United States Department of Agriculture

Lassen National Forest Over-snow Vehicle Use Designation

Revised Final Environmental Impact Statement

Volume II. Chapter 3 (Wildlife through Fisheries and Aquatics), Chapter 4, References and Index

Forest Service Lassen National Forest May 2022

Cover photo: Winter in Lassen National Forest. Photo credit: Jono Hey

Lassen National Forest Over-snow Vehicle Use Designation

Revised Final Environmental Impact Statement

Lassen National Forest

Lassen, Shasta, Tehama, Butte, Plumas, Siskiyou, and Modoc Counties, California

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Abstract: The Forest Service proposes to designate snow trails and areas for public over-snow vehicle (OSV) use on the Lassen National Forest. These designations would occur on National Forest System (NFS) snow trails and areas on NFS lands within the Lassen National Forest. The Forest Service would also identify snow trails where grooming for public OSV use would occur within the Lassen National Forest.

Consistent with the Forest Service's Travel Management Regulations at 36 CFR Part 212 Subpart C, trails and areas designated for public over-snow vehicle use would be displayed on a publicly available over-snow vehicle use map (OSVUM). Public over-snow vehicle use off designated trails and outside designated areas is prohibited by 36 CFR §261.14.

This Revised Final Environmental Impact Statement (RFEIS) discloses the comparative analysis of the options being considered in designating snow trails and areas of the Lassen National Forest for OSV use. We consider the environmental impacts of a proposed action, a no-action alternative, and three additional action alternatives developed in response to issues. A Notice of Intent to prepare an EIS was published in the Federal Register on June 26, 2015. A final EIS and draft record of decision were released in August of 2016, and "Legal Notice of Opportunity to Object" was published in the Lassen County Times on August 23, 2016. That legal notice signified the beginning of a 45-day objection period which began on August 24, 2016. After considering the objections received, the Forest Service determined it would be necessary to revise the analysis, starting with a Revised Draft Environmental Impact Statement (RDEIS).

After reviewing comments on the RDEIS, we prepared this Revised Final Environmental Impact Statement (RFEIS) and included further revisions. This RFEIS and the associated draft decision

document (Record of Decision) are subject to the pre-decisional administrative review process (objection process) pursuant to 36 CFR 218, Subparts A and B. Objections will only be accepted from those who have previously submitted specific written comments regarding this proposed project during scoping or other designated opportunity for public comment in accordance with §218.5(a). Issues raised in objections must be based on previously submitted, timely, specifically written comments regarding this proposed project unless based on new information arising after the designated comment opportunities.

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Revised Final Environmental Impact Statement

Volume II. Chapter 3 (continued), Chapter 4, References and Index

Contents

List of Tables

List of Figures

Listed and Sensitive Wildlife Species

Introduction

A biological evaluation for the Lassen National Forest Over-snow Vehicle (OSV) Use Designation Project has been prepared in accordance with the Endangered Species Act of 1973, as amended, and follows policy established in Forest Service Manual Direction (FSM 2670) for Threatened, Endangered, Proposed, Candidate, and Sensitive (TEPCS) wildlife species. Species considered for analysis are shown in table 139 and table 140 (pages 429 and 430). Potential effects of OSV use and trail grooming, including associated actions, to Region 5 terrestrial TEPCS wildlife species and terrestrial wildlife species of public interest are disclosed and analyzed. Referenced maps are included in a separate map packet to accompany this analysis. Special-status aquatic and plant species, management indicator species, survey and manage species, and Neotropical migratory landbirds are analyzed in separate reports (please refer to the project record).

Project Location

This proposal would be implemented on all of the National Forest System (NFS) lands within the Lassen National Forest in northeastern California (figure 1 in volume I). However, not all NFS trails and areas on these NFS lands would be designated for public OSV use.

Relevant Laws, Regulations, and Policy (Applies to All Alternatives)

Regulatory Framework

Land and Resource Management Plan

The Lassen National Forest Land and Resource Management Plan (USDA Forest Service 1992; LRMP), as amended (USDA Forest Service 1994, 2004) provides management direction. Although amendments to the LRMP have modified management direction for northern goshawk, California spotted owl, marten, and Sierra Nevada red fox, the following LRMP direction remains relevant to all species under consideration for this project:

Desired Future Condition

Biological diversity remains high with viable populations of all native wildlife and plant species maintained.

Forest Goals

Manage habitat for sensitive wildlife species to ensure that these species do not become threatened or endangered due to Forest Service actions.

Forest Standards and Guidelines

Manage habitat for sensitive wildlife species to ensure that these species do not become threatened or endangered due to Forest Service actions

(1) Management activities within habitat occupied by sensitive species, or where potential habitat exists, will not be permitted unless supported by a biological evaluation

Management Area

OSV-related Management Area Direction

Lassen National Forest LRMP contains no management area direction specific to OSVs. However, it does prohibit motorized vehicles within the Blacks Mountain and Cub Creek Research Natural Areas (RNAs) in the Ebey Management Area and in some other areas including designated Wilderness.

Other Relevant Management Area Direction

Appendix T: Furbearer Management

The management objective for marten and fisher is to maintain and enhance their populations where possible, to insure they do not become federally listed as threatened or endangered suitable, marten and fisher habitat was identified based on the latest scientific knowledge at that time. Habitat management areas were established using the guidelines in Appendix T to (1) determine approximate locations of territories; (2) determine the effects of these territories on timber management objectives and; (3) develop recommendations for marten and fisher habitat distribution on the forest. On the forest, 93,900 acres were identified as marten and fisher habitat management areas; this includes home range and travel corridors. Using the Appendix T methodology, marten and fisher habitat is managed under a no scheduled harvest prescription.

Sierra Nevada Forest Plan Amendment

Lassen National Forest Land and Resource Management Direction (USDA Forest Service 1992): The Lassen Forest Plan, as amended by the Northwest Forest Plan and Sierra Nevada Forest Plan Amendment (USDA Forest Service 2001, 2004).

Management Goals and Strategies

Old Forest Ecosystems and Associated Species

Goals: The broad goals of the old forest and associated species conservation strategy are to:

- Protect, increase, and perpetuate desired conditions of old forest ecosystems and conserve species associated with these ecosystems while meeting people’s needs for commodities and outdoor recreation activities;
- Increase the frequency of large trees, increase structural diversity of vegetation, and improve the continuity and distribution of old forests across the landscape; and
- Restore forest species composition and structure following large-scale, stand-replacing disturbance events.

Strategy: The old forest ecosystem strategy has the following key elements:

- A network of land allocations, including California spotted owl and northern goshawk protected activity centers (PACs), California spotted owl home range core areas, forest carnivore den sites, and the southern Sierra fisher conservation area, with management direction specifically aimed at sustaining viable populations of at-risk species associated with old forest ecosystems well distributed across Sierra Nevada national forests;
- A network of old forest emphasis areas managed to maintain or develop old forest habitat in areas containing the best remaining large blocks or landscape concentrations of old forest and areas that provide old forest functions (such as connectivity of habitat over a range of elevations to allow migration of wide-ranging old-forest-associated species);

- Direction for restoring ecosystems across all land allocations following large-scale catastrophic disturbance events; and
- A proactive approach for improving forest health with management objectives to reduce susceptibility of forest stands to insect and drought-related tree mortality by managing stand density levels.

Land Allocations and Desired Conditions

California Spotted Owl Protected Activity Centers

Designation

California spotted owl PACs are delineated surrounding each territorial owl activity center detected on NFS 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 nor roost locations are known.

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 diameter at breast height (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.

As additional nest location 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.

When activities are planned adjacent to lands of other ownership, available databases are checked for the presence of nearby California spotted owl activity centers. A 300-acre circular area, centered on the activity center, is delineated, and any part of the area that lies on NFS lands is designated and managed as a California spotted owl PAC.

PACs are maintained regardless of California spotted owl occupancy status. However, after a stand-replacing event, habitat conditions are evaluated within a 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.

Desired Conditions

Stands in each PAC 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.

Management Intent

Maintain PACs so they continue to provide habitat conditions that support successful reproduction of California spotted owls.

Northern Goshawk Protected Activity Centers

Designation

Northern goshawk (PACs are delineated surrounding all known and newly discovered breeding territories detected on NFS 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.

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 mile 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 west side conifer and east side mixed conifer forest types, stands have at least 70 percent tree canopy cover; and (3) in east side 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.

As additional nest location and habitat data become 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.

When activities are planned adjacent to lands of other ownership, available databases are checked for the presence of nearby northern goshawk activity centers. A 200-acre circular area, centered on the activity center, is delineated. Any part of the circular 200-acre area that lies on NFS lands is designated and managed as a northern goshawk PAC.

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 near the affected PAC.

Desired Conditions

Stands in each PAC 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.

Management Intent

Maintain PACs so they continue to provide habitat conditions that support successful reproduction of northern goshawks.

Great Gray Owl Protected Activity Centers

Designation

PACs are established and maintained to include the forested area and adjacent meadow around all known great gray owl nest stands. The PAC encompasses at least 50 acres of the highest quality nesting habitat (CWHR types 6, 5D, and 5M) available in the forested area surrounding the nest. The PAC also includes the meadow or meadow complex that supports the prey base for nesting owls.

Desired Conditions

Meadow vegetation in great gray owl PACs supports a sufficiently large meadow vole population to provide a food source for great gray owls through the reproductive period.

Forest Carnivore Den Site Buffers

Designation

Fisher den sites are 700-acre buffers consisting of the highest quality habitat (CWHR size class 4 or greater and canopy cover greater than 60 percent) in a compact arrangement surrounding verified fisher birthing and kit-rearing dens in the largest, most contiguous blocks available.

Marten den sites are 100-acre buffers consisting of the highest quality habitat in a compact arrangement surrounding the den site. CWHR types 6, 5D, 5M, 4D, and 4M in descending order of priority, based on availability, provide highest quality habitat for the marten.

Desired Conditions

Areas surrounding marten den sites have (1) at least two conifers per acre greater than 24 inches dbh with suitable denning cavities, (2) canopy closures exceeding 60 percent, (3) more than 10 tons per acre of coarse woody debris in decay classes 1 and 2, and (4) an average of 6 snags per acre on the west side and 3 per acre on the east side.

California Spotted Owl Home Range Core Areas

Designation

A home range core area is established surrounding 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 on the Almanor Ranger District and 2,400 acres on the Hat Creek and Eagle Lake Ranger Districts.

Aerial photography is used to delineate the core area. Acreage for the entire core area is identified on NFS lands. Core areas encompass the best available California spotted owl habitat nearest 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.

When activities are planned adjacent to lands of other ownership, circular core areas are delineated around California spotted owl activity centers. Using the best available habitat as described above, any part of the circular core area that lies on NFS lands is designated and managed as a California spotted owl home range core area.

Desired Conditions

Home range core areas consist of large habitat blocks that have: (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.

Forestwide Standards and Guidelines

The following standards and guidelines applicable to terrestrial biota will be considered during the analysis process. Standards and guidelines described in this section apply to all land allocations, other than Wilderness and wild and scenic river areas, unless stated otherwise.

Habitat Connectivity for Old Forest Associated Species

27. Minimize old forest habitat fragmentation. Assess potential impacts of fragmentation on old forest associated species (marten) in biological evaluations.

28. Assess the potential impact of projects on the connectivity of habitat for old forest-associated species.

29. Consider retaining forested linkages (with canopy cover greater than 40 percent) that are interconnected via riparian areas and ridge top saddles during project-level analysis.

30. If fishers are detected outside the southern Sierra fisher conservation area, evaluate habitat conditions and implement appropriate mitigations to retain suitable habitat within the estimated home range. Institute project-level surveys over the appropriate area, as determined by an interdisciplinary team.

Wolverine and Sierra Nevada Red Fox Detections

32. Detection of a wolverine or Sierra Nevada red fox will be validated by a forest carnivore specialist. When verified sightings occur, conduct an analysis to determine if activities within 5 miles of the detection have a potential to affect the species. If necessary, apply a limited operating period from January 1 to June 30 to avoid adverse impacts to potential breeding. Evaluate activities for a 2-year period for detections not associated with a den site. Limited operating periods for old forest-dependent species apply only to vegetation management activities.

Wheeled Vehicles

69. Prohibit wheeled-vehicle travel off of designated routes, trails, and limited off-highway vehicle (OHV) use areas. Unless otherwise restricted by current forest plans or other specific area standards and guidelines, cross-country travel by over-snow vehicles [OSVs] would continue.

Standards and Guidelines for California Spotted Owl and Northern Goshawk Protected Activity Centers

75. For California spotted owl PACs: Maintain a limited operating period (LOP), prohibiting vegetation treatments within approximately ¼ mile of the activity center during the breeding season (March 1 through August 31[1]), unless surveys confirm that California spotted owls are not nesting. Prior to implementing activities within or adjacent to a California spotted owl PAC and the location of the nest site or activity center is uncertain, conduct surveys to establish or confirm the location of the nest or activity center. Limited operating periods for old forest-dependent species apply only to vegetation management activities.

76. For northern goshawk PACs: Maintain an LOP, 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 (PAC is unknown, either apply the LOP to a ¼-mile area surrounding the PAC, or survey to determine the

[1] Changed to August 15th by Region 5 Regional Forester direction issued November 16, 2006.

nest stand location. Limited operating periods for old forest-dependent species apply only to vegetation management activities.

77. 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. Where 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.

82. 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.

Standards and Guidelines for Great Gray Owl Protected Activity Centers

83. Apply a limited operating period, prohibiting vegetation treatments and road construction within ¼ mile of an active great gray owl nest stand, during the nesting period (typically March 1 to August 15). 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. Where 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 reduced.

Standards and Guidelines for Fisher and Marten Den Sites

85. Protect fisher den site buffers from disturbance with an LOP from March 1 through June 30 for vegetation treatments as long as habitat remains suitable or until another regionally approved management strategy is implemented. The LOP may be waived for individual projects of limited scope and duration, when a biological evaluation documents that such projects are unlikely to result in breeding disturbance considering their intensity, duration, timing, and specific location.

87 and 89. Mitigate impacts where there is documented evidence of disturbance to the den 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 den sites.

88. Protect marten den site buffers from disturbance from vegetation treatments with an LOP from May 1 through July 31, as long as habitat remains suitable or until another regionally approved management strategy is implemented. The LOP may be waived for individual projects of limited scope and duration, when a biological evaluation documents that such projects are unlikely to result in breeding disturbance considering their intensity, duration, timing, and specific location. Limited operating periods for old forest-dependent species apply only to vegetation management activities.

Federal Law

Endangered Species Act

The Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) requires that any action authorized by a Federal agency not be likely to jeopardize the continued existence of a threatened or endangered species, or result in the destruction or adverse modification of critical habitat for these species. Section 7 of the Endangered Species Act, as amended, requires the responsible Federal agency to consult the Fish and Wildlife Service and the National Marine Fisheries Service concerning any project or action that may affect a threatened or endangered species under their jurisdiction. It is Forest Service policy to analyze impacts to threatened or endangered species to ensure management activities are not likely to jeopardize the continued existence of a threatened or endangered species, or result in the destruction or adverse modification of critical habitat for these species. This assessment is documented in a biological assessment (project record).

Bald Eagle Protection Act of 1940

The Bald Eagle Protection Act of 1940 provides for the protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession, and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the act or regulations issued pursuant thereto and strengthened other enforcement measures. The act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb." Disturb means to agitate or bother a bald or golden eagle to a degree that causes, based on the best scientific information available, (1) injury to an eagle; (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior (USDI Fish and Wildlife Service 2007).

Other Guidance or Recommendations

Forest Service Manual (FSM) 2600 – Wildlife, Fish, and Sensitive Plant Habitat Management

Chapter 2670 – Threatened, Endangered and Sensitive Plants and Animals

2670.22 – Objectives for Sensitive Species: Maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands.

2670.32 – Policy for Sensitive Species: Review programs and activities as part of the National Environmental Policy Act of 1969 process 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. Analyze, if impacts cannot be avoided, the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole.

2672.4 – Biological Evaluations: Review all Forest Service planned, funded, executed, or permitted programs and activities for possible effects on endangered, threatened, proposed, or sensitive species. The biological evaluation is the means of conducting the review and of documenting the findings. Document the findings of the biological evaluation in the decision notice.

2672.41 – Objectives of the Biological Evaluation:

1. To ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or contribute to animal species or trends toward Federal listing of any species.

3. To provide a process and standard by which to ensure that threatened, endangered, proposed, and sensitive species receive full consideration in the decision-making process.

2672.42 – Standards for Biological Evaluations

Biological evaluations shall include the following:

1. An identification of all listed, proposed, and sensitive species known or expected to be in the project area or that the project potentially affects. Contact the Fish and Wildlife Service ([US]FWS) or the National Marine Fisheries Service (NMFS) as part of the informal consultation process for a list of endangered, threatened, or proposed species that may be present in the project area.

2. An identification and description of all occupied and unoccupied habitat recognized as essential for listed or proposed species recovery, or to meet Forest Service objectives for sensitive species.

3. An analysis of the effects of the proposed action on species or their occupied habitat or on any unoccupied habitat required for recovery.

4. A discussion of cumulative effects resulting from the planned project in relationship to existing conditions and other related projects.

5. A determination of no effect, beneficial effect, or "may" effect on the species and the process and rationale for the determination, documented in the environmental assessment or the environmental impact statement.

6. Recommendations for removing, avoiding, or compensating for any adverse effects.

7. A reference of any informal consultation with the Fish and Wildlife Service as well as a list of contacts, contributors, sources of data, and literature references used in developing the biological evaluation.

Topics and Issues Addressed in This Analysis

Issues

The public identified several non-significant issues during scoping. Designating trails and areas for OSV use and grooming trails for OSV use could impact terrestrial wildlife through direct, indirect, or cumulative:

- Injury or mortality
- Disturbance to individuals (e.g., increased noise and human presence resulting in a loss of breeding and/or feeding)
- Impacts to wildlife habitats including
  - Habitat fragmentation or modification
  - Snow compaction in the habitat of species that hibernate, subnivean species habitat, or in or near denning sites.

Resource Indicators and Measures

The following resource indicators and measures (table 138) were used in the analysis to measure and disclose effects to TEPCS species and other species of public interest:

Table 138. Resource indicators and measures for assessing effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Used to address: P/N, or key issue?	Source
Federally Listed, Proposed Species Forest Service Sensitive Species	Potential for disturbance to individuals from noise associated with OSV use and related activities[2]	All species unless otherwise noted below: Acres and percentage of habitat with potential to be impacted by OSV use Acres and percentage of buffered Northern spotted owl (NSO), California spotted owl (CSO) activity centers and northern goshawk (NGO) PACs with potential to be impacted by OSV use Acres and percentage of buffered bald eagle nests with potential to be impacted by OSV use Species that Migrate or Hibernate: Qualitative discussion only	Yes	FSM 2672.4
Federally Listed, Proposed Species Forest Service Sensitive Species	Potential for injury or mortality of individuals from OSV use or related activities	All species unless otherwise noted below: Acres and percentage of habitat with potential to be impacted by OSV use Acres and percentage of buffered California spotted owl (CSO) activity centers and northern goshawk (NGO) PACs with potential to be impacted by OSV use Acres and percentage of buffered bald eagle nests with potential to be impacted by OSV use	Yes	FSM 2672.4
Applicable Federally Listed, Proposed Species Applicable Forest Service Sensitive Species (marten, Sierra Nevada red fox)	Potential for habitat fragmentation or modification	Acres and percentage of habitat with potential to be impacted by OSV use	Yes	FSM 2672.4

[2] Related activities include snow plowing of roads, parking lots, and trailheads (i.e., staging areas)

Resource Element	Resource Indicator	Measure (Quantify if possible)	Used to address: P/N, or key issue?	Source
Marten	Potential for loss of habitat connectivity	Acres and percentage of connectivity corridors with potential to be impacted by OSV use	Yes	FSM 2672.4
Applicable Forest Service Sensitive Species (willow flycatcher, western pond turtle, Shasta Hesperian snail, western bumble bee, bats)	Potential for habitat degradation	Qualitative discussion	Yes	FSM 2672.4
Applicable Federally Listed, Proposed Species, marten, and Sierra Nevada red fox	Potential for effects of snow compaction or snow compaction effects to foraging (marten) or denning (Sierra Nevada red fox) individuals	Acres and percentage of habitat with potential to be impacted by OSV use	Yes	FSM 2672.4
Subnivean Species (prey for Federally Listed and Proposed Species and Forest Service Sensitive Species)	Potential for effects of snow compaction by OSV use or related activities on subnivean species habitat	Acres and percentage of habitat with potential to be impacted by OSV use for applicable species (NSO, fisher, marten, CSO, Sierra Nevada red fox)	Yes	FSM 2672.4

Methodology

Species biology, habitat information, and potential for OSV-related effects, from the best available scientific information, were discussed in species account sections. Species occurrence information specific to the Lassen National Forest was disclosed. For quantitative assessment, the amount of suitable habitat with potential to be impacted by OSV use was used to measure effects to species for the purpose of comparison by alternative. Specific reproductive site information, when available, was also used to measure effects to species.

Analysis Process

Using Geographic Information Systems (GIS), modeled habitat and reproductive sites, when available, for each species was intersected with areas of moderate to high OSV use assumptions criteria (canopy cover less than 70 percent, slopes less than 21 percent; see below) and areas in which OSV use would be permitted under each alternative. The resulting total acres and percentages of habitat, by assumption and alternative, were disclosed and compared. Using best available scientific information, known reproductive sites were buffered [Northern spotted owl and California spotted owl activity center points (0.70 mile), goshawk PACS (0.25 mile), and bald eagle nest site points (660 feet)] to identify habitats with the greatest potential to be impacted by OSV use and associated activities.

Assumptions Specific to the Wildlife Resources Analysis

Snowmobile use patterns vary by day of the week, time of the day, topography, terrain, and vegetation. With assistance from Lassen National Forest staff, we developed the following use patterns and categories to create a more accurate description of potential impacts of each alternative to species and habitats. Refer to the project record for mapped assumptions.

General OSV use patterns:

- Primarily day use (generally 10:00 am to 3:00 pm; grooming occurs at night).
- OSV use is highest on weekends and holidays.
- Highest concentrations of OSV use occur along groomed trails (this is supported by research documented in the California OSV Program Final EIR (2010)). Generally, groomed trails are used to access cross-country areas.
- Use is concentrated at trailheads.
- Higher use occurs in open meadows adjacent to groomed trail access and in flatter areas.
- OSV “high marking” occurs primarily on slopes with open vegetation, near groomed trails.
- Lower elevations generally have less OSV use – snow occurs at lower elevations less frequently and persists for short periods of time (2 to 5 days).
- Non-groomed trails receive 50 percent less use than groomed trails (only 25,000 registered OSVs in California per California OSV Program Final EIR (2010), most use on groomed trails; if OSV trail grooming were discontinued, assume that use would decline by 50 percent).
- OSV use is assumed to be very low (fewer than 10 riders per site per day on a weekend), depending on specific snow depths and daily temperatures, after the March 31 termination date closing roads for exclusive OSV use. Based on surveys of Forest Snow Parks and designated OSV trail access points, OSV use was documented until the end of April, at which point snow levels no longer allow continued use of designated OSV trails (California OSV Program Final EIR (2010)). Therefore, for the purpose of this analysis, April 30 is used as a cut-off date for the maximum period of interaction between snowmobiles and wildlife.

Areas of Moderate to High OSV Use:

- Canopy cover less than 70 percent: CWHR vegetation (California Department of Fish and Wildlife 2014) 1S, 1P, 1M, 2S, 2P, 2M, 3S, 3P, 3M, 4S, 4P
- Slope less than or equal to 20 percent

High Use:

- Areas within 0.5 mile of snowmobile staging areas
- Areas within 0.5 mile of groomed trails
- Meadows within 0.5 mile of a designated OSV trail

Moderate Use:

- Areas within 0.5 mile of marked (not groomed) OSV trails
- Areas between 0.5 and 1.5 miles from groomed trails
- Meadows 10 acres or greater in size, or 0.5 to 1.5 miles from an OSV trail

Areas of Low to No OSV Use:

Low Use:

- Areas where OSV use is prohibited or restricted under current management. Unauthorized uses will be addressed as law enforcement issues and may prompt corrective actions.
- Areas below 3,500 feet in elevation
- Canopy cover greater than 70 percent: CWHR vegetation 2D, 3D, 4D, 4M; vegetation size 5 and 6
- Slope 21 percent or greater
- Meadows 30 acres or greater, 1.5 miles or more from an OSV trail
- Areas more than 1.5 miles from a groomed OSV trail
- Areas more than 0.5 mile from a marked (not groomed) OSV trail

Potential Use:

- CWHR vegetation open areas (annual grass, barren, lacustrine, mixed chaparral, montane chaparral, perennial grass, sagebrush, wet meadow and urban).

Indirect Effects (Snow Compaction)

Potential indirect effects, including snow compaction and vehicle emissions, are likely to be concentrated in areas of moderate to high OSV use.

New Information:

Future studies or monitoring may identify new information or unexpected types or levels of impacts to terrestrial wildlife resources, and may prompt corrective actions as necessary.

Information and Data Sources

We used the best available scientific information with respect to terrestrial wildlife species information and data sources for this project, which include the following:

- California Department of Parks and Recreation (California OSV Program Final EIR (2010))
- Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement (USDA Forest Service 2001) and Record of Decision for Sierra Nevada Forest Plan Amendment (USDA Forest Service 2004)
- Assessing the Cumulative Effects of Linear Recreation Routes on Wildlife Habitats on the Okanogan and Wenatchee National Forests. Gen. Tech. Rep. PNW-GTR-586 (Gaines et al. 2003)
- Species' literature
- Personal communications with researchers, Forest Service Regional Office staff and Lassen National Forest staff
- California Wildlife Habitat Relationships (2014)
- EVEG data
- Available Lassen National Forest GIS Data

- Natural Resources Management (NRM) Wildlife Data

Incomplete and Unavailable Information

OSV use is not consistent across all available habitat. Although we don't know specifically where impacts would occur at any given time and we cannot quantify the amount of impact from noise-based disturbance, the amount of impact contributing to snow compaction to the subnivean space, or the amount of impact on habitat connectivity, we know the potential for impacts would be greatest in areas of moderate to high OSV use and in high-use areas (see assumptions).

It is also unknown whether compacted trails resulting from snowmobile use are facilitating predator or competitor incursion into deep snow areas; if this is occurring, the extent to which it is occurring, as a result of OSV use and related activities on the Lassen National Forest, is unknown.

Climate change, when identified as a specific threat (marten) or stressor (Sierra Nevada red fox) to a species, is disclosed, by species. However, synergistic impacts of climate change with those of OSV use and related activities are largely unknown at this time.

Spatial and Temporal Context for Effects Analysis

Direct, Indirect, and Cumulative Effects Boundaries

The spatial boundaries for analyzing the direct, indirect, and cumulative effects to all of the species under consideration for analysis, including threatened, endangered, proposed, candidate, Forest Service sensitive species, and species of public interest is the Lassen National Forest boundary (unless otherwise specified) for the following reasons: the forest boundary is large enough to address wide-ranging species and Forest Service Sensitive Species' viability is assessed at the Forest Plan area. The temporal boundary for this analysis is 10 years from the signing of the decision document and is based on adequate time for an effectiveness monitoring program to be designed and implemented and for results to be assessed.

Appendix H of this RFEIS (Volume II) discloses how cumulative impacts were considered. The potential impacts of the alternatives would accumulate with the impacts of past, other present, and reasonably foreseeable future actions in both time and geographic space (FSH 1909.15, Sec. 15.2). If the proposed action or alternatives being analyzed in this RFEIS would result in no direct or indirect impacts, there could be no cumulative impacts. If the direct and indirect impacts of the action would occur within a different context than the impacts of past, present, and reasonably foreseeable future actions, there would also be no potential for impacts to accumulate in time and geographic space.

Only those residual impacts from past actions that are of the same type, occur within the same geographic area, and have a cause-and-effect relationship with the direct and indirect impacts of the proposed action and the alternatives are considered relevant and useful for the cumulative impacts analysis; this analysis relies on current environmental conditions as a proxy for the impacts of past actions.

Cumulative impacts can only occur when the likely impacts resulting from the proposed action or alternatives overlap spatially and temporally with the likely impacts of reasonably foreseeable future actions (FSH 1909.15, Sec. 15.2). Present and reasonably foreseeable future actions are listed in Appendix H of this RFEIS (Volume II) and include routine maintenance throughout the project area on roads and in campgrounds; routine Forest Service use of mineral material sources in designated areas throughout the project area; routine noxious weed management (hand pulling/digging) along forest roads throughout the project area; a wide range of recreational use, in all seasons, across the forest; ongoing maintenance and use of communication sites; personal use woodcutting throughout the project area; grazing on range allotments, primarily between June 1 and October 31, annually, although grazing occurs between April 16 and May 31 on several allotments. Current vegetation management activities include the following:

- Bald Fire Salvage and Restoration, including salvage, treatment of non-merchantable trees, removal of hazard trees along roads and trails, treatment of activity slash (approximately 14,000 acres), site preparation, and planting (approximately 12,000 acres);
- Jellico Fire and Salvage (formerly a part of Bald Fire Salvage; see above)
- Tamarack and Dutch Fire Salvaged (formerly Eiler Fire Salvage), including treating approximately 3,048 acres of area salvage (20 percent of NFS lands), 1,174 acres of roadside hazard trees (8 percent of NFS lands), 4,480 acres of fuels treatments (30 percent of NFS lands), reforesting 5,645 acres (38 percent of NFS lands) within the fire perimeter, and adding 2.4 miles of existing non-system roads into the Forest road system as Maintenance Level 2 roads;
- Castle Timber Sale;
- Lassen Day Fire Salvage of dead and/or dying trees within approximately 200 acres of the Day Fire area on the Lassen National Forest;
- Lost Timber Sale;
- Urfa Timber Sale; and
- Yellow Modified Contract Timber Sale

In addition, the Schedule of Proposed Actions includes the following:

- Storrie Aquatic Organism Passage (AOP) Project that is removing three road-stream crossing structures that are barriers to aquatic organism passage on the Almanor Ranger District and replacing them with new structures that allow aquatic organisms to pass above and below the road crossings and that are capable of passing a 100-year storm flow;
- Grizzly Restoration Project that would move Forest road 26N11 away from Scotts John Creek; increase forest resilience, decrease fuels, maintain/improve wildlife habitat through thinning and prescribed fire; and implement actions to support three research proposals on the Almanor Ranger District;
- Rust Resistant Sugar Pine Maintenance project on the Eagle Lake Ranger District, including forest vegetation improvements that would thin areas around proven rust resistant sugar pine trees to increase sustainability by reducing direct vegetative competition, wildfire risk, over-wintering habitat for cone boring insects, and squirrel access to crowns;
- Big Meadows Powerline Improvement Project that would authorize Pacific Gas and Electric to improve 12 power poles lying along the south shore of Lake Almanor;
- High Lakes Motorized Trail Re- routes and Staging Area Improvements Project that would re-route and reconstruct motorized trail segments, decommission the eliminated trail segments, restore or improve dispersed recreation areas within inventoried roadless area, and develop a staging area outside inventoried roadless area;
- Rocks Restoration Project that proposes fuels reduction, vegetation management, aspen and meadow habitat improvement, and reforestation of some moderate to high severity burned areas on the Almanor Ranger District;

- Moonlight Hand-Thinning Project that would hand-thin small trees and brush along designated Forest Service roads on the Eagle Lake Ranger District to reduce fuels;
- Big Lake Restoration Project that would include removal of encroaching conifers, protection of a spring complex, and pre-commercial thinning in plantations on the Hat Creek Ranger District;
- Halls Flat Windthrow Project that would salvage wind thrown trees, recover economic value and reduce fuel accumulation of material blown down in a wind event on approximately 2,000 acres on the Hat Creek Ranger District; and
- Plum Restoration Project that would encompass: surface fuels treatment for fire hazard reduction; thinning for ponderosa pine, silver sage, meadow and aspen enhancements; noxious weed treatments; and road improvements on the Hat Creek Ranger District.

Potential effects of the Lassen National Forest Over-snow Vehicle Use Designation project that are most likely to combine with past, present, or reasonably foreseeable future actions, include disturbance to individuals from OSV use and increased human presence; habitat fragmentation or modification that facilitate predation or competition for wide-ranging forest carnivores; loss of habitat connectivity for marten; and snow compaction effects on subnivean species habitat. OSV use, and associated activities, would not alter vegetative structure or composition of habitats. Past, present, and reasonably foreseeable future actions overlapping in time (mid-December through the end of April; refer to General OSV Use Patterns under the Assumptions Specific to the Wildlife Resources Analysis section above) and space with the Lassen National Forest Over-snow Vehicle Use Designation project, and with similar potential effects, include the following:

- Noise-based disturbance or disruption to individuals from routine maintenance of roads across the forest during the time of overlap between OSV use and wheeled vehicles; winter recreational use across the forest; personal use woodcutting throughout the project area during the time of overlap between OSV use and wheeled vehicles; and salvage and fuels reduction projects, along with associated actions, toward the beginning and end of the OSV season;
- Habitat fragmentation or modification that facilitate predation or competition for wide-ranging forest carnivores or loss of habitat connectivity for marten, during the time of overlap between OSV use and salvage and fuels reduction projects; or
- Snow compaction effects on subnivean species habitat during the time of overlap between OSV use and wheeled vehicle use or salvage and fuels reduction projects.

Based upon spatial data provided by the Lassen National Forest, the vegetation management or restoration projects identified above are very small in comparison to the OSV Use Designation action area and/or do not overlap with groomed and non-groomed OSV trails or staging areas where the highest OSV use occurs. In addition, seasonal limited operating periods required for vegetation projects, for most sensitive species, would prevent disturbance to breeding individuals. Wheeled motorized vehicles may not be used off of authorized National Forest System roads or motorized trails to scout for fuelwood or to harvest Christmas trees (USDA Forest Service 2014a). Therefore, there would be minimal overlap between the Christmas tree and firewood cutting season (annually between November 1 and December 31), and disturbance or displacement from these activities would occur outside of the breeding season for all species, under all of the alternatives.

Affected Environment and Environmental Consequences

Species Considered in this Analysis

We obtained official species lists for the Lassen National Forest Over-snow Vehicle Use Designation Project on February 20, 2018, from the Klamath Falls, Sacramento, Yreka, and Nevada Field Offices of the U.S. Department of the Interior, Fish and Wildlife Service (USDI Fish and Wildlife Service 2018a, 2018b, 2018c, 2018d). The lists identify wildlife species to consider, because they may be present within the general area of the Lassen National Forest (table 139). Sensitive species applicable to the Lassen National Forest are identified in the Pacific Southwest Region list of sensitive animal species by forest (USDA Forest Service 2014b). Terrestrial sensitive species applicable to the project area are listed below in table 140.

Table 139. Terrestrial threatened, endangered, proposed, and candidate (TEPC) species and designated or proposed critical habitat considered within this analysis

Species Name	TEPC Status[3]	Project Area Within Species' Range	Detections in or Near the Project Area	Suitable Habitat Present	Species Addressed Further/Rationale
Giant garter snake (*Thamnophis gigas*)	FT	No	No	No	No Project area is outside the known distribution of this species
Sierra Nevada red fox (*Vulpes vulpes necator*), Sierra Nevada Distinct Population Segment	FC/FSS	Yes	Yes	Yes	Yes
Gray wolf (*Canis lupus*)	FE	Yes	Yes	Yes	Yes
California wolverine (*Gulo gulo luteus*)	FP/FSS	Yes	Tahoe NF (~150 – 200 miles)	Yes	Yes
Northern spotted owl (*Strix occidentalis caurina*)	FT	Yes	Yes	Yes	Yes
Northern spotted owl designated critical habitat	NA	NA	NA	Designated critical habitat present within the project area	See northern spotted owl section
Valley elderberry long-horned beetle (*Desmocerus californicus dimorphus*)	FT	No	No	Yes (within historical distribution)	No; Project area is outside the known distribution of this species

[3] FE = federally endangered; FT = federally listed as threatened; FP = Federal proposed for listing; FC = Federal candidate for listing; FSS = Forest Service sensitive. Sources: Official federally endangered, threatened, proposed, and candidate species list obtained on June 21, 2017, from the Klamath Falls, Sacramento, Yreka, and Nevada U.S. Fish and Wildlife Service (USFWS) Field Offices and USDA Forest Service, Pacific Southwest Region, Sensitive Animal Species by Forest, Updated October 10, 2014.

Species Name	TEPC Status[3]	Project Area Within Species' Range	Detections in or Near the Project Area	Suitable Habitat Present	Species Addressed Further/Rationale
Valley elderberry long-horned beetle designated critical habitat	NA	No	No	No	No; project area is outside the designated critical habitat
Yellow-billed cuckoo (*Coccyzus americanus*)	FT	No	No	No	No Project area is outside the known distribution of this species
Yellow-billed cuckoo proposed critical habitat	NA	No	No	No	No; project area is outside the proposed critical habitat

Table 140. Terrestrial Forest Service sensitive species considered in this analysis

Species Name	Project Area Within Species' Range	Detections in or Near the Project Area	Suitable Habitat Present	Species Addressed Further/Rationale
Mammals				
Fisher (*Pekania pennanti*)	Yes	Yes	Yes	Yes
Pacific marten (*Martes caurina*)	Yes	Yes	Yes	Yes
Fringed myotis (*Myotis thysanodes*)	Yes	Yes	Yes	Yes
Pallid bat (*Antrozous pallidus*)	Yes	Yes	Yes	Yes
Townsend's big-eared bat (*Corynorhinus townsendii*)	Yes	Yes	Yes	Yes
Birds				
Bald eagle (*Haliaeetus leucocephalus*)	Yes	Yes	Yes	Yes
California spotted owl (*Strix occidentalis occidentalis*)	Yes	Yes	Yes	Yes
Great gray owl (*Strix nebulosa*)	Yes	Near	Yes	Yes
Greater Sandhill crane (*Grus canadensis tabida*)	Yes	Yes	Yes	Yes
Northern goshawk (*Accipiter gentilis*)	Yes	Yes	Yes	Yes
Willow flycatcher (*Empidonax traillii*)	Yes	Yes	Yes	Yes
Yellow rail (*Coturnicops noveboracensis*)	Yes	Yes	Yes	Yes
Reptiles				
Western pond turtle (*Emys marmorata*)	Yes	Yes	Yes	Yes
Invertebrates				
Shasta Hesperian snail (*Vespericola shasta*)	Yes	Yes	Yes	Yes
Western bumble bee (*Bombus occidentalis*)	Yes	Yes	Yes	Yes

Species Not Analyzed in Detail

Valley elderberry longhorn beetle

The valley elderberry longhorn beetle originally occurred in elderberry thickets in moist valley oak woodland along the margins of the Central Valley in California (USDI Fish and Wildlife Service 1984). The habitat of this insect has now largely disappeared throughout much of its former range due to agricultural conversion, levee construction, and stream channelization. Remnant populations are found in the few remaining natural woodlands and in some State and county parks. Critical habitat has been designated in Sacramento County along the American River in the City of Sacramento and along the American River Parkway.

The analysis area falls within the historical range of this species and potential suitable habitat occurs below 3,000 feet in elevation along the foothills in the southwestern portion of the forest (watersheds of Antelope, Deer, Mill and Butte Creeks, Tehama, and Butte Counties). Other riparian zones below 3,000 feet in elevation are within the Pitt River watershed around Lake Britton, Shasta County. However, review of USFWS species location information (USDI Fish and Wildlife Service 2014b) shows that lands administered by the Lassen National Forest (i.e., project area) occur outside the distribution of the nearest presumed extant species occurrences (i.e., southern and western Butte County; south-central and central Tehama County).

This species is known to use riparian habitats. Emissions from OSVs, particularly two-stroke engines on snowmobiles, release pollutants like ammonium, sulfate, benzene, PAHs and other toxic compounds that are stored in the snowpack; during spring snowmelt runoff, these accumulated pollutants are released and may be delivered to surrounding waterbodies (USFS National Core BMP Rec-7: Over-Snow Vehicle Use; please refer to the project hydrology report (project record) for additional information). However, the minimum cross-country snow depth of 12 inches under alternatives 2, 3, and 5 is expected to be adequate to protect aquatic and riparian habitats from measurable impacts to vegetation or water quality (McNamara 2016). Under alternatives 1and 4, the minimum cross-country snow depth would be the depth necessary to avoid resource damage. Due to the project area being outside the range of the species, and due to a lack of downstream effects from project activities, all alternatives would have no effect on the valley elderberry longhorn beetle or its designated critical habitat.

Western yellow-billed cuckoo

This is an uncommon to rare summer resident of valley foothill and desert riparian habitats in scattered locations in California (CDFW 1999). Along the Colorado River, breeding population on the California side was estimated at 180 pairs in 1977. Additional pairs reside in the Sacramento and other riverine habitats found in Southern California. Formerly, the species was much more common and widespread throughout lowland California, but numbers were drastically reduced by habitat loss and current population estimations show about 50 pairs existing in California.

There are no known occurrences of this species found on the Lassen National Forest. In addition, cuckoos are migratory and are not expected to be in the general vicinity of the project area when snow is on the ground. Proposed critical habitat is located more than 10 miles from the project area.

Yellow-billed cuckoos use riparian environments during the breeding season. Emissions from OSVs, particularly two-stroke engines on snowmobiles, release pollutants like ammonium, sulfate, benzene, PAHs, and other toxic compounds that are stored in the snowpack; during spring snowmelt runoff, these accumulated pollutants are released and may be delivered to surrounding waterbodies (USFS National Core BMP Rec-7: Over-Snow Vehicle Use; please refer to the project hydrology report (project record) for additional information). However, the minimum cross-country snow depth of 12 inches for alternatives 2, 3, and 5, is expected to be adequate to protect aquatic and riparian habitats from measurable impacts to vegetation or water quality (McNamara 2016). Under alternatives 1 and 4, the minimum cross-country snow depth would be that depth necessary to avoid resource damage. Due to the project area being outside the range of the species, and due to a lack of downstream effects from project activities, all alternatives would have no effect on yellow-billed cuckoo or its proposed critical habitat.

Giant garter snake (Thamnophis gigas)

The giant garter snake inhabits agricultural wetlands and other waterways such as irrigation and drainage canals, sloughs, ponds, small lakes, low gradient streams, and adjacent uplands in the Central Valley (USDI Fish and Wildlife Service 2009). Because of the direct loss of natural habitat, the giant garter snake relies heavily on rice fields in the Sacramento Valley, as well as, managed marsh areas in Federal and State refuge areas. Giant garter snakes are typically absent from larger rivers because of lack of suitable habitat and emergent vegetative cover, and from wetlands with sand, gravel, or rock substrates. Riparian woodlands typically do not provide suitable habitat because of excessive shade, lack of basking sites, and absence of prey populations. Possible suitable habitats occur downstream from the Lassen National Forest and outside the project area. Because the project area is outside the range of the species, and due to the lack of downstream effects from project activities, all alternatives would have no effect on the giant garter snake.

Species Analyzed in Detail

General Direct and Indirect Effects by Action

According to Gaines et al. (2003), the interactions between snowmobile trails and focal wildlife species are poorly documented for many species and these interactions need to be further refined with additional research and monitoring. The most common interactions between snowmobile trails and wildlife that Gaines et al. (2003) documented from the literature included trapping as facilitated by winter human access, disturbance-based displacement and avoidance,[4] and disturbance at a specific site,[5] usually wintering areas. To a lesser degree, hunting, trapping, poaching, collection, and habitat loss and fragmentation[6] were other interactions identified. Specific types of habitat modification that occurred on winter recreation trails include the effect of snow compaction[7] on the subnivean sites used by small mammals and alteration of competitor/predator communities.[8] The same types of responses would be expected off of designated trails (i.e., cross-country). Other interactions facilitated by linear recreation trails in general, but not specific to OSV use, include vehicle collision and physiological response.[9]

Trapping

Trapping of fisher, marten, wolf, wolverine, or any of the special-status species under consideration is not legal in California. Poaching and collecting without a valid permit are also illegal activities.

[4] Spatial shifts in populations or individual animals away from human activities on or near roads, trails, or networks.
[5] Displacement of individual animals from a specific location that is being used for reproduction and rearing of young.
[6] Loss and resulting fragmentation of habitat owing modification to the establishment of roads, trails, or networks, and associated human activities.
[7] Direct mortality of animals suffocated as a result of snow compaction from snowmobile routes or groomed ski trails or alteration of movement.
[8] A physical human-induced change in the environment that provides access for competitors or predators that would not have existed otherwise.
[9] Increase in heart rate or stress hormones when near a road or trail or network of roads or trails.

These types of activities, facilitated by OSV use, are expected to be rare and addressed as a law enforcement issue. Therefore, they will not be examined in this analysis.

Disturbance

Breeding Disruption

This type of disruption could impact late-successional species or wide-ranging carnivores. If the winter season overlaps with the beginning of breeding, the presence of OSVs or grooming equipment could disrupt courtship and nesting or denning activities due to noise and/or visual disturbance that result in behavioral changes in the animals.

Winter Range and/or Home Range Use

This type of impact could affect late-successional species or wide-ranging carnivores. Noise and extended human presence from OSV activities could reduce the size of the winter home range for several wildlife species. The home range provides food, shelter, and breeding opportunity, and if it is reduced, could compromise species survival, particularly during stressful survival conditions in the winter.

Many of the species that may be active or present during the OSV program season are nocturnal and may not be affected by daytime snowmobile activities. However, 29 percent of snowmobilers report some nighttime riding (California OSV Program Final EIR (2010)), and resulting human disturbance could disrupt home range use by nocturnal species. Trail grooming activities occur at night and are infrequent, and the grooming equipment moves slowly enough that grooming is not expected to have a substantial negative effect on wildlife home range. For nocturnal and crepuscular (most active at sunrise and sunset) species, trail grooming and OSV use may also result in animals avoiding areas frequented by OSV recreationists and groomers.

Physiological Response

Single or repeated interactions between OSVs and wildlife could lead to energy expenditures from flight or vigilance reactions. The energetic cost of flight can be significant for predatory animals. Quantifying these physiological responses in wildlife is extremely difficult.

The grooming equipment operates infrequently and moves slowly, so it is estimated that it results in fewer flight or vigilance reactions. Grooming is not expected to have a substantial negative effect on wildlife populations as a result of physiological stress. OSV use likely results in more flight or vigilance reactions because there are more vehicles, they move faster, and they are generally louder than grooming equipment. Physiological stress may impact individuals, but not populations as a whole.

Vehicle Collision

As previously discussed, the likelihood of a collision between snow grooming equipment and wildlife is extremely low because the equipment travels slowly (3 to 6 mph). There is an increased likelihood of collision with OSVs due to higher frequency of OSV use and higher speeds. This effect would be most specific to mammals. Vehicle collision would be expected to be rare and would impact individuals rather than populations as a whole.

Habitat Modification

Trails as Routes for Competitors and Predators

Packed trails resulting from snowmobile use facilitate coyote incursion into deep snow areas (Bunnell et al. 2006) and can negatively impact marten, Sierra Nevada red fox, fisher, or other mammal populations through increased competition and predation. A study in Utah found that

90 percent of coyote movement was made within 1,150 feet of packed trails (Bunnell et al. 2006). It is unknown if this is occurring or the extent to which it is occurring, as a result of OSV use and related activities on the Lassen National Forest.

Competition and predation, if occurring, would be predictably restricted to areas in the immediate vicinity of trails. The use of OSV trails and regular grooming is an existing condition that has been in operation for numerous years; and no new trail expansion is proposed at this time. Therefore, coyote incursion, if occurring, would continue, but would not increase in size of area as a result of OSV program activities.

Pacific Crest Trail Crossing Features

The addition of designated trails for OSVs to cross the PCT is proposed under all action alternatives. These features are not expected to add measureable impacts beyond those identified within the analyses for individual species.

Avoidance

For diurnal species, OSV use of the trails may result in animals avoiding areas used by OSV recreationists.

Snow Compaction

Mechanical snow compaction can suffocate or alter the movements of subnivean fauna (small mammals, such as shrews, voles, pocket gophers, and mice that remain active throughout the winter with much of their activity occurring in the subnivean space beneath the snowpack) and small mammals that den under the snow, such as marten. Snow compaction may impact individuals. However, small mammals' population densities are dependent on numerous factors.

Threatened, Endangered, and Proposed Species, and Critical Habitat

Northern Spotted Owl (*Strix occidentalis caurina*)

Threatened

Species Account

On the Lassen, northern spotted owls (NSO) are surveyed and monitored, as needed, on the Hat Creek Ranger District. Surveys are usually associated with forest management practices to determine whether there is a need to implement limited operating periods or other mitigations. Table 141 shows observation data for the NSO on the Lassen National Forest. NSOs were observed as single individuals until 2009. No reproduction has been observed. Observations occurred over multiple years at three sites: Screwdriver Creek, Poison Creek, and Underground Creek. The sites are within 1.5 miles of each other. These detections were made during different years. In 1989, a male was detected in the Poison Creek drainage. A single male was detected in 1991, adjacent to Screwdriver Creek. A male was detected in the headwaters of Poison Creek during 1992. A female was detected in the headwaters of Underground Creek during 1995 and 1996. Inventory work did not detect spotted owls at any of these sites during other years.

Surveys conducted in 2009 reported one pair of NSO within the project area, located in the Snow Mountain area. No nest site or reproduction has been documented for this site. In addition, surveys completed in 2011 documented a single male NSO-barred owl cross at various locations near this pair.

Table 141. Northern spotted owl observations and status on the Lassen National Forest

Year	Number of Birds	Sex	Pair	Young	Reproductive Status
1982	1	Unknown	No	No	Single
1989	2	Male	No	No	Single
1991	5	Male	No	No	Single
1992	2	Male	No	No	Single
1995	2	Female	No	No	Single
1996	3	Female	No	No	Single
2000	1	Unknown	Unknown	Unknown	Unknown
2004	0	-	-	-	-
2005	0	-	-	-	-
2009	2	M/F	Yes	No	Unknown
2011	1	M (NSO-barred owl cross)	No	No	No

Habitat Status

The spotted owl is a forest-dwelling owl strongly associated with late-successional forests that have a complex multi-layered structure, large-diameter trees, and high overstory tree canopy (Bias and Gutiérrez 1992). Nest stands often have a well-developed hardwood understory (e.g., canyon live oak (*Quercus chrysolepsis*)) and a conifer overstory. However, nest stands on Lassen National Forest generally consist primarily of conifers (USDA Forest Service 2010). Spotted owl habitats are consistently characterized by greater structural complexity compared to available forest habitat.

The spotted owl breeding season is March 1 through August 31. Breeding activity for spotted owls is broken into 5 stages (pre-laying, laying, incubation, nestling, and fledging) and roughly parallels the time frame of goshawks. Pre-laying behavior in spotted owls begins in March and lasts for 3 weeks prior to the laying of the first egg. Egg-laying starts from April 11 to 25 and can take 1 to 6 days to complete. Incubation starts with laying of the first egg and lasts 28 to 32 days. Nestlings fledge after 34 to 36 days around June 12 to 26 (Forsman et al. 1984). Much of the data available for spotted owl breeding phenology is derived from the northern spotted owl subspecies.

Foraging

NSO forage in forested habitats with hunting perches and a stand structure that allows for flight in the understory and access to prey. The following is summarized from USDI Fish and Wildlife Service (2009):

> “Habitats used by NSO are highly variable, particularly in the diverse conifer-hardwood forests of the Klamath Province”
>
> “Spotted owls also forage within intermediate (younger and/or more open) forest classes. One study (Zabel et al. 2003) found a positive association between NSO in the Klamath Province and moderate amounts of intermediate forest at the core area scale. This habitat class was based on conditions known to be used by foraging NSO.”
>
> “Foraging habitat encompasses nesting and roosting habitat but includes a broader range of structure and might not support successful nesting by NSO (Gutiérrez 1996, USDI Fish and Wildlife Service 2008). Foraging NSO generally use older, denser, and more complex forest than expected based on its availability, but they also use younger forest (Solis and Gutiérrez 1990, Carey et al. 1992, Carey and Peeler 1995, Irwin et al. 2007).”

> "Foraging habitat encompasses a broad range of structure, and low-quality foraging habitat includes younger and more open habitats that may be important for prey production."

Based on the extensive research review conducted, the USFWS went on to define "infrequently-used," low-quality foraging habitat as having a minimum of 40 percent canopy cover and 11-inch dbh conifer trees.

Prey Species

In this portion of the northern spotted owl's range (below about 4,100 feet in southern Oregon and northern California), dusky-footed woodrats (*Neotoma fuscipes*) are the most important prey species of spotted owls, both in frequency and biomass (Forsman 1976, Forsman et al. 1984, Carey et al. 1992, Zabel et al. 1995, White 1996, Ward et al. 1998, and Foresman et al. 2004).

Sakai and Noon (1993) found the highest abundance of woodrats in 15- to 30-year-old plantations resulting from past clearcut timber harvest. The study used radio telemetry to track the movement of woodrats and found that although they inhabited younger stands, woodrats would often cross distinct ecotonal boundaries between forest types. Woodrats tracked during evening telemetry sessions made intermittent, short-distance movements into adjacent old-growth forests occupied by spotted owls. Predators killed a substantial number of radio-tagged woodrats, and carcasses were most often found in adjacent old forest. This is presumably because the younger, dense plantations are difficult for owls to forage in and they must wait until the prey leave these refugia.

Ward et al. (1998) found that owls foraged along late-seral forest edges where dusky-footed woodrats were more abundant. Woodrats living in or dispersing from adjacent shrub lands may be more available for owls hunting along the ecotonal edges between habitat types. Edge or transitional habitats appear to be more important to foraging spotted owls when woodrats dominate the diet (Zabel et al. 1995, Ward et al. 1998). Edges may provide cover to conceal owls from predators while making them inconspicuous to woodrats.

These results suggest that the infrequent use of younger stands by foraging spotted owls is not due to low abundance of prey. Simply increasing prey densities within a stand may not result in an increase in prey available to spotted owls if their foraging efficiency is low in these stands (Rosenberg et al. 1994). High tree densities and homogeneous canopies in second-growth forests may reduce flight maneuverability and the ability of owls to capture prey (Rosenberg and Anthony 1992). However, silvicultural procedures that maintain or enhance woodrat populations adjacent to spotted owl habitat may benefit spotted owls (Sakai and Noon 1993, Irwin et al. 2007).

The northern flying squirrel (*Glaucomys sabrinus*) is a smaller component of the biomass collected by the spotted owl. In northwestern California, flying squirrels constitute only 9.3 percent of the biomass of northern spotted owl diet, while dusky-footed woodrats constitute 70.9 percent of the biomass of northern spotted owl diet (Ward et al. 1998). Forsman et al. (1984) described potential negative impacts to flying squirrels through the loss of the truffle crop; however, the conditions described by Forsman occurred in heavily thinned mature and old-growth stands.

Approximately 26,240 acres of lands administered by the Lassen National Forest occur within the range of the northern spotted owl and 13,432 acres of northern spotted owl suitable habitat occurs within the analysis area.

Northern spotted owl critical habitat was originally designated in 1992, revised in 2008, and most recently revised in 2012 (USDI Fish and Wildlife Service 2012). Approximately 2,736 acres of designated critical habitat within the Interior California Coast, Subunit 8 (ICC-8) overlap lands administered by the Lassen National Forest in the northwestern portion of the Hat Creek Ranger District and includes areas of Late Successional Reserve (LSR; 236 acres). Only about 440 acres within designated critical habitat constitute suitable nesting and roosting habitat (CWHR 5D stands), with an additional 1,622 acres in CWHR 4D stands.

The existing environment refers to the existing conditions and relevant conservation or analysis units within the Action Area (LSR, matrix, critical habitat). It is a component of the environmental baseline, which is maintained by the USFWS. The environmental baseline includes "…the past and present impacts of all Federal, State, or private actions and other human activities in an action area, the anticipated impacts of all Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process." [50 CFR §402.02] The past and present impacts of all Federal, State and private activities in the Action Area, in combination with natural disturbance events and in-growth of vegetation represent the existing condition. The existing condition fully reflects the aggregate impact of all prior human actions and natural events that have influenced and contributed to the environmental baseline. The existing environment is the best representation of the NSO biological baseline relative to assessing project effects and can include other aspects such as the known or possible presence of competitors or predators as relevant to species-level effects as well as existing ambient noise levels (e.g., rivers, creeks, traffic).

Direct and Indirect Effects

Resource Indicators and Measures

Resource indicators and measures (FSH 1909.15, 12.5) used in this analysis to measure and disclose effects to northern spotted owl are listed in table 142.

Table 142. Resource indicators and measures for assessing effects to northern spotted owl

Resource Indicator and Effect	Measure (Quantify if possible)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Potential for disturbance to or displacement of individuals from noise and increased human presence, injury or mortality of individuals	Acres and percentage of important habitat impacted by OSV use	49 acres (< 1%) nest/roost habitat; 6,176 acres (46%) forage habitat	44 acres (< 1%) nest/roost habitat; 5,798 acres (43%) forage habitat	9 acres (< 1%) nest/roost habitat; 747 acres (6%) forage habitat	49 acres (< 1%) nest/roost habitat; 6,176 acres (46%) forage habitat	0 acres
Potential for disturbance to or displacement of individuals from OSV use and increased human presence, injury or mortality of individuals	Acres and percentage of buffered NSO activity center impacted by OSV use	2 (0%)	2 (0%)	2 (0%)	2 (0%)	0

Northern spotted owl is associated with late-successional forests that can be impacted by activities associated with trails. Gaines et al. (2003) conducted a literature review of 71 late-successional-forest-associated wildlife species and identified negative effects on these species that can result from trail-associated factors. These impacts include direct loss of habitat from type conversion, diminished quality of habitat attributes or fragmentation, and road avoidance or displacement resulting from direct harassment or noise disturbance. Individuals, environmental groups, and agency biologists have expressed growing concern over habitat fragmentation for late-successional forest-associated species. Various studies have shown that this species group is vulnerable to disturbance, changes in habitat, or displacement by habitat generalists.

As found in the Sierra Nevada Forest Plan Amendment (USDA Forest Service 2004), habitat types important for late-successional forest include stands typed as 4M, 4D, 5M, 5D, and 6 by California Wildlife Habitat Relationship (CWHR), which are all stands of trees greater than 11 inches dbh with greater than 40 percent canopy cover. The Sierra Nevada Forest Plan Amendment provides management direction for Old Forest Emphasis Areas to maintain or develop old forest habitat in areas containing the best remaining large blocks or landscape concentrations of old forest. Direction also includes providing for old forest functions, such as connectivity of habitat over a range of elevations to allow migration of wide-ranging old-forest-associated species.

Snowmobile use within late-successional forest habitats can have the following direct effects to individuals or their habitat (Gaines et al. 2003): Disturbance and potential for injury or mortality to individuals from vehicle collisions.

Disturbance:

- Displacement of populations or individual animals from a route, related to human activities.
- Disturbance and displacement of individuals from breeding or rearing habitats.
- Physiological response to disturbance, resulting in changes in heart rate or level of stress hormones.

Potential for injury or mortality to individuals from vehicle collision:
As previously discussed, the likelihood of a collision between snow grooming equipment and wildlife is extremely low because the equipment travels slowly (3 to 6 mph). There is an increased likelihood of collision with OSVs due to higher frequency of OSV use and higher speeds.

Potential indirect effects include:

- Altered or dispersed movement as caused by a route or human activities on or near a route.
- Snow compaction (prey base for several of the other late-successional forest species under consideration).

In addition, Gaines et al. (2003) found an interaction that occurred on winter recreation trails was the indirect effect of snow compaction on the subnivean sites used by small mammals in which small mammals can either be suffocated as a result of the compaction, or their subnivean movements can be altered because of impenetrable compact snow. Adverse effects to subnivean animals could indirectly affect the prey base for many Forest Service sensitive species, including northern spotted owl.

Forsman et al. (1984) indicate that northern spotted owl courtship behavior usually begins in February or March with the timing of nesting and fledging varying by elevation and latitude. April 1 coincides with incubation in most areas (USDI Fish and Wildlife Service 2012). The OSV grooming season generally begins in mid-December and continues through March. Start and stop times vary by trail location and are dependent upon the presence and depth of snow. Inspections of the Lassen National Forest snow parks on April 17 and May 1, 2010, showed that OSV enthusiast activity extends beyond the March 31 termination date closing roads for exclusive OSV use. OSV use was assumed to be very low (fewer than 10 riders per site per day on a weekend), depending on specific snow depths and daily temperatures. OSV use was documented until the end of April, at which point snow levels no longer allow continued use of designated OSV trails. For purposes of analysis, April 30 is used as a cut-off date for the maximum period of interaction (California OSV Program Final EIR (2010)).

Northern spotted owl observation points and activity centers in table 141 (page 437) reflect a cumulative count of both observations and known nest sites over time for survey efforts since 1982. Under all alternatives (1, 2, 3, 4, and 5) there are no groomed trails, designated non-groomed trails, or plowed parking areas within one-quarter mile of known northern spotted owl activity or past observations. The nearest such feature consists of a groomed trail located approximately 17 miles from the northern spotted owl range delineation for lands administered by the Lassen National Forest. Therefore, there would be no effect to northern spotted owl resulting from groomed trails, designated non-groomed trails, trail maintenance (including removal of obstacles such as down trees), or plowed parking activities.

Areas within northern spotted owl range are; however, designated for use of existing routes (roads and trails) as well as designated for cross-country travel by OSVs. However, due to the structural nature of suitable habitat (i.e., dense forested stands), the level of cross-country travel in northern spotted owl suitable habitat is expected to be low, and most disturbance is likely to occur primarily along existing roads and trails. Review of past observations and mapping shows that northern spotted owl locations vary in proximity to roads, with several observations occurring adjacent to existing roads designated for vehicular traffic under the travel management system (USDA Forest Service 2011). The activity center for the known owl pair in the Snow Mountain area occurs immediately adjacent to Road 37N08 (Snow Camp Road), which is maintained for high-clearance vehicle travel. Non-OSV as well as OSV access, including a low potential for cross-country travel, has been occurring over the past 30-plus years. Some species can habituate to disturbance and individuals or pairs can successfully reproduce with a range of minor to substantial disturbance depending on their adaptability and rate of previous exposure. The presumed levels of variable tolerance do not relieve the impacts of disturbance, however, those impacts are difficult to detect or measure (USDI Fish and Wildlife Service 1998).

There is some potential for direct effects due to collisions with vehicles. However, because northern spotted owls spend little time at ground level, the potential for injury or mortality due to colliding with an OSV is very low.

The Forest Service considers activities greater than one-quarter mile (400 meters) from a spotted owl nest site to have little potential to affect spotted owl nesting. In addition, Delaney et al. (1999) found that Mexican spotted owls were found to show an alert response to chainsaws at distances less than one-quarter mile. Results of a northern spotted owl study on the Mendocino National Forest in northern California indicated that spotted owls did not flush from nest or roost sites when motorcycles were greater than 70 meters (230 feet) away and sound levels were less than 76 owl-weighted decibels (dBO) (Delaney and Grubb 2003). Noise levels of OSVs (e.g., snowmobiles) are considered in this analysis to be comparable to those generated by motorcycles.

Behavioral responses to disturbance, such as leaving an area, can be readily observed (Tempel and Gutierrez 2003). Physiological responses to disturbance are not as easy to detect because they are not necessarily associated with behavioral responses (Tempel and Gutierrez 2003). Research has been conducted to measure the effects of noise on physiological stress levels of northern and California spotted owls by analyzing fecal corticosterone (e.g., Wasser et al. 1997, Tempel and Gutierrez 2003, Tempel and Gutierrez 2004) and fecal glucocorticoid (Hayward et al. 2011). It is difficult to tease out background differences in fecal corticosterone and fecal glucocorticoid levels from variables such as environment, body condition, and gender (Tempel and Gutierrez 2004; Hayward et al. 2011), making cause and effect determinations of whether disturbance is related to the action being tested or some other factor. The studies varied in design, analysis, and conclusions. The study by Hayward et al. (2011) is most similar to conditions in this project in that it used OHVs. The vehicles traveled back and forth along a 0.5-mile length of road within 5 to 800 meters of roost or nest locations for a period of one hour. Results from this study indicate that there were increased levels of fecal glucocorticoid and reduced reproductive success in response to this level of activity (Hayward et al. 2011).

Comparison of the Alternatives

A total of 13,432 acres of northern spotted owl suitable habitat occurs within the analysis area. Of this, 13,146 acres (98 percent) is currently open to OSV use (table 143). However, 46 percent is designated for and of moderate to high (less than 70 percent canopy closure and less than 21 percent slope; see assumptions section) OSV use (map BE-1)[10]; the same would be true under alternative 4 (map BE-4). This is the area with potential for direct and indirect effects to NSO from OSV use and related activities to occur. Under alternative 2, 43 percent of suitable habitat that would be designated for OSV use would be moderate to high OSV use (map BE-2). Under alternative 3, only 6 percent of suitable habitat would be designated for and of moderate to high OSV use (map BE-3). Under alternative 5, no areas are designated for cross-country OSV use; therefore, this alternative reduces the potential for direct and indirect effects in comparison to all other alternatives including the existing condition (map BE-5).

When considering the single northern spotted owl activity center within the analysis area, the entire activity center buffered by 0.7 mile is designated for OSV use. However, none of that designated area is of moderate to high OSV use under any of the alternatives (table 144; maps BE-6, BE-7, BE-8, BE-9, and BE-10).

[10] All BE maps referenced are located with the wildlife analysis in the project record.

Table 143. Acres of suitable northern spotted owl habitat with potential to be impacted by OSV use and related activities, by alternative

	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5	
	Nest/ Roost	**Forage**	**Nest/ Roost**	**Forage**	**Nest/ Roost**	**Forage**	**Nest/ Roost**	**Forage**	**Nest/ Roost**	**Forage**
Designated for OSV use	744	12,402	704	11,397	245	3,916	744	12,402	0	0
Not Designated for OSV use	6	280	46	1,285	505	8,766	6	280	750	12,682
OSV use restricted to trails	NA		NA		0	0	NA		0	0
Total	13,432 acres	(750 acres nest	/roost habitat;	12,682 acres	forage habitat)					
Designated for OSV use and of moderate to high OSV use	49	6,176	44	5,798	9	747	49	6,176	0	0
Not Designated for OSV use and of moderate to high OSV use	1	82	6	460	41	5,511	1	82	50	6,258
Moderate to high OSV use and OSV use restricted to trails	NA		NA		0	0	NA		0	0
Total	6,308 acres	(50 acres nest/	roost; 6,258	acres forage)						

Table 144. Acres of known northern spotted owl activity centers, buffered by 0.70 mile, with potential to be impacted by OSV use and related activities, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	642	642	639	642	0
Not Designated for OSV use	0	0	3	0	642
Moderate to high OSV use and OSV use restricted to trails	NA	NA	0	NA	0
Total	642				
Designated for OSV use and of moderate to high OSV use	2	2	2	2	0
Not Designated for OSV use and of moderate to high OSV use	0	0	0	0	2
OSV use restricted to trails	NA	NA	0	NA	0
Total	2				

Snowmobiles passing within 0.25 mile of unsurveyed nesting/roosting habitat or an active nest have the potential to disturb nesting northern spotted owls. The highest reproductive status observed in the project area was pair status; however, no northern spotted owl surveys have occurred in the project area since 2011. The intensity and duration of noise-generating activities tested by Hayward et al. (2011) are not expected to occur as a result of the proposed action. The noise associated with snowmobile use in the action area is expected to be of short duration (amount of time it would take to travel through any one given area) and of intermittent intensity (amount of concentrated noise). In addition, the area containing northern spotted owl suitable habitat is not near infrastructure that may facilitate OSV use of the area, including snow parks, and parking lots, as well as designated non-groomed and groomed trails. Therefore, OSV use in northern spotted owl habitats is expected to be low. Under alternative 5, no trails or areas that overlap with northern spotted owl suitable habitats and mapped distribution within the project area are proposed to be designated for OSV use. There would be no noise disturbance generated by OSVs under this alternative, and a corresponding net decrease in potential noise disturbance compared to the existing condition.

None of the alternatives propose to alter vegetation; therefore, they would not remove, downgrade, or degrade habitat for the northern spotted owl. Snowmobile use is not expected to substantially impact northern spotted owl foraging behavior or their ability to locate prey. While northern spotted owls may opportunistically forage during the day (e.g., capture prey at the immediate roost or nest site), they primarily forage at night when snowmobile activity is much less likely to occur. Prey are not expected to be impacted by snowmobile use as they are not likely to reside in the immediate footprint of the road or trail, and because material removed from the trails for safety that could provide cover would be left on site. As stated previously, there is low potential for cross-country OSV travel in dense stands used by northern spotted owl and their prey. Prey may be temporarily startled by noise as a snowmobile passes by; however, the overall abundance and availability of prey would not change as a result of the proposed action.

Cumulative Effects

Based upon spatial data provided by the Lassen National Forest, no foreseeable vegetation management or fuels management projects are projected to occur within northern spotted owl habitats on lands administered by the Lassen National Forest and adjacent NFS lands. Both firewood cutting and Christmas tree cutting are restricted from areas with known northern spotted owl observations (USDA Forest Service 2014). Vegetation and fuels management activities in recent years have included primarily thinned, masticated, and/or burned vegetation to reduce the potential for catastrophic wildfires. These projects are usually excluded from spotted owl reproductive habitat (i.e., Late Seral Reserves). Management prescriptions have emphasized recruitment of large snags and logs, as well as retention of large conifer, over a 20-year period. These are all important habitat attributes for spotted owl foraging habitat. Livestock grazing allotments are located within northern spotted owl distribution, but because livestock are normally present on allotments during the snow-free period, overlap of effects with this project are unlikely.

Recreational activities such as hunting and fishing are expected to continue at levels similar to existing conditions. Use of roads within northern spotted owl habitats for hunting access contributes a level of disturbance during the end of the northern spotted owl breeding season. This is incorporated into the environmental baseline for disturbance. Timber harvest and State and private lands within one-quarter mile of northern spotted owl habitats may impact habitat availability outside NFS lands and may increase disturbance locally. However, existing availability of suitable northern spotted owl habitat on private lands is expected to be low.

In summary, ongoing and reasonably foreseeable actions may be additive locally, but are not expected to contribute substantial impacts to effects discussed for the project under any alternative.

Determination Statement

Based on the above discussions, the Lassen National Forest Over-snow Vehicle Use Designation Project may affect, but is not likely to adversely affect the northern spotted owl, for alternatives 1, 2, 3, and 4, based on the following rationale:

- The OSV proposed actions would not modify any suitable (nesting, roosting or foraging), dispersal, or capable habitat within the OSV area.
- Although the potential for noise-based disturbance to individuals within suitable habitat ranges from 6 to 46 percent under alternatives 1, 2, 3, and 4, the percentage of habitats impacted would actually be lower considering that the concentration of OSV use is not equal across the landscape. Northern spotted owl habitats are not near infrastructure, including snow parks, and parking lots, as well as designated non-groomed and groomed trails, that may facilitate OSV use of the area. Although the whole of the single activity center within the analysis area is designated for OSV use, none of it is of moderate to high OSV use. Therefore, OSV use in northern spotted owl habitats is expected to be low. Noise generated through OSV use is expected to be intermittent and of short duration within and near unsurveyed suitable habitat, and would occur within the early part of the breeding season.
- OSV use is unlikely to influence northern spotted owl foraging or prey availability because owls forage at night when OSV use is low to non-existent.
- OSV use is dispersed across the landscape and is not concentrated in space or time.
- The potential for OSV collision with individual northern spotted owl s is very low.

Based on the above discussions, the Lassen National Forest Over-snow Vehicle Use Designation Project, alternative 5, may affect, but not likely to adversely affect - beneficial effect on the northern spotted owl based on the following rationale:

- No trails or areas overlapping northern spotted owl suitable habitat and mapped distribution within the project area are designated for OSV use under this alternative.

- The lack of OSV use in areas containing suitable northern spotted owl habitats represents a net decrease in potential noise disturbance levels in comparison to the existing condition.

Northern Spotted Owl Designated Critical Habitat

Northern spotted owl critical habitat was originally designated in 1992, revised in 2008, and most recently revised in 2012 (USDI Fish and Wildlife Service 2012). Approximately 2,736 acres of designated critical habitat within the Interior California Coast, Subunit 8 (ICC-8) overlap lands administered by the Lassen National Forest in the northwestern portion of the Hat Creek Ranger District and includes areas of Late Successional Reserve (LSR; 236 acres). Only about 440 acres within designated critical habitat constitute suitable nesting and roosting habitat (CWHR 5D stands), with an additional 1,622 acres in CWHR 4D stands.

Primary Constituent Elements

The 2012 designation of critical habitat for the northern spotted owl identifies the physical and biological features essential to the conservation of the northern spotted owl as forested lands that can be used for nesting, roosting, foraging, or dispersal (USDI Fish and Wildlife Service 2012). The primary constituent elements (PCEs) of the physical or biological features that are essential to the conservation of the northern spotted owl are:

PCE 1: forest types that may be in early-, mid-, or late-seral stages and that support the northern spotted owl across its geographical range*;

PCE 2: nesting/roosting habitat;

PCE 3: foraging habitat;

PCE 4: dispersal habitat

*PCE1 must occur with PCE 2, 3, or 4

Determination Statement

No vegetation treatments or alterations are proposed under any alternative. The primary constituent elements of the physical and biological features that are essential to the recovery of the species would not be affected by proposed activities under any alternative. Therefore, there would be no effect to northern spotted owl designated critical habitat.

Gray Wolf (*Canis lupus*)

Threatened

Species Account

In February 2011, the Oregon Department of Fish and Wildlife radio-collared a single male gray wolf, designated OR7. Tracking data indicates OR7 entered California on December 28, 2011, and travelled hundreds of miles within the state. As of February 2014, OR7 had returned to Oregon. Future movements of OR7 are unpredictable and it is beyond the scope of the biological assessment (project record) to predict whether OR7 would move back into California, remain in Oregon, or travel elsewhere. However, a CDFW trail camera in Siskiyou County, California, recorded a lone canid in May and July 2015. Additional cameras in the area took multiple photos showing two adults and several pups on public and private lands primarily in western Lassen County (CDFW 2015). The CDFW designated this group as the Shasta Pack. In early 2017, biologists found evidence of wolf presence on the Lassen National Forest, and in July 2017, CDFW confirmed the presence of 2 adults and several pups (designated as the Lassen Pack) on public and private lands primarily in western Lassen County (CDFW 2017). Updated information shows approximate pack activities overlap with the southeastern portion of the Lassen National Forest (CDFW 2018a).

Habitat Status

Gray wolves are habitat generalists inhabiting a variety of plant communities, typically containing a mix of forested and open areas with a variety of topographic features. Historically, they occupied a broad spectrum of habitats including grasslands, sagebrush steppe, and coniferous, mixed, and alpine forests. They have extensive home ranges and prefer areas with few roads, generally avoiding areas with an open road density greater than 1.0 mile per square mile (Witmer et al. 1998).

Dens are usually located on moderately steep slopes with southerly aspects near surface water. Rendezvous sites, used for resting and gathering, are complexes of meadows adjacent to timber and near water. Both dens and rendezvous sites are often characterized by having nearby forested cover remote from human disturbance. Wolves are strongly territorial, defending an area of 75 to 150 square miles, with home range size and location determined primarily by abundance of prey. Wolves feed largely on ungulates. Wolves are generally limited by prey availability and threatened by human disturbance. Generally, land management activities are compatible with wolf protection and recovery, especially actions that manage for viable ungulate populations.

Because wolves are habitat generalists, vegetation types and structural conditions across the project area are potentially open to utilization. However, more suitable areas would contain lower levels of human occurrence, including areas of lower road densities (Thiel 1985), and adequate prey (i.e., ungulate) availability (USDI Fish and Wildlife Service 1987). More suitable areas occur in the northern and western portions of the Hat Creek Ranger District; areas within and adjacent to Lassen Volcanic National Park; and southern portions of the Almanor Ranger District.

Direct and Indirect Effects

Resource Indicators and Measures

Resource indicators and measures (FSH 1909.15, 12.5) used in this analysis to measure and disclose effects to the gray wolf are listed in table 145.

Table 145. Resource indicators and measures for assessing effects to the gray wolf

Resource Element	Resource Indicator	Measure (Quantify if possible)	All Alternatives
Habitat Quality	Habitat Removal or Degradation	Acres and percentage of Habitat Removed or Degraded	0
Species Use of Available Habitats	Disturbance and/or Displacement from All or Portions of a Species Home Range	Overlap of acres of disturbing or potentially displacing activity within species' disturbance distance thresholds	See analysis
Injury or Mortality	Potential for Injury or Mortality of Individuals	Risk Level of Potential for Injury or Mortality	Very Low

Snowmobile use and associated activities within habitats for wide-ranging carnivores can have the following effects to individuals or their habitat (Gaines et al. 2003). Potential direct effects include: (1) Displacement or avoidance away from human activity on or near roads; (2) Displacement of individual animals from breeding or rearing habitat; and (3) Physiological response to disturbance resulting in changes in heart rate or level of stress hormones.

There is also a potential for injury or mortality to individuals from vehicle collision. As previously discussed, the likelihood of a collision between snow grooming equipment and wildlife is extremely low because the equipment travels slowly (3 to 6 mph). There is an increased likelihood of collision with OSVs due to higher frequency of OSV use and higher speeds. Vehicle collision with a gray wolf or wolverine would negatively affect that particular animal, but the likelihood of occurrence is assumed to be rare.

Potential indirect effects include behavioral modification such as altered or dispersed movement as caused by a route or human activities on a near a route.

Common Effects of Travel Management

Effects to gray wolves are described in terms of threats to wolves through human contact and conflict (i.e., livestock or grazing concerns), through activities that compromise denning or rendezvous sites, or through activities that affect prey base.

Human Conflict

Wolves initially experienced population declines due mainly to conflicts with humans. This included human settlement, direct conflict with livestock, and a lack of understanding of wolf ecology and habits as well as subsequent eradication programs (USDI Fish and Wildlife Service 1987). Today, human conflict still exists, most notably over livestock depredations and the associated economic losses.

Denning and Rendezvous Sites

Wolves may use den sites from year to year, and certain areas may contain several den sites that wolves use in different years (USDI Fish and Wildlife Service 1987). Wolf packs appear sensitive to human disturbance near den sites and may abandon the site (Ballard et al. 1987). Subsequently, most den sites are located away from trails and backcountry campsites.

Rendezvous sites refer to specific resting and gathering areas wolves use during the summer and early fall. Several rendezvous sites are used with the first one generally located between 1 to 6 miles from the natal den. A pack uses rendezvous sites until the pups are mature enough to travel with the adults, generally early autumn. Wolves appear to be most sensitive to human disturbance at the first rendezvous site and become less sensitive at later sites. However, wolf response to human disturbance is due to a variety of factors including specific setting, individuality of wolves, and whether the population is exploited or protected (USDI Fish and Wildlife Service 1987).

Because biologists routinely monitor satellite collar GPS locations and visit areas (CDFW 2018b), the locations of den dens and rendezvous sites will likely be readily identified. In order to prevent potential disturbance impacts to gray wolf denning and rendezvous sites, the following mitigation measure would apply to all action alternatives (Volume II, Appendices C and D):

> *Proposed project activities will cease within one mile of the current known den site and any future active wolf den or rendezvous sites during the denning period (late April to late June), to avoid human disturbance of the site. Current and future den and rendezvous sites will be closed to OSV use and related project activities, in consultation with a forest biologist, the Service, and California Department of Wildlife, to designate an appropriate buffer area or closure boundary. The Forest Service will provide this information to the Service and the California Department of Fish and Wildlife.*

Prey Base

Wolves prey primarily on ungulates (USDI Fish and Wildlife Service 1987). During all seasons, ungulates constitute the highest percentage of biomass. Because they are an important prey item, factors affecting ungulate distribution and abundance (e.g., habitat and access management, winter range productivity) also affect wolves. Mule deer can be expected to provide the most frequent foraging opportunities for wolves because they are the most numerous and accessible ungulate within the project area. Due to seasonal overlap between the proposed activities (OSV use) and potential effects to wolf prey base, impacts considered in this analysis are confined primarily to mule deer occurrence on winter range.

Effects from This Project

There could be disturbance effects to denning wolves if a natal den location overlaps with areas of OSV use. The denning period is estimated to last from mid-March through mid-June; therefore, there is potential for overlap during the earliest portion of the denning period. No impacts to structure and composition of habitats would occur under any alternative. Because there are known wolf locations to the north, wolves may be transient in the project area. However, since there have been no recent reported sightings and no known mortalities, it is assumed that the potential for direct effects resulting from injury or mortality due to vehicle collisions is very low.

Incidental disturbance of individual wolves from OSV use of established trails and cross-country travel is possible. The degree of effect is likely related to the intensity and duration of OSV disturbance. Studies of snowmobile use and wolf movements in Voyagers National Park (Olliff et al. 1999) have shown that wolves tend to avoid areas of snowmobile activity in restricted-use areas. The studies also showed that repeated avoidance or displacement could result in permanent displacement, an impact to an animal’s winter energy budget, and/or a conditioning of the animal to avoid certain areas. The literature also shows that wolves both used and avoided roads and trails designated for winter use. Although wolves use snowmobile trails for travel and foraging, they show decreased use or avoidance of roads and trails that had higher levels of human presence (Olliff et al. 1999, Whittington et al. 2005).

OSV use of groomed trails is expected to be frequent under all alternatives. Consequently, there is an increased likelihood that wolves would avoid these areas. All alternatives contain nearly identical amounts of groomed trails (406 to 408 miles); therefore, the effect of groomed trails is similar. Existing linear routes (i.e., roads and trails) in areas outside groomed trails designated for OSV travel (including existing roads and trails) are expected to receive less human use, resulting in decreased disturbance and potential displacement of wolves. Areas outside of existing linear trails and designated for cross-country travel are also expected to receive less OSV use due to potential for physical barriers and slope limitations, although open meadows or parks adjacent to linear trails may attract more use. The amount of area designated for OSV travel varies by alternative. Alternative 1 would be the least restrictive, not designating 186,000 acres for OSV use. Alternative 4 would restrict travel within 191,090 acres, while the proposed action provides restrictions on 228,890 acres. Alternative 5 would be the most restrictive, not designating 510,540 acres for OSV use. Alternative 5 would not designate areas below 3,500 feet elevation for OSV use, which would include all portions of mapped mule deer winter range.

Impacts to Primary Prey

Wintering deer are sensitive to disturbances of all kinds. Both snowmobiles and cross-country skiers are known to cause wintering ungulates to flee (Freddy et al. 1986). Dorrance et al. (1975) found that snowmobile traffic resulted in increased home range size, increased movement, and displacement of deer from areas along trails. Direct environmental impacts of snowmobiles include collisions causing mortality and harassment that increased metabolic rates and stress responses (Canfield et al. 1999).

No groomed or non-groomed designated OSV trails occur within mule deer winter range under any alternative. However, OSV use of existing linear trails is designated within winter range at some level under all alternatives, and cross-country travel is designated at some level under all alternatives, except alternative 5. Approximately 119,333 acres of mule deer winter range occurs within the project area. A total of 59,453 acres of winter range (roughly 50 percent of existing) is closed or not designated for OSV use under alternatives 1 and 4 (table 146; maps BE-11 and BE14, respectively). Roughly 59,453 acres (50 percent) are designated, but only 19,980 acres (17 percent) is designated for and of moderate to high OSV use based on slope and forest stand density under the OSV use level assumptions (see appendix G). Therefore, under alternatives 1 and 4, mule deer would have the potential to be subject to disturbance, mortality, injury, or altered movement from high or moderate OSV use across 17 percent of their winter range. OSV use would not be designated on additional winter range under both the proposed action and alternative 3 (maps BE-12 and BE-13), respectively. Under alternatives 2 and 3, mule deer would have the potential to be subject to disturbance, mortality, injury, or altered movement by high and moderate OSV use across only 8 to 13 percent of their winter range. No areas within mule deer winter range are designated for cross-country travel under alternative 5 (map BE-15); therefore, this alternative reduces the potential for direct and indirect effects in comparison to all other alternatives, including the existing condition.

Table 146. OSV areas not designated for cross-country travel by alternative

OSV Management	Current OSV Management	Proposed Action	Alternative 3	Alternative 4	Alternative 5
Total Area (Acres)	186,000	229,760	316,7400	194,550	517,260
OSV Use Not Designated within Mule Deer Winter Range (percent of total winter range acres)	59,453 (50%)	78,116 (65%)	90,552 (76%)	59,453 (50%)	119,333 (100%)
Mule Deer Winter Range Designated for OSV Use and of Moderate to High OSV Use (percent of total winter range acres)	19,980	15,871	9,959	19,980	0

Summary of Effects

Public OSV use would not be designated on at least 50 percent of mule deer winter range under all alternatives. By comparison, alternative 5 provides the largest amount of area where OSVs would be excluded, thereby potentially producing the lowest amount of disturbance spatially in addition to avoiding cross-country travel within all deer winter range. Alternative 3, the proposed action, alternative 4, and alternative 1 follow in order of increasing disturbance potential to wolves based on total acres available for OSV use. However, because wolves are known to follow prey species seasonally, potential effects during the project’s active period (December through April) are more likely to occur at lower elevations where deer would be distributed during that time of year. While all alternatives provide some disturbance-free portions within winter range, alternative 5 provides the largest amount of OSV-restricted area within mule deer winter range.

Cumulative Effects

Based upon spatial data provided by the Lassen National Forest, vegetation management or fuels management projects are projected to occur within Lassen National Forest lands suitable for use by wolves. These include timber harvest, fuels reduction, and associated activities, as well as road maintenance, firewood gathering, and special use activities. Vegetation management projects identified above are very small in comparison to the OSV Use Designation action area and/or do not overlap with groomed and non-groomed OSV trails or staging areas where the highest OSV use occurs. Recreational activities such as camping, hiking, hunting, and fishing are ongoing and expected to continue at levels similar to existing. Existing levels of livestock grazing may incur wolf-livestock conflicts if wolves become established, but because livestock are normally present on allotments during the snow-free period, overlap of effects with this project are unlikely. Use of roads for public and administrative access contributes a level of disturbance primarily during the snow-free period. This is incorporated into the environmental baseline for disturbance. Livestock on State and private lands adjacent to suitable habitats may increase risk of conflicts locally. In summary, ongoing and reasonably foreseeable actions may be additive locally, but are not expected to contribute substantial impacts to effects discussed for project under any alternative.

Determination Statement

All alternatives would have a low level of risk to wolves. Therefore, all alternatives of the Lassen National Forest Over-snow Vehicle Use Designation Project may affect, but are not likely to adversely affect gray wolves based on the following rationale:

- Mitigation measures are incorporated into all alternatives in order to prevent potential OSV disturbance impacts to fray wolf denning and rendezvous sites.
- Wolves are less likely to occur within most of the project area from December through April due to seasonal elevation shifts of prey species to winter range. Noise-based disturbance would largely be limited to only 8 percent to 17 percent of winter range of moderate to high OSV use, with the exception of alternative 5 under which no OSV use is designated in deer winter range.

Potential for direct impacts to wolves from collisions with OSVs is very low.

North American Wolverine (*Gulo gulo luscus*)

Proposed Threatened; Regional Foresters Sensitive Species

Species Account

Wolverines have a circumpolar distribution and occupy the tundra, taiga, and forest zones of North America and Eurasia (Wilson 1982). The species uses a wide variety of forested and non-forested habitats in North America (Banci 1994). In California, wolverines once occurred throughout the Sierra Nevada, Cascades, Klamath, and northern Coast ranges in alpine, boreal forest, and mixed forest vegetation types (Schempf and White 1977). Following dramatic increases in human development and disturbance (e.g., increased mining, fur trapping, and timber harvest) associated with the California gold rush of the mid-1800s (summarized in Zielinski et al. 2005) the distribution of wolverine in California was limited to the central and southern Sierra Nevada only (Ibid, Schempf and White 1977).

Primarily nocturnal, wolverines are difficult to observe, even when they are abundant (Banci 1994). An empirical wolverine habitat model developed for the Rocky Mountains found that wolverine occurrence was strongly associated with low human population density and low road density (Carroll et al. 2001).

An extensive furbearer study the Forest Service Pacific Southwest Research Station conducted from 1996 to 2002, using track plates and cameras on approximately 7,500,000 acres in the southernmost Cascades and Sierra Nevada range (estimated 150 of 344 sample units located within suitable wolverine habitats) did not detect this species and found that wolverines may be extirpated from or occur in extremely low densities within the area sampled (Zielinski et al. 2005).

On February 28, 2008, a detection of a lone male wolverine occurred near Truckee, California. This was the first verified record of a wolverine in California since 1922. Agency biologists and researchers used genetic samples (i.e., hair and scat) to determine that the wolverine is most closely related to, and most likely came from, a population on the western edge of the Rocky Mountains rather than either the historic California population (compared to samples taken from museum specimens) or contemporary northern Cascades (Washington) population (Moriarty et al. 2009). This attempted dispersal event may represent a continuation of the wolverine expansion in the contiguous United States and other wolverines may have travelled to the Sierra Nevada and remain undetected (USDI Fish and Wildlife Service 2013). Although incidental, unconfirmed sightings of wolverine have been reported throughout the Sierra Nevada, including Lassen National Forest (USDA Forest Service 2010), there is no evidence that California currently hosts a wolverine population or that female wolverines have made, or are likely to make, similar dispersal movements (USDI Fish and Wildlife Service 2013).

Wolverine effective population size in the northern Rocky Mountains, which is the largest extant population in the contiguous United States, is exceptionally low and is below what is thought necessary for short-term maintenance of genetic diversity; estimates for effective population size for wolverines in the northern Rocky Mountains averaged 35 (USDI Fish and Wildlife Service 2013).

Along the Pacific Coast, historical records show that wolverines occurred in two population centers in the North Cascades Range and the Sierra Nevada (USDI Fish and Wildlife Service 2013). However, records do not show occurrences between these centers from southern Oregon to northern California, indicating that the historical distribution of wolverines in this area is best represented by two disjunct populations rather than a continuous peninsular extension from Canada (USDI Fish and Wildlife Service 2013). This conclusion is supported by genetic data indicating that the Sierra Nevada and Cascades wolverines were separated for at least 2,000 years prior to extirpation of the Sierra Nevada population (USDI Fish and Wildlife Service 2013). Only one Sierra Nevada record exists after 1930, indicating that this population was likely extirpated in the first half of the 1900s.

Habitat Status

There are few studies about wolverine habitat use in the coterminous U.S.; the results of a 5-year study (Copeland et al. 2007) show wolverines used modestly higher elevations in summer versus winter, and they shifted use of cover types from whitebark pine (*Pinus albicaulis*) in summer to lower elevation Douglas-fir (*Pseudotsuga menziezii*) and lodgepole pine (*Pinus contorta*) communities in winter. Elevation explained use of habitat better than any other variable in both summer and winter. Grass and shrub habitats and slope also seemed desirable. Wolverine preferred northerly aspects, had no attraction to or avoidance of trails during summer, and avoided roads and ungulate winter range. In general, wolverines live at or above timberline, in areas relatively free from human disturbance, moving to lower elevations in winter likely due to prey availability.

Wolverine home ranges are large and variable. Home ranges in North America range from less than 38 square miles (100 square kilometers) to over 346 square miles (900 square kilometers). The average size of wolverine’s home range is between 300 and 500 square kilometers (186 to 310 square miles, USDI Fish and Wildlife Service 2013). Home range sizes within the Sierra Nevada remain unknown. Males typically have larger home ranges than females, especially those with young. Male home ranges increase during the breeding season, likely driven by the distribution of females.

Within their geographic range, wolverine use diverse coniferous forest types (Hornocker and Hash 1981) and unlike fisher and marten, this species also uses non-forested alpine habitats (Banci 1994). The presence of deep and persistent snow appears be a major contributing factor to habitat selection by wolverines. Wolverine select areas that are cold and receive enough winter precipitation to reliably maintain deep persistent snow late into the warm season (Copeland et al. 2010). Wolverines depend on persistent snow cover for successful reproduction (Copeland et al. 2010). No records exist of wolverines denning in snow-free habitats, despite the wide availability of these habitats within their range (USDI Fish and Wildlife Service 2013). Wolverines also appear to select areas that are free of significant human disturbance (summarized in USDA Forest Service 2001). A major threat to this species is loss of alpine habitat from climate change. Other potential threats to this species include habitat loss and fragmentation and increasing human presence.

Breeding occurs from late spring to early fall and females undergo delayed implantation until the following winter or spring when offspring are born typically from mid-February through March, although females will give birth in natal dens as early as January or as late as April (Banci 1994). Female wolverines use natal dens that are excavated in the snow and require persistent, stable snow conditions greater than 5 feet deep (Magoun and Copeland 1998, Copeland et al. 2010) presumably as thermal and predation protection (USDI Fish and Wildlife Service 2013). These dens are typically found at higher elevations than the average elevation used by non-reproductive wolverines (Magoun and Copeland 1998). Natal dens described in California were under rock ‘shelves’ at elevations above 10,000 feet (summarized in USDA Forest Service 2001). Females may use natal dens through late April or early May and may move kits to multiple maternal dens during May. Den abandonment is related to water accumulation from snowmelt, the maturation of offspring, and disturbance (USDI Fish and Wildlife Service 2013).

High and moderate capability wolverine denning habitat includes the following CWHR vegetation classes that are also in areas free of significant human disturbance. CWHR (2014) describes high capability denning and resting habitats as Lodgepole Pine (5M and 5D), Red Fir (5M and 5D), and Subalpine Conifer (5M and 5D); and moderate capability denning and resting habitats as Lodgepole Pine (all strata except 2S, 5M, and 5D), Red Fir (all strata except 5M and 5D), and Subalpine Conifer (all strata except 5M and 5D).

High capability foraging habitat is described as Alpine Dwarf-Shrub (all strata), Lodgepole Pine (5M and 5D), Red Fir (5M and 5D), and Subalpine Conifer (5M and 5D); and moderate capability foraging habitat as Lodgepole Pine (all strata except 2S, 5M, and 5D), Red Fir (all strata except 5M and 5D), Subalpine Conifer (all strata except 5M and 5D), and Wet Meadow (all strata).

Moderate and high capability resting habitat includes the CWHR vegetation classes described above and free from disturbance, as for denning habitat, but without the minimum elevation (10,000 feet). Similarly, high and moderate capability foraging habitat includes the CWHR vegetation classes described above for this habitat relationship type and free from disturbance.

This habitat generalist appears to select areas that are free of significant human disturbance and requires den sites associated with structural cover (e.g., boulders and persistent snow cover) in cirque basins or avalanche chutes at high elevations (summarized in USDA Forest Service 2001). The presence of deep and persistent snow appears be a major contributing factor to habitat selection by wolverines.

Although not currently known to exist on the Lassen National Forest, wolverines have been known to occupy habitats from 4,000 to over 10,000 feet elevation in the Sierra Nevada (USDA Forest

Service 2010). Habitat for this species occurs in subalpine conifer habitats interspersed with meadows (USDA Forest Service 2001). For this analysis, a total of 40,276 acres of habitat, based on the aforementioned criteria, is found within the project area (map BE-16).

Threats

Potential threats to this species include habitat loss and fragmentation, loss and alteration of alpine (snow) habitat from climate change, and increasing human presence (disturbance). The USDI Fish and Wildlife Service (2013) noted climate change as the threat with the greatest potential to impact wolverine. A warming climate will likely result in a loss of suitable habitat due to increased summer temperatures and a reduced incidence of persistent spring snowpack. The USDI Fish and Wildlife Service (2013) noted recreation as an additional threat to wolverines because mother wolverines tend to move their kits to alternate denning areas once humans have been detected nearby.

Direct and Indirect Effects

Resource indicators and measures (FSH 1909.15, 12.5) used in this analysis to measure and disclose effects to wolverine are listed in table 147.

Table 147. Resource indicators and measures for assessing effects to wolverine

Resource Indicator and Effect	Measure (Quantify if possible)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Potential for disturbance to individuals from noise and increased human presence, or injury or mortality of individuals	Acres and percentage of habitat affected and percentage of habitat impacted by OSV use	22,725 (56%)	22,572 (56%)	20,819 (52%)	22,618 (56%)	16,764 (42%)

Gray wolf (*Canis lupus*), Sierra Nevada red fox (*Vulpes vulpes necator*), and California wolverine (*Gulo gulo luteus*) are considered sensitive to the presence of humans and human activities.

The most common interactions between snowmobile trails and wildlife that Gaines et al. (2003) documented from the literature included trapping as facilitated by winter human access, disturbance-based displacement and avoidance,[11] and disturbance at a specific site,[12] usually wintering areas. To a lesser degree, hunting, trapping, poaching, collection, and habitat loss and fragmentation were other interactions identified. Trapping of wolverine, or any of the special-status species under consideration, is not legal in California and, therefore, would not be considered as a potential impact in this analysis.

Snowmobile use and associated activities within habitats for wide-ranging carnivores, such as wolverine, have the potential to affect individuals or their habitat (Gaines et al. 2003). Direct effects include disturbance by: (1) displacement from or avoidance of human activity on or near roads; (2) displacement of individual animals from breeding or rearing habitat; and (3) physiological response to disturbance resulting in changes in heart rate or level of stress hormones. There is also potential for injury or mortality to individuals from vehicle collision. As previously discussed, the

[11] Spatial shifts in populations or individual animals away from human activities on or near roads, trails, or networks
[12] Displacement of individual animals from a specific location that is being used for reproduction and rearing of young

likelihood of a collision between snow grooming equipment and wildlife is extremely low because the equipment travels slowly (3 to 6 mph). There is an increased likelihood of collision with OSVs due to higher frequency of OSV use and higher speeds, but the likelihood is extremely low in the case of wolverines given that wolverines have not been documented on the Lassen National Forest and the tendency for wolverines to avoid areas used by humans. Potential indirect effects include behavioral modification such as altered or dispersed movement as caused by a route or human activities on or near a route.

Although recreational activities such as snowmobiling and backcountry skiing have the potential to affect wolverines (USDI Fish and Wildlife Service 2013), there are no verified detections of wolverine within one-quarter mile of snowmobile trails or anywhere on the Lassen National Forest. Except for the anomaly of one recent wolverine detection on the Tahoe National Forest, genetically related to the Rocky Mountain population (Moriarty et al. 2009), the species is thought to be extirpated from the Sierra Nevada.

OSV use and related activities would not physically modify vegetative composition or structure of suitable wolverine habitat. Wolverines, if present, would be expected to have little interaction with snowmobiles or snow grooming equipment: whereas the majority of snowmobile use on the Lassen National Forest occurs during the daytime, wolverine are highly nocturnal. In addition, wolverines are known to avoid roads and areas of human habitation; areas within 0.5 mile of OSV trails and staging areas receive the highest use and no new trails are proposed under any of the alternatives.

Comparison of the Alternatives

Table 148 shows the amounts of wolverine habitat in which a wolverine, if present on the Lassen National Forest, could be subject to direct or indirect effects of OSV use and associated activities. Eighty-one percent of suitable wolverine habitat is currently open to OSV use (alternative 1), but 56 percent is designated for OSV use and overlaps areas of moderate to high OSV use, based on slope and forest density (map BE-16). The potential for OSV-related noise-based disturbance, injury or mortality impacting individual wolverines, should they be present, would be most likely to occur within that 56 percent of suitable habitat. In addition, of that 56 percent of habitat, high OSV use is concentrated within 0.5 mile of snowmobile staging areas, on and within 0.5 mile of groomed trails, and in meadows within 0.5 mile of a designated OSV trail, so the majority of OSV use occurs within less than that 56 percent of wolverine habitat. Similarly, under alternatives 2 and 4, 56 percent of wolverine habitat would be designated and of moderate to high OSV use (maps BE-17 and BE-19, respectively). Under alternatives 3 and 5, 52 percent and 42 percent respectively, of wolverine habitat would be designated for and of moderate to high OSV use, based on slope and forest density (map BE-20). For the range of alternatives, approximately 55 to 70 percent of habitat overlapped by moderate/high use based on slope and density also occurs within moderate or high use areas based on proximity to trails (see Appendix G for OSV use level assumptions). If a wolverine were detected, an analysis would be conducted 5 miles around the sighting area to determine if activities have potential to affect the individual and if changes in management, including application of a limited operating period, are necessary, thereby minimizing impacts to wolverine.

Table 148. Acres of wolverine habitat with potential to be impacted by OSV use and related activities, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	32,631	32,402	29,429	32,425	23,317
Not Designated for OSV use	7,644	7,874	10,847	7,851	16,959
OSV use restricted to trails	NA	NA	6	NA	6
Total	40,276 acres				
Designated for OSV use and of moderate to high OSV use	22,725 (56.4%)	22,572 (56%)	20,819 (51.3%)	22,618 (56.2%)	16,764 (41.6%)
Not Designated for OSV use and of moderate to high OSV use	5,266	5,419	7,172	5,373	11,227
Moderate to high OSV use and OSV use restricted to trails	NA	NA	5	NA	5
Total	27,991 acres				

Cumulative Effects

Based upon spatial data provided by the Lassen National Forest, actions that could result in a cumulative impact to wolverine, when combined with alternatives 1, 2, 3, 4, or 5 include vegetation management projects, firewood cutting, Christmas tree cutting, non-motorized winter recreational activities non-motorized winter recreational activities, or use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. Vegetation management projects identified above are very small in comparison to the OSV Use Designation action area and/or do not overlap with groomed and non-groomed OSV trails or staging areas where the highest OSV use occurs. Vegetation and fuels management activities in recent years have included primarily thinned, masticated, and/or burned vegetation to reduce the potential for catastrophic wildfires. These projects are usually excluded from larger CWHR types and management prescriptions emphasize recruitment of large snags and logs, as well as retention of large conifer that are attributes of wolverine habitat. In addition, seasonal limited operating periods required for wolverine for vegetation projects prevent disturbance to breeding individuals.

Wolverine habitat overlaps with areas open to Christmas tree and firewood cutting and use of roads within wolverine suitable wolverine habitat after the March 31 termination date of the forest order closing roads for exclusive OSV use could occur. However, wheeled motorized vehicles may not be used off of authorized NFS roads or motorized trails to scout for fuelwood or to harvest Christmas trees (USDA Forest Service 2014) and, due to their secretive nature, wolverines are likely to avoid roaded or heavily used roaded areas where disturbance or displacement would be more likely. Similarly, most non-motorized winter recreation occurs along designated trails and wolverine would probably avoid heavily used trails. Similar activities on State and private lands within the forest boundary may impact habitat availability outside of NFS lands and may increase disturbance locally. However, the potential for this type of disturbance is unknown; State and privately held lands make up about 20 percent of the area within the forest boundary.

In summary, ongoing and reasonably foreseeable actions may be additive locally, but are not expected to contribute significantly to potential impacts to wolverine discussed for the project under any of the alternatives. In addition, seasonal limited operating periods that prevent disturbance to wolverine denning sites would be used to minimize disturbance to these sites if they are identified.

Determination Statement

Alternatives 1, 2, 3, 4 and 5 of the Lassen National Forest Over-snow Vehicle Use Designation Project will not jeopardize the continued existence of the North American wolverine, based on the following rationale:

- The single male wolverine detected near Truckee, California, is genetically most closely related to, and most likely came from, a population on the western edge of the Rocky Mountains, rather than either the historic California population. Although incidental, unconfirmed sightings of wolverine have been reported throughout the Sierra Nevada, including Lassen National Forest, there is no evidence that California currently hosts a wolverine population or that female wolverines have made, or are likely to make, similar dispersal movements into the area. Therefore, wolverine is not currently known to be present on the Lassen National Forest and there is no evidence that California currently hosts a wolverine population.
- Vegetative composition or structure of suitable wolverine habitat would not be physically modified by OSV use or related activities.
- Although the potential for noise-based disturbance to individuals within suitable habitat ranges from 42 to 56 percent of suitable habitat under all of the alternatives, the percentage of suitable wolverine habitat impacted would actually be lower considering that the concentration of OSV use is not equal across the landscape. In addition, if a wolverine were detected, an analysis would be conducted 5 miles around the sighting area to determine if activities have potential to affect the individual and if changes in management, including application of a limited operating period, are necessary, thereby minimizing impacts to wolverine.
- Wolverines, if present, would be expected to have little interaction with snowmobiles or snow grooming equipment: whereas the majority of snowmobile use occurs during the daytime, wolverine are highly nocturnal and snow grooming equipment moves at a very slow speed not likely to impact individuals. In addition, wolverines are known to avoid roads and areas of human habitation.

Forest Service Sensitive Species

Late-successional Forest Species

Pacific Fisher (*Pekania pennanti*)

Regional Foresters Sensitive Species

Species Account

In 2014, the U.S. Fish and Wildlife Service proposed to list the West Coast Distinct Population segment of fisher as threatened (USDI Fish and Wildlife Service 2014a). On April 18, 2016, the Service withdrew its proposal, based on their evaluation of the best scientific and commercial information available, and the species was placed on the Region 5 Regional Forester’s Sensitive Species list (USDI Fish and Wildlife Service 2016a).

As generalized predators, fishers prey on a variety of small and medium-sized (e.g., woodrat [*Neotoma sp.*] and western gray squirrel [*Sciurus griseus*]) mammals and birds, and they also feed on carrion; in California, reptiles and insects are also notable components of the diet (Zielinski 2014).

Predation is probably the predominant cause of death, and fishers are regularly killed by cougars *(Puma concolor*), coyotes, and bobcats (Lofroth et al. 2010).

Between 1992 and 2004, no fishers were detected during survey efforts by Lassen National Forest personnel or systematic surveys conducted in 2002 by Pacific Southwest Research Station (PSW) (Zielinski et al. 2005). However, recent confirmed fisher detections have been recorded in the northwestern portion of the Hat Creek Ranger District. Zielinski et al. (2005) concluded that Lassen National Forest falls within an area considered a distribution gap within the range of the fisher. From late 2009 through late 2011, a total of 40 fishers were released onto the Stirling Management Area owned by Sierra Pacific Industries west of the Lassen National Forest. Radio-telemetry tracking and camera sets show that fishers from this introduced population ventured onto the extreme southern portion of the Lassen National Forest in 2012 and 2013, including known denning occurrences (Powell et al. 2014).

Habitat Status

Fishers occupy mid-elevation, multi-storied mature and old-growth conifer, mixed conifer and mixed-conifer hardwood forests with contiguous canopy cover. Closed canopies (over 50 percent) are typically selected, but fishers will use areas of low to moderate canopy cover (25 to 40 percent) if there is sufficient understory (Lofroth et al. 2010). They do not occur in high-elevation alpine or subalpine habitats.

Foraging habitat varies with primary prey species. Since fishers in California prey primarily on small to medium-sized mammals (woodrats, squirrels etc.) they will use forests with hardwood components which provide mast for prey, structurally complex structures near the forest floor (brushy understories) and high abundance of downed, woody debris (Lofroth et al. 2010).

Rest sites are strongly associated with moderate to dense forest canopy and elements of late-successional forests (Lofroth et al. 2010). Rest sites in northern California typically have more than 50 percent canopy cover and an average dbh of 30 to 45 inches for the 5 largest trees in the immediate area. These areas will often have a higher density of snags and large downed wood. Due to high temperatures, rest sites in this region often occur in the bottom of drainages or within 100 meters (328 feet) of water. Cavities, mistletoe blooms, branch deformities, and platforms in live trees and snags (conifers and hardwoods) are used for rest sites as well as logs, rock areas, brush piles, and concentrations of downed woody debris.

Cavities in live trees and snags are critical for reproduction. Females use cavities in a variety of tree species (Douglas-fir, ponderosa pine, black oak etc.), but live hardwoods appear to be particularly important in northern California. Most cavities used as natal and weaning dens are formed from heartwood decay and are in large (average 36 inches dbh) trees and snags. These trees are often much older than those available with Douglas-fir averaging 177 years (Lofroth et al. 2010).

Potential suitable habitat for the fisher occurs primarily on the lower-elevation steep slopes having an oak component typed as montane hardwood or montane hardwood-conifer habitat. As with marten habitat at the higher elevations, forest management practices and resulting roads have contributed to habitat fragmentation. Fishers generally avoid open areas with no overstory or shrub cover and roads associated with the presence of vehicles and humans. Fishers are known to modify their behavior near active roads (USDA Forest Service 2001).

Threats

Throughout the western United States, forest structure seems to be more important than tree species composition for within-home range fisher habitat selection. Both active (foraging) and inactive (resting and denning) fishers are associated with complex forest structure (i.e., understory vegetation, a diversity of tree sizes, and snags and other coarse woody debris). Fisher habitat can be fragmented or reduced in quality, at least temporarily, by disturbances that change forest structure and remove essential fisher habitat elements. Currently, large, severe wildfires, in concert with drought, climate change, and insect outbreaks, are considered the largest threat to fisher habitat. Vegetation management, including tree harvest and thinning to reduce wildfire risks, can also adversely affect fisher habitat, but this risk may be offset if vegetation treatments reduce the risk that large, severe wildfires will affect habitat over larger areas and longer periods (Spencer et al. 2015).

Fishers are long-lived, have low reproductive rates, large home ranges (for carnivores of their size) and exist in low densities throughout their range. This implies that fishers are highly prone to localized extirpation, colonizing ability is somewhat limited, and that populations are slow to recover from deleterious impacts. Isolated populations are therefore unlikely to persist. Habitat connectivity is a key to maintaining fisher within a landscape. Activities under Forest Service control that result in habitat fragmentation or population isolation pose a risk to the persistence of fishers. Timber harvest, fuels reduction treatments, and road construction may result in the loss of habitat connectivity resulting in a negative impact on fisher distribution and abundance (USDA Forest Service 2001). Fishers are known to generally avoid natural or human-created openings at the local level, and some populations appear to be isolated by past human actions that reduced available habitat at the landscape level (Buskirk and Powell 1994, Buskirk and Ruggiero 1994). Zielinski et al. (2005) attributed the reduction in fisher distribution in California to a combination of loss of mature forest habitat, residential development, and the latent effects of commercial trapping.

Vehicle collisions are identified as a substantial mortality factor in portions of the Sierra Nevada, especially where moderate to heavily traveled roads traverse high quality habitat. In addition, forest roads and trails may elevate fisher predation by mountain lions, bobcats, and coyotes using these trails as travel and hunting corridors (Spencer et al. 2015). Both bobcats and mountain lions have been noted as predominant predators of fishers (Wengert et al. 2014).

Other risk factors include rural or recreational development that may fragment habitat, increases in road density and traffic levels, and increases in human access to fisher habitat. Non-habitat based risk factors outside the control of the Forest Service include disease and climate change. Fishers are susceptible to both canine and feline distemper (USDA Forest Service 2001).

Direct and Indirect Effects

Resource indicators and measures (FSH 1909.15, 12.5) used in this analysis to measure and disclose effects to fisher are listed in table 149.

Table 149. Resource indicators and measures for assessing effects to Pacific fisher

Resource Indicator and Effect	Measure (Quantify if possible)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Potential for disturbance to individuals from noise and increased human presence, injury or mortality of individuals, increased predation, or snow compaction impacting subnivean prey	Acres and percentage of suitable fisher habitat[13] impacted by OSV use	45,464 (29%)	43,515 (28%)	39,558 (25%)	45,244 (29%)	34,134 (22%)

The Pacific fisher is associated with late-successional forests that can be impacted by activities associated with trails. Gaines et al. (2003) conducted a literature review of 71 late-successional forest-associated wildlife species and identified negative effects on these species that can result from route-associated factors. These impacts include direct loss of habitat from type conversion, diminished quality of habitat attributes or fragmentation, and road avoidance or displacement resulting from direct harassment or noise disturbance. Individuals, environmental groups, and agency biologists have expressed growing concern over habitat fragmentation for late-successional forest-associated species. Various studies have shown that this species group is vulnerable to disturbance, changes in habitat, or displacement by habitat generalists.

As found in the Sierra Nevada Forest Plan Amendment (USDA Forest Service 2004), habitat types important for late-successional forest include stands typed as 4M, 4D, 5M, 5D, and 6 by California Wildlife Habitat Relationship (CWHR), which are all stands of trees greater than 11 inches dbh with greater than 40 percent canopy cover. The Sierra Nevada Forest Plan Amendment provides management direction for Old Forest Emphasis Areas to maintain or develop old forest habitat in areas containing the best remaining large blocks or landscape concentrations of old forest. Direction also includes providing for old forest functions, such as connectivity of habitat over a range of elevations to allow migration of wide-ranging old-forest-associated species.

Snowmobile use within late-successional forest habitats can have the following potential direct effects to individuals or their habitat (Gaines et al. 2003): Disturbance and potential for injury or mortality to individuals from vehicle collisions.

Disturbance:

Displacement of populations or individual animals from a route, related to human activities.

Disturbance and displacement of individuals from breeding or rearing habitats.

Physiological response to disturbance, resulting in changes in heart rate or level of stress hormones.

Potential for injury or mortality to individuals from vehicle collision:

As previously discussed, the likelihood of a collision between snow grooming equipment and wildlife is extremely low because the equipment travels slowly (3 to 6 mph). There is an increased

[13] Based on U.S. Fish and Wildlife Service (2016)

likelihood of collision with OSVs due to higher frequency of OSV use and higher speeds. This effect would be most specific to mammals.

Potential indirect effects include:

Altered or dispersed movement as caused by a route or human activities on or near a route.

In addition, Gaines et al. (2003) found an interaction that occurred on winter recreation trails was the indirect effect of snow compaction on the subnivean sites used by small mammals in which small mammals can either be suffocated as a result of the compaction, or their subnivean movements can be altered owing to impenetrable compact snow. Adverse effects to subnivean animals could indirectly affect the prey base for many Forest Service sensitive species, including fisher.

Trails as routes for competitors and predators on packed trails resulting from snowmobile use facilitate coyote incursion into deep snow areas (Bunnell et al. 2006) and can negatively impact fisher or other mammal populations through increased competition or predation and that 90 percent of coyote movement was made within 1,150 feet of packed trails.

In contrast, Kolbe et al. (2007) reported from a study in western Montana that although roads and trails compacted by snowmobile use were readily available, only a small portion of coyote travel was on compacted snow surfaces. And, while coyotes did use compacted snow more than random expectation, it is unlikely that snowmobile trails strongly affected their movements. They found no difference in use of compacted or uncompacted forest roads, suggesting that coyotes may select for the clear corridor afforded by a road rather than the snow conditions on them. Whether or not increased predator use of existing trails is occurring or the extent to which it is occurring, as a result of OSV use and related activities on the Lassen National Forest, or whether or not it is impacting individual fishers or the fisher population, is unknown at this time. Predation, if occurring, would be predictably restricted to areas in the immediate vicinity of trails. The use of OSV trails and regular grooming is an existing condition that has been in operation for numerous years; and no new trail expansion is proposed at this time. Therefore, predator incursion, if occurring, would continue, but would not increase in size of area as a result of OSV program activities.

Based on CWHR (2014) habitat types, there are 155,139 acres of high-capability reproduction habitats for fisher on Lassen National Forest.

Areas on Lassen National Forest with a combination of fewer roads, higher canopy cover, and physical structure are typically more abundant in steep slopes and canyons on the Sierran portion of Lassen National Forest (e.g., North Fork Feather River) and Rock Creek/Screwdriver Creek, draining east off of Chalk Mountain into the Pit River west of Lake Britton.

Potential for disturbance of den sites:

Several fisher den sites are reported to occur on and adjacent to the southern edge of the Almanor Ranger District as described and displayed by Powell et al. (2014) at elevations that appear to range from approximately 3,400 to 5,200 feet. Den sites displayed as likely occurring on lands administered by the Lassen National Forest south of the Butte Meadows area coincide with areas designated as open to OSV use under all alternatives. Of 100 natal and maternal den structures identified in thie Stirling Management Area study, 93 were located in live trees or snags; the remaining 7 are classified as other (e.g., down log or debris pile; Powell et al. 2014). While specific structure utilized for denning on NFS lands isn’t disclosed, there’s a high likelihood that these dens are located in a standing structure (i.e., snag or live tree) for which negative effects from compaction or physical disturbance or damage are unlikely. In the event that one or more of these dens is located in a ground-level structure such as under a log or debris pile, there is low potential for impacts due to compaction or physical disturbance/damage, as OSVs are more likely to avoid such structures in the interest of safety.

The fisher natal denning period extends from mid to late March through May (Lofroth et al. 2010), thereby overlapping the latter portion of the OSV use period. Because of this overlap, there is potential for OSV use that occurs in close proximity to fisher dens to cause noise disturbance for a period of time that could temporarily displace an adult female or prevent a female from reentering a den. However, given that the Forest Service den locations displayed by Powell et al. occur in the periphery of a designated open OSV use area, these sites are estimated to be more than 6 miles from the nearest designated OSV trail where OSV use levels are assumed to be low, thereby, presenting a low risk of potential disturbance to these den sites under all alternatives.

Comparison of the Alternatives

Snow has been posited as limiting suitable fisher habitat and fisher distribution at higher elevations (Aubry and Houston 1992, Powell and Zielinski 1994, Weir et al. 2003, all cited in Lofroth et al. 2010). This is consistent with fisher studies elsewhere in North America indicating that some snow conditions may limit fishers because they are not efficient at traveling and hunting in terrain covered by soft deep snow. However, other factors associated with increasing elevation (e.g., lower forest productivity, changes in forest structure) may also limit fisher distribution through their influence on the abundance of structures critical for denning and resting, and abundance and availability of prey (Franklin and Dyrness 1988, Meidinger and Pojar 1991, McNab and Avers 1994, all cited in Lofroth et al. 2010). Composition or structure of suitable fisher habitat within the action area would not be physically modified under any of the alternatives.

Gaines et al. (2003) describe a number of potential direct and indirect effects of linear travel trails to fisher, but they identify increased vulnerability to trapping mortality as the single risk factor associated with winter recreation/snowmobiling trails. However, increased vulnerability is unlikely to be a risk factor under any alternative, because trapping of fisher is prohibited in California.

Fishers' tolerance of human presence and various activities appears to range from little effect resulting from moderate degrees of human activities to avoidance and displacement if disturbance occurs near den sites. Foraging behavior of mid-sized carnivores in forested areas may be disrupted along groomed trails and other travel corridors. Displacement or avoidance may occur due to noise of snow machines or to human presence. Snowmobile trails may facilitate travel for some carnivores, but compaction of snow from grooming or snowmobile use off existing roads or trails may adversely affect the subnivean habitat of prey species and, therefore, impact foraging opportunities for carnivores. Intentional killing of carnivores by a snowmobiler is possible, but most likely it would only occur in rare, isolated incidents (Olliff et al. 1999).

Although initially believed to be primarily nocturnal, more recent studies have reported that fishers tend to be crepuscular. Periods of activity are generally 2 to 5 hours long and are often separated by longer stretches (10 hours) of inactivity (Arthur and Krohn 1991; Kelly 1977; Powell 1993, all cited in Weir and Corbould 2007). As a result, fishers tend to be inactive during the time when OSV use on Lassen National Forest is highest. Therefore, the probability of mortality resulting from an accidental collision with a snowmobile would be quite low and the potential for mortality resulting from collision with snow grooming equipment would be even lower, given the slow speed at which the equipment moves.

High-value habitat acreages were derived from habitat modeling based on CWHR (2014) habitat types and value rankings. Gaines et al. (2003) suggest a human influence scale where less than

30 percent influence in high-value habitat is rated low, 30 to 50 percent influence is rated moderate, and greater than 50 percent influence is rated high. The trail-effect zone from noise and sight disturbance (200 meters; 656 feet) along designated groomed trails would affect 9,423 acres or 5.9 percent of existing high-value habitat acres (table 150), which, at 5.9 percent, is a very low human influence rating. Designated non-groomed trails under all alternatives would influence 2,160 acres (1.3 percent), which again is very low disturbance. In addition, trail densities under each of the alternatives are as follows: Alternative 1, 1.5 mi/m^2; Alternative 2, 0.2 mi/m^2; Alternative 3, 0.2 mi/m^2; Alternative 4, 0.2 mi/m^2; Alternative 5, 0.2 mi/m^2. The LRMP has recommended a 0 to less than 0.5 mi/m^2 (preferred) trail densities for fisher. Therefore, all of the action alternatives would be consistent with preferred LRMP road density recommendations and improve trail densities with respect to the existing condition for fisher. And because the majority of OSV use occurs on or within 0.5 mile of groomed trails and staging areas, or within meadows within 0.5 mile of designated trails, the potential for predator or competitor incursion into suitable fisher habitat, as well as the potential for impacts to subnivean prey species, would be expected to decline with reduced trail densities under alternatives 2, 3 4, and 5. The numbers in table 150 apply to designated trails only. Use of undesignated trails would be authorized only in areas designated for cross-country OSV use. Therefore, the effects of OSV use of undesignated trails areas designated for OSV use are discussed below.

Table 150. Acres of fisher high-value suitable habitat within 200 meters of designated groomed and designated non-groomed trails

Habitat	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Groomed trail	9,423	9,423	9,423	9,423	9,423
Non-groomed trail	2,160	2,160	2,160	2,160	2,160

Source: GIS query, 10/10/2015

Areas designated for cross-country OSV use vary among the alternatives.

Using a suitable fisher habitat model developed by the U.S. Fish and Wildlife Service (2016b), 156,606 acres of fisher habitat occur within Lassen National Forest System lands table 151 map BE-21). Of those, 132,672 acres (85 percent) of habitat are currently open to OSV use (table 151). Intersecting suitable fisher habitat with areas of moderate to high OSV use (slopes less than or equal to 21 percent and canopy cover less than 70 percent) results in 45,464 acres of fisher habitat (29 percent) of moderate to high OSV use. The potential for OSV-related impacts to fisher (injury or mortality, noise-based disturbance, predation facilitated by OSV trails, impacts to subnivean prey species) would be most likely to occur within that 29 percent of suitable habitat). However, of that 29 percent of habitat, high OSV use is concentrated within 0.5 mile of snowmobile staging areas, on and within 0.5 mile of groomed trails, and in meadows within 0.5 mile of a designated OSV trail, so the majority of OSV use actually occurs within less than that 29 percent of fisher habitat and the majority of areas proposed to be designated for OSVs are not known to currently support fishers. Under alternative 2, 28 percent of suitable fisher habitat would be designated and have moderate to high OSV use (map BE-22). Similarly, 25 percent of suitable habitat would be designated and conductive to OSV under alternative 3 (map BE-23), 29 percent under alternative 4 (map BE-24), and 22 percent under alternative 5 (map BE-25). However, actual use is expected to be less, considering that the concentration of OSV use is not equal across the landscape, with the highest use occurring on or within 0.5 mile of groomed trails and staging areas. For all alternatives, habitat overlap of moderate and high use areas based on slope and density as well as proximity to trails ranges from 40 to 45 percent of amounts shown for slope and density alone. Ongoing inventory and monitoring used to evaluate habitat conditions and mitigations to retain suitable habitat would be implemented, where necessary. Similarly, as fisher den sites are found within the portion of the action area designated for OSV use, den sites with potential to be impacted would be monitored to determine whether disturbance is occurring and if changes in management, including a limited operating period around den sites, are necessary, thereby minimizing impacts to fisher. The potential for noise-based disturbance would largely overlap with roughly the first quarter of the March 1 through June 30 fisher breeding season under alternatives 1, 2, 3, and 5, and may extend through the first half of the breeding season under alternative 4.

Table 151. Acres of suitable fisher habitat with potential to be impacted by OSV use and related activities, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	132,672	122,223	114,493	131,779	91,884
Not designated for OSV use	23,934	34,384	42,113	24,827	64,722
OSV use restricted to trails	NA	NA	4	NA	4
Total	156,606 acres				
Designated for OSV use and of moderate to high OSV use	45,464 (29%)	43,515 (27.8%)	39,558 (25.3%)	45,244 (28.9%)	34,134 (21.8%)
Not designated for OSV use and of moderate to high OSV use	2,612	4,561	8,518	2,832	13,942
Moderate to high OSV use and OSV use restricted to trails	NA	NA	3	NA	3
Total	48,076 acres				

Within areas designated for OSV cross-country use, use of existing roads other than groomed and ungroomed trails not designated is authorized. Use of these roads by OSVs is expected to be low where these occur more than 1.5 miles from a groomed OSV trail or more than 0.5 mile from a marked (not groomed) OSV trail (see Assumptions section), but density of these designated roads can be used to show relative permeability of areas for low OSV use among alternatives.

Density of roads within areas designated for OSV travel is highest (1.7 miles per square mile) under the existing condition (alternative 1) and alternative 4, and somewhat reduced under alternatives 2 and 3 (table 152). Under alternative 5 road densities drop to 1.2 mile per square mile overall with reductions shown for all areas, except Ashpan and Bogard, in comparison to the existing condition. Under alternative 5, no OSV use of existing roads is authorized for the Fall River and Shasta areas. Therefore, the project area as a whole would be most permeable to low levels of OSV use under alternatives 1 and 4, and least permeable under alternative 5.

Table 152. Road densities by area and alternative

OSV Area	Existing (Alternative 1)		Alternative 2		Alternative 3		Alternative 4		Alternative 5	
	Road Miles	Miles/ Sq.Mi.	Road Miles	Miles/ Sq.Mi.	Road Miles	Miles/ Sq.Mi.	Road Miles	Miles/ Sq.Mi.	Road Miles	Miles/ Sq.Mi.
Ashpan	217.0	1.4	217.0	1.4	212.8	1.4	217.0	1.4	212.8	1.4
Bogard	1104.1	2.0	1091.6	1.9	1090.4	0.2	1095.3	2.0	794.2	1.4
Fall River	139.8	2.1	130.5	1.9	57.2	0.9	139.8	2.1	0	0
Fredonyer	105.9	2.0	105.9	2.0	103.8	2.0	105.9	2.0	86.0	1.6
Jonesville	321.8	1.4	311.3	1.4	298.9	1.3	321.1	1.4	263.1	1.1
Morgan Summit	400.1	1.2	339.0	1.0	313.6	1.0	382.0	1.2	317.4	1.0
Shasta	91.8	1.0	91.8	1.0	85.6	0.9	91.8	1.0	0	0
Swain Mountain	613.1	2.0	605.7	2.0	452.8	1.5	613.1	2.0	410.8	1.4
Total by Alternative	2,993.6	1.7	2,892.7	1.6	2,615.1	1.5	2,966.0	1.7	2,084.4	1.2

Area Currently known to be Utilized and/or Occupied by Fisher

As stated above, fishers currently use portions of the project area as a result of movements from the population introduced onto Sierra Pacific Industries lands as well as recently detected individuals in the northwestern portion of the Hat Creek Ranger District. The dominant proportion of occurrences are concentrated within a total of 8 watersheds that contain approximately 245,220 acres of land administered by the Lassen National Forest. Under the existing condition (alternative 1) OSV use is restricted from use primarily within designated Wilderness areas on about 87,515 acres, leaving about 64 percent of the watersheds designated for OSVs (table 153). Additional restricted areas proposed under alternative 2 decrease OSV designated areas to about 58 percent of the watershed area. Alternative 5 proposes the most restricted area within the watersheds, leaving 42 percent of the area designated for OSVs. Alternative 4 would increase restricted area slightly (by 119 acres) in comparison to alternative 1. Additional areas, located in dense stands (70 percent or greater canopy closure) and on steeper terrain (greater than 20 percent slope) where conditions are likely to be of low OSV use, would further decrease fisher exposure to potential impacts. Acres and proportions of suitable habitat in areas designated and of moderate to high OSV use range from 19.3 percent under alternatives 1 and 4 to 15.5 percent under alternative 5 (table 153).

Increased vulnerability to trapping resulting from available access is not a risk factor for the species. Trapping of fishers is currently illegal in California.

Table 153. OSV designated area within fisher concentration areas

Habitat	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
OSV Designated Area (acres)	155,747	130,069	131,630	154,023	99,563
OSV Designated Area (percent of existing)	63.5	53.0	53.7	62.8	40.6
Total acres	245,220 acres				
Suitable Habitat Designated for OSV Use of moderate to high OSV Use (percent)	13,946 (19.3%)	12,959 (18.0%)	12,734 (17.8%)	13,926 19.3%)	11,194 (15.5%)
Total acres	72,118 acres				

Cumulative Effects

Based upon spatial data provided by the Lassen National Forest, vegetation management or fuels management projects are projected to occur within Lassen National Forest lands occupied, used, or suitable for use by fishers. These include timber harvest, fuels reduction, and associated activities, as well as road maintenance, firewood gathering, and special use activities. Vegetation management projects identified above are very small in comparison to the OSV Use Designation action area and/or do not overlap with groomed and non-groomed OSV trails or staging areas where the highest OSV use occurs. Vegetation and fuels management activities in recent years have included primarily thinned, masticated, and/or burned vegetation to reduce the potential for catastrophic wildfires. These projects can reduce stand densities and suitability for fisher. However, management prescriptions emphasize retention of large snags and logs, as well as large conifer that are attributes of fisher habitat. In addition, seasonal limited operating periods required for known fisher den sites for vegetation projects prevent disturbance to breeding individuals. Use of roads within fisher habitats for public and administrative access contributes a level of disturbance during a portion of the breeding season. This is incorporated into the environmental baseline for disturbance. Timber harvest and State and private lands within one-quarter mile of fisher habitats may impact habitat availability outside NFS lands and may increase disturbance locally. In summary, ongoing and reasonably foreseeable actions may be additive locally, but are not expected to contribute substantial impacts to effects discussed for this project under any alternative.

Determination Statement

Alternatives 2, 3, 4, and 5 would have a low level of risk to existing and future introduced fisher. Therefore, alternatives 1, 2, 3, 4, and 5 of the Lassen National Forest Over-snow Vehicle Use Designation Project may affect individuals, but are not likely to lead to a loss of viability or a trend toward Federal listing for fisher in the project area based on the following rationale:

- Vegetative structure of fisher habitat would not be physically modified by OSV use and related activities under any of the alternatives.
- Although the potential for noise-based disturbance to individuals within suitable habitat ranges from 22 to 29 percent under all of the alternatives, the percentage of suitable fisher habitat impacted would actually be lower, considering that the concentration of OSV use is not equal across the landscape in relation to proximity to designated trails. In addition, the forest would use the results of ongoing inventory and monitoring to determine whether disturbance is occurring and if changes in management, including application of a limited operating period around den sites, are necessary, thereby minimizing impacts to fisher.
- OSV use is unlikely to influence foraging because fishers tend to be crepuscular when OSV use is low to non-existent on the Lassen National Forest.
- Improved (i.e., reduced) trail densities, under alternatives 2, 3, 4 and 5, that would be consistent with LRMP preferred trail densities for fisher are likely to reduce the potential for predator or competitor incursion into suitable fisher habitat, as well as the potential for impacts to subnivean prey species.

Potential for direct impacts to fisher from collisions with OSVs is very low.

Pacific Marten (*Martes caurina*)

Regional Foresters Sensitive Species

Species Account

The Pacific marten (*Martes caurina*) is a Region 5 Forest Service sensitive species and a management indicator species for the late seral, closed canopy coniferous forest habitat component. Additional information for the marten is provided in the Management Indicator Species section. This species was previously classified as American marten (*Martes americana),* but recent genetic and morphological evidence led to a reclassification as Pacific marten (*Martes caurina*) (NatureServe 2017).

Females give birth in March or April (Zielinski, pers. comm., 2015). Home ranges of Pacific martens in the Sierra Nevada average 300 to 500 hectares (740 to 1,235 acres) for males and 300 to 400 hectares (740 to 990 acres) for females (Spencer et al. 1983). The diet of the marten in the Sierra changes with season, as does the time of day that martens search for particular prey; winter prey is primarily Douglas squirrel (*Tamiasciurus douglasii*), snowshoe hare, voles (*Microtus* sp.), and flying squirrels (*Glaucomys sabrinus*) (Zielinski 2014).

Martens have relatively low foot loading, which allows them to move relatively easily over deep, soft snow, and they are adept at using subnivean environments for foraging and resting. This gives martens a competitive advantage over larger carnivores that may otherwise compete with or prey on martens, such as bobcats (*Lynx rufus*), coyotes (*Canis latrans*), and fishers, whose distributions are limited by deep, soft snow (Zielinski 2014).

There are numerous marten detections documented on the Lassen National Forest, primarily in three areas of concentration. The largest concentration of observations, in the Swain Mountain Experimental Forest area, is likely the result of unequal survey effort (i.e., greater in the Swain Mountain Experimental Forest) as part of a research project. Smaller concentrations occur in the Humboldt Peak area and on NFS lands adjacent to the Latour State Forest. Systematic surveys conducted by the Pacific Southwest Research Station suggest that persistent marten occurrences are primarily associated with late-successional habitats in and near Lassen Volcanic National Park (Zielinski et al. 2005). Based upon the available information, there are known marten den sites on the Almanor Ranger District. To address deficiencies in marten den site knowledge, the Lassen National Forest has funded a study by the Pacific Northwest Research Station to locate natal and maternal dens and to model den site selection (Zielinski, pers. comm., 2015). Young disperse during late fall and winter (Zielinski et al. 2015).

Habitat Status

Marten prefers coniferous forest habitat with large-diameter trees and snags, large down logs, moderate-to-high overstory tree canopy, and an interspersion of riparian areas and meadows. Important habitat attributes are: vegetative diversity, with predominately mature forest; snags; dispersal cover; and large woody debris (Allen 1987). Spencer et al. (1983) found that martens select stands with 40 to 60 percent overstory tree canopy for both resting and foraging, and avoided stands with less than 30 percent overstory tree canopy. Martens generally avoid habitats that lack overhead cover, presumably because these areas do not provide protection from predators (Buskirk and Powell 1994, Spencer et al. 1983).

In the Sierra Nevada, this species is known to inhabit high-elevation (4,500 to 10,500 feet) late-successional, mature red fir and lodgepole pine forests with large, decadent live trees and snags, and complex physical structure near the ground composed of an abundance of large dead and downed wood (Buskirk and Powell 1994 *in* Ruggiero et al. 1998, Zielinski 2014). Martens can inhabit younger forests if important elements of the mature forest are still present, especially structures for resting and denning (Purcell et al. 2012, Zielinski 2014). Riparian areas, especially near mature forest, are important for foraging (Zielinski 2014). The abundant large trees and dead-wood structures associated with marten presence provide prey resources, resting structures, and escape cover (Zielinski 2014). Rest structures typically include snags, logs, and stumps; trees and snags used for resting are often the largest available (over 35 inches in diameter) (Purcell et al. 2012). Rest structures vary with season; above-ground cavities are used in summer, and subnivean logs, snags, and stumps are used during the winter (Zielinski 2013). Den structures typically include arboreal cavities in live trees, snags (Gilbert et al. 1997, Raphael and Jones 1997, Bull and Heater 2000) and logs, rock crevices and red squirrel middens (Ruggiero et al. 1998). Resting and denning structures may be the most limiting resource for marten on the landscape, because this species uses multiple structures within their ranges (Purcell et al. 2012).

Two marten dens were positively identified in the Lake Tahoe basin with a third possible. All known or possible dens were discovered opportunistically in 2009 and 2012, and are predominantly on the western and southern portion of the basin. One den that was positively identified in 2012 is located at an elevation of approximately 6,650 feet and within the CWHR Jeffrey Pine type, class 5M. The den identified in 2009 is at approximately 6,560 feet elevation and within the CWHR Sierra Mixed Conifer type, class 4M. Moriarty (2011) indicates that various 4M habitat types (lodgepole pine, montane riparian, red fir, subalpine conifer, and white fir) are considered "high quality habitat" for marten. CWHR also classifies some 4M habitat as high quality denning habitat for marten.

Threats facing martens include habitat loss and fragmentation, especially clear-cutting, fuel reduction treatments, and wildfire (Zielinski 2014). Marten are very sensitive to habitat loss and fragmentation and rarely occupy landscapes after more than 30 percent of the mature forest is harvested (Zielinski 2014). Martens tend to avoid clearcut openings or will cross only small openings (e.g., less than 500 feet). However, martens were more likely to cross openings in the Rocky Mountains that have some structure retained (e.g., isolated trees, snags, logs), even if the openings were relatively large (maximum distance = 600 feet), than if the opening had no structures and were small (summarized in Zielinski 2014). Females tend to be more specialized than males in their habitat needs, and tend to avoid managed areas of lesser habitat value and greater predation risk (summarized in Zielinski 2013).

The effect of thinning treatments (including fuel reduction treatments) on marten in the Sierra Nevada is currently being studied. The effects can be positive and negative for marten; positive if treatments set the trajectory toward historical conditions while retaining key habitat features (e.g., snags, large and complex trees, coarse woody debris), and if unsuitable stands are treated to accelerate the recruitment of mature forest characteristics and reduce the chance of catastrophic wildfire (Slauson et al. 2008). Effects can be negative if the treated habitat increases the risk of predation by reducing canopy cover significantly, removing resting and denning structures and escape cover (e.g., tree boles), and/or reducing the complexity of the understory (clearcutting from below). Treatment effects can also be negative if habitat patches require a lot of energy and risk to travel between (increased fragmentation), if treatment has adversely affected prey resources, and if den structures are reduced or altered in a way that reduces the survival of young (Slauson et al. 2008).

According to Zielinski (2013), there is a need to understand the tradeoff between treating stands to reduce fuel loadings and loss of the stand to catastrophic wildfire. Purcell et al. (2012) suggest that research findings support the validity of recommendations made in North et al. (2009) to treat habitat for marten in areas where historically, fire would have burned less frequently, such as north-facing slopes, canyon bottoms, and riparian areas. Regardless, the type and timing of treatments as well as home range and landscape-level effects from treatments should be carefully evaluated to understand the short- and long-term outcomes.

In addition to vegetation management, marten are also sensitive to recreation activities, particularly snow activities (e.g., ski facilities). Much of the information presented on marten and ski resorts comes directly from Zielinski (2013). Ski resorts are considered likely to affect marten populations because they remove and fragment high-elevation fir forest habitat. The operation of ski resorts includes the continued compaction of snow, presence of high densities of skiers, and nocturnal grooming activities. These factors can have negative effects on marten both directly (females may avoid these areas) or indirectly (snow compaction and forest fragmentation facilitate high predation by coyotes) (Slauson et al. 2008). To create ski runs, chair lifts, and associated facilities, trees are removed, creating open areas and fragmenting forest. Skiers and staff are active during the day, and grooming and some skiing activity occur during the night. Thus, martens that are sensitive to these activities may not find time for important foraging activities. Ski resort effects are not limited to winter, as habitat fragmentation is a year-round effect and many resorts are developing summer recreational activities (e.g., hiking, mountain biking).

There are approximately 25 ski resorts in the Sierra Nevada, and nearly all occur within the range of the marten (Zielinski 2013). The Lake Tahoe region includes approximately half of these resorts (not all found on the Lake Tahoe Basin Management Unit), constituting the highest density of resorts in the Sierra Nevada and one of the highest in North America (Zielinski 2013).

Other snow activities may affect marten, but data from the Lake Tahoe Basin Management Unit indicate that OHV/OSV use did not affect marten occupancy or probability of detection and that overall OHV/OSV use in the study areas was low (1 OHV/OSV pass every 2 hours) and exposure occurred in less than 20 percent of a typical home range (Zielinski et al. 2007).

Historically, martens were understood to be well distributed throughout the Cascades and northern Sierra Nevada, but recent surveys suggest that the populations are now fragmented, distribution is reduced, and suitable habitat has also been reduced and isolated in parts of the range (Zielinski et al. 2005, Kirk and Zielinski 2009, Spencer and Rustigian-Romsos 2012). In a study of marten in northeastern California, Kirk and Zielinski (2009) reported that marten populations detected are associated with areas that contain the largest amount of reproductive habitat consisting of mature, old forest. The highest density of detections was located in the largest protected area in the study region. Moriarty (2011) reported approximately 60 percent fewer detections of marten at Sagehen Experimental Forest on the Tahoe National Forest than those in the 1980s. These results, although on a smaller spatial scale, are similar to those reported by Kirk and Zielinski (2009). Although the cause of the decreased detections is unclear, Moriarty (2011) hypothesized that this was associated with loss and fragmentation of habitat; during the same period 39 percent of forested areas at Sagehen Experimental Forest experienced some form of timber harvest (11 percent clearcut or shelterwood and 28 percent salvage). Habitat and occupancy models developed by Rustigian-Romsos and Spencer (2010) indicate that habitat connectivity for marten is fragmented north of the Plumas National Forest, where martens appear to be restricted to isolated or semi-isolated high-elevation areas (consistent with Kirk and Zielinski (2009)), whereas south of the Plumas, habitat connectivity does not appear to be greatly limiting for martens, although the authors suggest that Interstate 80 may be a significant barrier to movement.

Marten predictive denning habitat models are currently lacking (B. Zielinski, pers. comm. 2015). In 2010, the Lassen National Forest contracted with Conservation Biology Institute to develop a habitat suitability model for marten on the Lassen to assist with project planning. Three models of habitat suitability were developed based on season-specific marten survey data for summer, winter, and year-round (Rustigian-Romsos and Spencer 2010). The summer model predicted high probability of marten occurrence within Lassen Volcanic National Park and the Caribou Wilderness as well as areas on the Lassen that were adjacent to those two areas. In addition, one small area of high-probability habitat was located in the Thousand Lakes Wilderness, and a yet-smaller area on Burney Mountain. A large area of mostly moderate probability was located in the southern portion of the forest. The winter model predicted a distribution of marten occupancy similar to the summer model, but with significantly more area predicted to have high probability of occupancy (nearly four times as much suitable habitat using 50 percent probability of occupancy to define suitable habitat). The winter model was used, solely, for this analysis because OSV use occurs solely within the winter. Summer habitat is likely the most limiting to the marten population because it is much less extensive than habitats occupied during the winter and supports adults during the breeding season (Rustigian-Romsos and Spencer 2010); OSV use and associated activities do no impact reproductive habitat structure. There are 122,473 acres of suitable marten winter habitat on NFS lands within the Lassen National Forest boundary (table 155, page 477; map BE-26).

Functional habitat connectivity for martens on the Lassen national Forest has been assessed using GIS cost-distance and least-cost corridor modeling (Kirk and Zielinski 2010). This effort involved two primary steps. First, the landscape was modeled as a permeability surface, which described the relative costs to dispersing martens for moving across each linkage from known source and destination locations. Resistance costs were assigned to different landscape features, primarily vegetation types, which allow behavioral responses to unsuitable habitat to be modeled in a biologically realistic manner. Landcover was considered the primary influence on animal movements. Second, least-cost algorithms were used to determine the least-cost movement corridors, using the “corridor” function, and least-cost path, using the “costdistance” function (see Kirk and Zielinski 2010 for a full description). Dispersal corridors calculated using the “costdistance” and “corridor” functions mapped every possible movement pathway across the landscapes defined by each linkage. Corridors with the lowest total resistance costs were assumed to be the most essential for successful movement. Corridors that depicted the most likely dispersal routes, the top 10 percent and 25 percent, respectively, were extracted from the model. The top 10 percent corridors were generally within the middle of the wider 25 percent corridors. For this analysis, the 25 percent corridors model was used to assess the potential for impact to marten functional habitat connectivity. There are 187,240 acres of 25 percent corridors on NFS lands within the Lassen National Forest boundary (table 155, page 477; map BE-31).

Threats

Threats facing martens include habitat loss and fragmentation, especially clearcutting, fuel reduction treatments, and wildfire (Zielinski 2014). Marten are also sensitive to habitat alternations and activities associated with ski areas. Slauson et al. (2017) identified the potential for ski areas to become population sinks for marten, based primarily on the potential increase in marten exposure to predation mortality due to frequently crossing wide (greater than 59 feet for males, and 43 feet for females) openings in the form of ski runs, in combination with the pulse stressor of human activity within the ski area. Ski area operations (including runs and resort areas) in the Slauson et al. study encompassed 50 to 65 percent of individual study areas. Avoidance of ski run crossings by marten was also difficult or impossible because the openings ran long distances, generally from summit to base of the mountains (Slauson et al. 2017).

In addition, marten occupancy and geographic range is predicted to be influenced by climate change such that the species will be highly sensitive to climate change, and would probably experience the largest climate impacts at the southernmost latitudes (i.e., in the southern Sierra Nevada) (Lawler et al. 2012). Moriarty (2014) and Moriarty et al. (2015) predicted future decreases in functional winter connectivity for martens, based on estimates from Klos et al. (2014) that winter snowpack within the study area would decrease by more than 30 percent. Manlick et al. (2017) and Zielinski et al. (2017) indicate that reductions in snow cover could increase spatial overlap between fisher and marten, thereby favoring fisher expansion and increasing interspecies competition as well as risk of marten to predation by fishers. Zielinski et al. (2017) stated that, given climate change predictions of increases in minimum temperatures and decreases snowpack by the end of the 21st century, the southern edge of marten habitat suitability will move north and marten will experience more conditions that appear to fall outside their thresholds for occurrence in the southern Sierra Nevada.

Direct and Indirect Effects

Resource indicators and measures (FSH 1909.15, 12.5) used in this analysis to measure and disclose effects to marten are listed in table 154.

Table 154. Resource indicators and measures for assessing effects to marten

Resource Indicator and Effect	Measure (Quantify if possible)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Potential for disturbance to individuals from noise and increased human presence, injury or mortality of individuals, increased competition or predation due to habitat modification, or snow compaction effects to foraging or denning individuals	Acres and percentage of suitable habitat impacted by OSV use	29,290 (24%)	28,220 (23%)	25,786 (21%)	27,581 (23%)	24,593 (20%)
Potential for loss of habitat connectivity	Acres and percentage of connectivity corridors impacted by OSV use	71,494 (38%)	70,252 (38%)	64,448 (34%)	70,987 (38%)	57,820 (31%)

Marten associated with late-successional forests can be impacted by activities associated with trails. Gaines et al. (2003) conducted a literature review of 71 late-successional forest-associated wildlife species and identified negative effects on these species that can result from route-associated factors. These impacts include direct loss of habitat from type conversion, diminished quality of habitat attributes or fragmentation, and road avoidance or displacement resulting from direct harassment or noise disturbance. Individuals, environmental groups, and agency biologists have expressed growing concern over habitat fragmentation for late-successional forest-associated species. Various studies have shown that this species group is vulnerable to disturbance, changes in habitat, or displacement by habitat generalists.

The most common interactions between snowmobile trails and wildlife that Gaines et al. (2003) documented from the literature included trapping as facilitated by winter human access, disturbance-based displacement and avoidance,[14] and disturbance at a specific site,[15] usually wintering areas. To a lesser degree, hunting, trapping, poaching, collection, and habitat loss and fragmentation were other interactions identified. Trapping of marten, or any of the special-status species under consideration, is not legal in California and, therefore, will not be considered as a potential impact in this analysis.

Snowmobile use within late-successional forest habitats can have the following potential direct effects to individuals or their habitat (Gaines et al. 2003): Disturbance and potential for injury or mortality to individuals from vehicle collisions.

Disturbance:

Displacement of populations or individual animals from a route, related to human activities.

Disturbance and displacement of individuals from breeding or rearing habitats.

Physiological response to disturbance, resulting in changes in heart rate or level of stress hormones.

[14] Spatial shifts in populations or individual animals away from human activities on or near roads, trails, or networks
[15] Displacement of individual animals from a specific location that is being used for reproduction and rearing of young

Potential for injury or mortality to individuals from vehicle collision:

As previously discussed, the likelihood of a collision between snow grooming equipment and wildlife is extremely low because the equipment travels slowly (3 to 6 mph). There is an increased likelihood of collision with OSVs due to higher frequency of OSV use and higher speeds.

Possible indirect effects include:

- Altered or dispersed movement as caused by a route or human activities on or near a route.
- Creation of a vector pathway for competitors or predators.
- Snow compaction impacts to den sites or subnivean prey.

In addition to the roads and trails themselves and associated infrastructure, human use of the trails and roads for dispersed recreation activities (e.g., driving, hiking, mountain biking, OHV and OSV use) can lead to direct mortality and injury in the form of vehicle strikes; temporary and permanent displacement of wildlife; alteration of normal behavior and activities by wildlife species (e.g., foraging, nesting, denning, etc.); and spread of noxious weeds. Prolonged or consistent use of trails and roads can lead to permanent displacement of individuals from territories, nest or den abandonment, and/or alteration of foraging behavior and species-specific effects can lead to community-wide effects. Higher trophic level species, such as marten, may be particularly vulnerable to disturbances from dispersed recreation activities (Manley et al. 2004). OSV use does not modify vegetative composition or structure.

Disturbance

As OSV trail use is an existing condition, animals that occur in the areas affected by OSV use during winter may be habituated to OSV disturbance or may have already modified their behavior to avoid areas adjacent to trails or OSV noise resonating in the forest may cause an alert or startle response in individual animals or may be accepted as ambient noise conditions of the environment as suggested by the study on martens (Zielinski et al. 2007). Although Zielinski et al. (2007), in investigating the response of marten to OHV and OSV-related disturbance in the Sierra Nevada Mountains in California, did not demonstrate an effect of OHV/OSV use on marten occupancy, probability of detection, sex ratio, or activity patterns, the study did not measure behavioral, physiological, or demographic responses, so it is possible that OHV/OSVs may have effects, alone or in concert with other threats (e.g., timber harvest) that were not quantified in this study. However, those types of responses would be expected to affect individuals rather than the population as a whole.

In analyzing models of least-cost corridor movement for marten, Spencer and Rustigian-Romsos (2012) identified roads as a variable that may affect marten movements or risks during dispersal. The roads included in the model consisted of interstate highways as well as primary, secondary, and local roads. NFS roads (see figures 2, 3, and 4 in Spencer and Rustigian-Romsos 2012) or areas of varying system road densities do not appear to have warranted inclusion in the models as factors contributing to environmental resistance to marten movement in their study, nor were OSV trail systems or areas designated for OSV cross-country use. A query of the Lassen NRIS database for the period 1992 to 2010 shows a total of 77 marten sightings within projected OSV high-use areas (i.e., within 0.5 mile of groomed trails) during the grooming period (December 26 through March 31). This indicates that, while some effect to marten may be occurring due to OSV disturbance, individuals are not completely avoiding high-use areas. Given the information above, it is unlikely that existing groomed trail systems and areas designated for OSV areas preclude marten movement through the least-cost corridor modeled by Spencer and Rustigian-Romsos. In addition, marten movements and dispersal is unaffected by OSVs during the late spring, summer, and fall periods outside the period of OSV use.

Potential for Injury or Mortality to Individuals from Vehicle Collision

Although there is an greater likelihood of collision of individual martens with OSVs than trail grooming equipment due to higher frequency of OSV use and higher speeds, OSV use occurs in more open areas (canopy cover less than 70 percent) and martens generally avoid habitats that lack overhead cover (canopy cover less than 30 percent), such as trails and meadows, where OSV use would most pronounced. Presumably, a marten would hear an OSV and flee prior to injury or collision.

Competition and Predation

In the winter, OSV use compacts snow and some predators may use compacted snow for travel, changing the spatial pattern of their movements and predation (Manley et al. 2004). Buskirk and Powell (1994) documented predation on marten by coyotes, red foxes, and great-horned owls. Roads driven during the winter months provide travel corridors for coyotes to enter marten winter habitat, affecting marten through competition or direct predation. Since marten have unique morphology that allows them to occupy deep snow habitats where they have a competitive advantage over carnivores, such as coyotes and bobcats, human modifications of this habitat, such as winter road use, over-the-snow travel, and snowmobile trails, can eliminate this advantage and increase access for predators and competitors. Perrine et al. (2010) reported in the Sierra Nevada red fox conservation assessment that coyotes appear to be expanding their winter season range and identified this as a risk factor to the endemic red fox, needing further investigation. However, the recent species report (USDI Fish and Wildlife Service 2015b) noted there isn’t any information to indicate that coyotes are increasing at any of the Sierra Nevada red fox sighting areas; red fox sighting areas largely overlap with marten observation areas. It is unknown if or how much competition with or predation on martens by coyotes is occurring on the Lassen National Forest as the result of OSV-related snow compaction or other OSV-related activities.

Snow Compaction Effects to Denning Individuals or Subnivean Prey

Martens access subnivean space beneath the snow to prey on subnivean species and use a variety of structures for maternal den sites. Potential impacts of OSV use on marten den sites are unknown at this time, but could occur, because of the overlap between marten whelping (March/April) season and the OSV use season, and the potential for compaction of subnivean habitat where some natal and maternal dens may be found (B. Zielinski, pers. comm. 2015). There are approximately 28 documented natal and maternal den sites on the Lassen National Forest, all of which occur on the Almanor Ranger District. A total of 2 sites were reported in 2012 while the remaining 26 sites were found in 2016 and 2017. Review of the data associated with these dens shows that for the 26 sites where denning structure was reported, 25 dens occurred in snags or live trees where effects from compaction and physical disturbance to these above-ground structures are not likely. There is potential that marten access into and out of an additional snag den described as a snow tunnel into the base could be affected by snow compaction, but, given the distance from the nearest designated OSV trail (over one mile) and location adjacent to a snag in a forested stand, the potential for impacts to this site is low.

General noise disturbance that could temporarily displace a female from a den site is also a possibility as 22 den locations fall within areas conducive to OSV use and all sites occur in high or moderate OSV use areas due to location proximities within 0.5 to 1.5 miles of groomed trails. Distances of the 2016/2017 sites from a groomed trail range from 0.2 to 1.2 miles. The 2012 sites both occurred at 60 and 270 feet from a groomed trail; however, no observation date for these sites is available. Both sites are identified as maternal dens, which could have been used by marten at any time from April through June, potentially outside the OSV use period.

The natal denning period for marten generally begins in March and lasts into April and May until the young are weaned. This period of time overlaps the latter portion of the OSV use season. Disturbance that could cause a female to leave the den for an inordinate amount of time would potentially increase risk of mortality to the young during this more vulnerable period prior to weaning. A total of 7 sites are identified as natal dens, all of which are located between 0.2 and 0.5 mile from a groomed trail. All natal den sites are separated from groomed trails by moderate to dense forest and none are within 0.2 mile of an open road that could be used for cross country travel. One site is located within 100 feet of a closed National Forest System road that could potentially be used for cross-country travel, although the amount and frequency of existing use is unknown. Henry et al. (1997) determined that female marten spend from 25 to 55 percent of their time away from the den during the natal period. In-den events averaged about 5.7 hours and individual periods spent away from the den (away events) averaged about 3 hours with maximum length of away event reported to be 24 hours. Transitions (arrivals/departures) ranged from 1 to 13 per day with away events occurring more commonly between dusk and midnight. Based on the range in duration and frequency of home and away events reported by Henry et al. (1997), it is evident that female marten do spend time outside the natal den, sometimes for extended durations, under undisturbed conditions. The degree of effects from disturbance that forces a female from the den, or precludes a female from reentering, would likely be dependent upon the frequency and duration of disturbance. Repeated OSV use that occurs in close proximity to the den or infrequent use that stops or stages in close proximity with extended human presence has the potential to affect frequency/duration of female marten home and away events, which may both increase energy expenditure of the female and increase risk of mortality of the young. However, there are no landscape features such as large meadows that would attract repeated OSV use or stopping/staging along the road adjacent to this den site, nor are there such features that would attract OSV use in proximity to the remaining natal dens. Therefore, the risk due to OSV disturbance at these sites is expected to be low.

Of the 21 known maternity dens, a total of 13 are not near areas that could attract OSV use, such as larger open areas and roads leading to these sites. The risk of OSV disturbance to denning marten at these sites is expected to be low. Of the remaining 8 maternity dens, a total of 6 are located in close proximity to larger open areas that are accessed by open roads. One site lies within about 150 feet of a meadow area with potential for increased OSV use. The other 5 sites used by one female consist of a small cluster of dens in an area less than 0.5 acre situated closely between an open road and a larger opening. Although the level of OSV activity at these 6 sites is not known, there is potential that the activity could be at a level that causes the female to move the young to an alternate den site, which would increase the female's energy expenditure, as well as increase risk of the female and young to predation. The known use periods of these sites range from late April through mid-June, therefore, these potential effects would only apply to the OSV use period, which effectively runs through the end of April. As mentioned above, the 2012 sites are in closer proximity to a groomed route, which increases the potential for disturbance, but use of these sites by marten may very well occur outside the OSV season of use, which would avoid any potential impacts.

As additional den sites are located, Sierra Nevada Forest Plan Amendment standards and guidelines designed to evaluate and protect marten den sites if necessary would apply. OSV-related impacts to marten dens that consist of underground squirrel middens, snags, or logs for denning sites would be expected to be minor and primarily noise disturbance-based due to their structure. Rock crevicebased dens could be subject to a greater degree of impact if the rocks are small enough to compact under the weight of an OSV, in which case they could lead to crushing of or burying individuals.

Although OSV use or related activities would not physically alter the vegetative composition or structure of marten habitat, martens or their prey species could be subject to OSV-related impacts from snow compaction, including suffocation or alteration of movement while foraging in the subnivean space beneath the snow. In addition, some small mammals (i.e., voles) may have difficulty navigating through compact snow layers (Manley et al. 2004). However, because marten typically travel and forage in denser forests where OSV use would be infrequent, and generally avoid open areas that would attract OSV cross-country use, the risk of direct impacts to marten and marten prey from OSV snow compaction is expected to be low. The risk would also be low on groomed and designated routes, which occur on existing roads and lack suitable prey habitat.

Other Potential Indirect Effects

Slauson et al. (2017, pg. 901, 902) identified the potential for ski areas to become population sinks for marten based primarily on the potential increase in marten exposure to predation mortality due to frequently crossing wide (greater than 59 feet for males, and 43 feet for females) openings in the form of ski runs, in combination with the pulse stressor of human activity within the ski area. Ski area operations (including runs and resort areas) in the Slauson et al. study encompassed 50 to 65 percent of individual study areas. Avoidance of ski run crossings by marten was also difficult or impossible because the openings ran long distances generally from summit to base of the mountains (Slauson et al. 2017; pg. 896, Figure 2).

In contrast, groomed and ungroomed OSV trails in the project area occur on NFS roads with prism widths averaging approximately 12 to 15 feet, which presents a much lower risk of exposure to predation in comparison. A total of 5 OSV plowed parking areas located in existing openings along existing roads are scattered within the project area. These total 23 acres representing 0.002 percent of total project area acres. Parking areas range in size from 2 to 8 acres with maximum width of openings ranging from 498 to 912 feet. While it is likely that marten would avoid crossing these five areas, they would do so with or without OSV use due to the existence of the opening. In addition, these openings are small in size and sparse on the landscape, thereby, posing a minor barrier to a mobile carnivore such as marten, and circumvention of these openings by individual marten is very unlikely to add a substantial energy expenditure burden to the population. Therefore, due to the dissimilarities between study area conditions reported by Slauson et al. (2017) and conditions existing or proposed in this project, it is unlikely that their findings of source-sink risk to marten caused by ski area conditions apply to the Lassen OSV project.

Comparison of the Alternatives

Although we don’t know where, specifically, impacts would occur at any given time and we cannot quantify the amount of impact, we know the potential for impacts would be greatest in areas of high OSV use. As described in the assumptions section, flatter areas with slopes less than 21 percent and canopy cover less than 70 percent, including the trails and staging areas, themselves, are used by OSVs more than others and, therefore, likely to receive the highest use. Those assumptions have been incorporated into the following analysis.

Based upon the information displayed in table 155, 81 percent of marten winter habitat is currently designated for OSV use (alternative 1). However, only 24 percent is designated for OSV use and of moderate to high OSV use based on slope and forest density (table 155; map BE-26). The potential for OSV-related noise-based disturbance, injury or mortality, competition or predation, or snow compaction effects (den sites or subnivean prey) impacting individual martens would be most likely to occur within that 24 percent of winter habitat. The amount of marten winter habitat designated for OSV use under the remaining alternatives is decreased somewhat in comparison to alternative 1: alternative 2, 23 percent (map BE-27); alternative 3, 21 percent (map BE-28), alternative 4, 23 percent (map BE-29); and alternative 5, 20 percent (map BE-30). However, actual use is expected to be less considering that the concentration of OSV use is not equal across the landscape, with the highest use occurring on or within 0.5 mile of groomed trails and staging areas. For all alternatives, habitat overlap of moderate and high use areas based on slope and density as well as proximity to trails ranges from 55 to 60 percent of amounts shown for slope and density alone.

Table 155. Acres of marten winter habitat[16] with potential to be impacted by OSV use and related activities, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	74,242	68,709	64,299	68,687	56,410
Not Designated for OSV use	48,231	53,764	57,578	53,786	66,063
OSV use restricted to trails	NA	NA	2	NA	2
Total	122,473 acres				
Designated for OSV use and of moderate to high OSV use	29,290 (23.9%)	28,220 (23.0%)	25,786 (21.1%)	27,581 (22.5%)	24,595 (20.0%)
Not Designated for OSV use and of moderate to high OSV use	22,734	23,804	26,238	24,443	27,430
Moderate to high OSV use and OSV use restricted to trails	NA	NA	1	NA	1
Total	52,024 acres				

Marten whelping season (March – April) overlaps with the latter portion of the OSV season. Analysis shows that the potential for OSV-caused physical damage to existing known den sites is low, but there is potential for OSV noise disturbance to several known den sites. As previously described, once OSV trail grooming season ends on March 31, trail use declines by roughly 50 percent and, therefore, the potential for direct and indirect effects to marten dens is expected to decrease through April.

Of the modeled marten connectivity habitat (i.e., dispersal corridors) on the Lassen National Forest, 84 percent are currently designated for OSV use (table 156); 38 percent of which consists of moderate to high OSV use landscape feature areas (map BE-31). This would be slightly less under alternatives 2 and 4 (maps BE-32 and BE 34). There is some decrease in the amount of marten connectivity habitat that would overlap moderate to high OSV use under alternative 3 (34 percent; map BE-33). Alternative 5 would have the least amount of overlap with marten connectivity habitat overall (31 percent; map BE-35). Slightly less than half of these amounts also overlap with moderate or high OSV trail use areas. None of the alternatives would physically alter elements that define forest structure suitable for marten use as connective corridors (e.g., tree densities, canopy cover, and near-ground complexity) and no activities would form a potential barrier to marten movement within these corridors. Potential impacts described for marten in general (disturbance and/or temporary avoidance) would apply to individual marten using these corridors.

[16] Rustigian-Romsos and Spencer (2010) Conservation Biology Institute Marten Habitat Suitability Model

Several marten observations that were concentrated in a 200-acre area fell outside of either the Conservation Biology Institute Marten Habitat Suitability Model or the Least Cost 25 percent Corridor Model. Although the individual occurrences are based upon all available observational data, regardless of time of year, we created a polygon to determine how much of the area falls within areas of moderate to high OSV use; 54 percent of the polygon area is of moderate to high OSV use, based on slope and stand density under all of the alternatives (maps BE-26, BE-27, BE-28, BE-29, and BE-30). Impacts to individual marten or marten dens would be expected to be similar, as previously discussed for winter habitat in general, and similar management actions would be taken as den sites are identified.

Table 156. Acres of marten habitat connectivity corridors[17] with potential to be impacted by OSV use and related activities, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	156,995	152,117	143,174	156,264	122,059
Not Designated for OSV use	30,245	35,123	44,066	30,976	65.151
OSV use restricted to trails	NA	NA	0	NA	0
Total	187,240 acres				
Designated for OSV use and of moderate to high OSV use (percent of connected habitat)	71,494 (38.2%)	70,252 (37.5%)	64,448 (34.4%)	70,987 (37.9%)	58,820 (31.4%)
Not Designated for OSV use and of moderate to high OSV use	10,402	11,588	17,395	10,857	22,908
Moderate to high OSV use and OSV use restricted to trails	NA	NA	0	NA	0
Total	81,896 acres				

It is unknown if OSV use or related activities on the Lassen National Forest are negatively impacting marten using winter habitat or connectivity habitat. As previously noted, data from the Lake Tahoe Basin Management Unit indicate that OHV/OSV use did not affect marten occupancy or probability of detection when overall OHV/OSV use in the study areas was low (1 OHV/OSV pass every 2 hours; Zielinski et al. 2007). High OSV use is concentrated within 0.5 mile of snowmobile staging areas, on and within 0.5 mile of groomed trails, and in meadows within 0.5 mile of a designated OSV trail, and moderate use occurs within 0.5 mile of marked trails and in areas between 0.5 and 1.5 miles of groomed trails. Therefore, the majority of OSV use occurs would occur within less than 20 to 24 percent of marten winter habitat or 31 to 38 percent of connectivity habitat. Similar to the results of natal and maternal den research, the results of other types of research, as it becomes available, would be used to determine whether disturbance is occurring and if changes in management are necessary

Under all of the action alternatives (i.e., alternatives 2, 3, 4, and 5), trail densities would decline from 1.5 miles per square mile to 0.2 mile per square mile. Because the majority of high and moderate OSV use occurs on or within 0.5 mile of groomed trails and staging areas, or within meadows within 0.5 mile of designated trails, the potential for impacts to subnivean prey species would be expected to decline where reduced trail densities overlap with marten habitat under alternatives 2, 3, 4, and 5.

[17] Least Cost 25% Corridor Modeling (Kirk and Zielinski 2010)

In addition, the potential for compaction impacts to marten or prey on designated trails is low due to a lack of suitable habitat under these trails that are located on existing roads.

Cumulative Effects

Based upon spatial data provided by the Lassen National Forest, actions that could result in a cumulative impact to marten, when combined with alternatives 1, 2, 3, 4, or 5 include vegetation management projects, firewood cutting, Christmas tree cutting, non-motorized winter recreational activities non-motorized winter recreational activities, or use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. Vegetation management projects identified above are very small in comparison to the OSV Use Designation action area and/or do not overlap with groomed and non-groomed OSV trails or staging areas where the highest OSV use occurs. Vegetation and fuels management activities in recent years have included primarily thinned, masticated, and/or burned vegetation to reduce the potential for catastrophic wildfires. These projects can reduce stand densities and suitability for marten. However, management prescriptions emphasize retention of large snags and logs, as well as large conifer that are attributes of marten habitat. In addition, seasonal limited operating periods required for marten for vegetation projects prevent disturbance to known den sites.

Marten habitat also overlaps with areas open to Christmas tree cutting and firewood cutting. However, because wheeled motorized vehicles may not be used off of authorized NFS roads or motorized trails to scout for fuelwood or to harvest Christmas trees (USDA Forest Service 2014), there would be minimal overlap between the Christmas tree and firewood cutting season (annually between November 1 and December 31) and OSV trail grooming season (beginning December 26), and disturbance or displacement from this activity would occur outside of the marten breeding season under alternatives 1, 2, 3, and 5. Under alternative 4, in which trail grooming would begin at the discretion of the groomer, there is the potential for a somewhat larger degree of overlap during years in which heavy snowfall begins early. Use of roads within marten habitats after the March 31 termination date of the forest order closing roads for exclusive OSV use could contribute additional disturbance during the early part of the denning season, but the potential for impact would be expected to be localized.

In general, most non-motorized winter recreation occurs along designated trails, where individuals would either avoid a specific area, if too great a disturbance, or habituate to the noise. Similar activities on State and private lands within the Forest boundary may impact habitat availability outside of NFS lands and may increase disturbance locally. However, the potential for this type of disturbance is unknown; State and privately held lands make up about 20 percent of the area within the forest boundary. In summary, ongoing and reasonably foreseeable actions may be additive locally, but are not expected to contribute significant impacts to those discussed for marten for the project under any of the alternatives. In addition, seasonal limited operating periods that prevent disturbance to marten denning sites would be used to minimize disturbance to these sites once they are identified.

Marten occupancy, geographic range, habitat connectivity, and interactions with competitors and predators is predicted to be influenced by climate change (Moriarty 2014; Moriarty et al. 2015, Manlick et al. 2017, and Zielinski et al. 2017). Moriarty et al. (2015) suggest addressing the potential impacts of future climate change on marten habitat connectivity by maintaining adequate suitable habitats in the form of structurally diverse forested stands. None of the alternatives proposed under this project would physically alter elements that define forest structure suitable for marten use (e.g., tree densities, canopy cover, and near-ground complexity). Therefore, while spatial overlap between areas used by OSVs and those used by marten may show future shifts, particularly in response to available snow levels. The continued use by OSVs would not alter trajectories of habitat and resource availability.

Determination Statement

Alternatives 1, 2, 3, 4, and 5 of the Lassen National Forest Over-snow Vehicle Use Designation Project may affect individuals, but are not likely to lead to a loss of viability or a trend toward Federal listing for marten in the project area based on the following rationale:

- Vegetative structure or composition of marten habitat would not be physically modified by OSV use and related activities under any of the alternatives.
- Available research suggests that OHV/OSV use did not affect marten occupancy or probability of detection when overall OHV/OSV use in the study areas was low. Although overlap of OSV use areas totals up to 80 percent for winter habitats and 84 percent for connective habitat, the potential for impacts to individuals due to moderate or high OSV use within winter habitat ranges from 20 to 24 percent under all of the alternatives, and for connectivity habitat, ranges from 31 percent under alternative 5 to 38 percent under alternatives 1 and 4. In addition, the percentage of winter habitat and connectivity habitat affected by OSV use would actually be lower considering that the concentration of OSV use is not equal across the landscape, with the highest use occurring on or within 0.5 mile of groomed trails and staging areas.
- Martens tend to avoid the open areas where the majority of OSV use occurs, so the potential for disturbance or collisions is expected to be low under all alternatives.
- Den sites in above-ground structures (trees, snags) would not be physically impacted due to the types of structures that are used.
- Marten whelping season (March – April) overlaps with the latter portion of the OSV season, but the results of future natal and maternal den and other types of monitoring research would be used to determine whether disturbance is occurring and if changes in management are necessary, thereby minimizing impacts to marten.
- It is unknown if or how much competition with or predation on martens by coyotes is occurring on the Lassen National Forest as the result of OSV-related snow compaction or other OSV-related activities; however, reduced trail densities under alternatives 2, 3, 4, and 5 are likely to reduce the potential for predation, because most OSV use on the Lassen National Forest occurs on groomed trails.
- Reduction in trail densities and moderate to high OSV use areas that overlap marten habitat under alternatives 2, 3, 4, and 5 are likely to reduce the potential for impacts to subnivean prey species where trail-related effects overlap marten habitat. In addition, the potential for compaction impacts to marten or prey on designated trails is low due to a lack of suitable habitat under these trails that are located on existing roads.

California Spotted Owl (*Strix Occidentalis occidentalis*)

Regional Foresters Sensitive Species

Species Account

The California spotted owl (*Strix occidentalis occidentalis*) is a Region 5 Forest Service sensitive species and a management indicator species for the late seral, closed canopy coniferous forest habitat.

The range of the California spotted owl is divided into two major physiographic provinces: the Sierra Nevada Province and the Southern California Province, with Tehachapi Pass as the dividing line (Verner et al. 1992). The southern Cascade and Sierra Nevada ranges comprise the Sierra Nevada Province, while all the mountain ranges of Southern California and the Central Coast ranges at least as far north as Monterey County comprise the Southern California Province (Ibid). The range of the California spotted owl was revised in 2005, based on mitochondrial deoxyribonucleic acid (mtDNA) haplotypes as follows: west slope (locally on east slope) of Sierra Nevada in California from Shasta (Pit River) and Lassen Counties south to Kern County, and mountains of central, coastal, southern, and transverse ranges of California from Monterey (south side of Carmel Valley) and Kern Counties south through San Diego County to the Cuyamaca Mountains in California, and Sierra San Pedro Martir in Baja California Norte, Mexico (Gutierrez and Barrowclough 2005).

NRM currently has 356 recorded activity centers on the Lassen National Forest. Maps BE-36 and BE-41 show known California spotted owl activity centers and California spotted owl important habitat[18] occurring within the action area. There are 120,312 acres of known activity sites, buffered by 0.7 mile (table 158, page 492), and 330,312 acres of California spotted owl important habitat (table 159, page 493), including high reproductive habitat, on the Lassen National Forest.

Habitat Status

Across the range of this species, a broad array of habitat types such as western hemlock, mixed evergreen, mixed conifer, Douglas-fir, pine-oak, ponderosa pine, western incense cedar, redwood, Douglas-fir/hardwood, and conifer/hardwood are used (Gutierrez et al. 1995a). In the Sierra Nevada Province, spotted owls occur in conifer, mixed conifer and hardwood, and hardwood forests (Verner et al. 1992). More specifically, spotted owls use the following five vegetation types in the Sierra Nevada: foothill riparian hardwood, ponderosa pine hardwood, mixed-conifer forest, red fir forest, and east side pine forest (USDA Forest Service 2001). Mixed-conifer forest is used most frequently by this species in the Sierra Nevada: approximately 80 percent of known sites are found in mixed-conifer forest, 10 percent in red fir forest, 7 percent in ponderosa pine/hardwood forest, and the remaining 3 percent in foothill riparian/hardwood forest and eastside pine (Ibid). In Northern California, the species' elevational range extends from sea level to approximately 7,600 feet (USDI Fish and Wildlife Service 2015b).

Spotted owl home ranges, and nesting and roosting locations are strongly associated with mature coniferous forests with high tree canopy cover (70 percent or greater), multi-layered canopies, and an abundance of large trees and snags (Forsman et al. 1984, Bias and Gutierrez 1992, Call et al. 1992, Verner et al. 1992, Bond et al. 2004, Chatfield 2005). Spotted owl foraging habitat consists of a broader range of vegetation types that may include younger, more open habitat (Williams et al. 2011, Roberts and North 2012, Keane 2014). Large coarse woody debris is a key habitat feature of spotted owl prey. It has been suggested that some level of landscape (forest) heterogeneity may be an important consideration for spotted owl management and can improve spotted owl conservation (Williams et al. 2011, Roberts and North 2012).

Bond et al. (2004) described spotted owl nesting habitat as typically composed of "forested stands with large trees, moderate-to-high tree densities, high canopy cover, and structural complexity." Structural complexity may be both horizontal and vertical. Habitats used for nesting typically have "greater than 70 percent total canopy cover (all canopy above 7 feet), except at very high elevations

[18] Habitat types important for late-successional forest species include stands typed as 4M, 4D, 5M, 5D, and 6 by California Wildlife Habitat Relationship (CWHR 2014), which are all stands of trees greater than 11 inches dbh with greater than 40 percent canopy cover (Sierra Nevada Forest Plan Amendment, USDA Forest Service 2004). In addition, a 7,600-foot elevational limit was included based upon species elevational range (CDFW 2015).

where canopy cover as low as 30 to 40 percent may occur (as in some red fir stands of the Sierra Nevada)" (Verner et al. 1992). Large snags and an accumulation of downed woody debris are typically present (Ibid).

Spotted owl habitat use and life history requirements may be discussed at spatial scales varying from the nest area (smallest) to the non-breeding home range (largest). The nest stand (approximately 100 acres) includes one or more forest stands, the nest tree, and possibly several roost sites. Nest stands may be occupied by breeding spotted owls from February until October, and are the focus of all movements and activities associated with nesting. Spotted owls may have more than one nest stand within their home range, and nest stands may be used intermittently for many years. Nesting behavior is initiated in February or early March, when pairs begin roosting together and calling to each other more frequently at dusk before foraging or when returning to roost before dawn (Forsman 1976, Forsman et al. 1984). Egg laying occurs in March or April (Ibid). The average incubation period is 30 ± 2 days, hatching peaks May 7 to 21 (Sierra Nevada), and fledging (young leaving the nest) occurs generally when the nestlings are 34 to 36 days old (Forsman et al. 1984). The post-fledging dependency period extends through late summer; dispersal from the natal site occurs in September or October (Gutierrez et al. 1995b, Miller 1989).

Investigations into the thermal ecology and ecological energetics of spotted owls (Weathers et al. 2001) found that this species' metabolic rate increases faster than predicted allometrically in response to thermal stress and that spotted owls have exceptionally low energy requirements, compared to similar-sized non-passerine birds. There is considerable debate (Verner et al. 1992) regarding whether, or to what extent, spotted owls prefer or require the micro-habitats presumed to occur within old growth or late seral forested habitats for nesting or roosting based on species-specific thermal ecology and energetics. Several previous studies of roosting habitat use indicate that northern spotted owls move vertically and horizontally within the canopy to exploit more favorable micro-climates (Forsman et al. 1984). Yet, Verner et al. (1992) presented evidence that California spotted owls occupy and breed in habitats with high ambient summer temperatures, and at least occasionally, nest or roost in full sunlight when ambient temperatures exceed 100 degrees Fahrenheit and are well above the thermoneutral (64.8 to 95.4 degrees Fahrenheit or 18.2 to 35.2 degrees Celsius) zone (Weathers et al. 2001).

The diet of spotted owls varies geographically (Gutierrez et al. 1995b). Spotted owls in the Sierra Nevada Province prey mainly on northern flying squirrels (*Glaucomys sabrinus*), whereas owls in the Southern California Province prey almost exclusively on dusky-footed woodrats (*Neotoma fuscipes*) (Verner et al. 1992). Other prey species in the Sierra Nevada include "deer mice (*Peromyscus maniculatus*), voles (*Microtus* spp.), bats, amphibians, insects (which are consumed with the highest frequency but represent a much lower percentage of the diet by mass), ground and tree squirrels, chipmunks (*Tamias* spp.), and some species of bird" (summarized by Verner et al. 1992).

Potential threats and stressors to spotted owls include high-severity stand-replacing fires, expansion of barred owls (*Strix varia*), loss of large trees and dense canopy cover, habitat fragmentation, climate change, and disease.

Years of fire suppression have led to dense forested conditions with heavy fuel loading; these conditions can reduce the quality of foraging and nesting habitat (Roberts and North 2012). For example, spotted owls do not typically use extremely dense stand conditions characteristic of fire-suppressed forests for foraging (Verner et al. 1992, Irwin et al. 2007).

Dense conditions characteristic of fire-suppressed forests (especially ladder fuels) can also be correlated with increased fire risk. In a synthesis of recent scientific research on California spotted owls, Keane (2013) concluded that spotted owls continue to occupy landscapes that have experienced low- to moderate-severity fire as well as some mixed severity fire. However, the effects of varying fire severities on spotted owl demographics (e.g., survival, reproduction) across multiple spatial and temporal (short-term versus long-term) scales are not well understood, and the current research presents mixed results.

High-severity (catastrophic) fire is considered to be a major potential threat to the California spotted owl (USDI Fish and Wildlife Service 2006). High-severity fires that kill most or all of the living trees effectively reduces the availability of preferred nesting and roosting habitat (mature coniferous forests with high tree canopy cover (70 percent or more), multi-layered canopies, and an abundance of large trees and snags) that can take centuries to regrow. In southwestern Oregon, Clark (2007) and Clark et al. (2011) found that annual survival rates were lower in northern spotted owls inhabiting burned areas or displaced by the wildfire as compared to owls that inhabited areas outside the burn perimeter. Clark (2007) observed that although 23 northern spotted owls used all types of fire severity, within burned areas owls strongly selected low-severity or unburned areas with minimal overstory canopy mortality. In this burned landscape, owl high-use areas were characterized by lower fire severity and greater structural diversity. Clark (2007) and Clark et al. (2011) also found that post-fire salvage logging reduced owl habitat quality.

Bond et al. (2009) reported that foraging may occur preferentially in high-severity burned areas; the study followed 7 owls in 4-year-old burned areas and found higher than expected owl foraging in high-severity burned areas. The study is limited by small sample size (7 owls), short duration (12 weeks), nonrandom selection of owls, and delay (4 years) following a wildfire. Bond et al. (2002) hypothesized that wildfires may have few short-term impacts on spotted owls; the authors reported that northern California and Mexican spotted owl survival; site fidelity; mate fidelity; and reproductive success at 11 territories one year after fires seemed uninfluenced by the fires. Four of the territories were mapped as having experienced low- to moderate-severity fire and four experienced high-severity fire that burned over 30 percent of the territories. Roberts et al. (2011) estimated that California spotted owls studied in Yosemite National Park had similar detection, density, and occupancy rates between randomly selected unburned sites (16) and recently burned (less than 15 years since burn) sites (16) that had predominantly burned at low to moderate severity. Jenness et al. (2004) found no statistical relationship between fire with mixed severity effects and Mexican spotted owl occupancy and reproduction in Arizona and New Mexico, but the authors caution that higher occupancy and reproduction in unburned sites may not have been detected as statistically significant because of small sample size, lack of information on temporal and spatial variability in owl occupancy rates, and high variability in burn extent and severity.

In a comparison of owl occupancy dynamics in burned versus unburned sites in the Sierra Nevada, Lee et al. (2012) found that the probability (model mean-averaged) of colonization and local extinction did not differ substantially between burned and unburned sites, and the authors concluded that fire has no significant effect on occupancy dynamics. The authors also found that owls continued to occupy sites (a distinct area in which a single or territorial owl or pair had been detected) where almost one-third (32 percent) of suitable habitat had been burned at high severity. They hypothesize that there may be a critical spatial threshold (proportion of a site) above which a burn at high severity could adversely affect spotted owl occupancy.

Collectively, a large number of studies of fire effects on owls suggest the presence of large trees and high overstory canopy closure are the most important pre- and post-fire conditions associated with spotted owl occupancy (Roberts and North 2012). However, it is clear that additional information is needed to better understand the effects of fire intensity on spotted owls.

In the Sierra Nevada, between 1999 and 2002, wildfire severely affected 18 spotted owl PACs and they could be considered “lost” (USDA Forest Service 2004, SEIS pp. 145). The Moonlight fire on the Plumas National Forest burned approximately 65,000 acres (46,000 on NFS lands) in September 2007. Based on fire severity assessment methods and severity maps (Miller and Thode 2007), a total of approximately 43,938 acres (NFS and private lands) burned at high and moderate-high severity (Basal Area Mortality over 50 percent). This fire resulted in the immediate long-term loss of 17 California spotted owl PACs and HRCAs, as well as the removal of 96 percent of the suitable nesting habitat and 86 percent of the suitable foraging habitat within the landscape.

Fuel reduction treatments attempt to remove ladder and surface fuels to reduce the potential for stand-replacing fire. Often, these treatments are conducted using mechanical equipment; on the Lake Tahoe Basin Management Unit, a combination of hand and mechanical treatments are conducted. Overall, there is limited information available about the effects of mechanical vegetation treatments on spotted owls and habitat condition (Keane 2014). The results of simulation modeling research summarized in Keane (2013) suggests that some fuels treatments can reduce fire risk with minimal effects on owl reproduction, and may have long-term benefits of reducing wildfire risk that outweigh short-term effects of treatments. Ultimately, the risk of not doing anything can outweigh the potential short-term impacts from reducing the risk of stand-replacing fire that would essentially kill all trees.

The USDI Fish and Wildlife Service (2006) recognized that short-term impacts on California spotted owl could occur from fuel reduction projects for the greater, long-term benefit of protecting nesting habitat from being lost to a stand-replacing fire. However, the effects of fuel reduction treatments to prevent stand-replacing fires is not well understood and more on-the-ground information would be useful in an adaptive management framework. For example, Seamans and Gutierrez (2007) found that alteration of 20 hectares or more (49 acres) of mature forest in spotted owl territories may decrease the probability of colonization. In the Plumas National Forest, where the Moonlight Fire resulted in the loss of PACs, fuel reduction treatments in the Meadow Valley Project are demonstrating the effects of fuel reduction treatments on spotted owls. The technique used in the Meadow Valley project, Defensible Fuel Profile Zone is currently not practiced on the Lake Tahoe Basin Management Unit, but results from this study demonstrate that although owls may incur short-term impacts from fuel reduction treatments, this risk outweighs the potential consequences of losing the habitat to a stand-replacing fire like the Moonlight Fire. In addition to the potential effects from fuel reduction treatments, more information is needed on the value of post-fire habitat and potential effects from alteration of this habitat. Northern spotted owls have avoided habitat treated during post-fire salvage logging (Clark 2007, Clark et al. 2011).

Spotted owls face a number of stressors unrelated to fire and forest management activities including the invasion of barred owls (*Strix varia*), climate change, and disease and contaminants. As with the previous description of effects of fire and forest management activities, the information on ecological stressors comes primarily from Keane (2013).

Barred owls are an increasing risk factor for California spotted owls in the Sierra Nevada. Barred owls can hybridize and also out-compete spotted owls. Barred owls were first recorded within the range of the California spotted owl in 1989, on the Tahoe National Forest. Two sparred owls (hybrids of spotted and barred owls) were reported in the Eldorado National Forest during 2003 – 2004 (Seamans et al. 2004), and one of these sparred owls is still present on the study area. Ongoing research has documented 73 records of barred or sparred owls in the Sierra Nevada to date, with the majority of records from the northern Sierra Nevada (Tahoe, Plumas, and Lassen National Forests).

Of note, five new records of barred owls were documented in the Stanislaus and Sierra National Forests in 2012, indicating further range expansion of barred owls in the southern Sierra Nevada. Barred owl numbers are likely higher than documented in the Sierra Nevada, as there have been no systematic surveys for them to date.

Across their range, spotted owls exhibit population-specific demographic relationships with local weather and regional climates (Glenn et al. 2010, Glenn et al. 2011, Peery et al. 2012). Based solely on projections of climate change (i.e., not incorporating other factors such as habitat, etc.), this population-specific variation is anticipated to result in population-specific responses to future climate scenarios, which could range from little effect to potentially significant effects. These population-specific responses could result in high vulnerability. For California spotted owls, Seamans and Gutiérrez (2007b) reported that temperature and precipitation during incubation most affected reproductive output, and conditions in winter associated with the Southern Oscillation Index most affected adult survival on the Eldorado National Forest. Weather variables explained a greater proportion of the variation in reproductive output than they did for survival. Further, these two weather variables were also included in the best models predicting annual population growth rate (Seamans and Gutiérrez 2007b). MacKenzie et al. (2012) found that the Southern Oscillation Index or other weather variables explained little variation in annual reproduction for this same population of owls. Future responses to climate change are likely to be governed by complex interactions of factors that directly affect spotted owls and their habitat, as well indirect factors that can affect habitat (e.g., insect pests, disease, increased fire risk). Carroll (2010) recommended using dynamic models that incorporate vegetation dynamics and effects of competitor species in addition to climate variables to rigorously assess future climate change on spotted owls.

Little information exists on disease prevalence in California spotted owl populations, and no information exists regarding the effects of disease on individual fitness or population viability. Blood parasite prevalence sampling for California spotted owls in the northern Sierra Nevada documented that 79 percent of individuals were positive for at least one infection, whereas 44 percent of individuals tested positive for multiple infections including West Nile Virus, a mosquito-borne flavivirus first detected in eastern North America in 1999, which spread rapidly across the continent. West Nile Virus has been demonstrated to have high acute species-specific mortality rates in many raptor species (owls, hawks, and their relatives) (Gancz et al. 2004). None of the 141 individual California spotted owl blood samples collected from the southern (Sierra National Forest, Sequoia-Kings Canyon National Park) or northern (Plumas and Lassen National Forests) Sierra Nevada from 2004 to 2008 have tested positive for West Nile Virus antibodies, which would indicate exposure and survival (Hull et al. 2010). Adult, territorial California spotted owls have high annual survival (80 to 85 percent) that has been stable across years, and no evidence has been published from the four long-term demographic studies indicating changes in adult owl survival. Nevertheless, although no effects have been documented to date, future outbreaks of West Nile Virus may pose a risk to California spotted owls.

The following CWHR classes provide high capability nesting habitat for this species: Montane Hardwood and Red Fir (5D); and Montane Hardwood-Conifer, Montane Riparian, Sierran Mixed Conifer, and White Fir (5D and 6). Within CWHR, size class 6 is only recognized for a subset of the forest vegetation types (Montane Hardwood Riparian, Montane Riparian, Sierran Mixed Conifer, and White Fir). The following CWHR classes provide moderate capability nesting habitat for this species: Eastside Pine and Lodgepole Pine (5D).

The following CWHR classes provide high capability roosting habitat for this species: Montane Hardwood and Red Fir (5M and 5D); Montane Hardwood-Conifer, Sierran Mixed Conifer, and

White Fir (5M, 5D, and 6); and Montane Riparian (5D and 6). The following CWHR types and strata provide moderate capability roosting habitat for this species: Eastside Pine and Lodgepole Pine (5M and 5D); Montane Riparian and Red Fir (4M, 4D, 5S, and 5P); and Sierran Mixed Conifer and White Fir (4M and 4D).

The following CWHR classes provide high capability foraging habitat for this species: Montane Hardwood and Red Fir (5M and 5D); Montane Hardwood-Conifer, Sierran Mixed Conifer, and White Fir (5M, 5D, and 6); and Montane Riparian (5D and 6). The following CWHR classes provide moderate capability foraging habitat for this species: Eastside Pine and Lodgepole Pine (5M and 5D); Montane Hardwood (4M and 4D); Montane Hardwood-Conifer, Red Fir, Sierran Mixed Conifer, and White Fir (4M, 4D, 5S, and 5P); and Montane Riparian (3M, 3D, 4M, 4D, 5S, 5P, and 5M).

Throughout the Sierra Nevada, California spotted owl nesting habitat is protected in California spotted owl protected activity centers (csoPACs). A csoPAC includes 300 acres of the highest quality nesting habitat available, and the most recent nest site or activity center within a spotted owl breeding territory as described in management direction for the forest (USDA Forest Service 2004b). A csoPAC size of 300 acres corresponds with the following two criteria reported by Verner et al. (1992) in the California spotted owl report: (1) the size of the nest stand and adjacent suitable nesting stands; and (2) the area encompassing approximately 50 percent of radio-telemetry locations within spotted owl territories on the Sierra National Forest (USDA Forest Service 2001). The amount of high and moderate capability nesting, roosting, and foraging habitat within each csoPAC varies according to what is available, given existing conditions, on the forest. The csoPAC is considered to be suitable for nesting and foraging.

High reproductive habitats include blue oak – foothill pine, Sierran mixed conifer, ponderosa pine, red fir, montane hardwood, montane hardwood-conifer, montane riparian and white fir and Jeffrey pine; eastside pine types are not considered suitable for California spotted owls (USDI Fish and Wildlife Service 2015b).

Zimmerman et al. (2003) investigated whether this territorial species follows an ideal despotic distribution and found a positive correlation between territory occupancy and “potential fitness” as estimated from survival and reproduction; generally supporting an ideal despotic distribution (though some noise in the data was observed). Perceptual limitations, prey dynamics, and large territory sizes were identified as potential factors affecting the ability of individuals to assess habitat quality accurately. Dispersal processes, high survival rates, and long life spans were suggested as other key factors that may prevent some individuals from selecting the highest quality sites as predicted by an ideal despotic distribution (Ibid).

A home range core area (HRCA) includes its associated PAC, is 1,000 acres in size, and is composed of the best available contiguous habitat. Like PACs, HRCAs are protected in the Sierra Nevada. The core area corresponds with 20 percent of a breeding pair home range plus one standard error. Home ranges vary substantially across the range of this subspecies. Home range sizes of California spotted owls tend to be smallest in lower-elevation hardwood forests, intermediate in size in conifer forests of the central Sierra Nevada, and largest in true fir forests in the northern Sierra Nevada. Sierra National Forest owls were found to have a median home range for pairs of approximately 3,000 to 5,000 acres (Verner et al. 1992). However, Verner et al. (1992) cite an overall mean home range size of owl pairs during the breeding period in Sierran conifer forests of about 4,200 acres.

Four demographic studies of California spotted owl have been ongoing for a number of years within the Sierra Nevada: (1) Eldorado National Forest (since 1983); (2) Lassen National Forest (since

1990); (3) Sierra National Forest (since 1990); and (4) Sequoia-Kings Canyon National Park (since 1990). One of the primary objectives of the demographic studies is to monitor rate of change (lambda (λ)) in owl populations (i.e., the number of owls present in a given year divided by the number of owls present the year before). For these demographic models, a lambda of 1.0 indicates a stable population; less than 1.0 indicates the population is decreasing, and greater than 1.0 indicates an increasing population. Lambda is estimated from models and is typically presented as an estimate of the rate of population change, along with the standard error (SE) or a 95 percent confidence interval. The 95 percent confidence interval represents the reliability of the estimate of lambda. Managers typically view a population as stable if the 95 percent confidence interval overlaps a lambda of 1.0.

A meta-analysis of the data from 1990 to 2005 for the four spotted owl populations in the study areas concluded that, with the exception of the Lassen study area, owl populations were stable, with adult survival rate highest at the Sequoia-Kings Canyon study site (Blakesley et al. 2010). The 95 percent confidence limit for lambda in the Lassen study area ranged from 0.946 to 1.001 (estimated value 0.973), indicating a stable population.

Recent analyses from the same four demographic study areas suggest that there may be a concern for decline in spotted owls within the three national forest demographic study areas in the Sierra Nevada (Eldorado, Sierra, and Lassen National Forests). A preliminary analysis conducted by the Sierra Nevada Adaptive Management Project in 2011, indicates that the owl population on the Eldorado National Forest may be declining, but the 95 percent confidence interval for lambda overlaps 1.0 (Gutierrez et al. 2012). Tempel and Gutiérrez (2013) conclude that data from the Eldorado Density Study Area (60 percent National Forest System land in Eldorado National Forest and 40 percent private land managed by timber companies) suggest a 31 percent decline in the spotted owl population size from1993 to 2010, but again, the 95 percent confidence interval slightly overlapped 1.0 for all parameters. Using data for an 18-year study period, Conner et al. (2013) found that the different estimators for ‘realized population change’ (expressed as ‘delta’ or Δ_t – ratio of population size at end time to initial population size) indicated population declines of 21 to 22 percent for the Lassen study area and 11 to 16 percent for Sierra study area, with an increase of 16 to 27 percent for Sequoia-Kings Canyon study area. The annual rate of population change (*lamda*) also showed a declining trend. However, similar to the analyses conducted by Tempel and Gutiérrez (2003) the confidence intervals overlapped 1.0 for all estimators and all study areas. As stated in Conner et al. (2013) “If a population is growing (lambda greater than 1.0), managers cannot tell whether the growth is from internal recruitment or immigration. Likewise, if a population is declining, managers cannot determine whether the declines are due to deaths within the population or emigration. Thus, additional information on specific vital rates is necessary to understand what is driving lambda and ultimately, the mechanisms driving population dynamics.” Causation for any potential decline in occupancy is unknown.

Using data collected at three of the four long-term California spotted owl study areas, including Lassen National Forest, Connor et al. (2013) compared mean λ and Δ_t as summaries of population change over time and evaluated the use of the posterior distribution of Δ_t as a means for estimating the probability of population decline retrospectively. For the Lassen study area, estimated median Δ_t over the 18-year monitoring period was 0.78, suggesting a 21 percent decline in population size. The probability of a 15 percent or greater decline over 18 years was 0.69, whereas the probability the population was stationary or increasing was 0.07. However, if a population is declining (mean λ less than 1.0), managers cannot determine whether the declines are due to deaths within the population or emigration. Thus, additional information on specific vital rates is necessary to understand what is driving λ and ultimately, the mechanisms driving population dynamics. Although mean λ and Δ_t are important metrics, they may not suffice for a full assessment of a population's health (Blakesley et al. 2010).

As previously described, focused studies on northern spotted owls (Shasta-Trinity and Mendocino National Forests), a species whose biology is very similar to California spotted owls, have been conducted to evaluate direct effects of noise on the species during its breeding timeframes. Behavioral responses to disturbance, such as leaving an area, can be readily observed (Tempel and Gutierrez 2003). Physiological responses to disturbance are not as easy to detect because they are not necessarily associated with behavioral responses (Tempel and Gutierrez 2003). Research has been conducted to measure the effects of noise on physiological stress levels of northern and California spotted owls through the analysis of fecal corticosterone (Wasser et al. 1997, Tempel and Gutierrez 2003, Tempel and Gutierrez 2004) and fecal glucocorticoid (Hayward et al. 2011). It is difficult to tease out background differences in fecal corticosterone and fecal glucocorticoid levels from variables such as environment, body condition, and gender (Tempel and Gutierrez 2004; Hayward et al. 2011), making cause and effect determinations of whether disturbance is related to the action being tested or some other factor. The studies varied in design, analysis, and conclusions. The study by Hayward et al. (2011) is most similar to conditions in this project in that it used off-highway vehicles. However, it is dissimilar in that exposure was applied by conducting simulated enduro events in which motorcycles traveled back and forth along a 0.5-mile length of road within 50 to 800 meters (0.03 to 0.5 mile) of roost or nest locations for an hour. Conditions such as these would only be expected on OSV trails with heavy use or near trailheads. Results from this study indicate that there were increased levels of fecal glucocorticoid, particularly in adult males in response to acute traffic exposure (i.e., and reduced reproductive success in response to this level of activity (Hayward et al. 2011). The highest sensitivity appeared to occur among males in May when they were the sole providers for their mates and offspring, suggesting that spring may be a particularly important time to limit motorized recreation near northern spotted owl territories (Ibid.). There was no evidence that fecal glucocorticoid response to enduro diminished with exposure to routine road noise in May or among northern spotted owl within 50 meters (164 feet) of a road in July. Traffic appeared always to be highly disturbing to these northern spotted owls. The fact that male northern spotted owls 50 to 800 meters (0.03 to 0.5 mile) from loud roads showed lower fecal glucocorticoid response to acute motorcycle exposure compared to northern spotted owls an equivalent distance from quiet roads in July suggests that partial habituation to noise from traffic may occur in this species among individuals as long as they are a sufficient distance (over 50 meters (164 feet)) from the road.

Direct and Indirect Effects

Resource indicators and measures (FSH 1909.15, 12.5) used in this analysis to measure and disclose effects to California spotted owl are listed in table 157.

Table 157. Resource indicators and measures for assessing effects to California spotted owl

Resource Indicator and Effect	Measure (Quantify if possible)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Potential for disturbance to or displacement of individuals from noise and increased human presence, injury or mortality of individuals	Acres and percentage of important habitat impacted by OSV use	112,300 (34%)	108,154 (33%)	99,116 (30%)	111,136 (34%)	82,831 (25%)
Potential for disturbance to or displacement of individuals from OSV use and increased human presence, injury or mortality of individuals	Acres and percentage of buffered CSO activity centers impacted by OSV use	38,416 (32%)	38,192 (32%)	34,020 (28%)	37,595 (31%)	32,451 (27%)

California spotted owl is associated with late-successional forests that can be impacted by activities associated with trails. Gaines et al. (2003) conducted a literature review of 71 late-successional-forest-associated wildlife species and identified negative effects on these species that can result from route-associated factors. These impacts include direct loss of habitat from type conversion, diminished quality of habitat attributes or fragmentation, and road avoidance or displacement resulting from direct harassment or noise disturbance. Individuals, environmental groups, and agency biologists have expressed growing concern over habitat fragmentation for late-successional forest-associated species. Various studies have shown that this species group is vulnerable to disturbance, changes in habitat, or displacement by habitat generalists.

Snowmobile use within late-successional forest habitats can have the following direct effects to individuals or their habitat (Gaines et al. 2003): Disturbance and potential for injury or mortality to individuals from vehicle collisions.

Disturbance:

Displacement of populations or individual animals from a route, related to human activities.

Disturbance and displacement of individuals from breeding or rearing habitats.

Physiological response to disturbance, resulting in changes in heart rate or level of stress hormones.

Potential for Injury or Mortality to Individuals from Vehicle Collision:

Although there is the potential for collision of California spotted owls with OSVs or grooming equipment, the likelihood of it is very low for the following reasons: spotted owls spend little time at ground level; whereas spotted owls are nocturnal, most OSV use on the Lassen occurs during daytime hours; and although snow grooming equipment operates during darkness, the equipment travels slowly (3 to 6 mph).

Potential indirect effects include:

- Altered or dispersed movement as caused by a route or human activities on or near a route.
- Snow compaction (prey base for several of the other late-successional forest species under consideration).

In addition, Gaines et al. (2003) found an interaction that occurred on winter recreation trails was the indirect effect of snow compaction on the subnivean sites used by small mammals in which small mammals can either be suffocated as a result of the compaction, or their subnivean movements can be altered owing to impenetrable compact snow. Adverse effects to subnivean animals could indirectly affect the prey base for many Forest Service sensitive species, including California spotted owl.

According to Forsman et al. (1984) spotted owl courtship behavior usually begins in February or March with the timing of nesting and fledging varying by elevation and latitude. April 1 coincides with incubation in most areas (USDI Fish and Wildlife Service 2012). The OSV grooming season generally begins in mid-December and continues through March. Start and stop times vary by trail location and are dependent upon the presence and depth of snow. As described in the assumptions section, for the purpose of this analysis, April 30 will be used as the cut-off date for the maximum period of interaction between California spotted owls and OSV use and related activities.

The Forest Service considers activities greater than one-quarter mile (400 meters) from a spotted owl nest site to have little potential to affect nesting spotted owls. Snowmobiles passing within 0.25 mile of unsurveyed nesting/roosting habitat or an active nest have the potential to disturb nesting spotted owls. Under all alternatives, groomed and non-groomed trails and staging areas occur within 0.25 mile of California spotted activity centers and/or important habitat. However, OSV use is not consistent across all available habitat. Although we don’t know specifically where impacts would occur at any given time and we cannot quantify the amount of impact, we know the potential for impacts would be greatest in areas most of high OSV use. As described in the assumptions section, flatter areas with slopes less than 21 percent and canopy cover less than 70 percent, including the trails and staging areas, themselves, are used more by OSVs than others and, therefore, likely to receive the highest use. Those assumptions have been incorporated into the following analysis.

As previously discussed, behavioral responses to disturbance, such as leaving an area, can be readily observed in spotted owls (Tempel and Gutierrez 2003) and sensitivity in adult male spotted owls in response to acute traffic exposure was highest in May (Hayward et al. 2011). A total of 120,312 acres of buffered California spotted owl activity sites and 330,312 acres of important habitat occurs within the analysis area. The intensity and duration of noise-generating activities tested by Hayward et al. (2011) are not expected to occur as a result of the proposed action because the maximum period of interaction between OSVs, and related activities occurs prior to May, when breeding adult males are most sensitive to noise, and noise associated with snowmobile use and associated activities in the action area is expected to be of short duration (amount of time it would take to travel through any one given area) and of intermittent intensity (amount of concentrated noise).

In addition, monitoring of PACs by Lassen National Forest found no apparent relationship between a PAC’s distance from a snow park and whether it was recently occupied (California OSV Program Final EIR (2010)). Based on the overlap with the breeding seasons for both northern goshawk and California spotted owl, it was recommended that snow grooming activities not be allowed to extend beyond the forest order expiration date of March 31, and under the existing condition, it does not.

Based upon OSV use patterns described in the assumptions section, once OSV trail grooming ends, it is estimated that use of those trails declines by 50 percent. Therefore, the potential for direct and indirect effects to activity centers within 0.25 mile of groomed trails would decrease substantially after March 31 for alternatives 1 through 3, but not necessarily for alternative 4. Due to the structural nature of important spotted owl habitat (i.e., dense forested stands), the level of cross-country travel occurring in this habitat is less than the amount of available habitat. The potential for noise-based disturbance is actually expected to be lower because use, and therefore, the highest potential for disturbance is expected within 0.5 mile of existing roads, trails and staging areas, under all alternatives. Vegetative structure of habitat would not be physically modified by OSV use and related activities.

Trail grooming occurs on existing roads and trails and primarily occurs at night when fewer species are active, but when spotted owls are more active. Under alternatives 1, 2, 3, and 5, the snow grooming season would conclude on March 31; under alternative 4, it would be left to the discretion of the groomer and could extend for as long as 12 inches of snow remain on the ground. Therefore, under all of the alternatives, snow grooming season overlaps with a portion of the March 1 through August 15 California spotted owl breeding season. However, under alternative 4, it could last longer, which is not consistent with Lassen National Forest OSV monitoring report recommendations. Potential effects of noise disturbance would be the same as those noted due to OSV use. In addition, trail grooming and night riding could disturb owls that forage at night. A passing trail grooming machine or OSV may interrupt owl foraging, result in owl prey taking refuge, or cause owls to redirect their foraging away from trail areas. However, due to the limited frequency[19] and duration of trail grooming at any trail segment location, as well as grooming activity being an ongoing operation for many years on the same trails, the noise disturbance from trail grooming would not have a significant impact on breeding or foraging spotted owls.

Although OSV use or related activities would not physically alter the vegetative structure of spotted owl habitat, spotted owl prey species, that use the subnivean space could be subject to OSV-related impacts from snow compaction, including suffocation or alteration of movement while foraging in the subnivean space beneath the snow. The degree of this impact is unknown, but would be more likely in areas most conductive to OSV.

Comparison of the Alternatives

Table 158 and table 159 show and compare, by alternative, the acres of known activity centers buffered by 0.70 mile and important California spotted owl habitats, respectively, with the potential for direct and indirect effects from OSV use and related activities. Ninety-five percent of California spotted owl activity centers buffered by 0.70 miles are currently open to OSV use (alternative 1). However only 32 percent is currently open to OSV use and of moderate to high OSV use, based on slope and forest stand density (map BE-36). Similarly, 88 percent of important California spotted owl habitat is currently open to OSV use, but only 34 percent is currently open to OSV use and of moderate to high OSV use (map BE-33). The potential for OSV-related impacts to California spotted owls, including noise-based disturbance, snow compaction impacting subnivean space of prey species, or injury/mortality, would be most likely to occur in those areas of moderate to high OSV use. In addition, of the 32 percent of buffered activity centers and the 34 percent of important habitat

[19] Grooming operations at most trail systems currently operate near a maximum level. Trails are prioritized for grooming based on visitor use. Grooming on priority trails occurs several times per week and after significant storms. The total hours of trail grooming occurring expected at each site for an average season vary from 94 annual snowcat hours at Swain Mountain to 680 hours at Bogard and Fredonyer on the Lassen National Forest. Snow removal on access roads and trailhead parking areas, serving the OSV Program trail systems, occurs several times during storm events as necessary dependent upon weather conditions (California Department of Parks and Recreation 2010).

currently open to and of moderate to high OSV use, approximately 33 and 57 percent, respectively, also overlaps areas of moderate to high OSV use, based on trail proximity, so the majority of OSV activity occurs within in an even smaller percentage of each of those habitats. This would be similar under the remaining alternatives, which range from 33 to 62 percent overlap.

Table 158. Acres of known California spotted owl activity centers, buffered by 0.70 mile, with potential to be impacted by OSV use and related activities, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	114,001	112,754	98,659	111,174	90,413
Not Designated for OSV use	6,311	7,516	21,159	8,643	29,843
Moderate to high OSV use and OSV use restricted to trails	NA	NA	13	NA	13
Total	120,312 acres				
Designated for OSV use and of moderate to high OSV use (percent of buffered total)	38,416 (31.9%)	38,192 (31.7%)	34,020 (28.3%)	37,595 (31.2%)	32,451 (27.0%)
Not Designated for OSV use and of moderate to high OSV use	1,341	1,560	5,697	2,126	7,301
OSV use restricted to trails	NA	NA	6	NA	6
Total	39,757 acres				

Under alternative 2, 33 percent of important California spotted owl habitat (map BE-42) and 32 percent of buffered PACs (map BE-37) would be designated and of moderate to high OSV use based on slope and stand density. Similarly, 30 percent of important habitat (map BE-43) and 28 percent of buffered PACs would be designated and conductive to OSV under alternative 3 (map BE-31) and 34 percent of important habitat (map BE-38) and 31 percent of buffered PACs under alternative 4 (map BE-39). Alternative 5 would produce the lowest amount of potential disturbance with 25 percent of important habitat (map BE-45) and 27 percent of buffered PACs designated and of moderate to high OSV use (map BE-40). The Forest Service would use the results of ongoing inventory and monitoring of California spotted owl activity centers to determine whether disturbance is occurring and if changes in management are necessary. The potential for noise-based disturbance would largely overlap with roughly the first 20 percent, or the pair bonding, mating, and egg laying stages, of the March 1 through August 15th California spotted owl breeding season under alternatives 1, 2, 3, and 5, and may extend up through the first one-third of the breeding season, into the hatching stage, under alternative 4. As previously described, once OSV trail grooming season ends on March 31, trail use declines by roughly 50 percent and, therefore, the potential for direct and indirect effects to activity centers within 0.25 mile of groomed trails would decrease by an estimated 50 percent after March 31 for alternatives 1 through 3 (and not long, thereafter, for alternative 4, with the exception of extremely high snowfall years).

Under all of the action alternatives (i.e., alternatives 2, 3, 4, and 5) trail densities would decline from 1.5 mi/m^2 to 0.2 mi/m^2. And, because the majority of OSV use occurs on or within 0.5 mile of groomed trails and staging areas, or within meadows within 0.5 mile of designated trails, the potential for impacts to subnivean prey species, would be expected to decline with reduced trail densities under alternatives 2, 3, 4 and 5.

Table 159. Acres of important California spotted owl habitat with potential to be impacted by OSV use and related activities, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	289,900	274,994	250,063	286,946	201,497
Not Designated for OSV use	40,406	54,926	79,589	40,940	125,735
OSV use restricted to trails	NA	NA	52	NA	52
Total	330,312 acres				
Designated for OSV use and of moderate to high OSV use (percent of habitat total)	112,300 (34.0%)	108,154 (32.7%)	99,166 (30.0%)	111,136 (33.6%)	82,831 (25.1%)
Not Designated for OSV use and of moderate to high OSV use	9,346	13,341	22,337	10,187	37,814
Moderate to high OSV use and OSV use restricted to trails	NA	NA	29	NA	29
Total	121,646 acres				

Cumulative Effects

Based upon spatial data provided by the Lassen National Forest, past, present, and foreseeable future actions that could result in a cumulative impact to California spotted owl, when combined with alternatives 1, 2, 3, 4, or 5 include vegetation management projects, firewood cutting, Christmas tree cutting, non-motorized winter recreational activities, or use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. Vegetation management projects identified above are very small in comparison to the OSV Use Designation action area and/or do not overlap with groomed and non-groomed OSV trails or staging areas where the highest OSV use occurs. For example, the Castle Defensible Fuel Profile Zone 2 is proposed on 39 acres within 0.25 mile of PAC PL 121; PL 121 is also within 0.25 mile of groomed OSV trail 27N11. However, seasonal limited operating periods required for vegetation projects would prevent disturbance to known nest sites. In another example, the Dutch and Tamarack fire salvage projects would remove standing dead or dying trees across roughly 1,500 and 1,300 acres, respectively, of coniferous forest including Sierran mixed conifer, suitable California spotted owl habitat, in the northwestern portion of the analysis area. However, the area does not overlap with any known csoPACs. In addition, vegetation and fuels management activities in recent years have included primarily thinned, masticated, and/or burned vegetation to reduce the potential for catastrophic wildfires. Management prescriptions have emphasized retention of large snags and logs, as well as retention of large conifer, over a 20-year period. These are all important habitat attributes for spotted owl foraging habitat.

California spotted owl habitat also overlaps with areas open to Christmas tree and firewood cutting. However, wheeled motorized vehicles may not be used off of authorized National Forest System roads or motorized trails to scout for fuelwood or to harvest Christmas trees (USDA Forest Service 2014), there would be minimal overlap between the Christmas tree and firewood cutting season (annually between November 1 and December 31) and OSV trail grooming season (beginning December 26), and disturbance or displacement from these activities would occur outside of the California spotted owl breeding season under alternatives 1, 2, 3, and 5. Under alternative 4, in which trail grooming would begin at the discretion of the groomer, there is the potential for a somewhat larger degree of overlap during years in which heavy snowfall begins early. Use of roads within California spotted owl habitats after the March 31 termination date of the forest order closing roads for exclusive OSV use can contribute additional disturbance during the early part of the breeding season, particularly for nests within 0.25 mile of roads. In general, most non-motorized winter recreation occurs along designated trails and California spotted owl would either avoid roosting in those areas, if too great a disturbance, or habituate to the noise. Similar activities on State and private lands within the forest boundary and within one-quarter mile of California spotted owl habitats may impact habitat availability outside of NFS lands and may increase disturbance locally. However, the potential for this type of disturbance is unknown; State and privately held lands make up about 20 percent of the area within the forest boundary. In summary, ongoing and reasonably foreseeable actions may be additive locally to individual California spotted owls, but, given the small scale for the potential of overlap of cumulative effects in time and space with any of the alternatives, they are not expected to contribute substantial impacts to effects discussed for the project under any of the alternatives.

Determination Statement

Based upon the best available data and scientific information, all of the alternatives of the Lassen National Forest Over-Snow Vehicle Use Designation Project would impact individuals, but are not likely to lead to a trend toward Federal listing or a loss of viability for California spotted owl in the Forest Plan area based on the following rationale:

- OSV proposed actions would not physically modify the vegetative structure or composition of any suitable (nesting, roosting or foraging), dispersal, or capable habitat within the project area.
- Due to the structural nature of suitable habitat (i.e., dense forested stands), the level of cross-country OSV travel in California spotted owl suitable habitat is expected to be relatively low, and most disturbance is likely to occur primarily along existing roads and trails. Although the potential for noise-based disturbance to individuals within important habitat ranges from 25 to 34 percent, and individuals within buffered PACs ranges from 27 to 32 percent, under all of the alternatives, the percentage of habitats impacted would actually be lower considering that the concentration of OSV use is not equal across the landscape.
- The potential for OSV-related noise-based disturbance would overlap with only the early part of the March 1 through August 31 California spotted owl breeding season.
- OSV use is most common on trails. Once OSV trail grooming season ends on March 31, trail use declines by roughly 50 percent and, therefore, the potential for direct and indirect effects to activity centers within 0.25 mile of groomed trails would decrease by an estimated 50 percent after March 31 for alternatives 1 through 3 and 5 (and not long, thereafter, for alternative 4, with the exception of extremely high snowfall years).
- The forest would use the results of ongoing inventory and monitoring of spotted owl activity centers to determine whether or not disturbance is occurring and if changes in management are necessary, thereby minimizing impacts to California spotted owl.
- Based upon analysis of previous monitoring data, Lassen National Forest found no apparent relationship between a csoPAC’s distance from a snow park and whether it was recently occupied.
- Other than a single OHV study, with uncharacteristically high disturbance exposure times, there is no evidence of a disturbance impact to individuals or reproductive output.
- There is no evidence linking OSV noise-based disturbance to long-term population declines.

- Disturbance to California spotted owl foraging behavior would largely be limited to areas adjacent to OSV trails and short-term in nature during trail grooming because the species is nocturnal and OSV use largely occurs during the daytime.
- The potential for OSV collision with individual California spotted owls is very low.
- Reduced trail densities, under alternatives 2, 3, 4, and 5 are likely to reduce the potential for impacts to subnivean prey species.

Northern Goshawk (*Accipiter gentilis*)

Regional Foresters Sensitive Species

Species Account

Northern goshawks occupy boreal and temperate forests throughout the Holarctic zone (Squires and Reynolds 1997). This broad range of forested communities includes mixed conifer, true fir, montane riparian, Jeffrey pine, ponderosa pine, and lodgepole pine forests (USDA Forest Service 2004). Within California, this species occurs in the Sierra Nevada, Klamath, Cascade, Inyo-White, Siskiyou, and Warner Mountains, and the North Coast Ranges.

The northern goshawk (*Accipiter gentilis*; goshawk) is a Forest Service Sensitive Species on the Lassen National Forest. Goshawk territories on Lassen National Forest are managed as protected activity centers (ngoPAC) under direction prescribed by the Sierra Nevada Forest Plan Amendment (USDA Forest Service 2004). NRM contains numerous goshawk nest site data points. Because goshawks may have multiple nest areas within their home range, ngoPACs are used for this analysis. Based upon the best available data, there are 172 designated ngoPACs on Lassen National Forest totaling 31,433 acres. The Sierra Nevada Forest Plan Amendment (USDA Forest Service 2004) requires that goshawk surveys be conducted for any new vegetation management activities. Ongoing surveys have occurred since 1993, and much of the suitable habitat within roaded, commercial forest areas has been surveyed (USDA Forest Service 2010).

Habitat Status

The goshawk prefers mature forests with large trees on moderate slopes with open understories. They nest in coniferous, deciduous, or mixed-pine forests, depending on availability (Squires and Reynolds 1997). Goshawks typically use multiple nesting sites within a nesting territory, which can sometimes be located more than one-half mile apart (Woodbridge and Detrich 1994). Because of this behavior, locating active nesting locations and verifying occupancy of a territory can be difficult using only irregular broadcast surveys or searches for active nests. As a result, verification of an inactive stand requires multiple visits in subsequent years.

The goshawk is a year-round resident throughout most of California. Since the early 1970s, research has resulted from concerns about the effects of forest management on populations (Squires and Reynolds 1997). The nesting home range of goshawks contains three components: the nest area, the post-fledging family area, and the foraging area, each with its individual characteristics and management requirements.

Northern goshawk nesting habitat at the nest stand scale has consistently greater canopy cover, greater basal area, greater numbers of large-diameter trees, fewer small-diameter trees, less understory cover, and gentle to moderate slopes relative to non-used, random sites (USDA Forest Service 2001). McGrath et al. (2003) found that goshawks in the Interior Northwest nested, at the 0.4 acre (one hectare) scale, on the lower one-third or bottom of north-facing slopes in stands characterized by relatively higher basal area, higher quadratic mean diameter, greater canopy closure, and greater live stem densities, compared to random sites. Goshawks nesting in the relatively open-canopied and xeric stands found on the eastern slopes of the Sierra Nevada in the Inyo National Forest selected nest stands with a mean canopy closure of 29 percent (Hargis et al. 1994). Variability in the structural characteristics of nest stands between studies appears to be related to differences in vegetation type and geographic region.

Within the Lake Tahoe region of the Sierra Nevada, Keane (1999) found that nest-site areas (0.25 acre) were characterized by high canopy closure (mean=70.4 percent, SE=3.1, canopy measured above 9.8 feet or 3 meters), high densities of live trees in greater than 24- to 40-inch (mean=22.1 trees per acre, SE=3.2) and greater than 40-inch (mean=15.8 trees per acre, SE=2.2) dbh classes, high densities of dead trees in the greater than 24- to 40-inch (mean=3.6 trees per acre, SE=0.7) class, low densities of 2- to 12-inch dbh live trees (mean=121.4 trees per acre, SE=12.3), and low shrub/sapling and ground cover (mean=9.9 percent, SE=2.0). No difference in slope aspect was detected for nest sites (Ibid.).

The goshawk breeding season is February 15 through September 15. Breeding activity for goshawks can be broken down into five general activity stages: courtship (pre-breeding), laying, incubation, nestling, and fledgling stages. The courtship stage typically begins in mid-February or early March and extends through the formation of breeding pairs, nest building, and copulation. Egg laying and incubation overlap in goshawks, with eggs being laid every 3 days, and incubation beginning with the laying of the second egg. The average incubation period is approximately 33 days and the nestling period typically extends from early June through early July, with most young fledged by mid-July. The post-fledging dependency period extends until mid/late August (Woodbridge and Hargis 2006). The onset of the incubation in the Lassen National Forest region (southern Cascades/ northern Sierra Nevada) occurs between April 10 and May 15 (USDA Forest Service 2010), though it can be delayed by up to a month with cool or damp spring weather (Younk and Bechard 1994), and lasts 28 to 38 days. Nestlings typically fledge at 35 to 42 days old (Squires and Reynolds 1997).

Goshawks are morphologically adapted to foraging in forested habitats, but are also adapted to ambushing prey in open habitats (summarized in Squires and Reynolds 1997). Moderately dense, mature conifer forests are generally the preferred foraging habitat for this species (Ibid). However, goshawks also forage in a variety of other forest age classes, structures, and compositions, and into openings and along forest edges (summarized in Reynolds et al. 2006). In California, mature and old growth habitat (20.8 inches and greater dbh, canopy closure 40 percent and greater) were used, whereas open habitats such as meadows and early seral areas were avoided in mixed-conifer forests (Austin 1993). In Arizona, Beier and Drennan (1997) found that goshawks foraged in stands that had higher canopy closure, greater tree density, and a greater density of large trees (over 16.2 inches dbh) than on contrast plots. Snags and logs are key components of goshawk foraging areas, as they provide habitat for prey species. Prey availability rather than prey abundance, within suitable foraging habitats, appears to be more important to habitat use by this species (Reynolds et al. 2006).

Northern goshawks are known to prey on over 50 species of birds and mammals throughout their western range (Graham et al. 1999). Prey size varies little between geographic regions (Boal and Mannan 1994). In the Lake Tahoe region, primary prey species include Douglas squirrel (*Tamiasciurus douglasii*), Steller's jay (*Cyanocitta stelleri*), northern flicker (*Colaptes auratus*), and ground squirrel (*Spermophilus* spp.). Other prey species include American robin (*Turdus migratorius*), blue grouse (*Dendragapus obscurus*), other woodpeckers, and other squirrels (Keane 1999).

The following CWHR classes provide high capability nesting habitat for this species: Jeffrey Pine, Lodgepole Pine, Montane Hardwood, and Subalpine Conifer (4M, 4D, and 5D); Montane Hardwood-Conifer, Montane Riparian, Sierran Mixed Conifer, and White Fir (4M, 4D, 5D, and 6); and Red Fir (5D). Within CWHR, size class 6 is only recognized for a subset of the forest vegetation types (Sierran Mixed Conifer, White Fir, Montane Hardwood-Conifer, Montane Riparian, and Aspen). The following vegetation types and strata provide moderate capability nesting habitat for goshawks: Aspen (4M, 4D, 5D, and 6), Eastside Pine (3M, 3D, 4M, 4D, and 5D), Lodgepole Pine (3M and 3D), Red Fir (4M and 4D), and Subalpine Conifer (3M and 3D).

The following CWHR classes provide high capability perching habitat for this species: Jeffrey Pine, Lodgepole Pine, Montane Hardwood, Montane Hardwood-Conifer, Montane Riparian, Sierran Mixed Conifer, Subalpine Conifer, and White Fir (4M and greater size and density classes); and Red Fir (5M and 5D). The following CWHR types and strata provide moderate capability perching habitat for this species: Aspen and Eastside Pine (3M and greater size and density classes); Jeffrey Pine, Lodgepole Pine, Sierran Mixed Conifer, Subalpine Conifer, and White Fir (3M, 3D, 4S, and 4P); Montane Hardwood, Montane Hardwood-Conifer, and Montane Riparian (4S and 4P); and Red Fir (4M, 4D, 5S, and 5P).

The following CWHR classes provide high capability foraging habitat for goshawk: Alpine Dwarf-Shrub (all strata); Eastside Pine (4D, 5S, 5P, 5M, and 5D); Jeffrey Pine, Lodgepole Pine, Montane Hardwood, Montane Hardwood-Conifer, Montane Riparian, Sierran Mixed Conifer, Subalpine Conifer, and White Fir (4M and greater size and density classes); and Red Fir (5M and 5D). The following vegetation types and strata provide moderate capability foraging habitat for goshawks: Aspen (3M and greater size and density classes); Eastside Pine (1, 2S, 3S, 3P, 3M, 3D, 4S, 4P, and 4M); Jeffrey Pine, Montane Hardwood, Montane Hardwood-Conifer, Montane Riparian, Sierran Mixed Conifer and White Fir (4P and below); Juniper and Pinyon Juniper (3S and greater); Lodgepole Pine and Subalpine Conifer (1, 2S, 3S, 3P, 3M, 3D, 4S, and 4P); and Red Fir (3M, 3D, 4S, 4P, 4M, 4D, 5S, and 5P).

Goshawk habitat use and life history requirements may be discussed at spatial scales varying from the nest area (smallest) to the non-breeding home range (largest). The nest area (approximately 20 to 25 acres) includes one or more forest stands, the nest tree, and possibly several alternate nests. Nest areas may be occupied by breeding goshawks from mid-February until late September, and are the focus of all movements and activities associated with nesting. Goshawks may have multiple nest areas within their home range, and nest areas may be used intermittently for many years. Nest areas have relatively high canopy cover (typically greater than 50 percent) and a high density of large trees.

The post-fledging family area corresponds to the area (approximately 500 acres) used by the adults and young from the time the young fledge until they are no longer dependent on the adults for food. Post-fledging family areas provide juveniles with cover from predators and sufficient prey to develop foraging skills prior to dispersal. Post-fledging family areas typically include a variety of forest conditions and areas of high canopy cover (greater than 50 percent).

The home range increases in size from the breeding season to the non-breeding season and is generally larger for males than for females throughout the year. During the breeding season, the average home range of goshawks in the Lake Tahoe area is 6,745 acres for males and 5,040 acres for females. Non-breeding season home ranges averaged 23,448 acres for males and 13,888 acres for females (Keane 1999). Home ranges include areas with a greater proportion of larger tree size classes and higher density classes than that randomly available across the landscape. The area within the home range, but outside the post-fledging family area, is often referred to as the foraging area

(Reynolds et al. 1992). Maintaining requisite habitat elements can be best accomplished by managing large tracts of forests as sustainable ecological units where forest successional processes are continually moving a number of stands, within the natural range of variability, through the late seral stages preferred by this species (Graham et al. 1999).

Goshawks are well known to be territorial and exhibit high site fidelity (Detrich and Woodbridge 1994). In the Sierra Nevada, northern goshawk nesting habitat is protected by the delineation of ngoPACs. Northern goshawk PACs are delineated to include the best available 200 acres of nesting habitat, and the most recent nest site and alternate nests within a goshawk breeding territory as described in management direction for the forest (USDA Forest Service 2001, USDA Forest Service 2004). The size of the PACs corresponds with criteria reported by Detrich and Woodbridge (1994) such that territory occupancy rates of approximately 100 percent were associated with clusters of nest stands totaling 150 to 200 acres (USDA Forest Service 2001).

Threats

Some of the threats facing goshawk include habitat loss and fragmentation (e.g., loss of large-diameter trees), forest structure changes and changes in prey populations due to fire suppression and climate change, risk of habitat loss due to stand-replacing fires, and disturbance from human activity in and near territories. A study conducted by Morrison et al. (2011) in the Lake Tahoe Basin indicated that northern goshawks are susceptible to human disturbance; human activity was twice as high within infrequently occupied territories as compared to frequently occupied territories. Many kinds of human activities have been documented to affect raptors by altering habitats; physically harming or killing eggs, young, or adults; and by disrupting normal behavior (Postovit and Postovit 1987, Delany et al. 1999 as cited in Morrison et al. 2011). A recent study on nesting northern goshawk response to logging truck noise found that while goshawks alerted (turned their head in the direction of the noise) to the noise, they did not flush and response was inversely proportional to the distance of the nest from the road (Grubb et al. 2012).

Little is known about the goshawk’s sensitivity or responses to human disturbance (Dunk et al. 2011). Human disturbance, including noise disturbance generated by OSVs and associated trail grooming equipment, could cause goshawks to abandon nests during the nesting and post-fledging period (February 15 through September 15). As a result, Dunk et al. (2011) experimentally tested whether ATVs and hikers disturb goshawks in Plumas National Forest of the Sierra Nevada. More specifically, they analyzed whether there was evidence of an effect of ATVs or hikers on the behavior or reproduction of goshawks. Given the absence of OSV/goshawk studies, this study is the closest to potential for disturbance from OSV use because sound levels are similar. ATVs in this study produced sound in the range of 70 to 110 dBA; noise from snowmobiles manufactured after June 30, 1976, have a noise emission of 73 dBA at 50 feet while traveling at 15 mph, when tested under SAE J1161 procedures,[20] and noise generated by snowplows and snowcats used for OSV program operations ranges from 80 to 85 dBA[21] (California OSV Program Final EIR (2010)). Dunk et al. (2011) evaluated the potential effects of three kinds of recreational activity: (1) sustained activity by ATVs on roads near nests and fledglings (Sustained-ATV experiments), (2) direct approaches by

[20] This is the equivalent of a single passenger vehicle or motorcycle on a roadway. A snowmobile under full throttle emits the same sound level as a truck pulling a camper at a constant highway speed applying very little throttle. In a worst case scenario, a snowmobile leaving a stop sign and applying full throttle, the noise produced is still about the same as a passenger vehicle driving down the road (International Snowmobile Manufacturers Association 2008). The effect is audible but not long lasting (California Department of Parks and Recreation 2010).

[21] This is similar to typical construction equipment (backhoe, excavator, grader). Typical hourly average noise levels from this equipment are 75 to 80 dBA at a distance of 100 feet. These noise levels drop off at a rate of 6 dBA per doubling of distance between the noise source and receptor.

ATVs or hikers toward nests (Direct-approach experiments), and (3) sustained activity below nests by hikers and a dog (Intensive-hiker experiments). For the purpose of this analysis, we will focus on Sustained-ATV experiments for nesting goshawks, because the OSV use period is outside of the fledgling period, and Direct-approach ATV experiments.

Sustained-ATV treatments were designed to evaluate whether, and how, nesting goshawks and their young respond to sound from ATVs operated on nearby roads. Treatments consisted of driving an ATV for approximately 1 hour back and forth on transects on established roads near the nest, exposing the nest to multiple ATV passes during each treatment. Each sustained-ATV treatment during the nesting phase consisted of two portions: slower driving (approximately 16 kilometers per hour) and faster driving (approximately 24 to 32 kilometers per hour) to expose goshawks to a realistic variety of sound levels associated with ATV use on these kinds of roads.

Three potential metrics of ATV impacts on goshawks were used to compare sustained-ATV treatment and control territories: (1) percentage of time females spent off the nest, (2) frequency of kekking [calls are also typically associated with alarm or agonism in goshawks (Squires and Reynolds 1997)] bouts, and (3) frequency of prey deliveries. There were no significant differences in the mean percentage of time that females spent off nests, mean number of kekking bouts, or mean number of prey deliveries per hour during control experiments and during sustained-ATV treatments. However, a significant difference between treatment and control territories in the percentage of time that female goshawks spent off the nest during the treatment/control hour and the pre-treatment/control hour was found. This was interpreted to mean that sustained ATV use near nests had an effect on goshawks. However, based on the researchers' extensive personal observations, the kind of activity goshawks were exposed to during sustained-ATV treatments was more intensive than was typical recreational use of ATVs on the Plumas National Forest. The same would be expected of OSV use on the Lassen National Forest.

The ATV used in direct nest approaches followed a pre-determined transect that, at its midpoint, passed directly below or as close as possible to the nest, and then returned by the same route. The total (round-trip) transect length was 800 meters (0.5 mile). Direct-ATV approach treatments did not include slower and faster driving phases. Because they were often located on rough terrain, direct-ATV approaches generally required driving in lower gears at relatively slow speeds. The mean transect duration was 7 minutes (range 4 to 15 minutes). Nesting females did not appear to respond negatively to direct approaches by ATVs.

In addition, Dunk et al. (2011) evaluated whether a relationship existed between the number of young produced by a territory and the type(s) of experiments that occurred within it during that year and whether there was any evidence that the frequency or duration of research activities influenced reproduction. No evidence was found indicating experimental treatments, or research visits in general, influenced goshawk reproduction. Longer-term and more rigorous reproductive data, including physiological data, are needed to fully address whether recreational or research activities can impact goshawk reproduction. However, data suggest that recreational and research activities would have to be more intensive and extensive than those conducted to negatively affect goshawk reproduction (Dunk et al. 2011).

Direct and Indirect Effects

Resource indicators and measures (FSH 1909.15, 12.5) used in this analysis to measure and disclose effects to goshawk are listed in table 160.

Table 160. Resource indicators and measures for assessing effects to northern goshawk

Resource Indicator and Effect	Measure (Quantify if possible)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Potential for disturbance to individuals from noise and increased human presence, injury or mortality of individuals	Acres and percentage of important habitat impacted by OSV use	117,272 (36%)	113,511 (35%)	105,729 (33%)	116,202 (36%)	87,988 (27%)
Potential for disturbance to individuals from OSV use and increased human presence, injury or mortality of individuals	Acres and percentage of buffered NGO PACs impacted by OSV use	49,860 (44%)	49,498 (44%)	45,627 (41%)	49,306 (44%)	39,636 (35%)

Northern goshawk is associated with late-successional forests that can be impacted by activities associated with trails. Gaines et al. (2003) conducted a literature review of 71 late-successional forest-associated wildlife species and identified negative effects on these species that can result from route-associated factors. These impacts include direct loss of habitat from type conversion, diminished quality of habitat attributes or fragmentation, and road avoidance or displacement resulting from direct harassment or noise disturbance. Individuals, environmental groups, and agency biologists expressed growing concern over habitat fragmentation for late-successional forest-associated species. Various studies have shown that this species group is vulnerable to disturbance, changes in habitat, or displacement by habitat generalists.

Snowmobile use within late-successional forest habitats can have the following potential direct effects to individuals or their habitat (Gaines et al. 2003): Disturbance and potential for injury or mortality to individuals from vehicle collisions.

Disturbance:

Displacement of populations or individual animals from a route, related to human activities.

Disturbance and displacement of individuals from breeding or rearing habitats.

Physiological response to disturbance, resulting in changes in heart rate or level of stress hormones.

Potential for Injury or Mortality to Individuals from Vehicle Collision:

As previously discussed, the likelihood of a collision between snow grooming equipment and wildlife is extremely low because the equipment travels slowly (3 to 6 mph). There is an increased likelihood of collision with OSVs due to higher frequency of OSV use and higher speeds. However, the potential for this effect on goshawks would be low given that they spend little time at ground level.

Possible indirect effects include:

Altered or dispersed movement as caused by a route or human activities on or near a route.

In addition, Gaines et al. (2003) found an interaction that occurred on winter recreation trails was the indirect effect of snow compaction on the subnivean sites used by small mammals in which small mammals can either be suffocated as a result of the compaction, or their subnivean movements can be altered owing to impenetrable compact snow. Adverse effects to subnivean animals could indirectly affect the prey base for many Forest Service sensitive species, including goshawk.

There are 113,550 acres of ngoPACs, when each of the 172 PACs is buffered by 0.25 mile (map BE-46), and 325,070 acres of goshawk important habitat[22] (map BE-51), including high-reproductive habitat, on the Lassen National Forest.

Activities greater than 0.25 mile (400 meters) from a goshawk nest site to have little potential to affect nesting goshawks[23]. The OSV season overlaps with the courtship through incubation phases of the goshawk breeding season (Woodbridge and Hargis 2006; USDA Forest Service 2010), so snowmobiles passing within 0.25 mile of unsurveyed nesting/roosting habitat or an active nest have the potential to disturb nesting goshawks. Although Dunk et al. (2011) found sustained ATV use near nests had a significant effect on the percentage of time that female goshawks spent off the nest during the treatment, they also noted the kind of activity goshawks were exposed to during sustained-ATV treatments was more intensive than was typical recreational use of ATVs on the Plumas National Forest. The same would be expected of OSV use on the Lassen National Forest. In addition, Dunk et al. (2011) found no evidence indicating experimental treatments, or research visits in general, influenced goshawk reproduction. As previously described in the California spotted owl section, monitoring and analysis specific to California spotted owl and northern goshawk PACs and OSV use was conducted on the Lassen National Forest. Lassen National Forest had 174 northern goshawk PACs, at the time, of which 33 (19 percent) were within 400 meters (0.25 mile) of designated OSV trails. Twenty-three northern goshawk PACs fell within the scope of the GIS analysis conducted. No relationship was apparent between a PAC's distance from a snow park and whether it has been recently occupied.

Although the potential for OSV-related noise-based disturbance overlaps with only the early part of the February 15 through September 15 goshawk breeding season, once OSV trail grooming season ends on March 31, trail use declines by roughly 50 percent. Therefore, the potential for direct and indirect effects to ngoPACs within 0.25 mile of groomed trails would decrease by an estimated 50 percent after March 31 for alternatives 1 through 3 (and not long, thereafter, for alternative 4, with the exception of extremely high snowfall years).

Although OSV use or related activities would not physically alter the vegetative structure of goshawk habitat, goshawk prey species that use the subnivean space could be subject to OSV-related impacts from snow compaction, including suffocation or alteration of movement while foraging beneath the snow. The degree of this impact is unknown, but would be more likely in areas most conductive to OSV.

[22] Habitat types important for late-successional forest species include stands typed as 4M, 4D, 5M, 5D, and 6 by California Wildlife Habitat Relationship (CWHR 2014), which are all stands of trees greater than 11 inches dbh with greater than 40 percent canopy cover (Sierra Nevada Forest Plan Amendment, USDA Forest Service 2004). PACs buffered by 1 mile from the center point of each PAC were subtracted from the total amount of important habitat, based on Woodbridge and Hargis (2006) to prevent double counting with PAC analysis.
[23] Based on Sierra Nevada Forest Plan amendment standard/guideline #76 that assigns a 0.25-mile LOP around northern goshawk PACs - applicable to disturbance from vegetation management activities

Comparison of the Alternatives

Table 161 and table 162 show and compare, by alternative, the amount of northern goshawk PACs and important habitat, respectively, with the potential for direct (disturbance or displacement, injury or mortality from collision) and indirect (snow compaction effects to subnivean prey) effects, as previously described, and taking slope and canopy cover assumptions into account. Due to the structural nature of important goshawk habitat (i.e., dense forested stands), the level of cross-country travel in goshawk important habitat is less than the amount of available habitat. Ninety-six percent of goshawk PACs buffered by 0.25 mile are currently open to OSV use (alternative 1). However 44 percent is currently open to OSV use and of moderate to high OSV use, based on slope and stand density (table 161; map BE-46). Similarly, 87 percent of important goshawk habitat is currently open to OSV use, but 36 percent is currently open to OSV use and of moderate to high OSV use (table 162; map BE-51). The potential for OSV-related impacts to goshawk, including noise-based disturbance, snow compaction impacting subnivean space of prey species, or injury/mortality, would be most likely to occur in those areas of moderate to high OSV use. In addition, of the 44 percent of buffered activity centers and the 36 percent of important habitat currently open to and of moderate to high OSV use, about 33 and 36 percent, respectively, concides with areas of moderate to high use based on trail proximity; therefore, the majority of OSV use occurs within in an even smaller percentage of each of those habitats; 52 goshawk PACs buffered by 0.25 mile (30 percent) fall within 0.5 mile of a groomed trail or OSV staging area. This would be similar under the remaining alternatives where overlap ranges from 32 to 41 percent.

Table 161. Acres of goshawk PACs, buffered by 0.25 mile, with potential to be impacted by OSV use and related activities, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	109,087	107,005	97,437	107,602	86,054
Not Designated for OSV use	4,463	6,444	15,986	5,827	27,403
OSV use restricted to trails	NA	NA	17	NA	17
Total	113,550 acres				
Designated for OSV use and of moderate to high OSV use (percent of PAC total acres)	49,860 (43.9%)	49,498 (43.6%)	45,627 (40.7%)	49,306 (43.4%)	39,636 (34.9%)
Not Designated for OSV use and of moderate to high OSV use	1,487	1,808	5,674	2,003	11,674
Moderate to high OSV use and OSV use restricted to trails	NA	NA	8	NA	8
Total	51,347 acres				

Under alternative 2, 35 percent of important northern goshawk habitat (map BE-52) and 44 percent of buffered PACs would be designated and of moderate to high OSV use (map BE-38). Similarly, 33 percent of important habitat (map BE-53) and 41 percent of buffered PACs (map BE-39) would be designated and conductive to OSV under alternative 3, and 36 percent of important habitat (map BE-54) and 43 percent of buffered PACs (map BE-49) under alternative 4. Alternative 5 would produce the lowest amount of potential disturbance with 27 percent of important habitat (map BE-55) and 35 percent of buffered PACs designated and of moderate to high OSV use (map BE-50). The forest would use the results of ongoing inventory and monitoring of northern goshawk activity centers to determine whether or not disturbance is occurring and if changes in management are necessary. The potential for noise-based disturbance would largely overlap with roughly the first 20 percent, or the courtship (formation of breeding pairs, nest building, and copulation) phase of the February 15 through September 15 northern goshawk breeding season under alternatives 1, 2, 3, and 5, and may extend up through the first one-third of the breeding season, into the incubation period, under alternative 4. As previously described, once OSV trail grooming season ends on March 31, trail use declines by roughly 50 percent and, therefore, the potential for direct and indirect effects to activity centers within 0.25 mile of groomed trails would decrease by an estimated 50 percent after March 31 for alternatives 1 through 3 (and not long, thereafter, for alternative 4, with the exception of extremely high snowfall years).

Under all of the action alternatives, trail densities would decline from 1.5 mi/m^2 to 0.2 mi/m^2. And, because the majority of OSV use occurs on or within 0.5 mile of groomed trails and staging areas, or within meadows within 0.5 mile of designated trails, the potential for impacts to subnivean prey species, would be expected to decline with reduced trail densities under alternatives 2, 3, 4, and 5.

Table 162. Acres of important goshawk habitat with potential to be impacted by OSV use and related activities, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	283,075	269,807	247,428	280,113	198,198
Not Designated for OSV use	41,994	55,015	76,953	43,500	126,206
OSV use restricted to trails	NA	NA	40	NA	40
Total	325,070 acres				
Designated for OSV use and of moderate to high OSV use (percent of habitat total)	117,272 (36.1%)	113,511 (34.9%)	105,729 (32.5%)	116,202 (35.7%)	87,988 (27.1%)
Not Designated for OSV use and of moderate to high OSV use	10,551	14,228	21,997	11,352	39,737
Moderate to high OSV use and OSV use restricted to trails	NA	NA	22	NA	22
Total	127,823 acres				

Cumulative Effects

Based upon spatial data provided by the Lassen National Forest, past, present, and foreseeable future actions that could result in a cumulative impact to goshawk, when combined with alternatives 1, 2, 3, 4, or 5 include vegetation management projects, firewood cutting, Christmas tree cutting, non-motorized winter recreational activities, or use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. Vegetation management and salvage projects identified above are very small in comparison to the OSV Use Designation action area and/or do not overlap with groomed and non-groomed OSV trails or staging areas where the highest OSV use occurs. While thinning or other vegetation treatments have reduced stand densities, management prescriptions have emphasized retention of large snags and logs and retention of large conifer that are important attributes of goshawk habitat.

Goshawk habitat also overlaps with areas open to Christmas tree cutting and firewood cutting. However, wheeled motorized vehicles may not be used off of authorized NFS roads or motorized trails to scout for fuelwood or to harvest Christmas trees (USDA Forest Service 2014), there would be minimal overlap between the Christmas tree and firewood cutting season (annually between November 1 and December 31) and OSV trail grooming season (beginning December 26), and disturbance or displacement from this activity would occur outside of the northern goshawk breeding season under alternatives 1, 2, 3, and 5. Under alternative 4, in which trail grooming would begin at the discretion of the groomer, there is the potential for a somewhat larger degree of overlap during years in which heavy snowfall begins early. Use of roads within goshawk habitats after the March 31 termination date of the forest order closing roads for exclusive OSV use can contribute additional disturbance during the early part of the goshawk breeding season, particularly for nests within 0.25 mile of roads. However, current research shows no evidence that recreational vehicle use influences goshawk reproduction. In general, most non-motorized winter recreation occurs along designated trails, and northern goshawk would either avoid roosting in those areas, if too great a disturbance, or habituate to the noise. Similar activities on State and private lands within the forest boundary and within 0.25 mile of goshawk habitats may impact habitat availability outside of NFS lands and may increase disturbance locally. However, the potential for this type of disturbance is unknown; State and privately held lands make up about 20 percent of the area within the forest boundary. In summary, ongoing and reasonably foreseeable actions may be additive locally to individual goshawks, but are not expected to contribute substantial impacts to those discussed for the project under any of the alternatives.

Determination Statement

Alternatives 1, 2, 3, 4, and 5 of the Lassen National Forest Over-snow Vehicle Use Designation Project may affect individuals, but are not likely to lead to a trend toward Federal listing or loss of viability for northern goshawk in the project area based on the following rationale:

- Vegetative structure or composition of habitat would not be physically modified by OSV use and related activities under any of the alternatives.
- Due to the structural nature of suitable habitat (i.e., dense forested stands), the level of cross-country OSV travel in northern goshawk suitable habitat is expected to be relatively low, and most disturbance is likely to occur primarily along existing roads and trails under all alternatives.
- Although the potential for noise-based disturbance to individuals within important habitat ranges from 27 to 36 percent, and individuals within buffered PACs ranges from 35 to 44 percent, under all of the alternatives, the percentage of habitats impacted would actually be lower considering that the concentration of OSV use is not equal across the landscape; 30 percent of buffered goshawk PACs fall within 0.5 mile of a groomed trail or OSV staging area, the highest OSV use areas.
- The potential for OSV-related noise-based disturbance would overlap with only the early part of the February 15 through September 15 goshawk breeding season.
- OSV use is most common on trails and once OSV trail grooming season ends on March 31, trail use declines by roughly 50 percent. As a result, the potential for direct and indirect effects to ngoPACs within 0.25 mile of groomed trails would decrease by an estimated 50 percent after March 31 for alternatives 1 through 3 and 5 (and not long, thereafter, for alternative 4, with the exception of extremely high snowfall years).
- The forest would use the results of ongoing inventory and monitoring of goshawk nest sites to determine whether or not disturbance is occurring and if changes in management are necessary.

- Lassen National Forest monitoring found no apparent relationship between an ngoPAC's distance from a snow park and whether it was recently occupied, and Dunk et al. (2011) found no evidence indicating experimental recreational treatments influenced goshawk reproduction.

The potential for OSV collision with individual northern goshawks is very low.

Wide-ranging Carnivores

Sierra Nevada Red Fox (*Vulpes vulpes necator*), Southern Cascades Distinct Population Segment (DPS)

Candidate Species; Regional Foresters Sensitive Species

The Fish and Wildlife Service recently released its 12-month finding on a petition to list Sierra Nevada red fox as threatened or endangered (USDI Fish and Wildlife Service 2015c). In addition, the Service released a Sierra Nevada red fox species report (USDI Fish and Wildlife Service 2015b), a comprehensive summary of known information about the subspecies based on existing literature to date. Therefore, an excerpted version of the 12-month finding, with information relevant to the subspecies and its habitat on the Lassen National Forest from the species report will serve as the Sierra Nevada red fox subspecies account and existing condition information. Similarly, excerpted relevant stressors to the subspecies identified in the species report are identified below.

Species Account

Perrine et al. (2010, p. 9) concluded that Sierra Nevada red fox likely occur at low population densities even within areas of high relative abundance. Following publication of the Fish and Wildlife Service 90-day finding in the Federal Register (77 FR 45; January 3, 2012), the Sierra Nevada red fox's range was confirmed (via a combination of genetics and photographic evidence) to extend into the Oregon Cascades as far north as Mt. Hood, significantly extending the subspecies' range beyond its historically known range in California. Specifically, five sighting areas (clustered locations of recent Sierra Nevada red fox sightings) have been identified on Federal lands in Oregon where surveys have occurred, in addition to the two known sighting areas in California as described in the 90-day finding (77 FR 45). Sierra Nevada red fox are thus known from a total of seven sighting areas, located in the vicinity of (north to south) Mt. Hood, Mt. Washington, Dutchman Flat, Willamette Pass, and Crater Lake in Oregon; and Lassen and Sonora Pass in California.

The Fish and Wildlife Service found the areas occupied by the Sierra Nevada red fox within the Southern Cascades and Sierra Nevada Mountain Ranges are separated by a geologic gap in the range. The best available data indicate this gap represents a lack of population connectivity between the two geographic areas. This separation is further supported by recent genetic studies which demonstrate that the two closest sighting areas (known populations that reside at the Lassen and Sonora Pass sighting areas) show genetic differences, and there is no indication of gene flow between these populations. Therefore, the Fish and Wildlife Service concluded that the two areas are discrete under their distinct population segment policy. In conclusion, the Southern Cascades distinct population segment includes the Cascade Mountains of Oregon from the Columbia River south into the California Cascades around Lassen Peak, including Lassen National Forest, and the Sierra Nevada distinct population segment includes the upper elevations of the Sierra Nevada Mountain Range from Tulare to Sierra Counties, including Stanislaus National Forest. Sierra Nevada red fox likely occur at low population densities even within areas of high relative abundance (Perrine et al. 2010). In its 12-month finding (USDI Fish and Wildlife Service 2015c) the Service found that listing of the Sierra Nevada DPS was warranted. However, listing of the Southern Cascades DPS was not warranted at the time.

The Lassen sighting area includes lands managed by Lassen National Forest and Lassen Volcanic National Park (including the Caribou Wilderness), and some private inholdings primarily as timberlands (USDI Fish and Wildlife Service 2015b). Sacks et al. (2010, pp. 1532, 1536–1537) estimated that the effective size of the population at the Lassen sighting area (referred to in the study as the modern Southern Cascades population) is 21 breeding individuals, with a 95 percent confidence interval of 13 to 34 breeding individuals (see also Statham et al. 2012, pp. 122, 123). The "effective size" of the population refers to the number of breeding individuals in an "ideal" population (with discreet, non-overlapping generations, equal contribution of all members to the next generation, and free mixing prior to mate choice) that experiences the same amount of genetic drift (random change in gene frequencies) as the actual population (Lande and Barrowclough 1987, pp. 88–89). Actual Sierra Nevada red fox populations are likely to be somewhat larger than their effective population sizes because they include non-breeding individuals, including pups, and (possibly) adult offspring remaining on their parent's territory to help raise their siblings. Such "helpers" are not uncommon in other red fox subspecies, though clear evidence of them has not been demonstrated in Sierra Nevada red fox (Sacks et al. 2015, pp. 1–2). A high-end estimate of actual population size for the Lassen sighting area might therefore assume two non-breeders for every breeder, resulting in a total population of about 63 individuals (Sacks et al. 2015, p. 2).

Systematic carnivore surveys conducted from 1996 to 2002 throughout the Sierra Nevada and Cascades Mountains of California detected no Sierra Nevada red fox (Zielinski et al. 2005, pp. 1385, 1387), indicating the subspecies was likely extirpated or in low densities in the regions sampled; according to figures 1 and 3 in Zielinski et al. (2005, pp. 1387, 1389), the currently known Lassen sighting area was within the 1996 to 2002 sampling area. The population levels of Sierra Nevada red fox at that time were unknown, but the subspecies was believed to occur at very low density (Perrine et al. 2010, p. 9).

California Department of Fish and Wildlife (CDFW) obtained 187 Sierra Nevada red fox scat and hair samples from the Lassen sighting area between 2007 and 2013, and was able to genetically identify 18 separate individuals from those samples (USDI Fish and Wildlife Service 2015b), thereby tending to support the low effective population size estimate (i.e., 21 breeding individuals) of Sacks et al. (2010, p. 1532). CDFW was also able to identify the source individuals for over 100 Sierra Nevada red fox genetic samples collected within the Caribou Wilderness (immediately east of Lassen Volcanic National Park within the sighting area) in 2012 and 2013, finding that no new individuals (i.e., offspring) entered the population within the study area during those years (USDI Fish and Wildlife Service 2015b). Thus, successful reproduction in that portion of the sighting area during those years was low or nonexistent. However, CDFW cameras did photograph a Sierra Nevada red fox near the Caribou Wilderness in 2009 that appeared visibly pregnant (USDI Fish and Wildlife Service 2015b).

Habitat Status

Sierra Nevada red fox use multiple habitat types in the alpine and subalpine zones (near and above treeline) (California Department of Fish and Game (CDFG) 1987, p. 3). In addition to meadows and rocky areas (U.S. Department of Agriculture, Forest Service (USDA Forest Service) 2009, p. 506), Sierra Nevada red fox use high-elevation conifer habitat of various types (Perrine 2005, pp. 63–64). Nearest the treeline in the Lassen sighting area, where habitat use has been best documented, the subspecies frequents subalpine conifer habitat dominated by whitebark pine (*Pinus albicaulis*) and mountain hemlock (*Tsuga mertensiana*) (Perrine 2005, pp. 6, 63–64.

Sierra Nevada red fox in Oregon and at the Lassen sighting area in California, have also been found to descend during winter months into high-elevation conifer areas below the subalpine zone (Perrine

2005, pp. 63–64). In the Lassen sighting area, this habitat consists primarily of red fir (*Abies magnifica*), white fir (*Abies concolor*), and lodgepole pine (*Pinus contorta*) (Perrine 2005, pp. 63–64). Winter sightings have occurred as low as 1,410 meters (4,626 feet) in the Lassen sighting area (Perrine 2005, pp. 2, 162), and 1,280 meters (4,200 feet) in Oregon. Possible reasons for this elevational migration include lessened snow depths at lower elevations (Perrine 2005, pp. 80, 81), unsuccessful dispersal movements by nonbreeding individuals (Statham et al. 2012, p. 130), and lack of suitable prey at high elevations in the Lassen area (Perrine 2005, p. 30). While on these lower winter ranges, the subspecies has shown a preference for mature closed canopy conifer forests, despite the rarity of this forest structural category (less than 7 percent) in the area studied (Perrine 2005, pp. 67, 74, 90). Similar elevational migrations are not known for the Sonora Pass sighting area (Statham et al. 2012, p. 130).

Dispersal distances have not been documented for Sierra Nevada red fox, but one study found juvenile male red foxes in the American Midwest dispersed 30 kilometers (18.6 miles) on average, while juvenile females dispersed an average of 10 kilometers (6.2 miles) (Statham et al. 2012, p. 130). A few young American Midwest red foxes (5 percent) dispersed over 80 kilometers (50 miles) in their first year (Statham et al. 2012, p. 130).

Although little direct information exists regarding the Sierra Nevada red fox's reproductive biology, there is no evidence to suggest it is markedly different from lowland-dwelling North American red fox subspecies (Aubry 1997, p. 57). Those subspecies are predominately monogamous and mate over several weeks in the late winter and early spring (Aubry 1997, p. 57). The gestation period for North American red fox is 51 to 53 days, with birth occurring from March through May in sheltered dens (Perrine et al. 2010, p. 14). Sierra Nevada red fox use natural openings in rock piles at the base of cliffs and slopes as denning sites. They may also dig earthen dens similar to Cascade red foxes (although this has not been directly documented) (Aubry 1997, p. 58; Perrine 2005, p. 153). There are no documented Sierra Nevada red fox den sites on the Lassen National Forest.

Sierra Nevada red fox appear to be opportunistic predators and foragers, with a diet primarily composed of small rodents, but also including deer carrion (*Odocoileus hemionus*) (particularly in winter and spring) and manzanita berries (*Arctostaphylos nevadensis*) (particularly in fall) (Perrine et al. 2010, pp. 24, 30, 32–33). Sierra Nevada red fox are most active at dusk and at night (Perrine 2005, p. 114), when many rodents are most active. High-elevation lagomorphs, such as snowshoe hare (*Lepus americanus*) and pika (*Ochotona princeps*), also are diet components of the subspecies, although they were not an important food source in the Lassen sighting area, possibly due to scarcity in the region (Perrine 2005, pp. 29–30).Home range sizes of Sierra Nevada red fox have not been studied throughout the range of the subspecies. However, Perrine (2005, pp. 2, 159) found within a portion of the Lassen sighting area that adult Sierra Nevada red fox established summer home ranges averaging 2,564 hectares (6,336 acres), with individual home ranges ranging from 262 hectares (647 acres) to 6,981 hectares (17,250 acres) (Perrine 2005, pp. 2, 159). Winter home ranges were larger, averaging 3,255 hectares (8,042 acres) and ranging from 326 to 6,685 hectares (806 to 16,519 acres) (Perrine 2005, p. 159). For this analysis, a total of 103,803 acres of suitable Sierra Nevada red fox habitat[24] is found within the project area (table 164, page 516; map BE-56).

[24] Based upon Cleve et al. (2011): The model used occurrence data from the Lassen Peak region population combined with climatic and remotely sensed variables (December minimum temperature, February precipitation, greenness, distance to water). The Maxent MSB model was the best model for the Lassen Peak region, including Lassen National Forest. Suitable habitat is defined as the area that contains the probability of red fox occurrence ≥ the optimum cutoff value of 0.157. See Cleve et al. (2011) for additional information.

Based upon Sierra Nevada red fox monitoring conducted on the Lassen National Forest in 2012, interaction between Sierra Nevada red fox and OSV enthusiasts was considered to be unlikely due to inverse differences in peak activity hours, with peak activity for the fox occurring from approximately 2 hours after sunset until 2 hours prior to sunrise (Perrine 2005), while almost all OSV usage occurs during daylight hours. However, because there is considerable uncertainty about effects to this species, current direction requires project analysis within a 5-mile radius of any verified detection of Sierra Nevada red fox. If necessary, a limited operating period is applied from January 1 to June 30 to avoid adverse impacts to breeding sites (USDA Forest Service 2001, 2004).

General Potential Threats (Stressors)

Potential threats that may impact the subspecies in Oregon and California are those actions that may affect individuals or sighting areas either currently or in the future, including: wildfire and fire suppression; climate change; hunting and trapping; disease (including salmon poisoning disease, elokomin fluke fever, and possibly mange, distemper, or rabies); competition and predation by coyotes, which could be exacerbated in the future depending on climate change impacts to habitat; predation by domestic dogs; hybridization with nonnative red fox; vehicles; and small population size and isolation, specifically for the Lassen and Sonora Pass sighting areas. Possible impacts associated with logging or vegetation management and grazing were evaluated, but found to result in low or no impacts, overall, across the subspecies’ range. Due to regulatory protections, hunting and trapping do not constitute a current or likely future stressor to Sierra Nevada populations in California. Salmon poisoning disease, elokomin fluke fever, and other diseases were found to constitute stressors with low levels of impact (i.e., applicable to individuals rather than populations).

Relevant Potential Stressors

Small Population Size and Isolation

The effective size of the Lassen Sierra Nevada red fox population is estimated at 21 breeding individuals. Since this is considerably less than an effective population size of 50, inbreeding depression may be an issue in the population, now or in the future. Potential inbreeding depression at the Lassen sighting area is also unlikely to be avoided through interbreeding with other populations. The nearest Sierra Nevada red fox sighting area to the Lassen population is at Sonora Pass, but the distance between them (100 kilometers (62 miles) straight-line distance) is greater than 95 percent of dispersal distances recorded for lowland North American red foxes (80 kilometers (50 miles)) (Statham et al. 2012, p. 129). Genetic testing also provides no evidence of migration between the Lassen and Sonora Pass populations (Statham et al. 2012, p. 129). The population is thus both small and highly isolated from other Sierra Nevada red fox.

The actual size of the Lassen population is likely to be somewhere between 21 and 63 individuals, depending on the number of nonbreeding individuals present (Sacks et al. 2010, p. 1536; Sacks 2015, p. 1). Such a small population is at risk from deleterious chance events, such as major storms or epidemics that can harm or kill relatively large numbers of Sierra Nevada red fox. We do not have information regarding how often such chance events occur, but consider at least one such event likely within the next 50 years.

Although no current impacts are clearly attributable to small population size or isolation, physiological examination of four adult females from the Lassen population, captured in 2000 for a radio telemetry study, showed they had not reproduced, either before or during the 2-year study, despite the overlap of their ranges with a collared male (Perrine 2005, pp. 141, 164). Low reproductive success is a common result of inbreeding depression, although other possible explanations exist, such as low prey availability at higher elevations (Perrine et al. 2010, p. 5).

The small size and high isolation of the Lassen population make future impacts likely from inbreeding depression or chance deleterious events. The population will remain vulnerable to such threats so long as it stays small and isolated, but based on observed reproductive output and on a lack of evidence for nearby Sierra Nevada red fox populations, it appears likely to remain small and isolated for at least the next 50 years.

Based on the best available information, the Fish and Wildlife Service found this stressor has, or is likely to have within 50 years, population-level impacts at the Lassen and Sonora Pass sighting areas, but does not have subspecies-level impacts. Therefore, the Service concluded that "Small Population Size and Isolation" is a stressor with medium-level impacts to Sierra Nevada red fox.

Vehicles

Potential stressors related to vehicles (including cars, trucks, snowmobiles, and other OHV equipment) include direct impacts, disturbance from noise, and disruption of prey such as rodents living below the surface of the snow. Vehicles may also provide some benefits to Sierra Nevada red fox by providing roads and compacted snow trails for travel, and occasional road-killed animals for scavenging.

The only known incidents of vehicle impacts with Sierra Nevada red fox are relatively recent. Since 2010, five individuals have been reported killed by vehicles, including within the Sonora Pass sighting area (California State Hwy. 395), the Crater Lake sighting area (main Park road near administration building), two in the Mt. Washington sighting area, and one near Silver Lake, Oregon, about 80 kilometers (50 miles) west of the Crater Lake sighting area (USDI Fish and Wildlife Service 2015b).

Sierra Nevada red fox in the Lassen sighting area commonly use roads to travel on (Perrine 2005, p. 85), so the extent to which a given road is beneficial or detrimental may depend on traffic, particularly during dusk, dawn, and at night when foxes are most active (Perrine 2005, p. 110). Most OSV use occurs during daylight hours (primarily from 10:00 a.m. to 3:00 p.m.) when foxes are least active. Injury or mortality due to collision with OSVs is possible. However, during the past 30 years of OSV use within the project area, which has consisted of both trail and cross-country use, no such incidents are known to have occurred. The lack of past evidence of OSVs causing injury or mortality, in addition to the general segregation of daily activity patterns between foxes and OSVs create a low risk of impacts to the population within the project area. Grooming operations conducted using snowcats normally take place at night, thereby overlapping with daily activity periods for Sierra Nevada red fox. Snowcats are operated at speeds in the range of 3 to 6 miles per hour. The vehicle is relatively loud and operates with warning lights on at all times. Given these factors, risk of injury or mortality to Sierra Nevada red fox resulting from collisions with grooming vehicles is low.

All of the Sierra Nevada red fox sighting areas have moderate to extensive opportunities for OHV, snowmobile, and on-road vehicular traffic. Although no studies have been completed, the mere location of the sightings in these areas suggests that the foxes are able to adjust to the noise involved, and that sufficient prey remain in such areas.

Sierra Nevada red foxes are known to frequent OSV snow parks and show begging behavior for available food. This behavior can increase risk of injury or death due to vehicle strikes, ingestion of toxic materials, or attack by domestic dogs (Perrine 2005).

Human Disturbance

Available science addressing response of Sierra Nevada red fox to human presence and disturbance is somewhat mixed. Buskirk and Zielinski (2003) state that “The Sierra Nevada red fox has been considered extremely sensitive to the presence of humans (Grinnell et al. 1937) so that increased recreation within its range could be problematic.” Since Grinnell et al. (1937), more recent science indicates that Sierra Nevada red fox may not be extremely sensitive to human presence and may habituate to humans. For example, Perrine et al. (2010, pg. 28) state that “Risks from recreation are primarily associated with developments such as ski areas, snow parks, campgrounds, and picnic areas. In campgrounds without bear boxes, where campers' food and trash are more accessible, red foxes can develop begging habits and thereby increase the possibility for conflict with humans. They may be particularly susceptible in mountainous regions where natural productivity is low and winter food is scarce. Begging foxes have been a periodic problem in Lassen Volcanic National Park and the adjacent Lassen National Forest” (Perrine 2005). Perrine (2005) reported that Lassen red foxes were closely associated with roads, parking lots (including snowmobile parks) and campgrounds during both summer and winter, but responses of individual foxes to human recreation sites varied from one individual that scavenged at a recreation site only at night to several individuals that were characterized as bold and often approached humans and vehicles during the day.

Competition and Predation from Coyotes

Both coyote and Sierra Nevada red fox are opportunistic predators with considerable overlap in food consumed (Perrine 2005, pp. 36–37). Although no direct documentation of coyote predation on red foxes is available, coyotes will chase and occasionally kill other North American red fox subspecies, and are considered important competitors of red fox generally (Perrine 2005, pp. 36, 55; Perrine et al. 2010, p. 17). Red foxes consequently tend to avoid areas frequented by coyotes (though not necessarily to the point of complete exclusion) (Perrine 2005, p. 55). Perrine’s (2005, pp. 73–74) investigations at Lassen found coyotes were present at all elevations during the summer months, and that a positive correlation actually existed between Sierra Nevada red fox and coyotes during those times (Id. at 83). Since the correlation was only evident at broader scales, however, he considered it a likely artifact of their common affinity for roads (Id.). Even during snow-free months, however, Perrine found coyote population density to be greater at lower elevations, thus producing an elevational separation between most coyotes and the Sierra Nevada red fox population (Id. at 192).

During the winter season, Perrine (2005, pp. 30, 78) found that both Sierra Nevada red fox and coyotes descended to lower elevations, where mule deer (*Odocoileus hemionus*), (and more specifically in the case of Sierra Nevada red fox, mule deer carrion) became important components of their diets. However, foxes tended to stay at higher elevations than coyotes, thereby reducing potential for competition (Id. at 74). Perrine (Id. at 80–81) attributed the elevational descent of both species to very deep snowpacks at higher elevations. Sierra Nevada red fox are better able than coyotes to live in areas of relatively deep snow, however, and thus, tend to remain at higher elevations where coyotes are less common during winter months. Sierra Nevada red fox may also benefit from the presence of coyotes during winter by scavenging deer carcasses killed by coyotes (Perrine 2005, p. 31). Mule deer carrion may be more important to foxes in the Lassen sighting area than in other locations due to the lack of mid-sized winter prey such as snowshoe hare (Perrine 2005, p. 30). Mule deer was a relatively minor dietary component of Cascade foxes in Washington and of red foxes in Maine, where snowshoe hares were more available (Id. at 30–31). Even in the Lassen sighting area, Perrine (2005, p. 24) found that the main food source of Sierra Nevada red fox during the winter remained small rodents rather than deer.

The general tendency of red foxes to avoid coyotes has likely been an important factor determining red fox distribution, often relegating red foxes to suboptimal habitats (Perrine et al. 2010, p. 20; Sacks et al. 2010, p. 17). As Perrine (2005, pp. 84, 105) suggested, competition and predation from coyotes is thus likely a primary reason why the range of Sierra Nevada red fox is restricted to such high elevations. However, such competition likely varies in intensity with prey availability, such that at least in the Lassen area studied, it is stronger in winter. We therefore consider coyotes a likely determining factor of the historical lower elevational range of the Sierra Nevada red fox.

Although, as discussed above, competition and predation from coyotes may be an important factor restricting the lower elevational range of the Sierra Nevada red fox, we lack evidence to show that such competition has been increasing in recent years at Lassen, or the extent (if any) to which it may be responsible for recent declines in Sierra Nevada red fox population numbers (as described by Sacks et al. 2010, p. 1536). However, as climate change progresses, snowpacks are expected to diminish (Kapnick and Hall 2010, pp. 3446, 3448; Halofsky et al. 2011, p. 21). The greater disadvantage of coyotes relative to foxes in deep snow is likely the primary reason the two species segregate elevationally during the winter (Perrine 2005, p. 81). As snowpack depths decline, coyotes are likely to stay longer and return earlier to higher elevations, eventually becoming resident there. Sierra Nevada red fox raise their pups in the spring, while snowpacks are just beginning to recede (Id. at 192). This is also the time of greatest resource scarcity (Id. at 193).

Food availability is important for successful reproduction (Id.), so additional competition and predation from coyotes during this time would likely lower reproductive success. Examinations of four female Sierra Nevada red fox that were radio-collared and followed for 2 years in the Lassen region showed that none had successfully reproduced (Id. at 113, 116), so reproductive success already appears to be low. Increased competition and predation from coyotes due to climate change is thus likely to put the population at greater risk over the next 50 years.

The Fish and Wildlife Service expects that climate change will increase coyote competition at the Mt. Hood, Lassen, and Sonora Pass sighting areas in the future, as snowpacks diminish. However, that competition is likely to be checked at the Crater Lake sighting area by the establishment of wolf populations, which may also decrease coyote competition at the Willamette Pass, Dutchman Flat, and Mt. Washington sighting areas. Sierra Nevada red fox at the four Oregon sighting areas north of Crater Lake may also be able to avoid coyote competition by moving upward in elevation to areas with higher snowpacks. Such upward movement will be less likely for Sierra Nevada red fox at the Lassen, and Sonora Pass sighting areas, as these populations already appear to be at or near the highest elevations in their respective areas. Accordingly, based on the best available information, we therefore, expect increases in coyote competition to have population-level impacts to populations at the Sonora Pass and Lassen sighting areas within the next 50 years, but not to have impacts that are subspecies-wide. The Service, therefore, considers competition and predation from coyotes to constitute a stressor with a medium-level impact for Sierra Nevada red fox.

Climate Change

Potential climate change impacts to Sierra Nevada red fox in the Lassen sighting area include loss of habitat and reduced snowpack (see above). As previously stated, reduced snowpacks may increase the future risk of competition from coyotes. Red foxes have been sighted in the area at elevations ranging from 1,410 meters (4,626 feet) to 3,130 meters (10,269 feet) (Perrine 2005, p. 162). This is a wide range compared to other sighting locations, but it extends up to nearly the highest elevation in the area: Lassen Peak is 3,189 meters (10,463 feet). Accordingly, as climate change causes losses to snowpacks and forested ecosystems, the preferred habitat for Sierra Nevada red fox RF will tend to shrink. Sierra Nevada red fox at Lassen have also demonstrated the strongest affinity for mature closed-canopy forests (during the winter) (Perrine 2005, pp. 67, 74, 90), and so may be particularly impacted by forest losses due to climate change.

Climate change is also causing increased wildfires, and loss of forested habitat resulting from wildfires, drought stress, and pathogen and insect outbreaks. These losses will likely continue over the next 50 years throughout the Sierra Nevada red fox range, likely resulting in medium-level impacts at all sighting areas.

Cumulative and Synergistic Impacts

Certain combinations of stressors may result in cumulative or synergistic impacts that go beyond what might be expected from simply adding the impacts of each individual stressor. The potential stressors most likely to produce cumulative or synergistic effects with other potential stressors are "Small Population Size" and "Climate Change." The most important cumulative or synergistic effects involve the interactions of these potential stressors with "Competition and Predation from Coyotes."

Direct and Indirect Effects

Resource indicators and measures (FSH 1909.15, 12.5) used in this analysis to measure and disclose effects to Sierra Nevada red fox are listed in table 163.

Table 163. Resource indicators and measures for assessment of effects to Sierra Nevada red fox

Resource Indicator and Effect	Measure (Quantify if possible)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Potential for disturbance to individuals from Noise and increased human presence, injury or mortality of individuals, habitat modification, or snow compaction near denning sites	Acres and percentage of suitable Sierra Nevada red fox habitat[25] impacted by OSV use	32,986 (32%)	31,199 (30%)	28,794 (28%)	30,990 (30%)	27,699 (27%)

Gray wolf, Sierra Nevada red fox, and California wolverine are sensitive to the presence of humans and human activities. The most common interactions between snowmobile trails and wildlife that Gaines et al. (2003) documented from the literature included trapping as facilitated by winter human access, disturbance-based displacement and avoidance, and disturbance at a specific site, usually wintering areas. To a lesser degree, hunting, trapping, poaching, collection, and habitat loss and fragmentation were other interactions identified. Trapping of Sierra Nevada red fox, or any of the special-status species under consideration, is not legal in California and, therefore, will not be considered as a potential impact in this analysis.

[25] Based on Cleve et al. (2011)

Snowmobile use and associated activities within habitats for wide-ranging carnivores can have the following potential effects to individuals or their habitat (Gaines et al. 2003). Potential direct effects include (1) Displacement or avoidance away from human activity on or near roads; (2) Displacement of individual animals from breeding or rearing habitat; and (3) Physiological response to disturbance resulting in changes in heart rate or level of stress hormones.

There is also potential for injury or mortality to individuals from vehicle collision or OSV-related snow compaction because Sierra Nevada red fox dens under the snow. As previously discussed, the likelihood of a collision between snow grooming equipment and wildlife is extremely low because the equipment travels slowly (3 to 6 mph). There is an increased likelihood of collision with OSVs due to higher frequency of OSV use and higher speeds. Vehicle collision with a Sierra Nevada red fox or wolverine would negatively affect that particular animal, but the likelihood of occurrence is assumed to be rare.

Possible indirect effects include behavioral modification such as altered or dispersed movement as caused by a trail or human activities on or near a trail and, secondarily, creation of a vector pathway for competitors or predators.

OSV use and related activities would not physically modify the vegetative structure of Sierra Nevada red fox habitat. No studies have been conducted on OSV use related to this population at the current time. However, in its finding (USDI Fish and Wildlife Service 2015c), the USFWS analyzed potential stressors on the subspecies, including those that may be caused or exacerbated by OSV use, such as competition and predation by coyotes and vehicle collisions.

Potential for Injury or Mortality to Individuals from Vehicle Collision:

As previously discussed, In addition, the best available information suggests no significant increases in vehicular traffic or new roads are likely in areas where the subspecies occurs. Therefore, based on the information presented above and in the Species Report (USDI Fish and Wildlife Service 2015b, pp. 53–55), the best available data indicate that the impact of vehicle collisions on Sierra Nevada red fox would be minor and continue at similar levels into the future, resulting in a low-level impact on the subspecies (i.e., impacts to individual Sierra Nevada red foxes as opposed to populations).

Habitat Modification: (USDI Fish and Wildlife Service 2015b, unless otherwise noted):

Both coyotes and Sierra Nevada red foxes are opportunistic predators with considerable overlap in food consumed (Perrine 2005, pp. 36–37). Perrine (2005, pp. 84, 105) suggests that competition with coyotes, as well as predation, is likely a primary reason why the range of Sierra Nevada red fox is restricted to such high elevations. Any competition likely varies in intensity with prey availability, specifically in the Lassen sighting area where competition may be stronger during winter months when Sierra Nevada red fox descend in elevation.

Coyotes occur throughout the current range of the Sierra Nevada red fox, but typically at lower elevations during winter and early spring when snowpacks are high. If snowpacks are reduced in the area because of climate change, coyotes would likely encroach into high-elevation areas during early spring when Sierra Nevada red fox are establishing territories and raising pups. Even in the absence of direct predation, the tendency of coyotes to chase off red foxes, generally, and to compete with Sierra Nevada red fox for prey, may interfere with the ability of the subspecies to successfully raise offspring (USDI Fish and Wildlife Service 2015b, pp. 48–51).

Overall, the potential increase of coyote competition as it relates to shifting or modified habitats, or diminished snowpack levels from potential climate change impacts, may still occur throughout the range of the subspecies. The best available data indicate presence of coyotes at the same elevations as Sierra Nevada red fox during certain times of the year; however, there is no information to indicate any population-level impacts.

Sierra Nevada red fox could also be predated by coyotes. Sierra Nevada red fox and coyotes both are opportunistic predators with considerable overlap in food consumed (Perrine 2005, pp. 36–37). Although no direct documentation of coyote predation on Sierra Nevada red fox is available, coyotes will chase and occasionally kill other North American red fox subspecies, and are considered important competitors of red fox generally (Perrine 2005, pp. 36, 55; Perrine et al. 2010, p. 17). Thus, red foxes tend to avoid areas frequented by coyotes (though not necessarily to the point of complete exclusion) (Perrine 2005, p. 55).

The general tendency of red foxes to avoid coyotes often relegates them to suboptimal habitats and has likely been an important factor determining red fox distribution (Perrine 2010, p. 20; Sacks et al. 2010, p. 17). Perrine (2005, pp. 84, 105) suggests that predation (and competition; see above) from coyotes is likely a primary reason why the range of Sierra Nevada red fox is restricted to such high elevations.

During winter months in the Lassen sighting area, Perrine (2005, pp. 30, 78) found that both Sierra Nevada red fox and coyotes descended to lower elevations, where mule deer (*Odocoileus hemionus*) (and more specifically in the case of Sierra Nevada red fox, mule deer carrion) became important components of their diets. Perrine (2005, p. 31) also notes that Sierra Nevada red fox may potentially benefit from the presence of coyotes during winter by scavenging carcasses of deer killed by coyotes. However, Sierra Nevada red fox, whose main winter food source (at the Lassen study site) was small rodents rather than deer (Perrine 2005, p. 24), tend to stay at higher elevations than coyotes, thereby reducing potential predation.

Bunnell et al. (2006) reported that trails as routes for competitors and predators on packed trails resulting from snowmobile use facilitate coyote incursion into deep snow areas and can negatively impact other mammal populations through increased competition or predation. In contrast, Kolbe et al. (2007) reported from a study in western Montana that although roads and trails compacted by snowmobile use were readily available, only a small portion of coyote travel was on compacted snow surfaces. And, while coyotes did use compacted snow more than random expectation, it is unlikely that snowmobile trails strongly affected their movements. They found no difference in use of compacted or uncompacted forest roads, suggesting that coyotes may select for the clear corridor afforded by a road rather than the snow conditions on them.

It is unknown if or how much competition or predation on Sierra Nevada red fox is occurring on the Lassen National Forest as the result of OSV-related snow compaction or other OSV-related activities, including grooming. At this time, the best available data indicate that coyotes are present year-round throughout the subspecies' range, but generally at lower elevations than Sierra Nevada red fox during winter and early spring when snowpacks are high (USDI Fish and Wildlife Service 2015b, p. 52). Regardless, information does not indicate there has been any coyote predation on Sierra Nevada red fox, nor is there any information to indicate that coyotes are increasing at any of the sighting areas. However, as climate change progresses, climatologists predict that snowpacks are expected to diminish in the future (Kapnick and Hall 2010, pp. 3446, 3448; Halofsky et al. 2011, p. 21). Thus, higher elevations with deep snowpack that currently deter coyotes may become more favorable to them, potentially increasing the likelihood of coyote predation in the future.

Recently, two packs of gray wolves became established in the Southern Cascades between the Crater Lake and Lassen sighting areas (one pack each in Oregon and California). It is probable that restoration of wolves to the Southern Cascades in sustainable populations would lower coyote population numbers or exclude them from higher elevation forested areas, thereby facilitating the persistence of nearby Sierra Nevada red fox populations (Levi and Wilmers 2012, p. 926; Perrine et al. 2010); wolves are unlikely to compete heavily with Sierra Nevada red fox because they tend to take larger game (ODFW 2015, p. 8).

Based on the best available scientific and commercial data, the Fish and Wildlife Service found that predation may have had an overall low-level impact to the Sierra Nevada red fox due to the presence of coyotes co-occurring at multiple sighting areas within the subspecies' range; the potential for predation in the Crater Lake, Lassen, and Sonora Pass sighting areas into the future, given climate model projections of decreased snowpack levels that may make the habitat more favorable to coyotes; and the overall inability of the populations at those three locations to shift up in elevation (i.e., the Crater Lake, Lassen, and Sonora Pass populations appear at or near the highest elevations available for the subspecies). However, at this time, the best available data indicate that predation is not impacting the Sierra Nevada red fox at the subspecies-level to the degree that any more than individuals at a couple of the sighting areas may be affected both currently and into the future. Further, the best available data do not indicate that potential future changes in shifting habitat at high elevations (as suggested by climate models) would occur within the next 50 years to such a degree that coyote numbers would increase significantly throughout the subspecies' range to the point that coyote predation would rise to the level of a threat. Therefore, based on the analysis contained within the Species Report and summarized above, the Service has determined that predation does not rise to the level of a threat currently nor is it likely to increase into the future.

Disturbance:

Sierra Nevada red fox tends to be nocturnal and, OSV use within the Lassen National Forest primarily occurs during daylight. Therefore, potential impacts to foraging behavior or movement would be low. As OSV trail use is an existing condition, Sierra Nevada red fox that occur in the areas affected by OSV use during winter may be habituated to OSV disturbance or may have already modified their behavior to avoid trail areas or OSV noise resonating in the forest may cause an alert or startle response in individual Sierra Nevada red foxes or may be accepted as ambient noise conditions of the environment.

Snow Compaction near Denning Sites (Potential for Injury or Mortality to Denning Individuals):

Although the March through May denning period overlaps with the OSV season, Sierra Nevada red fox use natural openings in rock piles at the base of cliffs and slopes and earthen dens as denning sites. If the Sierra Nevada red fox, uses earthen dens for denning sites, then OSV use would not be expected to have a potential direct effect on dens due to minimum snow depth requirements under each of the alternatives. If rock piles at the bases of cliffs and slopes are used, then the potential for injury or mortality to denning individuals would be expected to be low due to the rocky structure of the dens and because most OSV use occurs in flatter areas. Although there currently are no documented Sierra Nevada red fox dens on the Lassen National Forest, as they are located, a January 1 to June 30 limited operating period could be applied to avoid adverse impacts to potential breeding, if determined to be necessary.

Comparison of the Alternatives

Although we don't know where, specifically, impacts would occur at any given time and we cannot quantify the amount of impact, we know the potential for impacts would be greatest in areas of high OSV use. As described in the assumptions section, flatter areas with slopes less than 21 percent and canopy cover less than 70 percent, including the trails and staging areas, themselves, are used more by OSVs than others and, therefore, likely to receive the highest use. Those assumptions have been incorporated into the following analysis.

Using a habitat model developed by Cleve et al. (2011) that utilized occurrence data from the Lassen Peak region population combined with climatic and remotely sensed variables, 103,803 acres of Sierra Nevada red fox habitat occur within Lassen NFS lands (map BE-56). Based upon the information displayed in table 164, 83 percent of suitable Sierra Nevada red fox habitat is currently open to OSV use (alternative 1). However, only 32 percent is currently open to OSV use and of moderate to high OSV use, based on slope and forest stand density. The potential for OSV-related injury or mortality, competition with coyotes, noise-based disturbance impacting individual foxes would be most likely to occur within that 32 percent of suitable habitat. High OSV use is concentrated within 0.5 mile of snowmobile staging areas, on and within 0.5 mile of groomed trails, and in meadows within 0.5 mile of a designated OSV trail, so the majority of OSV use occurs within less than 32 percent of Sierra Nevada red fox habitat. Across all alternatives, approximately 56 percent of habitat overlapped by moderate and high OSV use, based on slope and density, are also overlapped by moderate to high use areas, based on proximity to designated trails. Under alternative 2, 30 percent of habitat is designated for and of moderate to high OSV use (map BE-57). Under alternatives 3 and 4, 28 percent of habitat is designated for and of moderate to high OSV use (maps BE-58[26] and BE-59), and under alternative 5, 27 percent would be designated within areas of moderate to high use (map BE-60).

Unlike Pacific marten, no spatially separated Sierra Nevada red fox populations are known to exist within the exterior boundary of the project area. Therefore, an analysis of impacts to individuals using habitat that potentially facilitates movements between separate populations was unnecessary. However, with the landscape used by the species, none of the alternatives would alter habitat structure conducive to Sierra Nevada red fox movements, nor would any alternative create a barrier to Sierra Nevada red fox movements across the landscape.

Table 164. Acres of suitable Sierra Nevada red fox habitat with potential to be impacted by OSV use and related activities, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	85,956	82,319	75,332	80,663	69,911
Not Designated for OSV use	17,847	21,484	28,498	23,104	33,919
OSV use restricted to trails	NA	NA	2	NA	2
Total	103,803 acres				
Designated for OSV use and of moderate to high OSV use (percent of habitat total)	32,986 (31.8%)	31,199 (30.1%)	28,794 (27.7%)	30,990 (29.9%)	27,699 (26.7%)
Not Designated for OSV use and of moderate to high OSV use	7,602	9,389	11,864	9,598	12,889
Moderate to high OSV use and OSV use restricted to trails	NA	NA	1	NA	1
Total	40,588 acres				

[26] Sierra Nevada red fox occurrence information shown on maps is based upon all available observational data, regardless of time of year.

Based on available observations from 1992 to present, areas of known use by Sierra Nevada red fox within the project area occur primarily south and east of Lassen Volcanic National Park. Under the existing condition and all action alternatives proposed, areas designated for OSV travel largely overlap with known red fox observations, dated 1992 to present, on the Lassen National Forest with proportion of overlap ranging from 98 percent under alternative 1 to 81 percent under alternative 5 (table 165). In a review of Sierra Nevada red fox observations available in the Lassen National Forest NRIS database reported from 1992 (when existing OSV use designations on the Lassen National Forest were implemented) to the present, during the estimated highest OSV use period (December 26 – March 31), 23 of 47 observations (49 percent) occur within 0.5 mile of groomed or ungroomed trails designated for OSV use under the existing condition. This indicates that, while Sierra Nevada red fox may be affected by OSV use at some level, they do not demonstrate complete avoidance of OSV moderate to high use areas in the project area, or avoidance of designated OSV areas in general.

Table 165. Overlap of OSV designated areas with known Sierra Nevada red fox occurrences

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Sierra Nevada red fox observations (number)	46	46	39	44	38
Observation Percentage of Total (n=47)	98%	98%	83%	94%	81%

Based upon Sierra Nevada red fox monitoring conducted on the Lassen National Forest in 2012, interaction between Sierra Nevada red fox and OSV enthusiasts was considered to be unlikely due to inverse differences in peak activity hours, with peak activity for the fox occurring from approximately 2 hours after sunset until 2 hours prior to sunrise (Perrine 2005), while almost all OSV usage on the Lassen occurs during daylight hours. Therefore, the potential for injury, mortality, noise-based disruption of feeding or breeding is expected to be very low. However, as Sierra Nevada red fox den sites are located within the portion of the action area designated for OSV, den sites with potential to be impacted would be monitored to determine whether or not disturbance is occurring and if changes in management, including a January 1 to June 30 limited operating period around den sites, are necessary, thereby minimizing impacts to Sierra Nevada red fox. Snow compaction near denning sites would be limited to a much smaller area and unlikely due to the specific denning requirements of the species, as previously described.

Under all of the action alternatives (i.e., alternatives 2, 3, 4, and 5) trail densities would decline from 1.5 miles per square mile to 0.2 mile per square mile. And because the majority of OSV use occurs on or within 0.5 mile of groomed trails and staging areas, or within meadows within 0.5 mile of designated trails, the potential for impacts to subnivean prey species, would be expected to decline with reduced trail densities under alternatives 2, 3, 4, and 5.

Cumulative Effects

Based upon spatial data provided by the Lassen National Forest, past, present, and foreseeable future actions that could result in a cumulative impact to Sierra Nevada red fox, when combined with alternatives 1, 2, 3, 4, or 5, include vegetation management projects, fire salvage projects, firewood cutting, Christmas tree cutting, non-motorized winter recreational activities, or use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. Vegetation management and salvage projects identified above are very small in comparison to the OSV Use Designation action area and/or do not overlap with groomed and non-groomed OSV trails or staging areas where the highest OSV use occurs. Vegetation and fuels management activities in recent years have included primarily thinned, masticated, and/or burned vegetation to reduce the potential for catastrophic wildfires, which can benefit species such as Sierra Nevada red fox for which wildfire is a threat.

Sierra Nevada red fox habitat also overlaps with areas open to Christmas tree cutting and firewood cutting. However, wheeled motorized vehicles may not be used off of authorized NFS roads or motorized trails to scout for fuelwood or to harvest Christmas trees (USDA Forest Service 2014), there would be minimal overlap between the Christmas tree and firewood cutting season (annually between November 1 and December 31) and OSV trail grooming season (beginning December 26), and disturbance or displacement from this activity would occur outside of the Sierra Nevada red fox breeding season under alternatives 1, 2, 3, and 5. Under alternative 4, in which trail grooming would begin at the discretion of the groomer, there is the potential for a somewhat larger degree of overlap during years in which heavy snowfall begins early. Use of roads within Sierra Nevada red fox habitats after the March 31 termination date of the forest order closing roads for exclusive OSV use could contribute additional disturbance during the early part of the denning season. In general, most non-motorized winter recreation occurs along designated trails, where individuals would either avoid the area, if too great a disturbance, or habituate to the noise. Similar activities on State and private lands within the forest boundary may impact habitat availability outside of NFS lands and may increase disturbance locally. However, the potential for this type of disturbance is unknown; State and privately held lands make up about 20 percent of the area within the forest boundary.

In summary, ongoing and reasonably foreseeable actions are not expected to contribute significant impacts to effects discussed for Southern Cascades DPS of Sierra Nevada red fox for the project under any of the alternatives. Although impacts may be additive locally, particularly to foraging individuals, they would be much less likely to individuals utilizing reproductive dens in rocky areas at the base of cliffs and slopes.

Determination Statement

Alternatives 1, 2, 3, 4, and 5 of the Lassen National Forest Over-snow Vehicle Use Designation Project may affect individuals, but are not likely to lead to a loss of viability or a trend toward Federal listing for Southern Cascades DPS of Sierra Nevada red fox in the project area based on the following rationale:

The vegetative structure or composition of suitable Sierra Nevada red fox habitat would not be physically modified by OSV use and related activities.

- Although the potential for impacts to individuals within suitable habitat ranges from 27 to 32 percent under all of the alternatives, the percentage of suitable Sierra Nevada red fox habitat impacted would actually be lower considering that the concentration of OSV use is not equal across the landscape, and based upon Sierra Nevada red fox monitoring conducted on the Lassen National Forest in 2012, interaction between Sierra Nevada red fox and OSV enthusiasts was considered to be unlikely due to inverse differences in peak activity hours. Therefore, the potential for injury, mortality, noise-based disruption of feeding or breeding is expected to be very low under all of the alternatives.
- The best available data indicate that predation is not impacting the Sierra Nevada red fox at the subspecies-level to the degree that any more than individuals at a couple of the sighting areas may be affected both currently and into the future. Further, the best available data do not indicate that potential future changes in shifting habitat at high elevations (as suggested by climate models) would occur within the next 50 years to such a degree that coyote numbers

would increase significantly throughout the subspecies' range to the point that coyote predation would rise to the level of a threat to the Sierra Nevada red fox.

- OSV use would not be expected to have a potential direct effect on dens due to minimum snow depth requirements under each of the alternatives, the rocky structure of the dens and because most OSV use occurs in flatter areas. However, as Sierra Nevada red fox den sites are located within the portion of the action area designated for OSV, den sites with potential to be impacted would be monitored to determine whether disturbance is occurring and if changes in management, including a January 1 to June 30 limited operating period around den sites, are necessary, thereby minimizing impacts to Sierra Nevada red fox.
- Reduced trail densities, under alternatives 2, 3, 4, and 5 are likely to reduce the potential for impacts to subnivean prey species.

Bats

Fringed Myotis (*Myotis thysanodes*)

Regional Foresters Sensitive Species

Species Account

Most *Myotis thysanodes* in California are referable to *M. t. thysanodes*; populations in the northwestern part of the state (Humboldt, Siskiyou and Shasta Counties) have recently been placed in the subspecies, *M. t. vespertinus*, although relatively few specimens have been examined and the boundary between subspecies has not been clearly delineated.

Four subspecies are recognized (Manning and Jones 1988): *M. t. aztecus*, *M. t. thysanodes*, *M. t. pahasapensis*, and *M. t. vespertinus*. *M. t. pahasapensis* in western South Dakota, western Nebraska and eastern Wyoming; *M. t. aztecus* in southern Mexico (Hall 1981); and *M. t. vespertinus* in southwestern Washington, western Oregon, and northwestern California (Manning and Jones 1988). *M. t. thysanodes*, the primary subspecies found in California, ranges from 51′ 54° N. lat. in southern British Columbia (Rasheed et al. 1995) to Michoacán in southern Mexico (Hall 1981).

The limited data available suggest serious population declines. Maternity colonies identified between 1891 (Old Fort Tejon) and the early 1970s (Point Reyes National Seashore, Marin County) were likely considerably larger than any colonies known today. Forty-two animals were collected at the Fort Tejon site (five different collections between 1891 and 1945), 58 at Point Reyes National Seashore between 1973 and 1974, 40 in one year from a site in Napa County, 20 from a Tuolumne County site, and 14 from a Kern County site. Although, in the context of surveys not targeting this species, we have identified six new maternity sites in northern California, none of these contains more than 10 to 30 females. Dalquest (1947) described one site in Napa County as having about 50 animals in July 1945; 40 animals were collected at that time. In June 1987, the site contained 10 to 15 animals, and in August 1988, there were none. The grounds around this building had been considerably modified in 1988, for a new winery installation, and the building that housed the bats was experiencing more human activity and was scheduled for renovation. This species appears to be extremely sensitive to disturbance at roost sites and to human handling. While some species of *Myotis*, like *Myotis yumanensis*, seem tolerant of human incursions into their roosting space, *M. thysanodes* is not. A cave in Sequoia National Park was documented in 1951 as being a *M. thysanodes* maternity site; 16 animals were collected at that time. Additionally, this cave has experienced very heavy recreational use for many years. Vandalism has thwarted repeated attempts by the National Park Service to gate the cave. Although *M. thysanodes* has been mist-netted near this cave, it has not apparently been observed roosting there recently.

A comparison of historic and current records indicates limited re-colonization at sites from which *M. thysanodes* has been extirpated. What may have been the largest documented colony in California occupied a barn at Point Reyes National Seashore. Fifty-eight animals were collected from this site in 1973 and 1974. Monitoring of this site since 1979 showed annual reoccupation by a *Myotis yumanensis* maternity colony, but *M. thysanodes* was not detected until 1996. The Park Service has protected this site for at least 10 years, with no known human incursions into the roosting space.

M. thysanodes is widely distributed across southern British Columbia, Washington, Oregon, Idaho, Montana, Wyoming, Colorado, Utah, Nevada, California (including Santa Cruz Island), Arizona, New Mexico, western Texas, western South Dakota, western Nebraska, and south to Chiapas, Mexico.

In California, the species is found the length of the state, from the coast (including Santa Cruz Island) to over 1,800 meters (5,900 feet) in the Sierra Nevada. Records exist for the high desert and east of the Sierra Nevada. However, the majority of known localities are on the west side of the Sierra Nevada. Museum records suggest that while *M. thysanodes* is widely distributed in California, it is rare everywhere. Available museum records offer documentation for only six maternity sites: two in Kern County (including the type locality at Old Fort Tejon), and one each in Marin, Napa, Tuolumne, and Tulare counties. Investigation of four of these sites since 1990 has shown that while the roosts are still available, this species is no longer present at any of these sites.

Habitat Status

M. thysanodes occurs in xeric woodland (oak and pinyon-juniper most common) (Cockrum and Ordway 1959, Hoffmeister and Goodpaster 1954, Jones 1965, O'Farrell and Studier 1980, Roest 1951), hot desert-scrub, grassland, sage-grassland steppe, spruce-fir, mesic old growth forest, coniferous and mixed deciduous/coniferous forests (including multi-aged sub-alpine, Douglas-fir, redwood, and giant sequoia) (O'Farrell and Studier 1980, Pierson and Heady 1996, Weller and Zabel 2001). In a study in the Mogollon Mountains of New Mexico and Arizona, Jones (1965) found *M. thysanodes* occurred almost exclusively in evergreen forest (above 2,000 meters [6,600 feet] elevation), and was the fourth most common species in this habitat. Barbour and Davis (1969) found it to be one of the more common species in oak forest at 1,500 to 1,800 meters (4,900 to 5,900 feet) elevation in the Chiricahua Mountains. In a long-term study in western New Mexico (Jones and Suttkus 1972), *M. thysanodes* was found predominantly at the highest elevation sampled (2,600 meters [8,500 feet]), and was the ninth most common bat species in this habitat.

In mist-netting surveys, *M. thysanodes* is often found on secondary streams. Although nowhere common, the species occurs in netting records from sea level to at least 2,000 meters (6,500 feet) in the Sierra Nevada, California. It occurs primarily from sea level to approximately 1,200 to 2,100 meters (3,900 to 6,900 feet) (O'Farrell and Studier 1980) with an isolated record from 2,900 meters (9,500 feet) in New Mexico (Barbour and Davis 1969).

A paucity of records makes it difficult to assess habitat preferences for this species in California. Orr (1956) in reviewing specimens held at the California Academy of Sciences, notes two localities from the coastal region (Carmel in Monterey County and Woodside in San Mateo County). More recently, records have accumulated from the upper Sacramento River (Rainey and Pierson 1996). Although nowhere common, the species occurs as one of the rarer taxa in netting records from the central coast to at least 1,950 meters (6,400 feet) in the Sierra Nevada.

Roosting Habitat

Studies conducted in California, Oregon, and Arizona, have documented that *M. thysanodes* roosts in tree hollows, particularly in large conifer snags (Cross and Clayton 1995, Chung-MacCoubrey 1996, Rabe et al. 1998, Weller and Zabel 2001). Roost tree roosts were located in the tallest or second tallest snags in the stand, surrounded by reduced canopy closure, and under bark (ibid.). Tree roosting behavior is consistent with an observed association between *M. thysanodes* and heavily forested environments in the northern part of its range (Cross et al. 1976).

M. thysanodes is also known to use a variety of roost sites, including rock crevices (Cryan 1997), caves (Baker 1962, Burt 1934, Commissaris 1961, Easterla 1966, Easterla and Baccus 1973), mines (Cahalane 1939, Cockrum and Musgrove 1964), buildings (Barbour and Davis 1969, Musser and Durrani 1960, O'Farrell and Studier 1980), and bridges. It is also one of the species thought to be most reliant on abandoned mines (Altenbach and Pierson 1995).

M. thysanodes is a colonial roosting species. Colonies can be up to 2,000 individuals (Barbour and Davis 1969). Within buildings, this species tends to roost in the open in tightly packed clusters, mostly using the sides of ceiling joists (O'Farrell and Studier 1980). Any of these types of structures are used as both day and night roosts (Barbour and Davis 1969).

Work by Studier and O'Farrell (1972) on a colony in New Mexico suggested that *M. thysanodes* could fly at lower ambient temperature than many species, and sought cooler roosting conditions than did *M. lucifugus* with which it shared an attic roost. The two mine roosts identified recently in California were both relatively cool and damp (one mine had standing water). Barbour and Davis (1969) noted that this species was readily captured at the entrances to night roosts in buildings, mines, and caves. In a 5-year study on the upper Sacramento River, *M. thysanodes*, though one of the least commonly encountered bats, was more readily detected at bridge night roosts than in netting surveys conducted over water (Rainey and Pierson 1996).

This species shows high roost site fidelity (O'Farrell and Studier 1980). Weller and Zabel (2001) noted frequent roost switching in tree roosts, but high fidelity to a given area. Roost switching has also been reported for caves (Baker 1962). *M. thysanodes* is highly sensitive to roost site disturbance (O'Farrell and Studier 1980).

Foraging Habitat

M. thysanodes often forages along secondary streams, in fairly cluttered habitat. It also has been captured over meadows (Pierson et al. 2001). Limited information is available on diet. The feces of one individual captured on the upper Sacramento River in California contained predominantly Coleopterans (beetles) and Hemipterans (bugs) (Rainey and Pierson 1996). Relatively heavy tooth wear on animals examined in a 5-year study on the Sacramento River suggests that in that area the species feeds primarily on heavy-bodied insects, such as Coleopterans and Hemipterans. The presence of non-flying taxa in the diet of the Oregon animals suggests a foraging style that relies at least partially on gleaning. *M. thysanodes* is known to fly during colder temperatures (Hirshfeld and O'Farrell 1976).

Reproduction

Maternity roosts have been found in sites that are generally cooler and wetter than is typical for most other Vespertilionids. Recent radio-tracking studies in the forested regions of northern California have shown that this species forms nursery colonies in predominantly early to mid- decay stage, large-diameter snags 58 to 167 centimeters dbh (23 to 66 inches dbh) (Weller and Zabel 2001).

Clough Cave in Sequoia National Park is the only cave found in California housing a maternal colony, for which there are multiple records. Outside of California, maternity colonies have been found in caves (e.g., Baker 1962, Easterla 1966). Mines are also used as roost sites (Cahalane 1939, Cockrum and Musgrove 1964, Barbour and Davis 1969). Since 1987, two small maternity roosts in mines were located (approximately 10 adult females each) in the coast range north of San Francisco.

Mating occurs in the fall following break-up of the maternity colony. Ovulation, fertilization, and implantation occur from April to May and are followed by a gestation of 50 to 60 days. One young is born from May to July, capable of flight in 16 days, and volant within 20 days.

Migration and Hibernation

Winter behavior is even more poorly understood than summer behavior. *M. thysanodes* is thought to migrate short distances to lower elevations or more southern areas (O'Farrell and Studier 1980). Scattered winter records suggest, however, that the species does not complete long-distance migrations, and like many species in the more temperate parts of California, may be intermittently active throughout the winter (O'Farrell and Studier 1980). The species has been found hibernating in buildings and mine tunnels along the coast in the San Francisco Bay area and in the coast range north of San Francisco.

Threats

Anthropogenic Roosts

Although *M. thysanodes* does not occur in urban areas, it has often been found in buildings in rural and semi-rural settings (e.g., wineries, Hearst Castle, Big Bear attic, Bale Grist Mill State Historic Park). These colonies are typically at high risk for negative human interactions.

A significant number of the few known maternity roosts in California are in historic buildings. Restoration of historic buildings may pose a threat to this species. One historic roost site (Old Fort Tejon) and two current roost sites are located in historic buildings owned by the California Department of Parks and Recreation. Another is located in a utility building on a State wildlife refuge. No known protective measures are in place. The tendency for bats to occupy historic buildings creates potential conflicts between the goals of historic preservation, access for public education, and wildlife protection. Although these conflicts are generally resolvable, and bat populations can almost always be accommodated in buildings without damaging historic values, this is frequently not appreciated.

Urban expansion often leads to removal of older buildings that provide potential roosts. Newer buildings generally do not provide suitable roosting habitat.

Intervention by pest control operators and public health departments can result in the elimination of many roost sites.

Forest Management

M. thysanodes appears to be highly dependent on tree roosts within forest and woodland habitats and potentially requires denser vegetation for foraging. In some forested settings, *M. thysanodes* appears to rely heavily on tree cavities and crevices as roost sites (Weller and Zabel 2001), and may be threatened by certain timber harvest practices. For example, in Arizona Chung-MacCoubrey (1996) found that this species prefers large-diameter (45 to 65 centimeters [18 to 26 inches] dbh) conifer snags.

Removal of snags and hardwoods during timber harvesting and the loss of hardwoods through conifer and brush competition (from a lack of fire management) have caused reductions in both roosting structures and foraging habitat. These practices are likely to be more severe on private lands. An increased demand for firewood can also lead to a decrease in available snags as roosts.

Increasing tree densities in forest settings could limit foraging and flight access.

Transportation

Bridge retrofitting often renders bridges unsuitable (day and night roosts) and/or disturbs colonies that are present during construction. There would likely be a loss of riparian habitat for foraging where bridges are constructed. River drainages, because they frequently offer the easiest routes through mountain ranges, are favored corridors for highway construction. Such construction commonly entails blasting of cliff faces, either for initial highway construction or later improvements (i.e., widening and straightening). Cliff roosting species are at risk of both direct impacts from blasting, and long-term loss of roosting habitat from cliff modifications. In some settings, it is possible that soil removal and blasting may expose rock and create habitat, but this is not generally the case because fractured, potentially unstable rock is often removed.

Direct and indirect Effects

OSV use on the Lassen National Forest would not change the habitat for fringed myotis bat as no habitat modifications are anticipated

Very little is known about the wintering behavior of fringed myotis bats. Some limited migration to lower elevation may occur. However, it fringed myotis remain on the landscape in winter, there is a low likelihood that behavior of individuals could be modified by the noise or disruption associated with OSV use or grooming of OSV trails. This would be entirely dependent on the location of the winter roost in proximity to a bridge, building, cavity, mine, or tree. Since there are no known winter roosts on the Lassen, noise cannot be mitigated should there be a noise impact from OSV activities. Should OSV activities create a temporary disturbance, breeding could be impacted, however, it would not preclude breeding at a later time. There should be no impact to the maternal roosts, as they would start in April or May, following snowmelt.

Fringed myotis bats drink water from streams or lakes when they emerge from roosts. In addition, they forage in riparian areas and meadows. Emissions from OSVs, particularly two-stroke engines on snowmobiles, release pollutants like ammonium, sulfate, benzene, PAHs, and other toxic compounds that are stored in the snowpack; during spring snowmelt runoff, these accumulated pollutants are released and may be delivered to surrounding waterbodies (USFS National Core BMP Rec-7: Over-Snow Vehicle Use; please refer to the project hydrology report (project record) for additional information). However, the minimum cross-country snow depth of 12 inches for alternatives 2, 3, and 5 is expected to be adequate to protect aquatic and riparian habitats from measurable impacts to vegetation or water quality (McNamara 2016). Under alternatives 1 and 4, the minimum cross-country snow depth would be that depth necessary to avoid resource damage.

Cumulative Effects

Based upon spatial data provided by the Lassen National Forest, past, present, and foreseeable future actions that could result in a cumulative impact to *M. thysanodes*, when combined with alternatives 1, 2, 3 4, or 5 include vegetation management and fire salvage projects, firewood cutting, Christmas tree cutting, non-motorized winter recreational activities, or use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. Vegetation management and salvage projects are very small in comparison to the OSV Use Designation action area and/or do not overlap with groomed and non-groomed OSV trails or staging areas where the highest OSV use occurs. Seasonal limited operating periods required for raptor and other sensitive species for vegetation projects to prevent disturbance to known nesting or denning sites could also reduce disturbance to breeding bats. Vegetation and fuels management activities in recent years have included primarily thinned, masticated, and/or burned vegetation to reduce the potential for catastrophic wildfires. Management prescriptions have emphasized retention of large snags and logs and retention of large conifers.

M. thysanodes habitat also overlaps with areas open to Christmas tree cutting and firewood cutting. However, wheeled motorized vehicles may not be used off of authorized National Forest System roads or motorized trails to scout for fuelwood or to harvest Christmas trees (USDA Forest Service 2014), there would be minimal overlap between the Christmas tree and firewood cutting season (annually between November 1 and December 31) and OSV trail grooming season (beginning December 26), minimizing the potential for disturbance or displacement of roosting bats. Use of roads within fringed myotis bat habitats after the March 31 termination date of the forest order closing roads for exclusive OSV use can contribute additional disturbance during the early part of the *M. thysanodes* breeding season. There is a small potential for an additive effect from vehicle fluids from wheeled vehicles used to access firewood and Christmas trees, as well as from the use of wheeled vehicles during the overlap season between OSVs and wheeled vehicles, to enter waterways, modifying pallid bat prey/food base. However, the risk for this impact is low because vehicle use does not occur in waterways and fluids would not normally reach waterways.

In general, most non-motorized winter recreation occurs along designated trails, and individual bats would either avoid roosting in those areas, if too great a disturbance, or habituate to the noise. Similar activities on State and private lands that make up about 20 percent of the area within the Forest boundary may impact habitat availability outside of NFS lands and may increase disturbance locally. However, the potential for this type of disturbance is unknown. In summary, ongoing and reasonably foreseeable actions may be additive locally to individual bats, but are not expected to contribute substantial impacts to those discussed for the project under any of the alternatives.

Determination Statement

All alternatives of the Lassen National Forest Over-snow Vehicle Use Designation Project may impact individuals, but are not likely to lead to a loss of viability or a trend toward Federal listing for fringed myotis in the Forest Plan area based on the following:

- Proposed actions would not physically modify fringed myotis bat habitat.
- Proposed actions would generally occur when the species is hibernating and is generally inactive. However, individuals that emerge to forage during warmer weather could experience missed feeding when snow grooming activities occur during the early evening.
- Depending upon the location of winter roost structures with respect to OSV use, individual bats within winter roosts could be disturbed by noise associated with OSVs and human presence, and missed breeding attempts could result.
- The low risk of modification of the prey/food base or impact on drinking water quality from oil, gas, or other vehicle fluids entering waterways would be mitigated by the 12-inch minimum snow depth that would protect aquatic and riparian habitats from measurable impacts to vegetation or water quality.

Pallid Bat (*Antrozous pallidus*)

Regional Foresters Sensitive Species

Species Account

Antrozous pallidus was originally described in 1856 as *Vespertilio pallidus*, but has had the genus name of *Antrozous* since 1862, and has most commonly been recognized as *Antrozous pallidus* (Barbour and Davis 1969, Hermanson and O'Shea 1983). There are currently two subspecies recognized in California (*A. p. pacificus* and *A. p. pallidus*) (Hall 1981, Simmons 2005).

A. pallidus is distributed throughout much of the West, from southern British Columbia to central Mexico, and as far east as western portions of Kansas, Oklahoma, and Texas, with an isolated subspecies in Cuba (Hermanson and O'Shea 1983; Simmons 2005).

In California, *A. pallidus* is found from sea level up to approximately 2,250 meters (7,400 feet) (Baker et al. 2008, Pierson et al. 2001), although it is most commonly found below 1,800 meters (5,900 feet) (Barbour and Davis 1969, Orr 1954, Pierson et al. 2001), and there is a record from – 178 feet in Death Valley (Orr 1954). It is found along the coast, in the Coast Ranges, the Central Valley, up to mid-elevation in the Sierra Nevada and Cascade ranges, and in the more xeric and desert habitats east of the Sierra Nevada and in southern California. Pallid bat has been documented on the Lassen National Forest.

Habitat Status

A. pallidus occurs in a number of habitats ranging from rocky arid deserts to grasslands into mid-elevation mixed deciduous/coniferous forests. In California, they are most commonly found in low-elevation desert washes, western sycamore (*Plantanus racemosa*) open riparian habitat, coast live oak (*Quercus agrifolia*) and valley oak (*Q. lobata*) savannah, mid-elevation black oak (*Quercus kelloggii*) and mixed deciduous/coniferous forest (black oak, incense cedar (*Libocedrus decurrens*) and ponderosa pine (*Pinus ponderosa*) habitat (Barbour and Davis 1969, Johnston et al. 2006, Orr 1954, Pierson et al. 2001, Pierson et al. 2002, Rainey and Pierson 1996). It is also associated with both coast redwood and giant sequoia forests (Pierson and Heady 1996, Orr 1954, Rainey et al. 1992).

Roosting Habitat

Pallid bats are quite eclectic in their roosting habits (Barbour and Davis 1969, Hermanson and O'Shea 1983, Lewis 1994 and 1996, Orr 1954). They roost in rock crevices (Orr 1954, Hermanson and O'Shea 1983, Pierson et al. 2002), under rock slabs (Vaughan and O'Shea 1976, Lewis 1996), in tree hollows (Orr 1954, Rainey and Pierson 1996, Rabe et al. 1998, Pierson et al. 2004), caves, abandoned mines, and a variety of other anthropogenic structures, including buildings (vacant and occupied), porches and garages (van Zyll de Jong 1985), and bridges (Barbour and Davis 1969, Beck and Rudd 1960, Johnston et al. 2004, Lewis 1996, Orr 1954, Pierson et al. 2001, Pierson et al. 2002, Vaughan and O'Shea 1976). Tree roosting appears to be preferred in the forested regions of northern California, and has been documented in large conifer snags (e.g., incense cedar, ponderosa pine, sugar pine) (Baker et al. 2008, Johnston and Gworek 2006), inside basal hollows of redwoods (Orr 1954, Rainey et al. 1992) and giant sequoias (Pierson and Heady 1996), and bole cavities in oaks and other trees (e.g., cottonwood, cypress) (Hall 1946, Orr 1954, Pierson et al. 2004, Rainey and Pierson 1996).

A radio-tracking study in the central coastal region of California documented winter roosting in the attic of an unheated building, with satellite roosts in trees (*Quercus lobata*, *Q. agrifolia*, *Umbellularia californica*, and *Platanus racemosa*) on or in the ground (under a large rock, under a dry mop in a shed, and under a concrete outhouse foundation) (Johnston et al. 2006). They have also been reported roosting in stacks of burlap sacks (Beck and Rudd 1960) and stone piles, particularly in the winter.

Pallid bats typically roost in maternity groups of 20 to 200 during summer (Hermanson and O'Shea 1983, Vaughan and O'Shea 1976), but this species will also roost singly during pregnancy (Lewis 1996). In fall, maternity colonies disperse into smaller groups, which may be found in many sites where they do not occur in summer (Orr 1954, Barbour and Davis 1969).

In Oregon, Pallid bats showed a higher fidelity toward night roosts than day roosts (Lewis 1994). Night roosts are most typically located within 1 to 2 kilometers of the day roost (Lewis 1994, Johnston et al. 2006, Johnston and Gworek 2006, Baker et al. 2008). Roost switching by females is variable; in Arizona, *A. pallidus* were reported to switch roosts in spring and autumn, but not during late pregnancy and lactation (O'Shea and Vaughan 1977), while in Oregon, females switch roosts throughout the summer, perhaps in an effort to benefit from lower ectoparasite loads (Lewis 1994). When using anthropogenic roosts in northern California, reproductive female *A. pallidus* generally occupy maternity roosts in April or May, and move to winter roosts in September, October, or even later if weather is moderate.

Compared to some other California bat species, *A. pallidus* are relatively intolerant of disturbance (O'Shea and Vaughan 1977, Lewis 1996, Johnston et al. 2004) and may abandon a roost when disturbed. Lewis (1996) noted that distances between day and nighttime roosts were usually less than 200 meters (656 feet), but ranged from 40 to 1,850 meters (0.025 to 1.1 miles).

This is one of the species most likely to be found night-roosting under bridges (Barbour and Davis 1969, Johnston et al. 2004, Pierson et al. 2001), but it can also be found in shallow caves, cliff overhangs, and other human-made structures (Hermanson and O'Shea 1983, Lewis 1994). Lewis (1994) also noted that bridges used by pallid bats as night roosts were wooden, or concrete girder. Pallid bats show a higher fidelity toward night roosts than day roosts (Lewis 1994). Night roosts are typically located within 1 to 2 kilometers (0.6 to 1.25 miles) of the day roost.

Foraging Habitat

Pallid bats forage close to the ground and vegetation in desert washes, open grassland, oak savannah, and/or forest with limited understory (e.g., ponderosa pine parkland or granite slabs with sparse vegetation) (Hermanson and O'Shea 1983). Johnston et al. (2006) found that male and female *A.pallidus pacificus* foraged intermittently through the winter months along and in riparian corridors with western sycamore (*Plantanus racemosa*), California bay (*Umbellularia californica*), and coast live oak (*Quercus agrifolia*) within canyon bottoms in central California; and during summer months, females and males foraged along ridges with grasslands, high open meadows and oak savannah habitats. Johnston and Gworek (2006), and Baker et al. (2008) determined that pallid bats frequently foraged on logging roads and in open and semi-open short grass meadows in the northern Sierra Nevada. Foraging appears to be concentrated in two periods – one just after emergence and one before returning to the roost (Hermanson and O'Shea 1983).

Lewis (1996) recorded distances of between 1 and 4 kilometers (0.6 to 2.5 miles) traveled between roost sites and foraging areas and Johnston et al. (2006) found similar distances (0.2 to 4.0 kilometers) for males and females during winter months. Johnston and Gworek (2006), found that radio-tagged bats in the northern Sierra Nevada foraged a mean distance of 1.1 miles from day roosts during summer months in the northern Sierra Nevada. Baker et al. (2008) noted that the size of foraging areas for this species varied among sex and reproductive classes, with lactating females exhibiting the smallest foraging areas (1.56 square kilometers ± 0.88 SE) and post-lactating females the largest foraging areas (5.97 square kiometers ± 2.69 SE).

A. pallidus feeds primarily on medium to large, ground-dwelling prey, such as flightless arthropods (such as scorpions, Jerusalem crickets, cicadas, wolf spiders, and centipedes), (Hatt 1923, Ross 1961, Hermanson and O'Shea 1983) and typically between 20 and 70 millimeters (0.8 to 2.7 inches) in length (Bell 1982). Large cerambycid beetles, particularly *Prionus californicus*, and ten-lined June beetles (*Polyphylla decemlineata*) are also major prey items (Barbour and Davis 1969, Johnston and Fenton 2001, Orr 1954, Pierson et al. 2004) during the early part of summer. Johnston and Fenton (2001) found that a colony of *A. p. pacificus* had specialized individual dietary preferences within the same colony, whereas individuals in a colony of *A. p. pallidus* all ate generally the same prey items on any given night. *Antrozous* also gleans prey from vegetation (Hermanson and O'Shea 1983, and take prey in flight (Johnston and Fenton 2001). Bell (1982) stated that pallid bats used passive listening, and not echolocation, to detect and capture arthropods. However, *A. p. pallidus* foraged primarily on a 10-millimeter (0.4-inch) scarab beetle in flight during mid-summer in Death Valley when the prey species was abundant (Johnston and Fenton 2001).

Reproduction

Pallid bats are gregarious, and often roost in colonies of between 20 and several hundred individuals. Males and females congregate in a central winter roost often associated with smaller satellite roosts in late fall and winter months (Johnston et al. 2006) when breeding occurs (Hermanson and O'Shea 1983). During spring months, pregnant females leave the winter roost and gather in summer maternity colonies (Johnston et al. 2006), with parturition generally occurring between May and July, depending on local climate (Barbour and Davis 1969). Males often leave the winter roost and use a variety of solitary roosts, but they sometimes form a bachelor colony (Johnston et al. 2006). Females can give birth to a single pup, twins, or sometimes triplets, with twins being most common (Barbour and Davis 1969). Young are generally weaned in mid to late August. Maternity colonies generally form in early April (Barbour and Davis 1969) and disband between August and October (Hermanson and O'Shea 1983, Lewis 1994.

Migration/Hibernation

Pallid bats are relatively inactive during the winter; however, Johnston et al. (2006) found that males and females foraged intermittently throughout the winter months, in central California.

They are not known to migrate long distances (Barbour and Davis 1969), and Johnston et al. (2004) determined that the primary female/male winter roost of a large colony in central California was approximately 1.7 kilometers (1 mile) from the primary maternity colony roost. During January and February, pallid bats foraged about once every six nights, at temperatures down to 4 degrees C (39 degrees F) and on rainy nights, and winter prey at a central California coast site included darkling ground beetles (Carabidae), moths (Lepidotera) and other prey types often taken during warmer parts of the year (Johnston et al. 2006). Occasional winter activity has been reported in southern portions of its range and has been observed in Nevada flying during winter when temperatures were as low as 36 degrees F (O'Farrell et al. 1967, O'Farrell and Bradley 1970). Hibernating or mildly torpid bats were reported in buildings and a hollow post (Barbour and Davis 1969), limestone cliffs (Orr 1954), and caves and mines (Hall 1946).

Threats

Anthropogenic Roosts

Due to their propensity for using a wide range of buildings as well as bridges, their highly visible roosting habits, urine stains and odor, as well as visible insect prey remains at night roosts, these bats are highly susceptible to negative human contact. Because pallid bats frequently roost in buildings and bridges, display considerable roost loyalty in such roosts, and are often found roosting together with *T. brasiliensis* and *M. yumanensis*, two species that form large colonies (several hundreds to thousands), often where they are highly visible (e.g., open rafters) they are frequently subjected to vandalism, exclusion (humane or otherwise), and even illegal poisoning. This species is often associated with historic buildings in which their presence is typically viewed as a hazard by property managers. Exclusion, renovation, and demolition of buildings and urban expansion likely account for observed declines in Los Angeles, Orange, Santa Clara, and San Diego Counties. Particularly vulnerable are rural structures inhabited by pallid bat colonies that become subjected to renovation or demolition due to a change in land ownership or change in land-use practices. These changes are usually associated with the onset of urban development, but can occur many years and miles ahead of such development.

Forest Management

The removal of snags and damaged trees (particularly large ponderosa pines and incense cedars) and hardwoods during timber harvesting and the loss of hardwoods through conifer and brush competition (from a lack of fire management) have caused reductions for both roosting structures and foraging habitat. These practices may be severe on both private and public lands. Prescribed burning of leaf-litter likely results in a reduction or loss of foraging habitat.

Mines

Pallid bat colonies can be impacted by inappropriate mine closures or disturbance during human visitation. Most pallid bat colonies in mines in southern California appear to be in the desert.

Oak Woodlands

The loss of hardwoods due to firewood cutting, urban expansion, conversion to agriculture, rangeland management, and disease (e.g., sudden oak death syndrome) has caused serious reductions for both roosting and foraging habitat. Pallid bats are strongly associated with oaks throughout California. They can be found roosting in both dead and live oaks, and are frequently found foraging under or at the edge of the oak canopy (Rainey and Pierson 1996, Johnston and Fenton 2001, Johnston et al. 2006). Radio-tracking studies identified pallid bats roosting in black oaks in mixed deciduous forest (Rainey and Pierson 1996). At Vandenberg Air Force Base, they were radio-tracked foraging in coast live oak habitat (Pierson et al. 2002).

Oak roosts (Rainey and Pierson 1996). Pallid bats were also radio-tracked to roosts in blue oak in Carmel Valley. Sudden oak death predisposes woodlands to fire.

Transportation

Bridge retrofitting can render bridges unsuitable for both day and night roosting by this species, both during construction and after completion. Bridge replacement can result in complete loss of long-term day and night roost habitat, as many bridges being replaced are 40 to 60 years old. Bridges can support large populations of *A. pallidus*, increasing impacts to this species when bridge roosts are lost. Pallid bats may not return to bridge roosts disturbed by construction activities, even when roost sites are not modified (Johnston et al. 2004). Riparian habitat used for foraging where bridges occur is frequently partially cleared or temporarily disturbed to accommodate construction activities.

Direct and indirect Effects

OSV use and related activities on the Lassen National Forest would not change the habitat for pallid bat, as no habitat modifications are anticipated. Due to the behavior of pallid bats when they can be seen in winter on warmer nights (39 degrees F), or males moving between winter roosts, or an occasional feeding (once every six nights), there is a low likelihood that pallid bat behavior could be modified by OSV noise or disruption of grooming trails for OSV use.

OSV noise could cause disturbance at the winter roost. This would be entirely dependent on the location of the winter roost in proximity to a bridge, building, cavity, mine or tree. Since there are no known winter roosts on the Lassen, no reduction of noise can be mitigated should there be a noise impact from OSV activities. Should OSV activities have a temporary disturbance, breeding could be impacted; however, it would not preclude breeding at a later time. There should be no impact to the maternal roosts, as they would start in April or May, following snowmelt.

Species such as pallid bat forage on invertebrates in areas with riparian and/or aquatic environments. Emissions from OSVs, particularly two-stroke engines on snowmobiles, release pollutants like ammonium, sulfate, benzene, PAHs and other toxic compounds that are stored in the snowpack; during spring snowmelt runoff, these accumulated pollutants are released and may be delivered to surrounding waterbodies (USFS National Core BMP Rec-7: Over-Snow Vehicle Use; please refer to the project hydrology report (project record) for additional information). However, the minimum cross-country snow depth of 12 inches under alternatives 2, 3, and 5 is expected to be adequate to protect aquatic and riparian habitats from measurable impacts to vegetation or water quality (McNamara 2016). Under alternatives 1 and 4, the minimum cross-country snow depth would be that depth necessary to avoid resource damage.

Cumulative Effects

Based upon spatial data provided by the Lassen National Forest, past, present, and foreseeable future actions that could result in a cumulative impact to pallid bats, when combined with alternatives 1, 2, 3, 4 or 5, include vegetation management and salvage projects, firewood cutting, Christmas tree cutting, non-motorized winter recreational activities, or use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. Vegetation management and salvage projects identified above are very small in comparison to the OSV Use Designation action area and/or do not overlap with groomed and non-groomed OSV trails or staging areas where the highest OSV use occurs. Seasonal limited operating periods required for raptor species for vegetation projects to prevent disturbance to known nest sites could also reduce disturbance to breeding bats. Vegetation and fuels management activities in recent years have included primarily thinned, masticated, and/or burned vegetation to reduce the potential for catastrophic wildfires. Management prescriptions have emphasized retention of large snags, logs, and large conifers.

Pallid bat habitat also overlaps with areas open to Christmas tree cutting and firewood cutting. However, wheeled motorized vehicles may not be used off of authorized NFS roads or motorized trails to scout for fuelwood or to harvest Christmas trees (USDA Forest Service 2014), there would be minimal overlap between the Christmas tree and firewood cutting season (annually between November 1and December 31) and OSV trail grooming season (beginning December 26), minimizing the potential for disturbance or displacement of roosting bats from this activity. Use of roads within pallid bat habitats after the March 31 termination date of the forest order closing roads for exclusive OSV use can contribute additional disturbance during the early part of the pallid bat breeding season. There is a small potential for an additive effect from vehicle fluids from wheeled vehicles used to access firewood and Christmas trees, as well as from the use of wheeled vehicles during the overlap season between OSVs and wheeled vehicles, to enter waterways, modifying pallid bat prey/food base. However, the risk for this impact is low because vehicle use does not occur in waterways and fluids would not normally reach waterways.

In general, most non-motorized winter recreation occurs along designated trails, and pallid bats would either avoid roosting in those areas, if too great a disturbance, or become habituate to the noise. Similar activities on state and private lands that make up about 20 percent of the area within the Forest boundary may impact habitat availability outside of NFS lands and may increase disturbance locally. However, the potential for this type of disturbance is unknown. In summary, ongoing and reasonably foreseeable actions may be additive locally to individual pallid bats, but are not expected to contribute substantial impacts to those discussed for the project under any of the alternatives.

Determination Statement

All alternatives of the Lassen National Forest Over-snow Vehicle Use Designation Project may impact individuals, but are not likely to lead to a loss of viability or a trend toward Federal listing for pallid bat in the project area based on the following:

- Proposed actions would not physically modify pallid bat habitat.
- Proposed actions would generally occur when the species is hibernating and is generally inactive. However, individuals that emerge to forage during warmer weather could experience missed feeding when snow grooming activities occur during the early evening.
- Depending upon the location of winter roost structures with respect to OSV use, individual bats within winter roosts could be disturbed by noise associated with OSVs and human presence and missed breeding attempts could result.
- The low risk of modification of the prey/food base from oil, gas, or other vehicle fluids entering waterways would be mitigated by the 12-inch minimum snow depth that would protect aquatic and riparian habitats from measurable impacts to vegetation or water quality.

Townsend's Big-eared Bat (*Corynorhinus townsendii*)

Regional Foresters Sensitive Species

Species Account

For most of its taxonomic history, the recognized generic name for this North American species was *Corynorhinus*. Beginning, however, with a taxonomic revision by Handley (1959 in Piaggio and Perkins 2005), it became known as *Plecotus*. Two recent phylogenetic studies have reviewed relationships among plecotine genera (Frost and Timm 1992, Tumlison and Douglas 1992), and have recommended resurrecting the generic name of *Corynorhinus* to distinguish the North American from the Palearctic forms. This change has been recognized by Simmons (2005).

There are five currently recognized subspecies of *C. townsendii* in the United States (Handley 1959 in Piaggio and Perkins 2005); two (*C. t. townsendii* and *C. t. pallescens*) in the western U.S., two (*C. t. ingens* and *C. t. virginianus)* in the eastern part of the country, and one (*C. t. australis*) with a primarily Mexican distribution, which overlaps with *C. t. pallescens* in western Texas. Only the two western subspecies are found in California (Piaggio et al. 2009).

C. t. townsendii occurs in California, Oregon, Washington, Nevada, Idaho, and possibly southwestern Montana and northwestern Utah. *C. t. pallescens* occurs in all the same states as *C. t. townsendii*, plus Arizona, Colorado, New Mexico, Texas, and Wyoming (Handley 1959 in Piaggio and Perkins 2005). Throughout much of their range in California, Idaho, Nevada, Oregon and Washington, there are extensive zones of intergradation for the two subspecies. Throughout the zone of intergradation, it is frequently impossible to assign individuals to one subspecies or the other. Handley (1959 in Piaggio and Perkins 2005) distinguishes the two subspecies based on size and color characteristics, but he also notes that the full spectrum of characteristics for both subspecies can be found within a single population. For the purposes of this document, we make no distinction between these subspecies.

In California, *C. townsendii* is found throughout much of the state, except for the Central Valley and very high elevations. The largest populations are concentrated in areas offering caves (commonly limestone or basaltic lava) or mines as roosting habitat. The species is found from sea level along the coast to 1,820 meters (6,000 feet) in the Sierra Nevada (Dalquest 1947, Pearson et al. 1952, Pierson and Rainey 1998). In the White Mountains, summer records for males extend up to 2,410 meters (7,900 feet), and hibernating groups have been found in mines as high as 3,188 meters (10,460 feet) (Szewczak et al. 1998). Maternity colonies are more frequently found below 2,000 meters (6,560 feet) (Pierson and Fellers 1998, Szewczak et al. 1998).

Outside California, *C. townsendii* has been found to 2,400 meters (7,900 feet) (Jones 1965) and 2,900 meters (9,500 feet) (Findley and Negus 1953).

There are historical and fairly recent (1997) records of Townsend’s big-eared bat near the Lassen National Forest as well as a documented maternity and hibernaculum in lava tubes on the Hat Creek Ranger District.

Habitat Status

C. townsendii occurs from the inland deserts to the cool, moist coastal redwood forests; in oak woodlands of the inner Coast Ranges and Sierra Nevada foothills; and lower- to mid-elevation mixed coniferous-deciduous forests. Distribution is patchy, and strongly correlated with the availability of caves and cave-like roosting habitat, with population centers occurring in areas dominated by exposed, cavity-forming rock and/or historic mining districts (Genter 1986, Graham 1966, Humphrey and Kunz 1976, Kunz and Martin 1982, Pierson and Rainey 1998). Its habit of roosting on open surfaces makes it readily detectable, and it is often the species most frequently observed (commonly in low numbers) in caves and abandoned mines throughout its range.

Roosting Habitat

C. townsendii prefers open surfaces of caves or cave-like structures, such as mines (vertical and horizontal) (Barbour and Davis 1969, Graham 1966, Humphrey and Kunz 1976). It has also has been reported in such structures as buildings, bridges, and water diversion tunnels that offer a cavernous environment (Barbour and Davis 1969, Dalquest 1947, Howell 1920, Kunz and Martin 1982, Pearson et al. 1952, Perkins and Levesque 1987, Brown et al. 1994, Pierson and Rainey 1998). Roosting structures often contain multiple openings. It seems to prefer dome-like areas, possibly where heat or cold is trapped (warm pockets for maternal roosting, cold pockets for hibernation). It has also been reported in rock crevices and large hollow trees (Fellers and Pierson 2002). The discovery of a maternity roost in a hollow redwood tree (Mazurek 2004) suggests that coastal populations may have historically relied on these structures.

Specific roosts may be used only one time of year or may serve many different functions throughout the year (i.e., maternal, hibernation, dispersal, bachelor, breeding, etc.). Roosting surfaces often occur in twilight conditions; however, some have been located very deep inside caves or mines. There is evidence that maternity colonies may use multiple sites for different stages (pregnancy, birthing, or rearing) (Pierson et al. 1991, Sherwin et al. 2000). Males remain solitary during the maternity season.

This species appears to have fairly restrictive roost requirements (Humphrey and Kunz 1976, Pierson et al. 1991). Roost temperature appears to be critical (Lacki et al. 1994, Pearson et al. 1952, Pierson and Rainey 1998). Temperatures vary in maternity roosts throughout California from 19 degrees C (66 degrees F) in cooler regions to 30 degrees C (86 degrees F) in warmer southern regions (Pierson et al. 1991). Some colonies are known to change roosts during the maternity season, using cooler roosts earlier in the year (Pierson et al. 1991) and using warmer roosts after pups are born. Roost dimensions are also important. The majority of the roosts examined in California are fairly spacious, at least 30 meters (100 feet) in length, with the roosting area located at least 2 meters (6 feet) above the ground, and a roost opening at least 15 centimeters by 62 centimeters (6 inches by 24 inches) (Pierson et al. 1991). Maternity clusters are always situated on open surfaces, often in roof pockets or along the walls just inside the roost entrance, within the twilight zone.

C. townsendii is very sensitive to human disturbance; however, in some instances it can habituate to reoccurring and predictable human activity.

Foraging Habitat

Foraging associations include edge habitats along streams and areas adjacent to and within a variety of wooded habitats (Brown et al. 1994, Fellers and Pierson 2002, Pierson et al. 2002). Recent radio-tracking and light-tagging studies have found *C. townsendii* foraging in a variety of habitats. Brown et al. (1994) showed that on Santa Cruz Island in California, they avoided the lush introduced vegetation near their day roost, and traveled up to 5 kilometers (3 miles) to feed in native oak and ironwood forest. Radio-tracking and light-tagging studies in northern California found *C. townsendii* foraging within forested habitat (Rainey and Pierson 1996). In Oklahoma, *C. t. ingens* preferred edge habitats (along intermittent streams) and open areas (pastures, agricultural fields, native grass) over wooded habitat (Clark et al. 1993). *C. townsendii* has been known to travel up to 24 kilometers (15 miles) from roost sites while foraging (Dobkin et al. 1995). They forage as long as weather permits in the fall, and are periodically active in winter (Pierson et al. 1991).

Although diet has not been examined in detail for any California populations, it is likely that *C. townsendii* here, as elsewhere, is a Lepidopteran specialist, feeding primarily (over 90 percent of the diet) on medium-sized (6 to 12 millimeter) (0.2 to 0.5 inch) moths (Dalton et al. 1986, Ross 1967, Sample and Whitmore 1993, Whitaker et al. 1977, 1981). Shoemaker and Lacki (1993) determined that *P. t. virginianus* differentially selected noctuid moths, with geometrids, notodontids, and sphingids also making up a significant portion of the diet. Representatives of the family Arctiidae constituted 37.5 percent of the available moth prey items, but were not consumed. Sample and Whitmore (1993) identified moth species from wing fragments collected at maternity caves. Of the 28 moth taxa identified, 15 were noctuids. Twenty-one species were forest-dwelling, and six were associated with open, field habitats. In addition to Lepidopterans, small quantities of other insects have been detected in the diet of *C. townsendii*, particularly Coleoptera and Diptera (Dalton et al. 1986, Ross 1967, Sample and Whitmore 1993). Hemiptera, Hymenoptera, Homoptera, Neuroptera, Trichoptera, and Plecoptera have also been found sporadically (Dalton et al. 1986, Whitaker et al. 1977).

Reproduction

C. townsendii is a colonial species with maternity aggregations forming between March and June (based on local climate and latitude). Colony size ranges from a few dozen to several hundred. Mating generally takes place in both migratory sites and hibernacula between September or October and February. Females are generally reproductive in their first year, whereas males do not reach sexual maturity until their second year. Gestation length varies with climatic conditions, but generally lasts from 56 to 100 days (Pearson et al. 1952). Some evidence shows that maternity colonies may have up to three different sites for given stages – one each for pregnancy, birthing, and rearing. A single pup is born between May and July (Easterla 1973, Pearson et al. 1952, Twente 1955). *C. townsendii* pups average 2.4 grams (0.1 ounce) at birth, nearly 25 percent of the mother's postpartum mass (Kunz and Martin 1982). Young bats are capable of flight at 2.5 to 3 weeks of age and are fully weaned at 6 weeks (Pearson et al. 1952). Nursery colonies start to disperse in August about the time the young are weaned, and break up altogether in September and October (Pearson et al. 1952, Tipton 1983). Pearson et al. (1952) estimated annual survivorship at about 50 percent for young, and about 80 percent for adults. Band recoveries have yielded longevity records of 16 years, 5 months (Paradiso and Greenhall 1967).

Migration/Hibernation

C. townsendii is a relatively sedentary species, for which no long-distance migrations have been reported (Barbour and Davis 1969, Humphrey and Kunz 1976, Pearson et al. 1952). The longest movement known for this species in California is 32.2 kilometers (20 miles) (Pearson et al. 1952). There is some evidence of local migration, perhaps along an altitudinal gradient.

Hibernation sites are generally caves or mines (Pearson et al. 1952, Barbour and Davis 1969), although animals are occasionally found in buildings (Dalquest 1947, E. Pierson pers. obs.,). Winter roosting is typically composed of mixed-sexed groups from a single individual to several hundred or several thousand, however, behavior varies with latitude. In areas with prolonged periods of non-freezing temperatures, *C. townsendii* tends to form relatively small hibernating aggregations of single to several dozen individuals (Barbour and Davis 1969, Pierson et al. 1991, Pierson and Rainey 1998). Larger aggregations (75 to 460) are confined to areas which experience prolonged periods of freezing temperatures (Pierson and Rainey 1998). Studies in the western United States have shown that *C. townsendii* selects winter roosts with stable, cold temperatures, and moderate air flow (Humphrey and Kunz 1976, Kunz and Martin 1982). Individuals roost on walls or ceilings, often near entrances (Humphrey and Kunz 1976, Twente 1955). Temperature appears to be a limiting factor in roost selection. Recorded temperatures in *C. townsendii* hibernacula range from minus 2.0 to 13.0 degrees C (28 to 55 degrees F) (Humphrey and Kunz 1976, Genter 1986, Pearson et al. 1952, Pierson et al. 1991, Twente 1955), with temperatures below 10 degrees C (50 degrees F) being preferred (Pierson and Rainey 1998). The period of hibernation is shorter at lower elevations and latitudes.

Threats

Surveys conducted by Pierson and Rainey (1996) show marked population declines for both subspecies in California. This species has been petitioned for listing as threatened or endangered status in the state. Over the past 40 years, there has been a 52 percent loss in the number of maternity colonies, a 45 percent decline in the number of available roosts, a 54 percent decline in the total number of animals, and a 33 percent decrease in the average size of remaining colonies for the species as a whole statewide. The status of particular populations is correlated with amount of disturbance to or loss of suitable roosting sites. The populations that have shown the most marked declines are along the coast, in the Mother Lode country of the western Sierra Nevada foothills, and along the Colorado River.

A comparison of former and current population estimates for 18 historically known maternity colonies shows that six colonies (33 percent) appear to be extirpated; six others (33 percent) have decreased in size; one (6 percent) has remained stable; and five (28 percent) (four of which are protected within national parks) have increased.

A comparison of colony size for historically and currently known colonies, indicates that mean colony size has decreased from 165 (n = 18) to 111 (n = 34). The median colony size has decreased from 100 to 75. There are currently 38 known maternity colonies, occupying 55 known roost sites, with an estimated total population of about 4,300 individuals. Only three of these colonies have adequately protected roost sites.

Hibernating *C. townsendii* have been found historically or during a recent survey (Pierson and Rainey 1998) at 44 sites (24 in mines, 19 in caves, one in a building). Most of these sites contain fewer than 20 individuals. Only three hibernating colonies number more than 100. The most significant aggregations (all those with over 100) occur in the northernmost part of the state, particularly Siskiyou County. In other areas, particularly the desert, smaller aggregations (5 to 20) are more typical. Four additional hibernating sites, not visited by Pierson and Rainey (1994) were located in 1979 (Marcot 1984), one of which contained 40 to 50 individuals.

Inappropriate behavior on the part of well-intentioned researchers and others (i.e., entry into maternity roosts, capture of animals in roosts) could also contribute to population declines.

The combination of restrictive roost requirements and sedentary behavior suggests that *C. townsendii* is roost limited, and that roost loss, through disturbance or destruction, has been primarily responsible for population declines in most areas. Although fire, winter storms, or general deterioration are sometimes responsible, in all but 2 of 39 documented cases, roost loss in California can be directly linked to human activity (e.g., demolition, renewed mining, entrance closure, human-induced fire, renovation, or roost disturbance). Population declines are most highly correlated with roost destruction in the San Francisco Bay area, along the northern coast, and in San Diego County, and with roost disturbance in the Mother Lode country and along the Colorado River.

Anthropogenic Roosts

Although *C. townsendii* is often found using human-made structures, such as barns, large houses, historic buildings, and bridges, they are very sensitive to disturbance, and will readily abandon a day roost, particularly a maternity roost, if disturbed. Bats are often not tolerated in historic structures, even those that are not open to the public, due to concerns over damage to the historic fabric of a building, so even a rare species such as *C. townsendii*, one that forms relatively small colonies, is subject to permanent loss of critical roost habitat. Because *C. townsendii* is a large cavity-roosting species, and not a crevice-roosting species, they will not use bat houses as replacement habitat, so loss of structure roosts is highly significant for this species.

The tendency for *C. townsendii* to roost in visible clusters on open surfaces, near roost entrances, makes them highly vulnerable to negative human interactions. Inadequate management policies on public lands can lead to roost destruction. Of the 20 largest currently known colonies in California, 13 are on public lands. While the National Park Service and California Department of Parks and Recreation have made substantial commitments to protecting known roosts in some parks, they have failed to provide adequate protection in others. Other agencies have been less willing to recognize the biological significance of cave and mine roosts, often against the advice of their own biologists.

Caves

Maternity colonies are impacted by inappropriate cave closures or disturbance during human visitation.

The increasing and intense recreational use of caves in California provides the most likely explanation for why most otherwise suitable, historically significant roosts are currently unoccupied. It is well documented that *C. townsendii* is so sensitive to human disturbance that simple entry into a maternity roost can cause a colony to abandon or move to an alternate roost (Pearson et al. 1952; Graham 1966; Stebbings 1966; Mohr 1972; Humphrey and Kunz 1976; Stihler and Hall 1993).

While the National Park Service has made substantial commitments to protecting known roosts in some parks, other agencies have been less willing to recognize the biological significance of cave and mine roosts, often against the advice of their own biologists

Forest Management

This issue is restricted to commercially harvested areas of the state, particularly eastern and northern California. Large hollow redwood and sequoia offer cave-like structures for maternal roosting. Other conifer and hardwood snags offer male roosting sites. Harvested areas can also affect riparian edge habitats for foraging. Harvesting may alter microclimates around caves and mines, possibly rendering them uninhabitable.

Forest management activities, particularly timber harvest and spraying that kills non-target Lepidopteran species, may alter the prey base for *C. townsendii*. Perkins and Schommer (1991) suggest that *Bacillus thuringiensis* sprays may suppress Tussock moth and spruce budworm reproduction enough to suppress reproduction in resident *C. townsendii*.

Mines

Maternity colonies are impacted by renewed mining activities, inappropriate mine closures, and disturbance during human visitation.

Old mines are significant roosting habitat for a number of bat species, particularly *C. townsendii* (Altenbach and Pierson 1995). The intense recreational use of mines in California provides the most likely explanation for why most otherwise suitable, historically significant roosts are currently unoccupied. It is well documented that *C. townsendii* is so sensitive to human disturbance that simple entry into a maternity roost can cause a colony to abandon or move to an alternate roost (Pearson et al. 1952; Graham 1966; Stebbings 1966; Mohr 1972; Humphrey and Kunz 1976; Stihler and Hall 1993). Liability and safety concerns have led to extensive mine closure programs in western states, particularly on public lands, often without consideration for the biological values of old mines. If non-bat compatible closures (backfilling or blasting) are done without prior biological survey or if surveys are conducted at the wrong time of year (Altenbach 1995, Navo 1995, Rainey 1995), they can result in the entrapment, and thus, elimination of entire colonies. Even if the bats are excluded prior to hard closure, they may be unable to find suitable replacement habitat.

The resurgence of gold mining in the West could threaten cave-dwelling bat species (Brown and Berry 1991, Brown et al. 1995). Since open pits, created by current mining practices, are often located in historic mining districts, old mine workings are frequently demolished as part of the ore extraction process. While effective mitigation is possible (Pierson 1989, Pierson et al. 1991), there is currently no legal mandate requiring that existing populations be protected.

Additionally, process water containing cyanide has caused substantial wildlife mortality at a number of mine sites in the West. Although one study found that bats constitute 33.7 percent of documented wildlife fatalities (Clark and Hothem 1991), they frequently are not considered in assessment of cyanide risks (Nevada Mining Assoc. et al. 1990). Similarly, process residues in open oil sumps are another significant source of wildlife mortality (Flickinger and Bunck 1987, Esmoil and Anderson 1995).

Transportation

Bridge modifications could also impact *C. townsendii* colonies. The mandate for earthquake retrofitting on bridges could either disturb active roosts or render roost sites unsuitable. A number of older bridges are being removed and replaced with those that have bat-unfriendly designs. There is a potential loss of riparian habitat for foraging where bridges are constructed.

Rangeland Management

The presence of livestock can severely reduce ground and shrub cover (when not managed properly), which can lead to a reduction in prey species abundance. Many species of bats do benefit from properly designed water impoundments as a drinking source.

Although the effects of grazing have not been specifically addressed for this species, a radio-tracking study at Point Reyes National Seashore indicated that telemetered bats avoided grazed pastureland (E. Pierson pers. obs.).

Direct and Indirect Effects

OSV use on the Lassen National Forest would not change the habitat for Townsend’s big-eared bat, as no habitat modifications are anticipated

Very little is known about Townsend’s big-eared bats’ wintering behavior. Some limited migration to lower elevation may occur. However, if Townsend’s big-eared bats remain on the landscape in winter, there is a low likelihood that their behavior could be modified by the noise or disruption associated with OSV use or grooming of OSV trails. This would be entirely dependent on the location of the winter roost in proximity to a bridge, building, cavity, mine or tree. Since there are no known winter roosts on the Lassen, no reduction of noise can be mitigated should there be a noise impact from OSV. Should OSV activities have a temporary disturbance, breeding could be impacted; however, it would not preclude breeding at a later time. There should be no impact to the maternal roosts, as they would start in April or May, following snowmelt.

Townsend’s big-eared bats forage in riparian areas and meadows outside of the hibernation period. Emissions from OSVs, particularly two-stroke engines on snowmobiles, release pollutants like ammonium, sulfate, benzene, PAHs and other toxic compounds that are stored in the snowpack; during spring snowmelt runoff, these accumulated pollutants are released and may be delivered to surrounding waterbodies (USFS National Core BMP Rec-7: Over-Snow Vehicle Use; please refer to the project hydrology report (project record) for additional information). However, the minimum cross-country snow depth of 12 inches under alternatives 2, 3, and 5 is expected to be adequate to protect aquatic and riparian habitats from measurable impacts to vegetation or water quality (McNamara 2016). Under alternatives 1 and 4, the minimum cross-country snow depth would be that depth necessary to avoid resource damage.

Cumulative Effects

Based upon spatial data provided by the Lassen National Forest, past, present, and foreseeable future actions that could result in a cumulative impact to Townsend's big-eared bats, when combined with alternatives 1, 2, 3, 4 or 5, include vegetation management projects, fire salvage projects, firewood cutting, Christmas tree cutting, non-motorized winter recreational activities, or use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. Vegetation management and salvage projects identified above are very small in comparison to the OSV Use Designation action area and/or do not overlap with groomed and non-groomed OSV trails or staging areas where the highest OSV use occurs. However, seasonal limited operating periods required for raptor species for vegetation projects to prevent disturbance to known nest sites could also reduce disturbance to breeding bats. Vegetation and fuels management activities in recent years have included primarily thinned, masticated, and/or burned vegetation to reduce the potential for catastrophic wildfires

Townsend's big-eared bat habitat also overlaps with areas open to Christmas tree cutting and firewood cutting. However, wheeled motorized vehicles may not be used off of authorized NFS roads or motorized trails to scout for fuelwood or to harvest Christmas trees (USDA Forest Service 2014), there would be minimal overlap between the Christmas tree and firewood cutting season (annually between November 1and December 31) and OSV trail grooming season (beginning December 26), minimizing the potential for disturbance or displacement of roosting bats from this activity. Use of roads within Townsend's big-eared bat habitats after the March 31 termination date of the forest order closing roads for exclusive OSV use can contribute additional disturbance during the early part of the Townsend's big-eared bat breeding season. There is a small potential for an additive effect from vehicle fluids from wheeled vehicles used to access firewood and Christmas trees, as well as from the use of wheeled vehicles during the overlap season between OSVs and wheeled vehicles, to enter waterways, modifying Townsend's big-eared bat prey base. However, the risk for this impact is low because vehicle use does not occur in waterways, and fluids would not normally reach waterways.

In general, most non-motorized winter recreation occurs along designated trails, and individual bats would either avoid roosting in those areas, if too great a disturbance, or habituate to the noise. Similar activities on State and private lands that make up about 20 percent of the area within the forest boundary may impact habitat availability outside of NFS lands and may increase disturbance locally. However, the potential for this type of disturbance is unknown. In summary, ongoing and reasonably foreseeable actions may be additive locally to individual bats, but are not expected to contribute substantial impacts to those discussed for the project under any of the alternatives.

Determination Statement

All alternatives of the Lassen National Forest Over-snow Vehicle Use Designation Project may impact individuals, but are not likely to lead to a loss of viability or a trend toward Federal listing for Townsend's big-eared bat in the project area based on the following:

- Proposed actions would not physically modify Townsend's big-eared bat habitat.
- Proposed actions would generally occur when the species is hibernating and is generally inactive.
- Depending upon the location of winter roost structures with respect to OSV use, individual bats within winter roosts could be disturbed by noise associated with OSVs and human presence and missed breeding attempts could result.

- The low risk of modification of the prey/food base from oil, gas, or other vehicle fluids entering waterways would be mitigated by the 12-inch minimum snow depth that would protect aquatic and riparian habitats from measurable impacts to vegetation or water quality.

Species that Utilize Riparian or Wetland Habitats

Bald Eagle (*Haliaeetus leucocephalus*)

Regional Foresters Sensitive Species

Species Account

The bald eagle, (*Haliaeetus leucocephalus*), was federally de-listed on August 8, 2007 (Federal Registrar Vol. 72, No. 130, pp. 37346-37372) and then placed on the USDA Forest Service Region 5 Regional Forester's sensitive species list.

Bald eagles occur throughout most of North America and have undergone large population fluctuations during the past two centuries (Murphy and Knopp 2000, USDA Forest Service 2001). This species occurs and winters throughout California, except in desert areas. Migratory individuals from northern and northeastern parts of the State arrive between mid-October and December, and remain until March or early April. Most bald eagle breeding in California occurs in the northern counties (Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity Counties), typically at low elevations; breeding in the high Sierra Nevada is rare (USDA Forest Service 2001).

Lassen National Forest has some of the most productive bald eagle breeding habitat in California (USDA Forest Service 2010). Based upon the best available data, 33 breeding territories currently exist within Lassen National Forest boundary.

Habitat Status

Bald eagles winter throughout California near lakes, reservoirs, riverine, and marsh habitats. They breed mainly in the northern portion of the state near coastlines, rivers, large lakes or streams that support an adequate food supply. They often nest in mature or old-growth trees; snags (dead trees); cliffs; rock promontories; rarely on the ground; and with increasing frequency on human-made structures such as power poles and communication towers. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that can weigh more than 1,000 pounds; nest sites typically include at least one perch with a clear view of the water where the eagles usually forage (USDI Fish and Wildlife Service 2007). Egg-laying dates vary throughout the United States. On the Lassen National Forest, bald eagles initiate breeding in January. Incubation begins in late February to mid-March with the nesting period extending as late as the end of June (USDA Forest Service 2010).

Bald eagles require open water with juxtaposed mature trees or steep cliffs for nesting, perching, foraging, and roosting. This species typically perches in "large, robustly limbed trees, on snags, on broken topped trees, or on rocks near water" (Peterson 1986). Perches function as resting, preening, foraging, and feeding sites.

Roost trees are perches where one or more bald eagles rest at night and may occur long distances from open waterbodies. Roost trees are similar in structure compared to perch trees; "dominant trees that have open and robust branches, are sometimes defoliated (i.e., snags), are protected from prevailing winds, and are typically far from human development" (Anthony et al. 1982 in Murphy and Knopp 2000).

Bald eagles are usually monogamous and pair for life, though repairing may occur if either of the pair dies. The mating season varies by latitude. Pair initiation begins in January and egg-laying occurs in early May. Incubation lasts for approximately 35 days, and hatching occurs in mid-June. Both parents provide care for the nestlings for approximately 10 to 12 weeks. Juveniles fledge in late August and exhibit nest site dependency for 4 to 11 weeks following the first flight. Bald eagles require 4 to 5 years to reach sexual maturity and full adult plumage. Dispersal distances can be substantial; this species often disperses several hundred miles from the natal site. Females tend to disperse farther than males. Breeding home ranges vary substantially by location from 58 acres in Alaska to 5 acres in Arizona. Migration distances of up to 1,712 miles have been recorded. Fidelity to wintering grounds is strong (summarized in USDA Forest Service 2001).

Nest trees are "typically established in large, dominant live trees with open branch work and are often located within 1.6 km [0.96 miles] of open water" (Murphy and Knopp 2000). Nest trees must be sturdy to support the large, heavy stick nests built by this species at or just below the tree canopy (Ibid). Nests are located most frequently in stands with less than 40 percent canopy cover (Call 1978 in Murphy and Knopp 2000).

The following CWHR classes provide high capability nesting habitat for this species: Eastside Pine (5S, 5P, and 5D), Sierran Mixed Conifer (5S, 5P, 5D, and 6), and White Fir (5S, 5P, 5D, and 6). Moderate capability nesting habitats include Sierran Mixed Conifer (all strata in size classes 1 through 3) and White Fir (all strata in size classes 1 through 3). As bald eagles are known to use the Jeffrey Pine vegetation type for nesting in the Lake Tahoe basin, despite the CWHR model prediction that this vegetation type would normally provide low nesting capability for this species, the Jeffrey Pine vegetation type will be considered high capability (5S, 5P, and 6) and moderate capability (4S, 4P, and 4D) nesting habitat for the purposes of this analysis. Moderate and high capability nesting habitat is located within 1.0 mile of open water as described above. Within CWHR, size class 6 is only recognized for a subset of the forest vegetation types (Jeffrey Pine, Montane Riparian, Sierran Mixed Conifer, and White Fir).

The following CWHR classes provide high capability perching habitat for this species: Eastside Pine (5S, 5P, 5M, and 5D), Sierran Mixed Conifer (5S, 5P, and 5M), and White Fir (5S, 5P, and 5M). Moderate capability perching habitats include Eastside Pine (4S, 4P, and 4M), Juniper (5S, 5P, and 5M), Montane Hardwood (5S, 5P, and 5M), Montane Hardwood-Conifer (5S, 5P, and 5M), Sierran Mixed Conifer (all strata in size classes 1 through 3; and 5D and 6), and White Fir (all strata in size classes 1 through 3; and 5D and 6).

The following CWHR classes provide high capability foraging habitat for this species: Lacustrine (all strata except size class 3), Riverine (all strata except size class 3), Sierran Mixed Conifer (5S, 5P, and 5M), and White Fir (5S, 5P, and 5M). Moderate capability foraging habitats include Eastside Pine (all strata except 2D, 3D, 4D, and 5D), Fresh Emergent Wetland (all strata), Juniper (all strata except 2D, 3D, 4D, and 5D), Montane Hardwood (all except 5D), Montane Hardwood-Conifer (all except 5D and 6), Montane Riparian (all strata except 2D, 3D, 4D, 5D, and 6), Sierran Mixed Conifer (all strata except 5S, 5P, and 5M), Wet Meadow (all strata), and White Fir (all strata except 5S, 5P, and 5M).

There are 1,239 acres of nest sites buffered by 660 feet[27] (map BE-61) and 26,668 acres of bald eagle reproductive habitat[28] (map BE-66) on NFS lands within the Lassen National Forest boundary.

Threats

The Recovery Plan for the Pacific Bald Eagle (USDI Fish and Wildlife Service 1986) states that the main threats to this species in Sierra Nevada Mountains (Zone 28) are disturbance at wintering grounds and loss of potential nesting habitat to logging or development. The Plan's proposed management directions are maintenance of winter habitat and evaluation of potential reintroduction/expansion of 'breeders.' The most urgent site-specific task (1.3211) identified for the Forest Service in the Sierra Nevada Mountains is to prohibit logging of known nest, perch, or winter roost trees (USDI Fish and Wildlife Service 1986).

Bald eagles are also sensitive to human or recreation disturbance. Numerous studies have reported that eagles avoid or are adversely affected by human disturbance during the breeding period, which may result in nest abandonment and reproductive failure (Stalmaster and Newman 1978, Andrew and Mosher 1982, Fraser et al. 1985, Knight and Skagen 1988, Buehler et al. 1991, Grubb and King 1991, Chandler et al. 1995). The response of bald eagles to human activities is variable. Individual bald eagles show different thresholds of tolerance for disturbance. This variability may be related to a number of factors, including visibility, duration, noise levels, extent of the area affected by the activity, prior experiences with humans, and tolerance of the individual nesting pair (USDI Fish and Wildlife Service 2007). Forested habitats can mute noise generated by vehicles and screen the vehicle from sight. Disturbance effects are greatest during nest building, courtship, egg laying, and incubation. However, disruption, destruction, or obstruction of roosting and foraging areas can also negatively affect bald eagles. Disruptive activities in or near eagle foraging areas can interfere with feeding, reducing chances of survival or productivity (number of young successfully fledged). Migrating and wintering bald eagles often congregate at specific sites, usually in mature trees where the eagles are somewhat sheltered from the wind and weather, for purposes of feeding and sheltering because of their proximity to sufficient food sources. Human activities near or within communal roost sites may prevent eagles from feeding or taking shelter, especially if no other undisturbed and productive feeding and roosting sites are available.

In Washington, bald eagles have been found to be adversely affected by recreation that involves both pedestrian traffic and boat use by adversely affecting feeding activity (Stalmaster and Kaiser 1998). Stalmaster and Newman (1978) found that wintering bald eagles were adversely affected by human disturbance and distribution patterns were significantly changed by human activity. Eagles were displaced in areas of high human activity and moved to areas of lower human activity. Flush distances were lower when the disturbance was on land than in the water and lower still if the eagle couldn't see the cause of the disturbance. Knight and Knight (1984) found that bald eagles became habituated to canoes in areas where they were common.

Additional studies indicate that animals, including bald eagles, infrequently demonstrated active responses to OSVs and associated human presence (USDI National Park Service 2013). In a study based on approximately 5,688 interactions[29] over four winters between groups of wildlife and groups of snowmobiles and/or snowcoaches, White et al. (2009) found the following observed responses of

[27] 660 foot nest site buffers based on USDI Fish and Wildlife Service (2007)

[28] Ponderosa pine [CWHR (2014) types 5S, 5P, 5M, 5D)] and Sierran mixed conifer and white fir [CWHR (2014) types 5S, 5P, 5M, 5D, and 6)] within 1 mile of waterbodies and major rivers. Buffered nest sites are not included in total to prevent double counting with nest site analysis.

[29] An interaction sampling unit was defined as the interaction between a group of OSVs and associated humans and a group of bison or elk within 1,500 feet (500 meters) of the road.

bald eagles to OSV use: no apparent response (17 percent), look-resume (64 percent), alert (9 percent), travel (4 percent), flight (6 percent), and defensive (0 percent). Based on these findings, it would appear that eagles have become desensitized to OSV use and other human disturbance in the park during winter to some extent (USDI National Park Service 2013).

White et al. (2009) also assessed the relationship between wildlife behavioral responses and factors including wildlife group size or distance from road, interaction time, group size of snowmobiles or snowcoaches, type of habitat, and cumulative winter OSV traffic. For bison, elk, swans, and bald eagles, the odds of a movement response (travel, flight) decreased with increasing distance of the animals from the road.

National Bald Eagle Management Guidelines (USDI Fish and Wildlife Service 2007) include a buffer of 100 meters (330 feet) for off-road vehicle use, including snowmobiles, in forested landscapes and/or variable terrain, and 200 meters (660 feet) in open landscapes where line of sight to nest trees may be a concern.

Direct and Indirect Effects

Resource indicators and measures (FSH 1909.15, 12.5) used in this analysis to measure and disclose effects to bald eagle are listed in table 166.

Table 166. Resource indicators and measures for assessing effects to bald eagles

Resource Indicator and Effect	Measure (Quantify if possible)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Potential for disturbance to individuals from noise and increased human presence, injury or mortality of individuals	Acres and percentage of reproductive habitat impacted by OSV use	7,962 (30%)	7,366 (28%)	7,087 (27%)	7,904 (30%)	6,475 (24%)
Potential for disturbance to individuals from OSV use and increased human presence, injury or mortality of individuals	Acres and percentage of buffered bald eagle nests impacted by OSV use	741 (63%)	663 (54%)	454 (37%)	694 (56%)	137 (11%)

The Lassen National Forest currently has 26,668 total acres of high-value reproductive habitat (map BE-61) and 1,239 acres of bald eagle nest trees on NFS lands buffered by 660 feet (map BE-66).

The majority of associated risk factors within wetland and riparian habitats apply to roads and trails and primarily include the following direct effects (Gaines et al. 2003): site disturbance and potential for injury or mortality to individuals from vehicle collisions. Site disturbance includes (1) Displacement or avoidance by populations or individual animals away from human activities; and (2) Disturbance and displacement of individuals from breeding or rearing habitats. Potential for injury or mortality to individuals from vehicle collision: The likelihood of a collision between snow grooming equipment and bald eagles is extremely low because the equipment travels slowly (3 to 6 mph) and snow grooming occurs at night, when eagles are roosting. There is an increased likelihood of collision with OSVs due to higher frequency of OSV use and higher speeds, but the potential is still very low. OSV proposed actions would not physically modify any suitable bald eagle habitat within the project area.

Comparison of the Alternatives

Table 167 and table 168 show and compare, by alternative, the amount of buffered bald eagle nest sites and reproductive habitat, respectively, with the potential for direct and indirect effects (disturbance, injury, or mortality) from OSV use and related activities.

Ninety-five percent of eagle nest sites buffered by 660 feet are currently open to OSV use (alternative 1). However, 63 percent are currently open to OSV use and of moderate to high OSV use, based on slope and stand density (map BE-61). Similarly, 83 percent of reproductive habitat is currently open to OSV use, but 30 percent is currently open to OSV use and of moderate to high OSV use (map BE-66). The potential for OSV-related impacts to bald eagle, including noise-based disturbance or injury/mortality, would be most likely to occur in those areas of moderate to high OSV use. In addition, of the 60 percent of buffered activity centers and the 30 percent of reproductive habitat currently open to and of moderate to high OSV use, approximately only 3 percent and 51 percent, respectively, overlap moderate and high use areas based on trail proximity, so the majority of OSV use occurs within in an even smaller percentage of each of those habitats. This is similar for the remaining alternatives where nest buffer overlap with moderate to high use trail proximity areas ranges from 1 to 4 percent, and for reproduction habitat overlap, ranges from 44 to 51 percent. No nest sites are located within high OSV-use areas and only 4 nest sites are located within 1.5 miles of designated OSV trails, where moderate use would be expected to occur. The Fish and Wildlife Service (2007) recommended nest buffer for off-road vehicle use to prevent impacts to nesting bald eagles is 660 feet. Therefore, bald eagle nest sites are not expected to be impacted under the current condition. In addition, bald eagles and their habitat are subject to the Bald Eagle Protection Act of 1940 that prohibits disturbance to bald eagles that results in injury, a decrease in productivity, or nest abandonment. The Forest Service would use the results of ongoing inventory and monitoring of bald eagle nest sites to determine whether or not disturbance is occurring and if changes in management are necessary.

Table 167. Acres of bald eagle nest sites, buffered by 660 feet, with potential to be impacted by OSV use and related activities, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	1,175	1,076	695	1,108	271
Not Designated for OSV use	64	163	544	131	968
OSV use restricted to trails	NA	NA	0	NA	0
Total	1,239 acres				
Designated for OSV use and of moderate to high OSV use (percent of total buffered area)	741 (63.1%)	663 (53.5%)	454 (36.6%)	694 (56.0%)	137 (11.1%)
Not Designated for OSV use and of moderate to high OSV use	48	126	335	95	652
Moderate to high OSV use and OSV use restricted to trails	NA	NA	0	NA	0
Total	789 acres				

Under alternative 2, the percentage of buffered eagle nests and bald eagle reproductive habitat with the potential to be impacted by OSV use is slightly less than the existing condition at 28 percent (map BE-62) and 54 percent (map BE-67), respectively. Under alternative 3, the percentage of buffered eagle nests and bald eagle reproductive habitat with the potential to be impacted by OSV use is slightly less than alternative 2 at 27 percent (map BE-55) but the percentage of buffered nest sites with the potential to be impacted by OSV use (map BE-63) is notably less at 37 percent (map BE-68). Under alternative 4, amounts of buffered eagle nest sites (map BE-64) and reproductive habitat (map BE-69) are less than alternative 1, but more than alternatives 2, 3, and 5. Under alternative 5, the percentage of reproductive habitat with the potential to be impacted by OSV use is similar to the other alternatives (24 percent; map BE-70), but the percentage of buffered nest sites with the potential to be impacted by OSV use under alternative 5 would be substantially less than the other alternatives (11 percent; map BE-65) because areas under 3,500 feet would not be designated for OSV use. Under alternatives 2 and 3, only two eagle nest sites would be located within OSV moderate use areas. However, like alternative 1, no bald eagle nest sites are within 660 feet of high or moderate OSV use areas under alternatives 2, 3, 4, or 5 and, therefore, no disturbance impacts to breeding bald eagles are expected under any of the alternatives.

Table 168. Acres of high-value bald eagle reproductive habitat with potential to be impacted by OSV use and related activities, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	22,049	21,016	19,989	21,765	16,517
Not Designated for OSV use	4,619	5,652	6,679	4,093	10,151
OSV use restricted to trails	NA	NA	1	NA	1
Total	26,668 acres				
Designated for OSV use and of moderate to high OSV use (percent of total habitat)	7,962 (29.9%)	7,366 (27.6%)	7,087 (26.6%)	7,904 (29.6%)	6,475 (24.3%)
Not Designated for OSV use and of moderate to high OSV use	1,588	2,184	2,463	1,646	3,075
Moderate to high OSV use and OSV use restricted to trails	NA	NA	1	NA	1
Total	9,550 acres				

Cumulative Effects

Based upon spatial data provided by the Lassen National Forest, past, present, and foreseeable future actions that could result in a cumulative impact to bald eagles, when combined with alternative 1, 2, 3, 4, or 5, include firewood cutting, Christmas tree cutting, non-motorized winter recreational activities, or use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. Bald eagle habitat overlaps with areas open to Christmas tree cutting and firewood cutting. However, wheeled motorized vehicles may not be used off of authorized NFS roads or motorized trails to scout for fuelwood or to harvest Christmas trees (USDA Forest Service 2014), there would be minimal overlap between the Christmas tree and firewood cutting season (annually between November 1 and December 31) and OSV trail grooming season (beginning December 26), and disturbance or displacement from this activity would occur outside of the bald eagle breeding season under alternatives 1, 2, 3, and 5. Under alternative 4, in which trail grooming would begin at the discretion of the groomer, there is the potential for a somewhat larger degree of overlap during years in which heavy snowfall begins early. Use of roads within bald eagle habitats after the

March 31 termination date of the forest order closing roads for exclusive OSV use can contribute additional disturbance during the early part of the bald eagle breeding season, particularly for nests within 0.25 mile of roads. In general, most non-motorized winter recreation occurs along designated trails, where birds would either avoid the area, if too great an impact, or habituate to the noise. Similar activities on State and private lands within the forest boundary and within one-quarter mile of bald eagle nests may impact habitat outside of NFS lands and may increase disturbance locally. However, the potential for this type of disturbance is unknown; State and privately held lands make up about 20 percent of the area within the forest boundary. In summary, ongoing and reasonably foreseeable actions may locally increase the potential for disturbance to or displacement of bald eagles, but are not expected to contribute substantial impacts to those discussed for the project under any of the alternatives

Determination Statement

Alternatives 1, 2, 3, 4, and 5 of the Lassen National Forest Over-snow Vehicle Use Designation Project may affect individuals, but are not likely to lead to a loss of viability or a trend toward Federal listing for bald eagle in the project area for the following reasons:

- OSV proposed actions would not physically modify the structure or composition of suitable bald eagle habitat within the project area.
- Although the potential for noise-based disturbance to individuals within high-reproductive habitat ranges from 24 to 30 percent under all of the alternatives, the forest would use the results of ongoing inventory and monitoring of bald eagle nest sites to determine whether or not disturbance is occurring and if changes in management are necessary, thereby minimizing impacts to bald eagle.
- Although 11 percent of buffered bald eagle nests under alternative 5, 37 percent under alternative 3, and 54 to 63 percent under alternatives 1, 2, and 4 are within designated OSV use areas, no bald eagle nest sites are within 660 feet of high OSV use areas under any of the alternatives and, therefore, no disturbance impacts to breeding bald eagles are expected.
- The potential for injury or mortality from OSV collision with individual bald eagles is very low under all of the alternatives.

Great Gray Owl (*Strix nebulosa*)

Regional Foresters Sensitive Species

Species Account

The primarily nocturnal great gray owl is a Forest Service sensitive species. The great gray owl population estimate for California is fewer than 300 individuals (Wu et al. 2015). The present known population is centered in and adjacent to Yosemite National Park. Nesting activity on the Stanislaus National Forest has been documented at five distinct locations. There have also been several recent sightings on the Sierra National Forest, including a successful nest site in 2002. Recent sightings of great gray owls have also been recorded in or near Modoc, Plumas, Tahoe, Eldorado, and Toiyabe National Forests, as well as privately owned lands adjacent to the Lassen National Forest.

Sightings have been reported on the Lassen National Forest. However, to date none have been confirmed and recorded. Since 1996, there have been 15 survey efforts on various meadow/forest areas which are potential suitable habitat for the great gray owl. Additional surveys were conducted by California Department of Fish and Game in 2008. There have been no positive detections from these survey efforts.

Habitat Status

As described by Beck and Winter (2000), great gray owl (*Strix nebulosa*) require mid- or late-succession conifer forests at size class 4 (dominant and co-dominant trees 12 to 23 inches), containing large (over 24 inches dbh), broken-top snags in the forest matrix in sufficient numbers (5 to 6 snags per acre) to provide nest sites. These sites are typically red and/or white firs vegetation types; however, old and decadent black oaks have been used for nesting at lower elevations. More recently, Wu et al. (2015) characterized habitat at known nesting sites and found that 30 percent of nests were in oak trees and 21 percent were below 1,000 meters (3,281 feet), which loosely corresponds to the lower conifer-zone limit. Across all elevations and tree species, degree of deterioration was the most important factor with nest trees being significantly more decayed than paired reference trees in the same meadow.

Located suitable nest sites located were near (less than 440 yards or approximately 400 meters) montane meadows between 2,000 and 8,000 feet in elevation. Forest canopy closures are greater than 60 percent in at least some portion of the forest stands adjacent to meadows or other natural or managed herbaceous openings (i.e., patch cut regenerated forest). Foraging areas include meadows and openings that have sufficient herbaceous cover to support pocket gophers and microtine rodents (i.e., meadow voles); pocket gophers and meadow voles are believed to comprise the majority of the owl's diet (Kalinowski et al. 2014). Meadows or portions of meadows, with standing water remaining at mid-summer, are not suitable because they would be void of these prey rodents. Potential territories include meadows which total 10 acres or more in size adjacent to these mature closed canopy forest stands (Beck and Winter 2000). Van Riper et al. (2013) found that human recreational activities seem to have a negative influence on great gray owl distribution in Yosemite National Park, particularly in remote natural areas of the park, largely avoiding those areas where people are present; in the park, owls primarily use meadows with lower levels of human activity. Loss of mature forest habitat for nesting and the degradation of montane meadows remain the major sources of habitat loss.

Potentially suitable habitat for the great gray owl is scattered across the Lassen National Forest. Most habitats meeting the above description occur on the southwestern side of the forest south and west of Lassen Volcanic National Park. Given that there have been no great gray owls confirmed breeding on the Lassen National Forest, to date, there have been no protected activity centers established. There are 86,745 acres of great gray owl high-value reproductive habitat[30] on NFS lands within the project area (table 170, page 548; map BE-71).

Direct and Indirect Effects

Resource indicators and measures (FSH 1909.15, 12.5) used in this analysis to measure and disclose effects to great gray owl are listed in table 169.

[30] Areas < 440 yards (~ 400 m) to montane meadows >10 acres in size and between 2,000 and 8,000 feet in elevation with forest canopy closures >60% [CWHR (2014) closure class "D")] in at least some portion of the forest stands adjacent to meadows; habitat query includes adjacent meadows that are foraging habitat.

Table 169. Resource indicators and measures for assessing effects to great gray owl

Resource Indicator and Effect	Measure (Quantify if possible)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Potential for disturbance to individuals from noise and increased human presence, injury or mortality of individuals, or habitat modification	Acres and percentage of high-reproductive habitat impacted by OSV use	32,228 (37%)	31,456 (36%)	29,852 (34%)	31,805 (37%)	26,998 (31%)

The majority of associated risk factors within wetland and riparian habitats apply to roads and trails and primarily include the following potential direct effects (Gaines et al. 2003): site disturbance and potential for injury or mortality to individuals from vehicle collisions. Site disturbance includes (1) Displacement or avoidance by populations or individual animals away from human activities; and (2) Disturbance and displacement of individuals from breeding or rearing habitats.

In addition, Gaines et al. (2003) found an interaction that occurred on winter recreation trails was the indirect effect of snow compaction on the subnivean sites used by small mammals in which small mammals can either be suffocated as a result of the compaction, or their subnivean movements can be altered owing to impenetrable compact snow. Adverse effects to subnivean animals could indirectly affect the prey base for many Forest Service sensitive species, including great gray owl, should it be present.

Although great gray owls have not been confirmed on the Lassen National Forest, they have been observed nearby, and, over time, could be affected by Forest OSV activities. Snowplay in meadows may prevent great gray owl use in or adjacent to those meadows. Like the other raptor species under consideration in this analysis, potential noise-based disturbance to breeding individuals is the primary concern. If great gray owls are present on the Lassen National Forest, the potential for disturbance to breeding individuals would be limited to the early portion of the March 1 through August 15 great gray owl breeding season that overlaps with the OSV use season.

Owls are nocturnal, whereas the majority of OSV use and associated activities on the Lassen National Forest, with the exception of trail grooming, occur during the daytime, so the potential for collisions of OSVs with great gray owls, should they be present, would be negligible and foraging behavior would generally not be interrupted.

Potential effects of noise disturbance would be the same as those noted due to OSV use. In addition, trail grooming and night riding could disturb owls that forage at night. Trails are generally located away from meadows, but the passage of a trail grooming machine on a trail adjacent to or nearby a meadow, may interrupt owl foraging, result in owl prey taking refuge, or cause owls to redirect their foraging away from that particular area. However, due to the limited frequency[31] and duration of trail grooming at any trail segment location, noise disturbance from trail grooming would probably not

[31] Grooming operations at most trail systems currently operate near a maximum level. Trails are prioritized for grooming based on visitor use. Grooming on priority trails occurs several times per week and after significant storms. The total hours of trail grooming occurring expected at each site for an average season vary from 94 annual snowcat hours at Swain Mountain to 680 hours at Bogard and Fredonyer on the Lassen National Forest. Snow removal on access roads and trailhead parking areas, serving the OSV Program trail systems, occurs several times during storm events, as necessary dependent upon weather conditions (CA Parks and Recreation 2010).

have a significant impact on breeding or foraging great gray owls. Although night riding could have similar impacts to foraging owls, it would be uncommon because most OSV use on the Lassen National Forest occurs during daytime hours.

Based upon OSV use patterns described in the assumptions section, once OSV trail grooming ends, it is estimated that use of those trails declines by 50 percent. Therefore, the potential for direct and indirect effects to activity centers within 0.25 mile of groomed trails would decrease substantially after March 31 for alternatives 1 through 3, limiting impacts to the first month of the great gray owl breeding season, but not necessarily for alternative 4. However, potential impacts under alternative 4 would still largely be limited to the early portion of the breeding season.

Although OSV use or related activities would not physically alter the vegetative structure of spotted owl habitat, spotted owl prey species, that use the subnivean space could be subject to OSV-related impacts from snow compaction, including suffocation or alteration of movement while foraging in the subnivean space beneath the snow. The degree of this impact is unknown, but would be more likely in areas most conductive to OSV, including meadows used by great gray owls for foraging.

Comparison of the Alternatives

Table 170 displays, by alternative, the acres of great gray owl reproductive habitat, with the potential for direct and indirect effects from OSV use and related activities. Eighty-nine percent of great gray owl reproductive habitat is currently open to OSV use (alternative 1). However, 37 percent is currently open to OSV use and of moderate to high OSV use (map BE-71). The potential for OSV-related impacts (noise-based disturbance, snow compaction impacting subnivean space of prey species, or injury/mortality) to great gray owls, should they be present, would be most likely to occur in those areas of moderate to high OSV use. In addition, of the 37 percent of habitat currently open to and of moderate to high OSV use, based on slope and stand density, about 46 percent of these acres also occur within moderate and high use areas based on proximity to trails; therefore, the majority of OSV use occurs within in an even smaller percentage of each of those habitats. This would be similar under the remaining alternatives where habitat overlap of moderate and high use areas, based on slope and density as well as proximity to trails, ranges from 43 to 48 percent of amounts shown for slope and density alone.

Under alternative 2, 36 percent of great gray owl reproductive habitat would be designated and of moderate to high OSV use, based on slope and density (map BE-72). Approximately, 34 percent would be designated and of moderate to high OSV use under alternative 3 (map BE-73), and 37 percent under alternative 4 (map BE-74). Alternative 5 is slightly less at 31 percent (map BE-75). In the event that great gray owls are found on the forest, as previously noted, the potential for OSV-related noise-based disturbance would overlap with only the early part of the March 1 through August 15 great gray owl breeding season. In addition, nest sites with potential to be impacted would be monitored to determine whether disturbance is occurring and if changes in management, including a limited operating period around nest sites, are necessary, thereby minimizing impacts to great gray owl.

Table 170. Acres of high-value great gray owl reproductive habitat with highest potential to be impacted by OSV use and related activities, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	77,457	75,147	70,300	76,384	61,136
Not Designated for OSV use	9,288	11,598	16,445	10,361	25,609
OSV use restricted to trails	NA	NA	16	NA	16
Total	86,745 acres				
Designated for OSV use and of moderate to high OSV use (percent of habitat total)	32,228 (37.2%)	31,456 (36.3%)	29,853 (34.4%)	31,805 (36.7%)	26,998 (31.1%)
Not Designated for OSV use and of moderate to high OSV use	3,669	4,401	5,997	4,039	8,838
Moderate to high OSV use and OSV use restricted to trails	NA	NA	8	NA	8
Total	35,897 acres				

Cumulative Effects

Based upon spatial data provided by the Lassen National Forest, past, present, and foreseeable future actions that could result in a cumulative impact to great gray owl, when combined with alternatives 1, 2, 3, 4 or 5, include those with the potential for disturbance to or displacement of great gray owls such as the vegetation management projects, fire salvage projects, firewood cutting, Christmas tree cutting, non-motorized winter recreational activities or use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. Vegetation management and salvage projects identified above are very small in comparison to the OSV Use Designation action area and/or do not overlap with groomed and non-groomed OSV trails or staging areas where the highest OSV use occurs. Limited operating periods required for vegetation management and road construction reduce impacts near known great gray owl nest sites. In addition, vegetation and fuels management activities in recent years have included primarily thinned, masticated, and/or burned vegetation to reduce the potential for catastrophic wildfires

Great gray owl habitat also overlaps with areas open to Christmas tree cutting and firewood cutting. However, wheeled motorized vehicles may not be used off of authorized NFS roads or motorized trails to scout for fuelwood or to harvest Christmas trees (USDA Forest Service 2014), there would be minimal overlap between the Christmas tree and firewood cutting season (annually between November 1 and December 31) and OSV trail grooming season (beginning December 26), and disturbance or displacement from this activity would occur outside of the great gray owl breeding season under alternatives 1, 2, 3, and 5. Under alternative 4, in which trail grooming would begin at the discretion of the groomer, there is the potential for a somewhat larger degree of overlap during years in which heavy snowfall begins early. Use of roads within great gray owl habitats after the March 31 termination date of the forest order closing roads for exclusive OSV use could contribute additional disturbance during the early part of the great gray owl breeding season, particularly for nests within 0.25 mile of roads. However, no great gray owl nests have been identified on the Lassen National Forest.

In general, most non-motorized winter recreation occurs along designated trails, where birds would avoid roosting in the area, if too great a disturbance, or habituate to the noise. Similar activities on State and private lands within the forest boundary and within one-quarter mile of goshawk habitats may impact habitat availability outside of NFS lands and may increase disturbance locally. However, the potential for this type of disturbance is unknown; State and privately held lands make up about 20 percent of the area within the forest boundary. In summary, ongoing and reasonably foreseeable actions could be additive locally to individual great gray owls, but are not expected to contribute substantial impacts to those discussed for the project under any of the alternatives.

Determination Statement

Alternatives 1, 2, 3, 4, and 5 of the Lassen National Forest Over-snow Vehicle Use Designation Project may affect individuals, but are not likely to lead to a loss of viability or a trend toward Federal listing for great gray owl in the project area for the following reasons:

- Structure or composition of great gray owl habitat would not be physically modified by OSV use and related activities.
- Although the potential for noise-based disturbance to individuals within high-reproductive habitat ranges from 31 to 37 percent under all of the alternatives, great gray owls have not been confirmed on the Lassen National Forest. In the event that great gray owls are found on the forest, the potential for OSV-related noise-based disturbance would overlap with only the early part of the March 1 through August 15 great gray owl breeding season, and nest sites with potential to be impacted would be monitored to determine whether disturbance is occurring and if changes in management, including a limited operating period around nest sites, are necessary, thereby minimizing impacts to great gray owl.
- Due to their nocturnal behavior, great gray owls, if present, would be expected to have little interaction with snowmobiles or snow grooming equipment resulting in very little potential for direct effects from snowmobiles or grooming equipment.

Willow Flycatcher (*Empidonax trailii*)

Regional Foresters Sensitive Species

Species Account

The willow flycatcher (*Empidonax trailii*) is a Forest Service Sensitive species.

This Neotropical migrant species breeds within the contiguous United States, except the Southeast, and the southern margins of Canada (Green et al. 2003) and winters from Mexico to northern South America (USDA Forest Service 2001). Three subspecies occur in California: *E. t. extimus* (southern California), *E. t. brewsteri* (north of Fresno County from the Pacific coast to the western slopes of the Sierra Nevada crest), and *E. t. adastus* (on the eastern slopes of the Sierra Nevada and Cascade ranges, including the Lake Tahoe basin – a watershed that drains to the east of the Sierra crest) (summarized in USDA Forest Service 2001and Green et al. 2003). The latter subspecies, *E. t. adastus*, occurs and breeds from May through September (Ibid) and winters from the Mexican state of Colima to northwestern Venezuela (USDA Forest Service 2001).

Historically, this species likely occurred in suitable habitats throughout California and portions of Nevada including the central coast, Central Valley, Sierra Nevada, and Great Basin (summarized in USDA Forest Service 2001). Willow flycatchers were common in the Sierra Nevada until as recently as 1910, and locally abundant through 1940 (Ibid). However, this species has declined precipitously in the Sierra Nevada since 1950 (summarized in Green et al. 2003). Urbanization and the draining, channelization, and filling of wetlands; grazing; mining; and pesticide use are likely responsible for the decline in range and abundance of this species.

Livestock grazing, predation, and human activity have all been considered threats to flycatcher nesting habitat. Poorly managed grazing can alter the hydrologic and vegetative characteristics of meadows and contribute to poor quality habitat for nest selection and increased visibility (vulnerability) of nests to predation (Stanley and Knopf 2002). Nest predation is the leading cause of nest failure in willow flycatcher nests (Mathewson et al. 2011).

In the past three decades, willow flycatchers have undergone substantial population declines in California. Multiple factors likely contributed to the decline including poor quality of meadow habitat, shortened breeding-season length and stochastic weather events, the initial small population size, and low reproduction that influenced dispersal dynamics (Mathewson et al. 2011). Nest predation was the primary cause of nest failure at their study sites. The authors recommend two types of restoration, including: (1) restoring meadows currently occupied by willow flycatchers, and (2) restoring meadows within 5 miles of occupied sites to provide habitat for dispersing flycatchers. Mathewson et al. (2011) suggest that restoration could enhance nest success and recommend increasing riparian shrub cover (e.g., willow) and improving meadow wetness to both increase vegetation and reduce predation rates on nests, fledglings, and adults.

Willow flycatchers currently occur and breed in areas (e.g., Upper Truckee River watershed) where they were thought to have “all but disappeared” (USDA Forest Service 2001), though at very low densities and with limited reproductive success. The recent extirpation of this species from Yosemite National Park, where suitable habitats are presumably better preserved than those located outside the park suggests that other factors may be contributing to the decline of this species in the Sierra Nevada (Siegel et al. 2008). Siegel et al. (Ibid) tentatively suggested that severe habitat degradation during the 19th century (due to grazing, which was discontinued in Yosemite National Park decades ago), meadow desiccation (due to global warming and resulting in earlier spring melts and a reduction in site wetness), disrupted meta-population dynamics, or conditions on the wintering grounds or along migration routes may explain the decline in Yosemite National Park.

Lassen National Forest has one of the largest concentrations of breeding willow flycatcher in the Sierra Nevada; most birds are located in Warner Valley Ecological Reserve, managed by California Department of Fish and Game (CDFG), situated upstream from Lake Almanor and near the southwestern boundary of Lassen Volcanic National Park (USDA Forest Service 2010). Earliest arrival dates range from late May to early June in the southern Sierra Nevada to the first of June in the northern Sierra Nevada (Green et al. 2003).

Habitat Status

Suitable habitat (i.e., the combination of resources and environmental conditions required to survive and reproduce) for this species in the Sierra Nevada is defined by site elevation, shrub coverage, foliar density, wetness, and meadow size (summarized in Green et al. 2003). Known willow flycatcher sites range in elevation from 1,200 to 9,500 feet, though most (88 percent, 119 of 135) are located between 4,000 and 8,000 feet (Stefani et al. 2001). Willow flycatchers are closely associated with meadows that have high water tables in the late spring and early summer, and abundant shrubby, deciduous vegetation (especially *Salix* spp.). Shrubs in these preferred habitats are typically 6.5 to 13 feet in height, with the lower half composed of dense woody stems. Live foliage density within the shrub layer is moderate to high and uniform from the ground to the shrub canopy (summarized in USDA Forest Service 2001). Sites are “significantly more likely to support multiple willow flycatchers, and result in successful breeding efforts, as riparian shrub cover in meadows and willow flycatcher territories increases” (Bombay 1999 as cited in USDA Forest Service 2001).

Within preferred sites, “the herbaceous community is consistent with high water tables and late seral conditions” (Ibid). Furthermore, this species prefers and is significantly more likely to occupy and defend territories that have standing water or saturated soils during the breeding season, often selecting the wettest portions within meadows (summarized in USDA Forest Service 2001). Occupied meadows range in size from less than 1.0 acre to 716 acres, averaging approximately 80 acres (USDA Forest Service 2001). More than 95 percent of breeding meadows are larger than 10 acres, and meadows where multiple territories have fledged young are larger than 15 acres (summarized in Green et al. 2003). This species exhibits some site fidelity; 15 percent of adult birds tarsal-banded in the Sierra Nevada in 1997 and 1998 returned in a subsequent year, compared to 31 percent at the Kern River Preserve (California), and 50 percent at Malheur National Wildlife Refuge in southeastern Oregon (summarized in Bombay et al. 2003). Between-year site fidelity on wintering grounds in Costa Rica averaged 68 percent (Koronkiewicz et al. 2006).

The CWHR model describes high to moderate capability nesting habitats in the montane riparian vegetation type (high = 2D, 3D, 4M, and 4D; moderate = 2M, 3M); high to moderate capability perching habitats in the montane riparian vegetation type (high = greater than 2P; moderate = 2P); and high capability foraging habitat (no moderate capability habitats described) in the montane riparian (all strata except 1 and 2S) and wet meadow (all strata) vegetation types for this species. Similarly, as *E. t. adastus* nests locally in wet meadows, high and moderate capability perching habitat will include wet meadow (high = all strata) and montane riparian (high = greater than 2P; moderate = 2P) vegetation types. High capability foraging habitat, as described in CWHR (no moderate capability habitats described), will include montane riparian (all strata except 1 and 2S) and wet meadow (all strata).

Sanders and Flett (1989) reported the average territory size for a paired male willow flycatcher as approximately 0.84 acre (range = 0.145 to 2.19) in the central Sierra Nevada. This species typically nests from June 1 to August 31 and fledges young between July 15 and August 31. Fledglings remain in territories for 2 for 3 weeks after fledging (USDA Forest Service 2004). However, these dates vary due to factors such as when willow flycatchers arrive on the breeding grounds, snowpack, late spring and summer weather, nest predation, and brown-headed cowbird parasitism (Green et al. 2003).

This species may attempt nesting as many as three times during a single breeding season in the Sierra Nevada (USDA Forest Service 2004). Nest predation has been positively associated with edge effects, distance of the nest to edges and isolated trees, and aspects of meadow size and wetness (Cain and Morrison 2003). Meadow restoration (i.e., restoring natural hydrologic regimes, mitigating erosion, and stemming forest encroachment) was suggested to reduce predation of willow flycatcher nests (Green et al. 2003). Conservation concerns begin at parasitism rates of approximately 30 percent (Green et al 2003) and management actions to control cowbirds may be warranted above a 60 percent parasitism rate (USDA Forest Service 2004).

Willow flycatchers are insectivorous and known to hawk prey in flight and to aerially glean prey from foliage. Foraging occurs from perches within the territory. Average foraging flights are reported to be very short (mean=13 feet, range=up to 33 feet) (summarized in Sanders and Flett 1989).

Degradation and alteration of willow flycatcher habitat (i.e., montane meadows) is a primary factor contributing to population declines (Green et al. 2003). Degradation could include, but is not limited to: (1) alterations to the hydrological patterns leading to meadow drying, (2) destruction of shrub vegetation resulting in loss of nesting sites and cover for predator avoidance, (3) increased predator access to meadow interior, (4) loss of foraging substrate and decreased insect abundance, and (5) potentially increased contact with brown-headed cowbirds (Green et al. 2003).

Direct and Indirect Effects

Green et al. (2003) identified meadow degradation, which results in meadow drying, loss of nesting and foraging substrates, increased predator access to meadow interiors, and potentially cowbird parasitism as among the key factors likely responsible for the decline of the willow flycatcher. Minimum cross-country snow depth requirements under all of the alternatives, including the existing condition, is expected to be adequate to protect vegetation from measurable impacts (McNamara 2016). Emissions from OSVs, particularly two-stroke engines on snowmobiles, release pollutants like ammonium, sulfate, benzene, PAHs and other toxic compounds that are stored in the snowpack; during spring snowmelt runoff, these accumulated pollutants are released and may be delivered to surrounding waterbodies (USFS National Core BMP Rec-7: Over-Snow Vehicle Use; please refer to the project hydrology report (project record) for additional information). However, the minimum cross-country snow depth of 12 inches under alternatives 2, 3, and 5 is expected to be adequate to protect aquatic and riparian habitats from measurable impacts to water quality (McNamara 2016). Under alternatives 1 and 4, the minimum cross-country snow depth would be that depth necessary to avoid resource damage, including impacts to water quality.

Cumulative Effects

None; the Lassen National Forest Over-snow Vehicle Use Designation Project would not result in measurable direct or indirect impacts to the willow flycatcher and, therefore, there would be no cumulative impacts to this species.

Determination Statement

None of the alternatives of the Lassen National Forest Over-snow Vehicle Use Designation Project would impact willow flycatcher or its habitat in the project area for the following reasons:

- Willow flycatcher is a Neotropical migrant that arrives well past the end of the OSV season of use, so no direct impacts to the species would occur.
- OSV use has not been identified as a factor in meadow degradation for this species, and the minimum cross-country snow depth of 12 inches under alternatives 2, 3 and 5, as well as the minimum snow depth to prevent resource damage requirement under alternatives 1 and 4, is expected to protect meadow and riparian habitats from measurable impacts to water quality or vegetation.

Greater Sandhill Crane (*Grus Canadensis tabida*)

Regional Foresters Sensitive Species

Species Account

Greater sandhill cranes, including breeding individuals, have been documented on the Lassen National Forest.

Habitat Status

The California breeding population of sandhill cranes winters chiefly in the Central Valley and peak breeding occurs between May and July. High reproductive habitats for sandhill crane include fresh emergent wetland, irrigated hayfield, and wet meadow (CWHR 2014).

Much of the wetland acres on Lassen National Forest, which are important to waterfowl and sandhill crane, are ephemeral; flooding occurs from snow melt and staging and breeding occurs in spring and early summer (USDA Forest Service 2010). Threats to greater sandhill crane include destruction and degradation of structurally diverse wet meadow and shallow emergent wetland habitats used for nesting and rearing habitat by conversions for road development, croplands, and water diversions (USDA Forest Service 2010); predation; human disturbance of crane pairs during the nesting season; and the spread of invasive plants into greater sandhill crane habitats (USDI Fish and Wildlife Service 2015a).

Direct and Indirect Effects

Emissions from OSVs, particularly two-stroke engines on snowmobiles, release pollutants like ammonium, sulfate, benzene, PAHs and other toxic compounds that are stored in the snowpack; during spring snowmelt runoff, these accumulated pollutants are released and may be delivered to surrounding waterbodies (USFS National Core BMP Rec-7: Over-Snow Vehicle Use; please refer to the project hydrology report (project record) for additional information). However, the minimum cross-country snow depth of 12 inches under alternatives 2, 3, and 5 is expected to be adequate to protect aquatic and riparian habitats from measurable impacts to vegetation or water quality (McNamara 2016). Under alternatives 1 and 4, the minimum cross-country snow depth would be that depth necessary to avoid resource damage, including effects to water quality.

Cumulative Effects

None; the Lassen National Forest Over-snow Vehicle Use Designation Project would not result in measurable direct or indirect impacts to greater sandhill crane and, therefore, there would be no cumulative impacts to this species.

Determination Statement

None of the alternatives of the Lassen National Forest Over-snow Vehicle Use Designation Project would impact greater sandhill crane or its habitat in the project area for the following reasons:

- Greater sandhill crane is a migratory species that breeds outside of the OSV season of use, so no direct impacts to the species would occur.
- OSV use has not been identified as a factor in meadow degradation for this species, and the minimum cross-country snow depth of 12 inches under alternatives 2, 3 and 5, as well as the minimum snow depth to prevent resource damage requirement under alternatives 1 and 4, is expected to protect meadow and riparian habitats from measurable impacts to water quality or vegetation.

Yellow Rail (Coturnicops noveboracensis)

Regional Foresters Sensitive Species

Species Account

The continuous breeding range of the yellow rail is from southcentral Northwest Territories through eastern Alberta, Saskatchewan, Manitoba, Ontario, southern Quebec, New Brunswick, and Maine, and south to northern New Hampshire, Vermont, New York, Michigan, Wisconsin, Minnesota, North Dakota, and northeastern Montana; a small, separate breeding population is located in southcentral Oregon. (Goldade et al. 2002). The species has been documented year-round in California, but in two primary seasonal roles: as a very local breeder in the northeastern interior and as a winter visitor (early October to mid-April) on the coast and in the Suisun Marsh region (Shuford and Gardali 2008). There is a single known observation of yellow rail on the Eagle Lake Ranger District of the Lassen National Forest.

Habitat Status

The length of the breeding season is poorly known in California, but on the basis of information from Oregon, it probably extends from May through early September (Shuford and Gardali 2008). Yellow rails prefer wet meadows, fens, boggy swales, floodplains, montane meadows, and emergent vegetation in fresh and brackish wetlands (Goldade et al. 2002).

Direct and Indirect Effects

California is outside of the continuous breeding range of the yellow rail and it appears to be primarily a winter visitor to the coastal and central portion of the state, as there are no recent records of reproduction in the state. The minimum cross-country snow depth of 12 inches under alternatives 2, 3, and 5, as well as the minimum snow depth to prevent resource damage requirement under alternatives 1 and 4, is expected to be adequate to protect grasslands, wet meadow and fresh emergent wetland habitats used by this species from measurable impacts to vegetation or water quality. Therefore, no direct or indirect impacts are expected from the actions.

Cumulative Effects

None; the Lassen National Forest Over-snow Vehicle Use Designation Project would not result in measurable direct or indirect impacts to the yellow rail and, therefore, there would be no cumulative impacts to this species.

Determination Statement

None of the alternatives of the Lassen National Forest Over-snow Vehicle Use Designation Project would impact yellow rail or its habitat in the project area based on the following:

- There are no recent records of yellow rail reproduction within California.
- Based upon available information, the species appears to be limited to being a seasonal migrant within the project area, so no direct impacts to the species would occur.
- The minimum cross-country snow depth requirements under all alternatives is expected to be adequate to protect grasslands, wet meadow and fresh emergent wetland habitats used by this species from measurable impacts to vegetation or water quality.

Western Pond Turtle (*Emys marmorata*)

Regional Foresters Sensitive Species

Species account

The western pond turtle (*Emys marmorata*) is found on the west coast of North America. Historically, it was found from as far north as British Columbia, Canada, to as far south as Baja California, mostly west of the Cascade-Sierra crest (Lovich and Meyer 2002). Disjunct populations have been documented in the Truckee, Humboldt, and Carson Rivers in Nevada, Puget Sound in Washington, and the Columbia Gorge on the border of Oregon and Washington. It is unclear if these are relictual or introduced populations (Lovich and Meyer 2002). Western pond turtles are the only native aquatic turtle in California and southern Oregon, and in the northern part of its range, it coexists with only the western painted turtle (*Chrysemys picta bellii*) (Germano and Rathbun 2008).

On Region 5 lands, this turtle can be found on all national forests, except the Inyo and Lake Tahoe Basin.

Official taxonomy by the Society for the Study of Amphibians and Reptiles no longer recognizes subspecies for the western pond turtle. Presumably, this is based on recent genetic work that indicates that the recognized subspecies were not geographically or genetically correct, and the currently recognized species likely represents as many as four cryptic species. However, the study that identified the four distinct clades of pond turtle did not elevate any to species status as the authors wanted to wait until further molecular work was undertaken. The two former subspecies were the northwestern pond turtle (*Emys marmorata marmorata*) and the southwestern pond turtle (*Emys marmorata pallida*) with a subspecies split along the transverse mountain range in southern California (Spinks and Shaffer 2005).

Abundance has been well studied in this species. In some stream habitats, densities can exceed 1,000 turtles per hectare. In Oregon, small ponds can hold over 500 turtles per hectare. These densities represent extremes with typical densities ranging from 23 to 214 turtles per hectare throughout most of the range (Lovich and Meyer 2002). Capture rates at one site in southern California were ca. 2 to 2.6 turtles per trap night (Germano 2010). These density estimates are likely accurate for populations on NFS lands where habitat is suitable.

Habitat Status

The western pond turtle inhabits a Mediterranean climate defined by mild, wet winters and long hot, dry summers. In the northern portion of its range, winters are colder with more rainfall than in southern areas (Germano and Rathbun 2008). Aquatic habitats include lakes, natural ponds, rivers, oxbows, permanent streams, ephemeral streams, marshes, freshwater and brackish estuaries and vernal pools. Additionally, these turtles will use human-made waterways including drainage ditches, canals, reservoirs, mill ponds, ornamental ponds, stock ponds, abandoned gravel pits, and sewage treatment plants. Turtles captured at waste-water treatment plants grew quickly, had successful recruitment, and produced large clutches (Germano 2010). Turtles favor areas with offshore basking sites including floating logs, snags, protruding rocks, emergent vegetation and overhanging tree boughs, but also will use steep and/or vegetated shores. Terrestrial habitats are less well understood. In southern California, animals spend only one to two months in terrestrial habitats while animals in the northern portions of the range can be terrestrial for up to eight months (Lovich and Meyer 2002). Animals have been documented to overwinter under litter or buried in soil in areas with dense understories consisting of vegetation such as blackberry, poison oak, and stinging nettle, which reduces the likelihood of predation (Davis 1998).

Western pond turtles are generalist omnivores and have been documented to eat a wide variety of prey. Prey items include larval insects, midges, beetles, filamentous green algae, tule and cattail roots, water lily pods, and alder catkins (Germano 2010).

Turtles move upland at different times across the range of this species. Animals can move upland as early as September, but typically move following the first winter storm in November or December. Not all animals move upland, some move to nearby ponds for the winter (Davis 1998). Upland animals remain somewhat active throughout the winter and can be observed basking on warm winter days (Davis 1998). Upland movements for both overwintering and reproduction typically occur in the afternoon and evenings. Walkabouts to scout for nest sites can be completed within one day or they can last up to four days (Crump 2001). Home ranges differ between males and females with male home ranges averaging 0.976 hectares and females averaging 0.248 hectares.

Local climatic and water level variations can alter the timing of nesting in this species (Crump 2001). The nesting season is from late April through mid-July at low elevation, and June through August at higher elevations (Scott et al. 2008). Although some females can reproduce with a carapace length as small as 111 millimeters, 120 millimeters is the minimum reproductive size in most areas with most gravid females being 140 millimeters or larger (Scott et al. 2008). Animals of this size are often at least 7 years old in southern areas and 8 to 12 years old in northern areas.

Some western pond turtles have shown nest site fidelity. Four of five detected nesting areas in one study area had instances of nest site fidelity. It is likely that nest site fidelity is common, and sites are changed only after a negative encounter during either a walkabout or while forming a nest at a particular site (Crump 2001). Most females nest within 50 meters (0.03 mile) of water; however some females nest upwards of 400 meters (0.25 mile) away from water (Lovich and Meyer 2002). It is believed that in coastal populations nesting occurs far from water to protect overwintering hatchlings from being injured during winter floods (Lovich and Meyer 2002).

Mean clutch size ranges from 4.5 ± 0.25 on the Santa Rosa Plateau to 7.3 ± 1.18 in southern Oregon. More research is needed to determine if clutch size varies with latitude (Germano and Rathbun 2008). Average annual egg production for 39 animals in southern California was 7.2 ± 3.9 eggs. This number did not vary statistically among females of differing carapace length or among different streams and in many cases represented two clutches per female. Clutch size varies significantly among drainages; however, it does not differ significantly across years or within individual drainages. When double clutching occurs, the first clutch typically contains more eggs than the second clutch (Scott et al. 2008).

Hatchlings in the Mojave River population overwinter in the nest and emerge as early as March of the following year (Lovich and Meyer 2002). However, most hatchlings in southern California emerge in late fall of the year they were laid. Northern animals typically emerge the following spring. Delayed emergence can be caused by soil structure, where sandy soil results in earlier emergence (Crump 2001). Microhabitat use, behavior, and diet differ between juvenile and adult western pond turtles (Lovich and Meyer 2002). Little is known about the specific requirements of hatchling turtles as they are cryptic and are rarely represented in population assessments of many species including those with known stable populations (Germano and Rathbun 2008).

Growth and maturation in western pond turtles is heavily influenced by ambient air and water temperatures and basking behaviors, which include aerial basking, and cryptic behaviors such as burying in warm sand or lying in warm algal mats (Germano and Rathbun 2008). Sites with cold water require turtles to bask more, causing average body size to be smaller compared to sites with warmer water. Areas that have higher invertebrate densities, typically classified as having organic mud bottom substrates, yield larger turtles (Lubcke and Wilson 2007).

Threats/Management Concerns

Western pond turtles have significantly declined in number with many populations representing less than 10 percent of the historical population. In California alone, there has been a loss of 80 to 85 percent of western pond turtles since the 1850s. The Puget Sound population in Washington, which encompassed the type location for this species as well as British Columbia populations, has been considered extirpated since at least the 1970s. Ninety-eight percent of the population is gone in Oregon's Willamette Valley, 95 to 99.9 percent of the population in the San Joaquin Valley is gone, and most of the Nevada populations have disappeared.

The major threat to this species is habitat loss or degradation. Most of the historical habitat for this species has been permanently lost as a result of development for human occupancy. Riparian and wetland habitats are cleared for agriculture use, destroyed by cattle, channelized and stripped of vegetation, or invaded by the saltcedar shrub, which destroys water quality, alters stream structure, and dries streams. Groundwater pumping lowers water tables and further stresses riparian plant communities. Gold and gravel mining can directly destroy habitat as well as introduce toxins through toxic spills and illegal dumping of chemicals (Lovich and Meyer 2002).

Additional human-related threats further jeopardize population viability. Cattle grazing destroys riparian habitat, cattle trample and kill turtles and nests, and cattle waste pollutes waterways. Western pond turtles, especially gravid females, are easily killed on roadways by direct impact with vehicles. Historically, animals were also collected for the pet trade with hundreds of animals from a single site being exported to Europe in the 1960s. Although collection and sale of western pond turtles have been banned for many years, animals are still listed for sale in the eastern United States. Animals were collected for food in great numbers from the mid-19th century to the 1930s when animals first started to become scarce. Modern watercourse recreation also impacts these turtles.

Disease poses a notable threat to western pond turtles, as seen in Washington. A die-off in 1990 was attributed to a syndrome similar to an upper-respiratory disease. Several years later, as part of a head-starting program, several animals were found dead with no apparent cause of death (Vander Haegen et al. 2009). Animals from a wastewater treatment pond in California were found to be less healthy in both the short and long term compared to animals in a natural habitat despite being larger in size. Although larger, these animals had more chronic stress from more interactions with humans and invasive species, increased water pollution, and greater exposure to water-borne diseases (Polo-Cavia et al. 2010). Dehydration also poses a threat to turtles under a year old, which likely makes these animals more susceptible to disease (Vander Haegen et al. 2009).

In addition to threats that affect entire populations, many populations are failing as a result of extremely high juvenile mortality. While adults may have annual survival rates of 95 to 97 percent, nests, juveniles, and sub-adults have extremely high mortality rates (Vander Haegen et al 2009). Nests are also destroyed when exposed to too much moisture or are crushed by cattle or machines. There are many predators of hatchling turtles, including two very successful nonnative predators—large-mouth bass and bullfrogs. Sub-adult mortality can be as high as 85 to 90 percent annually for animals under 4 years old, however head-started sub-adults had mortalities as low as 10 percent when carapace length was greater than 90 millimeters. Natural predators that have been documented to take sub-adult turtles include: raccoons, coyotes, black bears and western river otters, with most predations occurring while the animal was terrestrial (Vander Haegen et al. 2009). Adults face less predation risk. A study documented one predation of an adult turtle by a loon, and only 3 of 196 turtles had evidence of predation attempts such as shell or limb damage (Davis 1998).

Direct and Indirect Effects

Western pond turtles have been documented to overwinter under litter or buried in soil in areas with dense understories consisting of vegetation such as blackberry, poison oak and stinging nettle, which reduces the likelihood of predation (Davis 1998). Since these areas would be under snow, there should not be a direct impact to the species unless individuals leave their hibernation burrows for brief periods of time, in which case there would be a low likelihood for trampling by OSVs or grooming equipment. There are no known areas of overwintering on the Lassen.

Indirect effects include the risk of oil, gas, or other vehicle fluids entering the waterway and modifying the prey/food base or water quality for breeding and basking. The potential for these risks is extremely low as no OSV use occurs on waterways.

Western pond turtles hibernate and, therefore, would be absent from the area of potential effect during the OSV season of use. Since they are known to either build a burrow or overwinter amongst shrubs, or other underground structures that would not be impacted by OSVs or underground. OSVs generally do not create a permanent trail or have direct impact on soil and ground vegetation when snow depths are sufficient to protect the ground surface (USFS National Core BMP Rec-7: Over-Snow Vehicle Use; please refer to the McNamara (2016) for additional information). All of the project alternatives would maintain a minimum snow depth of 12 inches in areas designated for cross-country use, which should provide sufficient depth to protect the ground surface.

Western pond turtles utilize riparian and/or aquatic environments during the breeding season. Emissions from OSVs, particularly two-stroke engines on snowmobiles, release pollutants like ammonium, sulfate, benzene, PAHs and other toxic compounds that are stored in the snowpack; during spring snowmelt runoff, these accumulated pollutants are released and may be delivered to surrounding waterbodies (USFS National Core BMP Rec-7: Over-Snow Vehicle Use; please refer to the project hydrology report (project record) for additional information). However, the minimum cross-country snow depth of 12 inches under alternatives 2, 3, and 5 is expected to be adequate to protect aquatic and riparian habitats from measurable impacts to vegetation or water quality (McNamara 2016). Under alternatives 1 and 4, the minimum cross-country snow depth would be that depth necessary to avoid resource damage, including water quality and existing vegetation.

Cumulative Effects

Past, present, and foreseeable future actions identified to have the potential to result in a cumulative impact to terrestrial wildlife species, when combined with alternatives 1, 2, 3 4, or 5 include the Castle Defensible Fuel Profile Zone 2 vegetation management project, Dutch and Tamarack fire salvage projects, firewood cutting, Christmas tree cutting, non-motorized winter recreational activities, or use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. Firewood and Christmas tree cutting, and non-motorized winter recreational activities are unlikely to directly impact western pond turtles that are hibernating under the snow. There is a small potential for an additive effect from vehicle fluids from wheeled vehicles used to access firewood and Christmas trees, as well as from the use of wheeled vehicles during the overlap season between OSVs and wheeled vehicles, to enter waterways, modifying the prey/food base or water quality for breeding and basking. However, the risk for this impact is low because vehicle use does not occur in waterways and fluids would not normally reach waterways. The Castle Defensible Fuel Profile Zone 2 is proposed on 39 acres. The Dutch and Tamarack fire salvage projects would remove standing dead or dying trees across roughly 1,500 and 1,300 acres, respectively, of coniferous forest. Vegetation and fuels management activities in recent years have included primarily thinned, masticated, and/or burned vegetation to reduce the potential for catastrophic wildfires and include riparian area protections. Similar activities on State and private lands that make up about 20 percent of the area within the forest boundary may have the similar potential for limited impacts to western pond turtles and their habitat.

Determination Statement

Alternatives 1, 2, 3, 4, and 5 of the Lassen National Forest Over-snow Vehicle Use Designation Project may impact individuals, but are not likely to lead to a loss of viability or a trend toward Federal listing for western pond turtle in the project area based on the following:

- Proposed actions would not physically modify western pond turtle habitat.
- Proposed actions would occur when the species is hibernating under the snow and, therefore, would not result in noise impacts or impacts to foraging or breeding unless individuals leave their hibernation burrows for brief periods of time, in which case, there would be a low likelihood for trampling by OSVs or grooming equipment.

- The low risk of modification of the prey/food base or water quality for breeding and basking from oil, gas, or other vehicle fluids entering waterways would be mitigated by the minimum cross-country snow depth requirements that would protect aquatic and riparian habitats from measurable impacts to vegetation or water quality.

Shasta Hesperian Snail (*Vespericola Shasta*)

Regional Foresters Sensitive Species

Species Account

Shasta Hesperian snail is endemic to the Klamath Province, primarily in the vicinity of Shasta Lake, up to 915 meters elevation (USDI BLM 1999). The type locality was given as La Moine, Shasta County, California (Cordero and Miller 1995). Although Shasta Hesperian snail has been documented on the Lassen National Forest, the records are questionable, based on its distance from the type locality and elevation.

Habitat Status

Shasta Hesperian snail has been found in moist bottom lands, such as riparian zones, springs, seeps, marshes, and in the mouths of caves (USDI BLM 1999).

Direct and Indirect Effects

All observations were made in 2000 near the northeastern portion of the forest in areas that would be expected to receive low OSV use. In the event the records are accurate, the Shasta Hesperian snail would be expected to hibernate or be beneath the snow surface where no OSV-related impact would occur. In addition, the minimum cross-country snow depth of 12 inches under alternatives 2, 3, and 5 is expected to be adequate to protect moist bottomland habitats utilized by this species from measurable impacts to vegetation or water quality (McNamara 2016). Under alternatives 1 and 4, the minimum cross-country snow depth would be that depth necessary to avoid resource damage, including water quality.

Emissions from OSVs, particularly two-stroke engines on snowmobiles, release pollutants like ammonium, sulfate, benzene, PAHs and other toxic compounds that are stored in the snowpack; during spring snowmelt runoff, these accumulated pollutants are released and may be delivered to surrounding waterbodies (USFS National Core BMP Rec-7: Over-Snow Vehicle Use; please refer to the project hydrology report (project record) for additional information). However, the minimum cross-country snow depth of 12 inches under alternatives 2, 3, and 5 is expected to be adequate to protect aquatic and riparian habitats from measurable impacts to vegetation or water quality (McNamara 2016). Under alternatives 1 and 4, the minimum cross-country snow depth would be that depth necessary to avoid resource damage, including water quality.

Cumulative Effects

None; the Lassen National Forest Over-snow Vehicle Use Designation Project would not result in measurable direct or indirect impacts to the Shasta Hesperian snail and, therefore, there would be no cumulative impacts to this species.

Determination Statement

None of the alternatives of the Lassen National Forest Over-snow Vehicle Use Designation Project would impact Shasta Hesperian snail or its habitat in the project area based on the following:

- Proposed actions would occur when the species is hibernating under the snow and, therefore, would not result in noise impacts or impacts to foraging or breeding.
- The minimum cross-country snow depth requirements under all alternatives is expected to be adequate to protect moist bottomland habitats used by this species from measurable impacts to vegetation or water quality.

Terrestrial Invertebrates

Western Bumble Bee (*Bombus occidentalis*)

Regional Foresters Sensitive Species

Species Account

Historically, the western bumble bee was one of the most broadly distributed bumble bee species in North America (Cameron et al. 2011). 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). Currently, the western bumble bee occurs in all states adjacent to California, but 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, and 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 western bumble bee populations are associated with highest infection rates with the *Nosema* parasite, and the incidence of *Nosema* infection is significantly higher near greenhouses that use imported bumble bees for pollinating 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 largely depends 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.

The western bumble bee (*Bombus occidentalis*) has 94 collection records for the western bumble bee on 11 national forests in Region 5 (Hatfield 2012). *B. occidentalis* was recently documented on the Eagle Lake Ranger District of the Lassen National Forest.

Habitat Status

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 (Hopwood et al. 2012). In the absence of fire, native conifers encroach upon meadows and this can also decrease foraging and nesting habitat available for bumble bees.

Heavy grazing and high forage utilization should be avoided 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.

The following account of bumble bee life history is summarized from Heinrich (1979). Queens overwinter in the ground in abandoned rodent (i.e., mouse, chipmunk or vole) burrows at depths from 6 to 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 to 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 create 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.

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 western bumble bee, 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 can 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).

Direct and Indirect Effects

Bumble bees require habitats with rich supplies of floral resources with continuous blooming from spring to autumn. Isolated patches of habitat are not sufficient to fully support bumble bee populations. Bumblebee colonies are annual. In the late winter or early spring, the queen emerges from hibernation and then selects a nest site, which is often a pre-existing hole, such as an abandoned rodent hole. Although little is known about queen habitat preferences for hibernation sites, extrapolations are made from the limited knowledge available for a few bumble bee species (R. Thorp, pers. comm.): Generally, observations suggest most Northern Hemisphere species prefer well-drained slopes facing north, which may prevent them from emerging too early. The only published record of a hibernaculum of *B. occidentalis* was based on an observation in a mating and hibernation cage. In this instance, the female dug 2 inches into sandy soil of a steep west-facing slope. The most detailed published observations for hibernating bumble bees came from studies conducted in southern England. Two of the species are closely related to *B. occidentalis* and may serve as examples of what might be expected in *B. occidentalis*. Those two species showed a preference for digging the hibernaculum just below the litter and soil interface, and most were under trees rather than on exposed slopes.

Habitat loss and fragmentation may be playing a role in the decline of these bumble bee species. Habitat alterations that destroy, fragment, degrade, or reduce their food supplies, nest sites (e.g., abandoned rodent burrows or undisturbed grass), and hibernation sites for overwintering queens can harm these species (Evans et al. 2008). The minimum cross-country snow depth of 12 inches under all alternatives 2, 3, and 5 is expected to be adequate to protect vegetation from measurable impacts (McNamara 2016). Under alternatives 1 and 4, the minimum cross-country snow depth would be that depth necessary to avoid resource damage.

Cumulative Effects

None; the Lassen National Forest Over-snow Vehicle Use Designation Project would not result in measurable direct or indirect impacts to the western bumble bee and, therefore, there would be no cumulative impacts to this species.

Determination Statement

None of the alternatives of the Lassen National Forest Over-snow Vehicle Use Designation Project would impact western bumble bee or its habitat in the project area based on the following rationale:

- Colonies are annual outside of the OSV season.
- Queens of the species hibernate during the OSV season of use and, therefore, proposed actions would not result in noise impacts or impacts to foraging or breeding.
- Known information suggests that queens burrow under duff under trees and on steeper slopes where OSV use does not occur (refer to OSV use assumptions).
- OSV use is not expected to degrade terrestrial habitat based upon a minimum cross-country snow depth requirements under all of the alternatives.

Summary of Determinations

Table 171 provides a summary of effects and impacts determinations for species addressed in this analysis.

Table 171. Summary of effect or impact determinations[32] by alternative

Species Name	Status[33]	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Giant garter snake (*Thamnophis gigas*)		NE	NE	NE	NE	NE

[32] NE=No Effect; NLAA=May affect, not likely to adversely affect; NLAA-B= May affect, not likely to adversely affect, Beneficial effect; NJ=Will not jeopardize; MII=May impact individuals, but not likely to lead to a loss of viability or a trend toward Federal listing; NI=No Impact

[33] FE = federally endangered; FT = federally listed as threatened; FP = Federal proposed for listing; FC = Federal candidate for listing; FSS = Forest Service sensitive

Species Name	Status[33]	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Sierra Nevada red fox (*Vulpes vulpes necator*)	FC/FSS	MII	MII	MII	MII	MII
Gray wolf (*Canis lupus*)	FE	NLAA	NLAA	NLAA	NLAA	NLAA
California wolverine (*Gulo gulo luteus*)	FP/FSS	NJ	NJ	NJ	NJ	NJ
Northern spotted owl (*Strix occidentalis caurina*)	FT	NLAA	NLAA	NLAA	NLAA	NLAA-B
Northern spotted owl Designated critical habitat	--	NE	NE	NE	NE	NE
Valley elderberry long-horned beetle (*Desmocerus californicus dimorphus*)	FT	NE	NE	NE	NE	NE
Valley elderberry long-horned beetle Designated critical habitat	--	NE	NE	NE	NE	NE
Yellow-billed cuckoo (*Coccyzus americanus*)	FT	NE	NE	NE	NE	NE
Yellow-billed cuckoo Proposed critical habitat	--	NE	NE	NE	NE	NE
Fisher (*Pekania pennanti*)	FSS	MII	MII	MII	MII	MII
Pacific marten (*Martes caurina*)	FSS	MII	MII	MII	MII	MII
Fringed myotis (*Myotis thysanodes*)	FSS	MII	MII	MII	MII	MII
Pallid bat (*Antrozous pallidus*)	FSS	MII	MII	MII	MII	MII
Townsend's big-eared bat (*Corynorhinus townsendii*)	FSS	MII	MII	MII	MII	MII
Bald eagle (*Haliaeetus leucocephalus*)	FSS	MII	MII	MII	MII	MII
California spotted owl (*Strix occidentalis occidentalis*)	FSS	MII	MII	MII	MII	MII
Great gray owl (*Strix nebulosa*)	FSS	MII	MII	MII	MII	MII
Greater Sandhill crane (*Grus Canadensis tabida*)	FSS	NI	NI	NI	NI	NI
Northern goshawk (*Accipiter gentilis*)	FSS	MII	MII	MII	MII	MII
Willow flycatcher (*Empidonax traillii*)	FSS	NI	NI	NI	NI	NI

Species Name	Status[33]	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Yellow rail (*Coturnicops noveboracensis*)	FSS	NI	NI	NI	NI	NI
Shasta Hesperian snail (*Vespericola shasta*)	FSS	NI	NI	NI	NI	NI
Western bumble bee (*Bombus occidentalis*)	FSS	NI	NI	NI	NI	NI

Migratory Birds

Migratory Landbird Conservation on the Lassen National Forest

Introduction

Under the National Forest Management Act (NFMA), the Forest Service is directed to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives." (P.L. 94-588, Sec 6 (g) (3) (B)). The January 2000 USDA Forest Service (FS) Landbird Conservation Strategic Plan, followed by Executive Order 13186 in 2001, in addition to the Partners in Flight (PIF) specific habitat Conservation Plans for birds and the January 2004 PIF North American Landbird Conservation Plan all reference goals and objectives for integrating bird conservation into forest management and planning.

In late 2008, a *Memorandum of Understanding between the USDA Forest Service and the US Fish and Wildlife Service to Promote the Conservation of Migratory Birds* was signed. This MOU was extended to December 31, 2017. The intent of the MOU is to strengthen migratory bird conservation through enhanced collaboration and cooperation between the Forest Service and the Fish and Wildlife Service as well as other Federal, State, Tribal and local governments. Within the national forests, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales and ensuring that bird conservation is addressed when planning for land management activities.

The Lassen National Forest is proposing to manage lands on the Lassen National Forest. Proposed management is intended to implement direction contained within the Lassen National Forest Land and Resource Management Plan (LRMP, USDA Forest Service 1992). Opportunities to promote conservation of migratory birds and their habitats in the project area were considered during development and design of the Lassen National Forest Over-snow Vehicle Use Designation project (Lassen OSV project) (MOU Section C: items 1 and 11 and Section D: item 3).

Consistency with the MOU

Potential impacts to migratory species' habitats would be minimized because none of the alternatives propose to alter vegetation structure. Migratory birds of conservation concern (BOCC) have been identified regionally by the Fish and Wildlife Service (USDI Fish and Wildlife Service 2008). Table 172 lists a total of 28 BOCC species applicable to portions of Bird Conservation Regions 9 and 15 that encompass the Lassen National Forest. Of these, 24 species known to occur or potentially occur within the project area were reviewed for potential disturbance impacts (table 172). Disturbance of breeding birds due to OSV use is avoided for 12 species due to the lack of temporal overlap between season of OSV trail grooming (December 26 through March 31), general OSV use period (generally December through March or mid-April), and the breeding season. Overlap of OSV use and breeding season may occur during the OSV use period for eight species (burrowing owl, loggerhead shrike, Nuttall's woodpecker, oak titmouse, short-eared owl, eared grebe, western grebe, and Swainson's hawk); however, these species are most likely to occur at lower elevations less capable of providing snow levels that support OSV use late in the season. Temporal overlap of OSV use and eared grebe and western grebe nesting season may also occur, but because the species depends on ice-free lakes, ponds, and marshes with emergent vegetation for nesting, the species is unlikely to breed in or near areas concurrently suitable for OSV use.

Breeding season could overlap spatially and temporally with four remaining BOCC species (bald eagle, California spotted owl, white-headed woodpecker, and peregrine falcon). While peregrine falcons may utilize portions of the Lassen National Forest for foraging, there are currently no known peregrine falcon nesting areas on the Lassen National Forest. Therefore, the potential for breeding disturbance due to OSV use is currently low.

Bald Eagle

Bald eagle nest sites do occur on the Lassen National Forest, and breeding activity may begin in February. Potential impacts to bald eagles were analyzed in the Lassen OSV Project Biological Evaluation. National Bald Eagle Management Guidelines (USDI Fish and Wildlife Service 2007) include a buffer of 100 meters (330 feet) for off-road vehicle use, including snowmobiles, in forested landscapes and/or variable terrain, and 200 meters (660 feet) in open landscapes where line of sight to nest trees may be a concern. No existing or proposed groomed or non-groomed designated trails, or plowed parking areas are located within 660 feet of known bald eagle nest sites, under any alternative. Designated area or cross-country OSV travel may occur within buffered areas, with potential for OSV access in buffers (due to terrain and vegetation density) estimated to range from 11 percent under alternative 5 to over 60 percent under alternatives 1 and 4 (see the Biological Evaluation in the project record for more information). However, no bald eagle nest sites are within 660 feet of high or moderate OSV use areas under all alternatives and, therefore, no disturbance impacts to breeding bald eagles are expected under any of the alternatives.

In addition, mitigations to address the minimization criteria applicable to all action alternatives require the Forest to use the results of ongoing inventory and monitoring of bald eagle nest sites to determine whether or not disturbance is occurring and if changes in management (i.e., mitigation according to forest plan direction) are necessary.

California Spotted Owl

The Forest Service considers activities greater than 0.25 mile (400 meters) from a spotted owl nest site to have little potential to affect nesting spotted owls. Snowmobiles passing within 0.25 mile of unsurveyed nesting/roosting habitat or an active nest have the potential to disturb nesting spotted owls. Under all alternatives, groomed and non-groomed trails and staging areas occur within 0.25 mile of California spotted activity centers and/or important habitat. However, OSV use is not consistent across all available habitat. Although we don't know specifically where impacts would occur at any given time and we cannot quantify the amount of impact, we know the potential for impacts would be greatest in areas of high OSV use. Flatter areas with slopes less than 21 percent and canopy cover less than 70 percent, including the trails and staging areas, themselves, are used more by OSVs than others and, therefore, likely to receive the highest use.

Behavioral responses to disturbance, such as leaving an area, can be readily observed in spotted owls (Tempel and Gutierrez 2003) and sensitivity in adult male spotted owls in response to acute traffic exposure was highest in May (Hayward et al. 2011). A total of 120,312 acres of buffered California spotted owl activity sites and 330,312 acres of important habitat occurs within the analysis area. The intensity and duration of noise-generating activities tested by Hayward et al. (2011) are not expected to occur as a result of the proposed action because the maximum period of interaction between OSVs, and related activities occurs prior to May, when breeding adult males are most sensitive to noise, and noise associated with snowmobile use and associated activities in the action area is expected to be of short duration (amount of time it would take to travel through any one given area) and of intermittent intensity (amount of concentrated noise).

In addition, monitoring of PACs by Lassen National Forest found no apparent relationship between a PAC's distance from a snow park and whether it was recently occupied (California OSV Program Final EIR (2010)). Based on the overlap with the breeding seasons for both northern goshawk and California spotted owl, it was recommended that snow grooming activities not be allowed to extend beyond the forest order expiration date of March 31, and under the existing condition, it does not.

Mitigations to address the minimization criteria applicable to all action alternatives require the Forest to use the results of ongoing inventory and monitoring of California spotted owl nest sites to determine whether or not disturbance is occurring and if changes in management (i.e., mitigation according to forest plan direction) are necessary.

White-headed Woodpecker

Some overlap between white-headed woodpecker breeding and OSV use may occur within the project area. However, there is no evidence that white-headed woodpeckers are susceptible enough to human disturbance to warrant seasonal restrictions except in the immediate vicinity of active nests. Nests of the birds have been observed along well-traveled roads, in campgrounds, and in housing developments (Mellen-McLean et al. 2013). If OSV use occurs near an active nest, it is likely of short duration and is not expected to impact species breeding.

Determination

The Lassen National Forest Over-snow Vehicle Use Designation project includes design features that minimize potential impacts to migratory birds, and is consistent with the Forest Service-Fish and Wildlife Service 2008 Migratory Bird Memorandum of Understanding.

Table 172. Fish and Wildlife Service Migratory Birds of Conservation Concern (USDI Fish and Wildlife Service 2008)

Species	Season[34]	Habitat	Breeding Period[1]	Potential for Occurrence Within Project Area
Bald eagle *Haliaeetus leucocephalus*	YR	Conifer forest near large water bodies	February – July (a)	Known to occur
Black rosy-finch *Leucosticte atrata*	YR	Alpine tundra	Early June – August (b)	Unlikely. Habitat lacking
Brewer's sparrow *Spizella breweri*	B	Sagebrush	May – August (a)	Potential for occurrence
Burrowing owl *Athene cunicularia*	YR	Lower elevation valleys and grasslands	March – August (a)	Potential occurrence at lowest elevations

[34] YR=Year round; B=Breeding only; W= Winter presence only

Species	Season[34]	Habitat	Breeding Period[1]	Potential for Occurrence Within Project Area
California spotted owl *Strix occidentalis*	YR	Mature conifer forest	March - June (a)	Known occurrence
Calliope hummingbird *Stellula calliope*	B	Montane and riparian forest	Early May – Early August (1)	Potential occurrence
Eared grebe *Podiceps nigricollis*	B	Ponds, lakes, marshes with emergent vegetation	Late March – July (a)	Potential occurrence
Flammulated owl *Otus flammeolus*	B	Mature open yellow pine forest	May - October	Known occurrence
Fox sparrow *Passerella iliaca*	YR	Chaparral	Mid May - Early August (a)	Potential occurrence
Greater sage-grouse *Centrocercus urophasianus*	YR	Sagebrush	Mid-February - Late August (c)	Not known to occur on the Lassen NF
Green-tailed towhee *Pipilo chlorurus*	B	Montane chaparral, sagebrush	May – Early September (a)	Potential occurrence
Lewis's woodpecker *Melanerpes lewis*	W	Open hardwood or conifer	Early May – July (a)	Potential occurrence at lower elevations in winter
Loggerhead Shrike *Lanius ludovicianus*	YR	Shrubland or open woodland	March – August (a)	Potential occurrence at lowest elevations
Long-billed curlew *Numenius americanus*	B	Marshes, estuaries, wet meadows	Mid-April – September (a)	Potential occurrence
Nuttall's woodpecker *Picoides nuttallii*	YR	Low elevation riparian hardwood	Late March - Early July (a)	Potential occurrence at lowest elevations
Oak titmouse *Baeolophus inornatus*	YR	Oak-dominated woodlands	March – July (a)	Potential occurrence at lower elevations in winter
Olive-sided flycatcher *Contopus cooperI*	B	Montane conifer with openings	Early May – August (a)	Potential occurrence
Peregrine falcon *Falco peregrinus*	YR	High cliffs near open habitat or water	Early March – August (a)	Potential occurrence, but no known nest sites.
Pinyon jay *Gymnorhinus cyanocephalus*	YR	Pinyon-juniper woodland	February – October (a)	Unlikely due to minor amount of habitat
Sage thrasher *Oreoscoptes montanus*	B	Sagebrush	Early April – Mid-August (a)	Potential occurrence
Short-eared owl *Asio flammeus*	W	Large open grasslands and marshes	Early March – July (a)	Winters in areas where snow cover is scant or absent

Species	Season[34]	Habitat	Breeding Period[1]	Potential for Occurrence Within Project Area
Snowy plover *Charadrius alexandrinus*	B	Sparsely vegetated areas	April – August (a)	Not known to occur on the Lassen NF
Swainson's hawk *Buteo swainsoni*	B	Open grasslands and sparse shrublands	Late March - Late August (a)	Potential occurrence at lower elevations
Tri-colored blackbird *Agelaius tricolor*	B	Emergent wetlands	Mid-April - Late July (a)	Potential occurrence at lowest elevations
Western grebe *Aechmophorus occidentalis*	YR	Lakes	April – August (a)	May occur in winter at lowest elevations with ice-free lakes
White-headed woodpecker *Picoides albolarvatus*	YR	Mature pine with large snags	Mid-April - Late August (a)	Known occurrence
Williamson's sapsucker *Sphyrapicus thyroideus*	YR	Montane conifer, mixed conifer-hardwood	May – July (d)	Potential occurrence
Willow flycatcher *Empidonax traillii*	B	Wet meadow and montane riparian	May – August (a)	Known occurrence

1 References used for breeding seasons:

CDFW 2017

Johnson 2002

Shuford and Gardali 2008

Gyug et al. 2012

Management Indicator Wildlife Species

The purpose of this section is to evaluate and disclose the impacts of the Lassen National Forest Over-snow Vehicle Designation Project (Lassen OSV Project) on the habitat of the 13 management indicator species (MIS) identified in the Lassen National Forest LRMP (USDA 1992) as amended by the Sierra Nevada Forests Management Indicator Species Amendment (SNF MIS Amendment) Record of Decision (USDA Forest Service 2007a). This section documents the effects of the proposed action and alternatives on the habitat of selected project-level MIS. Detailed descriptions of the Lassen OSV Project alternatives are found in the chapter 2 of this RFEIS.

MIS are animal species identified in the SNF MIS Amendment Record of Decision (ROD) signed December 14, 2007, which was developed under the 1982 NFS Land and Resource Management Planning Rule (1982 Planning Rule) (36 CFR Part 219). Guidance regarding MIS set forth in the 1992 LRMP as amended by the 2007 SNF MIS Amendment ROD directs Forest Service resource managers to (1) at project scale, analyze the effects of proposed projects on the habitat of each MIS affected by such projects, and (2) at the bioregional scale, monitor populations and/or habitat trends of MIS, as identified in the 1992 LRMP as amended.

Direction Regarding the Analysis of Project-level Effects on MIS Habitat

Project-level effects on MIS habitat are analyzed and disclosed as part of environmental analysis under the National Environmental Policy Act (NEPA). This involves examining the impacts of the proposed project alternatives on MIS habitat by discussing how direct, indirect, and cumulative effects would change the habitat in the analysis area.

These project-level impacts to habitat are then related to broader scale (bioregional) population and/or habitat trends. The appropriate approach for relating project-level impacts to broader scale trends depends on the type of monitoring identified for MIS in the LRMP as amended by the SNF MIS Amendment ROD. Hence, where the Lassen National Forest LRMP as amended by the SNF MIS Amendment ROD identifies distribution population monitoring for an MIS, the project-level habitat effects analysis for that MIS is informed by available distribution population monitoring data, which are gathered at the bioregional scale.

Adequately analyzing project effects to MIS generally involves the following steps:

- Identifying which habitat and associated MIS would be either directly or indirectly affected by the project alternatives; these MIS are potentially affected by the project.
- Summarizing the bioregional-level monitoring identified in the LRMP, as amended, for this subset of MIS.
- Analyzing project-level effects on MIS habitat for this subset of MIS.
- Discussing bioregional scale habitat and/or population trends for this subset of MIS.
- Relating project-level impacts on MIS habitat to habitat and/or population trends at the bioregional scale for this subset of MIS.

These steps are described in detail in the Pacific Southwest Region’s draft document “MIS Analysis and Documentation in Project-Level NEPA, R5 Environmental Coordination” (May 25, 2006) (USDA Forest Service 2006a). This MIS Report documents application of the above steps to select project-level MIS and analyze project effects on MIS habitat for the Lassen OSV Project.

Direction Regarding Monitoring of MIS Population and Habitat Trends at the Bioregional Scale

The bioregional scale monitoring strategy for the Lassen National Forest’s MIS is found in the 2007 SNF MIS Amendment ROD (USDA Forest Service 2007a). Bioregional scale habitat monitoring is identified for all 12 of the terrestrial MIS. In addition, bioregional scale population monitoring, in the form of distribution population monitoring, is identified for all of the terrestrial MIS except for the greater sage-grouse. For aquatic macroinvertebrates, the bioregional scale monitoring identified is Index of Biological Integrity and Habitat. The current bioregional status and trend of populations and/or habitat for each of the MIS is discussed in the 2010 Sierra Nevada Forests Bioregional Management Indicator Species (SNF Bioregional MIS) Report (USDA Forest Service 2010a).

MIS Habitat Status and Trend

All habitat monitoring data are collected and/or compiled at the bioregional scale, consistent with the LRMP as amended by the 2007 SNF MIS Amendment ROD (USDA Forest Service 2007a).

Habitats are the vegetation types (for example, early seral coniferous forest) or ecosystem components (for example, snags in green forest) required by an MIS for breeding, cover, and/or feeding. MIS for the Sierra Nevada National Forests represent 10 major habitats and 2 ecosystem components (USDA Forest Service 2007a), as listed in table 172. These habitats are defined using the California Wildlife Habitat Relationship (CWHR) System (CDFG 2005). The CWHR System provides the most widely used habitat relationship models for California's terrestrial vertebrate species (ibid). It is described in detail in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a).

Habitat status is the current amount of habitat on the Sierra Nevada forests. Habitat trend is the direction of change in the amount or quality of habitat over time. The methodology for assessing habitat status and trend is described in detail in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a).

MIS Population Status and Trend

All population monitoring data are collected and/or compiled at the bioregional scale, consistent with the LRMP as amended by the 2007 SNF MIS Amendment ROD (USDA Forest Service 2007a). The information is presented in detail in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a).

Population monitoring strategies for MIS of the Lassen National Forest are identified in the 2007 SNF MIS Amendment ROD (USDA Forest Service 2007a). Population status is the current condition of the MIS related to the population monitoring data required in the 2007 SNF MIS Amendment ROD for that MIS. Population trend is the direction of change in that population measure over time.

There are a myriad of approaches for monitoring populations of MIS, from simply detecting presence to detailed tracking of population structure (USDA Forest Service 2001, Appendix E, page E-19). A distribution population monitoring approach is identified for all of the terrestrial MIS in the 2007 SNF MIS Amendment, except for the greater sage-grouse (USDA Forest Service 2007a). Distribution population monitoring consists of collecting presence data for the MIS across a number of sample locations over time. Presence data are collected using a number of direct and indirect methods, such as surveys (population surveys), bird point counts, tracking number of hunter kills, counts of species sign (such as deer pellets), and so forth. The specifics regarding how these presence data are assessed to track changes in distribution over time vary by species and the type of presence data collected, as described in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a).

Aquatic Macroinvertebrate Status and Trend

For aquatic macroinvertebrates, condition and trend is determined by analyzing macroinvertebrate data using the predictive, multivariate River Invertebrate Prediction and Classification System (RIVPACS) (Hawkins 2003) to determine whether the macroinvertebrate community has been impaired relative to reference condition within perennial water bodies. This monitoring consists of collecting aquatic macroinvertebrates and measuring stream habitat features according to the Stream Condition Inventory (SCI) manual (Frazier et al. 2005). Evaluation of the condition of the biological community is based upon the “observed to expected” (O/E) ratio, which is a reflection of the number of species observed at a site versus the number expected to occur there in the absence of impairment. Sites with a low O/E scores have lost many species predicted to occur there, which is an indication that the site has a lower than expected richness of sensitive species and is therefore impaired.

Selection of Project-level MIS

MIS for the Lassen National Forest are identified in the 2007 SNF MIS Amendment ROD (USDA Forest Service 2007a). The habitats and ecosystem components and associated MIS analyzed for the project were selected from this list of MIS (table 173). In addition to identifying the habitat or ecosystem components (1st column), the CWHR type(s) defining each habitat/ecosystem component (2nd column), and the associated MIS (3rd column), the table discloses whether the habitat of the MIS is potentially affected by the Lassen OSV Project (4th column).

Conclusion

For all alternatives, elements contained in the alternatives pertaining to OSV management and use would not alter MIS habitat structural components, and would not directly or indirectly affect existing amounts of MIS habitats on the Lassen National Forest. Therefore, no MIS species will be carried forward for further analysis.

Table 173. Selection of MIS for project-level habitat analysis for the Lassen OSV Project

Habitat or Ecosystem Component	CWHR Type(s) defining the habitat or ecosystem component[1]	Sierra Nevada Forests MIS *Scientific Name*	Category for Project Analysis [2]
Riverine & Lacustrine	lacustrine (LAC) and riverine (RIV)	aquatic macroinvertebrates	2
Shrubland (west-slope chaparral types)	montane chaparral (MCP), mixed chaparral (MCH), chamise-redshank chaparral (CRC)	fox sparrow *Passerella iliaca*	2
Sagebrush	Sagebrush (SGB)	greater sage-grouse *Centrocercus urophasianus*	2
Oak-associated Hardwood & Hardwood/conifer	montane hardwood (MHW), montane hardwood-conifer (MHC)	mule deer *Odocoileus hemionus*	2
Riparian	montane riparian (MRI), valley foothill riparian (VRI)	yellow warbler *Dendroica petechia*	2
Wet Meadow	Wet meadow (WTM), freshwater emergent wetland (FEW)	Pacific tree (chorus) frog *Pseudacris regilla*	2
Early Seral Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree sizes 1, 2, and 3, all canopy closures	Mountain quail *Oreortyx pictus*	2
Mid Seral Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 4, all canopy closures	Mountain quail *Oreortyx pictus*	2
Late Seral Open Canopy Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 5, canopy closures S and P	Sooty (blue) grouse *Dendragapus obscurus*	2
Late Seral Closed Canopy Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), tree size 5 (canopy closures M and D), and tree size 6.	California spotted owl *Strix occidentalis occidentalis*	2
		American marten *Martes americana*	
		northern flying squirrel *Glaucomys sabrinus*	

Habitat or Ecosystem Component	CWHR Type(s) defining the habitat or ecosystem component[1]	Sierra Nevada Forests MIS *Scientific Name*	Category for Project Analysis [2]
Snags in Green Forest	Medium and large snags in green forest	hairy woodpecker *Picoides villosus*	2
Snags in Burned Forest	Medium and large snags in burned forest (stand-replacing fire)	black-backed woodpecker *Picoides arcticus*	2

[1] All CWHR size classes and canopy closures are included unless otherwise specified; **dbh** = diameter at breast height; **Canopy Closure classifications:** S=Sparse Cover (10-24% canopy closure); P= Open cover (25-39% canopy closure); M= Moderate cover (40-59% canopy closure); D= Dense cover (60-100% canopy closure); **Tree size classes:** 1 (Seedling)(<1" dbh); 2 (Sapling)(1"-5.9" dbh); 3 (Pole)(6"-10.9" dbh); 4 (Small tree)(11"-23.9" dbh); 5 (Medium/Large tree)(≥24" dbh); 6 (Multi-layered Tree) [In PPN and SMC] (Mayer and Laudenslayer 1988).

[2] **Category 1:** MIS whose habitat is not in or adjacent to the project area and would not be affected by the project.

Category 2: MIS whose habitat is in or adjacent to project area, but would not be either directly or indirectly affected by the project.

Category 3: MIS whose habitat would be either directly or indirectly affected by the project.

Survey and Manage Wildlife Species

Forestwide standards and guidelines for “Survey and Manage” old-growth associated species were revised in January 2001, and described in the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures, Standards and Guidelines (2001 ROD) (USDA Forest Service and USDI BLM 2001). Category A and C species that are considered to be within the California Klamath Province require pre-disturbance field survey prior to implementing management actions that could significantly, negatively affect the species’ habitat or persistence of the species on the site. Pre-disturbance surveys are not required if delay in implementation of a proposed action to perform surveys would result in an unacceptable environmental risk. The adopted standards and guidelines for Survey and Manage species only applies within the area of the Northwest Forest Plan (NWFP), which, on the Lassen National Forest, encompasses approximately 41,893 acres in the northwestern portion of the Hat Creek Ranger District. This analysis addresses potential effects of the Lassen Over-snow Use Designation Project on Survey and Manage vertebrates, mollusks, and arthropods. Fungi, lichens, bryophytes, and vascular plants are addressed in the project botany report (project record).

Survey and Manage Standards and Guidelines germane to this project are as follows:

1. Manage for known sites of Survey and Manage species in Categories A, B, or E and high-priority sites of Category C or D species.

2. Complete pre-disturbance surveys for Category A and C species if activity is potentially habitat disturbing such that it is likely to have a significant negative impact on the species’ habitat, life cycles, microclimate, or life support requirements (USDA Forest Service and USDI BLM 2001).

Assessment Process

1. Consideration of species category, range, habitat, and current scientific information

Considerations that would preclude further analysis of survey and manage species for this project are as follows:

a) Species assigned to Category F, a category, which does not require management of known sites or pre-disturbance surveys.

b) Species assigned to Categories B, D, or E, categories requiring management of known sites where no known sites are documented in this project area.

c) Species assigned to Categories A or C, categories requiring pre-disturbance surveys (if habitat-disturbing activities are suspected) but these species' habitats do not correspond to the project area.

d) Species assigned to Categories A or C, but the ranges of these species do not coincide with the project area or Lassen National Forest.[35]

e) Current scientific information such as taxonomic uncertainty or taxonomic changes.

2. The following steps were conducted to determine which species would be carried forward in the analysis and which of the aforementioned activities are considered habitat disturbance.

a) Query of the National Resources Information System (NRIS) database and California Natural Diversity Database (CNDDB) to determine if known sites exist in the project area.

b) Determination of which activities may compromise the persistence of a species at a site based upon the focal species' habitat, life cycle, microclimate or life support requirements.

c) Assessment of the level of management for known sites to assure persistence at a site and the portion of the project area warranting pre-disturbance surveys, based upon the potential for habitat disturbing activities.

Survey and Manage Species Analysis

Affected Environment

Existing Condition

Manage Known Sites Requirement

The 2001 ROD requires management of known sites of any Category A, B, or E species and high-priority sites of Category C or D species. High-priority sites are those that are needed to provide for reasonable assurance of species persistence. No high-priority sites are located on the Lassen National Forest.

Category A, C, and E species

Currently, only one species requiring pre-disturbance surveys, if habitat-disturbing activities are suspected, has suitable habitat within the Lassen National Forest (table 174). According to NRIS, CNDDB, and forest staff, there are no verified sightings of great gray owl on the Lassen National Forest.

[35] Based on information in USDA Forest Service and USDI Bureau of Land Management (2001), Bureau of Land Management (1999), and NatureServe (2014).

Table 174. Survey and manage terrestrial wildlife species, categories A, C, and E

Common Name ***Scientific Name***	**Habitat**	**Known sites within NWFP portion of project?**	**Potential habitat present?**
Great gray owl *Strix nebulosa* Category A	Mid- or late-succession conifer forests at size class 4 (dominant and co-dominant trees 12 to 23 inches), containing large (over 24 inches dbh), broken-top snags. No known sites in NWFP area. Also a Region 5 Sensitive species[36].	No	Yes

The 2001 ROD requires specific mitigations for the great gray owl, within the range of the northern spotted: provide a no-harvest buffer of 300 feet around meadows and natural openings and establish 0.25-mile protection zones around known nest sites.

Category B species

The 2001 ROD provides direction to perform equivalent effort (project level) field surveys for all Category B Survey and Manage species. There are no category B terrestrial wildlife species within the Lassen National Forest.

Environmental Consequences

Mitigations to Address Minimization Criteria of the Travel Management Regulations

In designating NFS trails and areas on a national forest, the Forest Service Travel Management Regulations require the responsible official to “consider effects on the following, with the objective of minimizing:

- Damage to soil, watershed, vegetation, and other forest resources;
- Harassment of wildlife and significant disruption of wildlife habitats;
- Conflicts between motor vehicle use and existing or proposed recreational uses of National Forest System lands or neighboring Federal lands; and
- Conflicts among different classes of motor vehicle uses of National Forest System lands or neighboring Federal lands” (36 CFR §212.55(b)).

The mitigations that address the minimization criteria are in appendices C and D of this RFEIS (Volume II) and the Wildlife Biological Evaluation (see project record).

Effects Common to All Alternatives

None of the alternatives under consideration as part of the Lassen Over-snow Vehicle Designation project would physically modify structure or composition of great gray owl habitat and, therefore, the mitigations[37] in the 2001 ROD for the great gray owl, within the range of the northern spotted owl would not apply. In addition, OSV use and related activities are an ongoing use on the Lassen National Forest.

Although the potential for noise-based disturbance to individuals within high-reproductive habitat ranges from 32 to 37 percent under all of the alternatives, great gray owls have not been confirmed

[36] Assessed in the project Biological Evaluation

[37] Provide a no-harvest buffer of 300 feet around meadows and natural openings and establish 1/4-mile protection zones around known nest sites.

on the Lassen National Forest. In the event that great gray owls are found on the forest, the potential for OSV-related noise-based disturbance would overlap with only the early part of the March 1 through August 15 great gray owl breeding season, and nest sites with potential to be impacted would be monitored to determine whether or not disturbance is occurring and if changes in management, including a limited operating period around nest sites, are necessary, thereby minimizing impacts to great gray owl. In addition, due to their nocturnal behavior, great gray owls, if present, would be expected to have little interaction with snowmobiles or snow grooming equipment resulting in very little potential for direct effects from snowmobiles or grooming equipment.

Fisheries and Aquatic Resources

The purpose of this analysis is to determine the impacts of over-snow vehicles (OSVs) on aquatic resources in support of a court-ordered settlement for the Lassen National Forest. The focus is on impacts to aquatic species and their habitat that may result from the use of OSVs as described in the alternatives.

OSV use could impact aquatic species and their habitat through chemical contamination, ground surface disturbance, runoff timing, or through altering streamside vegetation. The Lassen National Forest adheres to a variety of laws, regulations and policy that provide guidelines and standards for managing OSV impacts. Direct, indirect, and cumulative effects of OSV use on aquatic species and their habitat from implementation of this plan, and specific actions identified in the alternatives, will be analyzed.

This analysis will describe the area affected by the alternatives and existing resource conditions within watersheds where aquatic species and their habitat overlap with OSV use. Hydrology and aquatic resource measurement indicators are used to describe the existing conditions for watersheds within the analysis area and for analysis to compare, quantify, and describe how each alternative addresses resource concerns as they pertain to aquatic resources. The analysis includes all aquatic resources that could be affected by OSVs. This includes perennial and seasonal streams, lakes, ponds, meadows, and springs.

Aquatic Species Biological Evaluation/Biological Assessment

Because OSV use and snow trail grooming could affect some aquatic species and their habitat, this analysis will evaluate the direct, indirect, and cumulative effects of the alternatives on aquatics species and their habitat, including threatened, endangered, proposed or sensitive species (TEPS) that could result from the proposed actions.

The main body of this section documents the biological evaluation/biological assessment (project record) to evaluate and disclose effects of the proposed action and alternatives on Federal threatened, endangered, proposed, or candidate aquatic species, and Forest Service Region 5 sensitive species. Collectively, these aquatic species are referred to as TEPS.

Relevant Laws, Regulations, and Policy

Regulatory Framework

Land and Resource Management Plan

The Lassen National Forest Land and Resource Management Plan (LRMP, USDA Forest Service 1992) provides direction specific to management of fish, water and riparian areas, and is found as goals, objectives, and standards and guidelines in chapter 4 of the Lassen LRMP as well as in the

Northwest Forest Plan (NWFP) and Sierra Nevada Forest Plan Amendment (SNFPA), both of which include aquatic conservation strategies (including a long-term strategy in the SNFPA for management of anadromous fishes on the Lassen National Forest). Aquatic conservation strategies are found in their entirety in each of the aforementioned amendments to the LRMP.

Endangered Species Act (ESA)

The Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) requires that any action authorized by a Federal agency not be likely to jeopardize the continued existence of a threatened or endangered (TE) species, or result in the destruction or adverse modification of critical habitat for these species. Section 7 of the ESA, as amended, requires the responsible Federal agency to consult the Fish and Wildlife Service and the National Marine Fisheries Service concerning TE species under their jurisdiction. It is Forest Service policy to analyze impacts to TE species to ensure management activities are not be likely to jeopardize the continued existence of a TE species, or result in the destruction or adverse modification of critical habitat for these species. This assessment is documented in a biological assessment (project record).

Magnuson–Stevens Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a Federal fisheries management plan. The MSA requires Federal agencies to consult with the National Marine Fisheries Service on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (MSA '305(b)(2)).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA '3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species = contribution to a healthy ecosystem; and spawning, breeding, feeding, or growth to maturity covers a species' full life cycle (50 CFR §600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR §600.810).

EFH for the Pacific coast salmon fishery means those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem. To achieve that level of production, EFH must include all those streams, lakes, ponds, wetlands, and other currently viable water bodies and most of the habitat historically accessible to salmon in Washington, Oregon, Idaho, and California. In the estuarine and marine areas, salmon EFH extends from the near shore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (370.4 kilometers (230 miles)) offshore of Washington, Oregon, and California north of Point Conception Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other waterbodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the Pacific Fishery Management Council),and longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for several hundred years).

Essential fish habitat determinations are either “May Adversely Affect” (MAA) or “Not Adversely Affect (NAA). EFH is the same area as designated critical habitat (DCH) for species discussed in this aquatics analysis and is used interchangeably in the analysis.

Forest Service Manual and Handbooks (FSM/H 2670)

Forest Service sensitive species are species identified by the Regional Forester for which population viability is a concern. The Forest Service develops and implements management practices to ensure that rare plants and animals do not become threatened or endangered and ensure their continued viability on national forests. It is Forest Service policy to analyze impacts to sensitive species to ensure management activities do not create a significant trend toward Federal listing or loss of viability. This assessment is documented in a biological evaluation (project record).

Forest Service Manual 2670.32 (USDA Forest Service 2005) directs the forest to avoid or minimize impacts to species whose viability has been identified as a concern, and therefore, listed as sensitive by the Regional Forester. If impacts cannot be avoided then the forest must analyze the significance of the potential adverse effects on the population or its habitat within the area of concern and on the species as a whole. Impacts may be allowed but the decision must not result in a trend toward Federal listing.

Forest Service Manual 2670.22 (USDA Forest Service 2005) directs national forests to “maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands.” To comply with this direction, forests are encouraged to track and evaluate effects to additional species that may be of concern even though they are not currently listed as sensitive. Such plant species are referred to as species of interest or watch list species.

Sierra Nevada Forest Plan Amendment (SNFPA)

The Sierra Nevada Forest Plan Amendment (USDA Forest Service 2004) amended each of the forest plans in the Sierra Nevada and provides regional direction to restore aquatic, riparian, and meadow ecosystems and provide for the viability of native plant and animal species associated with these ecosystems. This includes mountain yellow-legged frogs, Yosemite toads, and their habitats. This regional direction is represented by an array of features that, in their entirety, constitute an aquatic management strategy for the Sierra Nevada. The fundamental principle of the aquatic management strategy is to retain, restore, and protect the processes and landforms that provide habitat for aquatic and riparian-dependent organisms. Accomplishment of these objectives are achieved through a combination of tactics such as standards and guidelines and policies that are intended to work collectively, and include a suite of interrelated actions that work together to manage and conserve aquatic habitats.

Riparian Conservation Areas (RCA): Activity-Related Standards and Guidelines

Where a proposed project encompasses an RCA or a critical aquatic refuge (CAR), conduct a site-specific project area analysis to determine the appropriate level of management within the RCA (or CAR). Determine the type and level of allowable management activities by assessing how proposed activities measure against the riparian conservation objectives (RCO) and their associated standards and guidelines. Areas included in RCAs are: 300 feet on each side of perennial streams; 150 feet on each side of intermittent and ephemeral streams; and 300 feet from lakes, meadow, bogs, fens, wetlands, vernal pools, and springs.

Topics and Issues Addressed in This Analysis

Issues

Designating trails and areas for OSV use have the potential to impact aquatic wildlife through direct, indirect, or cumulative disturbance to individuals and direct, indirect, or cumulative disturbance or impacts to aquatic wildlife habitats.

OSV use also has the potential for releasing burned and unburned fuel and lubricants into the environment. These potential impacts can then indirectly result in adverse impacts to water quality and alter snowmelt patterns.

Over-snow vehicles, when operated cross-country instead of on designated trails have the potential for more widespread impacts due to the potential for ground disturbance (similar in nature to summer motorized use if there is inadequate snow cover). These potential effects are highly dependent on location, particularly areas of thin snow cover, and the amount and timing of use. Wet meadows, springs, seeps, and fens, are particularly sensitive to disruption.

Resource Indicators and Measures

Table 175. Aquatic species resource indicators and measures for assessing effects

Resource Element	Resource Indicator	Measure (Quantify if possible)
Aquatic species	Species presence	Occurrence of TEPS species within designated OSV use areas. Occurrence of TEPS species in proximity to designated OSV trails.
	Minimum Snow Depth for OSV Use on Designated Trails	Minimum snow depths on trails can be evaluated for effectiveness for protecting the trail surface and potential for sediment delivery to waterways
Aquatic habitat	Minimum Snow Depth for Cross-country OSV Use	Minimum snow depths for cross-country travel can be evaluated for effectiveness for protecting aquatic habitats
	*Consistency with RCOs 1, 2, 4, 5, and 6 (Analyzed in the hydrology analysis)	Evaluation of the effects to RCAs, water quality and beneficial uses of water

*Note: The Sierra Nevada Forest Plan Amendment requires that riparian conservation objectives (RCO) analyses be conducted during environmental analyses for new proposed management activities within CARs and RCAs (Standard and Guideline 92). There are no additional routes proposed for addition to the national forest transportation system within CARs in the analysis area. Consequently, consistency with the RCOs is an indicator to ensure that goals of the aquatic management strategy are met (USDA FForest Service 2004: 32). The RCO Analysis is in appendix F of the hydrology analysis.

Methodology and Information Sources

This analysis uses relevant Geographic Information System (GIS) data layers from the Lassen National Forest. The GIS layers of proposed OSV designations and groomed trails were overlain with the aquatic resource (i.e., species distribution, critical habitat, surveys) layers to identify areas of potential effects.

The biological evaluation/biological assessment (project record) reviews the proposed action and alternatives in sufficient detail to determine the level of effect that would occur to federally listed aquatic and Region 5 sensitive species. One of four possible determinations is chosen based on the available literature, a thorough analysis of the potential effects of the project, and the professional judgment of the biologist who completed the evaluation. The four possible determinations (from FSM 2672.42) are:

1. "No impact" – where no impact is expected;
2. "Beneficial impact" – where impacts are expected to be beneficial;
3. "May adversely impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area" – where impacts are expected to be immeasurable or extremely unlikely; and
4. "May affect individuals, and is likely to result in a trend toward Federal listing or loss of viability in the planning area" – where impacts are expected to be detrimental and substantial.

Similar categories for federally listed threatened and endangered species are:

1. No effect
2. Beneficial effect
3. May affect, not likely to adversely affect
4. May affect, likely to adversely affect

Incomplete and Unavailable Information

There is little research and information available regarding the responses of each aquatic species from OSV uses, including indirect effects from snow compaction and vehicle emissions during the winter.

No field observations or site specific aquatic surveys or monitoring related to OSV use and their potential effects to aquatic species was done to support this analysis. Lassen recreation staff monitor OSV and other winter recreation use on the forest, but no water quality sampling or assessments on effects of OSV use on aquatic species have been made. Assessments of impacts of OSVs were primarily based on current scientific literature and professional judgement.

Spatial and Temporal Context for Effects Analysis

The project area boundary serves as the analysis boundary for direct, indirect, and cumulative effects. Effects to aquatic species or their habitat would be expected to have occurred or become evident within one or two years of disturbance and this constitutes the short term. Effects that linger beyond 2 years are considered long term effects. Long term effects beyond 2 years become increasingly difficult to predict due to unknown interactions and the many environmental variables with numerous possible outcomes.

Direct and Indirect Effects Boundaries

The spatial boundary for analyzing the direct and indirect effects to aquatic resources is the project area boundary, because all expected effects relevant to this resource would occur and remain within this area.

Cumulative Effects Boundaries

Because effects from the proposed activities would interact with effects from other ongoing or future projects only within the project area boundary, the cumulative effects boundary is also the project area boundary. The project area boundary is the Lassen National Forest boundary.

Assumptions specific to the aquatic resources analysis:

- Aquatic species are unlikely to be directly affected by authorized OSV use (with the specified snow depth requirements).

- Indirect effects, such as those possibly resulting from snow compaction and vehicle emissions, are likely to be concentrated along designated OSV trails (groomed or ungroomed) because OSV use is concentrated. Therefore, an area within 100 feet of designated OSV trails is reasonably foreseeable to be affected by snow compaction, emissions, or other contamination. Areas designated for OSV use away from OSV trails are much less likely to experience measurable indirect effects.
- Only authorized OSV uses will be analyzed. Concerns arising from unauthorized uses would be addressed as law enforcement issues and may prompt corrective actions.
- Future aquatic resource-related monitoring may identify unexpected types or levels of impacts to aquatic resources, and may prompt corrective actions as warranted.

Affected Environment

Existing Condition

Threatened, Endangered, and Proposed Aquatics Species

Official species lists for this project were obtained on September 29, 2015, from the Klamath Falls, Sacramento, Yreka, and Nevada Field Offices of the United States Department of the Interior, Fish and Wildlife Service (USDI Fish and Wildlife Service 2015a, b, c, and d). An updated list was obtained in September 2017 through the Fish and Wildlife Service Information for Planning and Conservation website (https://ecos.fws.gov/ipac/) from the Sacramento, Yreka and Nevada Fish and Wildlife Service office. The lists identify aquatic species to consider because they may be present within the general area of the Lassen National Forest.

The lists identify aquatic species to consider because they may be present within the general area of the Lassen National Forest:

Species Considered in the Analysis

Species or critical habitat that may occur in the action area or be affected by activities associated with the proposed action and alternatives were reviewed. The species and critical habitat in table 176 were evaluated for potential presence in the action area. Species which are not known or suspected to occur in areas that may be designated for OSV use are not carried forward into the effects analysis.

Table 176. TEPS aquatic species considered for Lassen National Forest Over-snow Vehicle Use Designation project

Species	Status	Known or Potential Occurrence in the action area	Finding/Rationale
Amphibians			
California red-legged frog (*Rana draytonii*)	Threatened	No Potential Occurrence	No Effect. No DCH on Lassen NF

Species	Status	Known or Potential Occurrence in the action area	Finding/Rationale
Oregon spotted frog (*Rana pretiosa*)	Threatened	No Potential Occurrence	No Effect. Species is not suspected to occur on Lassen NF. Historically, in California this species ranged in extreme northeast California, where it was known from only a few scattered localities including Pine Creek, S. Fork Pitt River near Alturas, Warner Mtns., and the southwestern side of Lower Klamath Lake.
Sierra Nevada yellow-legged frog (*Rana sierrae*)	Endangered	Potential Occurrence	Historical occurrence, but no known extant populations on the Lassen NF. Currently classified under 'utilization unknown' Fish and Wildlife Service suitable habitat category, therefore presence is assumed.
Fishes			
Chinook salmon (*Oncorhynchus tshawytscha*) Central Valley Spring Run ESU	Threatened	Potential Occurrence	Habitat currently located in the southwest portion within Lassen National Forest administrative boundaries.
Coho salmon (*Oncorhynchus (=salmo) kisutch*)	Threatened	No Potential Occurrence	No Effect. Species and habitat does not exist on Lassen National Forest.
Delta smelt (*Hypomesus transpacificus*)	Threatened	No Potential Occurrence	No Effect. The geographic range of the Delta smelt (USDI Fish and Wildlife Service 1993) is outside the project area.[1]
Longfin, San Francisco Bay Delta Population smelt (*Spirinchus thaleichthys*)	Candidate	No Potential Occurrence	No Effect. Species and habitat does not exist on Lassen National Forest.
Central Valley Steelhead (*Oncorhynchus (=salmo) mykiss*)	Threatened	Potential Occurrence	Habitat currently located in the southwest portion within Lassen National Forest administrative boundaries.
Aquatic Invertebrates			
Conservancy fairy shrimp (*Branchinecta conservatio*)	Endangered	No Potential Occurrence	No Effect. Forest is outside the elevational range of this species, and specific habitat (Central Valley vernal pools) does not exist within its boundaries. [2]
Shasta crayfish (*Pacifastacus fortis*)	Endangered	No Potential Occurrence	No Effect. Project area is located outside range of species. [3]
Vernal pool fairy shrimp (*Branchinecta lynchi*)	Threatened	No Potential Occurrence	No Effect. Forest is outside the elevational range of this species, and specific habitat (Central Valley vernal pools) does not exist within its boundaries.[4]
Vernal pool tadpole shrimp (*Lepidurus packardi*)	Endangered	No Potential Occurrence	No Effect. Forest is outside the elevational range of this species, and specific habitat (Central Valley vernal pools) does not exist within its boundaries. [5]

Species	Status	Known or Potential Occurrence in the action area	Finding/Rationale
	CRITICAL	**HABITATS WITHIN**	**THE PROJECT AREA**
Species	**Status**	**Occurrence**	**Analysis**
Sierra Nevada yellow-legged frog (*Rana sierrae*)	Final Designated Critical Habitat	Known Occurrence	Yes, DCH
Chinook salmon (*Oncorhynchus tshawytscha*) Central Valley Spring Run	Final Designated	Known Occurrence	Yes. There is DCH for this species and EFHdesignated for Chinook salmon on Lassen National Forest. [6]
Steelhead (*Oncorhynchus (=salmo) mykiss*)	Final Designated	Known Occurrence	Yes. There is DCH for this species on Lassen National Forest.
	Forest	**Sensitive Species**	
Species	**Status**	**Occurrence**	**Analysis**
Cascades frog *(Rana cascadae)*	Sensitive	Known Occurrence	Known presence; considered in analysis.
Black Juga *(Juga nigrina)*	Sensitive	Likely Occurrence	Present within stream located within project boundaries; considered in analysis.

[1] USDI Fish and Wildlife Service. 1993.
[2] USDI Fish and Wildlife Service. 2007a.
[3] USDA Forest Service. 2010.
[4] USDI Fish and Wildlife Service. 2007b..
[5] USDI Fish and Wildlife Service. 2007c.
[6] NOAA Fisheries, West Coast Region. Map of critical habitat, Central Valley Spring-run Chinook Salmon. http://www.westcoast.fisheries.noaa.gov/publications/gis_maps/maps/salmon_steelhead/critical_habitat/chin/chinook_cvsr.pdf

Because they are not present and not suspected of occurring within areas currently or proposed for OSV use, the following species would **not** be affected and are not carried forward into the effects analysis:

Threatened or Endangered

- California red-legged frog (*Rana draytonii*)
- Oregon spotted frog (*Rana pretiosa*)
- Coho salmon (*Oncorhynchus kisutch*)
- Delta smelt (*Hypomesus transpacificus*)
- Longfin, San Francisco Bay Delta Population smelt (*Spirinchus thaleichthys*)

* see further explanation in the determinations section of this analysis.

Sensitive

- Foothill yellow-legged frog (*Rana boylii*)
- California floater (*Anodonta californiensis*)
- Great Basin Rams-horn (*Helisoma newberryi newberryi*)
- Scalloped Juga (*Juga (Calibasis) acutifilosa*)
- Topaz Juga (*Juga (Calibasis) occata*)
- Montane Peaclam (*Pisidium (Cyclocalyx) ultramontanum*)

- Nugget pebblesnail (*Fluminicola seminalis*)
- Kneecap lanx (*Lanx patelloides*)
- Eagle Lake rainbow trout (*Oncorhynchus mykiss aquilarum*)
- Goose Lake redband trout (*Oncorhynchus mykiss pop. 6*)
- Hardhead (*Mylopharodon conocephalus*)

Listed Species and Critical Habitat Information

Chinook salmon (Oncorhynchus tshawytscha) Central Valley Spring Run ESU and Central Valley steelhead (Oncorhynchus (=salmo) mykiss)

Affected Environment

In 1999, the National Marine Fisheries Service listed the Central Valley spring-run Chinook salmon evolutionarily significant unit (ESU) as threatened under the Federal Endangered Species Act (ESA) (64 FR 50394). The Central Valley ESU includes all naturally spawned populations in the Sacramento River, tributaries of the Sacramento River, and the Feather River (64 FR 50394). In 2005, the National Marine Fisheries Service published a final listing determination for Central Valley spring-run that added Feather River Hatchery spring-run to the designation and the final designation of critical habitat, which includes the Sacramento, lower Feather, and Yuba Rivers; and Beegum, Battle, Clear, Cottonwood, Antelope, Mill, Deer, Butte, and Big Chico Creeks (70 FR 52590).

Of five fourth-field sub-basins occupied by these two federally listed species, only two are occupied by the species within the Lassen National Forest boundary: Sacramento-Thomes-Elder-Mill (containing Mill and Antelope Creeks) and Sacramento-Deer (containing Deer Creek) (see figure 18 showing anadromous fish-producing fourth-field watersheds).

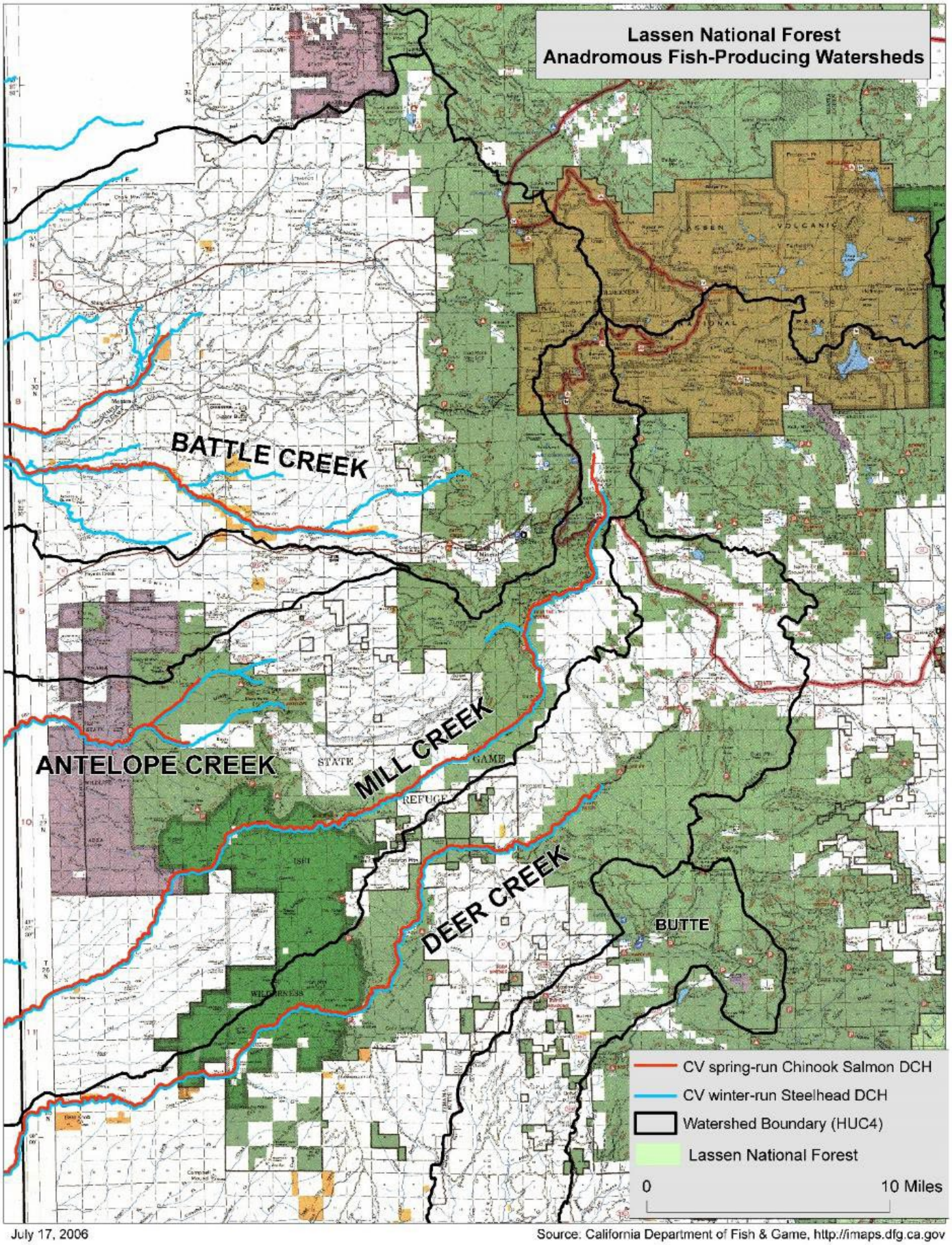

Figure 18. Anadromous fish-producing watersheds on the Lassen National Forest

The following subbasins summarized details of anadromous fish occupancy in the Lassen NF:

Antelope Creek: contains assumed occupancy based on DCH for each species.

Mill Creek: contains occupancy for both species up to 0.25 mile from the Lassen Volcanic National Park boundary on the mainstem of Mill Creek. Steelhead have an assumed occupancy on any accessible tributaries, e.g., tributary with DCH (Rocky Gulch) + tributary that intersects with Rd 28N06 crossing (note: crossing no longer present). Location =T28N; R4E; Sec 8 (tributary enters Mill Creek downstream of Hole in the ground).

Deer Creek: contains occupancy for both species that overlaps their DCH.

Battle Creek and Butte Creek: no occupancy on the Lassen National Forest, but are under specific management direction with the Lassen National Forest Land and Resource Management Plan and the Sierra Nevada Forest Plan Amendment.

Total miles of anadromous habitat present within the boundary of the Lassen National Forest is estimated at 25 miles for Deer Creek, 43 miles for Mill Creek, and 7 miles for Antelope Creek.

The California Department of Fish and Game (CDFG) has been working with PG&E and other interested parties to restore and enhance anadromous fish passage around several water diversion dams located on both forks of Battle Creek. As of November 2011, fish passage work has been mostly completed on all water diversions found on North Fork Battle Creek, with the upper limit to anadromy now located at a natural fish barrier located approximately 13 miles downstream of the Lassen National Forest boundary and 2 miles upstream of the confluence of Bailey and North Fork Battle creeks. Work is currently underway on fish passage enhancement around three diversion dams located on South Fork Battle Creek. It is anticipated that spring-run Chinook salmon would have access to habitat upstream of these dams with upstream migration of spring-run Chinook salmon anticipated to come within 2 to 3 miles of NFS lands in the vicinity of Angel Falls, a natural barrier to anadromy. Current utilization of habitat downstream of Angel Falls by steelhead is unknown. However, like with spring-run Chinook salmon, completion of restoration efforts is expected to improve access for steelhead to habitat on the South Fork upstream to Angel Falls as well (Mayes personal comm. 2016).

Designated critical habitat for both species is identified within the Lassen National Forest boundary in Antelope, Mill, and Deer Creeks. In the Panther Creek drainage (Upper South Fork Battle Creek subwatershed), critical habitat has also been designated for steelhead. The latter DCH within the project area, however, is associated with a small, headwater stream/shallow intermittent lake (Panther Creek/Dry Lake), which lacks suitable habitat for steelhead. Specifically, and Dry Lake in particular, there is no stream habitat that provides any of the following three primary constituent elements of DCH: spawning, rearing, or migration habitat. Additionally, the species is not in close proximity to the Lassen National Forest boundary; the upper extent of habitat known to be currently occupied by steelhead is more than 10 miles downstream of the forest boundary in the South Fork of Battle Creek.

Therefore, due to the lack of primary constituent habitat elements in the Panther Creek drainage DCH, and the lack of proximity to this DCH, the primary area of analysis for the two listed anadromous fish considers the aquatic features (perennial streams) designated as critical habitat that are occupied by the species and, their associated RCAs on NFS lands within the project area in the Antelope, Mill and Deer Creek DCHs.

Sierra Nevada yellow-legged frog (Rana sierrae) -- Endangered

Affected Environment

Sierra Nevada (mountain) yellow-legged frog (*Rana sierrae*) is an endangered species with Final Designated Critical Habitat under the ESA. On April 25, 2013, the Fish and Wildlife Service published a proposal in the *Federal Register* (Vol.78, No. 80) proposing listing the Sierra Nevada yellow-legged frog as endangered and designating critical habitat. On April 29, 2014, the final rule was published in the *Federal Register* (Vol. 79, No. 82) designating the species endangered, with an effective date of this final rule on June 30, 2014. A final rule on DCH became effective on September 26, 2016. The criterion for the listing was based on the danger of extinction throughout the species' entire range and on the immediacy, severity, and scope of the threats to its continued existence. These threats include habitat degradation and fragmentation, predation and disease, climate change, inadequate regulatory protections, and the interaction of these various stressors impacting small remnant populations. There has been a range-wide reduction in abundance and geographic extent of surviving populations of frogs following decades of fish stocking, habitat fragmentation, and, most recently, a disease epidemic. This combination of population stressors makes persistence of the species precarious throughout the currently occupied range in the Sierra Nevada.

The project area supports potential suitable habitat for the Sierra Nevada yellow-legged frog (*Rana sierrae*). The Sierra Nevada yellow-legged frog is endemic to the northern and central Sierra Nevada and adjacent Nevada ranging from north of the Feather River (including the Plumas and southern edge of the Lassen National Forest) south to the Monarch Divide on the western side of the Sierra Nevada crest (Sierra National Forest), and near Independence Creek on the eastern side of the Sierra Nevada crest (Inyo National Forest).

Suitable habitat typically occurs above 4,500 feet in elevation, but in some areas, including the western side of the Plumas National Forest, it is thought to occur as low as 3,500 feet in elevation. Suitable habitat includes permanent waterbodies or those hydrologically connected with permanent water such as wet meadows, lakes, streams, rivers, tarns, perennial creeks, permanent plunge pools within intermittent creeks, and pools, such as a body of impounded water contained above a natural dam. Suitable habitat includes adjacent areas, up to a distance of 82 feet. When waterbodies occur within 984 feet of one another, as is typical of some high mountain lake habitat, suitable habitat for dispersal and movement includes the overland areas between lake shorelines. In mesic areas such as lake and meadow systems, the entire contiguous or proximate areas are suitable habitat for dispersal and foraging.

The Sierra Nevada yellow-legged frog inhabits a variety of habitats including lakes, ponds, tarns, wet meadows, and streams from near 4,500 feet to 12,000 feet (Zweifel 1955; Stebbins 1985; Zeiner et al. 1988). At lower elevations, particularly in the northern part of their historic range, the frogs are known to be associated with rocky streambed and wet meadows surrounded by coniferous forest (Zweifel 1955; Zeiner et al. 1988). Sierra Nevada yellow-legged frogs use a variety of different habitats throughout the year for breeding, feeding, and overwintering sites (Matthews and Preisler 2010).

Breeding occurs in the spring, from April to July depending on elevation, as soon as the ice on the lakes, ponds, and streams recedes. Females deposit eggs in clusters attached to vegetation, granite, and under undercut banks (Matthews and Pope 1999, Zweifel 1955). Females lay from 40 to 300 eggs in a compact cluster. Emergence from the egg occurs after approximately 2 to 3 weeks. Tadpoles often congregate in the warm shallows near shore where they feed on algae. *R. sierrae* tadpoles may overwinter 2 to 3 times before metamorphosing (Zweifel 1955). Due to their long larval life stage breeding sites must remain a permanent water source year round. After metamorphosis, *R. sierrae* can remain juveniles for up to four years before reaching sexual maturity. *R. sierrae* are long-lived with a maximum recorded estimated age of 14 years (Matthews and Miaud 2007).

After breeding, adults may disperse into a larger variety of aquatic habitats (Pope and Matthews 2001). *R. sierrae* often move hundreds of meters between breeding, feeding, and overwintering habitats (Pope and Matthews 2001). The frogs appear to use a restricted set of lakes that provide suitable microhabitats for breeding and overwintering then disperse into a greater number of sites during the summer months for feeding (Matthews and Pope 1999, Matthews and Preisler 2010, Pope and Matthews 2001). Frogs can be found along shallow, rocky shorelines often interspersed with vegetation (Mullally and Cunningham 1956). *R. sierrae* use a variety of cover including vegetation, logs, and partially submerged trees. Similar to tadpoles, adults and subadults seek areas with warmer water (Bradford 1984). In high-elevation habitats, Sierra Nevada yellow-legged frog may spend up to nine months overwintering under ice in lakes and streams. Frogs have been found overwintering in the bottoms of lakes and in protected nearshore microhabitats including deep underwater rock crevices under banks and under ledges (Bradford 1983, Matthews and Pope 1999).

Genetic analyses of the *R. sierrae* indicate that the species is divided into three distinct subpopulations called “clades” (Vredenburg et al. 2007). Clade 1 is in the northwest portion of *R. sierrae* range and occurs on the Lassen and Plumas National Forests. This region is relatively low elevation and contains some of the lowest known *R. sierrae* populations. Environments in this clade are relatively unique for this species because they are predominantly forested. The species commonly inhabits streams in this area, likely because lakes are scarce. Little is known about the ecology of the species in this region including its historic distribution and abundance, where it breeds, and how it uses stream habitats. Only 5 to 6 known populations exist within this clade and all are on the Plumas National Forest.

The Lassen National Forest is the northernmost forest in the Sierra Nevada with documented distribution of *R. sierrae*. Based on historic records from museum collections (Museum of Vertebrate Zoology, University of California at Berkeley; California State University, Chico; California Academy of Sciences, San Francisco) the range of the species has been determined to be limited to certain watersheds on the Almanor Ranger District of the Lassen (USDA Forest Service 2010). Considering historic records (HR), recent positive detections (RPD) and/or potential suitable habitat (PSH), count data along with the suitable habitat layer for the species (figure 19 and figure 20) suggest that ten 5th field watersheds represent the historic range of the Sierra Nevada yellow-legged frog. These are Baxter Creek-Frontal Honey Lake, Big Chico Creek, Hamilton Branch, Yellow Creek, Upper Butte Creek, Upper Indian Creek, Lower Susan River-Frontal Honey Lake, Upper Susan River, West Branch Feather River, and Middle North Fork Feather River.).

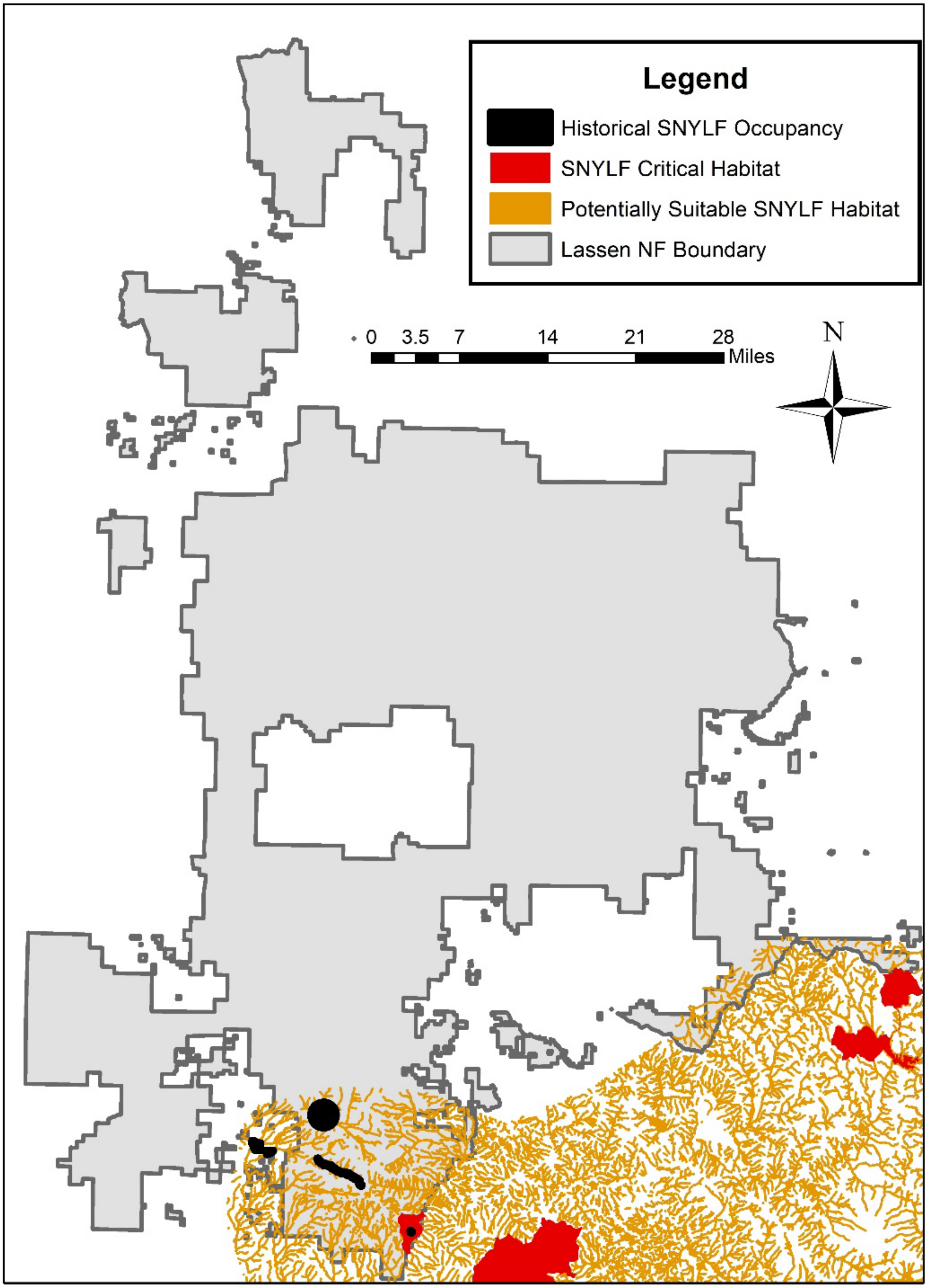

Figure 19. The location of critical and potentially suitable habitats for the Sierra Nevada yellow-legged frog (SNYLF) and where individuals have been historically detected within the Lassen National Forest boundary

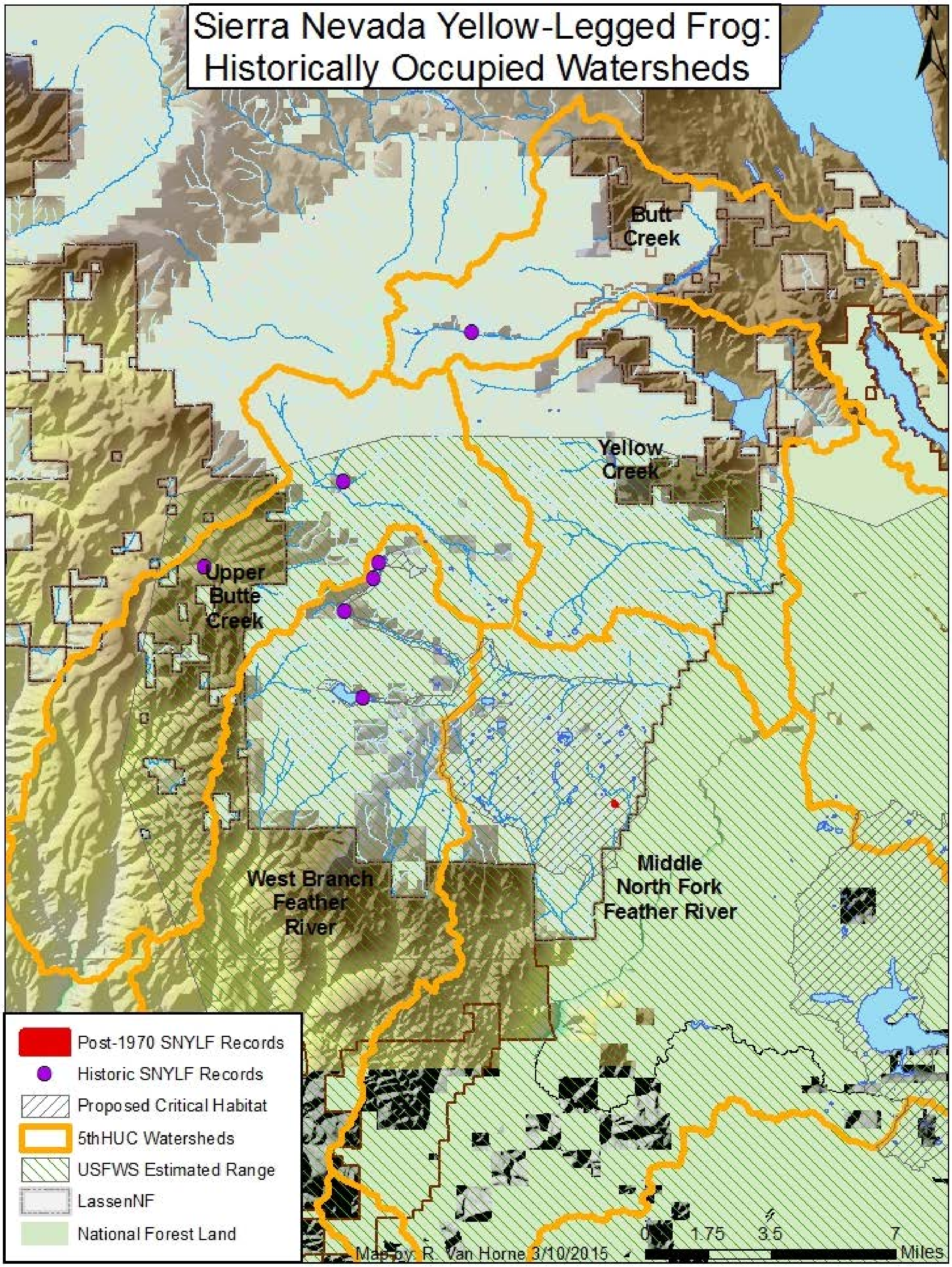

Figure 20. Historically occupied watersheds of Sierra Nevada yellow-legged frog

No extant populations of *R. sierrae* are currently known to exist on the Lassen. The only (remnant) population of the species last discovered on the Lassen National Forest was in a remote lake (Oliver) and associated pond in 2005, in the Mill Ranch Creek 6th field subwatershed. Three subsequent surveys conducted by the California Department of Fish and Wildlife had no positive detections, thus the population is believed to be extirpated.

Cascades frog (Rana cascadae) Forest – Sensitive

Affected Environment

Life History

The following life history information was taken from Pope et al. (2014):

Cascades frogs breed shortly after spring snowmelt. Males appear first and form chorusing groups when melting ice and snow creates open water along the edges of water bodies. During breeding, females swim primarily underwater to breeding sites and leave the site as soon as breeding is complete. Oviposition occurs between April and July, depending on seasonal conditions and elevation. Egg masses are often laid communally in pond and lake habitats. In the high-elevation habitats in California, larvae usually hatch in early to mid-July and metamorphose into frogs in September. However, some larvae do not successfully complete metamorphosis prior to the onset of winter. No larvae have been observed to survive the winter. In the southern Cascades, larvae usually hatch in June and metamorphose in late August.

Cascades frogs are relatively long-lived and late maturing. A skeletochronology study conducted in the Klamath Mountains found that frogs can live more than 10 years. Adult Cascades frogs display a high degree of site fidelity. At Deep Creek Basin in the Trinity Alps Wilderness, Garwood (2009) found that adults commonly move among unique breeding, feeding, and overwintering habitats following a consistent annual pattern (see “Movement” section). At other sites where breeding, feeding, and overwintering habitat occur at the same site, frogs may remain at the same waterbody throughout the year.

Lake habitats are important for breeding and overwintering of Cascades frogs. Based on the frog’s movement patterns and distribution in early spring and late fall, overwintering habitat is almost as restrictive as breeding habitat. In late fall, Garwood (2009) found frogs congregated at spring-fed ponds and lakes, and perennially flowing streams (although the frogs may have been using the streams as movement corridors to lentic overwintering habitats). The frogs are suspected of overwintering in aquatic sites that do not freeze solid (e.g., springs and deep lakes), similar to the mountain yellow-legged frog (*Rana muscosa* and *R. sierrae*) in the Sierra Nevada. Cascades frogs have been found overwintering in deep, loose silt at the bottom of a pond and in surrounding springwater-saturated ground.

Distribution

The Cascades frog is known (historically and/or currently) to utilize habitat above approximately 4,500 feet in elevation in the following 16 sixth-field subwatersheds that encompass, in whole or in part, Lassen National Forest: Headwaters of Hat Creek, Upper Old Cow Creek, Upper SF Battle Creek, Bailey Creek (within Battle Creek system), Upper NF Battle Creek, Upper Mill Creek, Sacramento-Deer, Butte Creek, Bailey Creek (within Feather River system), Louse Creek, Rice Creek, Butt Valley Reservoir, Juniper Lake, Big Kimshew Creek, Upper West Branch Feather River, and Lower Yellow Creek.

For subwatersheds where historic information is available (e.g., via voucher specimens), almost all collections have enough information to indicate which sixth-field subwatershed the specimens were associated with. In only one or two subwatersheds is there some uncertainty of the specific collection location; in these circumstances, nearby subwatersheds with potential suitable habitat were included in the analysis (e.g., Coyote Flat). In the Upper Yellow Creek subwatershed, 4,250 feet is presumed to be the approximate lower elevation for this species, based on existing habitat conditions. In the Screwdriver Creek subwatershed, the Cascades frog is known (presently) above approximately 2,500 feet in elevation.

Present occupancy (defined here as more than one individual observed at one time since the 1990s, and, with one or more individuals still present) is only known within five sixth-field subwatersheds: Upper Old Cow Creek, Sacramento-Deer, Butte Creek, Juniper Lake, and Screwdriver Creek (Pope 2008). Only two incidental observations of individual Cascades frogs have been made outside known breeding populations; one adult frog was observed in the Sacramento-Deer subwatershed in Alder Creek in 2002 (Roby 2002) and one adult was observed in the Shanghai Creek subwatershed on Butt Creek in 1996 (Brown 2000). Within the Rice Creek subwatershed, two Cascade frogs were also found in Crumbaugh Creek (in Lassen Volcanic National Park) in the early 1990s, but this species has not been found there since 1994 (Fellers et al. 2008).

From extensive amphibian surveys conducted on Lassen National Forest (Fellers et al. 2008), it is probable that this species is no longer present in the remaining 10 subwatersheds where it historically occurred (e.g., pre-1970s), as documented from available sources of historical accounts including, but not limited to, Zweifel (1955), Grinnell et al. (1930), various museums (e.g., California State University Chico, Museum of Vertebrate Zoology), Fellers and Drost (1993) and Koo et al. (2004)). According to Fellers et al. (2008), there could be a few populations that went undetected in the surveys conducted, but “it is unlikely that any large *R. cascadae* populations exist in the Lassen area” (the Lassen area referred to is defined as lands within a 50-kilometer radius of Lassen Peak, so this excludes the northern area with existing populations within Screwdriver Creek subwatershed). Fellers (ibid) concluded “the small size of, and lack of connectivity between, the current populations of *R. cascadae* in the Lassen area greatly reduces their long-term viability, potentially leading to a genetic bottleneck (Young and Clarke 2000).” The existing Cow Creek population (represented by a minimum of two breeding sites) on private lands off Lassen National Forest, however, “…may represent the largest extant population of *R. cascadae* in the Lassen region…” (Stead and Pope 2007).

The area of effect for the Cascades frog conservatively considers all of the following aquatic features; springs, perennial streams, lakes, ponds, wetlands and fens, and their associated RCAs on Lassen National Forest lands above the elevational range for all 18 subwatersheds listed previously within the project area. Additionally, within the Sacramento-Deer and Butte Creek sixth-field subwatersheds, Carter and Colby/Willow CARs are designated for the Cascades frog (USDA Forest Service 2004). Populations are present in both the Carter and Colby/Willow CARs.

Table 177. Survey records of Cascades frog historical or occupied occurrence by 6th field subwatershed within the Lassen National Forest

6th field subwatersed name	Cascades frog Documented Occurrences	
	Historical	Occupied
Big Kimshew Creek	2	
Bull Creek-Butte Creek	1	
Butt Valley Reservoir-Butt Creek	1	
Colby Creek-Butte Creek		2
Cub Creek-Deer Creek	1	2
Deer Creek	3	
Gurnsey Creek		2
Last Chance Creek-West Branch Feather River	1	
Lost Creek-Deer Creek	2	1
Lower Yellow Creek	2	
Nelson Creek		1
Rock Creek-Pit River	1	1
Soldier Creek-Butt Creek	2	
Upper Mill Creek	7	
Upper Old Cow Creek		1
Upper South Cow Creek		1
Upper South Fork Battle Creek	3	
Upper Yellow Creek	1	
Warner Creek	5	1
Willow Creek-North Fork Feather River	5	
Grand Total	37	12

Black Juga (Juga nigrina)

Affected Environment

The black juga is an aquatic mollusk occupying perennial stream and spring habitat in the Lassen, Tahoe, and perhaps Shasta-Trinity National Forests. This species occurs in the upper Sacramento, McCloud and Pit River systems (Frest and Johannes 1995). Recent analyses on anatomy and genetics has established that the black juga is a composite and as presently understood taxonomically, is restricted in California to the upper Sacramento system (USDA Forest Service 2014), Brim Box (2005) reported finding 575 individuals at 22 of 113 survey sites on the Lassen National Forest. In general, this species is located within large tributaries and some springs of Hat Creek, Lost Creek, Deer Creek, Domingo Creek, Davis Spring, Soldier Creek, Beaver Creek, Antelope Creek, North Fork Feather River, Gurnsey Creek, and the Pit River. Brim Box (2005) noted that this species is not restricted to a particular area on the Lassen National Forest. Additionally, this species is fairly common within the region where populations currently exist, however, it appears that the species has been extirpated from many historic locations within tributaries to the upper Sacramento River.

Suitable habitat for this species has been identified as perennial streams and springs with prominent channel substrate being comprised of boulders/cobble, gravel, sand, and in some cases, mud (Brim Box 2002). Black juga habitat is threatened by excessive sedimentation resulting from various land management activities, including mining, logging, road and railroad grade construction, and grazing.

Increased sedimentation may result in smothering of suitable channel substrate, increased stress and mortality, and impairment of egg-laying or survival of eggs and young. Livestock utilization in close proximity to suitable habitat may result in reduced dissolved oxygen levels, and elevated water temperature if removal of riparian vegetation and/or increases in channel width-to-depth ratios occur. Additionally, water diversions can result in reduced spring/stream flow, elevated water temperature, increased sedimentation, and lower dissolved oxygen.

Environmental Consequences

Project Design Features and Monitoring

The following project design features and mitigation measures were developed to be used as part of the implementation of the action alternatives. These practices would apply to all alternatives unless specified only for a specific alternative. These features were developed to reduce or eliminate adverse impacts from project activities and are incorporated as an integrated part of each alternative. Project design features are based upon standard practices and operating procedures that have been employed and proved effective in similar circumstances and conditions.

Project design features do not apply to the no-action alternative because no project activities are proposed; no changes would be made to the existing system of OSV trails or areas in the planning area under the no-action alternative. However, continuing current management under the no-action alternative would include the use of standard operating procedures and best management practices for routine OSV trail grooming and maintenance of the current OSV trail and area system.

Forest Service National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1 National Core BMP Technical Guide (BMPs, USDA Forest Service 2012) applicable to OSV use would be implemented under all of the action alternatives.

The following describes the minimization measures for watershed resources that are used as a proxy for aquatic resources measures that would be applied to the management of OSV uses on the Lassen National Forest:

Minimizing Damage to Watershed Resources

All Public OSV Use:

1. The objective of minimizing impacts of public OSV use to watershed resources would be addressed by adhering to Best Management Practices related to Over Snow Vehicle Use from the 2012 USDA Forest Service National Core BMP Technical Guide and the 2011 Region 5 Soil and Water Conservation Handbook.

Groomed Snow Trails:

1. The objective of minimizing impacts to watershed resources would be addressed by making spill containment equipment available at the facilities where grooming equipment is re-fueled.

- The objective of minimizing impacts to watershed resources would be addressed by designating equipment maintenance and refueling sites to ensure that they are located on gentle slopes, on uplands, and outside of riparian conservation areas and sensitive terrestrial wildlife habitats.
- To address the objective of minimizing impacts to watershed resources, all stream crossings and other in-stream structures facilitating OSV passage would be designed and maintained to

provide for the passage of flow and sediment, to withstand expected flood flows, and to allow for free movement of resident aquatic life.

- To address the objective of minimizing impacts to watershed resources, public OSV use of trails and grooming snow trails for OSV use would be prohibited in wetlands unless protected by at least 12 inches of packed snow or 2 inches of frozen soil. If OSV trails must enter wetlands, bridges or raised prisms with diffuse drainage to sustain flow patterns would be used.
- To address the objective of minimizing impacts to watershed resources, crossing bottoms would be set at natural levels of channel beds and wet meadow surfaces.
- To address the objective of minimizing impacts to watershed resources, actions that dewater or reduce water budgets in wetlands would be avoided.

Public, Cross-country OSV Use:

1. The objective of minimizing impacts to watershed resources would be addressed by prohibiting public, cross-country OSV use when and where there is less snow coverage than sufficient to prevent damage to underlying soil and vegetation resources.
2. The objective of minimizing impacts to watershed resources would be addressed because public, cross-country OSV use would be generally dispersed and would not result in high concentration of OSV use on bare soil. Also, travel over bare soil can damage machines so is generally avoided by operators. With adequate snow depths, this plan would result in no soil erosion and therefore would not create water quality impacts to streams or water bodies by introducing sediment in water runoff.
3. The objective of minimizing impacts to watershed resources would be addressed by prohibiting public OSV use on unfrozen lakes, reservoirs, ponds and any other open surface water.
4. The objective of minimizing impacts to watershed resources would be addressed by providing information to the public of the hazards of running OSVs on thin ice and the effects of OSV emissions on air quality and water quality.

Monitoring to Minimize Impacts to Watershed Resources:

1. The objective of minimizing impacts to watershed resources would be addressed by monitoring to determine if implementing protective measures ensures that aquatic resources are adequately protected. Possible protective measures include restricting access to aquatic communities where substantial impacts are observed through the dissemination of educational materials and by using signage, or, if necessary, through the use of barriers or trail re-routes.
    - The objective of minimizing impacts to watershed resources would be addressed by monitoring in consultation with forest biologists to ensure that public OSV use is not damaging sensitive resource locations.
    - The objective of minimizing impacts to watershed resources would be addressed by monitoring water quality in spring snowmelt periodically at specified locations, in consultation with the forest hydrologist and aquatic biologist, to determine potential impacts of public OSV use on water quality. If adverse impacts are observed, changes in management of public OSV use would be considered, or other appropriate protective measures would be taken, in consultation with a forest hydrologist.

- The objective of minimizing impacts to watershed resources would be addressed by periodically monitoring the effects of public OSV use with sufficient snow coverage over road or trail surfaces.
- The objective of minimizing impacts to watershed resources would be addressed by periodically monitoring water quality in spring snowmelt periodically at specified locations, in consultation with the forest hydrologist and aquatic biologist, to determine potential impacts of OSV exhaust on water quality. If adverse impacts are observed, changes in management of OSV use would be considered, or other appropriate protective measures taken, in consultation with a forest botanist.
- Sections 208 and 319 of the Federal Clean Water Act (CWA) address nonpoint source pollution and require water quality management plans for nonpoint sources of pollution. The Forest Service in the Pacific Southwest Region (Region 5) has worked with the California water quality agencies to meet CWA requirements. The greatest emphasis in this coordination has been on the management and control of nonpoint sources of water pollution, with sediment, water temperature, and nutrient levels of most concern.
- The State Water Resources Control Board and Regional Water Quality Control Boards entered into agreements with the Forest Service to control nonpoint source discharges by implementing best management practices. These best management practices, which are set forth in the Forest Service Pacific Southwest Region guidance document, "Water Quality Management for Forest System Lands in California, Best Management Practices" (USDA Forest Service 2000), constitute a portion of the State's Nonpoint Source Management Plan and comply with the requirements of Sections 208 and 319 of the CWA.
- The agreements include best management practices related to OSV use, and to road construction and maintenance. The implementation and effectiveness of the best management practices are reviewed annually. In recent years, the Forest Service has emphasized monitoring in national forests to ensure the implemented projects follow approved control measures.
- The Forest Service best management practices are in conformance with the provisions and requirements of the Federal CWA and within the guidelines of the Basin Plans developed for the nine Regional Water Quality Control Boards in California. The best management practices most relevant to the OSV Program pertain to snow removal and monitoring (Volume II, Appendices E and F).
- For the 6-inch or less minimum snow depths allowed on trails (alternatives 2 and 4), operation of OSVs would be monitored periodically when use is allowed at every site where this standard would apply when snow is less than 12 inches deep. Monitoring would be consistent with BMP 4-7 (Volume II, Appendix E) and focus on whether OSVs are impacting trail surfaces, and be reported to the Forest or District hydrologist and soil scientist. If adverse effects are observed to occur on trail surfaces, use should be discontinued.

Effects Common to All Alternatives

Because the alternatives are very similar, with the same activities proposed, and the differences are mainly the spatial extent of OSV use, most of the effects are described in this section. The varying areas of authorized OSV use would result in mostly small differences in degree of potential effects. Therefore, each alternative's effects will mainly summarize the extent of aquatic resources affected, and provide the basis for determinations.

Direct Effects Introduction

Direct effects are caused by the action and occur at the same time and place. A key difference between OSV use and other types of motor vehicle use is that, when properly operated and managed, OSVs do not make direct contact with soil, water, and ground vegetation, whereas most other types of motor vehicles operate directly on the ground (USDA Forest Service 2014).

Direct impacts to fish and amphibians would be extremely rare as amphibians hibernate during the winter, and OSVs would have to travel through water to collide with fish. Due to the rarity of this occurring, the direct impacts to fish and amphibians are considered less than significant.

Indirect Effects Introduction

Indirect effects are caused by the action and occur later in time or are farther removed in distance, but are still reasonably foreseeable. Potential indirect impacts include snow compaction and impaired water quality or pollutants entering waterways, which are described below.

Snow Compaction

Snow compaction could indirectly affect aquatic species through delayed snowmelt, affecting the hydrologic regime, and alteration of habitat or riparian vegetation potentially leading to erosion and sediment into waterways.

Widespread snow compaction from cross-country OSV uses can affect melt patterns, and in turn the hydrologic regime. Studies have found delayed snowmelt in areas compacted by OSVs versus areas of uncompacted snow (Keddy et al., 1979; Neumann and Merriam, 1972). During spring snowmelt, these effects can reduce the ability of the snow to slow runoff. It is unknown how much OSV-related snow compaction would affect runoff rate and timing, but some studies suggest up to a 2-week delay. Because snow compaction from off-trail cross-country use is currently not extensive on a watershed scale, measureable changes in hydrology are not expected (McNamara 2018).

Riparian vegetation important to aquatic species could potentially be affected by snow compaction. Due to snow compaction, early spring growth of some plant species may be retarded or may not occur under an OSV trail; however, the current and proposed OSV trails are underlain by existing roads and trails which are already compacted and/or disturbed and little, if any, additional impacts are expected to the vegetation. Trail grooming on the Lassen National Forest occurs over an existing road and trail network and does not alter landforms or result in significant soil disturbance that would change water flow patterns or quantities of surface water runoff. Trail grooming does not cause substantial impacts to water quality, perennial, intermittent or ephemeral streams, wetlands or other bodies of water (Hydrology report, McNamara 2018).

Cross-country OSV use could affect woody riparian species by bending and breaking of branches by recreationists running over the branches (Neumann and Merriam 1972). This is most likely to occur with lower snow depths such as the beginning of the winter season and before sufficient snow has accumulated to protect vegetation, and during spring snowmelt. Regenerating timber could also be affected by bending and breaking of leaders with inadequate snow depth. However, both the hydrology report (project record) (McNamara 2017) and botany report (project record) (Davidson 2017) concluded that vegetation trampling from OSVs and potential impacts to riparian resources from OSV use would be considered negligible with adequate snowpack coverage.

Disturbance to soil and vegetation by OSV use is reduced as snowpack depths increase. Damage to soil and low-growing vegetation is much more likely when OSV use occurs under low snow conditions (Greller et al. 1974, Fahey and Wardle 1998). Thus, the minimum snow depth requirements of all alternatives are expected to prevent or minimize damage to soil and vegetation

(Davidson 2017). On the Lassen National Forest, OSV travel on snow-free areas is prohibited in the current and proposed scenarios. By not allowing cross country OSV use when and where there is less than 12 inches snow depth, the Lassen National Forest minimizes the possibility of direct damage to soils and ground vegetation.

Similarly, the hydrology analysis (McNamara 2018) found that with adequate snow depth, cross-country use of OSVs would have a negligible effect on ground disturbance that could lead to erosion and sedimentation in streams or other water bodies, and a negligible effect on vegetation, especially along streams and other waterbodies. It further states "…off-trail OSV use would be generally dispersed and would not result in high concentration of OSV use on bare soil. Also, travel over bare soil can damage machines so is generally avoided by operators. With adequate minimum snow levels, this plan would result in no more than incidental soil erosion and therefore would not create water quality impacts to streams or water bodies by introducing sediment in water runoff."

These conclusions are generally attributed to the fact that OSV use on the Lassen National Forest is considerably less than Yellowstone National Park where detailed studies were conducted on OSV use and their potential effects to the aquatic environment and hydrologic regime.

The number of snowmobiles that entered Yellowstone in 2003 and 2004 was 47,799 and 22,423, respectively (Arnold and Koel 2006). The estimated seasonal day use of OSV Program trails across the Lassen National Forest is around 10,000 OSVs. These visitations are spread across multiple trailheads and trail systems and do not all occur in the same location. As a result OSV seasonal use levels at any Lassen National Forest trailhead or trail system are considerably less than OSV use that occurred at Yellowstone National Park, and are considered very low. Since Yellowstone OSV use levels studied had not resulted in impaired water quality, due to much lower use numbers, it follows that the OSV use in the project area from the Lassen National Forest OSV Use Designation would not adversely affect snowmelt water quality.

Snow Compaction Effects Summary

There are no effects to aquatic species from snow compaction along designated OSV trails because aquatic species are not present. Away from the designated OSV trails, dispersed cross-country OSV travel is much less likely to compact snow with enough intensity and repetition to measurably or predictably affect ground vegetation or the hydrologic regime, and therefore, snow compaction is not considered further in this analysis as a reasonably foreseeable source of indirect effects to aquatic species.

Pollutants

Emissions from OSVs, particularly two-stroke engines on OSVs, release pollutants including ammonium, sulfate, benzene, nitrogen oxides, ozone, carbon dioxide, carbon monoxide, aldehydes, polycyclic aromatic hydrocarbons and other toxic compounds into the air. A portion of these compounds may become trapped and stored in the snowpack, to be released during spring runoff. Four-stroke OSV engines produce considerably lower amounts of pollutants.

Some of the airborne pollutants would enter the snowpack and be released during snowmelt. Similar responses can be assumed to occur in aquatic species that ingest these compounds from snowmelt, although the compounds may undergo chemical changes while in the snowpack, confounding the predictability of effects.

Airborne pollutants can enter the snowpack from both local and regional sources, including but not limited to vehicle emissions, dust storms, and smog. The concentrations of basic cations and acidic anions in the snowpack can be altered and, when released quickly during snow melt, can temporarily lower the pH of surface waters in a process known as “episodic acidification” (Blanchard et al. 1988).

Demonstrating that snowpack chemistry can be used as a quantifiable indicator of airborne pollutants from vehicular traffic, a correlation was shown between pollutant levels and vehicle traffic in Yellowstone National Park (Ingersoll et al. 1997). Ammonium and sulfate levels were consistently higher for the in-road snow compared to off-road snow, but nitrate concentrations did not decrease within a distance of 100 meters from the emission source; thus, the nitrate ion may be used to distinguish between local and regional emission sources (Ingersoll et al. 1997). Studying snow chemistry in Yellowstone National Park, Ingersoll (1998) found that concentrations of ammonium, nitrate, sulfate, benzene, and toluene were positively correlated with OSV use. Concentrations of ammonium were up to three times higher for the in-road snow compared to off-road snow. Concentrations decreased rapidly with distance from roadways.

Arnold and Koel (2006) also examined volatile organic compounds in Yellowstone National Park, and found that the snow in heavily used areas contained higher levels of benzene, ethylbenzene, m- and p-xylene, o-xylene, and toluene compared with a control site only 100 meters from the traveled roadways. Even at the most heavily used area (Old Faithful) they found that the concentrations of volatile organic compounds were considerably below the Environmental Protection Agency’s water quality criteria for these compounds.

In situ water quality measurements (temperature, dissolved oxygen, pH, specific conductance, and turbidity) were collected; all were found within acceptable limits. Five volatile organic compounds were detected (benzene, ethylbenzene, m- and p-xylene, o-xylene, and toluene). The concentrations were found below EPA criteria and guidelines for the volatile organic compounds analyzed and were below levels that would adversely impact aquatic ecosystems (Arnold and Koel 2006).

Studying air quality and snow chemistry effects from OSVs in the Snowy Range, Wyoming, Musselman and Korfmacher (2007) found that heavier OSV use resulted in higher levels of nitrogen oxides and carbon monoxide, but ozone and particulate matter were not significantly different. When compared with air quality during the summer, they found that carbon monoxide levels were higher in the winter, but nitrogen oxides and particulate matter were higher in the summer. Air pollutants were well-dispersed and diluted by winds, and air quality was not perceived as being significantly affected by OSV emissions. Pollutant concentrations were generally low in both winter and summer. These results differ from those studies examining air pollution from OSVs in Yellowstone National Park. However, snow chemistry observations did agree with studies from Yellowstone National Park. Compared with off-trail snow, the snow sampled from OSV trails was more acidic with higher amounts of sodium, ammonium, calcium, magnesium, fluoride, and sulfate. OSV activity apparently had no effect on nitrate levels in the snow.

In the winter, overwintering amphibians are typically hibernating. Airborne compounds would only be taken up by respiring species. Airborne pollutants normally disperse quickly in mountain environments that are prone to windy conditions, such as the Sierra Nevada. The levels of OSV exhaust contaminants on the Lassen National Forest (considerably less than those observed in Yellowstone National Park) are not expected to impair water quality (McNamara 2018).

The available research on OSV pollutants (both airborne and in the snowpack) indicate that some effects to aquatic species may occur in the immediate vicinity of heavy use areas. Pollutants that become trapped in the snowpack are also concentrated in areas of heavy OSV use.

Away from the designated OSV trails, dispersed OSV travel is much less likely to contribute harmful contaminants with high enough levels and repetition to measurably or predictably affect aquatic resources, and therefore, is not considered in this analysis as a reasonably foreseeable source of indirect effects.

Based on multi-year studies in Yellowstone National Park, researchers concluded that Yellowstone OSV use levels have not resulted in impaired water quality. Given that OSV use levels on the Lassen NF at OSV trailheads are less than OSV use levels occurring at Yellowstone during the study period, it is determined that water quality is not impaired by the OSV Program (Hydrology report, McNamara 2018).

There are few studies regarding effects of OSVs on aquatic biota but, Adams (1975) addressed the effects of high levels of lead and hydrocarbons from OSV exhaust on brown trout (*Salvelinus fontinalis*). His study found that that high-level exposure to lead and hydrocarbon can lower activity levels and feeding. The alternatives of the OSV Use Designation project are expected to have negligible effects to water quality and fish, because OSV use on the Lassen National Forest is widely dispersed and does not occur at concentrations that have been shown to cause adverse effects to water quality or aquatic organisms. The results of the Adams Study support this contention and state that the levels of hydrocarbons found in the study are “unrealistic for all but a few small lakes in well populated areas.”

Pollutants Effects Summary

The uptake of harmful pollutants is not expected to result in the death of any individual aquatic species on the Lassen National Forest, based on the studies described, and the findings related to water quality impacts. Therefore, the level of effect to TEPS aquatic species from OSV pollutants is expected to be minimal, and would not result in loss of individuals.

Based on findings on studies of OSV-related effects to aquatic species and/or their habitat, negative impacts to special-status fish and amphibians due to impaired water quality are considered less than significant.

In addition, effects are more likely to occur along designated OSV trails compared to areas designated for cross-country OSV use because dispersed OSV travel is much less likely to contribute harmful contaminants with high enough levels and repetition to measurably or predictably affect aquatic resources.

Effects to Aquatic Species

Threatened and Endangered

Chinook salmon (Oncorhynchus tshawytscha)

Direct and Indirect Effects

Direct effects to *O. tshawytscha and O. mykiss* individuals from OSV use would not occur because OSV use is prohibited over open water.

Pollutants that are trapped and then later released during snowmelt could have some adverse indirect effects if in close proximity to *O. tshawytscha* or *O. mykiss* occupied streams. However, the probability of this occurring and the potential resultant pollutant concentration is expected to be low because of the widely dispersed nature of cross-country OSV use in space and time. Similar conclusions are supported by the hydrology analysis, which determined that pollutant concentrations from OSV use entering waterways would be low enough that water quality would not be impaired.

There are would be no designated OSV trails that would cross occupied *O. tshawytscha* streams. Two crossings exist for *O. mykiss* and are described in table 180.

Chinook salmon (Oncorhynchus tshawytscha) Central Valley Spring Run ESU and Central Valley Steelhead (Oncorhynchus (=salmo) mykiss) Critical Habitat

Direct and Indirect Effects

There are a total of 62.9 miles of steelhead critical habitat and 52.73 miles of Chinook critical habitat within the Lassen National Forest administrative boundary.

Under alternative 1, there are a total of 18.34 miles and 22.73 miles of critical habitat within areas designated for cross-country OSV use for Chinook salmon and steelhead, respectively (table 180).

For alternatives 2, 3, 4, and 5, the total number of miles of critical habitat within areas designated for cross-country OSV use are 9.64, 10.73, 18.34, and 0.85, respectively (table 180).

There would be no crossings of Chinook critical habitat with designated OSV trails for any of the alternatives.

Two crossings exist under alternatives 1,4, and 5 where steelhead critical habitat intersects with designated OSV trails and one crossing under alternative 3 (table 180). The first crossing is on Turner Mtn. Loop (29N48), which is a gravel road in a heavily wooded area. It is a groomed OSV trail that crosses a culvert over Rock Gulch Creek. The area immediately south of the crossing is not designated for OSV use so no OSVs would cross Rock Gulch Creek outside of the groomed trail.

The second crossing is on Mineral Viola Hwy (31N17) and is a culvert over Panther Creek, just below Dry Lake. In the area of this crossing, Panther Creek is a small headwater stream and Dry Lake is a shallow intermittent lake which lacks habitat for steelhead. Along Panther Creek and Dry Lake there is no stream habitat that provides any of the following three primary constituent elements of DCH: spawning, rearing, or migration habitat. The upper extent of habitat known to be currently occupied by steelhead is more than 10 miles downstream of the Lassen National Forest boundary in the South Fork of Battle Creek. OSV use during the winter is not expected to result in habitat disturbance because the minimum snow depth of 12 inches is likely sufficient to prevent contact between OSVs and the soil surface. Based upon these factors discussed in the effects common to all alternatives, no soil disturbance would occur that would contribute to instream sediment increases.

The Lassen OSV Designation project does not involve the construction of any structures that could impede or redirect flood flows, nor any ground surface modifications that could change drainage patterns, impervious surfaces, soil permeability, or other hydrological characteristics such as surface water volumes (McNamara 2018).

Sierra Nevada yellow-legged frog Critical Habitat

Direct and Indirect Effects

Of the total 1,090,392 acres of Sierra Nevada yellow-legged frog critical habitat, approximately 2,518.4 acres are within the Lassen National Forest. Of which, a total of approximately 896 acres lay within areas designated for cross-country OSV use under alternatives 1, 2, 3, and 4. Alternative 5 has 771.8 acres of critical habitat within areas designated for cross-country OSV use.

There would be no designated OSV trails that cross or overlap with Sierra Nevada yellow-legged frog critical habitat for any of the alternatives.

Based upon factors described in the effects section, soil disturbance is not expected to occur that would contribute to instream sediment increases.

The Lassen OSV Designation project does not involve the construction of any structures that could impede or redirect flood flows, nor any ground surface modifications that could change drainage patterns, impervious surfaces, soil permeability, or other hydrological characteristics such as surface water volumes (McNamara 2018).

OSV use during the winter is not expected to result in habitat disturbance because the minimum snow depth of 12 inches is likely sufficient to prevent contact between OSVs and the soil surface.

Sensitive Species

Cascades frog (Rana cascadae)

Direct and Indirect Effects

Direct effects to Cascade frog are unlikely to occur and are considered less than significant because:

- OSV trails to be designated are outside historical or known occurrences of Cascade frog.
- Cascade frog are less active in winter when OSV use is most prevalent and would have to travel through water to collide with Cascade frog.

As documented in the Hydrology section, soil disturbance is not expected to occur that would contribute to pollutants or instream sediment increases.

Pollutants that are trapped and then later released during snowmelt could have some adverse indirect effects if in close proximity to Cascade frog suitable habitat. However, the probability of this occurring and the potential resultant pollutant concentration is expected to be low because of the widely dispersed nature of cross-country OSV use in space and time. Similar conclusions are supported by the hydrology analysis, which determined that pollutant concentrations from OSV use entering waterways would be low enough that water quality would not be impaired.

Compacted snow generally causes delayed snowmelt and increases the transfer of freezing temperatures to the ground due to reduced insulating air spaces (Keddy et al. 1979, Fahey and Wardle 1998, Davenport and Switalski 2006, Eagleston and Rubin 2012, Gage and Cooper 2013).

For Cascades frog, breeding occurs when snow begins to melt. The short delay of snowmelt and colder soil temperatures from OSV-compacted snow would not likely delay or reduce Cascades frog. The effects of snow compaction and OSV emissions are concentrated in areas of heavy use, such as along designated OSV trails. No Cascades frog occurrences are present within 100 feet of existing or proposed designated OSV trails; therefore, it is anticipated that there would be no measurable or predictable indirect effects to the occurrences.

Black Juga (Juga nigrina)

Direct and Indirect Effects

Black Juga would not be directly affected by current or proposed OSV uses because OSVs are not authorized to operate over unfrozen open water where black Juga may be present.

Pollutants that are trapped and then later released during snowmelt may have some adverse effects; however, the extent and direction of specific effects is unknown. Impacts to water quality are assessed in the Hydrology section, which concluded that water quality is not impaired by the Lassen National Forest OSV Project for any of the alternatives. For this reason, it is expected that pollutant concentrations would be low enough that water quality would not be impaired for aquatic species, and thus, it is likely that *Juga nigrina* response would be discountable.

Cumulative Effects Alternative 1

Cumulative impacts can only occur when the likely impacts resulting from the proposed action or alternatives overlap spatially and temporally with the likely impacts of reasonably foreseeable future actions (FSH 1909.15, Sec. 15.2). It is assumed that the contribution of past actions to the cumulative effects of the proposed action result in current environmental conditions and are therefore used as a proxy for impacts of past actions. By looking at current conditions, residual effects of past human actions and natural events are captured, regardless of which particular action or event contributed those effects. Potential contributions of the proposed action to cumulative effects are therefore considered along with ongoing and reasonably foreseeable future actions.

Present and reasonably foreseeable future actions are listed in appendix H (Volume II) of this RFEIS and include vegetation management activities, maintenance of roads and campgrounds, road re-construction, fuels reduction activities, recreational use, timber harvest, and grazing. Potential effects to aquatic species or their habitat that are most likely to combine with present or reasonably foreseeable future actions, include disturbance to individuals from OSV use; habitat fragmentation or modification; and snow compaction effects on aquatic species habitat that could add sediment or other pollutants to surface waters.

Snow plowing at the established OSV trailheads is an ancillary activity associated with the Lassen National Forest OSV Designation project, and is not analyzed as a part of the proposal. Snow plowing is not expected to affect aquatic resources. Other ongoing and foreseeable future actions include livestock grazing, recreation, timber harvest, fuels reduction, woodcutting activities, wildfire suppression, and other activities.

There are many ongoing and reasonably foreseeable projects identified by the Lassen National Forest that may be ground-disturbing and could add sediment or other pollutants to surface waters within the forest. The Forest Service uses BMPs in compliance with the Clean Water Act to minimize water quality impacts. The Lassen National Forest monitors trails used for OSVs and implements BMPs to control erosion and other effects.

The risks of cumulative effects from this alternative are very low because existing requirements of adequate snow depths for OSV use appear to be sufficient to protect the ground surface. There would continue to be only incidental ground disturbance, low risk of damage to vegetation, and other direct and indirect effects. As a result, there would be no change to cumulative watershed effects or equivalent roaded acres calculations for any watersheds under this alternative (McNamara 2018). There would be negligible effects from exhaust emissions stored in snowpack. Over the long term, potential for increased sediment should be minimized with proper implementation of LRMP standards and guidelines for actions along stream channels and within riparian areas.

This alternative would not implement the recommended project design criteria or mitigation measures, and has the second highest amount of land area designated for OSVs. However, this alternative appears to have adequate snow cover requirements to protect soils, water, and aquatic resources, and to protect vegetation in riparian areas. This alternative would not directly conflict with

LRMP standards and guidelines, and would not result in irreversible or irretrievable effects to soil, water, aquatic, or riparian resources.

Cumulative Effects Alternatives 2 through 5

Alternatives 2, 3, 4, and 5 are discussed together because they have minor differences in terms of potential effects to aquatic species or their habitat among alternatives.

There are many past, ongoing, and reasonably foreseeable projects identified on the Lassen National Forest that may be ground-disturbing and could add sediment or other pollutants to surface waters within the forest. Wildfires are unforeseeable events that may directly impair water quality until vegetation recovers. The Lassen National Forest uses BMPs in compliance with the Clean Water Act to minimize water quality impacts. Projects whose BMP monitoring show results that are not effective are addressed and improved. Because there is a low risk of direct and indirect effects, the risks of cumulative effects from these alternatives are negligible.

As a result of recommended minimum snow depths and avoidance of resource damage standards to the underlying ground for cross-country use, depending on alternative (see table 178), there would continue to be only incidental ground disturbance. As a result, there would be no change to equivalent roaded acres calculations for any watersheds under these alternatives, and no change in detrimental cumulative watershed effects (see Hydrology section). There would be negligible effects from exhaust emissions stored in snowpack, low risk of damage to vegetation or aquatic habitat, and other direct and indirect effects. Alternatives 2 through 5 would implement the recommended project design criteria or mitigation measures. These alternatives would have adequate snow cover to protect soils, water, vegetation and aquatic habitats to prevent resource damage. These alternatives would not directly conflict with LRMP standards and guidelines, and would not result in irreversible or irretrievable effects to soil, water, or vegetation of aquatic resources.

Additionally, a changing climate may result in less high mountain meadow habitat and more frequent droughts in the Sierras, decreasing the quantity and quality of aquatic habitat depending on many factors (for example, year, season, location). This could cumulatively contribute to the direct and indirect effects to aquatic species by decreasing suitable habitat and stressing existing populations. However, it is impossible to quantify changes in habitat or populations in the aquatic analysis area, due to the uncertainty of exactly where, what, and when climatic changes could occur at the scale of the project area.

Threatened and Endangered Species

The effects of present and future projects on threatened and endangered species would likely be minimal because all projects are analyzed and mitigation measures are designed for those species for which viability is a concern, on a project-by-project basis.

Alternatives Comparison

For all alternatives, including the no-action alternative, OSV use would be designated in the project area. A comparison of alternatives based on trails and areas designated for OSV use, and minimum snow depth for OSV use on trails and cross country is shown in table 178. Effects common to all alternatives from OSV use are outlined earlier in this section and include effects to aquatic species and their habitat from OSV exhaust and lubricants, and snow compaction and trampling of vegetation from OSV tracks.

Table 178. Summary comparing current OSV management with the modified proposed action for minimum snow depth (in inches) and OSV trail grooming season on the Lassen National Forest

OSV Management	Alternative 1 Current Management (no action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4	Alternative 5
National Forest System (NFS) Lands within the Lassen National Forest (acres)	1,150,020	1,150,020	1,150,020	1,150,020	1,150,020
OSV Use designated:					
Designated OSV Areas (Acres)	964,030	920,260	833,280	955,470	632,400
Approx. Percentage of NFS Land Area Designated (Designated in Alternatives 2 and 3) for Cross-country OSV Use	83.8%	80.1%	72.6%	83.4%	55%
Minimum Snow Depth for Public OSV Use on Snow Trails (Inches)	No minimum	6 inches on snow trails overlying roads and trails 12 inches on trail not overlying roads or trails	6 inches where site review determines there would be no damage to underlying resources	Depth necessary to avoid resource damage	12
Minimum Snow Depth for Snow Trail Grooming to Occur (Inches)	12	12*	18	12	12
OSV Trail Grooming Season	12/26–3/31	12/26–3/31	12/26 – 3/31	12/26–3/31	12/26–3/31

*The originally scoped proposed action has been modified to be consistent with the state grooming standard which states, “Begin grooming when the snow depth is at least 12 to 18 inches” (California OSV Program Final EIR, page 2-12).

Table 179. Alternatives comparison of potential effects to Sierra Nevada yellow-legged frog critical habitat

Sierra Nevada yellow-legged frog	Alternative 1 (no action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4	Alternative 5
OSV trails crossing Sierra Nevada yellow-legged frog critical habitat	0	0	f0	0	0
Critical habitat within areas designated for cross-country OSV use (acres)	896.0	896.0	896.0	896.0	771.8

Table 180. Alternatives comparison of potential effects to Central Valley Steelhead and Central Valley spring-run Chinook critical habitat

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Notes
Chinook critical	**habitat**					
Critical habitat within areas designated for cross-country OSV use (miles)	18.34	9.64	9.63	13.43	0.85	A total of 51.89 miles of critical habitat are within the Lassen National Forest
Number of crossings with a designated OSV trail	0	0	0	0		
Steelhead critical	**habitat**					
Critical habitat within areas designated for cross-country OSV use (miles)	22.73 (19.13 Morgan Summit, 3.6 mi Jonesville)	13.14 (Morgan Summit)	12.50 (Morgan Summit)	17.8 (Morgan Summit)	3.3 (Morgan Summit)	A total of 62.9 miles of critical habitat are within the Lassen National Forest
Number of crossings with a designated OSV trail	2	1	1 (upstream of crossing not designated for OSV use for Alt 3)	2	2	First crossing located at intersection of road 29N48 with Rock Gulch Cr. Second crossing located at intersection road 31N17 with Panther Cr. below Dry Lake.

Alternative 1 – No Action

The no-action alternative is required by the NEPA and serves as a baseline to compare effects of action alternatives. Under alternative 1, there would be no changes to the existing system of OSV use on trails and areas within the Lassen National Forest except as prohibited by forest order. In addition, only those seasonal restrictions as specified in the Lassen LRMP and contained in existing forest orders would be continued.

Current management would continue in accordance with the Lassen's Forest Plan.

- The no-action alternative does not meet the purpose and need of complying with the Forest Service 2005 Travel Management Rule's Subpart C procedures.

The following summarizes how the Forest Service currently manages OSV use on the approximately 1,150,020-acre Lassen National Forest:

- Approximately 964,030 acres of National Forest System land open to off-trail cross-country OSV use;
- Minimum snow depth for public OSV use on snow trails is: no minimum;
- Minimum snow depth for OSV snow trail grooming is 12 inches; and
- Minimum snow depth for off-trail, cross-country OSV use is: no minimum.

Alternative 2 – Proposed Action

The proposed action is similar to the current use in terms of effects to aquatic resources. It restricts OSV use to 920,260 acres of NFS lands on Lassen National Forest, and recommends at least 6 inches of snow on OSV trails that allow access to trails, with more snow at higher elevations. It requires a 12-inch snow cover minimum for cross-country OSV use, and 12-inch snow cover before trail grooming can occur.

Alternative 3

Alternative 3 is similar to alternative 2 in terms of effects to aquatic resources. It restricts OSV use to 833,280 acres of NFS lands on Lassen National Forest, and recommends at least 6 inches of snow on OSV trails that allow access to trails, with more snow at higher elevations. It requires a 12-inch snow cover minimum for cross-country OSV use, and 18-inch snow cover before trail grooming can occur.

Alternative 4

Alternative 4 restricts OSV use to 955,470 acres of NFS lands on Lassen National Forest, and recommends a minimum snow depth necessary to avoid resource damage on OSV designated trails. It calls for a "depth necessary to avoid resource damage" minimum for cross-country OSV use and 12-inch snow cover before trail grooming can occur.

Alternative 5

Alternative 5 restricts OSV use to 632,400 acres of NFS lands on Lassen National Forest,, and recommends a 12-inch minimum snow depth on OSV designated trails. It calls for a 12-inch snow cover minimum for cross-country OSV use, and 12-inch snow cover before trail grooming can occur.

Effects to Aquatic Resources

Alternative 1

There are no additional effects to aquatic resources beyond those described in Effect Common to All Alternatives that are specific to alternative 1. This alternative would generally have the greatest potential for direct effects to aquatic resources due to larger areas of designated OSV use.

Alternatives 2, 3, 4 and 5

The effects of alternatives 2, 3, 4, and 5 are similar to alternative 1, except for slightly lower number of acres designated for OSVs, and the snow depth requirement for use of OSV trails. Approximately 920,260 acres, 833,280 acres, 955,470 acres, and 632,400 acres of NFS lands on Lassen National Forest (table 178) are designated for OSV use for alternatives 2, 3, 4 and 5, respectively. Because direct and indirect effects of this alternative are negligible, having less acreage designated for OSVs would lead to a minimal increase in direct or indirect effects on aquatic species or their habitat.

Threatened and Endangered Species

As described above in Effects Common to All Alternatives, there would be less than significant direct and indirect effects to *O. tshawytscha*, *O. mykiss* and *Rana sierrae* or their critical habitats.

Summary of Environmental Effects

Table 181. Summary comparison of potential environmental effects to aquatic resources

Resource Element	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Threatened and Endangered Fish Species (based on table 180)	Greater potential for effects (issue sufficiently addressed – minor potential effects)	Greater potential than 3, 5 and less than 1 and 4	Greater potential than 5 and less than 1,2, and 4	Greater potential than 2,3,5 and less than 1	Least potential for effects
Threatened and Endangered Aquatic Species (based on table 179)	Greater potential for effects (issue sufficiently addressed – minor potential effects)	Greater potential than 5 and equal to 1,3, and 4	Greater potential than 5 and equal to 1, 2, and 4	Greater potential than 5 and equal to 1, 2, and 3	Least potential for effects
Sensitive Species (Cascade frog)	Greater potential for effects	Greater than 3, 5 and less than 4 or 1	Greater than 5 and less than 1,2 ,and 4	Greater than 2,3, 5 and less than 1	Least potential for effects
Sensitive Species (Black Juga)	Greater potential for effects	Greater than 3, 5 and less than 4 or 1	Greater than 5 and less than 1,2 ,and 4	Greater than 2,3, 5 and less than 1	Least potential for effects

Threatened and Endangered Aquatic Species Determinations

Central Valley spring-run Chinook (Oncorhynchus tshawytsha)

Although occurrences for *O. tshawytscha* are located within the Lassen National Forest OSV Designation project area, proposed activities are not expected to directly affect *O. tshawytscha* because occurrence of *O. tshawytscha* are located in water or open water areas that are prohibited from OSV use.

Direct effects to *O. tshawytscha* from OSV use on designated trails would not occur because there are no crossings of Chinook-occupied streams with designated OSV trails under any of the alternatives.

Indirect effects to *O. tshawytscha* from cross-country OSV use are expected to be minimal because of implementation of a required minimum snow depth, the dispersed nature of cross-country OSV use, and the conclusions of the hydrology analysis that little change is expected to soils, vegetation, or hydrology of aquatic habitats.

Therefore, the Lassen National Forest OSV Designation project may affect, not likely to adversely affect *O. tshawytscha*.

Central Valley spring-run Chinook Critical Habitat

No direct effects to *O. tshawytscha* critical habitat from OSV use on designated trails would occur because there are no crossings of Chinook critical habitat with designated OSV trails under any of the alternatives.

Potential direct or indirect effects to *O. tshawytscha* critical habitat from cross-country OSV use are expected to be minimal because of implementation of a required minimum snow depth, the dispersed nature of cross-country OSV use, and the conclusions of the hydrology analysis that little change is expected to soils, vegetation, or hydrology of aquatic habitats.

Therefore, the Lassen National Forest OSV Designation project may affect, not likely to adversely affect *O. tshawytscha* critical habitat.

Central Valley steelhead (Oncorhynchus (=salmo) mykiss)

Although occurrences for *O. mykiss* are located within the Lassen National Forest OSV Designation project area, proposed activities are not expected to directly affect *O. mykiss* because occurrences of *O. mykiss* are located in water or open water areas that are prohibited from OSV use.

Potential indirect effects to *O. mykiss* from cross-country OSV use are expected to be minimal because of implementation of a required minimum snow depth, the dispersed nature of cross-country OSV use, and the conclusions of the hydrology analysis that little change is expected to soils, vegetation, or hydrology of aquatic habitats.

Therefore, the Lassen National Forest OSV Designation project may affect, not likely to adversely affect *O. mykiss*.

Central Valley steelhead Critical Habitat

Direct effects to *O. mykiss* critical habitat from OSV use on designated trails is expected to be minimal because there are only two crossings of steelhead critical habitat with designated OSV trails under any of the alternatives.

Direct or indirect effects to *O. mykiss* critical habitat from cross-country OSV use are expected to be minimal because of implementation of a required minimum snow depth, the dispersed nature of cross country OSV use, and the conclusions of the hydrology analysis that little change is expected to soils, vegetation, or hydrology of aquatic habitats.

Therefore, the Lassen National Forest OSV Designation project may affect, not likely to adversely affect *O. mykiss* critical habitat.

Sierra Nevada yellow-legged frog

The Lassen National Forest OSV Use Designation project may affect, not likely to adversely affect *R. sierrae*. Though historical occurrences have been documented, surveys have shown no known extant populations exist on the Lassen National Forest. The only (remnant) population of the species last discovered on the forest was in a remote lake (Oliver) and associated pond in 2005, in the Mill Ranch Creek 6th field subwatershed. Three subsequent surveys conducted by the California Department of Fish and Wildlife had no positive detections, thus the population is believed to be extirpated.

Sierra Nevada yellow-legged frog critical habitat

The Lassen National Forest OSV Use Designation project may affect, not likely to adversely affect critical habitat of *R. sierrae*. This determination is based upon conclusions of the aquatics analysis that direct or indirect effects to habitat from cross-country OSV use are expected to be minimal because of implementation of a required minimum snow depth, the dispersed nature of cross-country OSV use, and the conclusions of the hydrology analysis that little change is expected to soils, vegetation, or hydrology of aquatic habitats.

Sensitive Species Determinations

Cascades Frog

Because *Rana cascadae* are not active and/or present during the period of OSV use, the species would not be directly affected. Potential indirect effects are expected to be minor, and all effects would be minimized by the required minimum snow depths proposed. OSV use is not expected to result in a trend toward Federal listing or loss of viability for *Rana cascadae*. Therefore, t the Lassen OSV Designation project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the project area.

Black Juga

Direct impacts to *Juga nigrina* would be extremely rare, as OSVs would have to travel through open water (prohibited from OSV use) to harm the species. Due to the rarity of this occurring, the direct impacts are considered less than significant. Potential indirect effects are undetectable and unlikely to affect the species or alter its habitat, as described above. With slight direct or indirect effects expected, there would be no cumulative effects to this species. The Lassen National Forest OSV Use Designation project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the project area.

Compliance with LRMP and Other Relevant Laws, Regulations, Policies and Plans

With the biological evaluation/biological assessment (project record), the proposed project effects on TESP aquatic species have been evaluated and measures taken to ensure that sensitive species do not become threatened or endangered because of Forest Service actions.

All alternatives would maintain viable populations of all native and desired nonnative species and would be compliant with Forest Service Manual direction. All alternatives would also comply with the Lassen National Forest Land and Resource Management Plan (LRMP) and the Sierra Nevada

Forest Plan Amendment because sensitive aquatic species populations would remain viable and their habitats would be maintained.

Chapter 4. Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and other organization and individuals during the development of this environmental impact statement:

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The following individuals, groups, agencies, and email addresses were either contacted directly in the scoping process, or made themselves known to the Forest Service by submitting comments during scoping for the Lassen OSV Designation analysis.

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Distribution of the Environmental Impact Statement

This revised final environmental impact statement has been distributed to individuals who specifically requested a copy of the document. In addition, copies have been sent to the following Federal agencies, federally recognized Tribes, State and local governments, and organizations representing a wide range of views (appendix J).

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Index

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