habitat (CWHR size class 4 or greater and 50-69% canopy cover). The Scottiago FHFR project area is somewhat different than previous project on the district in that, in the last 20 years much of the area that is not within either CSO PACs or northern goshawk PACs has been commercially thinned, retaining, and speeding growth of the large/tall tree components of the stands, and reducing canopy closure within these treated areas to an average of 55% canopy cover. This is in contrast to the PACs which contain

habitat that ranges more commonly between 70-100% canopy cover. This is the essentially the same habitat which was previously analyzed for the spotted owl.

PACs

There are five goshawk Protected Activity Centers (PACs), G37-01, G37-02, G37-07, G37-08, and G38-01 (Figure 1.0), within the project area and potentially directly affected by this projects. Under current management, the existing conditions and associated risks of wildfire, and habitat trends in the project area would remain unchanged. There would be no increased capacity for fire suppression within the project area, and the existing goshawk PACs and other habitat could suffer more intense and larger wildfires, than would be expected to occur with the proposed action. Taking no action would therefore provide less protection for existing high quality habitat, and could in the longer term result in loss of habitat that might be retained with the implementation of the proposed action.

Proposed Action

Suitable habitat for norther goshawk and spotted owl overlap, with differences being, what is believed to be high quality nesting habitat for both species. Nesting habitat for northern goshawk is more inclusive of vegetation types that are less likely to be used for nesting by spotted owl. The total suitable habitat, nesting and foraging habitat combined, is the same, and the effects from treatment would have very similar effects to those described for the spotted owl. Discussion of these effects will sumarize these similar effects.

The proposed action effects are essentially the same for goshawk and spotted owl, some further reduction canopy closure reductions, small opening creation/enlargement for both commercial thinning treatments, and fuel treatments. Snags would also be affected as previously described, some by harvest of recent mortality (commercial thinning) and others as hazards to roads and fuel break development and prescribed burning. See table 1.0, spotted owl section for tabular display of impacts to habitat.

Direct and Indirect Effects

Mechanical Thinning/Commercial Harvest- Mechanical thinning and commercial harvest would reduce canopy cover of approximately 2,350 acres of existing suitable goshawk habitat (CWHR 4/5 $\geq$ 50% cc $\leq$ 65% cc), resulting in an estimated average canopy cover of 50% (Young 2019). As previously described these treatment units would see a 0-15% decrease in canopy cover from the treatments, and removal of intermediate and codominant trees. This is a second entry into these areas, which is why the canopy cover is fairly uniformly moderate, and there are few suppressed trees to be removed. These reductions would not take place within the nest stands or PACs, and goshawks may use more open canopy for nesting and are more efficient at foraging within stands that are of moderate density. The treatment units would remain suitable for foraging and where 4M and 5M stands remain, there would likely be some potential for the species to nest in some areas and set up territories going forward.

Where small of opening creation/enlargement occurs, they would add heterogeneity to the habitat for this species, and may increase prey numbers and benefit the species. This structure could improve

foraging efficiency, and potentially longer term heterogeneity of the stands, and forest resilience, all beneficial to Northern goshawk.

Snags would remain at or above forest stands, 4 largest per acre, averaged over the unit. The removal of some of the recent insect related mortality would not result in a quality change to goshawk habitat with the retention standards in place.

The commercial thinning would have a limited effect on the quality of future goshawk habitat, and length of time required for its establishment. Remaining green trees in the project area are a valuable resource for goshawk, since they will provide the future supply of large decadent trees and snags within the forested habitat into the future. This project would primarily remove and reduce the intermediate and some codominant trees, leaving behind most of the larger and older trees to provide for future legacy habitat structure.

Fuel Treatments- Approximately 2,400 acres of the proposed fuel treatment areas overlap existing suitable habitat. Approximately 955 acres of this area currently has dense canopied, CWHR size class 5 (dense canopied, large/tall treed habitat) which is most likely to be selected for nesting and nest stands by the owl. Much of this habitat is within PACs, which has not been treated to any large extent for over 20 years. Impacts to PACs, will be discussed later in this analysis. The remaining 1,445 acres is a mix of small sized trees (CWHFR size 4) both dense and moderate canopy cover, and moderate canopy cover size class 5 stands.

The road corridor treatments, 200 feet from centerline would remove a tapered amount of stems, more immediately adjacent to the road (35 feet centerline) up to 30" dbh, and up to 18" dbh in the balance of the corridors. A 5-15% reduction in canopy cover, average over the unit would occur from either the thininng, mechanical or hand, and prescribed burning, or combination of these treatments. The design to limit mortality in the overstory both inside and outside of owl and goshawk PACs would dictate this level of change or lower. These would also be the treatment areas where snags would see the greatest reduction, but over the treatment unit, an average of the forest standard or higher would be maintained.

These treatments would also be expected to create small sized, scatter openings as previously described. Given the small size and scattered nature would not be expected to remove habitat acreage from goshawk suitability. Maintenance treatments would be expected to have less impact on habitat than the initial treatment, and depending the too used would have different return intervals, with mechanical and hand being more frequent 3-5 years, and prescribed burning returns of 5-10 years.

In summary, these strategic fuel treatments, both initial treatments and follow up treatments, would have limited impacts to canopy cover, and large tree habitat elements, snags, would maintain habitat quality for northern goshawk near its current capability, and provide for better protection and possibly longer-term retention of high-quality habitat for this species.

Road Maintenance and Reconstruction/Armstrong Camera Thinning- These activities would be expected to have no impact on goshawk habitat, the areas proposed for maintenance and reconstruction, and temporary road construction, and thinning associated with the fire camera at Armstrong Lookout do not provide suitable habitat for this species, and the areas affected are small and would not contribute to adverse impacts to habitat for goshawks.

PACS

The surveys conducted for this project indicated use of many of the PACs by goshawk, but no nesting or reproduction was detected during the 2017-2018 survey period in these PACs. Design criteria included in the proposed action will reduce potential impacts and facilitate achieving project desired conditions. Specifically the LOPs and retention of dense canopied, large treed inclusions in treatment units which have been discussed for the owl, would provide for future nest stands for goshawk, as well as spotted owls in the future.

Mechanical Thinning/Commercial Harvest The effects of the thinning to suitable habitat outside of PACs have been described above. There are no units within the existing goshawk PACs. No direct effects to PACs are anticipated from the mechanical thinning or commercial harvest and the indirect effects to habitat are captured in the discussion of effects to suitable habitat. Indirect impacts of the harvest have been capture above in the suitable habitat discussion at the project level scale for this project. Where these treatments retain habitat through time adjacent to PACs they would be beneficial to long term occupancy of the PACs.

Fuel Treatments- Five PACs G37-01, G37-02, G37-07, G37-08, and G38-01 would be directly or indirectly affected by the project. All of these goshawk PACs are embedded in (are a subset of) spotted owl PACs, so the affects to the habitat have been previously discussed for spotted owl. The affects are summarized and reframed in reference her to the embedded goshawk PACs in this discussion. Approximately 355 acres of fuel break treatments overlap suitable habitat within PACs in the project area. Of these, approximately 203 acres are highly suitable habitat (CWHR size class 5D, dense canopy cover) with 152 acres being moderate-quality habitat (CWHR 4M,4D, and 5M), less than 15 acres of which is 4M. Table 2.0 below breaks the habitat down by PAC ID, and shows best results of latest survey effort by PAC.

A total of approximately 360 acres of suitable habitat would be impacted by fuel treatments, of which approximately 250 acres is presently highly suitable habitat, nesting habitat (CWHR 5D). No snags would be removed in PACs, unless they pose an imminent human health hazard, or would compromise safe treatment of the unit. Table 2.0 below indicates the amount of habitat, by PAC that may be affected. Treatments would facilitate prescribed burning, reduce stand mortality effects from both prescribed and wildland fire, and would be expected to improve efficiency of suppression of wildfires. Effective management of prescribed fire and wildfire may help reduce loss of or damage to key northern goshawk habitat. PACs were selected for treatment based on necessity to ensure the overall effectiveness of the landscape fire and fuel strategy.

Table 2.0 Acres of existing northern goshawk habitat in PACS that could be affected by the Proposed Fuel Treatments, and recent survey results,

PAC ID	Total Suitable Habitat pre-treatment CWHR 4M&D, 5M&D Acres	CWHR 4M, 5M, & 4D Acres	CWHR Size Class 5D Acres	PAC Status Status/Year
G37-01	175	20	155	Non Reproductive during survey period
G37-02	<5	3	1	Non Reproductive during survey period
G37-07	27	14	13	Non Reproductive during survey period
G37-08	53	37	16	Non Reproductive during survey period
G38-01	97	78	19	Non Reproductive during survey period

As discussed for the spotted owl and previously for goshawk habitat across the project, the design of the project, and terrestrial wildlife design criteria would limit canopy cover changes, impacts to down logs, snags, impacts to nests and nest stands, and large trees, and the size and amount of openings created. The limited operating period (LOP), described in the design features, would eliminate the potential disturbance to reproducing owls, reducing potential disturbance to temporary displacement of individuals outside of LOP's.

Disturbance Effects

The disturbance related effects of the Proposed Action would be lessened or removed through the limited operating period in the design criteria. The implementation of the design criteria, limited operating period (LOP) within ¼ mile of known nests or PACs. Should implementation-related disturbance take place, the expectation is that it would take the form of temporary displacement of foraging individuals, and no effects to reproduction would be expected.

Cumulative Effects

This cumulative effects analysis will consider the impacts of this project and all relevant proposed actions, when combined with past, present, and foreseeable future actions and events that have affected or may affect the quantity or quality of goshawk habitat within the proposed treatment area, and associated habitat which have been analyzed for direct or indirect effects from proposed units. The

cumulative effects analysis area for goshawk is approximately 15,150 acres, acres, including both Federal and privately owned lands, includes recorded treatments which have affected habitat going back to records from 1951 to the present and foreseeable future (Table 1.4). This area includes the five goshawk PACs previously discussed and also encompasses one more PAC, G37-03, which is adjacent to the project boundary.

Past and future activity in the analysis area will/have resulted in approximately 4,270 acres, or about 43%, of the 15,150 acre cumulative effects analysis area being highly impacted past or planned future activities. Approximately 820 acres of high impact habitat alteration (long term reductions , up to 30 year plus duration of effects, or loss of habitat capability) affecting approximately 5% of the analysis area; 2,670 acres of moderate alteration treatments (10-15 years of effects), usually reductions in habitat capability, but not loss of suitable habitat affecting approximately18% of the analysis area; and 80 acres low (1-10 years of effects, may or may not reduce habitat capability slightly) affecting approximately <1% of the analysis area.

The proposed action would result in approximately 2,400 acres of low-impact habitat alteration, or an additional 16 % added cumulative impact from the fuel treatments. The mechanical/commercial thinning would normally be characterized as moderate habitat alteration of approximately 2,350 acres. However, as the habitat in being discussed has previously been treated and is accounted for above in the past treatment acreage, for this analysis it is realistically an additional impact to already moderately-impacted habitat. For this reason no additional acreage of impact to cumulative effects is counted here as the area is already accounted for at a greater modification level than would occur under this entry, and as discussed the treatment would retain the current moderate capability habitat levels for this commercially thinned treatment on these acres.

As time passes, early treatments in the analysis area tend to have less of an effect, depending on the type of treatment. The proposed action contributes to these cumulative effects, mainly through reductions of in canopy cover by adding approximately a 16% increase in treated area, the fuel treatments, in areas not recently treated. The road maintenance activities would result in little to no habitat alteration, they would not contribute to cumulative effects for this species. The above combined with the commercial thinning treatments which were designed outside of PACs, and are within areas that have previously been treated, and considering recent research on California spotted owls and habitat use, and given design criteria to minimize impacts from the treatments, cumulative effects associated with this project are not expected to reduce the number of spotted owls that can be supported in the analysis area and are likely to increase long-term sustainability of owl habitat through increased resilience to both wildfire and insect and disease.

High and moderate quality habitat for goshawk is at risk for wildfire, draught, and insect and disease, as is evidenced by recent events. To the degree that this project fire resiliency and protects the existing PAC, and suitable habitat both within and outside of the proposed units from future wildfires, and tree mortality events, when considered with other present and foreseeable projects, it may increase the amount of habitat that remains available to goshawks in the long-term. Goshawk PACs are currently well distributed across the Amador Ranger District, without evidence of population or habitat gaps.

Effects Summary

The proposed action, and specifically the fuels treatment units would reduce 100 acres of higher quality (CWHR 4D &5D) habitat to moderate capability habitat primarily through canopy cover reductions. Commercial treatment units would see a 0-15% reduction in canopy cover, but would retain canopy cover at level that would sustain foraging habitat (≥ 50% canopy cover) where it currently exists. Based on the existing canopy cover within the commercial harvest units (50-65%), the fact that no commercial treatment units fall within the PACs, and the relatively small reduction in existing canopy cover, the commercial harvest treatment would not be expected to greatly impact either the untreated PACs, or the local goshawk population.

The forest health treatments (commercial thinning) should reduce potential for large scale reductions in habitat quantity and quality for spotted owl, and retain key legacy features such as: large trees, snags, and downed logs. The retention of the 2 acre plus nest stand habitat in the commercial treatments, should provide for future nesting habitat for the species in a stand that will have a better chance of persisting intact due to the forest health treatments.

Treatments in PACs are limited to fuel reduction treatments, would retain 90% of existing canopy cover, limited impacts to over story (large/tall tree) 5%-10% or less, and retain most of the snags and logs (no active lighting, or removal beyond safety concerns.

Project generated disturbance effects would be low, would be reduced by design criteria, and are expected to affect individuals, but not long term reproduction potential.

The proposed removal of recently killed snags is not expected to change habitat suitability for this species, as snag retention will be maintained on average across the project area, and no snags would be removed from the PACs.

The potential opening generation by both the commercial treatments and fuel treatments are expected to be small in size and scattered, may improve overall habitat quality by increasing small scale heterogeneity, increasing prey availability, and forest resilience.

Wild fire is a known threat to spotted owl habitat, and without some pro-active treatments could be greatly reduced in extent in this next 75-100 years (Stephens et. al. 2016). Implementation of this project would reduce the likelihood of a large scale, high-intensity wildfire within the project area, would allow more efficient suppression should fire occur within goshaewk habitat, and would increase the likelihood that the high-quality habitat would persist given a wildfire event.

Existing past and foreseeable future modification of habitat are not expected to reduce the local goshawk population. The project would be expected to provide protection of existing suitable habitat from stand replacing wildfires, by reducing the size of high mortality patches, and providing for faster suppression of fires should they start, by reducing fire behavior and allowing safer access by fire suppression personnel.

Determination

The proposed action may affect/impact individual northern goshawks but is not likely to result in trend toward Federal listing or loss of species viability.

PACIFIC FISHER

Current Condition

Pacific Fisher- The Pacific fisher is a Forest Service regionally designated sensitive species. Surveys have been conducted on the Eldorado National Forest for this species and to date, no documented fishers have been detected. They are not be believed to occur in the project area, but there is suitable habitat for them in the project area. There are no known denning sites for fisher, within the project area, or on the Amador Ranger District.

Suitable Habitat

Forested habitats below 8,500 feet elevation, with fairly dense canopies and large trees, snags, and down logs. Hardwoods may also serve as an important habitat component (USDA Forest Service 2001, 2001b). Preferred habitat is characterized by dense (60 to 100% canopy), multi storied, multi species late seral coniferous forests with a high number of large (> 24 inch dbh) snags and downed logs. 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).

Habitat for this species is essentially the same as previously described and discussed for both goshawk and spotted owl. As was described for the spotted owl and goshawk, suitable habitat for this species overlaps many of the proposed treatment units.

Proposed Action

Direct Effects and Indirect Effects

As described for the spotted owl and goshawk, the project would have essentially the same affects to fisher habitat, as it is the same habitat. The project proposes to remove/harvest some of the recently killed trees (snags) that has occurred in project area related to the recent drought and insect conditions. These dead/trees would be removed with potentially the strategic fuel break treatment, and mechanical thinning/commercial harvest treatment areas. In both treatment areas the project would retain snags, at or above the forest plan standard (4-6 largest snags per acre) average throughout the project area. Trees over 30”dbh would also be retained, foraging habitat, and denning habitat would remain as the snag retention, down log retention, and canopy cover levels would remain at a suitable level. Both the mechanical thinning treatments, and fuels treatments are expected to result in small scattered opening creation/enlargement. Where this occurs it is expected to provide improve habitat diversity, positively impact potential prey species for fisher, and due to the small size of the openings and scattered nature is not expected to adversely impact connectivity of habitat for this species.

Mechanical Thinning/Commercial Harvest- Mechanical thinning and commercial harvest would reduce canopy cover of approximately 2,350 acres of existing suitable fisher habitat (CWHR 4/5 $\geq$ 50% cc $\leq$ 65% cc) , resulting in an estimated average canopy cover of 50% (Young 2019). As previously described these treatment units would see a 0-15% decrease in canopy cover from the treatments, and removal of intermediate and codominant trees. This is a second entry into these areas, which is why the canopy cover is fairly uniformly moderate, and there are few suppressed trees to be removed. No known

den sites would be affected by the commercial harvest units, as none are known to occur in the project areas. The treatment units would remain suitable for foraging and where 4M and 5M stands remain, there would likely be some potential for the species to nest in some areas and set up territories going forward.

Where small of opening creation/enlargement occurs, they would add heterogeneity to the habitat for this species, and may increase prey numbers and benefit the species. This structure could improve foraging efficiency, and potentially longer term heterogeneity of the stands, and forest resilience, all beneficial to fisher, should they occur in the project area.

Snags would remain at or above forest stands, 4 largest per acre, averaged over the unit. The removal of some of the recent insect related mortality would not result in a quality change to goshawk habitat with the retention standards in place.

The commercial thinning would have a limited effect on the quality of future habitat for this species, and length of time required for its establishment. Remaining green trees in the project area are a valuable resource for fisher, since they will provide the future supply of large decadent trees and snags within the forested habitat into the future. This project would primarily remove and reduce the intermediate and some codominant trees, leaving behind most of the larger and older trees to provide for future legacy habitat structure.

Fuel Treatments-Approximately 2,400 acres of the proposed fuel treatment areas overlap existing suitable habitat. Approximately 955 acres of this area currently has dense canopied, CWHR size class 5 (dense canopied, large/tall treed habitat) which is most likely to be selected for denning by this species. Much of this habitat is within PACs (both goshawk and spotted owl) as previously described, which has not been treated to any large extent for over 20 years. The remaining 1,445 acres is a mix of small sized trees (CWHFR size 4) both dense and moderate canopy cover, and moderate canopy cover size class 5 stands.

The road corridor treatments, 200 feet from centerline would remove a tapered amount of stems, more immediately adjacent to the road (35 feet centerline) up to 30" dbh, and up to 18" dbh in the balance of the corridors. A 5-15% reduction in canopy cover, average over the unit would occur from either the thinning, mechanical or hand, and prescribed burning, or combination of these treatments. The design to limit mortality in the overstory both inside and outside of owl and goshawk PACs would dictate this level of change or lower. These (road corridors) would also be the treatment areas where snags would see the greatest reduction, but over the treatment unit, an average of the forest standard or higher would be maintained.

These treatments would also be expected to create small sized, scatter openings as previously described. Given the small size and scattered nature would not be expected to remove habitat acreage from goshawk suitability. Maintenance treatments would be expected to have less impact on habitat than the initial treatment, and depending the too used would have different return intervals, with mechanical and hand being more frequent 3-5 years, and prescribed burning returns of 5-10 years.

In summary, these strategic fuel treatments, both initial treatments and follow up treatments, would have limited impacts to canopy cover, and large tree habitat elements, snags, would maintain habitat quality for fisher near its current capability, and provide for better protection and possibly longer-term retention of high-quality habitat for this species.

Road Maintenance and Reconstruction/Armstrong Camera Thinning- These activities would be expected to have no impact on fisher habitat.

Disturbance Effects

Disturbance potential to individual fisher, should they be present, unlikely, in the project area, would potentially be higher relatively low. With the spotted owl and goshawk LOPs in place, disturbance potential to fisher would be lower in areas near owl and goshawk PACs during the birth and rearing phase for the species, and therefore no direct impacts to reproduction would be expected to result for this project in these areas, should the species be present. Due to the quality of the habitat in PACs, should fisher be present there is a relatively high probability that these areas would be selected for denning and rearing of young.

Outside of the LOP areas there is some risk of reproductive disturbance, but as fisher are not believed to present, in the project area, the risk of reproductive disturbance is unlikely, and if it did occur would impact very few individuals.

Denning disturbance effects are unlikely to occur due to: unlikely occurrence of the species in the project area, timing of project activities, summer, and crucial denning being winter-spring. Should disturbance occur, disturbance is unlikely to affect more than one or two individuals, due to large species home ranges and the relatively low percentage of home range habitat potentially affected at any one time. 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 fisher.

Cumulative Effects

These geographic scopes of the cumulative effects analysis were selected considering the affects to the local populations of this species, home range core sizes, and nature of the project. This analysis is intended to provide an evaluation of the project's cumulative effects upon the existing fisher, suitable habitat within and adjacent to the project most likely to see effects, and the forest matrix near them through changes to habitat capability and dispersal capabilities of fisher within and adjacent to the project area. The cumulative effects area is the same, and effects to the species similar to the same as those previously described for spotted ow and goshawk.

This cumulative effects analysis will consider the impacts of the project when combined with past, present, and foreseeable future actions and events that have affected or may affect the quantity or quality habitat within the cumulative effects area. The area analyzed for spotted owl previously is used, as this species share similar habitat needs and the analysis areas should give good indication of cumulative effects for this species.

Absent denning sites, and better population and sighting data, the same cumulative affects area and data set used for the spotted owl, will be used for cumulative effects for this species. The same data set for past and foreseeable actions was utilized for this analysis as was described for the spotted owl analysis (Table 1.4). As the effects are essentially the same for fisher as described for the spotted owl and goshawk, the analysis is summarized, rather than restated.

The proposed action would result in approximately 2,400 acres of low-impact habitat alteration, or an additional 16 % added cumulative impact from the fuel treatments. The mechanical/commercial thinning would normally be characterized as moderate habitat alteration of approximately 2,350 acres. However, as the habitat in being discussed has previously been treated and is accounted for above in the past treatment acreage, for this analysis it is realistically an additional impact to already moderately-impacted habitat. For this reason no additional acreage of impact to cumulative effects is counted here as the area is already accounted for at a greater modification level than would occur under this entry, and as discussed the treatment would retain the current moderate capability habitat levels for this commercially thinned treatment on these acres.

To the degree that this project increases fire resiliency and protects the existing suitable habitat both within and outside of the proposed units from future wildfires, when considered with other present and foreseeable projects, it may increase the amount of habitat that remains available to fisher in the long-term. Fisher are not believed to be present, but are believed to have been extirpated and not absent due to a lack of suitable habitat, which is evenly distributed across the Amador District, and Eldorado National Forest.

Effects Summary

Existing past and foreseeable future modification of habitat combined with the proposed action are not expected to reduce the local fisher (should they be present) populations. This project would alter approximately of 100 acres of high quality habitat primarily through 10-15% canopy closure reductions, but would retain canopy closure at level that would sustain moderate capability habitat for this species.

Project generated disturbance effects are not likely, reduced by design criteria, and should there be any, are expected to affect individuals, and not affect long term reproduction of the species.

The proposed removal of recent mortality generated snags is not expected to greatly change habitat suitability for this species, as snag retention will be maintained on average across the project area, and snag availably is not expected to limit habitat capability or use for these species.

The potential opening generation both in the commercial thinning, and fuels treatments, may improve overall habitat quality by increasing small scale heterogeneity, increasing prey availability, and forest resilience.

The project would be expected to provide protection of existing suitable habitat from stand replacing wildfires, by reducing the size of high mortality patches, and providing for faster suppression of fires should they start, by reducing fire behavior and allowing safer access by fire suppression personnel.

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 Pacific fisher.

PALLID BAT, TOWNSENDS BIG-EARED BAT, AND FRINGED MYOTIS (BAT)

All three bat species have similarities in roosting and foraging habitat and behavior. For these reasons the affects of the proposed action are similar for each species and will be analyzed together. Where slight differences in effects occur, they will be pointed out on an individual species basis in the following analysis.

Current Condition

PALLID BAT

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, however, the species has been found up to 10,000 feet in the Sierra Nevada. 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 project area is within an area where mining occurred, there are no known cave sites within the project area, however there may be suitable roosting habitat in rock crevices along the Middle Fork Cosumnes River, or elsewhere in the project area. The projects elevation within the elevation at which oaks occur. Large conifer trees and snags are present in the project area. There have been no comprehensive surveys for pallid bat on the ENF. Surveys associated with the SNFP 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). Recent acoustical surveys 2017-2018 have not detected the species within the project area, but were not comprehensive.

TOWNSEND'S BIG EARED BAT

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. For this reason, the entire project area is believed to provide suitable 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.

There project area is within an area where mining occurred, there are no known mine or cave sites within treatment units that are expected to be affected by the project directly.

FRINGED MYOTIS

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 seas level and at much

higher elevations. There is some evidence that this species may migrated 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.

In northern California it appears that male and female *Myotis thysanodes* use 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. Fringed myotis are considered to be foraging generalist, but do seem to be tied to day roost habitat associated with old forest conditions, especially large diameter snags. 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).

As has been described the project area has had mining activity, but there are no known mine or cave sites, rock crevices within the project area that would be likely to be directly affected by the proposed action. 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.

Proposed Action

Direct and Indirect Effects (Pallid bat, Townsend's big-eared bat, and fringed myotis)

All three species tend to be foraging generalist. They also overlap in roost habitat use, using large oaks, snags, rock crevices, mines, man-made structures within conifer forests. For this reason all acres within the project area which are proposed for treatment are considered to be suitable habitat for this species.

Mechanical Thinning/Commercial Harvest- The mechanical thinning/commercial harvest would not be expected to impact roost availability, outside of the harvest of large recent dead trees (snags). This removal of large snags may have a greater impact on individual fringed myotis, if present, as they are appear to be more closely tied to this habitat type than the other species for day roosts in the Sierra Nevada. The snag retention design criteria would offset these reductions, as forest standards would be met, averaged across treatment units.

Although mining has occurred in the project area, and there may be suitable roosts associated with this past activity, none of the mining locations would be expected to be physically altered, and where known are usually excluded from project activity, due to heritage resource concerns. The man-made structures, such as bridges, would also not be altered by the thinning, nor would rock crevices. Oaks are to be retained, and would be released to some extent by the commercial thinning, and would be expected to remain essentially the same in distribution, and numbers across the project area.

Foraging habitat may be improved by the thinning, as the opening up of the canopy, may make foraging easier than the present moderately treed habitat. This change would be subtle, as 0-15% reduction in canopy cover is expected post-treatment. Where small openings are created or enhanced this would increase the structural diversity of the habitat, which may also improve foraging opportunities for these species.

Fuel Treatments- The fuels treatments, would have similar impacts to habitat for the three species. These treatments would remove snags, especially in the road corridor treatments, but would retain snags at or above forest standard averaged over the unit. The mine, cave, crevice and man-made roosting structure would not be affected similar to what was described above. Oaks and snags to some extent may be reduced where prescribed burning removes them. Both snags and oaks would not be actively lit, and impacts to both roost structures would be spotty, and would not remove them entirely from the forested habitat used by these species.

Foraging efficiency may be enhanced, in areas where trees mortality is in pockets, and especially immediately following the initial and maintenance fuel break treatments, as these treatments would be expected to open up the understory in the fuel breaks/road corridor areas and allow for easier prey location and predation for the bats. Where small openings are created by individuals tree torching and small pockets (1/4 acre- 2 acres) similar beneficial effects as described above would be expected due to increased habitat diversity.

Road Maintenance and Reconstruction- These activities would be expected to have little to no impact on foraging habitat or roosting habitat as the roads would not change in habitat quality with these treatments.

Disturbance Effects

Disturbance could occur to day roosting bats where roosting location coincide with project activities (both the commercial thinning and fuels treatments). The amount of potential disturbance and effect on individuals is difficult to assess as the local population status for these bats, and use of the project area is not known. Potential for disturbance to foraging bats would minimal from the proposed activities, as most of the project activities take place during daylight hours, burning and residual smoke being possible exceptions, when bat foraging activity is not or occurring or is at a minimum (dusk/dawn).

Temporary displacement would be possible where roosting sites and project activities coincide. Due to the wide variety of roosting habitats used, the project would not be expected to have any long term population effects on these species, as few individuals would be likely to be affected at any given time, and any impact to reproduction would be unlikely to be either long term, or affect more than a few individuals.

Cumulative Effects

Effects of the proposed actions would not be of sufficient magnitude to greatly contribute adverse, or beneficial cumulative effects for these species, and future actions on National Forest lands are likely to be favorable to the species. Snags and oaks 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 these bat species 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 a small improvement in bat habitat and will not contribute to substantial cumulative impacts.

Effects Summary

Foraging habitat within the project area would be maintained and may be enhanced by opening the forest structure up, frequent fuel break maintenance treatments, and possibly the longer term vegetation changes that may result. Roosting habitat would, for the most part maintained with implementation of this project, where large snags are removed, there would by localized reductions in roosting habitat, but by and large, roosts would be retained by the project. This project may result in some level of disturbance to a few individuals during implementation, but 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, and fringed myotis.

WESTERN BUMBLE BEE

Current Condition

Surveys have not been conducted for this species within the project area, and if present their numbers are likely low. Portions of the Power Fire, most of which somewhat distant to the project area but similar elevation on the Amador Ranger District, have been surveyed for bumble bees and this species has not been detected to date, the survey data, and other bumble bee behavior is used as a surrogate to inform the following analysis. 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. The project area is mostly dominated by forested habitats which provide low value habitat for the species, but there is a mix of higher quality habitat types, with ridges and riparian areas providing some of the highest quality foraging habitat.

Proposed Action

Direct, and Indirect Effect

Mechanical Thinning/Commercial Harvest- The commercial thinning stand provide very little quality foraging habitat, as they are conifer dominated stands, with relatively high canopy closures, and a correlated low amount of flowering herbaceous understory. These areas do provide nesting/wintering habitat in the form of rodent boroughs, and there would be some short term loss of these boroughs as a result of equipment use and tree felling crushing and covering the boroughs. These effects would be short lived, year of the treatment, and subsequent years the rodent activity would be expected to replace the habitat. Impacts would be to individuals or nest groups of individuals during the spring through summer of the treatment. Where the thinning activities, and opening creation, increase shrub/forbs in the understory, there may be an increase in both the amount of foraging habitat, and quality of the habitat for western bumble bees.

Fuel Reduction Treatment Units-

These areas would see a reduction in small trees, some simplification of canopy structure, and move areas treated to a vegetation type of lower fuel volume, height, and flammability (e.g., short shrub height/grasses and forbs). These effects would be chiefly seen along the road corridor/fuel break treatments. These initial treatments would reduce, short term immediately following the treatment, the availability of flowering shrubs, grasses and forbs for foraging use. Depending on how this is accomplished there would be more, or less potential for nest disturbance or destruction. With mechanical treatments being most likely to crush nests, and hand tools, and prescribed burning having a lower likelihood of impacting as many or to the same extent. These reductions in foraging quality and potential nest disturbance/loss would be expected to only impact the species, if present, immediately following the treatment.

Depending on the tools used to accomplish the maintenance treatments; treatments would occur at various intervals, with hand treatments and mechanical treatments requiring treatments every 3-5 years, and prescribed burning being required twice in a 10 year period. The potential for nest disturbance and foraging impacts increase with the necessary frequency of the treatments.

In summary, the fuel treatments, both initial treatments, and follow up treatments would have impacts to the availability of flowering plants used for foraging (season of treatment), and may change the makeup of the remaining vegetation species mix, which could either improve, or decrease the capability of the foraging habitat. The disturbance impacts would be expected to be limited to the actual years of treatment, affect individuals and potentially a number of nests. As the treatments would not be implemented in entirety in any given year, impacts would not be expected to impact many individuals or nests in any given year.

Road Maintenance and Reconstruction/Armstrong Camera Thinning- These activities would be expected to have little to no impact on foraging habitat, few flowering plants would be impacted by these activities, and the scale and dispersed nature of these activities would also lessen any impact to the species. There could be some nesting/wintering habitat impacts where rodent boroughs are damaged or destroyed. Again due to the type of areas being treated, scale of the activities, and dispersed nature of these activities, a few individuals might be impacted.

Disturbance

Disturbance to this species could occur during foraging activity, from either the fuel treatments or mechanical/commercial thinning treatments, where project activities coincide with bee use. Nest/wintering boroughs sites could also be areas where individuals may be disturbed by project activities. In the absence of surveys, 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. The most likely disturbance impact would be to foraging individuals, and would be unlikely to result in more than short term impacts to either the individual or local population. The potential for disturbance is lower with hand treatments than with mechanical equipment, in either case due to the expected low numbers of individuals, or nests that may be disturbed at any given time, no long term or local population impacts would be expected from disturbance. Spring burning, because of overlap with foraging on flowering plants, is more likely to affect foraging individuals than fall, when little or no flowering and foraging is taking place.

Cumulative Effects

Past activities have had similar effects to bumble bee habitat as described for this project. With the exception of fire suppression and the resulting reductions in early seral habitat, and resulting effects on foraging habitat, the other effect from the proposed action, combined past activities are short lived. For this reason there is not expected to be much of an additive adverse or beneficial cumulative effect from the interaction of past activities and the proposed activities in this project.

The proposed action would be unlikely to impact many individuals or nests. Disturbance impacts would be expected to affect individuals, nests and reproduction, where the species is present during and following treatments. Surveys to date have failed to detect the species on the Amador District, and these affects would be most keenly felt the season of treatment. Within the area that would see reduction of suitable habitat, reductions would be most likely to impact this species the season of treatment, by foraging habitat quality reductions, there would be riparian buffers, and buffers to protect amphibian habitat which would retain habitat connectivity and provide for both foraging and nesting habitat for western bumble bees. The project may provide some increase in habitat available for the species through the opening creation, both commercial thinning and fuels related treatments. For these reasons, this project would be expected to allow for species occupation, and reproduction post implementation, and would not be expected to accelerate the species decline.

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.

Summary of Determinations for the Scottiago Forest Health and Fuels Reduction Project

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

American Bald eagle
Great gray owl
Willow flycatcher
California wolverine
American marten

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

California spotted owl
Northern goshawk
Pacific Fisher
Townsend's big-eared bat
Pallid bat
Fringed myotis
Western bumble bee

Recommendation

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

References

Alaux, C., J. Brunet, C. Dussaubat, F. Mondet, S. Tchamitchan, M. Cousin, J. Brillard, A. Baldy, L.P. Belzunces and Y. Le Conte. 2010. Interactions between Nosema microspores and a neonicotinoid weaken honeybees (*Apis mellifera*). Environmental Microbiology 12: 774–78.

Aubry, K. and C. Raley. 1999. Ecological characteristics of fishers in southwestern Oregon. USFS Pacific Northwest Research Station. Olympia, WA. 7 pages.

Austin, K.K. 1993. Habitat use and home range size of breeding northern goshawks in the southern Cascades. MSc. Thesis. Oregon State Univ. Corvallis, OR.

Barbour, R.W. and W.H. Davis. 1969. Bats of America. University Press of Kentucky. 283 pp.

Bart, J. 1995. Amount of suitable habitat and viability of northern spotted owls. Conservation Biology 9:943-946.

Bateman, M.C. 1986. Winter habitat use, food habits and home range size of the marten, *Martes americana*, in western Newfoundland. Canadian Field Naturalist 100: 58-62.

Beardsley, D., C. Bolsinger, and R. Warbington. 1999. Old-growth forests in the Sierra Nevada: by type in 1945 and 1933 and ownership in 1993. Gen. Tech. Rep. PNW-GTR-516. USDA Forest Service, Pacific Northwest Research Station. Portland, OR.

Beier, P. and J.E. Drennan. 1997. Forest structure and prey abundance in foraging areas of northern goshawks. *Ecological Applications* 7:564-571.

Bennett, L.A. and F.B. Samson. 1984. Marten ecology and habitat management in the central Rocky Mountains: problem analysis. USDA Forest Service and Colorado Cooperative Wildlife Research Unit, Colorado State University. Fort Collins, CO. 60 pp.

Bingham, B.B. and B.R. Noon. 1997. Mitigation of habitat 'take': application to habitat conservation planning. *Conservation Biology* 11:127-139.

Blakelsley J.A., et al. 2005. Site Occupancy, Apparent Survival, and Reproduction of California spotted Owls in Relation to Forest Stand Characteristics. JOURNAL OF WILDLIFE MANAGEMENT 69(4):1554–1564; 2005.

Blakey, R.V., Siegel, R.B., Webb, E.B., Dillingham, C.P., Bauer, R.L., Johnson, M. and Kesler, D.C., 2019. Space use, forays, and habitat selection by California Spotted Owls (Strix occidentalis occidentalis) during the breeding season: New insights from high resolution GPS tracking. *Forest ecology and management*, *432*, pp.912-922.

Bloom, P.H., G.R. Stewart, and B.J. Walton. 1986. The status of the northern goshawk in California, 1981-1983. Calif. Dept. Fish and Game, Wildlife Management Branch, Administrative Report 85-1.

Bolster, B.C. 1998. Calif. Dept. of Fish and Game, Presentation to the Western Bat Working Group Workshop. Feb. 9-13, 1998. Reno, Nevada.

Bond, M.L., R.J. Gutierrez, A.B. Franklin, W.S. LaHaye, and M.E. Seamans. 2002. Short-Term Effects of Wildfires on Spotted Owl Survival, Site Fidelity, Mate Fidelity, and Reproductive Success. The Wildlife Society Bulletin. 30(4).

Bond, M.L., Lee, D.E., Siegel, R.B., Ward Jr., J.P., 2009. Habitat use and selection byCalifornia spotted owls in a postfire landscape. Journal of Wildlife Management73, 116–1124.

Bright-Smith, D.J. and R.W. Mannan. 1994. Habitat use by breeding male northern goshawks in northern Arizona. *Studies in Avian Biology* 16:58-65.

Brown, P. 1996. Presentation at the Natural History and Management of Bats in Calfornia and Nevada Conference. The Wildlife Society Western Section, Nov. 13-15, 1996. Sacramento, CA.

Buskirk, S.W. and L.F. Ruggiero. 1994. American marten. Pages 7-37 *in* L.F. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski, eds. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. U. S. Forest Service Gen. Tech. Rep. RM-254.

Buck, S., C. Mullis and A. Mossman. 1983. Final report: Coral Bottom - Hayfork Bally fisher study. USDA Forest Service. Unpublished report. 133 pp.

Cameron, S.A., J.D. Lozier, J.P. Strange, J.B. Koch, N. Cordes, L.F. Solter and T.L. Griswold. 2011. Patterns of widespread decline in North American bumble bees. Proceedings of the National Academy of Sciences 108:662-667. See http://www.pnas.org/content/108/2/662.full.pdf+html.

Carvell, C., W.R. Meek, R.F. Pywell, D. Goulson, M. Nowakowski. 2007. Comparing the efficacy of agri-environment schemes to enhance bumble bee abundance and diversity on arable field margins. Journal of Applied Ecology, 44:29-40.

Chapin, T.G., D.J. Harrison, D.M. Phillips. 1997. Seasonal habitat selection by marten in an untrapped forest preserve. J. Wildl. Manage. 61:707-717.

Conner, M.M., J.J. Keane, C.V. Gallagher, G. Jehle, T.E. Munton, P.A. Shaklee, and R.A. Gerrard. 2013. Realized population change for long-term monitoring: California spotted owl case study. Journal of Wildlife Management 77: 1449-1458.

Chung-MacCoubrey, A.L. 1996. Bat species composition and roost use in pinyon-juniper woodlands of New Mexico. pp. 118-123, in R.M.R. Barclay and M.R. Brigham, Editors. Bats and Forests Symposium, October 19-21, 1995, Victoria, British Columbia, Canada, Research Branch, Ministry of Forests, Victoria, British Columbia, Working Paper 23/1996.

Davis: University of California, Centers for Water and Wildland Resources. 1996. Sierra Nevada Ecosystem Project, Final Report to Congress.

de Vos, A. 1951. Recent findings in fisher and marten ecology and management. Transactions North American Wildl. Conf. 16:498-505. DeStefano, S.B. 1998. Determining the status of northern goshawks in the West: is our conceptual model correct. *J. Raptor Research* 32:342-348.

Dugger, K. M., et al. 2016. The effects of habitat, climate, and Barred Owls on long-term demography of Northern Spotted Owls. The Condor Volume 118: 57-116.

Dupont, Y.L, C. Damgaard, V. Simonsen. 2011. Quantitative Historical Change in Bumblebee (*Bombus* spp.) Assemblages of Red Clover Fields. PuPLoS One Volumbe 6: Issue 9. Available at http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0025172

Evans, E., R. Thorp, S. Jepsen and S.H. Black. 2008. Status Review of Three Formerly Common Species of Bumble Bee in the Subgenus Bombus: *Bombus affinis* (the rusty patched bumble bee), *B. terricola* (the yellowbanded bumble bee), and *B. occidentalis* (the western bumble bee). The Xerces society, Portland, OR. Available at http://www.xerces.org/wp-content/uploads/2009/03/xerces_2008_bombus_status_review.pdf

Ferguson, H. and I.M. Azerrad. 2004. Management recommendations for Washington's priority species – priority habitat and species. Volume 5. Mammals. Pallid bat, Antrozous pallidus. Washington Department of Fish and Wildlife, WA.

Franklin, A.B., D.R. Anderson, R.J. Gutierrez, and K.B. Burnham. 2000. Climate, habitat quality, and fitness in northern spotted owl populations in northwestern California. *Ecological Monographs* 70:539-590.

Franklin, A.B., R.J. Gutierrez, J.A. Blakesley, J. Keane, T.E. Munton, G.N. Steger, M.E. Seamans, G.S. Zimmerman, W.S. LaHaye, G. White, J. Hines, J. Nichols, B. Noon, S. Britting, T. McDonald, D. Shaw. 2003. Population dynamics of the California spotted owl: a meta-analysis. Final report to U.S. Department of Agriculture Forest Service, Region 5.

Franklin, J.F. and J.A. Fites-Kaufmann. 1996. Assessment of late-successional forests of the Sierra Nevada. Pages 627-669 In: Sierra Nevada Ecosystem Project, Final Report to Congress, Vol. II, Assessments and Scientific Basis for Management Options. Univ. Calif., Davis, Centers for Water and Wildland Resources.

Freel, M. 1991. A literature review for management of fisher and marten in California. Unpubl. Document, USDA Forest Service, Pacific Southwest Region.

Goulson, D., G.C. Lye and B. Darvill. 2008. Decline and Conservation of Bumble Bees. Annual Review of Entomology 53:191–208.

Gutierrez, R. J., Manley P. N., Stine P. A. technical editrors, July 2016, Draft: The Califronia Spotted Owl: Current State of Knowledge. USDA Forest Service, March 2016.

Gutiérrez, R.J., Seamans, M. E., Bond, M. Population ecology of the California spotted owl in the central Sierra Nevada: Annual Results 1999. Annual Progress Report to Region 5, USDA Forest Service. March 2000.

Gutierrez, R. J., M.E. Seamans, M.C. Crozier. March 2003. Population ecology of the California spotted owl in the central Sierra Nevada: Annual Results 2002. Annual Progress Report to Region 5, USDA Forest Service, March 2003.

Hargis, C.D. and D.R. McCullough. 1984. Winter diet and habitat selection of marten in Yosemite National Park. J. Wildlife Management 48:140-146.

Hargis, C.D., C. McCarthy, and R.D. Perloff. 1994. Home ranges and habitats of northern goshawks in eastern California. *Studies in Avian Biology* 16:66-74.

Hargis, C.D. and J.A. Bissonette. 1995. The effect of forest fragmentation on American marten populations and prey availability. Final report for the utah Division of Wildlife Resources, Wasatch-Cache National Forest, Ashley National Forest, Utah Wilderness Association (Contract No. 91-9166). December 31, 1995. 96pp.

Hatfield, R. 2012. Records of western and Franklin's bumble bees in the western United States. Database records provided by the Xerces Society, Portland, OR on 2/29/12.

Heinemeyer, K.S., and J.L. Jones. 1994. Fisher biology and management: a literature review and adaptive management strategy. Missoula, MT: USDA Forest Service Northern Region. 108 pages.

Heinrich, B. 1979. *Bumblebee Economics*. Harvard University Press, Cambridge, MA. 245 pp.

Henry, M.. M. Beguin, F. Requier, O. Rollin, J. Odoux, P. Aupinel, J. Aptel, S. Tchamitchian and A. Decourtye. 2012. A Common Pesticide Decreases Foraging Success and Survival in Honey Bees. SciencExpress available http://www.sciencemag.org/content/early/2012/03/28/science.1215039.full.pdf

Hermanson, J.W. and T.J. O'Shea. 1983. Antrozous pallidus. Mammalian Species 213:1-8

Hirshfeld, J.R., and M.J. O'Farrell. 1976. Comparisons of differential warming rates and tissue temperatures in some species of desert bats. Comp. Biochem. Physiol., 55A:83-87.

Hopwood, J., M. Vaughan, M. Shepherd, D. Biddinger, E. Mader, S. Hoffman Black and C. Mazzacano. 2012. Are Neonicotinoids Killing Bees? A Review of Research into the Effects of Neonicotinoid Insecticides on Bees, with Recommendations for Action. Xerces Society, Portland, OR. Available at http://www.xerces.org/wp-

content/uploads/2012/03/Are-Neonicotinoids-Killing-Bees_Xerces-Society1.pdf.
Hunsaker, C. T., B. B. Boroski, G.N. Steger, and J. Verner. 2002. Relations between occurrence and productivity of California spotted owls and canopy cover.
Jones, G. M., et al. 2016. Megafires: and emerging threat to old-forest species, Front Ecol Environ 2016; 14(6): 300–306.
Keane, J.J. and M.L. Morrison. 1994. Northern goshawk ecology: effects of scale and levels of organization. *Studies in Avian Biology* 16:3-11.
Keane, J.J. 1999. Ecology of the northern goshawk in the Sierra Nevada, California. PhD Dissertation. Univ. of Calif., Davis.
Keane, J. 2014. California spotted owl: scientific considerations for forest planning. Chapter 7.2 in Science Synthesis to support Socioecological Resilience in the Sierra Nevada and Southern Cascades, Post-Print Draft June 2014. Gen. Tech. Report GTR-247. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. Albany, CA.
Kennedy, P.L., J.M. Ward, G.A. Rinker, and J.A. Gessaman. 1994. Post-fledging areas in northern goshawk home ranges. *Studies in Avian Biology* 16:75-82.
Kennedy, P.L. 1997. The northern goshawk (*Accipiter gentilis atricapillus*): is there evidence of a population decline? *J. Raptor Research* 31:95-106.
Koch, J., J. Strange and P. Williams. 2012. Bumble Bees of the Western United States. U.S. Forest Service and the Pollinator Partnership, Washington, D.C. 144 pp.
Koehler, G.M., W.R. Moore and A.R. Taylor. 1975. Preserving the pine marten: management guidelines for western forests. Western Wildlands 2:31-36.
Kreyer, D., A. Oed, K. Walther-Hellwig and R. Frankl. 2004. Are forests potential landscape barriers for foraging bumblebees? Landscape scale experiments with *Bombus terrestris* agg. and *Bombus pascuorum* (Hymenoptera, Apidae). Biological Conservation 116 :111–118.
Kucera, T.E. and W.J. Zielinski. 1995. The Case of Forest Carnivores: Small Packages, Big Worries. Endangered Species Update, University of Michigan.
Kunz, T.H. and R.A. Martin. 1990. *Plecotus townsendii*. Mammalian Species. The American Society of Mammalogists. No. 175:1-6.
Lamberson, R.H., W.J. Zielinski, and D. MacFarlane. 2000. Preliminary analysis of fisher population viability in the southern Sierra Nevada. Unpublished report. February 2000.
Laymon, Steven A., 1988. Ecology of the spotted owl in the central Sierra Nevada. Unpublished Dissertation, University of California, Berkely.
Laudenslayer, W.F. and H.H. Darr. 1990. Historical effects of logging on the forests of the Cascade and Sierra Nevada ranges of California. *Transactions of the Western Section of the Wildlife Society* 26:12-23.
Mader, E., M. Shepherd, M. Vaughan, S. Black and G. LeBuhn. 2011. Attracting Native Pollinators: Protecting North America's Bees and Butterflies. The Xerces Society Guide to Conserving North American Bees and Butterflies and Their Habitat. Storey Publishing, North Adams, MA. 371 pp.
Maurer, J.R. 2000. Nesting habitat and prey relations of the northern goshawk in Yosemite National Park, California. MSc. Thesis. Univ. of Calif., Davis, CA Martin, S.K. 1987. The ecology of the pine marten (*Martes americana*) at Sagehen Creek, California. PhD Thesis. University of California, Berkeley. 223 pp.
McFrederick QS, Le Buhn G. 2006. Are urban parks refuges for bumble bees? Biol. Conserv. 129:372–382.

McKelvey, K.S. and J.D. Johnston. 1992. Historical perspectives on forests of the Sierra Nevada and the Transverse Ranges of southern California: forests at the turn of the century. In: *The California spotted owl: a technical assessment of its current status* coordinated by J. Verner, K.S. McKelvey, B.R. Noon, R.J. Gutierrez, G.I. Gould Jr., and T.W. Beck. Gen. Tech. Rep. PSW-GTR-133. USDA Forest Service, Pacific Southwest Research Station, Albany, CA.

Mikkola, K. 1984. Migration of wasp and bumblebee queens across the Gulf of Finland (Hymenoptera: Vespidae and Apidae). Notulae Entomologicae 64: 125-128.

Moen, C.A. and R. J. Gutiérrez. 1997. California spotted owl habitat selection in the central Sierra Nevada. *Journal of Wildlife Management*, 61(4): 1281-1287.

Noon, Barry R., Blakesley Jennifer A. Demographic parameters of the California Spotted Owl on the Lassen National Forest; preliminary results (1990-1998). Summary Report submitted to Region 5, USDA Forest Service. February 1999.

North, M., G. Steger, R. Denton, G. Eberlein, T. Munton, and K. Johnson. 2000. Association of weather and nest-site structure with reproductive success in California spotted owls. *J Wildlife Management* 64:797-807.

North, M.P., Kane, J.T., Kane, V.R., Asner, G.P., Berigan, W., Churchill, D.J., Conway, S., Gutiérrez, R.J., Jeronimo, S., Keane, J. and Koltunov, A., 2017. Cover of tall trees best predicts California spotted owl habitat. *Forest Ecology and Management*, *405*, pp.166-178.

Osborne, J.L., A.P. Martin, N.L. Carreck, J.L. Swain, M.E. Knight, D. Goulson, R.J. Hale and R.A. Sanderson. 2008. Bumblebee flight distances in relation to the forage landscape. Journal of Animal Ecology 77:406–415.

Pierson, E.D., W.E. Rainey and D.M. Koontz. 1991. Experimental mitigation for Townsend's big-eared bat at the McLaughlin Mine in California. From Proceedings V: Issues and technology in the management of impacted wildlife, April 8-10, 1991. Snowmass, Co., Thorne Ecological Institute, Boulder, CO.

Pierson, E. D. 1996. Pierson and Rainey Consultants, Berkeley CA. Presentation at the North California Mine Assessment for Bats Seminar. Shasta College, Redding CA. June 4-6, 1996.

Pierson, E. D. 1996. Presentation to The Western Section of the Wildlife Society, Natural History and Management of Bats in California and Nevada Workshop. Nov. 13-15. Sacramento, CA.

Pierson, E.D., W.E. Rainey, and R.M. Miller. 1996. Night roost sampling: a window on the forest bat community in northern California. Pp. 151-163 *in* Bats and Forests Symposium, October 19-21, 1995, Victoria, British Columbia, Canada. Research Branch, Ministry of Forests, Victoria, British Columbia, Working Paper 23/1996.

Pierson, E. D., and G. M. Fellers. 1998. Distribution and ecology of the big-eared bat, *Corynorhinus townsendii*. U.S. Geological Survey, Species at Risk Report.

Pierson, E.D., W.E. Rainey, and C. Corben. 2001. Seasonal patterns of bat distribution along an altitudinal gradient in the Sierra Nevada. Report to California State University at Sacramento Foundation, Yosemite Association, and Yosemite Fund, 70 pp.

Pierson, E. D., W. E. Rainey, and L.S. Chow. 2006. Bat use of the giant sequoia groves in Yosemite National Park. Report to Yosemite Fund, San Francisco, CA and Yosemite National Park, El Portal, CA, 154 pp.

Philpott, W. 1997. Summaries of the life histories of California bat species. USDA Forest Service, Sierra National Forest, Pineridge Ranger Station. 30pp. Unpublished Document.

Powell, R.A. 1979. Mustelid spacing patterns:variations on a theme by Mustela Zhurnal Tierpsychologie. 50:153-165.
Powell, R.A. and W.J. Zielinski. 1994. The fisher. Pages 38-73. In: L.F. Ruggiero et al., tech. eds. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the Western United States. Gen. Tech. Rep. RM-254. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Ft. Collins, CO. 184 pages.
Rao,S., W.P. Stephen, C. Kimoto and S.J. DeBano. 2011. The Status of the 'Red-Listed' *Bombus occidentalis* (Hymenoptera: Apiformes) in Northeastern Oregon. Northwest Science 85: 64-67.
Reynolds, R.T., R.T. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce, Jr., G. Goodwin, R. Smith, and E.L. Fisher. 1992. Management recommendations for the northern goshawk in the southwestern United States. Gen. Tech/ Rep/ RM-217. Rocky Mountain Forest and Range Experiment Station, USDA Forest Service, Ft. Collins, CO.
Roberts, S.L., et al. Effects of fire on spotted owl site occupancy in a late-successional forest. Biol. Conserv. (2011), doi:10.1016/j.biocon.2010.11.002
Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon and W.J. Zielinski, tech. eds. 1994. The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx, and Wolverine in the United States. Gen. Tech. Rep. RM-254. Ft. Collins, CO: U. S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 184 pp.
Saab, V. A. and H. D. W. Powell. 2005. Fire and avian ecology in North America: Process influencing pattern. Studies in Avian Biology 30:1-13.
Schempf, P.F. and M. White. 1977. Status of six furbearer populations in the mountains of northern California. USDA Forest Service. 51 pp.
Seamans, M. 2005. Population Biology of the California Spotted Owl in the Central Sierra Nevada.Ph.D. Dissertation. University of Minnesota, St. Paul.
Seamans, M. and R. Gutierrez. 2008. Habitat Selection in a Changing Environment: The RelationshipBetween Habitat Alteration and Spotted Owl Occupancy and Breeding Dispersal. The Condor. Vol.,109:566-576.
Sherburne, S.S. and J.A. Bissonette. 1994. Marten subnivean access point use: response to subnivean prey levels. J. Wildl. manage. 58:400-405.
Simon, T.L. 1980. An ecological study of the marten in the Tahoe National Forest, California. M.S. Thesis. California State University, Sacramento. 140 pp.
Schweitzer, D.F., N.A. Capuano, B.E. Young, and S.R. Colla. 2012. Conservation and management of North American bumble bees. NatureServe, Arlington, Virginia, and USDA Forest Service, Washington, D.C. http://www.natureserve.org/aboutUs/pdf/bumblebees.pdf
Sherwin, R. 1998. Presentation to the Western Bat Working Group Workshop.February 9-13. Reno, Nev., Pers. Comm.
Smallwood, K.S. 1998. On the evidence needed for listing the northern goshawks (*Accipiter gentilis*) under the Endangered Species Act: a reply to Kennedy. *J. Raptor Research* 32:323-329.
Spencer, W.D. and W. J. Zielinski. 1983. Predatory behavior of pine martens. Journal of Mammalogy 64:715-717.
Squires, J.R. and R.T. Reynolds. 1997. Northern Goshawk (*Accipiter gentilis*). In: The Birds of North America, No. 298. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologist's Union, Washington, D.C.

Steger, George N., Munton, T.E. , Eberlain, G.P., Johnson, K.D. A study of spotted owl demographics in the Sierra National Forest and Sequoia and Kings Canyon National Parks. Annual Progress Report submitted to R5, USDA Forest Service. December 1999.
Stephens, et al. 2016. Wildfire impacts on California spotted owl nesting habitat in the Sierra Nevada, Ecosphere 2016 (www.esajournals.org), volume 7(11) Article e01478.
Szewczak, Joseph M.; S.M. Szewczak, M.L. Morrison and L.S. Hall. 1998. Bats of the White and Inyo Mountains of California-Nevada. Great Basin Naturalist 58:66-75.
Tatum L. 1998. Wildlife Biologist. USFS, Mendocino National Forest, Supervisor's Office.
Tempel, D.J., and R.J. Gutiérrez. 2013. Relations between occupancy and abundance for a territorial species, the California spotted owl. Conservation Biology 27: 1087–1095
Tempel, D.J., M.Z. Peery, and R.J. Gutiérrez. 2014. Using integrated population models to improve conservation monitoring: California spotted owls as a case study. Ecological Modeling 289: 86-95.
Tempel, D.J., et al. 2016. Meta-analysis of California Spotted Owl (Strix occidentalis occidentalis) territory occupancy in the Sierra Nevada: Habitat associations and their implications for forest management, The Condor Volume 118: 747-765
Thorp, R. W., and M. D. Shepherd. 2005. Profile: Subgenus *Bombus*. In Shepherd, M. D., D. M. Vaughan, and S. H. Black (Eds). Red List of Pollinator Insects of North America. The Xerces Society for Invertebrate Conservation, Portland, OR.
Tommasi, D., A. Miro, H. A. Higo and M. L. Winston. 2004. Bee diversity and abundance in an urban setting. The Canadian Entomologist 136: 851–869.
Truex, R.L., W.J.Zielinski, R.T. Golightly, R.H. Barrett, and S.M. Wisely. 1998. A meta-analysis of regional variation in fisher morphology, demography, and habitat ecology in California. Draft report submitted to: Calif. Dept. Fish and Game, Wildlife Management Division, Nongame Bird and Mammal Section. Sacramento, CA. 118 pages.
USDA Forest Service. 2001. Sierra Nevada Forest Plan Amendment. Final Environmental Impact Statement. Pacific Southwest Region, USDA Forest Service.
USDA 2001b. Sierra Nevada Forest Plan Amendment Final Impact Statement, Volume 3 of 6 (Chapter 3 of Part 4). Pacific Southwest Region, USDA Forest Service.
USDA Forest Service. 2004. Sierra Nevada Forest Plan Amendment. Final Supplemental Environmental Impact Statement Record of Decision. Pacific Southwest Region, USDA Forest Service.
USDA Forest Service. 2015. Draft Interim Recommendations for the Management of California Spotted Owl Habitat on National Forest System Lands. Pacific Southwest Region, USDA Forest Service.
Verner, Jared, McKelvey, Kevin S., Noon, Barry R., Gutiérrez, R.J., Gould, Gordon I. Jr., Beck, Thomas W., Technical Coordinators, 1992. The California spotted owl: a technical assessment of its current status. General Technical Report PSW-GTR-133 Albany CA: Pacific Southwest Research Station, Forest Service, US Department of Agriculture; 285 p.
Verner, Jared. Review of "A Preliminary Report on the Status of the California Spotted Owl in the Sierra Nevada." USDA Forest Service, Pacific southwest Research Station, Forestry Sciences Laboratory, Fresno, California. July 7, 1999.
Wasser, S.K., K. Bevis, G. King and E. Hanson. 1997. Noninvasive physiological measures of disturbance in the northern spotted owl. *Conservation Biology* 4:1019-1022.
Weller, T. J., Zabel, C. J. Characteristics of Fringed Myotis Day Roosts in Norther California. 1991. JOURNAL OF WILDLIFE MANAGEMENT 66(3):489—497.

Weller, T. J. 2000. Snag use and roost fidelity of fringed myotis in an old-growth Douglas-fir forest in northern California. Thesis, Humboldt State Univer- sity, Arcata, California, USA.
Williams, P.H. and J.L. Osborne. 2009. Bumblebee vulnerability and conservation world-wide. Apidologie 40:367–387.
Woodbridge, B. and P.J. Detrich. 1994. Territory occupancy and habitat patch size of northern goshawks in the southern Cascades of California. *Studies in Avian Biology* 16:83-87.
Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer and M. White. 1990. California's wildlife: Volume III: Mammals. Calif. Dept. of Fish and Game, Sacramento, CA. 407 pp.
Zielinski, W.J., W.D. Spencer and R.H. Barrett. 1983. Relationship between food habits and activity patterns of pine martens. J. Mammalogy 64:387-396.
Zielinski, W.J., T.E. Kucera, and R. H. Barrett. 1995. Current distribution of the fisher, Martes pennanti, in California. Calif. Fish and Game 81(3): 104-112.
Zielinski, W.J. and R.H. Barrett. 1997. Southern Sierra Nevada fisher and marten sgudy: Progress Report IV. 15 May 1994- 2 October 1996. Unpublished report.
Zielinski, W.J., C.R. Carroll, and L. Campbell. Using Survey Data to Monitor Population Status and Develop Habitat Models for Fishers and other Mesocarnivores. Progress Report I. USDA Forest Service, Pacific Southwest Research Station, Redwood Sciences Laboratory, 28 May, 1997.

APPENDIX A

Species Accounts

Bald Eagle *Updated July 2005*

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 downlist 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 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 0.5 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 5 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.

Literature Cited

Alt, K.L. 1980. Ecology of the nesting bald eagle and osprey in the Grand Teton-Yellowstone National Parks Complex. M.S. Thesis, Montana State Univ., Bozeman. 95 pp.

Anthony, R.G., R.L. Knight, G.T. Allen, B.R. McClelland and J.I. Hodges. 1982. Habitat use by nesting and roosting bald eagles in the Pacific Northwest. Trans. A. Am. Wildl. Natural Res Conf. 47:332-342.

Detrich, P.J. 1981. Historic range of breeding bald eagles in California. Unpublished manuscript. Redding, CA. 17 pp.

Detrich, P.J. 1982. Results of California winter bald eagle survey--1982. U. S. Dept. Int. Fish Wildl. Serv., Sacramento, CA. 16 pp.

Grubb, T.G. 1976. A survey and analysis of bald eagle nesting in Western Washington. M.S. Thesis, Univ. Washington, Seattle. 87 pp.

Grubb, T.G., W.W. Bowerman, J.P. Giesy and G.A. Dawson. 1992. Responses of breeding bald eagles, *Haliaeetus leucocephalus*, to human activities in northcentral Michigan. Canadian Field-Naturalist 106(4):443-453.

Keister, G.P. and R.G. Anthony. 1983. Characteristics of bald eagle communal roosts in the Klamath Basin, Oregon and California. J. Wildl. Manage. 47:1072-1079.

Lehman, R.N. 1979. A survey of selected habitat features of 95 bald eagle nest in California. Calif. Dept. Fish and Game. Wildl. Manage. Branch Admin. Rep. 79-1, Sacramento. 23 pp.

Lehman, R.N., D.E. Craigie, P.L. Colins and R.S. Griffen. 1980. An analysis of habitat requirements and site selection criteria for nesting bald eagle in California. Report by Wilderness Research Institute, Arcata, CA. for U.S. Forest Service. Region 5, San Francisco, CA. 106 pp.
Stalmaster, M.V. 1976. Winter ecology and effects of human activity on bald eagles in the Nooksack River Valley, Washington. M.S. Thesis. West. Washington State Coll. Bellingham, WA. 100 pp.
USDI Fish and Wildlife Service. 1986. Recovery Plan for the Pacific Bald Eagle. U. S. Fish and Wildlife Service, Portland, Oregon. 160 pp.

California Spotted Owl *(updated April2015cl)*

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 provessional 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, that 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 assocated 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 repace 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 lire 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 rangewide 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 rangewide 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.

Literature Cited

Bart, J. 1995. Amount of suitable habitat and viability of northern spotted owls. Conservation Biology 9:943-946.

Beardsley, D., C. Bolsinger, and R. Warbington. 1999. Old-growth forests in the Sierra Nevada: by type in 1945 and 1933 and ownership in 1993. Gen. Tech. Rep. PNW-GTR-516. USDA Forest Service, Pacific Northwest Research Station. Portland, OR.

Bingham, B.B. and B.R. Noon. 1997. Mitigation of habitat 'take': application to habitat conservation planning. *Conservation Biology* 11:127-139.

Blakelsley J.A., et al. 2005. Site Occupancy, Apparent Survival, and Reproduction of California spotted Owls in Relation to Forest Stand Characteristics. JOURNAL OF WILDLIFE MANAGEMENT 69(4):1554–1564; 2005.

Conner, M.M., J.J. Keane, C.V. Gallagher, G. Jehle, T.E. Munton, P.A. Shaklee, and R.A. Gerrard. 2013. Realized population change for long-term monitoring: California spotted owl case study. Journal of Wildlife Management 77: 1449-1458.

Dugger, K. M., et al. 2016. The effects of habitat, climate, and Barred Owls on long-term demography of Northern Spotted Owls. The Condor Volume 118: 57-116.

Franklin, A.B., D.R. Anderson, R.J. Gutierrez, and K.B. Burnham. 2000. Climate, habitat quality, and fitness in northern spotted owl populations in northwestern California. *Ecological Monographs* 70:539-590.

Franklin, J.F. and J.A. Fites-Kaufmann. 1996. Assessment of late-successional forests of the Sierra Nevada. Pages 627-669 In: Sierra Nevada Ecosystem Project, Final Report to Congress, Vol. II, Assessments and Scientific Basis for Management Options. Univ. Calif., Davis, Centers for Water and Wildland Resources.

Franklin, A.B., R.J. Gutierrez, J.A. Blakesley, J. Keane, T.E. Munton, G.N. Steger, M.E. Seamans, G.S. Zimmerman, W.S. LaHaye, G. White, J. Hines, J. Nichols, B. Noon, S. Britting, T. McDonald, D. Shaw. 2003. Population dynamics of the California spotted owl: a meta-analysis. Final report to U.S. Department of Agriculture Forest Service, Region 5.

Gutierrez, R. J., Manley P. N., Stine P. A. technical editrors, July 2016, Draft: The Califronia Spotted Owl: Current State of Knowledge. USDA Forest Service, March 2016.

Gutiérrez, R.J., Seamans, M. E., Bond, M. Population ecology of the California spotted owl in the central Sierra Nevada: Annual Results 1999. Annual Progress Report to Region 5, USDA Forest Service. March 2000.

Gutierrez, R. J., M.E. Seamans, M.C. Crozier. March 2003. Population ecology of the California spotted owl in the central Sierra Nevada: Annual Results 2002. Annual Progress Report to Region 5, USDA Forest Service, March 2003.

Hunsaker, C. T., B. B. Boroski, G.N. Steger, and J. Verner. 2002. Relations between occurrence and productivity of California spotted owls and canopy cover.

Jones, G. M., et al. 2016. Megafires: and emerging threat to old-forest species, Front Ecol Environ 2016; 14(6): 300–306.

Keane, J. 2014. California spotted owl: scientific considerations for forest planning. Chapter 7.2 in Science Synthesis to support Socioecological Resilience in the Sierra Nevada and Southern Cascades, Post-Print Draft June 2014. Gen. Tech. Report GTR-247. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. Albany, CA.

Laudenslayer, W.F. and H.H. Darr. 1990. Historical effects of logging on the forests of the Cascade and Sierra Nevada ranges of California. *Transactions of the Western Section of the Wildlife Society* 26:12-23.

Laymon, Steven A., 1988. Ecology of the spotted owl in the central Sierra Nevada. Unpublished Dissertation, University of California, Berkely.

McKelvey, K.S. and J.D. Johnston. 1992. Historical perspectives on forests of the Sierra Nevada and the Transverse Ranges of southern California: forests at the turn of the century. In: *The California spotted owl: a technical assessment of its current status* coordinated by J. Verner, K.S. McKelvey, B.R. Noon, R.J. Gutierrez, G.I. Gould Jr., and T.W. Beck. Gen. Tech. Rep. PSW-GTR-133. USDA Forest Service, Pacific Southwest Research Station, Albany, CA.

Moen, C.A. and R. J. Gutiérrez. 1997. California spotted owl habitat selection in the central Sierra Nevada. *Journal of Wildlife Management*, 61(4): 1281-1287.

Noon, Barry R., Blakesley Jennifer A. Demographic parameters of the California Spotted Owl on the Lassen National Forest; preliminary results (1990-1998). Summary Report submitted to Region 5, USDA Forest Service. February 1999.

North, M., G. Steger, R. Denton, G. Eberlein, T. Munton, and K. Johnson. 2000. Association of weather and nest-site structure with reproductive success in California spotted owls. *J Wildlife Management* 64:797-807.

Seamans, M. 2005. Population Biology of the California Spotted Owl in the Central Sierra Nevada.Ph.D. Dissertation. University of Minnesota, St. Paul.

Seamans, M. and R. Gutierrez. 2008. Habitat Selection in a Changing Environment: The RelationshipBetween Habitat Alteration and Spotted Owl Occupancy and Breeding Dispersal. The Condor. Vol.,109:566-576.

Steger, George N., Munton, T.E. , Eberlain, G.P., Johnson, K.D. A study of spotted owl demographics in the Sierra National Forest and Sequoia and Kings Canyon National Parks. Annual Progress Report submitted to R5, USDA Forest Service. December 1999.

Stephens, et al. 2016. Wildfire impacts on California spotted owl nesting habitat in the Sierra Nevada, Ecosphere 2016 (www.esajournals.org), volume 7(11) Article e01478.

Tempel, D.J., and R.J. Gutiérrez. 2013. Relations between occupancy and abundance for a territorial species, the California spotted owl. Conservation Biology 27: 1087–1095

Tempel, D.J., M.Z. Peery, and R.J. Gutiérrez. 2014. Using integrated population models to improve conservation monitoring: California spotted owls as a case study. Ecological Modeling 289: 86-95.

Tempel, D.J., et al. 2016. Meta-analysis of California Spotted Owl (Strix occidentalis occidentalis) territory occupancy in the Sierra Nevada: Habitat associations and their implications for forest management, The Condor Volume 118: 747-765.

USDA Forest Service. 2001. Sierra Nevada Forest Plan Amendment. Final Environmental Impact Statement. Pacific Southwest Region, USDA Forest Service.
USDA 2001b. Sierra Nevada Forest Plan Amendment Final Impact Statement, Volume 3 of 6 (Chapter 3 of Part 4). Pacific Southwest Region, USDA Forest Service.

USDA Forest Service. 2004. Sierra Nevada Forest Plan Amendment. Final Supplemental Environmental Impact Statement Record of Decision. Pacific Southwest Region, USDA Forest Service.
USDA Forest Service. 2015. Draft Interim Recommendations for the Management of California Spotted Owl Habitat on National Forest System Lands. Pacific Southwest Region, USDA Forest Service.
Verner, Jared, McKelvey, Kevin S., Noon, Barry R., Gutiérrez, R.J., Gould, Gordon I. Jr., Beck, Thomas W., Technical Coordinators, 1992. The California spotted owl: a technical assessment of its current status. General Technical Report PSW-GTR-133 Albany CA: Pacific Southwest Research Station, Forest Service, US Department of Agriculture; 285 p.
Verner, Jared. Review of "A Preliminary Report on the Status of the California Spotted Owl in the Sierra Nevada." USDA Forest Service, Pacific southwest Research Station, Forestry Sciences Laboratory, Fresno, California. July 7, 1999.
Wasser, S.K., K. Bevis, G. King and E. Hanson. 1997. Noninvasive physiological measures of disturbance in the northern spotted owl. *Conservation Biology* 4:1019-1022.

Northern Goshawk *(updated May 2001)*

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). There are currently no

rigorous research or monitoring efforts 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 judgement 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 and 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% and 70% 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" in 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 Reynollds 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 form 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% 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 the 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% 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% to greater than 70% 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% to greater than 60% 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 were 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 foreign 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 goshawks 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:

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 goshawk 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 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 rangewide 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.

Literature Cited

Austin, K.K. 1993. Habitat use and home range size of breeding northern goshawks in the southern Cascades. MSc. Thesis. Oregon State Univ. Corvallis, OR.

Bloom, P.H., G.R. Stewart, and B.J. Walton. 1986. The status of the northern goshawk in California, 1981-1983. Calif. Dept. Fish and Game, Wildlife Management Branch, Administrative Report 85-1.

Beier, P. and J.E. Drennan. 1997. Forest structure and prey abundance in foraging areas of northern goshawks. *Ecological Applications* 7:564-571.

Bright-Smith, D.J. and R.W. Mannan. 1994. Habitat use by breeding male northern goshawks in northern Arizona. *Studies in Avian Biology* 16:58-65.

DeStefano, S.B. 1998. Determining the status of northern goshawks in the West: is our conceptual model correct. *J. Raptor Research* 32:342-348.

Hargis, C.D., C. McCarthy, and R.D. Perloff. 1994. Home ranges and habitats of northern goshawks in eastern California. *Studies in Avian Biology* 16:66-74.

Keane, J.J. 1999. Ecology of the northern goshawk in the Sierra Nevada, California. PhD Dissertation. Univ. of Calif., Davis.

Keane, J.J. and M.L. Morrison. 1994. Northern goshawk ecology: effects of scale and levels of organization. *Studies in Avian Biology* 16:3-11.

Kennedy, P.L. 1997. The northern goshawk (*Accipiter gentilis atricapillus*): is there evidence of a population decline? *J. Raptor Research* 31:95-106.

Kennedy, P.L., J.M. Ward, G.A. Rinker, and J.A. Gessaman. 1994. Post-fledging areas in northern goshawk home ranges. *Studies in Avian Biology* 16:75-82.

Maurer, J.R. 2000. Nesting habitat and prey relations of the northern goshawk in Yosemite National Park, California. MSc. Thesis. Univ. of Calif., Davis, CA.

Reynolds, R.T., R.T. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce, Jr., G. Goodwin, R. Smith, and E.L. Fisher. 1992. Management recommendations for the northern goshawk in the southwestern United States. Gen. Tech/ Rep/ RM-217. Rocky Mountain Forest and Range Experiment Station, USDA Forest Service, Ft. Collins, CO.

Squires, J.R. and R.T. Reynolds. 1997. Northern Goshawk (*Accipiter gentilis*). In: The Birds of North America, No. 298. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologist's Union, Washington, D.C.

Smallwood, K.S. 1998. On the evidence needed for listing the northern goshawks (*Accipiter gentilis*) under the Endangered Species Act: a reply to Kennedy. *J. Raptor Research* 32:323-329.

Woodbridge, B. and P.J. Detrich. 1994. Territory occupancy and habitat patch size of northern goshawks in the southern Cascades of California. *Studies in Avian Biology* 16:83-87.
USDA Forest Service. 2001. Sierra Nevada Forest Plan Amendment. Final Environmental Impact Statement. Pacific Southwest Region, USDA Forest Service.
USDA 2001b. Sierra Nevada Forest Plan Amendment Final Impact Statement, Volume 3 of 6 (Chapter 3 of Part 4). Pacific Southwest Region, USDA Forest Service.

Great Gray Owl *updated January 2003*

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.

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. 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).

In the Sierra Nevada, great gray owls are found in mixed coniferous forest from 2,400 to 9,000 feet elevation where such forests occur in combination with meadows or other vegetated openings. Nesting usually occurs within 600 feet of the forest edge and adjacent open foraging habitat. Most nests are made in broken top snags (generally firs), but platforms such as old hawk nests, mistletoe infected limbs, etc. are also used. Nest trees or snags are generally greater than 21 inches dbh and 20 feet tall. Nest trees on the Stanislaus National Forest averaged 32 inches dbh and 32 feet tall, while those in Yosemite National Park averaged 44 inches dbh and 45 feet tall (Greene 1995).

In the Yosemite area, males begin establishing nesting territories in March to early April (Beck 1985). After 30 to 36 days of incubation, eggs hatch from mid-May to mid-June. Young begin to fledge in early June to early July, but will remain around the nest through August. However, great gray owls will breed earlier at higher elevations (approximately 2 weeks earlier for every 1000 foot increase in elevation).

In the Sierra Nevada, pocket gophers and voles appear to be important prey species (Winter 1982, Reid 1989). Meadows appear to be the most important hunting habitat for great gray owls, where approximately 93% of their prey are taken (Winter 1981). Great gray owls have been documented also using open forest, clearcuts, and burned areas, but these habitats appear to provide suboptimal foraging habitat (Greene 1995).

Great gray owls hunt by perching 2 to 20 feet high (Winter 1981) at the edges of meadows or grasslands and listening for prey in grass runways or underground burrows, then flying low over the ground and dropping on the prey (Brunton 1971, Nero 1969, Winter 1981). Winter (1982) observed that owls at Ackerson Meadow in the Stanislaus NF used a mean perch height of 10.8 feet in trees with an average dbh of 13 inches and that they preferred trees with a dbh larger than 9 inches. Larger trees possibly have

more open limb development, allowing stooping and less view obstruction. Winter (1982) also observed owls using fence posts as hunting perches. Stoop distances observed in Yosemite National Park ranged from 0.98 feet to 213 feet, with a mean of 77.57 feet (Reid 1989). On the Stanislaus NF, the longest stoop distance observed was 200 feet and the average was 29.8 feet (Winter 1982). The lack of perches at the edges and/or within meadows may render a meadow unsuitable for great gray owls.

Literature Cited

Beck, T.W. 1985. Interim direction for management of great gray owl. USDA Forest Service, Stanislaus National Forest. Sonora, CA. 24pp.

Brunton, D.F. 1971. Observations of the great gray owl on winter range. Can. Field Nat. 86: 315-322.

Bull, E.L. and M.G. Henjum. 1990. Ecology of the great gray owl. General Technical Report PNW-GTR 265. Pacific Northwest Research Station, USDA Forest Service, Portland OR. 39pp.

Greene, C. 1995. Habitat requirements of great gray owls in the central Sierra Nevada. M.S. Thesis. University of Michigan. 94pp.

Reid, M.E. 1989. The predator-prey relationships of the great gray owl in Yosemite National Park. Cooperative National Park Research Studies Unit Technical Report No. 35. 86pp.

Wilson, J. 1981. Some aspects of the ecology of the great gray owl in the Central Sierra Nevada. USDA Forest Service. 30pp.

Wilson, J. 1985. Great gray owl survey, 1984. California Department of Fish and Game. Project W-65-r-2. Progress Report.

Winter, J. 1981. Some aspects of the ecology of the great gray owl in the Central Sierra Nevada. USDA, Forest Service. Stanislaus National Forest Contract # 43-2276. Final report. Sonora, CA. 30pp.

Winter, J. 1982. Further investigations on the ecology of the great gray owl in the central Sierra Nevada. Final Report to the Forest Service under contract #43-2348. Stanislaus National Forest, Sonora CA. 35pp.

Winter, J. 1986. Status, distribution and ecology of the great gray owl (*Strix nebulosa*) in California. San Francisco, CA: San Francisco State University. 121pp. M.S. thesis.

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 of meadows greater than 15 acres in size that occur within 5 miles of occupied habitat occurred between 2001 and 2004. 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.

Literature Cited

Fowler, C., B. Valentine, S. Sanders and M. Stafford. 1991. Habitat Suitability Index Model: willow flycatcher (*Empidonax traillii*). Unpublished document, USDA Forest Service, Tahoe National Forest. 15 pp.

Harris, J.H., S.D. Sanders and M.A. Flett. 1988. The status and distribution of the willow flycatcher in the Sierra Nevada: results of the 1986 Survey. California Department of Fish and Game. Wildlife Management Division Administrative Report. 88-1. 32 pp.

Sanders, S.D., and M.A. Flett. 1989. Ecology of a Sierra Nevada population of willow flycatchers (*Empidonax traillii*), 1986-1987. Wildlife Management Division Administrative Report 88-3. 34pp.

Serena, M. 1982. The status and distribution of the willow flycatcher (*Empidonax traillii*) in selected portions of the Sierra Nevada, 1982. Calif. Dept. of Fish and Game, Wildlife Management Division Administrative Report No. 82-5. 28 pp.

Pacific Fisher *(updated May 2004)*

Management Status and Direction

Management Status. 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 2000-5000 feet in the North Coast region and 4000-8000 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 (60-100%) 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) corresponds 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 travelled 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, the 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 factors that currently put the Sierra Nevada fisher population at risk of extinction:

1) **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.
2) **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).
3) **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).
4) 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.

5) **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).
6) **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.
7) **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).
8) **the 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.
9) **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.
10) **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).
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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 (2004) includes guidelines that should largely address project design recommendations for fisher on the Eldorado National Forest until a more specific conservation strategy is developed. 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 were 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.

Literature Cited

Aubry, K. and C. Raley. 1999. Ecological characteristics of fishers in southwestern Oregon. USFS Pacific Northwest Research Station. Olympia, WA. 7 pages.

Buck, S., C. Mullis and A. Mossman. 1983. Final report: Coral Bottom - Hayfork Bally fisher study. USDA Forest Service. Unpublished report. 133 pp.

Freel, M. 1991. A literature review for management of fisher and marten in California. Unpubl. Document, USDA Forest Service, Pacific Southwest Region.

Heinemeyer, K.S., and J.L. Jones. 1994. Fisher biology and management: a literature review and adaptive management strategy. Missoula, MT: USDA Forest Service Northern Region. 108 pages.

Kucera, T.E. and W.J. Zielinski. 1995. The Case of Forest Carnivores: Small Packages, Big Worries. Endangered Species Update, University of Michigan.

Lamberson, R.H., W.J. Zielinski, and D. MacFarlane. 2000. Preliminary analysis of fisher population viability in the southern Sierra Nevada. Unpublished report. February 2000.
Powell, R.A. and W.J. Zielinski. 1994. The fisher. Pages 38-73. In:L.F. Ruggiero et al., tech. eds. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the Western United States. Gen. Tech. Rep. RM-254. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Ft. Collins, CO. 184 pages.
Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon and W.J. Zielinski, tech. eds. 1994. The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx, and Wolverine in the United States. Gen. Tech. Rep. RM-254. Ft. Collins, CO: U. S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 184 pp.
Truex, R.L., W.J.Zielinski, R.T. Golightly, R.H. Barrett, and S.M. Wisely. 1998. A meta-analysis of regional variation in fisher morphology, demography, and habitat ecology in California. Draft report submitted to: Calif. Dept. Fish and Game, Wildlife Management Division, Nongame Bird and Mammal Section. Sacramento, CA. 118 pages.
USDA Forest Service. 2001. Sierra Nevada Forest Plan Amendment. Final Environmental Impact Statement. Pacific Southwest Region, USDA Forest Service.
USDA 2001b. Sierra Nevada Forest Plan Amendment Final Impact Statement, Volume 3 of 6 (Chapter 3 of Part 4). Pacific Southwest Region, USDA Forest Service.
Zielinski, W.J. and R.H. Barrett. 1997. Southern Sierra Nevada fisher and marten sgudy: Progress Report IV. 15 May 1994- 2 October 1996. Unpublished report.
Zielinski, W.J., T.E. Kucera, and R.H. Barrett. 1996. Current distribution of the Fisher, *Martes pennanti*, in California. *Calif. Fish and Game* 81(3):104-112.
Zielinski, W.J., T.E. Kucera, and R. H. Barrett. 1995. Current distribution of the fisher, Martes pennanti, in California. Calif. Fish and Game 81(3): 104-112.
Zielinski, W.J., C.R. Carroll, and L. Campbell. Using Survey Data to Monitor Population Status and Develop Habitat Models for Fishers and other Mesocarnivores. Progress Report I. USDA Forest Service, Pacific Southwest Research Station, Redwood Sciences Laboratory, 28 May, 1997.

American Marten *(Updated May 2000)*

In California, marten occur in the northern Sierra Nevada at elevations of 3,400 feet 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% 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 travelways), 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, which correspond to timber seral stages and densities of 3, 4, and 5, G and N (Freel 1991).

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 travelled 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% 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%, and abundant large diameter logs), and to maintain the landscape so that the percentage of non-forested acreage does not exceed 20% 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%, and typically less than 30%. 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.

Literature Cited

Bateman, M.C. 1986. Winter habitat use, food habits and home range size of the marten, *Martes americana*, in western Newfoundland. Canadian Field Naturalist 100: 58-62.

Bennett, L.A. and F.B. Samson. 1984. Marten ecology and habitat management in the central Rocky Mountains: problem analysis. USDA Forest Service and Colorado Cooperative Wildlife Research Unit, Colorado State University. Fort Collins, CO. 60 pp.

Buskirk, S.W. and L.F. Ruggiero. 1994. American marten. Pages 7-37 *in* L.F. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski, eds. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. U. S. Forest Service Gen. Tech. Rep. RM-254.

Chapin, T.G., D.J. Harrison, D.M. Phillips. 1997. Seasonal habitat selection by marten in an untrapped forest preserve. J. Wildl. Manage. 61:707-717.

Davis: University of California, Centers for Water and Wildland Resources. 1996. Sierra Nevada Ecosystem Project, Final Report to Congress.

de Vos, A. 1951. Recent findings in fisher and marten ecology and management. Transactions North American Wildl. Conf. 16:498-505.

Freel, M. 1991. A literature review for management of fisher and marten in California. Unpubl. Document, USDA Forest Service, Pacific Southwest Region.

Hargis, C.D. and J.A. Bissonette. 1995. The effect of forest fragmentation on American marten populations and prey availability. Final report for the utah Division of Wildlife Resources, Wasatch-Cache National Forest, Ashley National Forest, Utah Wilderness Association (Contract No. 91-9166). December 31, 1995. 96pp.

Hargis, C.D. and D.R. McCullough. 1984. Winter diet and habitat selection of marten in Yosemite National Park. J. Wildlife Management 48:140-146.

Koehler, G.M., W.R. Moore and A.R. Taylor. 1975. Preserving the pine marten: management guidelines for western forests. Western Wildlands 2:31-36.

Martin, S.K. 1987. The ecology of the pine marten (*Martes americana*) at Sagehen Creek, California. PhD Thesis. University of California, Berkeley. 223 pp.

Powell, R.A. 1979. Mustelid spacing patterns:variations on a theme by Mustela Zhurnal Tierpsychologie. 50:153-165.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon and W.J. Zielinski, tech. eds. 1994. The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx, and Wolverine in the United States. Gen. Tech. Rep. RM-254. Ft. Collins, CO: U. S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 184 pp.

Schempf, P.F. and M. White. 1977. Status of six furbearer populations in the mountains of northern California. USDA Forest Service. 51 pp.

Sherburne, S.S. and J.A. Bissonette. 1994. Marten subnivean access point use: response to subnivean prey levels. J. Wildl. manage. 58:400-405.

Simon, T.L. 1980. An ecological study of the marten in the Tahoe National Forest, California. M.S. Thesis. California State University, Sacramento. 140 pp.
Spencer, W.D. and W. J. Zielinski. 1983. Predatory behavior of pine martens. Journal of Mammalogy 64:715-717.
USDA Forest Service. 2001. Sierra Nevada Forest Plan Amendment. Final Environmental Impact Statement. Pacific Southwest Region, USDA Forest Service.
USDA 2001b. Sierra Nevada Forest Plan Amendment Final Impact Statement, Volume 3 of 6 (Chapter 3 of Part 4). Pacific Southwest Region, USDA Forest Service.
Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer and M. White. 1990. California Wildlife: Volume III: Mammals. California Dept. of Fish and Game, Sacramento CA. 407 pp.
Zielinski, W.J., W.D. Spencer and R.H. Barrett. 1983. Relationship between food habits and activity patterns of pine martens. J. Mammalogy 64:387-396.

California Wolverine (Updated May 2000)

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.

Literature Cited

Banci, V. 1994. Wolverine. Pages 99-127. In: L.F. Ruggiero, et al., tech. eds. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the Western United States. Gen. Tech. Rep. RM-254. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Ft. Collins, CO. 184 pages.
Butts, T.W. 1992. Wolverine (*Gulo gulo*) biology and management: A literature review and annotated bibliography. Unpublished paper for the U.S. Forest Service. Northern Region.
Hornocker, M.G. and H.S. Hash. 1981. Ecology of the wolverine in northwestern Montana. Can. J. Zool. 59:1286-1301.
Powell, R.A. 1979. Mustelid spacing patterns:variations on a theme by Mustela Zhurnal Tierpsychologie. 50:153-165.
Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon and W.J. Zielinski, tech. eds. 1994. The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx, and Wolverine in the United States. Gen. Tech. Rep. RM-254. Ft. Collins, CO: U. S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 184 pp.
White, M. and R.H. Barrett. 1979. A review of the wolverine in California with recommendations for management. Unpublished paper. Prepared for the USDA Forest Service, Region 5. By the Dept. of Forestry and Resource Mangement. College of Natural Resources. University of Calif. Berkley. 71 pp.
Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer and M. White. 1990. California Wildlife: Volume III: Mammals. California Dept. of Fish and Game, Sacramento CA. 407 pp.

Pallid Bat (*Reviewed 2015cl)*

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 (*Updated 2015cl)*

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 gleaned 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).

Literature Cited (Pallid and Fringed Myotis Bats)

Barbour, R.W. and W.H. Davis. 1969. Bats of America. University Press of Kentucky. 283 pp.

Bolster, B.C. 1998. Calif. Dept. of Fish and Game, Presentation to the Western Bat Working Group Workshop. Feb. 9-13, 1998. Reno, Nevada.

Brown, P. 1996. Presentation at the Natural History and Management of Bats in California and Nevada Conference. The Wildlife Society Western Section, Nov. 13-15, 1996. Sacramento, CA.

Chung-MacCoubrey, A.L. 1996. Bat species composition and roost use in pinyon-juniper woodlands of New Mexico. pp. 118-123, in R.M.R. Barclay and M.R. Brigham, Editors. Bats and Forests Symposium, October 19-21, 1995, Victoria, British Columbia, Canada, Research Branch, Ministry of Forests, Victoria, British Columbia, Working Paper 23/1996.

Ferguson, H. and I.M. Azerrad. 2004. Management recommendations for Washington's priority species – priority habitat and species. Volume 5. Mammals. Pallid bat, Antrozous pallidus. Washington

Department of Fish and Wildlife, WA.
Kunz, T.H. and R.A. Martin. 1990. *Plecotus townsendii*. Mammalian Species. The American Society of Mammalogists. No. 175:1-6.
Hermanson, J.W. and T.J. O'Shea. 1983. Antrozous pallidus. Mammalian Species 213:1-8
Hirshfeld, J.R., and M.J. O'Farrell. 1976. Comparisons of differential warming rates and tissue temperatures in some species of desert bats. Comp. Biochem. Physiol., 55A:83-87.
Philpott, W. 1997. Summaries of the life histories of California bat species. USDA Forest Service, Sierra National Forest, Pineridge Ranger Station. 30pp. Unpublished Document.
Pierson, Elizabeth. 1996. Pierson and Rainey Consultants, Berkeley CA. Presentation at the North California Mine Assessment for Bats Seminar. Shasta College, Redding CA. June 4-6, 1996.
Pierson, E.D. 1996. Presentation to The Western Section of the Wildlife Society, Natural History and Management of Bats in California and Nevada Workshop. Nov. 13-15. Sacramento, CA.
Pierson, E.D., W.E. Rainey, and R.M. Miller. 1996. Night roost sampling: a window on the forest bat community in northern California. Pp. 151-163 *in* Bats and Forests Symposium, October 19-21, 1995, Victoria, British Columbia, Canada. Research Branch, Ministry of Forests, Victoria, British Columbia, Working Paper 23/1996.

Pierson, E.D., W.E. Rainey and D.M. Koontz. 1991. Experimental mitigation for Townsend's big-eared bat at the McLaughlin Mine in California. From Proceedings V: Issues and technology in the management of impacted wildlife, April 8-10, 1991. Snowmass, Co., Thorne Ecological Institute, Boulder, CO.
Pierson, E.D., W.E. Rainey, and R.M. Miller. 1996. Night roost sampling: a window on the forest bat community in northern California. Pp. 151-163 *in* Bats and Forests Symposium, October 19-21, 1995, Victoria, British Columbia, Canada. Research Branch, Ministry of Forests, Victoria, British Columbia, Working Paper 23/1996.
Pierson, E. D., and G. M. Fellers. 1998. Distribution and ecology of the big-eared bat, *Corynorhinus townsendii*. U.S. Geological Survey, Species at Risk Report.
Pierson, E.D., W.E. Rainey, and C. Corben. 2001. Seasonal patterns of bat distribution along an altitudinal gradient in the Sierra Nevada. Report to California State University at Sacramento Foundation, Yosemite Association, and Yosemite Fund, 70 pp.
Pierson, E. D., W. E. Rainey, and L.S. Chow. 2006. Bat use of the giant sequoia groves in Yosemite National Park. Report to Yosemite Fund, San Francisco, CA and Yosemite National Park, El Portal, CA, 154 pp.
Sherwin, R. 1998. Presentation to the Western Bat Working Group Workshop.February 9-13. Reno, Nev., Pers. Comm.
Szewczak, Joseph M.; S.M. Szewczak, M.L. Morrison and L.S. Hall. 1998. Bats of the White and Inyo Mountains of California-Nevada. Great Basin Naturalist 58:66-75.
Tatum L. 1998. Wildlife Biologist. USFS, Mendocino National Forest, Supervisor's Office.
USDA Forest Service. 2001. Sierra Nevada Forest Plan Amendment. Final Environmental Impact Statement. Pacific Southwest Region, USDA Forest Service.
USDA 2001b. Sierra Nevada Forest Plan Amendment Final Impact Statement, Volume 3 of 6 (Chapter 3 of Part 4). Pacific Southwest Region, USDA Forest Service.
Weller, T. J. 2000. Snag use and roost fidelity of fringed myotis in an old-growth Douglas-fir forest in northern California. Thesis, Humboldt State Univer- sity, Arcata, California, USA.
Weller T. J., Zabel, C. J. Characteristics of Fringed Myotis Day Roosts in Norther California. 1991. JOURNAL OF WILDLIFE MANAGEMENT 66(3):489—497.
Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer and M. White. 1990. California's wildlife: Volume III: Mammals. Calif. Dept. of Fish and Game, Sacramento, CA. 407 pp.

Townsend's Big-eared Bat (*Reviewed 2015cl)*

Manaagement 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).

Literature Cited

Barbour, R.W. and W.H. Davis. 1969. Bats of America. University Press of Kentucky. 283 pp.
Brown, P. 1996. Presentation at the Natural History and Management of Bats in California and Nevada Conference. The Wildlife Society Western Section, Nov. 13-15, 1996. Sacramento, CA.
Kunz, T.H. and R.A. Martin. 1990. *Plecotus townsendii*. Mammalian Species. The American Society of Mammalogists. No. 175:1-6.
Philpott, W. 1997. Summaries of the life histories of California bat species. USDA Forest Service, Sierra National Forest, Pineridge Ranger Station. 30pp. Unpublished Document.

Sherwin, R. 1998. Presentation to the Western Bat Working Group Workshop. February 9-13. Reno, Nev., Pers. Comm.
Szewczak, Joseph M.; S.M. Szewczak, M.L. Morrison and L.S. Hall. 1998. Bats of the White and Inyo Mountains of California-Nevada. Great Basin Naturalist 58:66-75.
Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer and M. White. 1990. California's wildlife: Volume III: Mammals. Calif. Dept. of Fish and Game, Sacramento, CA. 407 pp.

Western Bumble Bee (*Updated 2015cl)*

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.

Literature Cited

Alaux, C., J. Brunet, C. Dussaubat, F. Mondet, S. Tchamitchan, M. Cousin, J. Brillard, A. Baldy, L.P. Belzunces and Y. Le Conte. 2010. Interactions between Nosema microspores and a neonicotinoid weaken honeybees (*Apis mellifera*). Environmental Microbiology 12: 774–78.

Cameron, S.A., J.D. Lozier, J.P. Strange, J.B. Koch, N. Cordes, L.F. Solter and T.L. Griswold. 2011. Patterns of widespread decline in North American bumble bees. Proceedings of the National Academy of Sciences 108:662-667. See http://www.pnas.org/content/108/2/662.full.pdf+html .

Carvell, C., W.R. Meek, R.F. Pywell, D. Goulson, M. Nowakowski. 2007. Comparing the efficacy of agri-environment schemes to enhance bumble bee abundance and diversity on arable field margins. Journal of Applied Ecology, 44:29-40.

Dupont, Y.L, C. Damgaard, V. Simonsen. 2011. Quantitative Historical Change in Bumblebee (*Bombus* spp.) Assemblages of Red Clover Fields. PuPLoS One Volumbe 6: Issue 9. Available at http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0025172

Evans, E., R. Thorp, S. Jepsen and S.H. Black. 2008. Status Review of Three Formerly Common Species of Bumble Bee in the Subgenus Bombus: *Bombus affinis* (the rusty patched bumble bee), *B. terricola*

(the yellowbanded bumble bee), and *B. occidentalis* (the western bumble bee). The Xerces society, Portland, OR. Available at http://www.xerces.org/wp-content/uploads/2009/03/xerces_2008_bombus_status_review.pdf

Goulson, D., G.C. Lye and B. Darvill. 2008. Decline and Conservation of Bumble Bees. Annual Review of Entomology 53:191–208

Hatfield, R. 2012. Records of western and Franklin's bumble bees in the western United States. Database records provided by the Xerces Society, Portland, OR on 2/29/12.

Heinrich, B. 1979. *Bumblebee Economics*. Harvard University Press, Cambridge, MA. 245 pp.

Henry,M., M. Beguin, F. Requier, O. Rollin, J. Odoux, P. Aupinel, J. Aptel, S. Tchamitchian and A. Decourtye. 2012. A Common Pesticide Decreases Foraging Success and Survival in Honey Bees. SciencExpress available at http://www.sciencemag.org/content/early/2012/03/28/science.1215039.full.pdf

Hopwood, J., M. Vaughan, M. Shepherd, D. Biddinger, E. Mader, S. Hoffman Black and C. Mazzacano. 2012. Are Neonicotinoids Killing Bees? A Review of Research into the Effects of Neonicotinoid Insecticides on Bees, with Recommendations for Action. Xerces Society, Portland, OR. Available at http://www.xerces.org/wp-content/uploads/2012/03/Are-Neonicotinoids-Killing-Bees_Xerces-Society1.pdf .

Koch, J., J. Strange and P. Williams. 2012. Bumble Bees of the Western United States. U.S. Forest Service and the Pollinator Partnership, Washington, D.C. 144 pp.

Kreyer, D., A. Oed, K. Walther-Hellwig and R. Frankl. 2004. Are forests potential landscape barriers for foraging bumblebees? Landscape scale experiments with *Bombus terrestris* agg. and *Bombus pascuorum* (Hymenoptera, Apidae). Biological Conservation 116 :111–118.

Mader, E., M. Shepherd, M. Vaughan, S. Black and G. LeBuhn. 2011. Attracting Native Pollinators: Protecting North America's Bees and Butterflies. The Xerces Society Guide to Conserving North American Bees and Butterflies and Their Habitat. Storey Publishing, North Adams, MA. 371 pp.

McFrederick QS, Le Buhn G. 2006. Are urban parks refuges for bumble bees? Biol. Conserv. 129:372–382.

Mikkola, K. 1984. Migration of wasp and bumblebee queens across the Gulf of Finland (Hymenoptera: Vespidae and Apidae). Notulae Entomologicae 64: 125-128.

Osborne, J.L., A.P. Martin, N.L. Carreck, J.L. Swain, M.E. Knight, D. Goulson, R.J. Hale and R.A. Sanderson. 2008. Bumblebee flight distances in relation to the forage landscape. Journal of Animal Ecology 77:406–415.

Rao,S., W.P. Stephen, C. Kimoto and S.J. DeBano. 2011. The Status of the 'Red-Listed' *Bombus occidentalis* (Hymenoptera: Apiformes) in Northeastern Oregon. Northwest Science 85: 64-67.

Saab, V. A. and H. D. W. Powell. 2005. Fire and avian ecology in North America: Process influencing pattern. Studies in Avian Biology 30:1-13.

Schweitzer, D.F., N.A. Capuano, B.E. Young, and S.R. Colla. 2012. Conservation and management of North American bumble bees. NatureServe, Arlington, Virginia, and USDA Forest Service, Washington, D.C. http://www.natureserve.org/aboutUs/pdf/bumblebees.pdf

Thorp, R. W., and M. D. Shepherd. 2005. Profile: Subgenus *Bombus*. In Shepherd, M. D., D. M. Vaughan, and S. H. Black (Eds). Red List of Pollinator Insects of North America. The Xerces Society for Invertebrate Conservation, Portland, OR.

Tommasi, D., A. Miro, H. A. Higo and M. L. Winston. 2004. Bee diversity and abundance in an urban setting. The Canadian Entomologist 136: 851–869.

Williams, P.H. and J.L. Osborne. 2009. Bumblebee vulnerability and conservation world-wide. Apidologie 40:367–387.