

Tahoe National Forest Over-snow Vehicle Use Designation Final Environmental Impact Statement

Volume I. Chapters 1 through 4 and References



Cover image: Trail grooming in the Tahoe National Forest

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Over-snow Vehicle Use Designation

Final Environmental Impact Statement

Tahoe National Forest

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Abstract: The Forest Service proposes to designate snow trails and areas for public over-snow vehicle (OSV) use within the Tahoe National Forest. These designations would occur on National Forest System snow trails and areas on National Forest System lands within the Tahoe National Forest. The Forest Service would also identify snow trails where grooming for public OSV use would occur within the Tahoe National Forest. An amendment to the *Tahoe National Forest Land and Resource Management Plan* (LRMP) (USDA Forest Service 1990) is needed contemporaneously with the approval of a decision regarding public OSV use to: (1) appropriately place planning, analysis, and decision-making for OSV use at the project level and (2) ensure this Project is consistent with the LRMP as amended (36 CFR 219.15(c)(4)).

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 OSV use that is inconsistent with the OSVUM would be prohibited under Federal regulations at 36 CFR §261.14.

This final environmental impact statement (FEIS) compares environmental effects of implementing five alternatives, including (1) no action-continuation of current management; (2) the Proposed Action, as modified; and three other action alternatives developed in response to issues, and discloses their environmental impacts.

A Notice of Intent to prepare an environmental impact statement (EIS) was published in the Federal Register on February 23, 2015. We prepared this FEIS using public comments received during the scoping period, multiple interdisciplinary team discussions, comments received during the draft EIS comment period, and coordination with project stakeholders, literature review, and resource analyses.

Summary of the Final Environmental Impact Statement

Purpose and Need

One purpose of this Project is to establish designated areas and trails for OSV use within the Tahoe National Forest to: provide access, ensure that public OSV use occurs when there is adequate snow, promote the safety of all users, enhance public enjoyment, minimize impacts to natural and cultural resources, and minimize conflicts among the various uses of National Forest System lands.

There is a need to provide a manageable, designated OSV system of trails and areas within the Tahoe National Forest that is consistent with, and achieves the purposes of, the Forest Service Travel Management Rule at 36 CFR Part 212. This action responds to this need.

The *Tahoe National Forest Land and Resource Management Plan* (LRMP) (USDA Forest Service 1990) contains management area-specific standards and guidelines pertaining to public OSV use. The existing system of OSV trails and areas within the Tahoe National Forest is based on the LRMP's standards and guidelines. Proposed changes to the existing system of OSV trails and areas have been identified, based on internal and public input and the Travel Management Rule's criteria for designating roads, trails, and areas at 36 CFR 212.55. These changes would address needs for protecting natural resources, providing access for OSV users, improving quiet winter recreation opportunities, and ensuring consistency with LRMP management direction. Travel management decisions (including designating OSV areas and trails) under the 2012 Forest Service Planning Rule (36 CFR 219) are not forest plan decisions, but rather project-level decisions that require site-specific planning, public involvement, environmental analysis, and decision making (36 CFR 219.2(b)(1) and (2); Forest Service Handbook (FSH) 1909.12, Section 23.23a). An amendment to the LRMP is needed contemporaneously with the approval of a decision regarding public OSV use to: (1) appropriately place planning, analysis, and decision-making for OSV use at the project level and (2) ensure this Project is consistent with the LRMP as amended (36 CFR 219.15(c)(4)).

A second purpose of this project is to comply with the Settlement Agreement between the Forest Service and Snowlands Network et al., by identifying those designated National Forest System snow trails where grooming for public OSV use would occur and analyzing the effects of the grooming program. Under the terms of the Settlement Agreement, the Forest Service is required to complete the appropriate NEPA analysis to identify snow trails available for grooming within the Tahoe National Forest.

This action identifies snow trails available for grooming and addresses the need to provide a high-quality OSV trail system within the Tahoe National Forest that is smooth and stable for the rider and designed so the novice rider can use these trails without difficulty.

Modified Proposed Action

The proposed action has been modified based on public comments received during the scoping and comment periods, and multiple interdisciplinary team discussions. These modifications are described in chapter 2 of this analysis. Figure 3, located in the map package, displays a map of the proposed action.

The Forest Service proposes to designate areas and trails on National Forest System (NFS) land for public over-snow vehicle (OSV) use. These designations would be consistent with the requirements of Subpart C of the Forest Service's Travel Management Regulation at 36 Code of Federal Regulations (CFR) Part 212. The Forest Service would also designate trails to be groomed for public OSV use under the Tahoe National Forest OSV trail grooming program.

The Forest Service proposes the following actions within the Tahoe National Forest:

- Approximately 410,703 acres of National Forest System lands are designated for public cross-country OSV use, generally above 5,000 feet elevation. OSV use designations for the affected management areas in the existing Forest Plan (Appendix B) would be amended to accommodate the proposed OSV use designation changes under alternative 2.
- Public OSV use would not be designated in a 1-acre area near Robinson Flat to protect historic structures.
- Individual parcels of National Forest System lands currently under long-term special use permits for Royal Gorge Cross Country Ski Area, Tahoe Donner Cross Country Ski Area, Boreal Ski Area, Donner Ski Ranch Ski Area, Sugar Bowl Ski Area, Alpine Meadows Ski Area and Squaw Valley Ski Area would not be designated for public OSV use.
- Implement forestwide snow depth requirements for public OSV use by:
 - ◆ Allowing public, cross-country OSV use in designated OSV areas only when there is adequate snow depth to avoid damage^{1,2} to natural³ and cultural resources. As a guideline to avoid damaging resources, a minimum of 12 inches of moderate to heavy density, uncompacted snow is typically needed (moderate to high water content snow common to Sierra storms). Snow water equivalency (SWE) is also an indicator for avoiding damage to resources. A SWE of 4 inches can be a reasonable baseline for avoiding resource damage.
 - ◆ On designated OSV trails with underlying roads, a minimum of 6 inches of uncompacted snow is typically needed to avoid damage to the underlying road surface.
- Implement forestwide snow depth requirements for grooming by:
 - ◆ Following California State Parks' Off-Highway Motor Vehicle Recreation Division snow depth standards for grooming, currently 12 to 18 inches of snow.

¹ **36 CFR §261.2 Definitions.** *Damaging* means to injure, mutilate, deface, destroy, cut, chop, girdle, dig, excavate, kill or in any way harm or disturb.

² Examples of damage may include (but is not limited to) the following: road and trail rutting; uprooted vegetation or vegetation and soil mixed with snow; compressing the subnivian space (wildlife habitat between the snowpack and ground).

³ **42 USCS § 9601** the term natural resources means "land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States

- Class 1 OSVs are allowed on all designated OSV trails and areas. Class 2 OSVs are only allowed on designated OSV trails available for grooming. Class of vehicle definitions can be found on page 2.
- Approximately 247 miles of designated OSV trails are available for grooming. Approximately 84 miles of designated OSV trails are not available for grooming with approximately 2 of these miles located within areas designated for cross-country OSV use. Approximately 53 miles of designated OSV trails not available for grooming are located on easements across private lands.
- There would be 34 designated OSV crossings of the Pacific Crest National Scenic Trail (PCT). In all cases, OSVs crossing the PCT would do so at, or as near as possible to, the identified crossing locations as is safe to do so, and as close to 90 degrees as is safe to minimize the time and distance needed to cross the trail. The 34 designated OSV crossings of the PCT would be as follows:
 - ♦ Fourteen designated crossings would utilize roads identified on the Tahoe National Forest's Motor Vehicle Use Map and would be the width of the road (approximately 14 feet). In one instance, the current alignment of the PCT overlays the Pass Creek Loop OSV Trail on National Forest System Road 70 for approximately 700 feet.
 - ♦ Twenty proposed OSV crossings of the PCT would range in width up to 0.25 mile. These crossings are located in areas where OSV use is designated on either side of the PCT. OSV users would need a way to get across the Trail as OSV use along the PCT is prohibited by the National System Trails System Act, P.L. 90-543, Section 7(c). Some of these proposed OSV crossings are wider than the width of a road because they are located in areas where snow conditions are highly variable during the course of a winter, for example areas prone to wind loading of snow and formation of cornices. These wider crossings give OSV users options to select a safe crossing of the trail under constantly changing, variable snow loading conditions.

Significant Issues

Internal and external scoping identified the following significant issues and these issues were used to develop the action alternatives. The significant issues include the following:

Table S-1. Significant issues

Issue Topic	Cause and Effect
Quality Recreational Experience	Public OSV use and grooming for public OSV use could impact the overall quality of the experience of recreationists seeking a quieter, non-motorized experience. Designating areas and trails for OSV use have the potential to change recreation settings and opportunities by enhancing opportunities for motorized winter users in some areas and limiting those opportunities in other areas.
Noise	OSV use and grooming OSV trails could generate anthropogenic noise and increase noise levels in the short term above ambient levels. This may adversely impact wildlife species that are sensitive to this sort of disturbance, as well as the experience of the recreational user who values solitude and quiet recreational opportunities.
Air Quality	OSV use and grooming OSV trails may add exhaust and pollutants to the air. This could degrade the quality of the air and possibly impact recreational users, wildlife, and sensitive areas.
Water and Soil Resources	OSV use may result in ground disturbance and snow compaction, and this could directly, indirectly and/or cumulatively adversely impact soil and water resources through soil compaction, erosion, and displacement.
Terrestrial Wildlife	OSV use and grooming trails for public OSV use may directly, indirectly, and cumulatively impact terrestrial wildlife through injury, mortality, or disturbance to individuals (e.g., increased noise and human presence resulting in a loss of breeding and/or feeding) and indirect and/or cumulative impacts to wildlife habitats (e.g., snow compaction in or near denning sites). OSVs, when operating cross-country instead of on designated trails, could affect wildlife species by compacting snow in areas of inadequate snow cover and disturbing subnivean (i.e., the zone in and under the snow) habitat for small mammals.
Aquatic Wildlife	Public OSV use and grooming for public OSV use could impact fish and amphibian populations and habitat in the project area through: (1) direct disturbance to species when OSV use occurs in wet meadows, streams, lakes, and/or other sensitive habitats; (2) indirectly through generation of exhaust and associated pollutants in or near sensitive habitat, which can degrade water quality; (3) indirectly through release of fuel or other pollutants during refueling and proximity to sensitive habitats, which can degrade water quality; and (4) indirectly through increased soil erosion in marginal snow depth areas.

Alternatives Considered in Detail

The Tahoe National Forest developed five alternatives: no Action, the modified proposed action, and three additional action alternatives generated in response to the significant issues listed above. The five alternatives considered in detail for this analysis are listed below. Complete details of the alternatives are found in chapter 2 of this document. Mitigations and monitoring procedures are in appendix E (Mitigations for Designated Areas), appendix F (Mitigations for Designated Trails), and in chapter 2 under the Monitoring and Enforcement heading, respectively.

Summary of alternatives considered in detail

Alternative 1 Continue Current Management

- 641,952 acres of NFS lands are designated for cross-country OSV use
- 369 miles of trails for OSV use
 - 220 miles of designated trails are available for grooming for OSV use
 - 9 miles of designated OSV trails are not available for grooming with 3 of these miles located within OSV Use Areas
- Approximately 140 miles of designated OSV trails not available for grooming are located on easements 1,218 acres of NFS land designated for OSV use from January 1 through September 14
- No designated crossings on the PCT
- No established minimum snow depth for public OSV cross-country or trail use

Alternative 2 Modified Proposed Action

- 410,703 acres of NFS lands are designated for OSV use, generally above 5,000 feet elevation
- 384 miles of trails for OSV use
 - 247 miles of designated trails are available for grooming for OSV use
 - 84 miles of designated trails not available for grooming with 2 of these miles located within OSV Use Areas
 - 53 miles of designated OSV trails not available for grooming are located on easements
- 34 designated crossings on the PCT
- Adequate snow depth to prevent impacts to surface and subsurface resources (generally 12 inches for public OSV cross-country use and 6 inches for trail use)
- Follow OHMVR snow depth for grooming, currently 12 to 18 inches of snow

Alternative 3 Addresses non-motorized quality recreational experience

- 257,024 acres of NFS lands are designated for cross-country OSV use
- 280 miles of trails for OSV use
 - 220 miles of designated trails are available for grooming for OSV use
 - 24 miles of designated trails not available for grooming with 15 of these miles located within OSV Use Areas
 - 36 miles of designated OSV trails not available for grooming are located on easements
- 1,408 acres of NFS land designated for OSV use from January 1 through September 14
- 3 designated crossings on the PCT
- Minimum snow depth of 18 inches for public OSV cross-country use and 18 inches for trail use
- Groom designated OSV trails when there are 18 or more inches of snow.

Alternative 4 Addresses motorized quality recreational experience

- 641,708 acres of NFS lands are designated for cross-country OSV use
- 326 miles of trails for OSV use
 - 262 miles of designated trails are available for grooming for OSV use
 - 9 miles of designated trails not available for grooming with 4 miles of these miles within OSV Use Areas
 - 55 miles of designated OSV trails not available for grooming are located on easements
- 1,218 acres of NFS land designated for OSV use from January 1 through September 14
- 21 designated crossings on the PCT
- Minimum snow depth of 12 inches for public OSV cross-country use and 6 inches for trail use
- Groom designated OSV trails when there are 12 or more inches of snow.

Alternative 5 Emphasizes protections for wildlife/natural resources and non-motorized opportunities

- 302,411 acres of NFS land open to cross-country OSV use
- 287 miles of trails for OSV use
 - 215 miles of designated trails are available for grooming for OSV use
 - 24 miles of designated trails not available for grooming with 6 of these miles within OSV Use Areas
 - 48 miles of designated OSV trails not available for grooming are located on easements
- OSV use would be limited to designated OSV trails within 1 mile of existing OSV trailheads.
- OSV use would not be designated in areas within the Forest Service Scenery Management System definition of Foreground for the Pacific Crest Trail.
- 10 designated crossings on the PCT
- Minimum snow depth of 24 inches for public OSV cross-country use and 24 inches for trail use
- Follow OHMVR snow depth for grooming, currently 12 to 18 inches of snow

Summary of Environmental Effects

Table S-2 Summary of environmental effects

Indicators by Resource	Measures	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Recreation Motorized Opportunities – cross-country						
Indicator: Opportunities for motorized winter uses	Size of areas (acres) designated for OSV use; percent change from current management	641,952 total acres designated for OSV use	410,703 total acres designated for OSV use, a 36 percent decrease from current management	257,024 total acres designated for OSV use, a 60 percent decrease from current management	641,708 total acres designated for OSV use, a 0.4 percent decrease from current management	302,411 total acres designated for OSV use, a 53 percent decrease from current management
Indicator: Quality of OSV opportunities	Percent of acres designated for OSV use in high to moderate assumption category	34 percent of acres designated for OSV use provide high-quality OSV opportunities, approximately 216,950 acres	47 percent of acres designated for OSV use provide high-quality OSV opportunities, approximately 194,130 acres	54 percent of acres designated for OSV use provide high-quality OSV opportunities, approximately 151,215 acres	34 percent of acres designated for OSV use provide high-quality OSV opportunities, approximately 216,938 acres	49 percent of acres designated for OSV use provide high-quality OSV opportunities, approximately 147,919 acres
Recreation Motorized Opportunities – designated snow trails available for grooming and ungroomed						
Indicator: OSV trail designations	Length (miles) of designated OSV trails available for grooming/Length (miles) of designated OSV trails (not available for grooming)	220 miles available for grooming 149 miles not available for grooming	247 miles available for grooming 137 miles not available for grooming	220 miles available for grooming 60 miles not available for grooming	262 miles available for grooming 64 miles not available for grooming	215 miles available for grooming 72 miles not available for grooming

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Indicators by Resource	Measures	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Recreation Non- motorized Opportunities – displacements						
Indicator: Access to desired non-motorized recreation settings and opportunities	Size of area (acres) and length of trails (miles) available to non-motorized recreation enthusiasts within 5 miles of plowed trailheads	22,310 acres, 10.2 miles of trails, and 20.5 miles of the PCT available for non-motorized recreation enthusiasts within 5 miles of plowed trailheads	62,695 acres, 10.2 miles of trails, and 20.5 miles of the PCT available for non-motorized recreation enthusiasts within 5 miles of plowed trailheads	85,645 acres, 10.2 miles of trails, and 20.5 miles of the PCT available for non-motorized recreation enthusiasts within 5 miles of plowed trailheads	22,310 acres, 10.2 miles of trails, and 20.5 miles of the PCT available for non-motorized recreation enthusiasts within 5 miles of plowed trailheads	89,667 acres, 10.2 miles of trails, and 20.5 miles of the PCT available for non-motorized recreation enthusiasts within 5 miles of plowed trailheads
Indicator: Quality of non-motorized opportunities	Percent of acres available for quiet, non-motorized use that are within 5 miles of plowed trailheads	11 percent of the acres available for quiet, non-motorized use provide high-quality non-motorized opportunities	15 percent of the acres available for quiet, non-motorized use provide high-quality non-motorized opportunities	15 percent of the acres available for quiet, non-motorized use provide high-quality non-motorized opportunities	11 percent of the acres available for quiet, non-motorized use provide high-quality non-motorized opportunities	17 percent of the acres available for quiet, non-motorized use provide high-quality non-motorized opportunities
Recreation Non- motorized conflicts						
Public Safety Indicator: Areas available to non-motorized recreation enthusiasts for quality non-motorized recreation experiences	Size of areas (acres) not designated for OSV use/percent change from current management	194,321 acres not designated for OSV use	425,570 acres not designated for OSV use/119 percent increase from current management	579,249 acres not designated for OSV use/198 percent increase from current management.	194,565 acres not designated for OSV use/a less than 1 percent increase from current management.	533,862 acres not designated for OSV use/175 percent increase from current management.

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Solitude, Air quality, Scenery Indicator: Proximity and frequency of OSV designations in relation to designated non-motorized areas	Solitude: Distance of groomed public OSV snow trails from designated areas. Number of crossings of linear designated areas	The closest OSV trail (available for grooming) to the Granite Chief Wilderness boundary is the Soda Springs Trail SNO-14E17 more than 3 miles to the west. PCT crossings not designated. High potential for motorized OSVs to impact non-motorized winter PCT experience	The closest OSV trail (available for grooming) to the Granite Chief Wilderness is the Mosquito Ridge Trail SNO-12E16, more than 1 mile to the west. 34 designated OSV crossings of the PCT. Low potential for motorized OSVs to impact non-motorized winter PCT experience	Same as alternative 1. 3 designated OSV crossings of the PCT. Very low potential for motorized OSVs to impact non-motorized winter PCT experience	Same as alternative 2. 21 designated OSV crossings of the PCT. High potential for motorized OSVs to impact non-motorized winter PCT experience	Same as alternative 1. 10 designated OSV crossings of the PCT. OSV use would not be designated within the Foreground of the PCT. Very Low potential for motorized OSVs to impact non-motorized winter PCT experience
	Air Quality: Qualitative/narrative description of potential impacts	Potential short-term impacts to the experience of recreational visitors in the vicinity of OSVs and grooming equipment due to the smell of exhaust emissions	Description same as alternative 1. Fewer acres designated for OSV use than in existing conditions.	Description same as alternative 1. Fewer acres designated for OSV use than in all other alternatives.	Description same as alternative 1. Slightly fewer acres designated for OSV use than in existing conditions.	Description same as alternative 1. Fewer acres designated for OSV use than in alternatives 1, 2, and 4.
	Scenery: Qualitative/narrative description of potential visual impacts	Cross-country OSV use creates temporary tracks that crisscross the landscape. The visual evidence of snowmobile use decreases as fresh snow covers tracks or when the snow melts.	Description same as alternative 1. Fewer acres designated for cross-country OSV use compared to alternative 1, and associated visual impacts than in existing conditions.	Description same as alternative 1. Fewer acres designated for cross-country OSV use compared to alternative 1, and less associated visual impacts than in all other alternatives.	Description same as alternative 1. Slightly fewer acres designated for cross-country OSV use compared to alternative 1, and slightly less associated visual impacts than in existing conditions.	Description same as alternative 1. Fewer acres designated for cross-country OSV use compared to alternative 1, and less associated visual impacts than in alternatives 1, 2, and 4.

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Solitude, Air quality, Scenery Indicator: Proximity and frequency of OSV designations in relation to designated non-motorized areas (continued)	Potential conflict with other resource values: Proximity of OSV use related to other resource values	No closure to historic structures at Robinson Flat.	One acre is designated for OSV use to protect historic buildings	Same as alternative 2	Same as alternative 2	Same as alternative 2
Recreation Designated Areas						
Indicator: Wilderness Attributes	Size of areas (acres) affected and duration of impact. Qualitative description for wilderness attributes.	5,735 acres designated for OSV use within 0.5 mile of wilderness boundaries. Potential impacts would be short-term when snow depth is adequate for OSVs to access the area.	2,685 acres designated for OSV use within 0.5 mile of designated wilderness boundaries. Potential impacts would be short-term, when snow depth is adequate for OSVs to access the area.	No areas are designated for OSV use within 0.5 mile of designated wilderness boundaries. Potential impacts would be very unlikely.	5,735 acres designated for OSV use within 0.5 mile of designated wilderness boundaries. Potential impacts would be short-term, during the winter while snow depth is adequate for OSVs to access the area.	2,518 acres designated for OSV use within 0.5 mile of designated wilderness boundaries. Potential impacts would be short-term, during the winter while snow depth is adequate for OSVs to access the area. Potential impacts are less than in alternatives 1 and 4, and slightly less than alternative 2.

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Indicators by Resource	Measures	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Indicator: Roadless Characteristics: (1) undisturbed soil, water, and air (short-term impacts to air quality due to the presence of OSV exhaust), and (2) solitude (due to the sights and sounds of OSVs)	Size of area (acres) affected and duration of impact. Qualitative description for roadless characteristics	Approximately 110,118 inventoried roadless area (IRA) acres and approximately 21,300 acres (approximately 5,900 acres conducive to OSV use) of other unroaded areas are designated for OSV use. Short-term impacts to the roadless characteristics during the winter while snow depth is adequate for OSVs to access the area.	Approximately 74,776 IRA acres and approximately 13,800 acres (approximately 5,300 acres conducive to OSV use) of other unroaded areas are designated for OSV use. Not designating OSV use in the High Loch Leven vicinity within the North Fork American River IRA reduces potential impacts on roadless characteristics.	Approximately 40,203 IRA acres and approximately 7,800 acres (approximately 3,800 acres conducive to OSV use) of other unroaded areas are designated for OSV use. Not designating OSV use in same areas as alternative 2, plus PCT/Grubb, Devil's Canyon, Coon Canyon, and Summit Lake areas within the Castle Peak IRA reduces potential impacts on roadless characteristics more than alternatives 1, 2 and 4.	Approximately 110,120 IRA acres and approximately 21,300 acres (approximately 5,900 acres conducive to OSV use) of other unroaded areas are designated for OSV use, slightly more than in alternative 1. Potential impacts are the same as alternative 1.	Approximately 5,161 IRA acres and approximately 8,000 acres (approximately 3,600 acres conducive to OSV use) of other unroaded areas are designated for OSV use. Alternative 5 provides the most protection for roadless area characteristics when compared to all other alternatives.
Noise						
Indicator: Opportunities for motorized winter uses	Size of areas (acres) open to public, cross-country OSV use	641,952 acres designated for OSV use	410,703 acres designated for OSV use, a 36 percent decrease from existing conditions.	257,024 acres designated for OSV use, a 60 percent decrease from existing conditions.	641,708 acres designated for OSV use, a 0.4 percent decrease from existing conditions.	302,411 acres designated for OSV use; a 53 percent decrease from existing conditions.
	Acres and percent of designated acres that are anticipated to have high to moderate OSV use levels and the associated potential for noise impacts.	216,950 acres, 34 percent of acres designated for use are anticipated to have high to moderate OSV use	194,130 acres, 47 percent of acres designated for use are anticipated to have high to moderate OSV use.	151,215 acres, 54 percent of acres designated for use are anticipated to have high to moderate OSV use.	216,938 acres, 34 percent of acres designated for use are anticipated to have high to moderate OSV use.	147,919 acres, 49 percent of acres designated for use are anticipated to have high to moderate OSV use

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Air Quality						
Indicator: Estimate of change (increase/decrease) in emissions and the potential to create adverse impacts to air quality	Miles of trail open to OSV visitor use	369 miles currently available for OSV use. No known violations of the Clean Air Act (CAA) as a result of OSV use	Approximately 384 miles would be available for OSV use. No violations of the CAA are anticipated.	Approximately 280 miles would be available for OSV use. No violations of the CAA are anticipated.	Approximately 326 miles would be available for OSV use. No violations of the CAA are anticipated.	Approximately 287 miles would be available for OSV use. No violations of the CAA are anticipated
	Acres designated for public cross-country OSV use	641,952 acres designated for cross-country OSV use. There are no known violations of the CAA as a result of OSV use under the existing condition	410,703 acres designated for cross-country OSV use. No violations of the CAA are anticipated.	257,024 acres designated for OSV use. No violations of the CAA are anticipated.	641,708 acres designated for OSV use. No violations of the CAA are anticipated.	302,411 acres designated for OSV use. No violations of the CAA are anticipated.
Indicator: Potential effects of OSV emissions to create adverse impacts to air quality	OSV use in relation to Class I and Class II areas (Desolation and Granite Chief Wildernesses).	OSV areas designated for OSV use are within 1 mile of a Class I area. There are no known violations of the CAA or impacts to the Class I or II area as a result of OSV use under the existing condition.	OSV areas designated for OSV use are within 1 mile of a Class I area and 2 miles to a Class II area. OSV designated crossings on the PCT would occur within 2 miles of Class I area. No violations of the CAA under this alternative are expected	OSV areas designated for use are within 1 mile of a Class I area and 2 miles to a Class II area. OSV designated crossings on the PCT would occur within 2 miles of Class I area. No violations of the CAA under this alternative are expected	OSV areas designated for use are within 1 mile of a Class I area and 2 miles to a Class II area. OSV designated crossings established on the PCT would occur within 2 miles of Class I area. No violations of the CAA under this alternative are expected	OSV areas designated for OSV use are within 1 mile of a Class I area and 2 miles to a Class II area. OSV designated crossings established on the PCT would occur within 2 miles of Class I area. No violations of the CAA under this alternative are expected.

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Hydrology – Water Quality						
Indicator: Number of snowmobiles per year using trails across the Forest	Total amount of use can be compared to use amounts in Yellowstone and other studies to gauge potential water quality effects	Higher Yellowstone OSV use levels than use levels on the Tahoe National Forest resulted in no impaired water quality. Not likely to adversely affect water quality of snowmelt from OSV exhaust emissions. Provides the lowest level of protection.	Description same as alternative 1. Fewer acres designated for OSV use than alternative 1 and established snow depths results in OSV exhaust emissions negligible and not be expected to exceed water quality standards.	Description same as alternative 1. Approximately 131,000 less acres designated for OSV use than alternative 2 and higher minimum snow depths results in OSV exhaust emissions negligible and not be expected to exceed water quality standards. Provides more protection than alternatives 1, 2, and 4 because fewer acres are open to OSVs.	Description same as alternative 1. Slightly higher number of acres designated for OSV use than alternative 1, snow depths and effects same as alternative 2. Provides more protection than alternative 1, less than alternative 3.	Description same as alternative 1. Provides the most protection of all alternatives due highest snow depths.
Soil Productivity and Stability						
Indicator: Designated OSV use on sensitive soils	Size of areas (acres) designated for OSV use on sensitive soils	190,169 acres on sensitive soil types	141,035 acres on sensitive soil types. This has less sensitive soils than alternatives 1 and 4, but greater than alternative 3 and 5.	89,037 acres on sensitive soil types. This has the least amount of sensitive soils designated for OSV use.	193,213 acres on sensitive soil types. This has the most acreage of sensitive soils designated for OSV use.	92,100 acres on sensitive soil types. This is less than alternatives 1, 2, and 4.
Indicator: Minimum snow depths on trails designated for OSV use	Depth of snow (inches)	No minimum snow depth. Soil resource damage could occur where snow levels are not sufficient to prevent contact directly with trail. May lead to increases in erosion where bare soil is exposed.	6-inch minimum snow depth guideline. May potentially create conditions in which the road surface is exposed to OSVs. May lead to some soil erosion or rutting of the trail surface.	18-inch minimum snow depth. May be sufficient to prevent contact of OSVs with bare soil.	6-inch minimum snow depth. May potentially create conditions in which the trail surface is exposed to OSVs. Potential for some soil erosion or rutting of trail surface.	24-inch minimum snow depth. Sufficient to prevent contact of OSVs with bare soil.

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Indicators by Resource	Measures	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Indicator: Minimum snow depths in areas designated for OSV use	Depth of snow (inches)	No minimum snow depth. Soil resource damage could occur where snow levels are not sufficient to prevent contact with the trail. This could lead to long term decreases in soil productivity	Potential effects to the soil are unlikely with at least 12 inches of snow covering the soil surface; although this is only a guideline, OSV use would only be allowed when there is adequate snow depth to avoid resource damage.	Potential effects to the soil is unlikely with at least 18 inches of snow covering the soil surface.	Potential effects to the soil is unlikely with at least 12 inches of snow covering the soil surface.	Potential effects to the soil is unlikely with at least 24 inches of snow covering the soil surface.
Terrestrial Wildlife - Federally Listed, Proposed Species – North American wolverine						
Indicator: Potential for disturbance to individuals from OSV use and increased human presence, or injury or mortality of individuals	Acres of high capability reproductive habitat impacted by areas conducive to OSV use.	4,831	4,831	4,826	4,831	4,460
Terrestrial Wildlife R5 Sensitive species – Pacific marten						
Indicator: Potential for disturbance to individuals from noise and increased human presence, injury or mortality of individuals, habitat modification or snow compaction effects to foraging or denning individuals	Acres of high capability reproductive habitat impacted by areas conducive to OSV use	4,831	4,831	4,826	4,831	4,460
Indicator: Potential for loss of habitat connectivity	Acres of corridors impacted by OSV use.	18,297	18,297	18,107	18,411	17,511

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Indicators by Resource	Measures	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Terrestrial Wildlife R5 Sensitive species – California spotted owl						
Indicator: Potential for disturbance to or displacement of individuals from noise and increased human presence, injury or mortality of individuals	Acres of important habitat impacted by OSV use	6,262	6,262	6,262	8,453	5,411
	Acres of buffered CSO activity centers impacted by OSV use	11,885	11,885	11,885	1,6293	12,108
Terrestrial Wildlife R5 Sensitive species – Northern goshawk						
Indicator: Potential for disturbance to individuals from noise and increased human presence, or injury or mortality of individuals	Acres of important habitat impacted by OSV use	2,234	2,234	2,234	3,981	1,927
	Acres of buffered NGO PACs impacted by OSV use	14,369	14,369	14,322	16,409	14,661
Terrestrial Wildlife R5 Sensitive species – Bald eagle						
Indicator: Potential for disturbance to individuals from noise and increased human presence, injury or mortality of individuals	Acres of high value reproductive habitat impacted by OSV use	4,124	4,124	4,748	4,259	4,124
	Acres of buffered bald eagle nests impacted by OSV use	18	18	18	18	18

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Indicators by Resource	Measures	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Terrestrial Wildlife R5 Sensitive species – Great gray owl						
Potential for disturbance to individuals from noise and increased human presence, injury or mortality of individuals, or habitat modification	Acres of high-reproductive habitat impacted by OSV use	914	914	912	924	841
Aquatic Resources Threatened and Endangered Species: California red-legged frog						
Indicator: Aquatic habitat	Acres designated for cross-country OSV in critical and suitable habitat	Critical habitat: 923 Suitable habitat: 62,473	Critical habitat: 0 Suitable habitat: 2,065	Critical habitat: 0 Suitable habitat: 2,843	Critical habitat: 923 Suitable habitat: 47,213	Critical habitat: 0 Suitable habitat: 2,081
	Critical and suitable habitat (acres) within 100 feet of OSV trails	Critical habitat: 0 Suitable habitat: 167	Critical habitat: 0 Suitable habitat: 340	Critical habitat: 0 Suitable habitat: 40	Critical habitat: 0 Suitable habitat: 107	Critical habitat: 0 Suitable habitat: 57
Aquatic Resources Threatened and Endangered Species: Sierra Nevada yellow-legged frog						
Indicator: Aquatic habitat	Acres designated for cross-country OSV in critical and suitable habitat	Critical habitat: 91,248 Suitable habitat: 33,458	Critical habitat: 78,253 Suitable habitat: 23,981	Critical habitat: 41,786 Suitable habitat: 8,141	Critical habitat: 87,047 Suitable habitat: 31,539	Critical habitat: 34,434 Suitable habitat: 16,003
	Critical and suitable habitat (acres) within 100 feet of OSV trails	Critical habitat: 1,142 Suitable habitat: 420	Critical habitat: 938 Suitable habitat: 403	Critical habitat: 789 Suitable habitat: 277	Critical habitat: 996 Suitable habitat: 376	Critical habitat: 946 Suitable habitat: 321

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Indicators by Resource	Measures	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Aquatic Resources Threatened and Endangered Species: Lahonton cutthroat trout						
Indicator: Aquatic habitat	Occupied habitat (stream and lake-shore miles) in areas designated for cross-country OSV use	4.3	3.8	0	4.3	3.7
	Occupied habitat (stream and lake-shore miles) within 100 feet of OSV trails	< 0.1	< 0.1	0.4	< 0.1	< 0.1
Botany Resources Threatened and Endangered Species						
Indicator: Species presence	Acres in designated high OSV use areas	0	0	0	0	0
	Acres in areas designated for OSV use	57	0	0	57	0
Botany Resources Sensitive Species						
Indicator: Species presence	Acres in designated high OSV use areas	308	253	102	354	237
	Acres in areas designated for OSV use	2,051	1,294	829	1,847	986

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Indicators by Resource	Measures	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Socioeconomics						
Indicator: Employment	Number of jobs and amount of labor income	No change due to management; increased visitor use over time would increase number of jobs, labor income, and tax revenue	Increased OSV visitation would support additional employment, labor income, and tax revenue in the local area; potential for reduction in non-motorized winter recreation visitation could offset increased economic activity	No change in the miles of groomed OSV trails; however, a decrease in OSV acres and changes to specific popular locations available for OSV use may result in minor changes in motorized winter recreation visitation that may have a minor effect on recreation-related employment, labor income, or tax revenue in local area	Increased OSV visitation would support additional employment, labor income, and tax revenue in the local area; potential for reduction in non-motorized winter recreation visitation could offset increased economic activity	Two percent decrease in groomed OSV trails, and quantity and location of OSV areas not designated may result in minor changes in motorized winter recreation visitation that may have a minor effect on recreation-related employment, labor income, or tax revenue in local area
Indicator: Recreation visitation	Number of recreation visits	No change; visitor use expected to increase over time	OSV visitation expected to increase due to more miles of trail available for grooming; increased OSV visitation may crowd out some non-motorized winter recreation users	Minor adverse effect to OSV users due to a decrease in acreage and location of OSV areas available for OSV use.	OSV visitation expected to increase due to more miles of trail available for grooming; increased OSV visitation may crowd out some non-motorized winter recreation users	Minor adverse effect to OSV users due to a 2 percent decrease in groomed trails and decrease in acreage and location of OSV areas available for OSV use
Indicator: Values, beliefs, and attitudes	Qualitative evaluation of public values, beliefs, and attitudes	User conflict may increase due to population growth and increased visitor use	Increased OSV visitation may affect non-motorized winter recreation users' quality of life	Due to the reduction in acres where OSV is allowed and the locations of OSV designated areas, non-motorized users' quality of life may improve slightly and OSV user's quality of life may decrease slightly	Increased OSV visitation may affect non-motorized winter recreation users' quality of life	OSV users' quality of life may decline if they travel farther or face site competition; non-motorized recreation users would benefit from decreased likelihood of user conflict

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Indicators by Resource	Measures	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Indicator: Low-income and minority populations	Qualitative evaluation of disproportionate effects to low-income and minority populations	No change; climate change may increase distances winter recreation users must travel for adequate snow depth	No change in cost; climate change may increase distances winter recreation users must travel for adequate snow depth	No change in cost due; climate change may increase distances winter recreation users must travel for adequate snow depth	No change in cost; climate change may increase distances winter recreation users must travel for adequate snow depth	OSV users would have to travel farther to access open areas or groomed trails; increased travel costs would disproportionately affect lower income individuals and families

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Acronyms

BAT	Best available technology
BMP	Best management practice
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CVC	California Vehicle Code
CWA	Clean Water Act
DEIS	Draft Environmental Impact Statement
DEM	Digital Elevation Model
FEIS	Final Environmental Impact Statement
GIS	Geographic Information System
IRA	Inventoried roadless area
LRMP	Land and resource management plan (forest plan)
MVUM	Motor vehicle use map
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NVUM	National Visitor Use Monitoring
OHMVR	Off-Highway Motor Vehicle Recreation Division
OHV	Off-highway vehicle
OSV	Over-snow vehicle
OSVUM	Over-snow vehicle use map
PCT	Pacific Crest National Scenic Trail
RCA	Riparian conservation area
RNA	Research natural area
RCO	Riparian conservation objectives
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum

Chapter 1. Purpose and Need for Action

Document Structure

The Forest Service has prepared this environmental impact statement (EIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This EIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters:

- **Chapter 1. Purpose and Need for Action:** This chapter briefly describes the modified proposed action, the need for that action, and other purposes to be achieved by the proposal. This section also details how the Forest Service informed the public of the proposed action and how the public responded.
- **Chapter 2. Alternatives, including the Modified Proposed Action:** This chapter provides a detailed description of the agency's modified proposed action as well as alternative actions that were developed in response to comments raised by the public during scoping. The end of the chapter includes a summary table comparing the Modified Proposed Action and alternatives with respect to their environmental impacts. Detailed maps for each alternatives can be found in figures 2 through 6 in the map package.
- **Chapter 3. Affected Environment and Environmental Consequences:** This chapter describes the environmental impacts of the modified proposed action and alternatives.
- **Chapter 4. Consultation and Coordination:** This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- **Appendices:** The appendices provide more detailed information to support the analyses presented in the environmental impact statement.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Tahoe National Forest Supervisor's Office in Nevada City, California.

This document is tiered to the 1990 Tahoe National Forest Land and Resource Management Plan, as amended, 2010 Over Snow Vehicle Program Final Environmental Impact Report, Program Years 2010 – 2020, by the State of California Department of Parks and Recreation, Off-Highway Motor Vehicle Recreation (OHMVR) Division (California Department of Parks and Recreation, Off Highway Motor Vehicle Recreation Division 2010).

Definitions

Route categories and travel planning definitions applicable to this project (table 1) are based on the definitions in 36 CFR 212 – Travel Management. For a complete list of terms, please refer to the glossary found at the end of this document.

Table 1. Road and trail terminology - definitions

Term	Definition
Administrative Use	Motorized vehicle use associated with management activities or projects on National Forest System land administered by the Forest Service or under authorization of the Forest Service. Management activities include but are not limited to: law enforcement, timber harvest, reforestation, cultural treatments, prescribed fire, watershed restoration, wildlife and fish habitat improvement, private land access, allotment management activities, and mineral exploration and development that occur on National Forest System land administered by the Forest Service or under authorization of the Forest Service.
Area	A discrete, specifically delineated space that is smaller, and, except for over-snow vehicle use, in most cases much smaller, than a Ranger District.
Cross-country Over-snow Vehicle Use	Public over-snow vehicle use that occurs off of snow trails designated for over-snow vehicle use, but within areas designated for public over-snow vehicle use.
Designated Road or Trail or Area	A National Forest System road, National Forest System trail, or an area on National Forest System lands that is designated for over-snow vehicle use pursuant to 36 CFR 212.51 on an over-snow vehicle use map (36 CFR 212.1). ⁴
Designation of over-snow vehicle use	Designation of a National Forest System road, a National Forest System trail, or an area on National Forest System lands where over-snow vehicle use is allowed pursuant to CFR 212.81.
Foreground	Seen areas and distance zones are determine the relative sensitivity of scenes based on their distance from an observer. These zones are identified as Foreground (up to 1/2 mile from the viewer), Middleground (up to 4 miles from the foreground), and Background (4 miles from the viewer to the horizon).
Forest road or trail	A road or trail wholly or partially within or adjacent to and serving the [National Forest System (NFS)] that is determined to be necessary for the protection, administration, and utilization of the NFS and the use and development of its resources (36 CFR 212.1)
Non-motorized use	A term used in this document to refer to travel other than that defined as motorized. For example, hiking, riding horses, or mountain biking.
Over-snow vehicle (OSV)	A motor vehicle that is designed for use over snow and that runs on a track or tracks and/or a ski or skis, while in use over snow (36 CFR 212.1). Class 1 OSVs are over-snow vehicles that typically exert 1.5 pounds per square inch (PSI) or less and include the following OSV types: snowmobiles, tracked motorcycles, snow-cats, tracked ATVs and tracked UTVs.; Class 2 OSVs are over-snow vehicles that typically exert more than 1.5 PSI and include the following OSV types: tracked four wheel drive SUVs and tracked 4-wheel-drive trucks..
Over-snow vehicle use map	A map reflecting roads, trails, and areas designated for over-snow vehicle use on an administrative unit or a Ranger District of the National Forest System.
Trail	A route 50 inches wide or less or a route over 50 inches wide that is identified and managed as a trail (36 CFR 212.1).

⁴ The decision resulting from this analysis would not designate National Forest System roads for public OSV use. Public OSV trails that would overlay existing National Forest System roads would be designated as National Forest System trails where public OSV use is allowed.

Background

This analysis responds to requirements in the Federal regulations for the management of OSV use on national forests (36 CFR Part 212, Subpart C), as well as a settlement agreement in the case of *Snowlands Network et al. v. U.S. Forest Service* (Case No. 2:11-cv-02921-MCE-DAD, E.D. Cal.) regarding the environmental impacts of the grooming of snow trails for OSV use on five national forests, including the Tahoe National Forest. The Forest Service will comply with the terms of the settlement agreement for the Tahoe National Forest by completing this analysis.

Furthermore, additional terms of the Settlement Agreement require the Forest Service to:

- Analyze ancillary activities such as the plowing of related parking lots and trailheads as part of the effects analysis;
- Consider a range of alternative actions that would result in varying levels of OSV use; and
- Consider an alternative submitted by Plaintiffs and/or Intervenor in the NEPA analysis, so long as the alternative meets the purpose and need, and is feasible and within the scope of the NEPA analysis, and Plaintiffs and/or Intervenor provide the Forest Service with a detailed description of that alternative during the scoping period for the NEPA analysis.

Travel Management Regulations – Subpart C: “Use by Over-snow Vehicles”

The Forest Service published its final rule for Subpart C of the Forest Service’s Travel Management Regulations (36 CFR Part 212) in the Federal Register on January 27, 2015 (80 FR 4500). The rule became effective on February 27, 2015, and states, in part:

“Over-snow vehicle use on National Forest System roads, on National Forest System trails, and in areas on National Forest System lands shall be designated by the Responsible Official on administrative units or Ranger Districts, or parts of administrative units or Ranger Districts, of the National Forest System where snowfall is adequate for that use to occur, and, if appropriate, shall be designated by class of vehicle and time of year...” (36 CFR §212.81(a)).

Designations of trails and areas for over-snow vehicle use made as a result of the analysis in this EIS would conform to Subpart C of the Travel Management Regulations.

Consistent with the Travel Management Regulations at 36 CFR Part 212 Subpart C, designated public OSV areas and trails would be displayed on a publicly available over-snow vehicle use map (OSVUM). Once issued, these designations would be made enforceable with the provisions of 36 CFR §261.14, which prohibits the possession or operation of an OSV on National Forest System lands other than in accordance with the Subpart C designations.

Designation Criteria

Background

The Travel Management Regulations set forth designation criteria that are to guide the responsible official’s designation of areas and trails for OSV use (see 36 CFR §212.55(a)-(e)).⁵ These criteria

⁵ Subpart C of the Travel Management Regulations incorporates the designation criteria found at 36 CFR §212.55 along with certain other requirements found in Subpart B. Specifically, 36 CFR §212.81(d) provides that: “the requirements governing

delineate certain elements and resources, the effects on which the responsible official must consider. The Travel Management Regulations at 36 CFR §212.55(a) and (b) require consideration of enumerated “general” and “specific” designation criteria,⁶ whereas 36 CFR §212.55(d) and (e) require the responsible official to consider rights of access and wilderness areas and primitive areas in designating areas and trails for OSV use.

The Travel Management Regulations describe the general designation criteria (36 CFR §212.55(a)) as follows:

In designating National Forest System roads, National Forest System areas and trails on National Forest System lands for motor vehicle use, the responsible official shall consider effects on National Forest System natural and cultural resources, public safety, provision of recreational opportunities, access needs, conflicts among uses of National Forest System lands, the need for maintenance and administration of roads, trails, and areas that would arise if the uses under consideration are designated; and the availability of resources for that maintenance and administration.

The Travel Management Regulations describe the specific designation criteria (36 CFR §212.55(b)) as follows:

In addition to the criteria in paragraph (a) of this section, in designating National Forest System areas and trails on National Forest System lands, the responsible official shall consider effects on the following, with the objective of minimizing:

- 1) Damage to soil, watershed, vegetation, and other forest resources;
- 2) Harassment of wildlife and significant disruption of wildlife habitats;
- 3) Conflicts between motor vehicle use and existing or proposed recreational uses of National Forest System lands or neighboring Federal lands; and
- 4) Conflicts among different classes of motor vehicle uses of National Forest System lands or neighboring Federal lands.

In addition, the responsible official shall consider:

- 5) Compatibility of motor vehicle use with existing conditions in populated areas, taking into account sound, emissions, and other factors.

Additionally, 36 CFR §212.55(d) requires the responsible official to recognize valid existing rights of access in designating areas and trails for OSV use and 36 CFR §212.55(e) provides that OSV areas and trails shall not be designated in wilderness areas or primitive areas, “unless, in the case of wilderness areas, motor vehicle use is authorized by the applicable enabling legislation for those areas.”

designation of National Forest System roads, National Forest System trails, and areas on National Forest System lands in §§212.52 (public involvement), 212.53 (coordination), 212.54 (revision), 212.55 (designation criteria (including minimization)), and 212.57 (monitoring), shall apply to decisions made under [Subpart C].”

⁶ 36 CFR §212.55(c) sets forth specific criteria for designation of roads, but because roads are not being designated as part of the OSV planning process, the §212.55(c) factors will not be addressed in detail in the EIS.

Minimization Criteria

The term “minimization criteria,” refers to the subset of the specific criteria which the responsible official is to consider “with the objective of minimizing” the four categories of impacts set forth in 36 CFR §212.55(b)(1)-(4) when designating areas and trails for motorized use.

The term “granular”⁷ refers to the degree of specificity with which the minimization criteria are applied. The Travel Management Regulations implement Executive Order 11644 (E.O. 11644), as amended by Executive Order 11989, from which the minimization criteria originate. E.O. 11644 states that “each respective agency head shall develop and issue regulations and administrative instructions... to provide for administrative designation of the *specific areas and trails* on public lands on which the use of off-road vehicles may be permitted....” (emphasis added). This supports the application of the minimization criteria to each specific area and trail. The Ninth Circuit Court of Appeals has further clarified this point:

[T]he TMR requires the Forest Service to apply the minimization criteria to *each area* it designated for snowmobile use.... The TMR is concerned with the effects of each particularized area and trail designation. The minimization criteria must be applied accordingly.” *WildEarth Guardians v. USFS*, No. 12-35434, D.C. No. 9:10-cv-00104-DWM, 9th Circuit Court of Appeals, 6/22/15, pp. 23 and 27 (emphasis in original).

However, it is important to note that applying the minimization criteria should not be interpreted as strictly requiring the prevention of all impacts. Instead, in applying the minimization criteria, the Forest Service maintains the flexibility to manage for a reasonable reduction of impacts while still addressing the need to provide areas and trails for public OSV experiences. This point is clarified in the preamble to the Travel Management Regulations Final Rule published on November 9, 2005:

An extreme interpretation of “minimize” would preclude any use at all, since impacts always can be reduced further by preventing them altogether. Such an interpretation would not reflect the full context of E.O. 11644 or other laws and policies related to multiple use of NFS lands. Neither E.O. 11644, nor these other laws and policies, establish the primacy of any particular use of areas and trails over any other. The Department believes “shall consider * * * with the objective of minimizing * * *” will assure that environmental impacts are properly taken into account, without categorically precluding motor vehicle use” (70 FR 68281).

Applying the General Designation Criteria

The general designation criteria were applied in the development of the proposed action are discussed within the effects analysis. The analysis contained in Chapter 3 analyzes the effects on natural and cultural resources, public safety, provision of recreation opportunities, access needs, conflicts among uses of National Forest System lands, the need for maintenance and administration of areas and trails that would arise if the uses under consideration are designated, and the availability of resources for maintenance and administration of OSV designations.

Applying the Minimization Criteria and Other Specific Designation Criteria

Although the Ninth Circuit Court of Appeals has referred only to the minimization criteria when specifying the granular application requirement, the Travel Management Regulations introduce the

⁷ Granular is used by plaintiffs to define use of minimization criteria. See United States Court of Appeals, Ninth Circuit Court, *Wild Earth Guardians v. U.S. Forest Service*, 2015, page 3 of 30.

four minimization criteria together with the fifth specific criteria, which requires the responsible official to consider the “[c]ompatibility of motor vehicle use with existing conditions in populated areas, taking into account sound emissions, and other factors” 36 CFR §212.55(b)(5). Accordingly, this analysis treats all five specific criteria the same, considering each specific area and trail proposed for designation against each of the five specific criteria.

To apply the specific criteria in developing the proposed action (alternative 2) and alternative 5, and to review alternatives 3 and 4, the Forest Service used a filter system. The filter system consists of a table that crosswalks each proposed area and trail (or trail group) against each of the five specific criteria in granular fashion (see Volume II of this FEIS, Appendices E and F). For all specific criteria, forest resource specialists developed potential effect indicators, which are triggers for determining when effects to the given resources and uses set forth in 36 CFR §212.55(b)(1)-(5) may warrant mitigation.

In developing the proposed action and alternative 5, the Forest Service applied the minimization criteria (indeed, all the specific criteria). Alternatives 3 and 4 were developed and submitted to the Forest Service by the plaintiffs and intervenors, respectively, per the terms of the Settlement Agreement (*Snowlands Network et al. v. U.S. Forest Service* (Case No. 2:11-cv-02921-MCE-DAD, E.D. Cal.)), which the Forest Service reviewed for consistency with the Travel Management Rule’s designation criteria (36 CFR 212.55). The forest developed 19 discrete, specifically delineated areas on the forest for which the minimization criteria were to be applied by screening the areas against the specific criteria (table 2) developed with the objective of minimizing the impacts to resources. That is, each specific area and trail (or trail group) proposed for designation was considered in light of each specific criteria.

The forest was subdivided into areas to address the relationship between OSV use, resource protection and socio-economic factors at a smaller scale. Generally, most of these areas encompass major components of the groomed trail system and affected communities that rely on the activity for economic benefit. Other areas occur in regions of the forest that, while located adjacent to communities, historically exhibit adequate snowfall and opportunities for OSV recreation. Minimization criteria were applied individually to each area to determine the need for designating or not designating OSV recreation trails and areas. These criteria allowed the Responsible Official to weigh socio-economic concerns against resource protection issues for each area and trail independently, and develop areas and trails for designations under the proposed action and alternative 5, and to analyze alternatives 3 and 4 against these criteria.

If for the proposed action and alternative 5 the resource specialists found that the potential effect indicators were not triggered for a particular area or trail designation, then the designation could proceed without additional mitigation. However, if the specialists found that a designation would trigger one or more potential effect indicators, then the specialists worked with the Responsible Official to identify specific mitigations that would address the concern. Designations of these areas and trails could proceed provided the mitigations could be implemented. Based on application of the specific criteria, portions of the nineteen OSV use areas were removed from further consideration if it triggered one or more potential effect indicators and mitigation that would not effectively address the minimization criteria. If alternatives 3 and 4 would trigger one or more potential effect indicators, then mitigation measures would need to be developed to address the concern prior to the Responsible Official making a final decision. If the potential effect indicators and mitigation would not effectively address the minimization criteria for a particular area or trail, then the Responsible Official would need to remove the unmitigatable OSV use area(s) or trail(s) from further consideration prior to making a final decision.

Table 2 captures the potential effects indicators developed to assess the areas and trails relative to minimization criteria. Appendices E and F document how the minimization criteria were applied within the Tahoe National Forest.

Table 2. Specific (and minimization) criteria (areas and trails proposed for designation for OSV use)

1 Minimize Damage to Soil, Watershed, Vegetation and Other Forest Resources	2 Minimize Harassment of Wildlife and Significant Disruption of Wildlife Habitats	3 Minimize conflicts between motor vehicle use and existing or proposed recreational uses of NFS lands or neighboring Federal lands	4 Minimize conflicts among different classes of motor vehicle uses on NFS lands or neighboring Federal lands	5 Consider compatibility of motor vehicle use with existing conditions in populated areas*
• Are there potential impacts to soil and water from OSV use? Could soil be exposed during the times OSV use could occur? Is there potential for soil disturbance associated with OSV use? • Would the area (or trail) contain sensitive riparian areas, for example wet meadows, bogs, fens, etc.? • Would the area (or trail) drain into a 303(d)-listed waterbody? • Does the area have a hydraulic mine site or sites? • Could OSV use affect a municipal water system comprised of a small reservoir that goes directly into a local community water supply? • Are TES plants known to occur in or around the trail or area under consideration that could be affected by OSV use? • Would the area (or trail) include designated botanical areas (SIA, RNA)?	• Would the area (or trail) encompass California spotted owl, and/or goshawk nest sites? • Would the area (or trail) encompass sandhill crane nest sites? • Would the area (or trail) encompass known bald eagle nest sites? • Does the trail or area contain key deer winter range? • Does the trail or area contain TES aquatic habitat and/or designated critical habitat? • Would the area contain habitat for marten, wolverine, or other sensitive forest carnivores?	• Would OSV use in this area cause conflicts with non-motorized visitors' desire for solitude and quiet recreation (for example, PCT, Wilderness, wild and scenic rivers, ski areas (cross-country, downhill)? • Would the area abut a wilderness area or National Park managed by other agencies? • Does the area abut a non-motorized area on adjacent national forest or other Federal lands? • Does the area abut a developed recreation site on neighboring Federal lands?	• Does this area allow wheeled motor vehicle use over snow? If so, does this affect safety and winter management of this area? • Does this area cross or contain plowed roads allowing vehicle use? Are road crossings allowed by OSVs? • Does this area receive use by both tracked over-snow vehicles under 50 inches wide and over 50 inches wide? Is this creating conflicts?	• Is the area adjacent to neighborhoods and communities? • Is the area adjacent to recreation residences used during the winter? If so, is OSV use of this area compatible with distinct characteristics of the community?

Note: Column 5 is not a minimization criteria but is required to be specifically considered by the Travel Management Regulations.

Scope of this Action

The Tahoe National Forest Over-snow Vehicle Use Designation is not intended to be a comprehensive, holistic winter recreation planning effort. The decision resulting from this analysis would not designate National Forest System roads for public OSV use. Public OSV trails that would exist on snow overlaying existing National Forest System roads would be designated as National Forest System trails where public OSV use is allowed.

Regulating the use of wheeled, motorized vehicles or bicycles is not within the scope of this action. Other types of motor vehicles that may operate over snow, but do not meet the definition of an OSV, are regulated under Subpart B of the Travel Management Regulations. Routes and areas for these types of vehicles were previously designated and published on a motor vehicle use map as the result of a separate environmental analysis and decision.

The following uses of OSVs would be exempt from these designations and the prohibition in 36 CFR §261.14:

- a. Limited administrative use by the Forest Service;
- b. Use of any fire, military, emergency, or law enforcement vehicle for emergency purposes;
- c. Authorized use of any combat or combat support vehicle for national defense purposes;
- d. Law enforcement response to violations of law, including pursuit;
- e. Over-snow vehicle use that is specifically authorized under a written authorization issued under Federal law or regulations [such as for managing permitted livestock or for access under a special use permit (36 CFR §212.81(a))]; and
- f. Use of a road or trail that is authorized by a legally documented right-of-way held by a State, county, or other local public road authority (36 CFR §261.14).

Not all existing National Forest System OSV areas and trails on National Forest System lands would be designated for public OSV use. The agency recognizes no need to designate OSV trails, only identify them, in areas that would be designated as open to cross-country OSV use. It would not be necessary to designate an OSV trail where OSV use would not be confined to the trail. However, to address requirements in the Settlement Agreement with Snowlands Network et al., groomed OSV trails located in areas designated for OSV use will be identified.

Further, with respect to the grooming action, there are financial limitations on the miles and frequency of trail grooming within the forest's snow trail grooming program. The forest's current grooming program is primarily funded by the State of California Department of Parks and Recreation, Off-Highway Motor Vehicle Recreation (OHMVR) Division. These funds are not likely to substantially increase in future years.

Subpart C of the Travel Management Regulations also specifies that certain requirements of Subpart B of the Travel Management Regulations will continue to apply to the decision designating National Forest System OSV areas and trails (36 CFR 212.81(d)), including:

1. Public involvement as required by the National Environmental Policy Act (36 CFR 212.52);
2. Coordination with Federal, State, county, and other local governmental entities and tribal governments (36 CFR 212.53);
3. Consideration of the criteria for designation of roads, trails, and areas (36 CFR 212.55);

4. Identification of designated uses on a publicly available use map of roads, trails, and areas (36 CFR 212.56); and
5. Monitoring of effects (36 CFR 212.57).

The trail and area designations made as a result of this analysis would be effective immediately upon the issuance of the record of decision, which is expected in March, 2019. To enforce these designations, the Forest Service would produce an OSVUM that would look similar to the existing motor vehicle use map (MVUM) for the Tahoe National Forest. Such a map would allow OSV enthusiasts to identify the routes and areas where OSV use would be allowed within the Tahoe National Forest.

Project Location

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

Land status is correct as of June 8, 2018. Subsequently, land may be acquired or exchanged. Any acquired lands will be managed in accordance with Forest Plan management direction for the area within which they occur. Designations do not apply to private lands.

Purpose and Need

One purpose of this Project is to establish designated areas and trails for OSV use within the Tahoe National Forest to: provide access, ensure that public OSV use occurs when there is adequate snow, promote the safety of all users, enhance public enjoyment, minimize impacts to natural and cultural resources, and minimize conflicts among the various uses of National Forest System lands.

There is a need to provide a manageable, designated OSV system of trails and areas within the Tahoe National Forest that is consistent with, and achieves the purposes of, the Forest Service Travel Management Rule at 36 CFR Part 212. This action responds to this need.

The *Tahoe National Forest Land and Resource Management Plan* (LRMP) (USDA Forest Service 1990) contains management area-specific standards and guidelines pertaining to public OSV use. The existing system of OSV trails and areas within the Tahoe National Forest is based on the LRMP's standards and guidelines. Proposed changes to the existing system of OSV trails and areas have been identified, based on internal and public input and the Travel Management Rule's criteria for designating roads, trails, and areas at 36 CFR 212.55. These changes would address needs for protecting natural resources, improving access for OSV users, improving quiet winter recreation opportunities, and ensuring consistency with LRMP management direction. Travel management decisions (including designating OSV areas and trails) under the 2012 Forest Service Planning Rule (36 CFR 219) are not forest plan decisions, but rather project-level decisions that require site-specific planning, public involvement, environmental analysis, and decision making (36 CFR 219.2(b)(1) and (2); Forest Service Handbook (FSH) 1909.12, Section 23.23a). An amendment to the Tahoe National Forest LRMP is needed contemporaneously with the approval of a decision regarding public OSV use to: (1) appropriately place planning, analysis, and decision-making for OSV use at the project level; and (2) ensure this Project is consistent with the LRMP as amended (36 CFR 219.15(c)(4)).

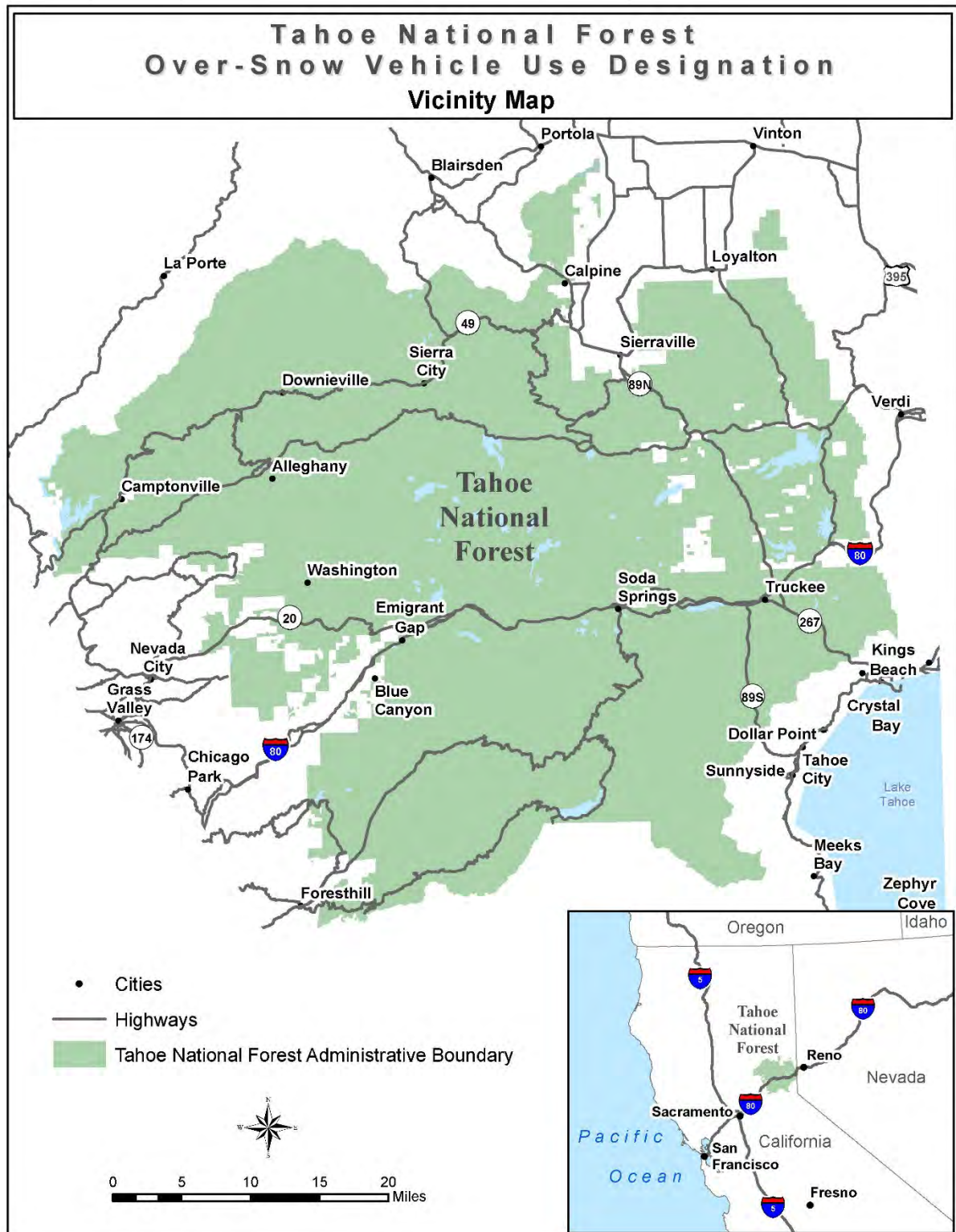


Figure 1. Vicinity map

A second purpose of this project is to comply with the Settlement Agreement between the Forest Service and Snowlands Network et al., by identifying those designated National Forest System snow trails where grooming for public OSV use would occur and analyzing the effects of the grooming program. Under the terms of the Settlement Agreement, the Forest Service is required to complete the appropriate NEPA analysis to identify snow trails available for grooming within the Tahoe National Forest.

This action identifies snow trails available for grooming and addresses the need to provide a high-quality OSV trail system within the Tahoe National Forest that is smooth and stable for the rider and designed so the novice rider can use these trails without difficulty.

Modified Proposed Action

Based on internal review and public comments received during the scoping and comment periods, the Forest Service modified its original proposed action. Mitigations to address minimization criteria for designated OSV areas and trails were used to modify the proposed action (appendix E and F, respectively). Specific actions of the modified proposed action, minimization criteria, mitigations and recommended monitoring are discussed in detail in chapter 2 and the appendices of this FEIS.

Decision Framework

This decision will designate snow trails and areas on National Forest System lands for OSV use on the Tahoe National Forest where snowfall is adequate for that use to occur. It will also identify the National Forest System and non-system trails where grooming for public OSV use would occur. The decision would only apply to public use of OSVs as defined in the Forest Service's Travel Management Regulations (36 CFR 212.1).

Responsible Official

The Tahoe National Forest Supervisor is the deciding official who would issue the decision. The Forest Supervisor will consider all reasonable alternatives and decide whether to continue current management of public OSV uses on the Tahoe National Forest, implement the modified proposed action, or select an alternative for the management of public OSV uses.

Public Involvement

The interdisciplinary team relied on public involvement to ensure that a reasonable range of alternatives, representing a broad array of perspectives, would be analyzed in this final environmental impact statement.

Scoping is a valuable step in the analysis process and is designed to share the proposed action, gather new information, define the overall scope of the analysis, and ultimately identify issues used to develop alternatives and otherwise refine the analysis.

A scoping letter describing the proposed action and seeking public comments was sent via regular mail or email to approximately 812 interested groups, individuals, tribes, and agencies on February 20, 2015, with comments requested to be returned by March 25, 2015. A press release was also sent to local news media outlets on February 20, 2015. A notice of intent to prepare an environmental impact statement was published in the Federal Register on February 23, 2015. All notices included a web address for the project's website where comments could be submitted, plus information on additional ways to provide comments. The project's website could also be accessed

from the homepage of the Tahoe National Forest's public website, where information on the project is available.

Scoping letters were sent to the plaintiffs on February 20, 2015. The Forest Service discovered that it had inadvertently omitted some of the intervenors from its address list for the February 20, 2015, mailing, so scoping letters were sent to those intervenors on March 19, 2015, and they were given 30 days to respond.

The public was invited to comment on the proposed action, identify potential conflicts or benefits, and provide any relevant information that would be useful in the subsequent environmental analysis. The Forest Service received and considered responses from 230 interested groups, individuals, and agencies in the form of letters, emails, and website submissions. All comments were thoughtful narratives reacting to the proposed action with support, opposition, concerns, or requests for revision and new alternatives. The Forest Service appreciates the time and perspectives shared by each commenter, and the willingness of all to engage in the environmental analysis process.

Public scoping meetings were held on March 2, 3, 4, 5, and 9, 2015, and were attended by interested and affected stakeholders and members of the public. The meetings' objectives were to share information about the project's proposed action and the NEPA process, as well as collect public input on the purpose and need for action. Approximately 215 people attended the five meetings. The project first appeared on the Tahoe National Forest's Schedule of Proposed Actions on January 1, 2015.

A letter notifying the public that the DEIS was available for review and comment for 45 days was sent via regular mail or email to approximately 475 interested groups, individuals, tribes, and agencies on April 12, 2018. A press release was also sent to local news media outlets on April 12, 2018. The Notice of Availability notifying the public that the DEIS was available for review and comment for 45 days was published in the Federal Register on April 13, 2018. Public open houses for the DEIS were held on April 24, 2018, at the Sierraville Ranger District Office; May 2, 2018, at the Auburn Holiday Inn; May 9, 2018, at the Sierra City Community Hall; and May 16, 2018, at the Truckee Ranger District Office.

On August 16 and 27, 2018, stakeholder representatives from local and regional snowmobile advocates, hybrid user groups (use OSVs to access areas for skiing, snowboarding, etc.) and winter non-motorized advocacy groups met to see if they could come to agreement on recommendations to provide the responsible official for areas of high interest to all sides of the user spectrum. No agreements were made during those meetings and no collaborative recommendations were given to the responsible official.

Future Administrative Review Opportunities

The Tahoe National Forest Over-snow Vehicle Use Designation is an activity implementing a land management plan. In addition, the action alternatives propose changes to the *Tahoe National Forest Land and Resource Management Plan* (USDA Forest Service 1990), as amended. It is not an activity authorized under the Healthy Forests Restoration Act of 2003 (Pub. L. 108-148). Therefore, this activity is subject to pre-decisional administrative review consistent with the Consolidated Appropriations Act of 2012 (Pub. L. 112-74) as implemented by subparts A and B of 36 CFR part 218. The forest plan amendment portion of this project is subject to the objection regulations at 36 CFR 219 Subpart B.

Issues

Comments that express concerns about cause-effect relationships between the proposed action and its effects are called “issues.” Issues serve to highlight effects or unintended consequences that may result from the proposed action, giving opportunities to reduce adverse effects through design features, mitigations, or alternatives. They are the cause-effect relationships that we identified to consider and analyze in depth to determine the likely impacts of each alternative. They are not the results of the analysis. Not all comments are issues.

Significant issues generally concern resources that may be significantly impacted by implementation of the proposed action and cannot be resolved through routine or standard project design features or mitigation measures. A significant issue is most often addressed by development and analysis of an alternative to the proposed action.

An issue may be deemed a non-significant issue for any of the following reasons: (1) the issue is already decided by law, regulation, Forest Plan, or other higher level decision; (2) the issue is outside the scope of the proposed action (the issue is not part of the proposal or is not affected by it); (3) the issue is irrelevant to the decision to be made; and (4) the issue is conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality NEPA regulations explain this delineation in Sec. 1501.7, “...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)....”

Significant Issues

Based on the content analysis process described above, six significant issues were identified for the Tahoe National Forest Over-snow Vehicle Use Designation analysis.

Quality Recreational Experiences

Non-motorized recreation.

OSV use and grooming for OSV use have the potential to impact the overall quality of the experience of recreationists seeking a more quiet, non-motorized experience through (1) displacing visitors who prefer non-motorized recreation opportunities; (2) posing safety concerns for non-motorized users due to the high speed of vehicles on shared trails; (3) creation of noise and air quality impacts that lead to the displacement of non-motorized users; (4) quickly consuming untracked powder snow, which reduces a desired backcountry skiing experience; (5) disrupting ski tracks, making the snow surface unsuitable for cross-country skiing; and (6) grooming trails, which the State of California’s Over Snow Vehicle Program Draft EIR estimates triples the OSV use on trails to the detriment of non-motorized users.

Motorized recreation experience.

Designating areas and trails for OSV use could change recreation settings and opportunities by enhancing opportunities for motorized winter users in some areas and limiting those opportunities in other areas. In the same way, OSV designations could enhance opportunities for non-motorized winter users in some areas, while limiting or displacing those users in other areas.

Conflicts

Conflicts between motorized and non-motorized winter users may arise due to differing desired recreation experiences, public safety concerns, noise, air quality, and access issues. OSV use has the potential to impact designated areas that are managed for non-motorized recreation opportunities (for

example, the Granite Chief Wilderness, North Fork American Wild and Scenic River, and Pacific Crest National Scenic Trail) through noise, and increased human presence. Of particular concern for conflicts between motorized and non-motorized winter recreationists are areas that can be accessed in the winter from the Forest's six winter trailheads: Yuba Gap, Donner Summit, Yuba Pass, Little Truckee Summit, Bassett's, and China Wall. Most winter recreationists (both motorized and non-motorized) launch their winter recreation activities from these six designated winter trailheads.

For this analysis, quality recreation experiences are defined as the forest's most popular winter recreation activities, according to the National Visitor Use Monitoring Report (USDA Forest Service 2005, 2010, 2015) along with the importance of motorized and non-motorized winter recreation opportunities as described in the Recreation Facility Analysis Niche Statements (USDA Forest Service 2007).

Measurement indicators for determining effects to motorized and non-motorized recreation settings, recreation opportunities, quality experiences, and conflicts between motorized and non-motorized winter users are described in Chapter 3, Recreation Resource section in table 19.

Noise

OSVs traveling in designated areas and on designated trails and machines grooming OSV trails could generate anthropogenic (human-caused) noise and increase noise levels in the short term above ambient levels. This has the potential to adversely impact wildlife species that are sensitive to this sort of disturbance as well as the experience of the recreational user who values solitude and quiet recreational opportunities.

The noise model inputs will consider the proximity of predicted noise increases above ambient levels in sensitive areas to include:

- Points on the Pacific Crest Trail;
- Trails near wilderness areas;
- Trails near communities;
- Trails brought forward by the public as concern areas during scoping;
- Wildlife concern areas.

Measurement indicators for determining effects of noise are described in Chapter 3, Noise Resource section in table 34.

Air Quality

OSVs traveling on designated trails and in designated areas and machines grooming OSV trails could generate exhaust and emit pollutants into the air, and possibly degrade the quality of the air. This potential degradation of air quality could impact recreational users, wildlife, and sensitive areas.

There are no measurement indicators for determining effects to air quality. Only a qualitative discussion of the potential contribution of OSV emissions from the estimated number of visitors to the Tahoe National Forest each year will be described.

Water and Soil Resources

OSV use may result in ground disturbance and snow compaction, and this could directly, indirectly and/or cumulatively adversely impact soil and water resources through soil compaction, erosion, and displacement. These possible impacts to soils could then indirectly result in adverse impacts to plants due to changes in soil temperature and productivity. In addition, changes in snowmelt patterns could affect hydrologic regimes in localized areas. It is also possible that public OSV use could directly damage riparian and wetland vegetation. Public OSV use could also release 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.

OSVs, when operating cross country instead of on trails, can disturb the ground, if snow depth and density are insufficient, and create widespread impacts. These possible effects are highly dependent on location, particularly in areas of thin snow cover, and the amount and timing of use.

OSVs, when operating on trails without adequate snow depth have the potential to also result in soil compaction, erosion, and displacement, and decreased water quality, as described above.

Measurement indicators for determining effects to soil and water resources are described in Chapter 3, Hydrology and Soils Resource sections in table 51 and table 60.

Terrestrial Wildlife

OSV use and grooming of OSV trails could impact terrestrial wildlife through direct injury, mortality, or disturbance to individuals (e.g., increased noise and human presence resulting in a loss of breeding and/or feeding) and modifications of wildlife habitats (e.g., alteration of competitor/predator communities).

OSVs, when operating cross country instead of on trails, can impact wildlife species as snow is compacted in areas of inadequate snow cover, in addition to subnivean (i.e., the zone in and under the snow) habitat for small mammals. These potential effects are highly dependent on location, particularly areas of inadequate snow cover, and the amount and timing of use.

Resource indicators and measures for this issue are shown in chapter 3, Terrestrial Wildlife in table 63.

Aquatic Wildlife

OSV use and grooming for OSV use have the potential to impact aquatic wildlife species (fish and amphibians) and their habitats in the project area through: (1) direct disturbance to species when OSV use occurs in wet meadows, streams, and/or other sensitive habitats; (2) indirectly through generation of exhaust and associated pollutants in or near aquatic species habitat, which can degrade water quality; (3) indirectly through release of fuel or other pollutants during refueling and proximity to aquatic species habitats, which can degrade water quality; and (4) indirectly through increased soil erosion in marginal snow depth areas.

Over-snow vehicles, when operated cross country instead of on designated trails, may create more widespread impacts due to the potential for soil compaction and soil erosion. These possible effects are highly dependent on location, amount of snow cover, and amount and timing of use.

Over-snow vehicles, when operated on designated National Forest System roads and designated National Forest System trails without adequate snow cover, could also result in soil compaction, erosion, and displacement, and decreased water quality, as described above. These potential impacts

to soil and water resources can indirectly affect riparian habitats and aquatic habitats, if in close proximity to these trails.

Resource indicators and measures for this issue are shown in chapter 3, Aquatic Resource section in table 87.

Other Relevant Resources Topics (Non-significant Issues)

Other relevant resources are not significant issues, and therefore, not necessarily critical to the analysis, but are helpful in understanding the full extent of the alternatives. Other relevant resources provide additional information for the analysis, but do not necessarily drive the formulation of alternatives. They are of interest in terms of minimizing impacts. It is anticipated that when project design features and mitigating measures are implemented, the resulting effects to each of the following resources would be imperceptible, or if perceptible (meaning, “if it occurs in some perceptible intensity”), meaningless when considered in the appropriate context. Analysis was conducted to identify and disclose how the minimization criteria were considered and evaluated for effectiveness (36 CFR 212.55(b)). The responsible official and interdisciplinary team reviewed public and internal scoping to date and law, regulation, and policy to determine other relevant resources. We identified the following relevant resources for the Tahoe National Forest OSV use designation analysis.

Botany

Designating areas and trails for public OSV use and grooming trails for public OSV use has the potential to (1) impact woody species that extend above the snow cover; (2) impact plant composition and habitat suitability; (3) impact plants under the snow when there is less than adequate snow cover; and (4) transport non-native invasive plant seeds into new areas.

The potential for impacts to botanical resources are influenced by snow depth, season of use, and proximity to groomed and ungroomed trails where public OSV use would occur.

Resource indicators and measures for this issue are shown in chapter 3, Botany Resource section in table 100.

Socioeconomics

Designating areas and trails for public OSV use and changes in areas available for public OSV use and non-motorized use may impact the local economy (economic contributions of winter recreation on National Forest System lands) and could result in social consequences (including quality of life and local lifestyles). In addition to economic impacts, management actions affecting over-snow vehicle use on National Forest System lands may also have social consequences. Social impacts will be considered qualitatively, including how management actions may affect traditional and cultural ties to Federal lands within the area of influence.

Minority and low-income populations within the area of influence that qualify as Environmental Justice populations will also be identified to determine if disproportionately high adverse human health or environmental effects would result from proposed actions.

Resource indicators and measures for this issue are shown in chapter 3, Socioeconomic Resource section in table 116.

Cultural Resources

In all of the alternatives, the types of management activities proposed could directly, indirectly, or cumulatively affect cultural resources and are subject to the regulations outlined in Section 106 of the National Historic Preservation Act, as amended and as promulgated by 36 CFR Part 800, to address those effects to cultural resources. A qualitative discussion of the effects to cultural resources in areas designated for OSV use will be described.

Transportation and Engineering

This analysis evaluates possible effects to engineering and roads, including safety, traffic, affordability, jurisdiction, and the underlying forest transportation system.

Effects on public safety and traffic will be evaluated by considering the interface between motor vehicle operators and other users of the trail systems. Cost and affordability will be evaluated in terms of changes to the total cost of maintaining the Tahoe National Forest transportation system that would be open to motor vehicle use. This analysis would not involve standard (wheeled motor vehicle) road maintenance costs. The effects to the underlying National Forest System roads and trails, including wear and tear that may affect wheeled motor vehicle use would also be evaluated. Mitigations and monitoring procedures have been identified for all of the action alternatives to minimize these possible impacts.

Climate Change

OSV use and grooming of OSV trails could contribute to greenhouse gas emissions via OSV exhaust and release of these pollutants into the air. The air quality analysis will consider these emissions and provide information for the EIS related to the differences between the alternatives regarding overall air quality.

However, preliminary analysis indicates that while localized air quality may be degraded in some site-specific locations based on concentrated OSV use in specific popular motorized recreation areas, it is unlikely to contribute in any measureable way to regional levels. For this reason, the impact of the project on climate change will not be considered further in the analysis.

Chapter 2. Alternatives

Introduction

This chapter describes and compares the no-action alternative and four action alternatives for the Tahoe National Forest Over-snow Vehicle Use Designation. It includes a detailed description and maps (located in the map package) of each alternative and alternatives considered, but eliminated from detailed study; and presents the alternatives in comparative form, sharply defining the differences between alternatives and providing a clear basis for choice among options by the decision maker and the public. Numbers such as acres and miles are approximate due to the use of GIS data and rounding.

Areas Considered for OSV Use Designation

The Tahoe National Forest Land and Resource Management Plan, as amended, uses standards and guidelines to establish OSV use designations on 109 management areas across the forest. However, for this planning effort, the Tahoe National Forest has delineated 21 discrete specific areas considered for OSV use designation, within the administrative boundaries of the Tahoe National Forest. Each area considered for OSV use is smaller than a ranger district, consistent with 36 CFR 212.1. Two of these areas will not be considered for OSV designation under any of the alternatives. Granite Chief Wilderness (designated by Congress as non-motorized) and North Fork American Wild and Scenic River, which is not for motorized use as stated in the Forest Plan (LRMP, pg. V-429 and 452).

The remaining 19 areas considered for OSV use designation (see table 3 for a list of all areas, and figure 2 in the map package) have been reviewed for consistency with the Travel Management Rule's designation criteria (36 CFR 212.55). Each alternative proposes designating varying portions of these 19 areas for public cross-country OSV use. These areas are primarily bounded by ridge tops, roads, or other geographic features that allow each area to be readily distinguished. They are also defined by their proximity to access points and communities that are socially and economically tied to OSV use and other types of winter recreation.

Designated Trails

Each alternative proposes specific National Forest System roads and trails to be designated as OSV trails (see table 4 for a full list of trails) for public OSV use. Designated OSV trails have been reviewed for consistency with the Travel Management Rule's designation criteria (36 CFR 212.55). OSV trail segments and mileages vary by alternative.

Two types of OSV trails are discussed in this document:

Designated OSV Trails Available for Grooming

The grooming season generally begins in mid-December and continues through March. Start and stop times vary per trail location and are dependent upon the presence and depth of snow. Trails are prioritized for grooming based on visitor use. Grooming has historically occurred several times per week on priority trails and after major storms.

Trails would be groomed for public OSV use to a minimum width of 10 feet and typically 14 feet wide. Groomed trail width is determined by a variety of factors such as width of the underlying road bed, width of grooming tractor, level of use, and to minimize use conflicts. Snow trails would not be groomed beyond the width of the underlying roadbed, where one

exists. Where the terrain allows, main ingress and egress snow trails that connect to the trailhead would be groomed to 18 feet wide or greater to facilitate the added traffic.

Snow trail grooming for public OSV use would be conducted in accordance with the 1997 Snowmobile Trail Grooming Standards set by the California Off-Highway Motor Vehicle Recreation (OHMVR) Division. The California OHMVR Division's snowcat fleet is subject to emission regulation by the California Air Resources Board (CARB) as off-road equipment. The CARB sets an emission limit for the vehicle fleet as a whole rather than for individual pieces of equipment.

Designated OSV Trails Not Available for Grooming

These trails are designated for OSV use and not available for grooming. Often, they are linkages between parking areas, trailheads and across private lands (using easements) to access designated OSV cross-country use areas within National Forest System lands.

Vehicle Class

An OSV is defined as a motor vehicle that is designed for use over snow and that runs on a track or tracks and/or a ski or skis, while in use over snow (36 CFR 212.1). This broad definition includes a wide range of vehicles, from snow bikes to highway-legal vehicles equipped with tracks. Subpart C of the Forest Service's Travel Management Regulation at 36 CFR Part 212 allows for designation by class of vehicle. To provide a safe and enjoyable recreation experience, as well as to protect resources, two different OSV classes are discussed in the action alternatives:

- Class 1: over-snow vehicles that typically exert 1.5 PSI or less (including snowmobiles, snow bikes, snow cats, tracked ATVs, tracked UTVs); and
- Class 2: over-snow vehicles that typically exert more than 1.5 PSI (including tracked 4WD SUVs and tracked 4WD trucks).

Forest Plan Amendment

A forest plan amendment would be needed under all of the action alternatives (alternatives 2, 3, 4, and 5). The proposed amendment to the forest plan, common to all of the action alternatives, would remove Tahoe National Forest Land and Resource Management Plan (LRMP) (USDA Forest Service 1990) OSV use standards and guidelines for each management area, and replace them with the following forest-wide standard: "Manage over the snow vehicle (OSV) use through designation of areas and trails consistent with travel management regulations."

Designating OSV areas and trails under the Travel Management Rule is not a land management plan decision, but rather a project-level decision that requires site-specific planning and analysis (36 CFR 219.2(b)(1) and (2); FSH 1909.12, Section 23.23a). Under this amendment, specific trail and area designations for public OSV use would be appropriately proposed and analyzed, with decisions made, at the project level. Any and all OSV use designations would require project-level environmental analysis and decision-making with public involvement as required by the National Environmental Policy Act (NEPA). The proposed change to the LRMP would be consistent with the 2012 Planning Rule's stated levels of planning at 36 CFR 219.2 in which forest plans do not authorize activities or projects, nor do they make commitments for taking site-specific actions. Rather, forest plans provide the sideboards for future site-specific actions (36 CFR 219.2(b)(1) and (2)).

In accordance with 36 CFR Part 219.13(b)(5), the responsible official must determine: (1) which specific substantive requirement(s) within 36 CFR 219.8 through 219.11 are directly related to the plan direction

being added, modified, or removed by the amendment and (2) apply such requirement(s) within the scope and scale of the amendment. The substantive requirements address sustainability (36 CFR 219.8), diversity of plant and animal communities (36 CFR 219.9), multiple use (36 CFR 219.10), and timber requirements based on the NFMA (36 CFR 219.11). The responsible official is not required to apply any substantive requirements that are not directly related to the amendment. The Responsible Official has determined the proposed plan amendment is directly related to 36 CFR 219.10 Multiple Use, (a)(1) recreation settings and opportunities.

Monitoring and Enforcement

Title 36 CFR 212.57 of the Travel Management Rule (Federal Register Vol. 70, No. 216, November 9, 2005) requires each administrative unit of the NFS to monitor effects of motor vehicle use (including OSV use) on designated roads and trails and in designated areas under the jurisdiction of that responsible official, consistent with the unit's land management plan, as appropriate and feasible. This monitoring requirement applies to areas or trails designated for OSV use in decisions made as a result of this project, pursuant to 36 CFR 212.81(d) (Federal Register Vol. 80, No. 18, January 18, 2015).

To achieve compliance with 36 CFR 212.57, all action alternatives include monitoring procedures to assess effects of OSV use within the designated OSV-use areas and on the designated OSV-use trails. The monitoring procedures are designed to: (1) measure the effectiveness of the designations in avoiding or minimizing resource damage; (2) measure public compliance within the area and trail designations; and (3) measure use levels and patterns of use; and identify concentrated use areas.

Monitoring that would be implemented in connection with any of the action alternatives include the following:

Effectiveness Monitoring

The results of effectiveness monitoring would be used to determine when conditions support OSV use and to communicate that to the public.

Use Conflict: During routine patrols, Forest Service recreation staff, forest protection officers (FPOs) and law enforcement officers (LEOs) would monitor trailheads, sno-parks, groomed trails, and other areas of concentrated use for use conflicts and public safety concerns. Site-specific controls such as: speed limits; segregated access points for motorized and non-motorized uses; increased visitor information; or increased on-site patrol personnel are implemented as needed annually.

Resource Protection: During routine patrols, recreation staff and FPOs would monitor OSV use and document any signs of damage occurring to Forest resources. Resource specialists (i.e., wildlife biologists, hydrologists, botanists) would periodically monitor areas and trails of special interest or concern and document any signs of damage occurring to Forest resources. During patrols, forest staff are looking for evidence of damage or potential damage or harm to soils, vegetation, wildlife, archaeological resources, water quality or other resources. Such damage may include (but is not limited to) the following: road and trail rutting, uprooted vegetation and soil mixed with snow, and damage to natural or cultural resources. Reports of resource damage and public complaints will be maintained in a cooperative effort between recreation staff and FPOs. This monitoring information could be used to take other actions, such as temporary closure of areas and/or trails to prevent resource damage from occurring.

Compliance Monitoring

Compliance monitoring would be conducted to ensure user compliance with the selected alternative's OSV use designations and other requirements. Based on monitoring results, coordination, educational materials, or enforcement actions would be used as needed.

Riding in Closed Areas: During wilderness patrols recreation staff, FPOs and LEOs would monitor wilderness boundaries and other designated non-motorized recreation areas near or adjacent to designated OSV-use areas or OSV-use trails to document signs of incursions occurring (e.g., tracks, or observed use outside of designated area or trail). The Forest would also accept reports from users of prohibited wilderness and other non-designated areas OSV incursions as an additional means to discover and gauge problem areas.

Riding on Designated Trails: Areas where OSV use is restricted to designated OSV-use trails (cross-country OSV use is not designated) would be monitored during routine patrols to ensure public OSV use is restricted to the footprint of the designated trail and OSV use does not encroach into areas adjacent to the trail that are not designated for OSV use.

Riding within Designated Areas: Areas where cross-country OSV use has been designated (i.e., within OSV-use areas) would be monitored during routine patrols to ensure public OSV remains within the designated use area.

Enforcement

The Forest Service would enforce the OSV use designations using a suite of approaches: (1) Education; (2) Warnings; and (3) Citations. These approaches will be used if, during routine patrols, recreation, FPO and LEO staff observe: (1) OSV use occurring on NFS lands outside of the designated OSV-use areas or designated OSV-use trails; (2) OSV use occurring when snow depths are insufficient to avoid damaging resources; ; or (3) OSV use is observed to be causing resource damage.

Education: Law enforcement officials would provide education through on site communication with OSV users. This approach would serve as a proactive measure to prevent OSV users from violating the OSV use designations or causing resource damage. Forest Service staff would demonstrate directly to the public where OSV use is designated to occur, if and why a user(s) was not in compliance with these designations, and share information that would enable the user(s) to ensure compliance and resource protection in the future.

Warnings: Writing a warning accomplishes two main objectives: (1) the warning documents the encounter between recreation, FPO or LEO staff and an OSV user and (2) the warning provides the OSV user with a written, physical, reminder of the encounter, including a description of how they were in violation and how to conduct their OSV use in the future to remain in compliance with the Forest's OSV use designations and resource protection measures.

Citations: Citations will be written on an individual, situational basis. Education and warnings are typically utilized first. Citations (citing 36 CFR 261.14) can be written for any OSV use not in accordance with the OSV use designations established pursuant to 36 CFR 212.81 on an administrative unit or a ranger district of the National Forest System where these designations have been identified on an over-snow vehicle use map (OSVUM). Citations (citing 36 CFR 261.9a, 36 CFR 261.9c, 36 CFR 261.12c) can also be written for any OSV use that is observed

to be causing (9a) damage to any natural feature or other property of the United States; (9c) damage to any plant species that is classified as threatened, endangered, sensitive, or rare; or; (12c) damage and leaving in a damaged condition any such road, trail or segment thereof.

How Alternatives were Developed

Five alternatives were developed to address the significant issues raised during scoping and detailed in Chapter 1 of this FEIS.

The no-action alternative (alternative 1) represents the current management of the OSV program within the Tahoe National Forest as described in the Tahoe National Forest Land and Resource Management Plan (LRMP) (USDA Forest Service 1990), as amended.

The proposed action (alternative 2), as originally described in the February 23, 2015 Notice of Intent, responds primarily to the quality recreational experience by balancing motorized and non-motorized opportunities. The Forest Service modified the original proposed action based on scoping input received from the public, taking into account where most visitors need to drive and park to access winter recreation opportunities in the forest, as well as elevations where snowfall is adequate for OSV use to occur (36 CFR 212.81(a)). Further, scoping input was combined with the Travel Management Rule's designation criteria (36 CFR 212.55) to propose and evaluate the proposed action's OSV trail and area designations. The Forest Service applied the Travel Management Rule's specific criteria at 36 CFR 212.55(b) using a route-by-route and area-by-area approach, which is documented in Volume 2 of this FEIS, Appendices E and F.

After reviewing scoping comments the original proposed action was modified in the DEIS with the following changes:

- The original proposed action described National Forest System areas and trails as open, closed, or prohibited. The Final Rule for Subpart C of the Forest Service's Travel Management Regulations (36 CFR Part 212) became effective on February 27, 2015. Due to the timing of the release of the Final Rule and the NOI, the NOI proposed action used the Proposed Rule, dated June 18, 2014, which stated: "Designation of a National Forest System road, National Forest System trail, or area on National Forest System lands where over-snow vehicle use is allowed, restricted, or prohibited pursuant to § 212.81 on an over-snow vehicle use map." The final rule, states: "Designation of a National Forest System road, a National Forest System trail, or an area on National Forest System lands where over-snow vehicle use is allowed pursuant to § 212.81." The modified proposed action in this FEIS (alternative 2) uses the Final Rule's approach of designating areas and trails for OSV use.
- The Forest Service has authority from Placer County to control and maintain the seasonally closed portion of Foresthill Road (G0088) and its right-of-way for snow recreation purposes starting at China Wall. This was not reflected in the Proposed Action/Notice of Intent, but is incorporated in this process going forward.
- Generally, areas below 5,000 feet elevation would not be designated for public OSV use. No key deer winter range would be designated for OSV use, except for the lower section of the Mosquito Ridge Trail.
- OSVs would be classified into two classes of vehicle, with restrictions on Class 2 vehicles.
- Snow depth requirements were clarified to reflect resource damage concerns.

- A rerouted section of the PCT in the Packer Lake area was completed after the original proposed action was released. The modified proposed action reflects the new PCT alignment.

The modified proposed action was modified again based on public comments received on the DEIS with the following changes:

- OSV use areas boundaries and acreages changed, including the following:
 - ◆ OSV designation proposals were made for lands acquired by the Tahoe National Forest between DEIS and FEIS.
 - ◆ In the Loch Leven non-OSV designated area moved the southern non-designated area boundary further south along the ridge above Fisher Lake, expanding the non-designated area to include Fisher Lake and its watershed.
 - ◆ In the Donner Lake Interchange area designated OSV use on two Tahoe National Forest parcels in T17N, R15E, Section 10.
 - ◆ In the Tahoe/Donner area designated OSV use for the southwest half (boundary on ridge line) of the Tahoe National Forest parcel in T17N, R15E, Section 2.
 - ◆ In the Granite Flat area (west of HWY 89) designated OSV use west of the 01 Road (T17N, R16E, sec 21) and south of the 01-03 Road (T17N, R16E, sec 20).
 - ◆ In the Anderson Peak area removed OSV use designations east for 300 to 500 feet from the ridgeline (running north/south) at Tinker's Knob and north past Anderson Peak to the north end of Section 33 (in the vicinity of Mount Lincoln) to reduce potential conflict with, and noise impacts to, non-motorized winter recreationists using the PCT in that area traveling to and from the Benson Hut, Squaw Valley and Highway 40 or I-80.
 - ◆ In the Frog Lake area removed OSV designation from National Forest System lands that are part of the Frog Lake bowl (watershed) north and west of Frog Lake (T18N, R15E, sec 33).
- Designated OSV trails were changed, including the following:
 - ◆ The category of "marked, ungroomed trails" was removed and the category of "designated OSV trails not available for grooming and located on easements" was added. Designated OSV trails not available for grooming were added over selected easements across private land to create legal connections between OSV designated areas on National Forest System lands. The miles and locations of snow trails were adjusted.
 - ◆ In the Sagehen area designated OSV trails not available for grooming over portions of the 11, 11-08, and 11-10 roads and over a non-system road. Also, one of the designated OSV trails up a ridgeline (not over a road) was extended to access Carpenter Ridge.
 - ◆ The entire length of the Sawtooth Snow Trail was added and designated as available for grooming.
 - ◆ For access to the Anderson Peak east area designated OSV trails not available for grooming were added over portions of roads/trails 01, 01-03, 01-06, 01-08, 01, 08-02 and 16E84 4x4.
 - ◆ A portion of Howard Trail (available for grooming) north of the 09 Trail that traversed through the wet meadow east of Howard Meadow (including a trail section without an underlying road through critical Sierra Nevada yellow-legged frog habitat (with detections)) was removed.

- OSV Classes were changed from width basis to ground pressure basis in response to comments to the DEIS. Class 1 OSVs are over-snow vehicles that typically exert 1.5 pounds per square inch (PSI) or less and include the following OSV types: snowmobiles, tracked motorcycles, snow-cats, tracked ATVs and tracked UTVs. Class 2 OSVs are over-snow vehicles that typically exert more than 1.5 PSI and include the following OSV types: tracked 4-wheel-drive SUVs and tracked 4-wheel-drive trucks. Class 1 OSVs would be allowed on all designated OSV trails and areas. Class 2 OSVs would only be allowed on designated OSV trails available for grooming. Only allowing Class 2 OSVs on designated OSV trails available for grooming reduces the potential for conflict between the different classes of OSVs.
- The number of PCT crossings was increased and the location and total mileage of PCT crossings was increased. The 34 designated crossings includes 12 strategically located crossings that were added to alternative 2 between the DEIS and FEIS in response to comments to the DEIS expressing concerns over the safety and impracticability of having too few designated locations to cross the PCT, which traverses the Forest at high elevation.
- The language related to snow depth requirements was modified for clarification.

Alternative 3 was submitted by Snowlands Network and others during scoping to respond to issues surrounding (1) the quality and quantity of non-motorized winter recreational opportunities available in the forest; (2) the potential for OSV trail grooming and OSV noise to adversely impact quiet recreation experiences and disturb wildlife; and (3) air quality impacts, particularly localized impacts to those desiring a non-motorized winter recreation experience. This alternative would designate less acreage for OSV use across the Forest, with an emphasis on providing greater non-motorized winter recreation opportunities compared to current management. This alternative would designate existing popular OSV cross-country areas and trails in the forest for public OSV use.

Following the comment period on the DEIS, alternative 3 was modified with the following changes:

- OSV use areas boundaries and acreages changed to provide OSV use designation proposals for lands acquired by the Tahoe National Forest between DEIS and FEIS. The category of “marked, ungroomed trails” was removed and the category of “designated OSV trails not available for grooming and located on easements” was added. Designated OSV trails not available for grooming were added over selected easements across private land to create legal connections between OSV designated areas on National Forest System lands. The miles and locations of snow trails were adjusted.
- OSV Classes were changed from width basis to ground pressure basis.
- The language related to snow depth requirements was modified for clarification.

Alternative 4 was developed with input from the Blue Ribbon Coalition and other OSV enthusiasts. This alternative emphasizes providing opportunities for winter motorized recreation and provides slightly more opportunities for public OSV user compared to current management (alternative 1).

Following the comment period on the DEIS, alternative 4 was modified with the following changes:

- OSV use areas boundaries and acreages changed to provide OSV use designation proposals for lands acquired by the Tahoe National Forest between DEIS and FEIS.
- Designated OSV trails were changed, including the following:
 - ◆ The category of “marked, ungroomed trails” was removed and the category of “designated OSV trails not available for grooming and located on easements” was added. Designated

OSV trails not available for grooming were added over selected easements across private land to create legal connections between OSV designated areas on National Forest System lands. The miles and locations of snow trails were adjusted.

- ◆ For access to the Anderson Peak east area designated OSV trails not available for grooming were added over portions of roads/trails 01, 01-03, 01-06, 01-08, 01, 08-02 and 16E84 4x4.
- OSV Classes were changed from width basis to ground pressure basis.

The language related to snow depth requirements was modified for clarification. Alternative 5 responds to public comments concerning potential impacts on wildlife and natural resources from OSV use. It would provide less designated acreage for OSV use, and therefore, fewer opportunities for motorized winter recreation experiences in the forest to emphasize protection of wildlife and other forest resources. In addition, alternative 5 would provide greater opportunities for non-motorized winter recreation activities compared to alternatives 1, 2, and 4.

Following the comment period on the DEIS, alternative 5 was modified with the following changes:

- OSV use areas boundaries and acreages changed, including the following:
 - ◆ OSV use designation proposals were made for lands acquired by the Tahoe National Forest between DEIS and FEIS.
 - ◆ In the Granite Flat area (west of HWY 89) designated OSV use west of the 01 Road (T17N, R16E, sec 21) and south of the 01-03 Road (T17N, R16E, sec 20).
- Designated OSV trails were changed, including the following:
 - ◆ The category of “marked, ungroomed trails” was removed and the category of “designated OSV trails not available for grooming and located on easements” was added. Designated OSV trails not available for grooming were added over selected easements across private land to create legal connections between OSV designated areas on National Forest System lands. The miles and locations of snow trails were adjusted.
 - ◆ For access to the Anderson Peak east area designated OSV trails not available for grooming were added over portions of roads/trails 01, 01-03, 01-06, 01-08, 01, 08-02 and 16E84 4x4.
 - ◆ Removed a portion of Howard Trail (available for grooming) north of the 09 Trail that traversed through the wet meadow east of Howard Meadow (including a trail section without an underlying road through critical Sierra Nevada yellow-legged frog habitat (with detections)).
- OSV Classes were changed from width basis to ground pressure basis.
- The language related to snow depth requirements was modified for clarification.

Alternatives Considered in Detail

The Forest Service explored and evaluated five alternatives (all are summarized and compared in the “Comparison of Alternatives” section at the end of this chapter).

Alternative 1: No Action (Continue Current Management)

The no-action alternative is required under NEPA regulations [40 CFR §1502.14(d)]. This alternative represents the existing baseline condition or trends by which the action alternatives are compared. Under this alternative, the Forest Service would follow the OSV use designations for each management

area in the *Tahoe National Forest Land and Resource Management Plan* (LRMP, USDA Forest Service 1990), as amended (Volume II of this FEIS, Appendix B). No changes would be made to the Forest Plan's OSV use designations within the Tahoe National Forest except as prohibited by Forest Order.

Under alternative 1, public OSV use designations on the approximately 836,273-acre Tahoe National Forest would be managed in accordance with existing Forest Plan direction as follows:

- Approximately 641,952 acres of National Forest System lands are designated for public cross-country OSV use (table 3).
- The use of BMPs (appendix D) would be required.
- Approximately 1,218 acres of National Forest System lands are designated for public cross-country OSV use in deer holding areas from January 1 through September 14 (LRMP, pg. V-30).
- The Forest Plan does not establish a minimum snow depth for trail or cross-country public OSV use but the Forest would continue to implement forestwide snow depth requirements for grooming by:
 - ♦ Following California State Parks' Off-Highway Motor Vehicle Recreation Division snow depth standards for grooming, currently 12 to 18 inches of snow.
- The Tahoe National Forest has a total of approximately 369 miles of designated OSV trails that consist of:
 - ♦ Approximately 220 miles of designated OSV trails available for grooming.
 - ♦ Approximately 149 miles of designated OSV trails not available for grooming, including:
 - (1) Approximately 9 miles, of which, 3 miles are located within areas designated for cross-country OSV use, and (2) Approximately 140 miles are located on easements across private lands (added between DEIS and FEIS) (table 4, figure 2 located in the map package).
- The Forest Plan does not provide specific management direction for OSV trail grooming activities; however, the forest follows the California State Parks' Off-Highway Motor Vehicle Recreation Division snow depth standards for grooming, currently 12 to 18 inches of snow.
- Approximately 99 miles of the PCT traverse the Tahoe National Forest. Of that, 76 miles of the PCT is on National Forest System lands. OSV use on the PCT is prohibited by the National Scenic Trails Act, P.L 90-543, Section 7(c).
- There are no designated OSV crossings of the PCT.

Alternative 1 is summarized in table 3 and table 4 and displayed in figure 2 located in the map package.

Table 3. OSV use designations - alternative 1

Areas Considered for OSV Use Designation	Area Size (Total Acres)	OSV Designated Use (Acres)
Barker	9,847	9,783
Black Buttes	41,288	39,618
Bowman	19,604	18,033
Donner Summit	11,634	9,052
Foresthill East	94,183	90,324*
Foresthill North	36,151	34,026
Foresthill West	32,957	26,482
Lafayette	46,814	41,210
Reservoirs	40,883	40,883
Sierraville East	75,557	55,375
Sierraville North	17,564	17,564
Sierraville West	102,262	99,198
South of 20	17,346	10,078
Summit West	16,322	4,466
Truckee	34,446	21,356
Yuba NE	83,273	72,566
Yuba NW	43,255	37,717
Yuba South	20,657	14,140
Yuba West	40,708	76

* Public OSV use is allowed between January 1 and September 14 for 1,218 acres.

Table 4. OSV Trails – alternative 1

Designated OSV Trails Available for Grooming	Trail Length (Miles)	Areas
American Hill Trail	9.51	Foresthill East
Bald Ridge Loop Trail	14.40	Sierraville West
Bowman Trail	13.60	Bowman
Duncan "Y" Trail	5.14	Foresthill East
Fifty-Four Road Trail	12.54	Sierraville West, Yuba NE
Ford Point Trail	1.68	Foresthill East
Foresthill Divide Trail	14.21	Foresthill East
Haskell Peak Trail	15.55	Yuba NE
Howard Trail	4.90	Yuba NE
Howard Trail Not on Roadbed	0.50	Yuba NE
Humbug Tie Trail	0.82	Foresthill East
Humbug Trail	4.66	Foresthill East
Independence Lake Loop Trail	1.98	Sierraville West, Truckee
Jackson Meadow Little Truckee Trail	14.61	Sierraville West
Lower Ford Point Trail	1.30	Foresthill East
Meadow Lake Loop Trail	6.18	Sierraville West
Mosquito Ridge Trail	6.78	Foresthill East
Pass Creek Loop Trail	7.58	Sierraville West

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Designated OSV Trails Available for Grooming	Trail Length (Miles)	Areas
Prosser Creek CNNTR Trail	13.35	Sierraville West
Prosser Hill Winter Trail	1.05	Sierraville West
Rattlesnake Trail	10.10	Black Buttes
Ridge Loop Trail	6.05	Sierraville West
Rim Loop Trail	2.84	Sierraville West
Robinson Flat Trail	1.27	Foresthill East
Sawmill Flat	0.22	Truckee
Sawtooth OSV Trail	1.48	Truckee
Soda Springs Trail	6.36	Foresthill East
Sterling Trail	4.26	Black Buttes
Tadpole Trail	3.01	Foresthill East
Treasure Mtn Loop Trail	16.17	Sierraville West
Yuba Webber Trail	17.00	Sierraville West, Yuba NE
Total	219.74	
Designated OSV Trails not Available for Grooming on Easements	Trail Length (Miles)	OSV use Area
19 Road System Trails	10.09	Foresthill North
American Hill Trails	2.42	Foresthill East
Anderson Peak Trails	8.58	Truckee
East Bowman Trails	5.73	Bowman, Yuba South
Calpine Trails	0.48	Sierraville North
Donner Lake Interchange Trail	1.81	Truckee
Excelsior Trail	0.95	South of 20
Hilda Trail	2.48	Sierraville West
Packer Saddle Trails	2.87	Yuba NE
Palmer Ridge Trail	0.68	Lafayette
Pinoli Ridge Trail	3.83	Black Buttes
Rattlesnake Trails	4.64	Black Buttes, Sierraville West
Weber/Independence Trails	7.66	Sierraville West, Truckee
Easements Yuba/Webber Trails	3.15	Sierraville West
Designated OSV Trails not Available for Grooming on Easements not in Action Alternatives	84.75	Barker Black Buttes Bowman Foresthill East Foresthill North Foresthill West Lafayette North Fork American Wild And Scenic River Reservoirs Sierraville West South of 20 Yuba North East Yuba North West Yuba South
Total	140.12	

Designated OSV trails Not available for grooming	Trail Length (Miles)	OSV use Area
Andesite West OSV Trail	3.47	Donner Summit
Boris	0.50	Truckee
Jackass Point	1.17	Truckee
Jackass Point SP	0.68	Truckee
Martis Peak Trail	1.81	Truckee
Mosquito Ridge Rd.	0.93	Foresthill East
Mosquito Ridge Trail	0.27	Foresthill East
Rocky	0.39	Truckee
Woodcamp	0.24	Truckee
Total	9.45	

Alternative 2: Modified Proposed Action (Preferred Alternative)

The following, along with mitigations in appendices E, and F, respectively, describes how the Forest Service would manage public OSV use within the Tahoe National Forest under the modified proposed action:

- Approximately 410,703 acres of National Forest System lands would be designated for public cross-country OSV use, generally above 5,000 feet elevation (table 5, figure 3 in the map package).
- The use of BMPs (appendix D) would be required.
- Public OSV use would not be designated in a 1-acre area near Robinson Flat to protect historic structures.
- Individual parcels of National Forest System lands currently under long-term special use permits for Royal Gorge Cross Country Ski Area, Tahoe Donner Cross Country Ski Area, Boreal Ski Area, Donner Ski Ranch Ski Area, Sugar Bowl Ski Area, Alpine Meadows Ski Area and Squaw Valley Ski Area would not be designated for public OSV use.
- Implement forestwide snow depth requirements for public OSV use by:
 - ♦ Allowing public, cross-country OSV use in designated OSV areas only when there is adequate snow depth to avoid damage^{8,9} to natural¹⁰ and cultural resources. As a guideline to avoid damaging resources, a minimum of 12 inches of moderate to heavy density, uncompacted snow is typically needed (moderate to high water content snow common to Sierra storms). Snow water equivalency (SWE) is also an indicator for avoiding damage to resources. An SWE of 4 inches can be a reasonable baseline for avoiding resource damage.

⁸ **36 CFR** §261.2 Definitions. Damaging means to injure, mutilate, deface, destroy, cut, chop, girdle, dig, excavate, kill or in any way harm or disturb.

⁹ Examples of damage may include (but is not limited to) the following: road and trail rutting; uprooted vegetation or vegetation and soil mixed with snow; compressing the subnivian space (wildlife habitat between the snowpack and ground).

¹⁰ **42 U.S.C. § 9601** the term natural resources means "land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States

- ◆ On designated OSV trails with underlying roads, a minimum of 6 inches of uncompacted snow is typically needed to avoid damage to the underlying road surface.
- Implement forestwide snow depth requirements for grooming by:
 - ◆ Following California State Parks' Off-Highway Motor Vehicle Recreation Division snow depth standards for grooming, currently 12 to 18 inches of snow.
- Class 1 OSVs are allowed on all designated OSV trails and areas. Class 2 OSVs are only allowed on designated OSV trails available for grooming. Class of vehicle definitions can be found on page 2.
- Designate a total of approximately 384 miles of OSV trails that would consist of:
 - ◆ Approximately 247 miles of designated OSV trails available for grooming.
 - ◆ Approximately 137 miles of designated OSV trails not available for grooming, including:
 - (1) Approximately 84 miles, of which approximately 2 miles are located within areas designated for cross-country OSV use; and
 - (2) Approximately 53 miles located on easements across private lands (added between DEIS and FEIS) (table 6, figure 3 in the map package).
- There would be 34 designated OSV crossings of the PCT (table 7, figure 3 in the map package).
 - ◆ Fourteen designated crossings would utilize roads identified on the Tahoe National Forest's Motor Vehicle Use Map and would be the width of the road (approximately 14 feet). In one instance, the current alignment of the PCT overlays the Pass Creek Loop OSV Trail on National Forest System Road 70 where they coincide for approximately 700 feet. Twenty proposed OSV crossings of the PCT would not utilize roads and would range in width up to 0.25 mile. These crossings are located in areas where OSV use is designated on either side of the PCT. Some of these proposed OSV crossings are wider than the width of a road because they are located in areas where snow conditions are highly variable during the course of a winter, for example areas prone to wind loading of snow and formation of cornices. These wider crossings give OSV users options to select a safe crossing of the trail under constantly changing, variable snow loading conditions. In all cases, OSVs crossing the PCT would do so at 90 degrees, or as close to 90 degrees as is safe, to minimize the time and distance needed to cross the trail. OSV users are to make crossings at, or as near as possible, to the identified crossing locations as is safe to do so.

Alternative 2 is summarized in table 5, table 6, and table 7 and displayed in figure 3 located in the map package.

Table 5. OSV use designations under alternative 2

Areas Considered for OSV Use Designation	Area size (Total Acres)	OSV Designated Use (Acres)
Barker	9,847	9,783
Black Buttes	41,288	37,816
Bowman	19,604	10,966
Donner Summit	11,634	7,972
Foresthill East	94,183	54,584
Foresthill North	36,151	22,926
Foresthill West	32,957	0
Lafayette	46,814	14,183
Reservoirs	40,883	36,998
Sierraville East	75,557	29,004
Sierraville North	17,564	4,111
Sierraville West	102,262	96,918
South of 20	17,346	4,246
Summit West	16,322	0
Truckee	34,446	9,323
Yuba NE	83,273	54,588
Yuba NW	43,255	15,268
Yuba South	20,657	1,750
Yuba West	40,708	267

Table 6. OSV Trails– alternative 2

Designated OSV Trails Available for Grooming	Trail Length (Miles)	Areas
American Hill Trail	9.51	Foresthill East
Bald Ridge Loop Trail	14.40	Sierraville West
Bowman Trail	13.60	Bowman
Duncan “Y” Trail	5.14	Foresthill East
Fifty-Four Road Trail	12.54	Sierraville West, Yuba NE
Ford Point Trail	1.68	Foresthill East
Foresthill Divide Trail	14.21	Foresthill East
Groomer Shed Trail	0.64	Yuba NE
Haskell Peak Trail	15.55	Yuba NE
Howard Trail	2.06	Yuba NE
Humbug Tie Trail	0.82	Foresthill East
Humbug Trail	4.66	Foresthill East
Independence Lake Loop Trail	1.98	Sierraville West, Truckee
Jackson Meadow Little Truckee Trail	14.61	Sierraville West
Lower Ford Point Trail	1.30	Foresthill East
Meadow Lake Loop Trail	6.18	Sierraville West
Mosquito Ridge Trail	28.16	Foresthill East

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Designated OSV Trails Available for Grooming	Trail Length (Miles)	Areas
Pass Creek Loop Trail	7.58	Sierraville West
Prosser Creek Trail	13.35	Sierraville West
Prosser Hill Winter Trail	1.05	Sierraville West
Rattlesnake Trail	10.10	Black Buttes
Ridge Loop Trail	6.05	Sierraville West
Rim Loop Trail	2.84	Sierraville West
Robinson Flat Trail	1.27	Foresthill East
Sawmill Flat Trail	0.22	Truckee
Sawtooth Trail	10.52	Truckee
Soda Springs Trail	6.36	Foresthill East
Sterling Trail	4.26	Black Buttes
Tadpole Trail	3.01	Foresthill East
Treasure Mtn Loop Trail	16.17	Sierraville West
Yuba Webber Trail	17.00	Sierraville West, Yuba NE
Total	246.82	
Designated OSV Trails not Available for Grooming on Easements	Trail Length (Miles)	OSV use Area
19 Road System Trails	10.09	Foresthill North
American Hill Trails	2.42	Foresthill East
Anderson Peak Trails	5.77	Truckee
East Bowman Trails	5.73	Bowman, Yuba South
Calpine Trails	0.48	Sierraville North
Donner Lake Interchange Trail	1.81	Truckee
Excelsior Trail	0.95	South of 20
Hilda Trail	2.48	Sierraville West
Packer Saddle Trails	2.87	Yuba NE
Palmer Ridge Trail	0.68	Lafayette
Pinoli Ridge Trail	3.83	Black Buttes
Rattlesnake Trails	4.64	Black Buttes, Sierraville West
Weber/Independence Trails	7.66	Sierraville West, Truckee
Easements Yuba/Webber Trails	3.14	Sierraville West
Total	52.55	
Designated OSV trails Not available for grooming	Trail Length (Miles)	OSV use Area
Andesite West OSV Trail	3.47	Donner Summit, Summit West
Bear Valley	6.52	Sierraville East
Boris	0.50	Truckee
CAL IDA Scales	14.86	Yuba NW
Carmen Valley	8.06	Sierraville North
Carmen Valley Spurs	1.70	Sierraville North
Carpenter Ridge	3.27	Truckee

Designated OSV trails Not available for grooming	Trail Length (Miles)	OSV use Area
Eureka	6.49	Yuba NW
Frosty East	5.01	Sierraville North
Jackass Point	1.17	Truckee
Jackass Point SP	0.68	Truckee
Martis Peak Trail	1.81	Truckee
Mosquito Ridge	18.72	Foresthill East, Foresthill West
North Tie	0.05	Sierraville North
Rocky	0.39	Truckee
Sagehen	4.68	Sierraville West, Truckee
Sawtooth OSV Trail	0.01	Truckee
South Sagehen Ck	2.56	Truckee
Texas Hill/Mears	3.83	Foresthill North
Woodcamp	0.24	Truckee
Total	84.02	

Table 7. Designated Pacific Crest Trail OSV crossings – alternative 2

Designated Pacific Crest Trail OSV Crossing	Area
16E75 (Rubicon Jeep)	Barker
0003-004 (Niehaus)	Barker
0003 (Barker Pass)	Barker
T.18N., R.14E.,21,	Sierraville West
T.18N., R.14E.,22	Sierraville West
T. 18N., R.14E., 26	Sierraville West
T. 18N., R.14E., 26, B	Sierraville West
T. 18N., R.14E., 35	Sierraville West
T. 18N., R.14E., 35, B	Sierraville West
T.19N., R.13E.,35	Sierraville West
T.19N., R.13E.,35, B	Sierraville West
0086 (Meadow Lake)	Sierraville West
0070-040-20 (Moscove Spur)	Sierraville West
0070-040 (Moscove)	Sierraville West
0070-065 (Jackson Overlook)	Sierraville West
0070 (Pass Creek Loop)	Sierraville West
0007 (Fibreboard)	Sierraville West
0093-002-03 (Monarch Spur)	Yuba NE
T.20N., R.12E.,8, SAC Dugan Pond Road	Yuba NE
T.20N., R.12E.,08	Yuba NE
T.20N., R.12E.,05	Yuba NE
T.20N., R.12E.,5,	Yuba NE
T.21N., R.12E.,18,	Yuba NE

Designated Pacific Crest Trail OSV Crossing	Area
T.21N., R.12E.,30,	Yuba NE
T.21N., R.12E.,32	Yuba NE
T.21N., R.12E.,32, B	Yuba NE
T.21N., R.11E.,13	Yuba NE
T.21N., R.11E.,11	Yuba NE
T.21N., R.11E.,02	Yuba NE
T.21N., R.12E.,18 12E66 Lots A Lakes OHV	Yuba NE
T.21N., R.12E.,19 12E66 Lots A Lakes OHV	Yuba NE
T.21N., R.12E.,19 12E67 Snake Lake OHV	Yuba NE
T.21N., R.12E.,29, 30	Yuba NE
11E68 (Lavezzola Creek OHV Trail)	Yuba NE

Alternative 3

This alternative addresses issues related to quality and quantity of non-motorized winter recreational opportunities, noise impacts from OSV use, and air quality impacts from OSV use by emphasizing providing opportunities for non-motorized winter recreation across the Forest. The proposed designated OSV areas and trails in this alternative were reviewed against the Travel Management Minimization Criteria (appendices E, and F, respectively). The following summarizes how the Forest Service would manage public OSV use within the Tahoe National Forest under this alternative:

- Approximately 257,024 acres of National Forest System lands would be designated for public cross-country OSV use (table 8 and figure 4 in the map package).
- The use of BMPs (appendix D) would be required.
- Approximately 1,408 acres of National Forest System lands are designated for public cross-country OSV use in deer holding areas from January 1 through September 14 (LRMP, page V-30).
- Public OSV use would not be designated in a 1-acre area near Robinson Flat to protect historic structures.
- Individual parcels of National Forest System lands currently under long-term special use permits for Royal Gorge Cross Country Ski Area, Tahoe Donner Cross Country Ski Area, Boreal Ski Area, Donner Ski Ranch Ski Area, Sugar Bowl Ski Area, Alpine Meadows Ski Area and Squaw Valley Ski Area would not be designated for public OSV use.
- Cross-country OSV use would be designated during specific dates in aquatic and terrestrial wildlife species' habitats as follows:
 - ◆ Within all Sierra Nevada yellow-legged frog habitat – First major snow event to April 15 (or earlier if there is insufficient snow to buffer vegetative habitat).
 - ◆ Bald eagle nesting habitat – September 1 to December 31
 - ◆ California spotted owl/great gray owl nesting habitat – August 16 to April 30
 - ◆ Northern goshawk nesting – September 16 to February 14
 - ◆ Pacific marten denning habitat– August 1 to April 30

- Public OSV use would not be designated within 150 feet of waterways that support Lahontan cutthroat trout.
- Public OSV use would not be designated within 300 feet of lakes and 150 feet of rivers and streams.
- Both Class 1 and 2 OSVs are allowed on all designated OSV trails and areas. Class of vehicle definitions can be found on page 2.
- Designate a total of approximately 280 miles of OSV trails that would consist of:
 - ♦ Approximately 220 miles of designated OSV trails available for grooming.
 - ♦ Approximately 60 miles of designated OSV trails not available for grooming, including: (1) Approximately 24 miles, of which approximately 15 miles are located within areas designated for cross-country OSV use, and (2) Approximately 36 miles of designated OSV trails not available for grooming located on easements across private lands (added between DEIS and FEIS) (table 9, figure 4 in the map package).
- Implement forestwide snow depth requirements for public OSV use by:
 - a. Allowing public, cross-country OSV use in designated OSV use areas when there are 18 or more inches of snow or ice covering the landscape, to prevent impacts to surface and subsurface resources including, but not limited to, archaeological deposits, historic features, and historic properties. Public OSV use on designated trails would be allowed when there are 18 or more inches of snow covering the trail.
 - b. Grooming designated OSV snow trails when there are 18 or more inches of snow.
- There would be 3 designated OSV crossings of the PCT (table 10, figure 4 in the map package). In all cases, OSVs crossing the PCT would do so at 90 degrees to minimize the time and distance needed to cross the trail. The 3 designated OSV crossings of the PCT would be as follows:
 - ♦ Two designated crossings would utilize roads identified on the Tahoe National Forest’s Motor Vehicle Use Map and would be the width of the road (approximately 14 feet).
 - ♦ In one instance the designated crossing would be approximately 700 feet where the current alignment of the PCT overlays the Pass Creek Loop OSV Trail on National Forest System Road 70.

Alternative 3 is summarized in table 8, table 9, and table 10 and displayed in figure 4 located in the map package.

Table 8. OSV use designations - alternative 3

Areas Considered for OSV Use Designation	Area size (Total Acres)	OSV Designated Use (Acres)
Barker	9,847	0
Black Buttes	41,288	24,753
Bowman	19,604	10,736
Donner Summit	11,634	1,608
Foresthill East	94,183	45,498*
Foresthill North	36,151	13,118
Foresthill West	32,957	0
Lafayette	46,814	293

Areas Considered for OSV Use Designation	Area size (Total Acres)	OSV Designated Use (Acres)
Reservoirs	40,883	14,484
Sierraville East	75,557	31,731
Sierraville North	17,564	86
Sierraville West	102,262	74,427
South of 20	17,346	0
Summit West	16,322	0
Truckee	34,446	14,795
Yuba NE	83,273	24,973
Yuba NW	43,255	0
Yuba South	20,657	522
Yuba West	40,708	0

* Public OSV use is allowed between January 1 and September 14 for 1,408 acres.

Table 9. OSV Trails – alternative 3

Designated OSV Trails Available for Grooming	Trail Length (Miles)	OSV use Area
American Hill Trail	9.51	Foresthill East
Bald Ridge Loop Trail	14.40	Sierraville West
Bowman Trail	13.60	Bowman
Duncan "Y" Trail	5.14	Foresthill East
Fifty-Four Road Trail	12.54	Sierraville West, Yuba NE
Ford Point Trail	1.68	Foresthill East
Foresthill Divide Trail	14.21	Foresthill East
Haskell Peak Trail	15.55	Yuba NE
Howard Trail	4.90	Yuba NE
Howard Trail Not on Roadbed	0.50	Yuba NE
Humbug Tie Trail	0.82	Foresthill East
Humbug Trail	4.66	Foresthill East
Independence Lake Loop Trail	1.98	Sierraville West, Truckee
Jackson Meadow Little Truckee Trail	14.61	Sierraville West
Lower Ford Point Trail	1.30	Foresthill East
Meadow Lake Loop Trail	6.18	Sierraville West
Mosquito Ridge Trail	6.78	Foresthill East
Pass Creek Loop Trail	7.58	Sierraville West
Prosser Creek CNTR Trail	13.35	Sierraville West
Prosser Hill Winter Trail	1.05	Sierraville West
Rattlesnake Trail	10.10	Black Buttes
Ridge Loop Trail	6.05	Sierraville West
Rim Loop Trail	2.84	Sierraville West
Robinson Flat Trail	1.27	Foresthill East
Sawmill Flat	0.22	Truckee
Sawtooth OSV Trail	1.48	Truckee

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Designated OSV Trails Available for Grooming	Trail Length (Miles)	OSV use Area
Soda Springs Trail	6.36	Foresthill East
Sterling Trail	4.26	Black Buttes
Tadpole Trail	3.01	Foresthill East
Treasure Mtn Loop Trail	16.17	Sierraville West
Yuba Webber Trail	17.00	Sierraville West, Yuba NE
Total	219.74	

Designated OSV Trails not Available for Grooming on Easements	Trail Length (Miles)	OSV use Area
19 Road System Trails	4.70	Foresthill North
American Hill Trails	2.42	Foresthill East
Anderson Peak Trails	4.39	Truckee
East Bowman Trails	5.73	Bowman, Yuba South
Calpine Trails	0	Sierraville North
Donner Lake Interchange Trail	0	Truckee
Excelsior Trail	0	South of 20
Hilda Trail	2.48	Sierraville West
Packer Saddle Trails	1.18	Yuba NE
Palmer Ridge Trail	0	Lafayette
Pinoli Ridge Trail	2.51	Black Buttes
Rattlesnake Trails	4.63	Black Buttes, Sierraville West
Weber/Independence Trails	4.52	Sierraville West, Truckee
Easements Yuba/Webber Trails	3.01	Sierraville West
Total	35.58	

Designated OSV trails Not available for grooming	Trail Length (Miles)	OSV use Area
0787-004-05 (In the Boca Hill/Prosser Ranch Area)	0.51	Reservoirs
0787-004-10 (In the Boca Hill/Prosser Ranch Area)	0.12	Reservoirs
0787-004-15 (In the Boca Hill/Prosser Ranch Area)	0.21	Reservoirs
0787-010 (In the Boca Hill/Prosser Ranch Area)	2.00	Reservoirs
0787-010-20 (In the Boca Hill/Prosser Ranch Area)	0.69	Reservoirs
0890-010-10 (In the Boca Hill/Prosser Ranch Area)	1.11	Reservoirs
0890-014 (In the Boca Hill/Prosser Ranch Area)	0.58	Reservoirs
Boca	0.03	Reservoirs
Boca Boat Ramp	0.50	Reservoirs
Boca CCC	0.21	Reservoirs
Gold Valley Snowmobile Trail	1.66	Yuba NE
Humps	2.68	Reservoirs
Humps Spur	0.74	Reservoirs
Jackass Point	1.17	Truckee
Martis Peak Trail	1.59	Truckee
Mosquito Ridge	4.69	Foresthill East

Designated OSV trails Not available for grooming	Trail Length (Miles)	OSV use Area
Old Reno Spur	3.68	Reservoirs
South Powerline Road	0.76	Reservoirs
U18171905 (In the Boca Hill/Prosser Ranch Area)	0.13	Reservoirs
U18171906 (In the Boca Hill/Prosser Ranch Area)	0.07	Reservoirs
U18172802 (In the Boca Hill/Prosser Ranch Area)	0.10	Reservoirs
Undetermined	0.43	Reservoirs
Total	23.65	

Table 10. Designated Pacific Crest Trail OSV crossings (displayed from south to north) – alternative 3

OSV/Pacific Crest National Scenic Trail Crossing	Area
• 0086 (Meadow lake)	Sierraville West
• 0070 (Pass Creek Loop)	Sierraville West
• 0007 (Fibreboard)	Sierraville West

Alternative 4

This alternative addresses the quality recreational experience significant issue by emphasizing motorized use. The proposed designated OSV Areas and Trails in this alternative were reviewed against the Travel Management Minimization Criteria (appendices E, and F, respectively). The following summarizes how the Forest Service would manage public OSV use within the Tahoe National Forest under this alternative.

- Approximately 640,708 acres of National Forest System lands are designated for public OSV use (table 11, figure 5 located in the map package).
- The use of BMPs (appendix D) would be required.
- Approximately 1,218 acres of National Forest System lands are designated for public cross-country OSV use in deer holding areas from January 1 through September 14 (LRMP, page V-30).
- Public OSV use would not be designated in a 1-acre area near Robinson Flat to protect historic structures.
- Implement forestwide snow depth requirements for public OSV use by:
 - a. Allowing public, cross-country OSV use in designated areas only when there are 12 or more inches of snow or ice covering the landscape, to prevent impacts to surface and subsurface resources including, but not limited to, archaeological deposits, historic features, and historic properties. On designated snow trails with underlying roads, a minimum of 6 or more inches of snow covering is typically needed to avoid damage to the underlying road surface.
 - b. Groom designated OSV snow trails when there are 12 or more inches of snow.
- Both Class 1 and 2 OSVs are allowed on all designated trails and areas. Class of vehicle definitions can be found on page 2.
- Designate a total of approximately 326 miles of OSV trails that would consist of:
 - ♦ Approximately 262 miles of designated OSV trails available for grooming.

- ♦ Approximately 64 miles of designated OSV trails not available for grooming, including: (1) Approximately 9, of which approximately 4 of these miles are located within areas designated for cross-country OSV use; and (2) Approximately 55 miles located on easements across private lands (added between DEIS and FEIS) (table 12, figure 5 located in the map package).
- There would be 21 designated OSV crossings of the PCT (table 13, figure 5 located in the map package). In all cases, OSVs crossing the PCT would do so at 90 degrees to minimize the time and distance needed to cross the Trail.
 - ♦ Thirteen crossings would utilize roads identified on the Tahoe National Forest’s Motor Vehicle Use Map and would be the width of the road (approximately 14 feet).
 - ♦ Eight proposed OSV crossings of the PCT would not utilize roads and would range in length from 0.13 mile to 1.31 miles.

Alternative 4 is summarized in table 11, table 12, and table 13, and figure 5 located in the map package.

Table 11. OSV use designations under alternative 4

Areas Considered for OSV Use Designation	Area Size (Total Acres)	OSV Designated Use (Acres)
Barker	9,847	9,783
Black Buttes	41,288	39,621
Bowman	19,604	18,033
Donner Summit	11,634	9,069
Foresthill East	94,183	89,110*
Foresthill North	36,151	34,026
Foresthill West	32,957	26,482
Lafayette	46,814	41,210
Reservoirs	40,883	40,883
Sierraville East	75,557	55,375
Sierraville North	17,564	17,564
Sierraville West	102,262	99,153
South of 20	17,346	10,078
Summit West	16,322	4,466
Truckee	34,446	21,356
Yuba NE	83,273	72,566
Yuba NW	43,255	37,717
Yuba South	20,657	14,139
Yuba West	40,708	76

* Public OSV use is allowed between January 1 and September 14 for 1,218 acres.

Table 12. OSV Trails – alternative 4

Designated OSV Trails Available for Grooming	Trail Length (Miles)	Areas
American Hill Trail	9.51	Foresthill East
Bald Ridge Loop Trail	14.40	Sierraville West
Bowman Trail	13.60	Bowman, Black Buttes

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Designated OSV Trails Available for Grooming	Trail Length (Miles)	Areas
Duncan "Y" Trail	5.14	Foresthill East
Fifty-Four Road Trail	12.54	Sierraville West, Yuba NE
Ford Point Trail	1.68	Foresthill East
Foresthill Divide Trail	14.21	Foresthill East
Haskell Peak Trail	15.55	Yuba NE
Howard Trail	4.90	Yuba NE
Howard Trail Not on Roadbed	0.50	Yuba NE
Humbug Tie Trail	0.82	Foresthill East
Humbug Trail	4.66	Foresthill East
Independence Lake Loop Trail	1.98	Sierraville West, Truckee
Jackson Meadow Little Truckee Trail	14.61	Sierraville West
Lower Ford Point Trail	1.30	Foresthill East
Meadow Lake Loop Trail	6.18	Sierraville West
Mosquito Ridge Trail	28.16	Foresthill East
Pass Creek Loop Trail	7.58	Sierraville West
Prosser Creek CNNT Trail	13.35	Sierraville West
Prosser Hill Winter Trail	1.05	Sierraville West
Rattlesnake Trail	10.10	Black Buttes
Ridge Loop Trail	6.05	Sierraville West
Rim Loop Trail	2.84	Sierraville West
Robinson Flat Trail	1.27	Foresthill East
Sawmill Flat	0.22	Truckee
Sawtooth Trail	1.48	Truckee
Soda Springs Trail	6.36	Foresthill East
Sterling Trail	4.26	Black Buttes
Tadpole Trail	3.01	Foresthill East
Texas Hill/Mears	21.38	Foresthill North
Treasure Mtn Loop Trail	16.17	Sierraville West
Yuba Webber Trail	17.00	Sierraville West, Yuba NE
Total	262.50	
Designated OSV Trails not Available for Grooming on Easements	Trail Length (Miles)	OSV use Area
19 Road System Trails	10.09	Foresthill North
American Hill Trails	2.42	Foresthill East
Anderson Peak Trails	8.55	Truckee
East Bowman Trails	5.73	Bowman, Yuba South
Calpine Trails	0.48	Sierraville North
Donner Lake Interchange Trail	1.81	Truckee
Excelsior Trail	0.95	South of 20
Hilda Trail	2.48	Sierraville West
Packer Saddle Trails	2.35	Yuba NE

Designated OSV Trails not Available for Grooming on Easements	Trail Length (Miles)	OSV use Area
Palmer Ridge Trail	0.68	Lafayette
Pinoli Ridge Trail	3.83	Black Buttes
Rattlesnake Trails	4.63	Black Buttes, Sierraville West
Weber/Independence Trails	7.66	Sierraville West, Truckee
Easements Yuba/Webber Trails	3.16	Sierraville West
Total	54.83	

Designated OSV trails not Available for Grooming	Trail Length (Miles)	OSV use Area
Andesite West OSV Trail	3.47	Donner Summit, Summit West
Boris	0.50	Truckee
Jackass Point	1.17	Truckee
Jackass Point SP	0.68	Truckee
Martis Peak Trail	1.81	Truckee
Mosquito Ridge Rd.	0.93	Foresthill West
Rocky	0.39	Truckee
Woodcamp	0.24	Truckee
Total	9.18	

Table 13. Designated Pacific Crest Trail OSV crossings (displayed from south to north) – alternative 4

OSV/Pacific Crest National Scenic Trail Crossing	Area
16E75 (Rubicon Jeep)	Barker
0003-004 (Niehaus)	Barker
0003 (Barker Pass)	Barker
T.18N., R.14E.,22	Sierraville West
0086 (Meadow Lake)	Sierraville West
0070-040-20 (Moscove Spur)	Sierraville West
0070-040 (Moscove)	Sierraville West
0070-065 (Jackson Overlook)	Sierraville West
0070 (Pass Creek Loop)	Sierraville West
0007 (Fibreboard)	Sierraville West
0093-002-03 (Monarch Spur)	Yuba NE
T.20N., R.12E.,08	Yuba NE
T.20N., R.12E.,05 T.21N., R.12E.,32	Yuba NE
T.21N., R.12E.,29, 30	Yuba NE
T.21N., R.12E.,19, 30	Yuba NE
12E66 (Lots A Lakes OHV)	Yuba NE
T.21N., R.11E.,13 T.21N., R.12E.,18, 19	Yuba NE
11E67 (Gold Valley OHV Trail)	Yuba NE
T.21N., R.11E.,02	Yuba NE
11E68 (Lavezzola Creek OHV Trail)	Yuba NE
2308-001 (Cowell Mine Rd.)	Yuba NE

Alternative 5

Alternative 5 emphasizes protections for wildlife and natural resources as well as quality recreational experiences for non-motorized recreation. The following, along with mitigations in Appendices E, and F, summarizes how the Forest Service would manage public OSV use within the Tahoe National Forest under this alternative.

The following summarizes how the Forest Service would manage public OSV use within the Tahoe National Forest under this alternative:

- Approximately 302,411 acres of National Forest System lands are designated for public cross-country OSV use (table 14, figure 6 in the map package).
- The use of BMPs (appendix D) would be required.
- OSV use would be limited to designated OSV trails within 1 mile of existing OSV trailheads.
- Public cross-country OSV use would not be designated within a 1-acre area near Robinson Flat to protect historic structures.
- Individual parcels of National Forest System lands currently under long-term special use permits for Royal Gorge Cross Country Ski Area, Tahoe Donner Cross Country Ski Area, Boreal Ski Area, Donner Ski Ranch Ski Area, Sugar Bowl Ski Area, Alpine Meadows Ski Area and Squaw Valley Ski Area would not be designated for public OSV use.
- Implement forestwide snow depth requirements for public OSV use by:
 - a. Allowing public, cross-country OSV use in designated OSV use areas when there are 24 or more inches of snow or ice covering the landscape, to prevent impacts to surface and subsurface resources including, but not limited to, subnivean habitat, archaeological deposits, historic features, and historic properties. Public OSV use on designated trails would be allowed when there are 24 or more inches of snow covering the trail. All designated trails for public OSV use (including those identified for OSV grooming) would overlay an existing paved, gravel, or native surface travel route.
 - b. Groom designated OSV snow trails when there are 12 inches or more of snow.
- Class 1 OSVs are allowed on all designated OSV trails and areas. Class 2 OSVs are only allowed on designated OSV trails available for grooming. Class of vehicle definitions can be found on page 2.
- Designate a total of approximately 287 miles of OSV trails that would consist of:
 - ♦ Approximately 215 miles of designated OSV trails available for grooming. Groomed OSV trails would be the same as alternative 1, plus changing Howard's Loop to an out and back ride by removing the section of trail that is not on an underlying roadbed from the trail system.
 - ♦ Approximately 72 miles of designated OSV trails not available for grooming, including:
 - (1) Approximately 24 miles, of which approximately 6 miles are located within areas designated for cross-country OSV use, and (2) Approximately 48 miles located on easements across private lands (added between DEIS and FEIS) (table 15, figure 6 in the map package).
- OSV use would not be designated in areas within the Forest Service Scenery Management System definition of Foreground for the Pacific Crest Trail. This area would be up to 0.5 mile in the visible lands on each side of the Pacific Crest National Scenic Trail or smaller as the visible

landscape along the trail will be less than 0.5 mile on each side of the trail due to topography. Users could cross this non-motorized corridor on designated OSV trails.

- ♦ Ten designated crossings would utilize roads identified on the Tahoe National Forest’s Motor Vehicle Use Map and would be the width of the road (approximately 14 feet). In all cases, OSVs crossing the PCT would do so at 90 degrees, or as close to 90 degrees as is safe, to minimize the time and distance needed to cross the trail. OSV users are to make crossings at, or as near as possible, to the identified crossing locations as is safe to do so. In one instance, the current alignment of the PCT overlays the Pass Creek Loop OSV Trail on National Forest System Road 70 for approximately 700 feet.

Alternative 5 is summarized in table 14, table 15, and table 16, and displayed in figure 6 located in the map package.

Table 14. OSV use designations for alternative 5

Areas Considered for OSV Use Designation	Area size (Total Acres)	OSV Designated Use (Acres)
Barker	9,847	7,111
Black Buttes	41,288	15,738
Bowman	19,604	10,147
Donner Summit	11,634	321
Foresthill East	94,183	39,783
Foresthill North	36,151	16,148
Foresthill West	32,957	0
Lafayette	46,814	13,593
North Fork Wild/Scenic River	40,883	0
Reservoirs	75,557	34,968
Sierraville East	17,564	28,788
Sierraville North	102,262	4,111
Sierraville West	17,346	77,234
South of 20	16,322	4,246
Summit West	34,446	0
Truckee	83,273	8,023
Yuba NE	43,255	24,480
Yuba NW	20,657	15,969
Yuba South	40,708	1,750
Yuba West	9,847	0

Table 15. OSV Trails – alternative 5

Designated OSV Trails Available for Grooming	Trail Length (Miles)	Areas
American Hill Trail	9.51	Foresthill East
Bald Ridge Loop Trail	14.40	Sierraville West
Bowman Trail	13.60	Bowman, Black Buttes
Duncan “Y” Trail	5.14	Foresthill East
Fifty-Four Road Trail	12.54	Sierraville West, Yuba NE

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Designated OSV Trails Available for Grooming	Trail Length (Miles)	Areas
Ford Point Trail	1.68	Foresthill East
Foresthill Divide Trail	14.21	Foresthill East
Haskell Peak Trail	15.55	Yuba NE
Howard Trail	2.63	Yuba NE
Humbug Tie Trail	0.82	Foresthill East
Humbug Trail	4.66	Foresthill East
Independence Lake Loop Trail	1.98	Sierraville West, Truckee
Jackson Meadow Little Truckee Trail	14.61	Sierraville West
Lower Ford Point Trail	1.30	Foresthill East
Meadow Lake Loop Trail	6.18	Sierraville West
Mosquito Ridge Trail	6.78	Foresthill East
Pass Creek Loop Trail	7.58	Sierraville West
Prosser Creek CNNT Trail	13.35	Sierraville West
Prosser Hill Winter Trail	1.05	Sierraville West
Rattlesnake Trail	10.10	Black Buttes
Ridge Loop Trail	6.05	Sierraville West
Rim Loop Trail	2.84	Sierraville West
Robinson Flat Trail	1.27	Foresthill East
Sawmill Flat	0.22	Truckee
Soda Springs Trail	6.36	Foresthill East
Sterling Trail	4.26	Black Buttes
Tadpole Trail	3.01	Foresthill East
Treasure Mtn Loop Trail	16.17	Sierraville West
Yuba Webber Trail	17.00	Sierraville West, Yuba NE
Total	215.50	

Designated OSV Trails not Available for Grooming on Easements	Trail Length (Miles)	OSV use Area
19 Road System Trails	10.09	Foresthill North
American Hill Trails	2.42	Foresthill East
Anderson Peak Trails	5.77	Truckee
East Bowman Trails	5.73	Bowman, Yuba South
Calpine Trails	0.48	Sierraville North
Donner Lake Interchange Trail	0	Truckee
Excelsior Trail	0.95	South of 20
Hilda Trail	2.48	Sierraville West
Packer Saddle Trails	2.32	Yuba NE
Palmer Ridge Trail	0.68	Lafayette
Pinoli Ridge Trail	3.83	Black Buttes
Rattlesnake Trails	4.63	Black Buttes, Sierraville West
Weber/Independence Trails	5.12	Sierraville West, Truckee
Easements Yuba/Webber Trails	3.17	Sierraville West

Designated OSV Trails not Available for Grooming on Easements	Trail Length (Miles)	OSV use Area
Total	47.67	
Designated OSV trails not Available for Grooming	Trail Length (Miles)	OSV use Area
Barker Pass	1.51	Barker
Cowell Mine Rd	1.93	Yuba NE
Gold Valley Snowmobile Trail	0.94	Yuba NE
Jackass Point	1.17	Truckee
Martis Peak Trail	1.59	Truckee
Moscove	2.46	Sierraville West
Mosquito Ridge Trail	7.39	Foresthill East
Niehaus	0.86	Barker
Niehaus SP	0.45	Barker
North Miller OHV	0.20	Barker
Rubicon Jeep	1.66	Barker
Sawtooth OSV Trail	1.41	Truckee
Sierra Buttes OSV	0.95	Yuba NE
White Rock Lake	1.43	Sierraville West
Total	23.93	

Table 16. Designated Pacific Crest Trail OSV crossings (displayed from south to north) – alternative 5

OSV/Pacific Crest National Scenic Trail Crossing	Area
• 16E75 (Rubicon Jeep)	Barker
• 0003-004 (Niehaus)	Barker
• 0003 (Barker Pass)	Barker
• 0086-070 (White Rock Lake)	Sierraville West
• 0086 (Meadow Lake)	Sierraville West
• 0070-040 (Moscove)	Sierraville West
• 0070 (Pass Creek Loop)	Sierraville West
• 0007 (Fibreboard)	Sierraville West
• 12E07 (Sierra Buttes OHV)	Yuba NE
• 2308-001 (Cowell Mine Rd.)	Yuba NE

Comparison of Alternatives

Table 17. Comparison of areas to be designated for OSV use, by alternative (acres)

Areas Considered for Designated OSV Use	Area size (Total Acres)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Barker	9,847	9,783	9,783	0	9,783	7,111
Black Buttes	41,288	39,618	37,816	24,753	39,621	15,738
Bowman	19,604	18,033	10,966	10,736	18,033	10,147
Donner Summit	11,634	9,052	7,972	1,608	9,069	321
Foresthill East	94,183	90,324*	54,584	45,498*	90,328*	39,783
Foresthill North	36,151	34,026	3,194	13,118	34,026	16,148
Foresthill West	32,957	26,482	0	0	26,482	0
Lafayette	46,814	41,209	14,183	293	41,210	13,593
Reservoirs	40,883	40,883	36,998	14,484	40,883	34,968
Sierraville East	75,557	55,375	29,004	31,731	55,375	28,788
Sierraville North	17,564	17,564	4,111	86	17,564	4,111
Sierraville West	102,262	99,198	96,918	74,427	99,153	77,234
South of 20	17,346	10,078	4,246	0	10,078	4,246
Summit West	16,322	4,466	0	0	4,466	0
Truckee	34,446	21,356	9,323	14,795	21,356	8,023
Yuba NE	83,273	72,566	54,588	24,973	72,566	24,480
Yuba NW	43,255	37,717	15,268	0	37,717	15,969
Yuba South	20,657	14,139	1,750	522	14,139	1,750
Yuba West	40,708	76	267	0	76	0
Total**	841,010	638,002	410,703	257,024	640,707	302,411

*Public OSV use allowed between January 1 and September 14 for 1,218 acres in alternatives 1 and 4; alternative 3 is 1,408 acres.

**Totals do not include the OSV Areas of Granite Chief Wilderness and North Fork American Wild and Scenic River

All area size estimates are approximate and are rounded to the nearest whole number.

Table 18. Comparison of trails for OSV use, by alternative (miles)

Trail	Areas	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated OSV Trails Available for Grooming						
American Hill Trail	Foresthill East	9.51	9.51	9.51	9.51	9.51
Bald Ridge Loop Trail	Sierraville West	14.40	14.40	14.40	14.40	14.40
Bowman Trail	Bowman	13.60	13.60	13.60	13.60	13.60
Duncan “Y” Trail	Foresthill East	5.14	5.14	5.14	5.14	5.14
Fifty-Four Road Trail	Sierraville West, Yuba NE	12.54	12.54	12.54	12.54	12.54
Ford Point Trail	Foresthill East	1.68	1.68	1.68	1.68	1.68
Foresthill Divide Trail	Foresthill East	14.21	14.21	14.21	14.21	14.21
Groomer Shed Trail	Yuba NE	0.64	0.64	0.64	0.64	0.64
Haskell Peak Trail	Yuba NE	15.55	15.55	15.55	15.55	15.55
Howard Trail	Yuba NE	4.90	2.06	4.900	4.90	2.63
Howard Trail Not on Roadbed	Yuba NE	0.50	0	0.50	0.50	0
Humbug Tie Trail	Foresthill East	0.82	0.82	0.82	0.82	0.82
Humbug Trail	Foresthill East	4.66	4.66	4.66	4.66	4.66
Independence Lake Loop Trail	Sierraville West, Truckee	1.98	1.98	1.98	1.98	1.98
Jackson Meadow Little Truckee Trail	Sierraville West	14.61	14.61	14.61	14.61	14.61
Lower Ford Point Trail	Foresthill East	1.30	1.30	1.30	1.30	1.30
Meadow Lake Loop Trail	Sierraville West	6.18	6.18	6.18	6.18	6.18
Mosquito Ridge Trail	Foresthill East	6.78	28.16	6.78	28.16	6.78
Pass Creek Loop Trail	Sierraville West	7.58	7.58	7.58	7.58	7.58
Prosser Creek CNNTR Trail	Sierraville West	13.35	13.35	13.35	13.35	13.35
Prosser Hill Winter Trail	Sierraville West	1.05	1.05	1.05	1.05	1.05
Rattlesnake Trail	Black Buttes	10.10	10.10	10.10	10.10	10.10
Ridge Loop Trail	Sierraville West	6.05	6.05	6.05	6.05	6.05
Rim Loop Trail	Sierraville West	2.84	2.84	2.84	2.84	2.84
Robinson Flat Trail	Foresthill East	1.27	1.27	1.27	1.27	1.27
Sawmill Flat Trail	Truckee	0.22	0.22	0.22	0.22	0.22
Sawtooth Trail	Truckee	1.48	10.52	1.48	1.48	0

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Trail	Areas	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated OSV Trails Available for Grooming						
Soda Springs Trail	Foresthill East	6.36	6.36	6.36	6.36	6.36
Sterling Trail	Black Buttes	4.26	4.26	4.26	4.26	4.26
Tadpole Trail	Foresthill East	3.01	3.01	3.01	3.01	3.01
Texas Hill/Mears	Foresthill North	0	0	0	21.38	0
Treasure Mtn Loop Trail	Sierraville West	16.17	16.17	16.17	16.17	16.17
Yuba Webber Trail	Sierraville West, Yuba NE	17.00	17.00	17.00	17.00	17.00
Total		219.74	246.82	219.74	262.50	215.50
Trail	Areas	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated OSV Trails not Available for Grooming on Easements Across Private Lands						
19 Road System Trails	Foresthill North	10.09	10.09	4.70	10.09	10.09
American Hill Trails	Foresthill East	2.42	2.42	2.42	2.42	2.42
Anderson Peak Trails	Truckee	8.58	5.77	4.39	8.55	5.77
East Bowman Trails	Bowman, Yuba South	5.73	5.73	5.73	5.73	5.73
Calpine Trails	Sierraville North	0.48	0.48	0	0.48	0.48
Donner Lake Interchange Trail	Truckee	1.81	1.81	0	1.81	0
Excelsior Trail	South of 20	0.95	0.95	0	0.95	0.95
Hilda Trail	Sierraville West	2.48	2.48	2.48	2.48	2.48
Packer Saddle Trails	Yuba NE	2.87	2.87	1.18	2.35	2.32
Palmer Ridge Trail	Lafayette	0.68	0.68	0	0.68	0.68
Pinoli Ridge Trail	Black Buttes	3.83	3.83	2.51	3.83	3.83
Rattlesnake Trails	Black Buttes, Sierraville West	4.64	4.64	4.63	4.63	4.63
Weber/Independence Trails	Sierraville West, Truckee	7.66	7.66	4.52	7.66	5.12
Easements Yuba/Webber Trails	Sierraville West	3.15	3.14	3.01	3.16	3.17

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Trail	Areas	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated OSV Trails not Available for Grooming on Easements Across Private Lands						
Designated OSV Trails not Available for Grooming on Easements not in Action Alternatives	Barker Black Buttes Bowman Foresthill East Foresthill North Foresthill West Lafayette North Fork American Wild And Scenic River Reservoirs Sierraville West South of 20 Yuba North East Yuba North West Yuba South	84.75	0	0	0	0
Total		140.12	52.55	35.58	54.83	47.67
Trail	Areas	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated OSV Trails Not Available for Grooming						
Andesite West OSV Trail	Donner Summit Summit West	3.47	3.47	0	3.47	0
Barker Pass	Barker	0	0	0	0	1.51
Bear Valley	Sierraville East	0	6.52	0	0	0
Boris		0.50	0.50	0	0.50	0
Boca	Reservoirs	0	0	0.03	0	0
Boca Boat Ramp	Reservoirs	0	0	0.50	0	0
Boca CCC	Reservoirs	0	0	0.21	0	0
CAL IDA Scales	Yuba NW	0	14.86	0	0	0
Carmen Valley	Sierraville North	0	8.06	0	0	0
Carmen Valley Spur	Sierraville North	0	1.70	0	0	0
Carpenter Ridge	Truckee	0	3.27	0	0	0
Cowell Mine Rd	Yuba NE	0	0	0	0	1.93

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Trail	Areas	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated OSV Trails Not Available for Grooming						
Eureka	Yuba NW	0	6.49	0	0	0
Frosty East	Sierraville North	0	5.01	0	0	0
Gold Valley Trail	Sierraville North	0	0	1.66	0	0.94
Humps	Reservoirs	0	0	2.68	0	0
Humps Spur	Reservoirs	0	0	0.74	0	0
Jackass Point	Truckee	1.17	1.17	1.17	1.17	1.17
Jackass Point SP	Truckee	0.68	0.68	0	0.68	0
Martis Peak Trail	Truckee	1.81	1.81	1.59	1.81	1.59
Moscove	Sierraville West	0	0	0	0	2.46
Mosquito Ridge Rd.	Foresthill East	0.93	18.72	0	0	0
Mosquito Ridge Trail	Foresthill East, Foresthill West	0.27	0	4.69	0.93	7.39
Niehaus	Barker	0	0	0	0	0.86
Niehaus SP	Barker	0	0	0	0	0.45
North Miller OHV	Barker	0	0	0	0	0.20
North Tie	Sierraville North	0	0.05	0	0	0
Rocky	Truckee	0.39	0.39	0	0.39	0
Sagehen	Sierraville West Truckee	0	4.68	0	0	0
Rubicon Jeep	Barker	0	0	0	0	1.66
Sawtooth OSV Trail	Truckee	0	0.01	0	0	1.41
Sierra Buttes OSV	Yuba NE	0	0	0	0	0.95
South Sagehen Ck	Truckee	0	2.56	0	0	0
Texas Hill/Mears	Foresthill North	0	3.83	0	0	0
Un-named (Boy Scout Camp to Yuba River)	Yuba NE	0	0	0	0	0
Old Reno Spur	Reservoirs	0	0	3.68	0	0
South Powerline Road	Reservoirs	0	0	0.76	0	0
White Rock Lake	Sierraville West	0	0	0	0	1.43
Woodcamp	Truckee	0.24	0.24	0	0.24	0
0787-004-05 (In the Boca Hill/Prosser Ranch Area)	Reservoirs	0	0	0.51	0	0

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Trail	Areas	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated OSV Trails Not Available for Grooming						
0787-004-10 (In the Boca Hill/Prosser Ranch Area)	Reservoirs	0	0	0.12	0	0
0787-004-15 (In the Boca Hill/Prosser Ranch Area)	Reservoirs	0	0	0.21	0	0
0787-010 (In the Boca Hill/Prosser Ranch Area)	Reservoirs	0	0	2.00	0	0
0787-010-20 (In the Boca Hill/Prosser Ranch Area)	Reservoirs	0	0	0.69	0	0
0890-010-10 (In the Boca Hill/Prosser Ranch Area)	Reservoirs	0	0	1.11	0	0
0890-014 (In the Boca Hill/Prosser Ranch Area)	Reservoirs	0	0	0.58	0	0
U18171905 (In the Boca Hill/Prosser Ranch Area)	Reservoirs	0	0	0.13	0	0
U18171906 (In the Boca Hill/Prosser Ranch Area)	Reservoirs	0	0	0.07	0	0
U18172802 (In the Boca Hill/Prosser Ranch Area)	Reservoirs	0	0	0.10	0	0
Undetermined	Reservoirs	0	0	0.43	0	
Total		9.45	84.02	23.65	9.18	23.93

Suggested Alternatives or Alternative Components Considered

The responsible official carefully considered each of the public suggestions below to determine whether the suggestion should be carried forward into detailed analysis in the EIS or dismissed from further consideration. Suggestions carried forward into detailed analysis could become a new alternative or part of a revision to the proposed action.

For an alternative to be analyzed in detail in the EIS, it must meet the purpose and need for action, must address one or more significant issues, and address unresolved conflicts related to the proposed action. Alternatives should be considered, even if outside the jurisdiction of the agency (40 CFR 1502.14(c)). Reasonable alternatives include those that are practical or feasible from a technical and economic standpoint and use common sense. Alternatives not considered in detail in the EIS may include, but are not limited to, those that fail to meet the purpose and need, are technologically infeasible or illegal, or would result in unreasonable environmental harm.

The suggested alternatives are summarized below.

Ensure OSV use designations avoid municipal watersheds.

There are no Forest Service designated municipal watersheds in the project area; however, the majority of water that flows off of National Forest System lands contribute to drinking water supplies for the States of California and Nevada.

Modify the minimum snow depth for cross-country OSV use to more or less than 12 inches. Also, lower the 6-inch snow depth to 2 inches or a range of 2-6 inches to accommodate access to areas with greater snow depths.

We heard a range of snow depth suggestions from commenters during the scoping process. Snow depth varies by the alternatives analyzed in detail in the EIS.

Ensure monitoring and enforcement are part of the proposal.

Monitoring and enforcement are critical to the success of implementation. A monitoring discussion can be found in the first part of this chapter.

Include, in any action, a prohibition of recreational OSV travel on or across open or flowing water.

This planning effort addresses OSV use on National Forest System lands. Therefore, OSV use on open water, such as lakes and ponds is not addressed.

Consider a suggestion for an alternative to the proposed action with an emphasis on providing additional opportunities for non-motorized users.

Alternatives 3 and 5 have been developed to address this suggestion and are included for detailed analysis in the EIS. However, not all aspects of the suggested alternative 3 are within the scope of the analysis, as described below, and these specific components have been dismissed from further detailed analysis:

- Designation of non-motorized trailheads to access non-motorized areas.
 - ◆ The designation of non-motorized trailheads is outside the scope of the purpose and need for action which is to provide a manageable, designated OSV system of areas and trails for public use within the Tahoe National Forest, that is consistent with and achieves the

purposes of the Forest Service Travel Management Rule at 36 CFR Part 212, subpart C. Therefore this feature would not be included in alternative 3 to be analyzed in detail.

- Monitoring of ambient air quality and noise near trails, in trailheads, and in OSV areas with heavy over-snow vehicle traffic.
 - ♦ The monitoring of ambient air quality and noise is outside the scope of the purpose and need for action, which is to provide a manageable, designated OSV system of areas and trails for public use within the Tahoe National Forest that is consistent with and achieves the purposes of the Forest Service Travel Management Rule at 36 CFR Part 212, subpart C. The Forest Service has no regulatory jurisdiction over air quality or noise. There are no standards which would allow the Forest Service to identify or enforce prohibitions against unacceptable noise or air quality levels. These levels are set by state law. The OSV Program Monitoring Checklist for the California Department of Parks and Recreation, OHMVR Division, and U.S. Forest Service does not include ambient air quality monitoring (California OSV Program EIR, Program Years 2010-2020, appendix C). Therefore this feature will not be included in alternative 3 to be analyzed in detail. The EIS, however, will examine effects on air quality and noise from the proposed action and alternatives to the proposed action, including the indirect effects of changes in air quality and noise levels on forest resources.
- Transition to cleaner and quieter OSVs through encouragement of best available technology (BAT) forestwide to reduce air and noise pollution. Exception is in the “Managed Shared Use” area where air quality and noise monitoring every five years will determine whether mandatory BAT would be needed.
 - ♦ The imposition of best available technology requirements is outside the scope of the purpose and need for action, which is to provide a manageable, designated OSV system of areas and trails for public use within the Tahoe National Forest that is consistent with and achieves the purposes of the Forest Service Travel Management Rule at 36 CFR Part 212, subpart C. The regulation of best available technology, whether only encouraged or mandated, is outside the scope of this analysis. The Forest Service has no regulatory jurisdiction over air quality or noise and there are no Forest Service directives requiring the establishment of standards. Therefore this feature will not be included in alternative 3 to be analyzed in detail.
- Nordic trail grooming.
 - ♦ Grooming of trails for non-motorized use would not address the purpose and need for action which is to provide a manageable, designated OSV system of areas and trails for public use within the Tahoe National Forest, that is consistent with and achieves the purposes of the Forest Service Travel Management Rule at 36 CFR Part 212, subpart C. The purpose and need for action calls for identifying those designated National Forest System OSV trails where grooming for OSV use could occur. Therefore, this feature would not be included in alternative 3 to be analyzed in detail.
- Granting of access rights to private lands.
 - ♦ Over-snow vehicle use that is specifically authorized under a written authorization issued under Federal law or regulations is exempt from subpart C designations (36 CFR Part 261.14(e)). The granting or maintenance of such access is outside the scope of the purpose and need for action, which is to provide a designated system of areas and trails for motorized over-snow vehicle use within the Tahoe National Forest that is consistent with

and achieves the purposes of the Forest Service Travel Management Rule at 36 CFR Part 212, subpart C. Therefore this feature will not be included in alternative 3 to be analyzed in detail. Under the scope of this project, the Forest Service would only designate routes under subpart C of the Travel Management Rule that are available for public use. Therefore, designating routes specifically for access to private lands, and not for public use, would not fall within the scope of this analysis or subpart C of the Travel Management Rule.

- Tahoe National Forest should designate appropriate areas for snow play. Designation of snow play areas allows for concentration of use in areas that are appropriate for snow play and that have adequate parking. Such areas and their primary access routes should be closed to OSV traffic for safety and other reasons.
 - ♦ The designation of snow play areas is outside the scope of the purpose and need for action, which is to provide a designated system of areas and trails for motorized over-snow vehicle use within the Tahoe National Forest that is consistent with and achieves the purposes of the Forest Service Travel Management Rule at 36 CFR Part 212, subpart C. Therefore, this feature will not be included in alternative 3 to be analyzed in detail.

Designate OSV crossings of the Pacific Crest Trail, using the same crossings as designated by wheeled motorized vehicles shown on the subpart B Motor Vehicle Use Map.

The responsible official has included this concept in all alternatives except alternatives 1 and 2.

Segregate motorized and non-motorized user groups by designating separate trailheads, separate trails and/or separate areas. Designate specific areas as snowplay areas.

Motorized and non-motorized recreational experiences are important concerns to be considered for this analysis (see Significant Issues). However, the development of new facilities such as new trailheads, new trails, or new snowplay areas are outside the scope of this project. This analysis is focused on the designation of OSV use and grooming of OSV trails. For this reason, this suggestion has been dismissed from further detailed analysis. However, we agree that facility improvements or changes may be valuable and/or necessary in the future.

Ensure OSV use is restricted in riparian areas, in streams and on frozen lakes

We considered this suggestion and have developed alternatives that does not designate OSV use when there is not adequate snow to prevent resource damage. This planning project only addresses OSV use on National Forest System lands. Water bodies (lakes), frozen or not, are not within the scope of this analysis.

Consider an alternative with an emphasis on providing additional opportunities for motorized users

Alternative 4, which emphasizes providing additional opportunities for winter motorized recreational use, is included for detailed analysis in the EIS. However, not all aspects of this suggested alternative are within the scope of the analysis, and these elements have been dismissed from further detailed analysis, as described below:

This suggested alternative recommends designating several OSV trails that are ungroomed but located within areas where cross-country OSV use would be designated under the proposed action. Since these trails would be unmarked, ungroomed, and located in areas where cross-country OSV use would be designated, the Agency sees no need to designate them in the proposed action.

- This suggested alternative recommends designating several OSV trails that are ungroomed but located within areas where cross-country OSV use would be allowed by the proposed action. Where trails would be unmarked, ungroomed, and located in areas where cross-country OSV use would be allowed, the agency sees no need to designate them in the applicable alternatives.
 - ♦ Many of these ungroomed trails pass through lands not under Forest Service jurisdiction. Establishment of Forest Service jurisdiction would be required for these trails to be designated for OSV use under subpart C.
- This suggested alternative recommends a sound standard for OSVs. The Forest Service has no regulatory jurisdiction over noise. These levels are set by state law. The OSV Program Monitoring Checklist for the California Department of Parks and Recreation, OHMVR Division, and Forest Service does not include ambient noise monitoring. Therefore this feature will not be included. The FEIS, however, will examine effects on noise from the proposed action and alternatives to the proposed action, including the indirect effects of changes in noise levels on forest resources.
- This suggested alternative recommends adding narrow groomed trails (using equipment with 8 feet or narrower width) to allow for utilizing more OHV trails where a larger groomer cannot fit. As part of the OSV trail grooming program, the Forest Service follows California State Parks Off-Highway Motor Vehicle (OHMVR) Division grooming standards, including state trail-width standards and existing equipment abilities. Standards state, “Trails should be groomed at a minimum of 10 feet wide, with wider trails when necessary due to traffic and other conditions. Where the terrain allows, main ingress and egress trails that connect to the trailhead should be groomed to 14 feet wide or greater to facilitate the added traffic.” Deviation of groomed trail width down to 8 feet wide is not feasible at this time, given the type and size of grooming equipment currently in use and will not be analyzed in this document.
- This suggested alternative recommends a review and update of parking and staging facilities. The purpose and need for action is to provide a manageable, designated OSV system of areas and trails that is consistent with and achieves the purposes of the Forest Service Travel Management Rule at 36 CFR part 212. The creation or addition of new parking areas at trailheads does not fall within the scope of these designations, and therefore, this recommendation will not be included.
- This suggested alternative recommends that designating non-motorized companion trails along motorized routes or designating/grooming non-motorized only trails to Wilderness or non-motorized land classification to reduce conflict of uses. The creation of non-motorized companion trails that do not currently exist along designated motorized routes and the designation/grooming of non-motorized only trails to Wilderness or non-motorized land classification would not address the purpose and need and are beyond the scope of this project.
- This suggested alternative recommends that the Forest Service consider a special user-fee pass/permit system “Fee- Demo” that is specific to an area, Forest, or Ranger District, specifically on-site self-service stations where a pass can be purchased to support on-the-ground services at said unit. Fees would be collected from both motorized and non-motorized users benefitted by any necessary management activities. Imposing user fees at additional winter recreation areas would not address the purpose and need for action and this action is outside the scope of this analysis.

Chapter 3. Affected Environment and Environmental Consequences

Introduction

This chapter presents the relevant resource components of the existing environment-the baseline environment. It describes the resources of the area that would be affected by the alternatives. This chapter also discloses the environmental effects of implementing the alternatives. These form the scientific and analytical basis for comparing the alternatives described in chapter 2.

The effects of the modified proposed action were aggregated rather than describing the site-specific effect at each road or trail, unless necessary for a particular sensitive resource or concern area. For instance, specialists' reports describe the overall effects of designating places people could ride OSVs instead of listing every route and predicting the effects at a particular site.

OSV Use Assumptions

Assumptions regarding areas of high, moderate, low and potential public OSV use were identified on an assumptions map (FEIS volume II, appendix G). This OSV use assumptions map was utilized by all resource specialists when conducting their analyses. In addition to years of observed OSV use patterns by Tahoe National Forest recreation staff, the following criteria were used to spatially delineate areas of the forest with different levels of potential public OSV use:

High use: Areas within 0.5 mile of staging areas and of groomed trails; meadows within 0.5 mile of a groomed trail.

Moderate use: Areas within 0.5 mile of marked (not groomed) trails; areas between 0.5 mile and 1.5 miles of groomed routes; meadows 10 acres or greater in size or 0.5 to 1.5 miles from OSV trails.

Low or no use: Areas where OSV use is prohibited or restricted under current management; areas below 5,000 feet elevation; California wildlife habitat relationships (CWHR) Vegetation 2D, 3D, 4D, 4M; vegetation types 5 and 6 with a slope greater than 20 percent; meadows 30 acres or greater, 1.5 miles or greater from OSV trail; areas more than 1.5 miles from groomed OSV trail; areas more than 0.5 mile from 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)

Additional resource specific assumptions utilized during effects analysis are disclosed in the applicable sections of this chapter.

Past, Present, and Reasonably Foreseeable Actions

The interdisciplinary team considered the effects of past actions as part of the existing condition. The current conditions are the sum total of past actions. The Council on Environmental Quality recognizes "agencies can conduct an adequate cumulative effects analysis by focusing on current aggregate effects of past actions without delving into the historical details of individual past actions" (Council on Environmental Quality 2005). Innumerable actions over the last century and beyond have shaped

the Tahoe National Forest's current designated road system within the planning area. Attempting to isolate and catalog these individual actions and their effects would be nearly impossible. By looking at current conditions, the effects of past human actions and natural events, regardless of which event contributed to those effects are captured.

Courts have interpreted a "reasonably foreseeable future action" as one that has been proposed and is in the planning stages. To analyze the cumulative effects of present and reasonably foreseeable future actions, each resource specialist looked at the list of projects in Volume II of this FEIS, Appendix C. They identified the ones expected to cause effects to their resource, at the same time and in the same place as effects from the proposed action or alternatives.

Recreation Resources

Relevant Laws, Regulations, and Policy

Regulatory Framework

National Forest Management Act

Specifically for off-highway vehicle management, the National Forest Management Act (NFMA) requires that this use be planned and implemented to protect land and other resources, promote public safety, and minimize conflicts with other uses of the National Forest System lands. NFMA also requires that a broad spectrum of forest and rangeland-related outdoor recreation opportunities be provided that respond to current and anticipated user demands.

Sierra Nevada Forest Plan Amendment

The Sierra Nevada Forest Plan Amendment established standards and guidelines specific to wheeled motor 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 or forest orders, cross-country travel by OSVs would continue (forestwide standard and guideline number 69 (USDA Forest Service 2009)).

Land and Resource Management Plan

The 1990 Tahoe National Forest Land and Resource Management Plan (USDA Forest Service 1990) provides forestwide and management area-specific goals and strategies, desired future conditions, land allocation, and standards and guidelines relevant to winter recreation as follows:

Management Goals and Strategies:

Recreation

Provide a broad spectrum of dispersed and developed recreation opportunities in accordance with identified needs and demands.

Recreation management will be in concert and cooperation with appropriate City, County, State, and other Federal agencies.

Manage the North Fork American Wild River in accordance with Public Law 95-625, which documents the Congressional designation of the River. Implement the management and development plan, the Wild Trout Plan, and the habitat management plans for the North Fork.

Develop several National Recreation Trail proposals for consideration during the trail implementation planning process. Emphasize developing a variety of trails that would provide for a wide range of recreation uses including hiking, equestrian, snowmobile, cross-country skiing, motorcycle, jeep/OHV, handicapped, and historical activities. Develop proposals for National Recreation Trail designation that would include needed facilities such as new or augmented trailheads and additional trails to create loops for improved recreational experiences. Identify and evaluate opportunities for trailheads and trails with easy access from urban areas along main routes to the forest.

Recognize the value of semi-primitive motorized (SPM) and non-motorized (SPNM) areas in the forest because of their scarcity and the demand for the few acres remaining. Closely monitor the loss of inventoried SPNM and SPM land that is not allocated in the Tahoe National Forest Land and Resource Management Plan for these recreation opportunity spectrum (ROS) classes. Where possible, avoid losing SPM and SPNM areas during the planning period by considering options that would not road the areas significantly.

Visual Management

Maintain visual quality at the visual quality objective (VQO) level specified in each management area, as a minimum, but maintain higher visual quality wherever practical and compatible with other goals.

Wilderness

Manage the Granite Chief Wilderness area to preserve the wilderness character of its living and nonliving components and to provide for compatible human use and enjoyment.

Provide quality wilderness experiences for the public.

Pacific Crest National Scenic Trail

The Pacific Crest National Scenic Trail (PCT) crosses the Tahoe National Forest. As required by public law 95-625, the Secretary of Agriculture was to prepare a comprehensive plan for the development, use, and protection of the trail. The Secretary assigned planning responsibilities to the Forest Service, which has overall responsibility for administration and coordination for the PCT. On April 15, 1982, Associate Chief Douglas Leisz signed the “Notice of Decision and Finding of No Significant Impact–Comprehensive Management Plan for the Pacific Crest National Scenic Trail.” This plan states the following direction:

Viewing and understanding resource management are considered to be part of the normal character of the trail. The management of the various resources will give due consideration to the existence of the trail and trail users within the multiple-use concept. Prescription for management of the visual resources associated with the trail will be part of agency planning process.'

The PCT is a primitive, non-motorized long-distance route that provides for outdoor recreation on foot or horseback along the high and spectacular spine of the Pacific mountain ranges. The trail promotes preservation of public access to and travel within, and the enjoyment and appreciation of the open-air, outdoor areas, and historic resources of the Nation. The PCT showcases the nationally significant scenic, natural, historic and cultural treasures of California, Oregon, and Washington. Volunteers and private, nonprofit trail groups are essential to the stewardship of the trail and are encouraged to assist with trail planning, development, maintenance, and management, where appropriate.

The *Comprehensive Management Plan for the Pacific Crest National Scenic Trail* (Comprehensive Plan 1982) includes the PCT Advisory Council's characteristics related to the purpose and nature of the trail. The Pacific Crest National Scenic Trail:

- Is a continuous recreation facility extending from Canada to Mexico and consists of the trunk trail, designated connecting and side trails, trailheads, campsites, signing, interpretive devices, and related public use facilities.
- Is located, designed, constructed, and maintained to a standard commensurate with its national significance, while reflecting the type and volume of traffic planned: limited by the standards established for special legislated areas (national parks, national monuments, wilderness, state parks) through which it passes.
- Is a linear interpretive facility that: displays throughout its length a changing landscape reflecting a diversity of land and resource management objective from preservation (national parks and wilderness) to industrial, agricultural and urban development; and affords opportunities to reflect on the history of the development and growth of the Nation and its people by identifying and interpreting nationally significant, cultural and historic sites.
- Across segments of private land, is primarily a travel route to provide continuity of the trail and safe and enjoyable passage for the traveler.
- Provides for a diversity of appropriate outdoor recreation opportunities limited principally by the carrying capacity of the area and the congressional restriction on motorized use.

Recommended Wild and Scenic Rivers

Sagehen Creek

To the extent the Forest Service is authorized under law to control stream impoundments and diversions, the free-flowing characteristics of Sagehen Creek will not be modified.

Outstandingly remarkable values for Sagehen Creek shall be protected, and or enhanced, to the extent practicable.

Control management and development of public lands on Sagehen Creek within a 0.5-mile corridor. Protect this corridor from modification to the degree that eligibility and classification would be affected based on the inventory classification.

North Yuba River, Canyon Creek, and lower South Yuba River

To the extent the Forest Service and Bureau are authorized under law to control stream impoundments and diversions, the free-flowing characteristics of the North Yuba River, Canyon Creek, and lower South Yuba River cannot be modified

Outstandingly remarkable values for the North Yuba River, Canyon Creek, and lower South Yuba River shall be protected, and/or enhanced, to the extent practicable.

Control management and development of Public lands on the North Yuba River, Canyon Creek, and lower South Yuba River and its 0.5-mile corridor. Protect these corridors from modification to the degree that eligibility and classification would be affected based on the inventory classification.

Management Standards and Guidelines

OSV Use

The Tahoe National Forest LRMP uses management area-specific standards and guidelines to establish OSV use designations across the Tahoe National Forest. Each of the forest's 109 management areas has a standard and guideline that specifies if: (1) the management area is open to OSV travel (for example, the Lavezzola Management Area, LRMP, pg. V-95) or (2) closed to OSV travel (for example, the Coolbrith Management Area, LRMP, pg. V-85) or (3) OSVs are restricted to designated routes (for example, the Queens Management Area, LRMP, pg. V-339). Some of the forest's management areas have a standard and guideline that closes a portion of the management area to OSVs, sometimes during a particular season (for example, the Pendola Management Area, LRMP, pg. V-174). Appendix B displays the Tahoe National Forest LRMP OSV use standards and guidelines for each of the Forest Plan's 109 management area.

Recreation Opportunity Spectrum

The Tahoe National Forest LRMP uses forestwide standards and guidelines to define the following Recreation Opportunity Spectrum classes: Primitive (P), Semi Primitive Non-Motorized (SPNM), Semi Primitive Motorized (SPM), Roaded Natural (RN), Rural (R), and Modern Urban (MU) (LRMP, Forestwide Standards and Guidelines #8 through #13, pp. V-20 through V-22). Descriptions of each ROS class from the Forest Plan are in the Existing Conditions section, below. Each of the Forest Plan's 109 management areas is assigned an ROS class (TNF LRMP, pp. V-69 through V-544).

Visual Quality Objectives

The Tahoe National Forest LRMP uses standards and guidelines to establish visual quality objectives across the forest. Each of the Forest Plan's 109 management areas has a standard and guideline specifying visual quality objectives for the management area (LRMP, pp. V-69 through V-544). Visual quality objective standards and guidelines define the following visual quality objectives (VQOs): Preservation (P), Retention (R), Partial Retention (PR), Modification (M), and Maximum Modification (MM) (LRMP, Forestwide Standards and Guidelines #16 through #20, pp. V-24 through V-25).

Pacific Crest National Scenic Trail Management

The Tahoe National Forest LRMP provides the following direction for managing the PCT: The standards and guidelines for location, design, signing, user facilities, and management of the PCT will be in accordance with the criteria established in the PCT Comprehensive Plan, January 18, 1982.

The 1982 Comprehensive Plan provides the following direction for winter use along the PCT:

Winter use (cross-country skiing and snowshoeing) should be accommodated where practical and feasible. Each agency should follow its own procedures for marking and signing the trail for winter use purposes. As a guideline, all trail markers should be at eye level (approximately 40 inches above average maximum snow depth). Sanitation facilities and snow removal for parking may be necessary. Any improvements, or alterations of the vegetation, should not detract from the quality of the recreation opportunities for other trail activities such as hiking and horseback riding.

Snowmobiling along the Trail is prohibited by the National Trails System Act, P.L. 90-543, Section 7(c). Winter sports plans for areas through which the trail passes should consider this prohibition in determining areas appropriate for snowmobile use. Winter sports brochures should indicate designated snowmobile crossings on the Pacific Crest Trail where it is signed and marked for winter use. If cross-country skiing and/or snowshoeing is planned for the trail, any motorized use of adjacent land should be zoned to mitigate the noise of conflict.

Special Area Designations

- North Fork American Wild River – congressional designation, Public Law 95-625
- Granite Chief Wilderness – congressional designation
- Onion Creek Experimental Forest, designated by the Chief of the Forest Service on December 29, 1958, will continue to be managed for watershed research under an agreement with the Pacific Southwest Forest and Range Experiment Station
- Sagehen Experimental Forest, designated by the Chief of the Forest Service on November 28, 2005
- Pacific Crest National Scenic Trail – congressional designation

Federal Law

Laws, regulations and policies applicable to OSV use designations include the following:

- Wilderness Act of 1964, California Wilderness Act of 1984, and applicable Wilderness Implementation Plans
- Wild and Scenic Rivers Act of 1968 and applicable Wild and Scenic River Plans
- National Trails System Act of 1968 (P.L. 90-543) and the Pacific Crest National Scenic Trail Comprehensive Plan
- 2005 Travel Management Rule – Subpart C (36 CFR Parts 212 and 261) as amended in 2015 - Use by Over-snow Vehicles (Travel Management Rule)

Executive Orders

Executive Order 11644 of February 8, 1972, as amended by Executive Order 11989 of May 24, 1977, and by Executive Order 12608 of September 9, 1987, requires certain Federal agencies, including the Forest Service, to “ensure that the use of off-road vehicles on public lands [is] controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands.”

Other Guidance or Recommendations

National Best Management Practices for Water Quality Management on National Forest System Lands - Rec - 7 Over Snow Vehicle Use.

The California Off-Highway Motor Vehicle Recreation Division of the California Department of Parks and Recreation provides funding for operating, maintaining, and grooming of winter recreation trails and trailheads in mountainous regions throughout California. OSV trail grooming and ancillary activities, such as trailhead plowing and maintenance are described in detail in the OSV Program Draft and Final Environmental Impact Report (EIR), Program Years 2010–2020. The EIR includes annual monitoring and reporting requirements for Forest Service participation in the grooming program (California Department of Parks and Recreation 2010).

Methodology

This analysis used ArcMap and relevant GIS data layers from the Tahoe National Forest, wilderness areas, inventoried roadless areas, national trails, wild and scenic rivers, research natural areas, etc. The GIS layer of proposed OSV designations and groomed trails was used as an overlay with the

recreation settings and opportunities, scenery, access and designated area layers listed above to determine potential conflicts.

Forest Plan direction was considered to ensure compliance with management direction. A review of existing law, regulation, and policy relevant to recreation settings and opportunities, access, scenery, and designated area resources within the project area was completed and referenced where appropriate.

The requirements of the Travel Management Rule, Subpart C, including the general criteria for designation of roads, trails and areas (36 CFR 212.55(a)):

- Natural and cultural resources
- Public safety
- Provision of recreational opportunities
- Access needs
- Conflicts among uses of National Forest System lands
- Need for maintenance and administration of roads, trails and areas that would arise if uses under consideration are designated and availability of resources for that maintenance and administration.

And the specific criteria to consider effects on the following with the objective of minimizing (36 CFR 212.55 (b)):

1. Damage to soil, watershed, vegetation, and other forest resources;
2. Harassment of wildlife and significant disruption of wildlife habitats;
3. Conflicts between motor vehicle use and existing or proposed recreational uses of National Forest System lands or neighboring Federal lands; and
4. Conflicts among different classes of motor vehicle uses of National Forest System lands or neighboring Federal lands.

In addition:

5. Compatibility of motor vehicle use with existing conditions in populated areas, taking into account sound, emissions, and other factors.

The Forest Service evaluated 21 discrete areas for OSV use designation, within the administrative boundaries of the Tahoe National Forest. Two of the areas will not be considered for potential OSV designation under any of the alternatives, including the Granite Chief Wilderness (designated by Congress as non-motorized) and the North Fork American Wild and Scenic River (not designated for motorized use in the Tahoe Forest Plan).

The remaining 19 areas considered for OSV use designation have been reviewed for consistency with the Travel Management Rule's designation criteria (36 CFR 212.55), see Appendix E. The OSV trails proposed for designation were also reviewed for consistency with the same criteria, see Appendix F.

The National Visitor Use Monitoring (NVUM) results, California State Parks, California Outdoor Recreation Plan, National Recreation Survey and the Environment information and online visitor

information sources provided by the Tahoe National Forest and other local organizations and industry was used as an overview of the recreation opportunities, visitor use, and trends within the analysis area. The Recreation Facility Assessment niche statement was used to depict the importance of winter use (motorized or non-motorized) on the national forest; and secondly, consideration was given to how important the National Forest System lands are for this use (motorized or non-motorized) compared to other non-National Forest System lands.

The NVUM visitor use information from 2005, 2010, and 2015 was considered. The best available site-specific visitor use information for Tahoe National Forest OSV use was from the 2009 OSV Winter Trailhead Survey conducted in support of the 2010 State OSV Program EIR for Program Years 2010–2020. OSV registration information for the State of California and for counties within the Tahoe National Forest was also used to depict OSV use trends.

A case study and literature review of current information regarding motorized and non-motorized winter recreation trends and preferences; and coordination with local Forest Service resource specialists regarding on-the-ground conditions and use patterns were used to summarize existing conditions and potential impacts.

To evaluate potential impacts to recreation settings and opportunities, access, scenery, and designated area resources, each alternative will be compared using issues, indicators and measures defined below.

Resource Indicators and Measures

Resource indicators and measures shown in table 19 will be used to measure and disclose effects to recreation resources related to OSV use designations and grooming trails for OSV use.

Table 19. Resource indicators and measures for assessing effects to recreation resources

Resource Element	Resource Indicator	Measure (Quantify if possible)	Source (LRMP S&G, ¹¹ law or policy, BMPs, ¹² etc.)?
Motorized Recreation Opportunities – cross-country	Opportunities for motorized winter uses	Acreage of designated public OSV cross-country use; percent change as compared to current management	The Tahoe LRMP has a standard and guideline pertaining to OSV use for each of its 109 management areas (MAs), specifying whether all or portions of the MA are open to OSV use, closed to OSV use, or OSVs are restricted to designated routes only. (TNF LRMP, pp. V-69 through V-544) Travel Management Rule (36 CFR 212), subpart C. OSV use assumptions for analysis
	Quality of OSV opportunities ¹³	Percent of designated acres that are considered high-quality OSV opportunities based on the high to moderate OSV use assumption categories	
Motorized Recreation Opportunities – designated snow trails	OSV trail designations	Length of designated OSV trails (miles), percent change from current management	Travel Management Rule (36 CFR 212), subpart C.
Motorized Recreation Opportunities – groomed snow trails	OSV trail grooming	Length of groomed OSV trails (miles), percent change from current management	Travel Management Rule (36 CFR 212), subpart C.

¹¹ Standard and guideline

¹² Best management practices

¹³ The areas mapped in the high to moderate OSV use assumption categories (shown FEIS volume II, appendix G) were also assumed to be areas that would provide high-quality OSV opportunities. The mapped OSV use assumptions were used to compare high-quality OSV opportunities across each alternative.

Over-Snow Vehicle Use Designation – Final Environmental Impact Statement – Volume I
Chapter 3: Affected Environment and Environmental Consequences

Resource Element	Resource Indicator	Measure (Quantify if possible)	Source (LRMP S&G,¹¹ law or policy, BMPs,¹² etc.)?
Non-motorized Recreation Opportunities - displacement	Access to desired non-motorized recreation settings and opportunities	Acreage and length of trails (miles) available for non-motorized recreation enthusiasts within 5 miles of plowed trailheads	Public comment
	Quality of non-motorized opportunities	Percent of acres available for quiet, non-motorized use that are considered high-quality non-motorized opportunities based on proximity to plowed trailheads (areas within 5 miles of plowed trailheads) and absence of motorized use	
Non-motorized Recreation Conflicts – Public Safety	Areas and trails available to non-motorized recreation enthusiasts for quality non-motorized recreation experiences	Acreage not designated for public cross-country OSV use; percent change compared to current management	Minimization Criteria: 36 CFR 212.55(b)(3): Consider effects on the following with the objective of minimizing: Conflicts between motor vehicle use and existing or proposed recreational uses of National Forest System lands or neighboring Federal lands; and (4) Conflicts among different classes of motor vehicle uses of National Forest System lands or neighboring Federal lands. In addition, the responsible official shall consider: (5) Compatibility of motor vehicle use with existing conditions in populated areas, taking into account sound, emissions, and other factors
Non-motorized Recreation Conflicts – Solitude, Air Quality, Scenery, Designated non-motorized areas	Solitude	Distance of groomed public OSV trails from non-motorized areas, number of crossings of linear non-motorized features.	Wilderness Act of 1964 Wild and Scenic Rivers Act of 1968 National Trails System Act of 1968 Pacific Crest National Scenic Trail Comprehensive Plan Values or features that often characterize Inventoried Roadless Areas (66 FR 3245, January 12, 2001)
	Air Quality	Qualitative/narrative description of potential impacts	Minimization Criteria: 36 CFR 212.55(b)(3)

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Resource Element	Resource Indicator	Measure (Quantify if possible)	Source (LRMP S&G, ¹¹ law or policy, BMPs, ¹² etc.)?
Non-motorized Recreation Conflicts – Solitude, Air Quality, Scenery, Designated non-motorized areas (continued)	Scenery	Qualitative/narrative description of potential visual impacts	LRMP Management Area Standards and Guidelines Specific Visual Quality Objectives standards and guidelines pertain to each management area. Visual quality objectives (VQO) include: Preservation (P), Retention (R), Partial Retention (PR), Modification (M), and Maximum Modification (MM).
	Potential conflict with other resource values	Proximity of OSV use related to other resource values (such as tribal/ spiritual sites, sensitive wildlife areas, popular non-motorized winter recreation areas, populated areas, neighboring Federal lands, etc.).	Minimization Criteria: 36 CFR 212.55(b)(3)
Designated Areas	Wilderness Attributes	Size of areas (acres) affected and duration of impact. Qualitative description for wilderness attributes	FSH 1909.12 (72.1)
	Roadless Characteristics	Size of area (acres) affected and duration of impact. Qualitative description for roadless characteristics	36 CFR 294.11

OSV Use Assumptions for Analysis

The following OSV use assumptions were developed based on information in the *California Over-Snow Vehicle Program Final State Environmental Impact Report (EIR) for Program Years 2010-2020* and 2009 Trailhead Survey (conducted in support of the 2010 State OSV Program EIR for Program Years 2010–2020), and based on local knowledge and observations of resource specialists from the Tahoe National Forest. The assumptions were mapped and used in this analysis to consider potential impacts from OSV designations and OSV trail grooming activities on recreation and designated areas, and to identify areas with high-quality, desirable OSV opportunities where OSV use is expected to be in the high to moderate range.

The OSV use assumptions include:

- Limited OSV use on steep slopes with heavy forest cover/high tree density (assume no use on slopes 35 percent or greater).
- In open terrain, with no trees, there is no slope-limiting factor for high-marking.
- OSVs avoid open areas with many shrubs until snow depth is adequate to cover the shrubs.
- OSV use patterns:
 - ◆ Primarily day use (generally 10:00 am to 3:00 pm; grooming occurs at night).
 - ◆ OSV use is at the highest on weekends and holidays.
 - ◆ Highest concentrations of OSV use occur along groomed trails (this is supported by research documented in State EIR).
 - ◆ Concentrated use occurs at trailheads.
 - ◆ Higher OSV use in open meadows (concentrated on meadows with groomed trail access) and 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 does not persist for long periods of time (2 to 5 days), 5,000 feet and below for the Tahoe National Forest.
- Ungroomed routes receive 50 percent less OSV use than groomed routes (only 25,000 registered OSVs in California per State EIR, most use on groomed trails; if OSV trail grooming were discontinued, assume that use would decline by 50 percent).
- Groomed trails are suitable for OSVs other than snowmobiles (side-by-sides and quads on tracks, snowcats, four-wheel-drive SUVs/trucks on tracks, etc.)
- Groomed trails provide a higher degree of potential receipt of educational messages including messages encouraging trail sharing to reduce potential use conflicts.

Spatial and Temporal Context for Effects Analysis

Spatial Context:

The spatial boundaries for analyzing the direct, indirect, and cumulative effects to recreation are within the Tahoe National Forest boundary, because the proposed OSV designation decision would apply to OSV trails and areas within the forest boundary and have the potential to cumulatively impact OSV recreation experiences and opportunities across the forest.

Effects Timeframe:

The temporal boundaries for analyzing the direct and indirect effects to recreation are, in the short term, one year, and in the long term up to 20 years. Short-term effects such as changes in the acres available to motorized or non-motorized winter uses would occur upon implementation of the OSV designation decision. Long-term effects such as decreases in use conflicts and protection of resources due to effective management of OSV use through a designated OSV system of trails and areas would occur over the life of the decision.

The temporal boundaries for analyzing cumulative effects to recreation are up to 20 years, because the OSV designations would remain in effect over the long term, and would therefore overlap in time with other forest management activities that could cumulatively impact OSV recreation experiences and opportunities.

Affected Environment

Existing Condition

Recreation Settings and Opportunities

The Tahoe National Forest is one of the most popular recreation forests in the United States with year-round recreation opportunities. In winter, there are outstanding winter sports opportunities including world-renowned downhill ski areas and extensive snowmobile and cross-country ski trails to experience. (USDA Forest Service 2016).

The main travel corridors are: Interstate 80, Highway 49, Highway 20, Highway 89 (North and South), Foresthill Divide Road, Mosquito Ridge Road, Bowman Road, Marysville Road, and Gold Lake Highway. The Tahoe National Forest is bordered on the north by the Plumas National Forest, on the south by the Eldorado National Forest, on the east by the Humboldt-Toiyabe National Forests and Lake Tahoe Basin Management Unit. On the western border are the foothills above the Sacramento Valley.

Recreation Niche

The recreation niche is a characterization of the distinct role the national forest has in providing outdoor recreation opportunities to the public. The niche allows the Forest Service to focus management efforts on providing recreation opportunities related to what is unique and valuable about the Tahoe. The recreation niche statement of Tahoe National Forest is:

Within a one-hour drive of Reno and Sacramento, the Tahoe National Forest provides visitors the opportunity for individual challenge and renewal in a rugged Sierra Nevada setting. Winter and summer activities abound; emerging outdoor recreation sports are tested here. World-class downhill ski areas can be found nestled in the Tahoe high country; cross-country ski areas

provide visitors with backcountry winter excursions in fir and pine-canopied landscapes. Other popular winter activities include snowplay, snowmobiling and backcountry skiing. With over 1000 miles of trails, the Tahoe provides California's most extensive motorized touring and non-motorized-trekking opportunities in mountainous landscapes. The Tahoe also provides a variety of rivers and lakes offering opportunities for waterbased recreation such as fishing, rafting, boating and swimming. Campgrounds and other facilities provide visitors lodging and simply a place to rest after a long day of arduous outdoor-recreation adventure. All of these activities are packaged in a scenic setting, surrounded by historic towns and locations that add to the visitor's overall quality experience. It's Tuesday, take the day off – and come up and enjoy a day on the Tahoe! (USDA Forest Service 2007).

Recreation Opportunity Spectrum

The Forest Service uses the recreation opportunity spectrum (ROS) to inventory and describe the range of recreation opportunities available based on the following characteristics of an area: physical (characteristics of the land and facilities), social (interactions and contact with others), and managerial (services and controls provided). The recreational settings are described on a continuum ranging from Primitive to Urban. The ROS classes within the Tahoe National Forest include Primitive (P), Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), Roaded Natural (RN), and Rural (R). OSV designations consistent with the ROS classes provide for a diversity of opportunities for both motorized and non-motorized winter activities and the associated desired experiences. The descriptions below are from the Tahoe Forest Plan Standards and Guidelines for ROS.

Primitive: Area is characterized by an essentially unmodified natural environment of fairly large size. Interaction among users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.

Users should have an extremely high probability of experiencing the area as it is described above.

Semi-Primitive Non-Motorized: Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Interaction among users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Public motorized use is not permitted.

Users should have a high, but not extremely high probability of experiencing the area as it is described above.

Temporary vehicle use may be authorized based on special needs, but only for the duration of the project, roads would then be obliterated. Examples of special needs are insect or fire salvage, vehicle and equipment access (supported by an escaped fire situation analysis), and placement or removal of facilities under special-use permit.

Semi-Primitive Motorized: Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Public motorized use is permitted. Roads constructed and projects planned for resource utilization will strive to maintain the character of the ROS class. Following resource utilization, roads will be closed to public use or put-to-bed unless the road meets a specific recreation use in keeping with the ROS class.

Users should have a moderate probability of experiencing the area as it is described above, except that there is a high degree of interaction with the natural environment. Opportunity is available to use motorized equipment while in the area.

Roaded Natural: Area is characterized by a predominantly natural-appearing environment with moderate evidences of the sights and sounds of humans. Such evidences usually harmonize with the natural environment. Interaction among users may be low to moderate, but evidence of other users is prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities.

Users should have about equal probability to either experience affiliation with other user groups or be isolated from sights and sounds of people.

Opportunity exist to have a high degree of interaction with the natural environment. Challenge and risk opportunities associated with more primitive type of recreation are not very important. Practice and testing of outdoor skills might be important. Opportunities for both motorized and non-motorized forms of recreation are possible.

Rural: Areas characterized by substantially modified natural environment. Resource modification and utilization practices are primarily to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by large numbers of people. Facilities are often provided for special activities. Moderate densities are provided far away from developed sites. Facilities for intensive motorized use and parking are available.

Users should be able to experience affiliation with individuals and groups, sites and opportunities are convenient. Human Interaction and convenience are generally more important than the setting of the physical environment. Opportunities for wildland challenges, risk taking, and testing of outdoor skills are generally unimportant except for specific activities like downhill skiing, for which challenge and risk taking are important elements.

Modern Urban¹⁴: Areas characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Renewable resource modification and utilization practices are designed to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Sights and sounds of humans, on site, are predominant. Large numbers of users can be expected, both on site and in nearby areas. Facilities for highly intensive motor use and parking are available with forms of mass transit often available to carry people throughout the site.

Users should be able to experience affiliation with individuals and groups. Sites and opportunities are convenient. Experiencing natural environments, having challenges and risks afforded by the natural environment, and the use of outdoor skills is relatively unimportant. Opportunities for competitive and spectator sports and for passive uses of highly human-influenced parks and open spaces are common.

A majority of Tahoe National Forest acres are in the Roaded Natural and Rural classes.

¹⁴ Although there is no Modern-Urban ROS Class identified on the Tahoe NF, this Class is presented for comparative purposes.

Table 20. Tahoe National Forest recreation opportunity spectrum classes

Recreation Opportunity Spectrum	ROS Class Acres	Acreage Percent of total Forest Acres
Primitive	33,000	4%
Semi-Primitive Non-Motorized	48,975	6%
Semi-Primitive Motorized	89,994	11%
Roaded Natural/Rural	664,122	79%
Total	836,041	100%

Travel Management Plan FEIS Table 3.07-2. ROS acres in each class for all alternatives

Acres and percentage for both Roaded Natural and Rural ROS were combined into a single category.

No Urban ROS designations have been made within the Tahoe National Forest.

The Granite Chief Wilderness and the North Fork American Wild River, the only Primitive ROS areas, are closed to public OSV use. The ROS classes are incorporated into the Tahoe Forest Plan management areas.

Motorized Winter Recreation

The Tahoe National Forest receives adequate snowfall for OSV trail grooming in all four Ranger Districts; however, the east side of the forest (Truckee and Sierraville districts) receives the most snow and has a longer grooming season. Snowmobile use is managed under the Tahoe Off-Highway Vehicle Travel Plan and the Transportation Management Program.

OSV use is prohibited in the Granite Chief Wilderness, Research Natural Areas, North Fork American River Wild and Scenic River and the Onion Creek Experimental Forest. Forest Plan standards and guidelines for each of the forest's 109 management areas specify OSV use designations (open to OSV use, closed to OSV use, or restricted to designated routes) for each management area. (Refer to Appendix B, Forest Plan Direction.)

There are four snowmobile outfitter/guides currently permitted to operate on the Tahoe National Forest, including Eagle Ridge Snowmobile Outfitters (Little Truckee Summit), Coldstream Adventures (Cabin Creek and Coldstream), Lake Tahoe Snowmobiling (Brockway Summit and Hwy 267), and Full Throttle (Martis Peak Road and Highway 267) (USDA Forest Service 2010).

For over 30 years, the Forest Service, Pacific Southwest Region, in cooperation with the California Department of Parks and Recreation (California State Parks) Off-highway Motor Vehicle Division has enhanced winter recreation, and more specifically, snowmobiling recreation by maintaining National Forest System trails by grooming snow for snowmobile use. Plowing of local access roads and trailhead parking lots, grooming trails for snowmobile use, and light maintenance of facilities (e.g., restroom cleaning, garbage collection) are the essential elements of the OSV program that keep the national forests open for winter recreation use.

There are approximately 265 miles of National Forest System OSV trails within the Tahoe National Forest, with approximately 217 miles of these available for grooming. There are six designated winter trailheads that include three SnoParks (Yuba Gap, Donner Summit, and Yuba Pass), restroom facilities, three Snow Tractor/Groomer storage sheds (Little Truckee Summit on the Sierraville Ranger District, Bassett's on the Yuba River Ranger District, and China Wall on the American River Ranger District). All grooming is done on top of the designated road system, except for an approximately 0.5-mile segment of the Howard Trail (SNO-12E72). The groomed OSV trail system that is included in the California

Department of Parks and Recreation, OSV Program funded activities on the American River, Yuba River, Truckee, and Sierraville Ranger Districts is described below.

Bassetts Trail System. The Bassetts trail system and trailhead parking are located off State Route 49 roughly 15 miles west of Sierraville in the Yuba River Ranger District. Trailhead parking is provided off Gold Lake Road. Some of the Bassett area trails extend north to the Gold Lake area in the Plumas National Forest. Bassetts provides 82 miles of groomed trail (including county roads). Trails connect to the Little Truckee Summit trailhead. Trail elevations range from 5,400 feet to 7,600 feet. The Bassetts trail system is located within the Yuba Northeast and Sierraville West OSV areas within the Tahoe National Forest.

China Wall Trail System. The China Wall trail system and trailhead parking are located 12 miles northeast of Foresthill on Foresthill Road off of Interstate 80 near Auburn. Trailhead parking is provided via a parking lot accessed from Foresthill Road. The China Wall trail system provides 50 miles of groomed trail (including County roads), a plowed trailhead, and a restroom maintained by the Forest Service (American River Ranger District). Trail elevations range from 5,000 feet to 7,200 feet. Unmarked routes follow Foresthill Road from which riders can take side trips to Humbug, Deadwood, and American Hill ridges. The groomed trails include the China Wall Staging Area to Road 66, Humbug Loop, Foresthill Divide Road, American Hill Loop (Road 13), Ford Point Trail and Tadpole Loop, Soda Springs Trail, and Duncan Y trail (Road 43). The China Wall trail system is located within the Foresthill East OSV area within the Tahoe National Forest.

Placer County plows 3 miles of Foresthill Road and the trailhead parking.

Little Truckee Summit Trail System. The Little Truckee Summit trail system is accessed from three different trailhead parking areas: Yuba Pass Sno-Park on State Route 49, 8 miles west of Sierraville; Little Truckee Summit on State Route 89 at Jackson Meadow Road roughly 16 miles north of Truckee; and Prosser Hill 5 miles north of Truckee.

Little Truckee Summit offers 138 miles of groomed trail (including County roads) with elevations ranging from 5,700 feet to 7,800 feet. Snowmobile trail grooming is done by a private contractor through the Sierra County Public Works and Transportation Department. Some snowmobile trail grooming is done under Forest Service volunteer agreements by private landowners living year-round off the groomed trail system. Plowed trailhead access is provided by Caltrans at all three trailheads; however only the Little Truckee Summit trailhead is plowed by State of California OSV Program funds under contract to Sierra County.

In the spring, temporary trailheads are set-up along the main groomed snowmobile route by plowing Jackson Meadow Road (Forest Route 07) out of Little Truckee Summit, to help provide better access for OSV riders and decrease damage to the Jackson Meadow Road. Plowing of Jackson Meadow Road has historically been done by private contractor through Sierra County; however, in 2010, plowing was done by Sierra County. Winter restroom cleaning and maintenance at all three locations is done with a combination of Forest Service (Tahoe National Forest), sno-park funds (Yuba Pass Sno-Park), and State of California OSV Program funds through Sierra County (Little Truckee Summit). The Little Truckee Summit trail system is located within the Sierraville West OSV areas within the Tahoe National Forest.

Table 21. Overview of State of California OSV Grooming Program activity within the Tahoe National Forest (includes grooming over county roads not under Forest Service jurisdiction)

Project Location National Forest (NF), Ranger District, and County	Recreation Facility	State of California OSV Program-Funded Activity
Tahoe NF, Yuba River Ranger District, Sierra County, near Bassetts	Bassetts and Little Truckee Summit Trail Systems	Groom 82 miles of trail, plow 13 miles of road and 2 trailheads, and service restrooms.
Tahoe NF, American River Ranger District, Placer County, near Auburn	China Wall Trail System	Groom 50 miles of trail, plow 3 miles of road and 1 trailhead, service 1 restroom, and refuse collection.
Tahoe NF, Sierraville and Truckee Ranger Districts (East Zone), Sierra and Nevada counties	Little Truckee Summit, Prosser, and Yuba Pass groomed trail systems	Groom 138 miles of trail (connects to Bassetts/Gold Lakes), plow 8 miles of road and 1 trailhead (2 plowed by Caltrans), service 3 restrooms

Non-motorized Winter Recreation

The Tahoe National Forest contains one designated wilderness (28,475 acres), 11 inventoried roadless areas (171,328 acres), one designated and four recommended Wild and Scenic Rivers, three research natural areas, and two experimental forests.

The non-motorized Pacific Crest National Scenic Trail follows the Sierra Crest through the middle of the Tahoe National Forest, and the non-motorized Pioneer National Recreation Trail follows California State Highway 20 east of Nevada City.

There are five cross-country ski areas including Lunch Creek, Castle Peak, Kyburz, Cabin Creek and Pole Creek.

Statutorily and Administratively Designated Areas

A designated area is an area or feature identified and managed to maintain its unique special character or purpose. Some categories of designated areas may be designated only by statute and some categories may be established administratively in the land management planning process or by other administrative processes of the Federal executive branch. Examples of statutorily designated areas are national heritage areas, national recreational areas, national scenic trails, wild and scenic rivers, wilderness areas, and wilderness study areas. Examples of administratively designated areas are experimental forests, research natural areas, scenic byways, botanical areas, and significant caves. (36 CFR 219.19)

Wilderness

The California Wilderness Act of 1984 designated the Granite Chief Wilderness within the Tahoe National Forest. The Wilderness is adjacent to the western watershed boundary of Lake Tahoe and includes Five Lakes Creek and the headwaters of the North Fork and Middle Fork of the American River. The major attractions of this area are its high, rugged granite cliffs and broad glaciated valleys. (USDA Forest Service 2007, p 36).

The Wilderness Act of 1964 prohibits OSV use in designated wilderness areas. The nearest designated OSV trail to the Granite Chief Wilderness is the Mosquito Ridge trail, located more than one air mile to the west of the Wilderness boundary.

Inventoried Roadless Areas

Inventoried roadless areas (IRA) provide clean drinking water and function as biological strongholds for populations of threatened and endangered species. They provide large, relatively undisturbed landscapes that are important to biological diversity and the long-term survival of many at-risk species. Inventoried roadless areas provide opportunities for dispersed outdoor recreation, opportunities that diminish as open space and natural settings are developed elsewhere. They also serve as bulwarks against the spread of non-native invasive plant species and provide reference areas for study and research (USDA Forest Service 2009).

Tahoe National Forest has 11 inventoried roadless areas totaling 171,328 acres (Tahoe National Forest, GIS data), excluding private lands located within the IRA boundaries. The names and acres of each IRA are listed in table 22. Detailed descriptions of the roadless area characteristics can be found in the 1990 Forest Plan FEIS appendix G, and in the 2010 Tahoe Motorized Travel Management FEIS.

Table 22. Tahoe National Forest inventoried roadless areas

Inventoried Roadless Area	Acres	OSV Status
Bald Mountain (extends onto the Humboldt-Toiyabe NF)	5,834	Approximately 1,061 acres of this IRA has been established as a Research Natural Area. OSV use prohibited within the SPNM and RNA portion, OSV use allowed or restricted in remaining acreage. No OSV trails in this area.
Castle Peak	15,738	The Andesite West OSV trail passes through the western side of the Castle Peak IRA. OSV use is prohibited in the Independence Zoological SIA in the northeast portion of the IRA. OSV use is allowed or restricted on the remaining acreage. This area receives heavy cross-country skiing and snowmobile use in the winter. There are areas of high to moderate OSV use in this IRA.
Duncan Canyon	9,253	The Mosquito Ridge, Robson Flat, Duncan Y and Soda Springs OSV trails form a loop around the Duncan Canyon IRA, but are not within the IRA acreage. OSV use is allowed within this IRA. There are areas of high to moderate OSV use in this IRA.
East Yuba	10,805	OSV use is allowed within this IRA. There are areas of high to moderate OSV use in this IRA.
Granite Chief (Granite Chief Wilderness acreage included)	31,297	The California Wilderness Act of 1984 designated 25,680 acres of this IRA as the Granite Chief Wilderness. OSV use is prohibited in the designated Wilderness, and in the SPNM areas of the IRA adjacent to the Wilderness. No OSV trails in this area.
Grouse Lakes (Grouse Lake vehicular closure included)	19,271	OSV use is allowed within this IRA. No OSV trails in this area. There are areas of high to moderate OSV use in this IRA.
Lakes (Basin) (extends onto the Plumas NF)	557	OSV use is allowed in this area.
Middle Yuba	7,884	Over 40 percent of this IRA is in private ownership. OSV use is allowed in a majority of this IRA. No OSV trails in this area.
North Fork American River (NFAR Wild River included)	43,374	The Soda Springs, Foresthill Divide, American Hill, Tadpole, Ford Point, Humbug, and Humbug Tie OSV trails run near the southern boundary of the North Fork American River IRA, but are not within the IRA or WSR acreage. OSV use is prohibited in a majority of this IRA. OSV use is low in this IRA.
North Fork of the Middle Fork American River	11,257	OSV use is allowed in a majority of this IRA. No OSV trails in this area.
West Yuba (extends onto the Plumas NF)	1,605	OSV use is allowed in a majority of this IRA. No OSV trails in this area.

In response to public comments received on the DEIS, the Forest Service also identified other areas in the Tahoe National Forest that are generally unroaded and are not already included within the IRAs listed above or within designated wilderness areas (in this case, the Granite Chief Wilderness). To be considered as unroaded, areas must be greater than 5,000 acres or, if less than 5,000 acres, located adjacent to existing designated IRAs or Wilderness areas. Unroaded areas do not contain roads designated as open to the public. Approximately 28,783 acres in six areas, all of which are located adjacent to existing IRAs and Wilderness, were identified within the forest as meeting the unroaded criteria: Bald Mountain (2,825 acres), Castle Peak (5,511 acres), Granite Chief – adjacent to IRA (5,357 acres), Granite Chief – adjacent to Wilderness (3,635 acres), Grouse Lakes (5,617 acres), and North Fork American River (5,838 acres).

Wild and Scenic Rivers

The North Fork American Wild River is classified by Congress and administered according to the North Fork American Wild River Management and Development Plan. Visual quality is managed according to standards and guidelines in the Tahoe National Forest Land and Resource Management Plan (USDA Forest Service 1990).

Four river corridors within the Tahoe National Forest have been recommended for designation as Wild and Scenic Rivers. The proposed corridors include sections of Sagehen Creek, Canyon Creek, North Yuba River, and the Lower South Yuba River. The proposed segments are managed to protect their wild and scenic characteristics through the study period and until designated or released from consideration.

The Bowman OSV trail passes through a recommended scenic segment of the South Yuba River. The Fifty Four Road trail crosses a recommended recreational segment of the North Yuba River. The Prosser Creek Connector trail crosses a recommended scenic segment of Sagehen Creek.

Research Natural Areas

There are three research natural areas (RNAs) within the Tahoe National Forest that are managed to maintain select vegetative, aquatic, and/or geologic elements in natural conditions. Babbitt Peak RNA (within the Bald Mountain IRA), Sugar Pine RNA (a portion of the RNA is in the North Fork American River IRA), and Lyon Peak Needle Lake RNA (within the Granite Chief IRA) are not designated for OSV use under existing Forest Plan standards and guidelines.

Experimental Forests

There are two experimental forests within the Tahoe National Forest. Experimental forests provide lands for conducting research and development that serves as a basis for the management of forests and grasslands.

Special Interest Areas

There are eight special interest areas within the Tahoe National Forest. Special interest areas are established to protect, and where appropriate, foster public use, study, and enjoyment of areas with scientific, scenic, historical, geological, botanical, zoological, paleontological, or other special characteristics. OSV use is not designated in a majority of the special interest areas, with the exception of Sagehen Headwaters and Meadow Lake Special Interest Areas.

Pacific Crest National Scenic Trail

Approximately 99 miles of the PCT traverse the Tahoe National Forest. Of that, 76 miles of the PCT is on National Forest System lands. OSV use along the PCT is prohibited by the National Trails System Act, P.L. 90-543, Section 7(c). The PCT is managed for non-motorized trail uses.

The PCT was designated in 1968 as one of the first national scenic trails. The PCT (extending from Mexico to Canada) was established to provide for maximum outdoor recreation potential and for the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the areas which such trails may pass (USDA Forest Service 1982).

The Pacific Crest National Scenic Trail Comprehensive Management Plan (1982) contains the following direction:

Viewing and understanding resource management are considered to be part of the normal character of the trail. The management of the various resources will give due consideration to the existence of the trail and trail users within the multiple use concept. Prescription for management of the visual resources associated with the trail will be part of agency planning processes.

The Comprehensive Management Plan reinforces that snowmobiling along the trail is prohibited and has the following direction for implementation of the Plan:

Winter Use: Winter use (cross country skiing and snowshoeing) should be accommodated where practical and feasible. Each agency should follow its own procedures for marking and signing the trail for winter use purposes. As a guideline, all trail markers should be at eye level (approximately 40" above average maximum snow depth). Sanitation facilities and snow removal for parking may be necessary. Any improvement or alterations of the vegetation should not detract from the quality of the recreation opportunities for other trail activities such as hiking and horseback riding.

Snowmobiling along the trail is prohibited by the national Trail System Act, P.L. 90-543, Sec 7(c). Winter sports plans for areas through which the trail passes should consider this prohibition in determining areas appropriate for snowmobile use. Winter sports brochures should indicate designated snowmobile crossing of the Pacific Crest Trail where it is signed and marked for winter use. If cross-country skiing and/or snowshoeing are planned for the trail, any motorized use of adjacent land should be zoned to mitigate the noise of conflict.

The Tahoe Forest Plan includes the following under Management Goals and Strategies for Facilities (transportation system):

3. Manage Tahoe National Forest lands next to the Pacific Crest National Scenic Trail under the multiple use concept, giving due consideration to the existence of the trail and users of the trail (LRMP, pg. V-11).

Management areas that are crossed by the PCT have the following standard and guideline as part of their prescription in the Forest Plan: "Location, design, signing, user facilities, and management of the Pacific Crest National Scenic Trail will be in accordance with the criteria established in the *Pacific Crest National Scenic Trail Comprehensive Plan*, 1/18/82" (LRMP, pg. V -64).

Under the existing Forest Plan, approximately one-quarter of the PCT mileage on the Tahoe National Forest passes through wilderness and other areas not designated for OSV use. The remaining PCT mileage passes through areas that are designated for OSV use; however, OSV use is not allowed on the

Trail itself. Existing groomed and designated non-groomed OSV trails cross the PCT in four locations, however no designated crossings have been identified.

The Tahoe National Forest Land and Resource Management Plan (USDA Forest Service 1990) assigns an ROS classification to all national forest lands within the forest. The PCT within the Tahoe National Forest traverses lands with ROS classifications of primitive, semi-primitive non-motorized, semi-primitive motorized, roaded natural, and rural. Approximately 76 miles of the PCT is located on National Forest System lands within the Tahoe National Forest. Of this total, approximately 62 miles (82 percent of the PCT mileage in the forest) traverses lands assigned ROS classifications that provide for motorized recreation opportunities (rural, roaded natural, and semi-primitive motorized). The remaining 14 miles of the PCT on National Forest System lands (18 percent of the PCT mileage in the forest) traverses lands with ROS classifications of primitive or semi-primitive non-motorized, which do not permit public motorized use.

Table 23. Recreation opportunity spectrum for the Pacific Crest National Scenic Trail

ROS Class	Miles
Primitive	8.87
Semi-Primitive Non-Motorized	4.89
Semi-Primitive Motorized	21.19
Roaded Natural	34.86
Rural	6.40
Total	76.22

Based on use observed by the Tahoe National Forest’s winter recreation specialists and public comments, non-motorized winter recreation, such as cross-country skiing and snowshoeing, along the PCT typically occurs near plowed parking areas where the public can park to access the trail. Public parking in the wintertime is limited to a few specific winter trailheads that are plowed for access and parking. The Forest Service identified the wintertime plowed public parking locations that access the PCT, and the typical one-day snowshoeing or cross-country skiing distances on the PCT from these access points. Most recreationists accessing the PCT in the winter park at the Donner Summit Winter Trailhead off Interstate Highway 80. Skiers and snowshoers can travel north on the PCT to Castle Pass, the Peter Grubb Hut, and Round Valley within a day as well as south to the Donner Pass Road and beyond. The public also accesses the PCT from the Donner Pass Road, heading south toward Mt. Lincoln and the Benson Hut. Public wintertime parking within a few miles of the PCT can also be found along Highway 89 near Pole Creek. Skiers and snowshoers can access the Bradley Hut and Benson Hut as well as Anderson Peak and Tinker Knob. Some visitors make a multi-day trip between Donner Summit and Squaw Valley, spending a night or two at the Benson Hut. Finally, the PCT could potentially be accessed where it crosses Highway 49, east of Sierra City. At this time, no suitable parking places exist where the PCT crosses Highway 49 due to snow berms along the highway. However, this situation could possibly change in the future, depending on how the highway is plowed.

Visitor use

To determine possible effects of management alternatives, it is important to understand the characteristics of people who visit and recreate within the Tahoe National Forest. Responding to the need for improved information about visitors to National Forest System lands, the Forest Service developed a nationwide,

systematic monitoring process for estimating annual recreation use: the National Visitor Use Monitoring (NVUM) program.

The NVUM program was designed to provide statistically reliable estimations of recreation visitation to national forests and grasslands. Through collection and dissemination of information about recreational visitors and their preferred activities, resource managers can make informed, strategic decisions about the types and amount of recreation opportunities provided on the national forest.

NVUM surveys were conducted within the Tahoe National Forest during fiscal years 2005, 2010, and 2015. Surveys collected information about participation in recreation activities, visitor demographics, and spending patterns. Summaries from these surveys are useful to describe recreation use patterns on the national forest. As displayed, these data are only valid at the forest level and cannot be disaggregated to specific sites or locations.

Local visitors are common to the Tahoe National Forest. Over 40 percent of visits came from people living within 25 miles of the national forest; and less than 10 percent have traveled over 200 miles. About half of all visits to the Tahoe National Forest last less than 4 hours. Frequent visitors are relatively common with over 35 percent of all visits made by people who visit more than 50 times per year.

In 2015, the three most reported main activities were downhill skiing (23 percent), hiking/walking (20 percent), and viewing natural features (8 percent). In 2010, the three most reported main activities were downhill skiing (18 percent), hiking (13 percent), and cross-country skiing (13 percent). In 2005, the three most reported main activities were downhill skiing (31 percent), hiking (15 percent), and fishing (11 percent). In 2015, snowmobiling was reported as a main activity for 0.2 percent, in 2010, snowmobiling was reported as a main activity for 1.7 percent, and in 2005 snowmobiling was reported as a main activity for 7 percent.

Table 24 shows the estimated visitor use based on the percentage of visitors reporting snowmobiling and cross-country skiing as their main activity.

Table 24. National Visitor Use Monitoring winter activities

Year	Activity	Total Annual National Forest Visits	% Main Activity	Estimated Annual National Forests Visits based on the % main activity	Average hours participating in main activity
2015	Snowmobiling	1,660,000	0.2%	3,320	3.5
2015	Cross-country Skiing	1,660,000	5.7%	94,620	3.0
2010	Snowmobiling	1,847,000	1.7%	31,399	3.1
2010	Cross-country Skiing	1,847,000	12.6%	232,722	3.5
2005	Snowmobiling	1,696,000	7.0%	118,720	3.9
2005	Cross-country Skiing	1,696,000	12.6%	213,696	3.5

*A national forest visit is defined as the entry of one person upon a national forest to participate in recreation activities for an unspecified period of time. A national forest visit can be composed of multiple site visits. The visit ends when the person leaves the national forest to spend the night somewhere else.

The California Department of Motor Vehicles records OSV registration by county each year. The Tahoe National Forest falls within the five counties shown in table 25.

Table 25. California OSV registration for counties in Tahoe National Forest, 2009 through 2014

County	2009	2010	2011	2012	2013	2014
Nevada	1,037	1,066	1,023	1,020	1,041	1,030

County	2009	2010	2011	2012	2013	2014
Placer	1,407	1,291	1,252	1,199	1,165	1,127
Plumas	1,236	1,180	1,111	1,025	1,022	920
Sierra	223	220	205	208	207	192
Yuba	340	351	325	300	310	303
TOTAL	4,243	4,108	3,916	3,752	3,745	3,572

*Data from CA State Parks, not official DMV records

Table 26 shows total statewide OSV registrations and out-of-state registrations.

Table 26. California statewide OSV registration, 2009 through 2014

	2009	2010	2011	2012	2013	2014
Subtotal	18,542	17,982	17,776	16,956	16,929	16,189
Out of State	260	242	235	244	215	197
Total	18,802	18,224	18,011	17,200	17,144	16,386

*Data from CA State Parks, not official DMV records

Snowmobile registrations in the Tahoe National Forest counties and statewide have declined slightly over the past 6 years. The State EIR estimated that OSV use would continue to increase at a rate of approximately 4 percent per year, as it had between 1997 and 2009 (California Department of Parks and Recreation 2010); however, that has not been the case in recent years.

Because the Tahoe National Forest is near several large metropolitan areas in northern California and Nevada, and high-use areas around Lake Tahoe, demand for a variety of year-long recreation opportunities is high. It is projected that recreation on the forest would, at a minimum, increase at the same rate as the projected population in the surrounding counties (USDA Forest Service 2007). OSV visitor use varies based on the amount of snowfall and the length of the season.

Table 27 is derived from the OSV trailhead survey conducted for the State EIR, and based on data summarized in the State EIR (California Department of Park and Recreation 2010). The table shows the average number of vehicles at winter trailheads, and the average number of OSVs that would be expected on weekends and holidays versus weekdays. Based on this information, estimated use per winter season would be 22,410 OSV users forestwide.

Table 27. Tahoe National Forest OSV visitor use

Location	Day description	Number of vehicles	Number of OSVs*
Forestwide	Weekend or holiday (approx. 33 per season)**	202	404
Forestwide	Weekday (approx. 65 per season)**	40	80
Forestwide (other non-program parking)	Weekend or holiday	43	86
Forestwide (other non-program parking)***	Weekday	8	16
Visitor Use information split out by trailhead:			
Bassetts Trailhead	Weekend or holiday	30	30
Bassetts Trailhead	Weekday	8	7
Little Truckee Summit Trailhead	Weekend or holiday	140	280
Little Truckee Summit Trailhead	Weekday	17	34
China Wall Trailhead	Weekend or holiday	32	64
China Wall Trailhead	Weekday	16	32

Based on 2009 data from California State Draft EIR

*assumes an average of 2 OSVs per vehicle parked at a trailhead

**seasonal total assumes 33 weekends/holidays of observed maximum total and 65 weekdays at 20 percent capacity.

*** Non-program parking is parking used by winter OSV visitors that is not one of the California State OSV Program-funded trailheads

Conflicts between Motorized and Non-motorized Winter Experiences

The 2015 NVUM report indicates that 80.6 percent of visitors to the Tahoe National Forest are very satisfied, and 14.5 percent are somewhat satisfied. The satisfaction survey questions did not directly address winter use; however, the NVUM Importance-Performance ratings for Undeveloped General Forest Areas that could be relevant to winter recreation include conditions of developed facilities, access, service, and feeling of safety, all were rated “keep up the good work” (USDA Forest Service 2015).

Both motorized and non-motorized winter recreation activities can be described in three general categories including trail touring, backcountry exploring, and alpine adventure (Snowlands 2015). Trail touring is typically focused on the use of groomed trail systems, where the quality of the groomed trail with moderate climbs and descents is often the most important factor for the recreation experience. Backcountry exploring is focused on cross-country travel away from the groomed trail system with emphasis on travelling and exploring. Alpine adventure is characterized by the challenge of riding or skiing through powder snow on steeper slopes. In alpine adventure, backcountry skiers seek the downhill experience, while snowmobilers enjoy the challenge of climbing up (Snowlands 2015). Of particular concern for conflicts between motorized and non-motorized winter uses are areas that can be accessed in the winter from the forest’s six winter trailheads: Yuba Gap, Donner Summit, Yuba Pass, Little Truckee Summit, Bassett’s, and China Wall. Most winter recreationists (both motorized and non-motorized) launch their winter recreation activities from these six designated winter trailheads.

Opportunities for quality recreation experiences depend on both the settings (physical, social, and managerial aspects), and on the desired experience of the recreationist. Conflicts occur when one

recreationist effects or degrades the experience of another. Many non-motorized recreationists experience conflict with motorized recreationists (Adams and McCool 2010). Conflict can result in displacement or the abandonment of the use of a particular trail or area, or a change in time of use (Adams and McCool 2010).

Conflict between motorized and non-motorized winter uses arise due to differing desired recreation experiences, public safety concerns, noise, air quality, and access issues. Public comments received during the scoping period for this project describe conflicts related to (1) displacing visitors who prefer non-motorized recreation opportunities; (2) posing safety concerns for non-motorized users due to the high speed of vehicles on shared trails; (3) creating noise and air quality impacts that lead to the displacement of non-motorized users; (4) quickly consuming untracked powder snow, which reduces a desired backcountry skiing experience; (5) disrupting ski tracks, making the snow surface unsuitable for cross-country skiing; and (6) grooming trails which the State of California's Over Snow Vehicle Program Draft EIR estimates triples public OSV use on trails to the detriment of non-motorized users.

In public comments received during the scoping period for this project, motorized winter enthusiasts expressed concerns regarding additional limitations on use; however, they generally did not describe conflicts with non-motorized uses. Snowmobile trails are available for multiple uses, and in some areas provide opportunities for non-motorized uses such as cross country skiing, snowshoeing, and dog-sledding. There are also those who use snowmobiles as a means to access backcountry areas to participate in non-motorized activities (American Council of Snowmobile Associations 2014).

There are approximately 25,000 annual OSV registrations in the state of California, and according to the 2009 State DEIR trailhead survey, approximately 22,410 OSV visits forestwide per winter season, typically mid-December through March. OSV use would be spread across the available areas and trails designated for OSV use. Based on 22,410 visits, if use were spread evenly across each day of the season, there would be approximately 213 OSVs on the forest per day. Daily use may be higher during weekends and holidays and lower during the week. For the existing conditions, this equates to 2,995 acres and 1 mile of trail per OSV. The level of OSV use is relatively low in comparison to other winter activities and there is adequate acreage available for the OSV use to disperse and avoid conflict.

Quality non-motorized winter recreation experiences are typically characterized by quiet activities such as cross-country skiing or snow-shoeing in a natural environment that is not influenced by the sound, smell of exhaust, or sight of snowmobiles. Areas must be accessible from plowed trailheads, as non-motorized recreationists typically do not travel long distances. Most non-motorized over snow recreation takes place within three to five miles of trailheads (American Council of Snowmobile Associations 2014). Non-motorized visitors spend an average of 2.3 hours on the snow per visit (Rolloff et al. 2009).

Quality motorized winter recreation opportunities are characterized by some as unique, prominent, and remote areas or areas of high visual interest, or areas suitable for "high marking." By others, quality motorized winter recreation opportunities are characterized by a continuous smooth groomed trail to, or through, areas of high visual interest or access to destinations. Groomed trail systems provide access to these high-quality motorized recreation opportunities, or provide the high-quality motorized opportunity in the trails themselves. For this analysis, OSV opportunities across the Tahoe National Forest were mapped based on the OSV use assumptions criteria (listed in the Methodology section above). The areas that fall within the high to moderate OSV use areas are considered to provide high-quality OSV opportunities based on years of observed use patterns, the proximity to groomed trails and plowed trailheads, open meadows with trail access, and slopes with open vegetation near groomed trails. Snowmobilers typically have a maximum 80-mile round-trip travel range (California Department of Parks

and Recreation 2010). Approximately half of motorized visitors indicated that they would not snowmobile or would snowmobile less if the trails were not groomed (Rolloff et al. 2009). OSV visitors spend an average of 6 hours on the snow per visit. Motorized recreationists are also interested in travelling through and experiencing a natural environment.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Recreation Settings and Opportunities

OSV use would continue to be managed according to the Tahoe Forest Plan. No changes to the OSV designations would be made, the existing winter motorized and non-motorized recreation opportunities would continue to be available. Grooming would continue as described in the 2010 State EIR, based on availability of funding, and adequate snowfall. There would be no reduction of opportunities or change in location for winter motorized OSV use.

The 2005 Travel Management Rule, subpart C, would not be implemented, and no OSV use map would be produced.

Opportunities for winter non-motorized recreation would also remain the same as described in the existing conditions. OSV use would remain consistent with existing ROS classes, with motorized use prohibited in Primitive and Semi-Primitive Non-motorized ROS classes (with the exception of the Grouse Management Area (041) and a small portion of the Sunflower Management Area (091) where OSV use is allowed in the winter) and allowed in Semi-Primitive Motorized, Roaded Natural and Rural ROS classes. OSV use is not allowed on the PCT and there are no designated OSV crossings of the PCT.

Conflicts between Motorized and Non-motorized Winter Experiences

Existing areas of conflict between motorized and non-motorized winter uses would continue. Most cross-country skiing occurs in the snow belt above 5,300 feet in elevation, and most use would occur within 5 miles of an all-weather road that is cleared of snow during the winter (USDA Forest Service 2007). These areas are most likely to see conflict between motorized and non-motorized winter uses. There are approximately 25,000 annual OSV registrations in the state of California, and according to the 2009 State DEIR trailhead survey, approximately 22,410 OSV visits forestwide per winter season, typically mid-December through March. OSV use would be spread across the available areas and trails that are designated for OSV use. For alternative 1, this equates to 3,014 acres and 1.1 miles of groomed trail per OSV. Potential conflicts between motorized and non-motorized uses would be most likely to occur on 171,633 acres that are highly desirable for non-motorized activities (within 5 miles of plowed trailheads) and are also open to motorized OSV use.

Non-motorized winter recreation enthusiasts may continue to be displaced in some areas by motorized OSV use. Displacement or conflict may occur where non-motorized enthusiasts are unable to access areas for desired quiet, non-motorized experiences away from the sights, sounds, and smells of motorized use, without traveling long distances through motorized routes and areas, or traveling further than they are physically able to traverse in a typical day. There are approximately 22,310 acres available for high-quality, quiet, non-motorized winter activities and approximately 10.2 miles of cross-country ski trails and 20.5 miles of the PCT within 5 miles of plowed trailheads. These areas are free from motorized use

and are easily accessible by non-motorized visitors in a typical day trip. There are approximately 194,321 acres across the forest available for quiet, non-motorized experiences, where OSV use is not designated. There are also 1,218 acres designated for public cross-country OSV use in deer holding areas from January 1 through September 14, allowing opportunities for quiet, non-motorized recreation in these areas when OSVs are not present.

Other potential conflicts would continue to occur in some areas, as motorized OSVs consume untracked powder snow that is desired by backcountry skiers, create tracks across the snow surface making skiing difficult, and creating safety concerns in areas where motorized and non-motorized use is occurring at shared trailheads, shared play areas and on shared trails.

Statutorily and Administratively Designated Areas

OSV use within the Granite Chief Wilderness is prohibited by the Wilderness Act. The closest OSV trail to the wilderness boundary is the Mosquito Ridge OSV trail, located more than one mile to the west. OSV incursions have not been an issue in this area.

OSV use is allowed on approximately 110,118 acres within inventoried roadless areas. Portions of the East Yuba, Lakes Basin, Grouse Lakes, Castle Peak, and Duncan Canyon Inventoried Roadless Areas are open to OSV use and include areas where moderate to high OSV use occurs in the vicinity of nearby groomed OSV trails. Portions of five other inventoried roadless areas also fall in areas designated for OSV use; however, low to no OSV use is expected in these areas. In addition, approximately 21,300 acres of “unroaded” areas outside of IRAs would be designated for OSV use under alternative 1, with approximately 5,900 acres in unroaded areas where moderate to high OSV use is expected to occur. Alternative 1 has 1.7 miles of a designated OSV trail (not available for grooming) within the Castle Peak IRA along its western boundary; an additional 0.3 mile of this OSV trail in the identified unroaded area adjacent to the Castle Peak IRA. This alternative has no OSV trails designated within any other IRAs or unroaded areas.

The roadless characteristics of high-quality or undisturbed soil, water, and air, and solitude within IRAs and other unroaded areas may be temporarily impacted when OSVs are present. Designating areas or trails for OSV use within and adjacent to IRAs or other unroaded areas does not reduce the potential that these areas could be considered under future planning efforts as potential wilderness. Impacts to the roadless area characteristics of solitude and undisturbed or high-quality soil, water, and air, which would occur when OSVs or their tracks were present, would be limited in scope and short-term.

The Pacific Crest National Scenic Trail (PCT) would continue to be managed as a non-motorized trail, however OSV use is allowed adjacent to the Trail. OSV crossings of the PCT would not be designated and OSVs would continue to cross the trail along existing OSV routes, and could cross the PCT at any location where the trail passes through an area where OSV use is allowed. OSV use adjacent to, or across the PCT could potentially impact the quiet, non-motorized trail experience, due to the sights and sounds of OSV use, when hikers and cross-country skiers encounter OSVs. Conflict between motorized and non-motorized uses along the Trail is most likely to occur in areas that are easily accessible to non-motorized enthusiasts, with plowed parking, as described in the existing conditions. The portion of the PCT within the Tahoe National Forest that passes through the Granite Chief Wilderness and other areas where OSV use is currently prohibited would continue to provide opportunities for quiet non-motorized trail experiences.

Ongoing motorized use in close proximity to areas managed as non-motorized and inventoried roadless areas temporarily degrades opportunities for solitude when OSVs are present. Similarly, there may be

temporary impacts to air quality from exhaust in the vicinity of OSVs, and short-term impacts to scenery when OSV tracks through the snow crisscross the landscape, leaving visual evidence of motorized use. The tracks only remain on the landscape until they are covered by additional snowfall or until the snow melts, and do not cause long-term impacts to scenery or the underlying soils and vegetation.

Table 28. Recreation resource indicators and measures for the existing condition, alternative 1

Resource Element	Resource Indicator	Measure (Quantify if possible)	Existing Conditions
Motorized Recreation Opportunities – cross-country	Opportunities for motorized winter uses Quality of OSV opportunities	Size of areas (acres) designated for to public OSV use Percent of designated acres that are considered high-quality OSV opportunities based on the high to moderate OSV use assumption categories	641,952 acres open for OSV use 34 percent of the acres open for OSV use provide high-quality OSV opportunities. This totals to approximately 216,950 acres. No minimum snow depth for OSV use cross-country
Motorized Recreation Opportunities – designated snow trails and snow trails available for grooming	OSV trail designations	Length (miles) of designated OSV trails available for grooming/Length (miles) of marked snow trails (ungroomed)	220 miles designated OSV trails available for grooming 149 miles designated OSV trails not available for grooming No minimum snow depth for OSV use on trails Follow OHMVR snow depth standards (for snow trail grooming to occur using OHMVR division funds/equipment)
Non-motorized Recreation Opportunities - displacement	Access to desired non-motorized recreation settings and opportunities Quality of non-motorized opportunities	Size of area (acres) and length of trails (miles) available to non-motorized recreation enthusiasts within 5 miles of plowed trailheads Percent of acres available for quiet, non-motorized use that are within desired areas (defined as areas within 5 miles of plowed trailheads)	22,310 acres and 10.2 miles of cross-country ski trails and 20.5 miles of the PCT available for non-motorized recreation within 5 miles of plowed trailheads 11 percent of the acres not designated for OSV use (available for quiet, non-motorized use) provide high-quality non-motorized opportunities, within 5 miles of plowed trailheads.
	Recreation Opportunity Spectrum	Consistency of OSV designations and grooming with existing ROS classes	Motorized OSV use prohibited in Primitive and Semi-Primitive Non-Motorized ROS classes. ¹⁵ Motorized OSV use allowed in Semi-Primitive Motorized, Roaded Natural and Rural ROS classes

¹⁵ With the exception of the Grouse Management Area (041) and a small portion of the Sunflower Management Area (091).

Resource Element	Resource Indicator	Measure (Quantify if possible)	Existing Conditions
Non-motorized Recreation Conflicts – Public Safety	Areas and trails available to non-motorized recreation enthusiasts for quality non-motorized recreation experiences	Size of areas (acres) OSV use not designated	194,321 acres not designated for OSV use 1,218 acres OSV use allowed between January 1 and September 14
Non-motorized Recreation Conflicts – Solitude, Quality, Scenery, Designated non-motorized areas	Proximity and frequency of OSV designations in relation to designated non-motorized areas	Distance of groomed public OSV snow trails from designated areas, number of OSV trails across linear designated areas	The closest OSV trail (available for grooming) to the Granite Chief Wilderness boundary is the Soda Springs groomed OSV trail (SNO-14E17), more than 3 miles to the west. OSV use is not allowed on the PCT. Groomed and designated non-groomed OSV trails cross the PCT in four locations. OSV trails across the PCT in areas where OSV use is allowed are not designated.
	Noise	Size of areas (acres) potentially affected by noise; size of areas (acres) not designated for winter motorized use	641,952 acres designated for OSV use and potentially affected by noise. 194,321 acres not designated for OSV use and available for quiet recreation. 1,218 acres OSV use designated between January 1 and September 14. This area is available for quiet recreation from September through January
	Air Quality	Qualitative/narrative description of potential impacts (with reference to air quality analysis)	Potential short-term impacts to the experience of recreational visitors in the vicinity of OSVs and grooming equipment due to the smell of exhaust emissions (see air quality report).
	Scenery	Qualitative/narrative description of potential visual impacts	Cross-country OSV use creates temporary tracks in the snow that crisscross the landscape. The visual evidence of snowmobile use decreases as fresh snow covers the tracks and/or when the snow melts at the end of the season.
	Potential conflict with other resource values	Proximity of OSV use related to other resource values (such as tribal/ spiritual sites, sensitive wildlife areas, popular non-motorized winter recreation areas, populated areas, neighboring Federal lands, etc.).	Existing conflict with historic structures at Robinson Flat.

Resource Element	Resource Indicator	Measure (Quantify if possible)	Existing Conditions
Statutorily and Administratively Designated Areas	Wilderness Attributes	Size of areas (acres) affected and duration of impact. Qualitative description for wilderness attributes	Opportunities for solitude may be temporarily affected due to the sights and sounds of OSVs near the wilderness boundaries. There are approximately 5,735 acres open to OSV use within 0.5 mile of designated wilderness boundaries. The duration of the potential impacts would be short-term, during the winter while snow depth is adequate for OSVs to access the area.
	Roadless Characteristics	Size of area (acres) affected and duration of impact. Qualitative description for roadless characteristics	Approximately 110,118 IRA acres and approximately 21,300 acres (approximately 5,900 acres conducive to OSV use) of other unroaded areas open to OSV use. Short-term impacts to the roadless characteristics of: (1) undisturbed soil, water, and air (short-term impacts to air quality due to the presence of OSV exhaust), and (2) solitude (due to the sights and sounds of OSVs) during the winter while snow depth is adequate for OSVs to access the area.

Cumulative Effects

In alternative 1 both motorized and non-motorized winter use would continue to occur on trails and in areas across the forest, existing conflicts between these uses and desired experiences would continue in some popular areas. Cumulative impacts to the recreation experience are unlikely, since no changes would be made to the allowed uses or areas, and other ongoing or reasonably foreseeable projects are not expected to impact winter recreation uses or create additional conflict between these uses. Short-term and temporary impacts to air quality (from OSV exhaust) and opportunities for solitude (due to OSV noise, and the presence of people) may occur when OSVs are present adjacent to Wilderness areas, within Inventoried Roadless Areas, or adjacent to the PCT. Noise from OSVs in areas and on trails across the forest would add to other sound sources, such as OSV grooming equipment, vehicles on highways, vehicles on Forest roads, equipment being used for forest management projects, etc.

Alternative 2 – Modified Proposed Action

Direct and Indirect Effects

Recreation Settings and Opportunities

Alternative 2 would provide a range of winter motorized and non-motorized recreation opportunities across the Tahoe National Forest. Having a clearly designated system of trails and areas where OSV use is designated and the subsequent production of the OSV use map would improve information available to the public about opportunities for OSV use. This would assist both motorized and non-motorized recreationists in selecting areas that meet their setting and experience preferences, and therefore, would minimize the potential for conflict.

Alternative 2 would increase the total miles of OSV trail available for grooming and include additional miles of OSV trail available for grooming on the Mosquito Ridge Trail in the Foresthill East OSV area. In response to comments to the DEIS, the entire length of the Sawtooth OSV trail (10.7 miles) would be available for grooming in alternative 2. Howard's Loop OSV trail (available for grooming) would be

changed to an out and back ride, eliminating a loop-riding opportunity, but it also would protect underlying soil, vegetation and aquatic species resources by not grooming or designating the segment of trail through a wet meadow that is not on an underlying road or trail. Actual groomed mileage varies and is based on snowfall and funding availability.

In response to comments to the DEIS, alternative 2 in the FEIS also increases the total miles of designated OSV trails not available for grooming to enhance OSV and hybrid¹⁶ users' access in the following ways: (1) adding trails across selected private lands over existing Forest Service System roads with easements to provide legal OSV access between otherwise fragmented designated OSV areas on National Forest System lands; (2) adding trails through the Sagehen non-OSV area to provide OSV and hybrid user access to Carpenter Ridge and areas beyond; (3) adding a trail north of the Donner Lake Interchange to facilitate access to the Castle Peak area, and; (4) adding trails to provide OSV and hybrid users' access to the bowl areas below the Anderson Peak/Tinkers Knob area.

Alternative 2 would designate fewer acres for OSV use compared to alternatives 1 and 4; however, alternative 2 focuses on providing motorized winter recreation opportunities in areas that receive high to moderate OSV use due to their access from parking and staging areas and groomed trails, elevation, and terrain while mitigating potential conflicts (particularly due to OSV noise and exhaust) in areas in the forest that are also popular for non-motorized winter recreation activities. Alternative 2 would provide a higher proportion of high-quality OSV use areas (defined by the high to moderate OSV use categories) relative to the acres designated for OSV use than alternatives 1 and 4, and just slightly less than in alternative 5. Some popular areas for both backcountry skiers and snowmobilers (e.g., Coon Canyon and the north and east bowls of Castle Peak) would remain designated for OSV use, and therefore, provide opportunities for winter visitors who enjoy using OSVs to reach backcountry areas to participate in non-motorized winter activities.

Alternative 2 would reduce the total acres proposed to be designated for OSV use from the existing condition, and the designated OSV areas would be located generally above 5,000 feet elevation. This reduces the acreage designated for OSV use (compared to existing management (alternative 1), which would enhance quiet, non-motorized winter recreation opportunities, particularly in the lower elevations of the forest. The specific areas that would not be designated for OSV use are included in portions of 18 of the 19 OSV areas analyzed, and specifically a 1-acre area near Robinson Flat to protect historic structures, the High Loch Leven (expanded to include Fisher Lake in response to comments to the DEIS), Independence Lake, Sagehen, and Steephollow areas, and individual parcels of National Forest System lands currently under long-term special use permits for Royal Gorge Cross Country Ski Area, Tahoe Donner Cross Country Ski Area, Boreal Ski Area, Donner Ski Ranch Ski Area, Sugar Bowl Ski Area, Alpine Meadows Ski Area and Squaw Valley Ski Area.

The proposed OSV use designations would be in compliance with existing ROS classes, maintaining a variety of both motorized and non-motorized recreation opportunities available across the national forest. Primitive and semi-primitive non-motorized areas would not be designated for OSV use (with the exception of the Grouse Management Area (041) and a small portion of the Sunflower Management Area (091) where public OSV use is allowed in the winter), while motorized opportunities would be available in semi-primitive motorized, roaded natural, and rural settings.

The forestwide requirement that cross-country travel is only allowed when there is adequate snow depth to avoid damage to resources, typically 12 inches, may impose additional limitations on OSV use, although it is likely that most OSV owners would not ride with less than adequate snow depths to prevent damage to their OSVs. Establishing the forestwide snow depth requirement for cross-country OSV use

¹⁶ Hybrid users utilize OSVs to reach desired locations for non-motorized activities further away from trailheads than what could be reached by human powered means.

would minimize impacts to soil, water, vegetation, and wildlife resources, as described in the relevant sections of this analysis. The requirement that public OSV use on snow trails is only allowed when there is adequate snow depth to avoid damage to resources, typically 6 inches would allow access to higher elevations and deeper snow conditions on and off trails.

Conflicts between Motorized and Non-motorized Winter Experiences

Based on 22,410 OSV visits per winter season, if use were spread evenly across each day of the season, there would be approximately 213 OSVs on the forest per day. Daily use may be higher during weekends and holidays and lower during the week. For the alternative 2, this equates to 1,928 acres and 1.2 miles of groomed trail per OSV. Based on the OSV use assumption that most OSV use would be concentrated along groomed trails, the trail opportunities in alternative 2 would be essentially the same as in existing conditions. The change from the existing 3,014 acres per OSV to 1,928 acres per OSV would not be likely to increase use conflict, especially since the majority of the acreage difference between the two figures is low-elevation terrain that seldom receives sufficient snow for a quality winter recreational experience. There is still likely adequate acreage to disperse the OSV use and minimize use conflict. Potential conflicts between motorized and non-motorized uses would be most likely to occur on 131,247 acres that are highly desirable for non-motorized activities (within 5 miles of plowed trailheads) and would also be designated for motorized OSV use.

Motorized use has inherent conflicts with non-motorized recreationists who are typically seeking a quiet recreation setting that is not influenced by the sight, sound, or exhaust smell of motorized vehicles. There are also inherent conflicts in that motorized OSVs travel much faster and farther than non-motorized recreationists. Public OSV use may impact the setting for non-motorized experiences by making tracks through the snow that often crisscross across the landscape, leaving visual evidence of motorized use. The tracks only remain on the landscape until they are covered by additional snowfall or until the snow melts, and do not cause long-term impacts to scenery or the underlying soils and vegetation (see additional analysis in the applicable resource sections of this analysis). OSV tracks can interfere with cross-country skiing by causing ruts in the trails, and since OSVs travel faster and farther than non-motorized recreationists, they often “consume” the fresh powder slopes, limiting opportunities for backcountry skiers who are seeking similar opportunities on snow covered slopes (Snowlands 2015).

Non-motorized winter recreation enthusiasts may continue to be displaced in some areas by motorized OSV use. Displacement or conflict may occur where non-motorized recreationists are unable to access areas for desired quiet, non-motorized experiences away from the sights, sounds, and smells of motorized use without traveling long distances through motorized routes and areas, or traveling further than they are physically able to traverse in a typical day. There are approximately 62,695 acres available for high-quality, quiet, non-motorized winter activities and 10.2 miles of cross-country ski trails and 20.5 miles of the PCT within 5 miles of plowed trailheads. These areas are free from motorized use and are easily accessible by non-motorized visitors in a typical day trip. This is a 40,385-acre increase from alternative 1. There are a total of approximately 425,570 acres across the Tahoe National Forest available for quiet, non-motorized experiences, where OSV use is not designated. Alternative 2 would provide more high-quality, quiet, non-motorized opportunities than alternatives 1 and 4, resulting in fewer conflicts between motorized and non-motorized uses, compared to the existing conditions, but fewer quiet non-motorized opportunities as in alternatives 3 and 5.

An approximate 1 percent increase in the miles of OSV trail currently available for grooming would provide about the same amount of opportunities for motorized OSVs.

Two classes of OSV have been identified and were changed from the DEIS to the FEIS in response to comments to the DEIS. Class 1 OSVs are over-snow vehicles that typically exert 1.5 pounds per square inch (PSI) or less and include the following OSV types: snowmobiles, tracked motorcycles, snow-cats, tracked ATVs and tracked UTVs. Class 2 OSVs are over-snow vehicles that typically exert more than 1.5 PSI and include the following OSV types: tracked 4-wheel-drive SUVs and tracked 4-wheel-drive trucks. Class 1 OSVs are allowed on all designated OSV trails and areas. Class 2 OSVs are only allowed on designated OSV trails available for grooming. Only allowing Class 2 OSVs on designated OSV trails available for grooming reduces the potential for conflict between the different classes of OSVs. There are currently no known conflicts occurring between different classes of OSV use. Snowcats are used for grooming OSV trails. The grooming operations are conducted during the night or during low-use timeframes, if possible, to avoid conflicts with day use. Since snowcats groom the OSV trails, the trails would be wide enough to accommodate larger tracked OSVs (i.e., tracked ATVs, tracked SUVs, tracked 4x4 trucks and snowcats), in addition to snowmobiles; however, there is currently very little use by larger or higher PSI tracked OSVs within the Tahoe National Forest. Class 1 OSVs are allowed on all designated OSV trails and areas.

Monitoring of trailheads and groomed trail areas for user conflicts and public safety concerns would be implemented. If monitoring indicates that conflicts are occurring, the Tahoe National Forest would consider implementing site-specific controls as necessary (such as speed limits, segregated access points for motorized and non-motorized use, increased visitor information or increased on-site management presence).

Statutorily and Administratively Designated Areas

In alternative 2, the Mosquito Ridge OSV trail (along a section of Road 96 in the Foresthill East OSV area) would be available for grooming, rather than just a designated OSV trail. This would provide a groomed loop-riding opportunity from the Robinson Flat area around French Meadows Reservoir. Grooming this section of trail could increase use as compared to existing conditions; however, this use would not be expected to impact the Granite Chief Wilderness area, because the trail is located more than a mile to the west.

OSV use would be designated on 74,776 acres within inventoried roadless areas, fewer acres than in alternatives 1 and 4. Not designating OSV use in the High Loch Leven vicinity (expanded between the DEIS and FEIS to include Fisher Lake and its watershed, in response to comments to the DEIS) within the North Fork American River IRA would reduce potential impacts on roadless characteristics affected by OSV use, which include: (1) undisturbed or high-quality soil, water and air and (2) opportunities for solitude in this area. Portions of the East Yuba, Lakes Basin, Grouse Lakes, Castle Peak, and Duncan Canyon Inventoried Roadless Areas would be designated for OSV use and include areas where moderate to high OSV use occurs in the vicinity of nearby groomed trails. Portions of five other inventoried roadless areas also fall in areas that would be designated for OSV use; however, low to no OSV use is expected in these areas. Under alternative 2, approximately 13,800 acres of “unroaded” areas outside of IRAs would be designated for OSV use, with approximately 5,300 acres in unroaded areas where moderate to high OSV use is expected to occur. Alternative 2 proposes to designate 1.7 miles of an OSV trail not available for grooming (Andesite West Trail), which lies within the Castle Peak IRA along its western boundary; an additional 0.3 mile of this OSV trail is located in the identified unroaded area adjacent to the Castle Peak IRA. In addition, this alternative proposes to designate 0.2 mile of an OSV trail not available for grooming (Carpenter Ridge) that lie within the boundary of the Castle Peak IRA. Alternative 2 proposes no OSV trail designations within any other IRAs or unroaded areas in the forest.

No new roads, groomed OSV trails within IRAs or other unroaded areas, trailheads, or permanent developments are proposed under this alternative.

The roadless characteristics of high-quality or undisturbed soil, water, and air, and solitude within IRAs and other unroaded areas may be temporarily impacted when OSVs are present. Designating areas or trails for OSV use within and adjacent to IRAs or other unroaded areas does not reduce the potential that these areas could be considered under future planning efforts as potential wilderness. Impacts to the roadless area characteristics of solitude and undisturbed or high-quality soil, water, and air, which would occur when OSVs or their tracks were present, would be limited in scope and short-term.

Alternative 2 would designate OSV use in areas adjacent to the PCT segments within the Northeast Yuba, Sierraville West, Truckee, and Barker OSV analysis areas. Alternative 2 would not designate any areas for OSV use adjacent to the PCT segments within the Donner Summit, Summit West, and Granite Chief Wilderness OSV analysis areas. Alternative 2 would not designate OSV use adjacent to the PCT along the Trail segments that are typically used for non-motorized winter recreation such as cross-country skiing and snowshoeing (described in the existing conditions section), where noise conflicts may be problematic. In response to comments to the DEIS the OSV use designations were changed from the DEIS along the ridgeline between Tinker's Knob, Anderson Peak and near Mount Lincoln, pulling the OSV use designation boundary off the ridge toward the east from 300 to 500 feet to reduce potential conflict with, and noise impacts to, non-motorized winter recreationists using the PCT in that area traveling to and from the Benson Hut, Squaw Valley and Highway 40 or I-80. Areas not designated for OSV use adjacent to the PCT vary from 300 feet from the trail to several miles from the Trail. (Refer to the FEIS map of alternative 2 and FEIS, Appendix E. Mitigations to Address the Minimization Criteria in the Travel Regulations for Areas Designated for OSV Use: Donner Summit, Summit West, Truckee, and Yuba NE OSV Areas.)

Alternative 2 would designate 34 OSV crossings of the PCT located in the Barker, Sierraville West and Yuba Northeast OSV analysis areas. The 34 designated crossings includes 12 strategically located crossings that were added to alternative 2 between the DEIS and FEIS in response to comments to the DEIS expressing concerns over the safety and impracticability of having too few designated locations to cross the PCT, which traverses the forest at high elevation. Designating OSV crossings of the PCT would minimize the potential for motorized use to impact the trail experience and is consistent with the PCT comprehensive management plan. Limiting the locations where OSVs cross the trail would enhance the quiet, non-motorized experience while accommodating motorized access to OSV areas and maintaining OSV loop-riding opportunities. Identifying designated PCT crossings on the OSV use map would allow PCT visitors to know in advance where they may encounter OSVs crossing the trail, and would alert OSV riders to locations of potential non-motorized recreationists along the trail. This knowledge enhances both public safety and the experience expectations of visitors in these areas. Alternative 2 would minimize potential motorized OSV impacts to the non-motorized PCT experience to a greater extent than alternatives 1 and 4, but does not provide as much protection of the non-motorized PCT experience as in alternatives 3 and 5. The proposed areas to be designated, and not designated for OSV use along the PCT provide for multiple uses along the trail, while also considering the existence of the trail and where winter recreationists are likely to use the PCT, consistent with the management direction for the PCT in the Tahoe Forest Plan and the purpose and nature of the PCT (as expressed in the National Trails System Act of 1968 and the PCT Comprehensive Management Plan).

Table 29. Recreation resource indicators and measures for alternative 2 direct and indirect effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 2, Modified Proposed Action
Motorized Recreation Opportunities – cross-country	Opportunities for motorized winter uses	Size of areas (acres) designated for public OSV use, percent change from current management	410,703 acres designated for OSV use, 49 percent of the Tahoe NF. This is a 36 percent decrease from current management.
	Quality of OSV opportunities	Percent of designated acres that are considered high-quality OSV opportunities based on the high to moderate OSV use assumption categories	47 percent of acres designated for OSV use provide high-quality OSV opportunities. This totals to approximately 194,130 acres. OSV use is allowed when there is adequate snow depth to avoid damage to resources, typically a minimum of 12 inches
Motorized Recreation Opportunities – designated snow trails and snow trails available for grooming	OSV trail designations	Length (miles) of designated OSV trails available for grooming/Length (miles) of marked snow trails (ungroomed)	247 miles of designated National Forest System (NFS) OSV trails available for grooming 137 miles designated OSV trails not available for grooming OSV use on trails allowed when there is adequate snow depth to avoid damage to resources, typically a minimum of 6 inches
	Access to desired non-motorized recreation settings and opportunities	Size of area (acres) and length of trails (miles) available to non-motorized recreation enthusiasts within 5 miles of plowed trailheads	62,695 acres and 10.2 miles of cross-country ski trails and 20.5 miles of the PCT available for non-motorized recreation enthusiasts within 5 miles of plowed trailheads
Non-motorized Recreation Opportunities - displacement	Quality of non-motorized opportunities	Percent of acres available for quiet, non-motorized use that are within desired areas (defined as areas within 5 miles of plowed trailheads)	21 percent of the acres not designated for OSV use (available for quiet, non-motorized use) provide high-quality non-motorized opportunities, within 5 miles of plowed trailheads.
Non-motorized Recreation Conflicts – Public Safety	Areas and trails available to non-motorized recreation enthusiasts for quality non-motorized recreation experiences	Size of areas (acres) not designated for OSV use, percent change from current management	425,570 acres not designated for OSV use This is a 119 percent increase from current management (alternative 1)

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 2, Modified Proposed Action
Non-motorized Recreation Conflicts – Solitude, Air Quality, Scenery, Designated non-motorized areas	Proximity and frequency of OSV designations in relation to designated non-motorized areas	Distance of groomed public OSV snow trails from designated areas, number of OSV trails across linear designated areas	The closest OSV trail (available for grooming) to the Granite Chief Wilderness boundary is the Mosquito Ridge Trail (SNO12E16) groomed OSV trail, more than a mile to the west. OSV use is not allowed on the PCT. 34 PCT crossings would be designated. Fourteen of which are on roads (approximately 14 feet in width), and the other 20 are crossings of various widths (up to 0.25 mile wide), not on national forest transportation system roads
	Solitude	Size of areas (acres) that could be affected by noise/size of areas (acres) not designated for winter motorized use	410,703 acres designated for OSV use and possibly affected by noise 425,570 acres not designated for OSV use and available for quiet recreation
	Air Quality	Qualitative/narrative description of possible impacts (with reference to air quality analysis)	Possible short-term impacts to the experience of recreational visitors in the vicinity of OSVs and grooming equipment due to the smell of exhaust emissions (see air quality report).
	Scenery	Qualitative/narrative description of possible visual impacts	Cross-country OSV use creates temporary tracks in the snow that crisscross the landscape. The visual evidence of snowmobile use decreases as fresh snow covers the tracks and/or when the snow melts at the end of the season. OSV use areas are designated adjacent to the PCT in the Northeast Yuba, Sierraville West, Truckee, and Barker OSV areas, OSV use is not designated adjacent to the PCT in the Donner Summit, Summit West, and Granite Chief Wilderness areas.
	Potential conflict with other resource values	Proximity of OSV use related to other resource values (such as tribal/spiritual sites, sensitive wildlife areas, popular non-motorized winter recreation areas, populated areas, neighboring Federal lands, etc.).	One acre is not designated for OSV use to protect historic structures.

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 2, Modified Proposed Action
Statutorily and Administratively Designated Areas	Wilderness Attributes	Size of areas (acres) affected and duration of impact. Qualitative description for wilderness attributes	Opportunities for solitude may be temporarily affected due to the sights and sounds of OSVs near the wilderness boundaries. There are approximately 2,685 acres designated for OSV use within 0.5 mile of designated wilderness boundaries. The impacts would be short-term during the winter while snow depth is adequate for OSVs to access the area.
	Roadless Characteristics	Size of area (acres) affected and duration of impact. Qualitative description for roadless characteristics	Approximately 74,776 IRA acres and approximately 13,800 acres (approximately 5,300 acres conducive to OSV use) of other unroaded areas designated for OSV use. Short-term impacts to the roadless characteristics of (1) undisturbed soil, water, and (2) solitude during the winter while snow depth is adequate for OSVs to access the area. Fewer IRA acres that could be impacted by OSV use than in alternative 1.

Cumulative Effects

Recreation Settings and Opportunities

The OSV route designations and restrictions increase the management presence across the forest through additional signs, maps, and motorized route designations that visitors must understand and comply with, slightly impacting the managerial component of the forest setting. This could result in cumulative impacts when added to other ongoing and future national forest projects that place limitations or temporary restrictions on the recreating public, or that provide additional signs, maps, and motorized route designations that visitors must understand and comply with, such as the 2017 MVUM update.

The trailhead and parking lot plowing activities associated with the OSV trail grooming program would also increase the presence of management personnel in the area; however, this would not be a change from existing conditions.

The foreseeable project, the Little Truckee Summit Parking Improvement project could cumulatively enhance winter recreational activities in this area.

Conflicts between Motorized and Non-motorized Winter Experiences

Indirect impacts of noise from alternative 2 would be less than in alternative 1, based on the number of acres designated for OSV use, therefore the potential cumulative impacts to quiet recreation experiences when added to other forest management projects that could also generate noise, is less than in alternative 1. One present action that could lead to cumulative noise impacts is the Placer County Water Agency (PCWA) gate and associated authorization to plow 15 miles of the Mosquito Ridge road, since OSVs, snow plows could be operating in the same area at the same time.

A general assumption can be made that as an area's population increases over time, visitor use would also increase, along with the potential for use conflicts on the limited public recreation resources. However,

OSV use is also dependent on weather conditions and snowpack. OSV use has not increased at the rate that was anticipated in the 2009 State EIR. Due to the fluctuations in OSV use levels and winter conditions, it is difficult to accurately predict whether use conflicts would continue to increase over time. As the climate changes and snow levels rise, the area on the Tahoe National Forest with sufficient snow for OSV use would be reduced. This would potentially lead to a loss of motorized recreation opportunities, or increased use conflicts as both motorized and non-motorized winter visitors are spread across an area with less snow and shorter winter seasons.

Statutorily and Administratively Designated Areas

OSV use is prohibited in statutorily and administratively designated areas within the Tahoe National Forest, such as wilderness. There are no known potential cumulative impacts associated with the OSV prohibitions, which are in compliance with the relevant management direction for specific statutorily and administratively designated areas. Illegal encroachment by OSVs into areas not designated for OSV use could occur, but would be monitored and dealt with as a law enforcement issue. The proposed Squaw Valley to Alpine Meadows Base-to-Base Gondola Project along a portion of the eastern wilderness boundary, in addition to the OSV use designations in the Barker OSV area south of the wilderness may add to the presence of people and OSVs that could be seen and heard from within the wilderness during the winter months, temporarily having a cumulative impact to opportunities for solitude within the Granite Chief Wilderness area, primarily near the eastern and southern wilderness boundaries.

Alternative 3

Direct and Indirect Effects

Recreation Settings and Opportunities

Alternative 3 would designate OSV use on fewer acres than any of the alternatives. With additional areas not designated for OSVs, the opportunities for winter non-motorized use (in areas not influenced by the sights, sounds and exhaust smells of OSV use) are enhanced, and opportunities for winter motorized use are reduced. Alternative 3 would emphasize providing greater non-motorized winter recreation opportunities compared to current management; however, alternative 3 would also designate existing popular OSV cross-country areas and trails in the forest for public OSV use. Alternative 3 would provide the highest proportion of high-quality OSV use areas (defined by the high to moderate OSV use categories) relative to the acres designated for OSV use of all alternatives.

Groomed trail opportunities would be reduced by about 10 percent from existing conditions, slightly decreasing motorized trail opportunities.

In response to comments to the DEIS, alternative 3 in the FEIS increases the total miles of designated OSV trails that would not be available for grooming to enhance OSV and hybrid users' access by adding trails across selected private lands over existing Forest Service System roads with easements to provide legal OSV access between otherwise fragmented designated OSV areas on National Forest System lands.

The proposed 257,024 acres of OSV designations would be consistent with existing ROS classes, maintaining a variety of both motorized and non-motorized recreation opportunities available across the forest. Primitive and Semi-Primitive Non-Motorized areas would not to be designated for OSV use. In addition, the Grouse Management Area (041) would largely not be designated for OSV use. Winter motorized opportunities would be available in Semi-Primitive Motorized, Roaded Natural, and Rural settings. The additional areas not designated for OSV use, which are located primarily within the Semi-

Primitive Motorized ROS class, would not require a change the existing ROS class, but would reduce the influence of motorized OSV use within these areas and help minimize impacts from motorized use on non-motorized winter visitors.

The forestwide snow depth requirement of 18 inches for both trail and cross-country travel would impose additional limitations on OSV use. Although it is likely that most OSV owners would not ride with less than adequate snow depths to prevent damage to their OSVs, the required depth of 18 inches may preclude access to some areas with lower snowfall, and may shorten the riding season due to lower snow depths both early and late in the season.

Conflicts between Motorized and Non-motorized Winter Experiences

Alternative 3 would reduce acreage of areas designated for OSV use thereby enhancing opportunities for non-motorized experiences, and reducing the potential for conflict by providing greater separation of motorized and non-motorized uses compared to alternatives 1, 2, and 4.

Based on 22,410 OSV visits per winter season, if use were spread evenly across each day of the season, there would be approximately 213 OSVs on the forest per day. Daily use may be higher during weekends and holidays and lower during the week. For alternative 3, this equates to 1,303 acres and 1 mile of groomed trail per OSV. Based on the OSV use assumption that most OSV use would be concentrated along groomed trails, the trail opportunities in alternative 3 would be slightly less than in existing conditions. The change from the existing 3,014 acres per OSV to 1,303 acres per OSV, although potentially noticeable to OSV visitors in large part due to former popular OSV areas no longer being available, would not be likely to create use conflict, and there is still likely adequate acreage to disperse the use and avoid use conflict. Potential conflicts between motorized and non-motorized uses would be most likely to occur on 108,296 acres that are highly desirable for non-motorized activities (within 5 miles of plowed trailheads) and would also be designated for motorized OSV use.

Non-motorized winter recreation enthusiasts may continue to be displaced in some areas by motorized OSV use. Displacement or conflict may occur where non-motorized enthusiasts are unable to access areas for desired quiet, non-motorized experiences away from the sights, sounds, and smells of motorized use without traveling long distances through motorized routes and areas, or traveling further than they are physically able to traverse in a typical day. There are approximately 85,645 acres available for high-quality, quiet, non-motorized winter activities and 10.2 miles of cross-country ski trails and 20.5 miles of the PCT within 5 miles of plowed trailheads. These areas are free from motorized use and are easily accessible by non-motorized visitors in a typical day trip. This is a 63,335 acre increase from alternative 1. There are a total of approximately 558,589 acres across the Tahoe National Forest available for quiet, non-motorized experiences, where OSV use is not designated. There are also 1,408 acres designated for public cross-country OSV use in deer holding areas from January 1 through September 14, that are available for quiet recreation when OSVs are not present. Alternative 3 would provide more quiet non-motorized opportunities than any other alternative, resulting in fewer conflicts between motorized and non-motorized uses.

Class1 and class 2 OSVs would be defined and allowed or restricted as described in alternative 2. Based on current use levels, conflicts are not anticipated. Alternative 3 effects on potential conflicts related to snow trails available for grooming and monitoring would be the same as described for alternative 2.

Statutorily and Administratively Designated Areas

The designated OSV trail closest to the wilderness boundary is the Mosquito Ridge. This marked (not groomed) OSV trail follows a portion of NFS Road 96 and is located more than one mile from the western boundary of the Granite Chief Wilderness. This is the same as in the existing conditions, and no known wilderness incursions associated with this trail are anticipated.

OSV use would be designated on 40,203 acres within inventoried roadless areas, fewer than in alternatives 1, 2, or 4. The addition of areas not designated for OSV use, including the High Loch Leven area within the North Fork American River IRA and the PCT/Grubb, Devil's Canyon, Coon Canyon, and Summit Lake areas within the Castle Peak IRA would reduce potential impacts on roadless characteristics, which include undisturbed or high-quality soil, water, and air, and opportunities for solitude in these areas. Under alternative 3, approximately 7,800 acres of "unroaded" areas outside of IRAs would be designated for OSV use, with approximately 3,800 acres in unroaded areas where moderate to high OSV use is expected to occur. Alternative 3 proposes no OSV trail designations within any IRAs or unroaded areas in the forest. No new roads, groomed OSV trails within IRAs or other unroaded areas, trailheads, or permanent developments are proposed under this alternative.

The roadless characteristics of high-quality or undisturbed soil, water, and air, and solitude within IRAs and other unroaded areas may be temporarily impacted when OSVs are present. Designating areas or trails for OSV use within and adjacent to IRAs or other unroaded areas does not reduce the potential that these areas could be considered under future planning efforts as potential wilderness. Impacts to the roadless area characteristics of solitude and undisturbed or high-quality soil, water, and air, which would occur when OSVs or their tracks were present, would be limited in scope and short-term. Alternative 3 would not designate any OSV use in areas directly adjacent to the PCT for the entire length of the PCT through the Tahoe National Forest. In the Northeast Yuba and Sierraville West OSV analysis areas, the closest designated OSV areas are approximately 0.25 to 0.50 mile away from the PCT, the closest designated area to the PCT in the Donner Summit OSV area is approximately 1.5 miles away, and the closest designated area in the Truckee OSV area is approximately 3 miles away. No OSV use would be designated in the Summit West, Granite Chief, or Barker OSV areas in alternative 3. Three OSV crossings of the PCT would be designated, two over roads that are on the Tahoe National Forest MVUM, and one approximately 700 feet in width where the PCT overlays the Pass Creek Loop OSV trail on NFS Road 70, in the Sierraville West OSV analysis area. Fewer OSV crossings of the PCT would be designated than in all other alternatives, further minimizing the potential for OSVs to impact the non-motorized trail experience. Alternative 3 would reduce OSV connectivity between areas designated for OSV use on either side of the PCT. Alternative 3 would minimize impacts to the non-motorized PCT experience to a greater extent than alternatives 1, 2, and 4, and is similar to alternative 5.

Table 30. Recreation resource indicators and measures for alternative 3 direct and indirect effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 3
Motorized Recreation Opportunities – cross-country	Opportunities for motorized winter uses	Size of areas (acres) designated for public OSV use, percent change from current management	257,024 acres designated for OSV use, a 57 percent decrease from current management
	Quality of OSV opportunities	Percent of designated acres that are considered high-quality OSV opportunities based on the high to moderate OSV use assumption categories	54 percent of acres designated for OSV use provide high-quality OSV opportunities. This totals to approximately 151,215 acres. 18-inch minimum snow depth for OSV use cross-country
Motorized Recreation Opportunities – designated snow trails and snow trails available for grooming	OSV trail designations	Length (miles) of designated OSV trails available for grooming/Length (miles) of marked snow trails (ungroomed)	220 miles of designated OSV trails available for grooming
			60 miles of designated OSV trails not available for grooming 18-inch minimum snow depth for OSV use on trails 18-inch minimum snow depth for grooming
Non-motorized Recreation Opportunities - displacement	Access to desired non-motorized recreation settings and opportunities	Size of area (acres) and length of trails (miles) available to non-motorized recreation enthusiasts within 5 miles of plowed trailheads	85,645 acres and 10.2 miles of cross-country ski trails and 20.5 miles of the PCT available for non-motorized recreation enthusiasts within 5 miles of plowed trailheads
	Quality of non-motorized opportunities	Percent of acres available for quiet, non-motorized use that are within desired areas (defined as areas within 5 miles of plowed trailheads)	15 percent of the acres not designated for OSV use (available for quiet, non-motorized use) provide high-quality non-motorized opportunities, within 5 miles of plowed trailheads.
Non-motorized Recreation Conflicts – Public Safety	Areas and trails available to non-motorized recreation enthusiasts for quality non-motorized recreation experiences	Size of areas (acres) not designate for OSV use	558,689 acres OSV use not designated, this is a 188 percent increase from current management 1,408 acres designated for public cross-country OSV use in deer holding areas from January 1 through September 14, available for quiet recreation when OSVs are not present)

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 3
Non-motorized Recreation Conflicts – Solitude, Air Quality, Scenery, Designated non-motorized areas	Proximity and frequency of OSV designations in relation to designated non-motorized areas	Distance of groomed public OSV snow trails from designated areas, number of OSV trails across linear designated areas.	The closest OSV trail (available for grooming) to the Granite Chief Wilderness boundary is the Soda Springs groomed OSV trail (SNO-14E17), more than 3 miles to the west. OSV use is not allowed on the PCT and the Andesite Trail (3 miles). Three PCT crossings would be designated, 2 on national forest transportation system roads, and one approximately 700 feet in width where the PCT overlays the Pass Creek Loop OSV trail on Forest Road 70.
	Solitude	Size of areas (acres) that could be affected by noise/size of areas (acres) closed to winter motorized use	277,584 acres designated for OSV use and possibly affected by noise/558,689 acres not designated for OSV use and available for quiet recreation/1,408 acres designated for public cross-country OSV use in deer holding areas from January 1 through September 14, available for quiet recreation when OSVs are not present.
	Air Quality	Qualitative/narrative description of possible impacts (with reference to air quality analysis)	Short-term impacts that could affect the experience of recreational visitors in the vicinity of OSVs and grooming equipment due to the smell of exhaust emissions (see air quality report).
	Scenery	Qualitative/narrative description of possible visual impacts	Cross-country OSV use creates temporary tracks in the snow that crisscross the landscape. The visual evidence of snowmobile use decreases as fresh snow covers the tracks and/or when the snow melts at the end of the season. OSV use is generally not designated adjacent to the PCT in alternative 3. In the Northeast Yuba and Sierraville West OSV analysis areas, the closest designated OSV areas are approximately 0.25 to 0.5 mile away from the PCT, the closest designated area to the PCT in the Donner Summit OSV area is approximately 1.5 miles away, and the closest designated area in the Truckee OSV area is approximately 3 miles away. No OSV use is designated in the Summit West, Granite Chief, or Barker OSV areas.
	Potential conflict with other resource values	Proximity of OSV use related to other resource values (such as tribal/spiritual sites, sensitive wildlife areas, popular non-motorized winter recreation areas, populated areas, neighboring Federal lands, etc.).	One acre is not designated for OSV use to protect historic structures.

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 3
Statutorily and Administratively Designated Areas	Wilderness Attributes	Size of areas (acres) affected and duration of impact. Qualitative description for wilderness attributes	No areas are designated for OSV use within 0.5 mile of designated wilderness boundaries.
	Roadless Characteristics	Size of area (acres) affected and duration of impact. Qualitative description for roadless characteristics	Approximately 40,203 IRA acres and approximately 7,800 acres (approximately 3,800 acres conducive to OSV use) of other unroaded areas are designated for OSV use. Short-term impacts to the roadless characteristics of undisturbed soil, water, and air (short-term impacts to air quality due to the presence of OSV exhaust), and solitude (due to the sights and sounds of OSVs) during the winter while snow depth is adequate for OSVs to access the area. Fewer IRA acres would be impacted by OSV use than in alternatives 1, 2 and 4.

Cumulative Effects

The cumulative effects to recreation settings and opportunities from alternative 3 are similar to those described in alternative 2, with the following exceptions.

The cumulative effects related to conflicts between motorized and non-motorized winter experiences would be less than described in alternative 2. The indirect impacts of noise from alternative 3 would be less than in all other alternatives, based on the number of acres designated for OSV use, therefore, the potential cumulative impacts to quiet recreation experiences, when added to other forest management projects or activities that could also generate noise, is less than in all other alternatives.

Cumulative effects related to winter use near the Granite Chief Wilderness boundaries would be less than in alternative 2, because OSV use would not be designated in the Barker OSV area south of the wilderness boundary. The proposed Squaw Valley to Alpine Meadows Base-to-Base Gondola Project along a portion of the eastern wilderness boundary may add to the presence of people and OSVs that could be seen and heard from within the wilderness during the winter months, temporarily having a cumulative impact to opportunities for solitude within the Granite Chief Wilderness area, primarily near the eastern wilderness boundary.

Alternative 4

Direct and Indirect Effects

Recreation Settings and Opportunities

Alternative 4 would designate OSV use on the slightly fewer acres (641,708 acres) than in the existing conditions, alternative 1 (641,952 acres). Alternative 4 would emphasize providing opportunities for winter motorized recreation and would designate more acres for OSV use than all other alternatives; however, the proportion of designated acres that are considered high-quality OSV use areas (defined by the high to moderate OSV use categories) relative to the acres designated for OSV use is lower than alternatives 2, 3, and 5, and the same as alternative 1. The minimum snow depth of 12 inches for cross-country OSV use and 6 inches for trails would allow motorized recreational access to higher elevations

and adequate snow levels to a greater extent than alternative 3 or 5, but with slightly less flexibility than described in the alternative 2 proposed snow depth requirements.

Alternative 4 proposes no additional areas that would not be designated for OSV use, other than those areas closed under existing conditions, and the miles of groomed snow trails would increase.

In response to comments to the DEIS, alternative 4 in the FEIS would increase the total miles of designated OSV trails not available for grooming to enhance OSV and hybrid users' access by adding trails across selected private lands over existing National Forest System roads with easements to provide legal OSV access between otherwise fragmented designated OSV areas on National Forest System lands.

The proposed OSV designations would comply with existing ROS classes, maintaining a variety of both motorized and non-motorized recreation opportunities available across the national forest. Primitive and semi-primitive non-motorized areas would not be designated for OSV use (with the exception of the Grouse Management Area (041) and a small portion of the Sunflower Management Area (091) where OSV use is allowed in the winter), while motorized opportunities would be available in semi-primitive motorized, roaded natural, and rural settings.

Conflicts between Motorized and Non-motorized Winter Experiences

Alternative 4 would slightly decrease the acreage of areas designated for OSV as compared to alternative 1, thereby, providing approximately the same amount of opportunities for motorized experiences as are currently available.

Based on 22,410 OSV visits per winter season, if use were spread evenly across each day of the season, there would be approximately 213 OSVs on the forest per day. Daily use may be higher during weekends and holidays and lower during the week. For alternative 4, this equates to 3,013 acres and 1.2 miles of groomed trail per OSV. Based on the OSV use assumption that most OSV use would be concentrated along groomed trails, the trail opportunities in alternative 4 would be slightly more per OSV than in all action alternatives. The change from the existing 3,014 acres per OSV to 3,013 acres per OSV, would not be a noticeable change from existing conditions; there is adequate acreage to disperse the use and avoid use conflict. Potential conflicts between motorized and non-motorized uses would be most likely to occur on 171,633 acres that are highly desirable for non-motorized activities (within 5 miles of plowed trailheads) and would also be designated for motorized OSV use. This is the same as in existing conditions.

Non-motorized winter recreation enthusiasts may continue to be displaced in some areas by motorized OSV use. Displacement or conflict may occur where non-motorized enthusiasts are unable to access areas for desired quiet, non-motorized experiences away from the sights, sounds, and smells of motorized use without traveling long distances through motorized routes and areas, or traveling further than they are physically able to traverse in a typical day. There are approximately 22,310 acres available for high-quality, quiet, non-motorized winter activities and 10.2 miles of cross-country ski trails and 20.5 miles of the PCT within 5 miles of plowed trailheads. These areas are free from motorized use and are easily accessible by non-motorized visitors in a typical day trip. This is the same as in existing conditions, alternative 1, and is substantially lower than in all other alternatives. There are a total of 194,565 acres across the Tahoe National Forest available for quiet, non-motorized experiences, where OSV use is not designated. There are also 1,218 acres designated for public cross-country OSV use in deer holding areas from January 1 through September 14, available for quiet recreation when OSVs are not present. Alternative 4 would provide slightly fewer non-motorized opportunities than alternative 1, and

substantially fewer than in alternatives 2, 3, and 5, resulting in a higher potential for use conflicts in more areas of the forest.

An 8 percent increase in the miles of OSV trail available for grooming provides the most opportunities for motorized OSV trail use and has the potential to increase OSV use along the trail system, and the associated potential for conflicts as compared to the existing conditions.

Class 1 and Class 2 OSVs would be defined and allowed or restricted as described in alternative 2. Based on current use levels, conflicts are not anticipated. Alternative 4 effects on potential conflicts related to snow trails available for grooming and monitoring would be the same as described for alternative 2.

Statutorily and Administratively Designated Areas

In alternative 4, the Mosquito Ridge OSV trail (along a section of NFS road 96) would be available for grooming, rather than just a designated OSV trail not available for grooming. This would provide a groomed loop-riding opportunity from the Robinson Flat area around French Meadows Reservoir. Grooming this section of trail could slightly increase use as compared to existing conditions; however, this use would not be expected to impact the Granite Chief Wilderness area, since the trail is located more than one mile to the west.

Under alternative 4, OSV use would be designated on 110,120 acres within inventoried roadless areas, slightly more acreage than under alternative 1. Approximately 21,300 acres of “unroaded” areas outside of IRAs would be designated for OSV use, with approximately 5,900 acres in unroaded areas where moderate to high OSV use is expected to occur. Alternative 4 proposes to designate 1.7 miles of an OSV trail not available for grooming (Andesite West Trail), which lies within the Castle Peak IRA along its western boundary; an additional 0.3 mile of this OSV trail is located in the identified unroaded area adjacent to the Castle Peak IRA. Alternative 4 proposes no OSV trail designations within any other IRAs or unroaded areas in the forest. No new roads, groomed OSV trails within IRAs or other unroaded areas, trailheads, or permanent developments are proposed under this alternative.

The roadless characteristics of high-quality or undisturbed soil, water, and air, and solitude within IRAs and other unroaded areas may be temporarily impacted when OSVs are present. Potential impacts to roadless characteristics are the same as described in alternative 1. Designating areas or trails for OSV use within and adjacent to IRAs or other unroaded areas does not reduce the potential that these areas could be considered under future planning efforts as potential wilderness. Impacts to the roadless area characteristics of solitude and undisturbed or high-quality soil, water, and air, which would occur when OSVs or their tracks were present, would be limited in scope and short-term.

Alternative 4 would designate OSV use in areas adjacent to PCT segments within the Northeast Yuba, Sierraville West, Donner Summit (restricted use), Summit West, Truckee, and Barker OSV analysis areas. Alternative 4 would not designate any areas for OSV use adjacent to the PCT segments within the Granite Chief Wilderness OSV analysis area. Alternative 4 would designate 21 OSV crossings of the PCT located in the Barker, Sierraville West, and Yuba Northeast OSV analysis areas. Alternative 4 would designate more OSV use areas adjacent to the PCT compared to alternatives 2, 3, and 5, and therefore, has a higher potential for motorized OSV use to impact the non-motorized trail experience than the other action alternatives. However, OSV use is not designated adjacent to the PCT in areas along the PCT classified as “primitive” and “semi-primitive non-motorized” in the Tahoe National Forest Land and Resource Management Plan (USDA Forest Service 1990).

Potential impacts to the non-motorized trail experience along the PCT would be slightly more than in alternative 2, and substantially more than in alternatives 3 and 5.

Table 31. Recreation resource indicators and measures for alternative 4 direct and indirect effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 4
Motorized Recreation Opportunities – cross-country	Opportunities for motorized winter uses	Size of areas (acres) designated for public OSV use, percent change from current management	641,708 acres designated for OSV use, a 0.4 percent increase from current management
	Quality of OSV opportunities,	Percent of designated acres that are considered high-quality OSV opportunities based on the high to moderate OSV use assumption categories	34 percent of the acres designated for OSV use provide high-quality OSV opportunities. This totals to approximately 216,938 acres. 12-inch minimum snow depth for OSV use cross-country
Motorized Recreation Opportunities – designated snow trails and snow trails available for grooming	OSV trail designations	Length (miles) of designated OSV trails available for grooming/Length (miles) of marked snow trails (ungroomed)	262 miles of designated NFS OSV trails available for grooming 64 miles designated OSV trails not available for grooming 6-inch minimum snow depth for OSV use on trails 12-inch minimum snow depth for grooming
	Access to desired non-motorized recreation settings and opportunities	Size of area (acres) and length of trails (miles) available to non-motorized recreation enthusiasts within 5 miles of plowed trailheads	22,310 acres and 10.2 miles of cross-country ski trails and 20.5 miles of the PCT available for non-motorized recreation enthusiasts within 5 miles of plowed trailheads
Non-motorized Recreation Opportunities - displacement	Quality of non-motorized opportunities	Percent of acres available for quiet, non-motorized use that are within desired areas (defined as areas within 5 miles of plowed trailheads)	11 percent of the acres not designated for OSV use (available for quiet, non-motorized use) provide high-quality non-motorized opportunities, within 5 miles of plowed trailheads
	Areas and trails available to non-motorized recreation enthusiasts for quality non-motorized recreation experiences	Size of areas (acres) not designated for OSV use	194,565 acres not designated for OSV use. This is a slight decrease from current management 1,218 acres designated for public cross-country OSV use in deer holding areas from January 1 through September 14, available for non-motorized recreation when OSVs are not present

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 4
Non-motorized Recreation Conflicts – Solitude, Air Quality, Scenery, Designated non-motorized areas	Proximity and frequency of OSV designations in relation to designated non-motorized areas	Distance of groomed public OSV snow trails from designated areas, number of OSV trails across linear designated areas	The closest OSV trail (available for grooming) to the Granite Chief Wilderness boundary is the Mosquito Ridge OSV trail (SNO –12E16), more than one mile to the west. OSV use is not allowed on the PCT. 13 PCT crossings on national forest transportation system roads, 14 feet wide 8 PCT crossings not on roads would range in length from 0.15 miles to 1.31 miles
	Solitude	Size of areas (acres) that could be affected by noise/size of areas (acres) not designated to winter motorized use	641,708 acres designated for OSV use and possibly affected by noise /194,565 acres not designated for OSV use and available for quiet recreation/1,218 acres designated for public cross-country OSV use in deer holding areas from January 1 through September 14, available for quiet recreation when OSVs are not present
	Air Quality	Qualitative/narrative description of possible impacts (with reference to air quality analysis)	Short-term impacts that could affect the experience of recreational visitors in the vicinity of OSVs and grooming equipment due to the smell of exhaust emissions (see air quality report).
	Scenery	Qualitative/narrative description of possible visual impacts	Cross-country OSV use creates temporary tracks in the snow that crisscross the landscape. The visual evidence of snowmobile use decreases as fresh snow covers the tracks and/or when the snow melts at the end of the season. Alternative 4 designates OSV use in areas adjacent to PCT segments within the Northeast Yuba, Sierraville West, Donner Summit (restricted use), Summit West, Truckee, and Barker OSV analysis areas. Alternative 4 does not designate any areas for OSV use adjacent to the PCT segments within the Granite Chief Wilderness OSV analysis area
	Potential conflict with other resource values	Proximity of OSV use related to other resource values (such as tribal/spiritual sites, sensitive wildlife areas, popular non-motorized winter recreation areas, populated areas, neighboring Federal lands, etc.).	Existing conflict with historic structures at Robinson Flat. One acre not designated for OSV use to protect historic structures.

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 4
Statutorily and Administratively Designated Areas	Wilderness Attributes	Size of areas (acres) affected and duration of impact. Qualitative description for wilderness attributes	Opportunities for solitude may be temporarily affected due to the sights and sounds of OSVs near the wilderness boundaries. There are approximately 5,735 acres designated for OSV use within 0.5 mile of designated wilderness boundaries. The duration of the possible impacts would be short-term, during the winter while snow depth is adequate for OSVs to access the area.
	Roadless Characteristics	Size of area (acres) affected and duration of impact. Qualitative description for roadless characteristics	Approximately 110,120 IRA acres and approximately 21,300 acres (approximately 5,900 acres conducive to OSV use) of other unroaded areas are designated for OSV use. Short-term impacts to the roadless characteristics of (1) undisturbed soil, water, and air (short-term impacts to air quality due to the presence of OSV exhaust), and (2) solitude (due to the sights and sounds of OSVs) during the winter while snow depth is adequate for OSVs to access the area. Slightly more IRA acres could be impacted by OSVs than in alternative 1 (current management).

Cumulative Effects

The cumulative effects to recreation settings and opportunities from alternative 4 are similar to those described in alternative 2.

The cumulative effects related to conflicts between motorized and non-motorized winter experiences would be less than described in alternative 2. Indirect impacts of noise from alternative 4 would be slightly more than in alternative 1 and substantially more than alternatives 2, 3, and 5, based on the number of acres designated for OSV use, therefore the potential cumulative impacts to quiet recreation experiences when added to other forest management projects and activities that could also generate noise, is more than in all other alternatives.

Cumulative effects related to winter use near the Granite Chief Wilderness boundaries would occur, as describe in alternative 2, since the Barker OSV area south of the Wilderness would be designated for OSV use.

Alternative 5

Direct and Indirect Effects

Recreation Settings and Opportunities

In alternative 5, acres designated for cross-country OSV use would be slightly more than in alternative 3, but less than all other alternatives. Alternative 5 would provide fewer opportunities for motorized winter recreation experiences in the forest to emphasize protection of wildlife and other forest resources.

Alternative 5 would provide a higher proportion of high-quality OSV use areas (defined by the high to moderate OSV use categories) relative to the acres designated for OSV use than alternatives 1, 2, and 4.

In addition, alternative 5 would provide greater opportunities for non-motorized winter recreation activities compared to alternatives 1, 2, and 4.

Groomed trails mileage would be less than all other alternatives. This would reduce opportunities for motorized winter recreation compared to alternatives 1, 2, and 4, and would enhance opportunities for quiet, non-motorized activities across the forest. Howard's Loop OSV trail (available for grooming) would be changed to an out and back ride, eliminating a loop-riding opportunity, but it also would protect underlying soil, vegetation and aquatic species resources by not grooming or designating the segment of trail through a wet meadow that is not on an underlying road or trail. Actual groomed mileage varies and is based on snowfall and funding availability.

Not designating the designated Andesite Ridge trail (not available for grooming) would enhance quiet, non-motorized opportunities in the Andesite Ridge/Castle peak area. In response to comments to the DEIS, alternative 5 in the FEIS would increase the total miles of designated OSV trails not available for grooming. This would enhance OSV and hybrid users' access by adding trails across selected private lands over existing Forest Service System roads with easements to provide legal OSV access between otherwise fragmented designated OSV areas on National Forest System lands.

Additional areas that would not be designated for OSV use under alternative 5 include isolated parcels on Schallenberger Ridge adjacent to Donner Memorial State Park (these parcels would also not be designated for OSV use under alternatives 2 and 3), White Rock Lake, North and west sides of Mt. Lola, South flank of Sand Ridge, Grouse Ridge Area (which is also not designated for OSV use under alternative 3), inventoried roadless areas, primitive and semi-primitive non-motorized areas, and Prosser-Boca. Not designating these areas would further enhance opportunities for quiet, non-motorized use and reduce conflicts between motorized and non-motorized winter use across the forest.

The proposed OSV designations would comply with existing ROS classes, maintaining a variety of both motorized and non-motorized recreation opportunities available across the national forest. Primitive and Semi-Primitive Non-Motorized areas would not be designated for OSV use (including the Grouse Management Area (041)), while motorized opportunities would be available in Semi-Primitive Motorized, Roaded Natural and Rural settings. Not designating OSV use areas within the Semi-Primitive Motorized ROS class would not formally change the ROS class, but would reduce the influence of motorized OSV use within these areas and help minimize impacts to non-motorized winter visitors desiring a quiet recreation experience.

Requiring a minimum of 24 inches for OSV cross-country use and trail use could lead to a notable reduction in OSV opportunities during seasons, or portions of seasons with lower snowfall and in lower elevation areas of the forest. This reduction of OSV opportunities could increase over time as changing climatic conditions impacted snow conditions.

Conflicts between Motorized and Non-motorized Winter Experiences

Alternative 5 would reduce acreage of areas designated for OSV, as compared to all alternatives, except alternative 3, thereby enhancing opportunities for non-motorized experiences, and reducing the potential for conflict by providing greater separation of motorized and non-motorized uses compared to the alternatives 1, 2, and 4.

Based on 22,410 OSV visits per winter season, if use were spread evenly across each day of the season, there would be approximately 213 OSVs on the forest per day. Daily use may be higher during weekends and holidays and lower during the week. For the alternative 5, this equates to 1,420 acres and 1 mile of

groomed trail per OSV. Based on the OSV use assumption that most OSV use would be concentrated along groomed trails, the trail opportunities in alternative 5 would be essentially the same as in alternative 3. The change from the existing 3,014 acres per OSV to 1,420 acres per OSV, although potentially noticeable to OSV visitors in large part due to former popular OSV areas no longer being available, would not be likely to create use conflict, and there is still likely adequate acreage to disperse the use and avoid use conflict. Potential conflicts between motorized and non-motorized uses would be most likely to occur on 104,276 acres that are highly desirable for non-motorized activities (within 5 miles of plowed trailheads) and would also be designated for motorized OSV use.

Non-motorized winter recreation enthusiasts may continue to be displaced in some areas by motorized OSV use. Displacement or conflict may occur where non-motorized enthusiasts are unable to access areas for desired quiet, non-motorized experiences away from the sights, sounds, and smells of motorized use without traveling long distances through motorized routes and areas, or traveling farther than they are physically able to traverse in a typical day. There would be approximately 89,667 acres available for high-quality quiet, non-motorized winter activities, 10.2 miles of cross-country ski trails, and 20.5 miles of the PCT within 5 miles of plowed trailheads. These areas would be free from motorized use and easily accessible by non-motorized visitors in a typical day trip. Of all the alternatives, alternative 5 would have the most acres in this category. There would be a total of 533,862 acres across the Tahoe National Forest available for quiet, non-motorized experiences, where OSV use is not designated. Alternative 5 would provide slightly fewer acres for quiet non-motorized opportunities as compared to alternative 3. Compared to alternatives 1, 2, and 4, alternative 5 would substantially decrease the potential for conflicts between motorized and non-motorized use within the areas where OSV use is not designated.

Alternative 5 would provide the fewest miles of OSV trail available for grooming of all alternatives. The potential for OSV trail-related conflict would be less than in existing conditions.

In alternative 5, OSV use would be limited to designated OSV trails within 1 mile of existing OSV trailheads. This would enhance opportunities for non-motorized, quiet recreation in close proximity to plowed trailheads. This would help minimize conflict between motorized and non-motorized uses and improve the sense of public safety at shared trailheads by providing areas near trailheads where non-motorized enthusiasts could recreate without the concern of encountering OSVs traveling cross-country at high speeds.

Class 1 and Class 2 OSVs would be defined and allowed/restricted as described in alternative 2. Based on current use levels, conflicts are not anticipated. Alternative 5 effects on potential conflicts related to snow trails available for grooming and monitoring would be the same as described for alternative 2.

Statutorily and Administratively Designated Areas

The OSV trail closest to the Granite Chief Wilderness boundary is the Mosquito Ridge marked (not groomed) OSV trail, along a portion of NFS Road 96, located more than 1 mile to the west. This is the same as in the existing conditions, and no known wilderness incursions associated with this trail are anticipated.

OSV use would be designated on 5,161 acres within inventoried roadless areas, fewer than all other alternatives. This would enhance roadless characteristics related to naturalness, and outstanding opportunities for solitude or primitive and unconfined recreation in a majority of inventoried roadless areas across the forest. There would be minimal impacts to roadless characteristics of undisturbed or high-quality soil, water, air, and solitude because OSVs and their associated sights, sounds, and exhaust would not be present within a majority of IRA acres. Under alternative 5, approximately 8,000 acres of

“unroaded” areas outside of IRAs would be designated for OSV use, with approximately 3,600 acres in unroaded areas where moderate to high OSV use is expected to occur. Alternative 5 proposes no OSV trail designations within any IRAs or unroaded areas in the forest. No new roads, groomed OSV trails within IRAs or other unroaded areas, trailheads, or permanent developments are proposed under this alternative.

Alternative 5 would provide the most protection to roadless area characteristics when compared to all other alternatives. The roadless characteristics of high-quality or undisturbed soil, water, and air, and solitude within IRAs and other unroaded areas may be temporarily impacted when OSVs are present. Designating areas or trails for OSV use within and adjacent to IRAs or other unroaded areas would not reduce the potential that these areas could be considered under future planning efforts as potential wilderness. Impacts to the roadless area characteristics of solitude and undisturbed or high-quality soil, water, and air, which would occur when OSVs or their tracks were present, would be limited in scope and short-term.

Ten OSV crossings of the PCT would be designated on national forest transportation system roads displayed on the MVUM. Alternative 5 would be more restrictive on where OSVs are designated to cross the PCT when compared to alternatives 1, 2, and 4, but not as restrictive as alternative 3.

Alternative 5 would not designate OSV use adjacent to the PCT for the entire length of the PCT through the Tahoe National Forest. Alternative 5 would not designate OSV use adjacent to the PCT up to one-half mile in the visible lands on each side of the PCT or smaller as the visible landscape along the Trail would be smaller than one-half mile on each side of the trail due to topography (in the Northeast Yuba, Sierraville West, Donner Summit, Truckee and Barker OSV analysis areas). Alternative 5 would not designate any OSV use areas in the Summit West and Granite Chief Wilderness OSV Analysis areas. This would protect the trail experience for PCT visitors and would eliminate the potential for OSV use to impact the trail experience (other than on the 10 designated OSV crossings of the PCT) and reduce the potential for conflict between motorized and non-motorized uses. Alternative 5 would minimize potential impacts from OSVs on the non-motorized trail experience to a similar extent as in alternative 3, and substantially more than in alternatives 1, 2, and 4.

Table 32. Recreation resource indicators and measures for alternative 5 direct and indirect effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 5
Motorized Recreation Opportunities – cross-country	Opportunities for motorized winter uses	Size of areas (acres) designated for public OSV use, percent change from current management	302,411 acres designated for OSV use, a 53 percent decrease from current management
	Quality of OSV opportunities	Percent of designated acres that are considered high-quality OSV opportunities based on the high to moderate OSV use assumption categories	49 percent of the designated acres provide high-quality OSV opportunities. This totals approximately 147,919 acres.
			24-inch minimum snow depth for OSV use cross-country

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 5
Motorized Recreation Opportunities – designated snow trails and snow trails available for grooming	OSV trail designations	Length (miles) of designated OSV trails available for grooming/Length (miles) of marked snow trails (ungroomed)	215 miles of designated NFS OSV trails available for grooming 72 miles designated OSV trails (not available for grooming) 24-inch minimum snow depth for OSV use on trails 24-inch minimum snow depth for OSV use on trails 12-inch minimum snow depth for grooming
Non-motorized Recreation Opportunities - displacement	Access to desired non-motorized recreation settings and opportunities Quality of non-motorized opportunities	Size of area (acres) and length of trails (miles) available to non-motorized recreation enthusiasts within 5 miles of plowed trailheads Percent of acres available for quiet, non-motorized use that are within desired areas (defined as areas within 5 miles of plowed trailheads)	89,667 acres and 10.2 miles of cross-country ski trails and 20.5 miles of the PCT available for non-motorized recreation enthusiasts within 5 miles of plowed trailhead 17 percent of the acres not designated for OSV use (available for quiet, non-motorized use) provide high-quality non-motorized opportunities, within 5 miles of plowed trailheads.
Non-motorized Recreation Conflicts – Public Safety	Areas and trails available to non-motorized recreation enthusiasts for quality non-motorized recreation experiences	Size of areas (acres) not designated for OSV use	533,862 acres not designated for OSV use
Non-motorized Recreation Conflicts – Solitude, Air Quality, Scenery, Designated non-motorized areas	Proximity and frequency of OSV designations in relation to designated non-motorized areas	Distance of groomed public OSV snow trails from designated areas, number of OSV trails across linear designated areas	The closest OSV trail (available for grooming) to the Granite Chief Wilderness boundary is the Soda Springs groomed OSV trail (SNO-14E17), more than 3 miles to the west. OSV use is not allowed on the PCT. 10 PCT crossings would be designated on national forest transportation system roads. A non-motorized corridor up to one-half mile in the visible lands on each side of the PCT will be established.
	Solitude	Size of areas (acres) that could be affected by noise/size of areas (acres) would not be designated to winter motorized use	302,411 acres designated for OSV use and possibly affected by noise 533,862 acres not designated for OSV use and available for quiet recreation

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 5
Non-motorized Recreation Conflicts – Solitude, Air Quality, Scenery, Designated non-motorized areas (continued)	Air Quality	Qualitative/narrative description of possible impacts (with reference to air quality analysis)	Short-term impacts that could affect the experience of recreational visitors in the vicinity of OSVs and grooming equipment due to the smell of exhaust emissions (see air quality report).
	Scenery	Qualitative/narrative description of possible visual impacts	Cross-country OSV use creates temporary tracks in the snow that crisscross the landscape. The visual evidence of snowmobile use decreases as fresh snow covers the tracks and/or when the snow melts at the end of the season. Alternative 5 would not designate OSV use adjacent to the PCT up to one-half mile in the visible lands on each side of the Pacific Crest National Scenic Trail or smaller as the visible landscape along the Trail would be smaller than one-half mile on each side of the trail due to topography (in the Northeast Yuba, Sierraville West, Donner Summit, Truckee and Barker OSV analysis areas). Alternative 5 would not designate any OSV use areas in the Summit West and Granite Chief Wilderness OSV Analysis areas.
	Potential conflict with other resource values	Proximity of OSV use related to other resource values (such as tribal/ spiritual sites, sensitive wildlife areas, popular non-motorized winter recreation areas, populated areas, neighboring Federal lands, etc.).	Existing conflict with historic structures at Robinson Flat. One acre is not designated for OSV use to protect historic structures.
Statutorily and Administratively Designated Areas	Wilderness Attributes	Size of areas (acres) affected and duration of impact. Qualitative description for wilderness attributes	Opportunities for solitude may be temporarily affected due to the sights and sounds of OSVs near the wilderness boundaries, although to a lesser degree than in alternatives 1 through 4. There are approximately 2,518 acres designated for OSV use within 0.5 mile of designated wilderness boundaries. The duration of the potential impacts would be short-term, during the winter while snow depth is adequate for OSVs to access the area.

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 5
Statutorily and Administratively Designated Areas (continued)	Roadless Characteristics	Size of area (acres) affected and duration of impact. Qualitative description for roadless characteristics	Approximately 5,161 IRA acres and approximately 8,000 acres (approximately 3,600 acres conducive to OSV use) of other unroaded areas would be designated for OSV use. Short-term impacts to (1) undisturbed or high-quality soil, water, and air (short-term impacts to air quality due to presence of OSV exhaust), and (2) solitude (due to the sights and sounds of OSVs) during the winter, while snow depth is adequate for OSVs to access the area. Alternative 5 would provide the most protection for roadless area characteristics when compared to all other alternatives.

Cumulative Effects

The cumulative effects to recreation settings and opportunities from alternative 5 are similar to those described in alternative 2.

The cumulative effects related to conflicts between motorized and non-motorized winter experiences would be less than described in alternative 2. The indirect impacts of noise from alternative 5 would be substantially less than in alternatives 1, 2, and 4, and slightly more than in alternative 3, based on the number of acres designated for OSV use, therefore, the potential cumulative impacts to quiet recreation experiences when added to other forest management projects or activities that could also generate noise, is less than in alternatives 1, 2, and 4, and slightly more than in alternative 3.

Cumulative effects related to winter use near the Granite Chief Wilderness boundaries would occur in alternative 5, but to a lesser degree than in alternative 2 or 4, since fewer acres would be designated for OSV use in the Barker OSV area, south of the wilderness boundary. The proposed Squaw Valley to Alpine Meadows Base-to-Base Gondola Project along a portion of the eastern wilderness boundary may add to the presence of people and OSVs that could be seen and heard from within the wilderness during the winter months, temporarily having a cumulative impact to opportunities for solitude within the Granite Chief Wilderness area, primarily near the eastern wilderness boundary.

Summary of Environmental Effects

Recreation Settings and Opportunities

Alternatives 2 and 4 would increase the miles of snow trail available for grooming. Alternatives 3 and 5 would reduce the amount of snow trail available for grooming as compared to the existing conditions. Cross-country travel by OSV would be limited by minimum snow depth requirements for all action alternatives; however, alternative 2 would provide the most flexibility in application of the minimum snow depth by requiring only adequate snow depth to avoid damage to resources. Alternative 5 represents the most restrictive snow depth requirement of 24 inches for both cross-country travel and travel on OSV trails. Alternatives 2 and 4 would provide the most access for motorized OSV use; alternative 3 would

enhance opportunities for quiet, non-motorized recreation with substantially more acreage where OSV use would not be designated. Overall, alternatives 3 and 5 would provide the most non-motorized winter recreation opportunities.

For this analysis, OSV opportunities across the Tahoe National Forest were mapped based on the OSV use assumptions criteria (listed in the Methodology section above). The areas that fall within the high to moderate OSV use areas are considered to provide high-quality OSV opportunities based on the proximity to groomed trails and plowed trailheads, open meadows with trail access, and slopes with open vegetation near groomed trails, as well as areas specified by Tahoe National Forest recreation specialists with years of experience observing OSV use patterns. Alternative 3 would provide the highest proportion of high-quality OSV use areas relative to the acres designated for OSV use in this alternative, as defined by the high to moderate OSV use assumption categories, but the second least total acres of high-quality OSV use areas (151,215). Alternatives 2 and 5 would provide approximately the same percentage of high-quality OSV use areas as a proportion of designated OSV use areas, but their total acres of high-quality OSV use areas differ considerably (Alt. 2 – 194,130, Alt. 5 – 147,919). Alternative 4 would provide about the same percentage of high-quality OSV use areas as alternative 1, and have similar total acres of high-quality OSV use acres (Alt. 4 – 216,938, Alt. 1 – 216,950).

Of the acres not designated for OSV use, and available for quiet, non-motorized recreation, alternative 5 would provide the highest percentage (17 percent) and total acres (89,667) of high-quality, desirable, non-motorized opportunities as defined as areas within 5 miles of plowed trailheads. Alternatives 2 and 3 would provide about the same percentage (15 percent) of high-quality non-motorized opportunities, though alternative 3 would have considerably more total acres in this category (Alt. 2 – 62,695, Alt. 3 – 89,645). Alternatives 1 and 4 would provide substantially fewer high-quality, desirable, non-motorized opportunities than all other alternatives in percentage (11 percent) and in total acres (Alt. 1 – 22,310 acres, Alt. 4 – 22,310 acres).

Conflicts between Motorized and Non-motorized Uses

All action alternatives minimize conflicts between motorized and non-motorized uses to some degree by designating a clear system of OSV trails and Areas, and development of the subsequent OSV use maps that would allow visitors to choose areas to recreate that would best meet their expectations and desired settings.

The potential for conflict between motorized and non-motorized uses is most likely to occur where OSV use is designated in areas that are also highly desirable for non-motorized winter activities (within 5 miles of plowed trailheads). The acres where the overlap between motorized OSV designations and areas highly desirable for non-motorized winter use would be highest in alternatives 1 and 4 with 171,633 acres of overlap, followed by alternative 2 with 131,247 acres of overlap, alternative 3 with 108,296 acres of overlap, and lowest in alternative 5 with 104,276 acres of overlap.

Alternative 3 would minimize conflicts between motorized and non-motorized uses to a greater extent than proposed in alternatives 2 and 4, by designating additional areas where OSV use is not designated. Alternative 5 would further minimize conflicts by not designating areas for OSV use within a 1-mile buffer around plowed trailheads, and would maintain the quiet, non-motorized experience along the PCT by not designating OSV use adjacent to the PCT up to 0.5 mile in the visible lands on each side of the PCT or smaller as the visible landscape along the trail would be smaller than 0.5 mile on each side of the trail due to topography. These designations provide separate areas for non-motorized recreation that are not influenced by the noise, smell of exhaust and presence of OSVs.

Alternatives 1, 2, and 4 would provide the most acres designated for public OSV use, and therefore, have the potential for continued or increased conflict between motorized and non-motorized uses in the future.

Alternative 2 would substantially increase opportunities for quiet, non-motorized use, while also slightly increasing OSV trail opportunities. Alternative 3 would substantially increase opportunities for quiet non-motorized use and reduce the amount of OSV trail opportunities as compared to existing conditions. Alternative 4 would provide approximately the same amount of quiet, non-motorized opportunities as in existing conditions, alternative 1, but would increase OSV trail opportunities. Alternative 5 would substantially increase opportunities for quiet, non-motorized use and reduce the amount of OSV trail opportunities as in existing conditions.

Alternatives 2, 3, 4 and 5 minimize potential conflicts between different classes of OSVs by allowing the higher PSI Class 2 OSVs only on OSV trails available for grooming.

Statutorily and Administratively Designated Areas

Potential impacts to designated wilderness from the OSV trail system are minimal, and the same in all alternatives. There would be fewer acres designated for OSV use adjacent to wilderness in alternative 3 than in all other alternatives. Alternative 5 would provide additional protection of the roadless characteristics by designating OSV use in fewer inventoried roadless area acres than the other alternatives. None of the alternatives would designate OSV use along the Wild and Scenic North Fork of the American River.

All of the action alternatives would designate OSV crossings of the PCT that would minimize the influence of motorized use on non-motorized opportunities and quiet settings along the trail. The alternatives would provide a range of OSV crossings (including varying crossing widths) of the PCT. The purpose of these crossings is to allow OSV users to get across the PCT in situations where OSV use is designated in areas located on either side of the trail. In all cases, OSV users would be required to cross the PCT at 90 degrees, or as close to 90 degrees as is safe to cross, to minimize the time and distance needed to cross the trail, and OSV users would be required to cross the PCT at the designated location, or as close to the designated location as is safe. These situational variance allowances for the PCT designated crossings were added to the FEIS based on comments to the DEIS, and are designed for the safety of OSV users in light of highly variable snow conditions that could create a hazardous crossing for a particular angle of approach or location.

Alternative 2 would designate a total of 34 crossings to address safety concerns as well as the practicality of crossing the Trail in the wintertime. Alternative 4 proposes 21 designated OSV crossings of the PCT, 13 of which utilize existing roads and 8 of which do not overlie roads and vary in width from 0.13 to 1.31 miles. Alternative 5 has 10 designated OSV crossings of the PCT. All 10 crossings are located on existing roads designated on the Tahoe National Forest MVUM, and in one instance, the current PCT alignment is located on an existing road (NFS Road 70) for approximately 700 feet. Alternative 3 proposes the fewest number of OSV crossings of the PCT, a total of three crossings.

The four action alternatives present a range of designated OSV use areas adjacent to the PCT. Alternative 2 focuses on not designating OSV use adjacent to the Trail in areas where wintertime use of the PCT is most likely to occur and where noise may be an issue for wintertime users of the PCT. Alternatives 3 and 5 would not designate OSV use adjacent to the PCT for the entire length of the Trail through the Tahoe National Forest. Alternative 5 would further protect the PCT experience by not designating OSV use in areas within the Forest Service Scenery Management System definition of foreground for the PCT. Alternative 4 relies on existing Forest Plan OSV use designations, and, as such, it would designate more

areas adjacent to the PCT than alternatives 2, 3, and 5. However, OSV use would not be designated adjacent to the PCT in areas along the PCT classified as primitive and semi-primitive non-motorized in the Tahoe National Forest Land and Resource Management Plan (USDA Forest Service 1990). Alternative 4 would not designate OSV use adjacent to the PCT in the Castle Valley/Round Valley area. None of the alternatives would designate OSV use adjacent to the PCT in the Granite Chief Wilderness.

Impacts of the Forest Plan Amendment

As stated in chapter 2, the responsible official has determined that the proposed plan amendment is directly related to 36 CFR 219.10 Multiple Use, (a)(1) recreation settings and opportunities. The health and resiliency of the Tahoe National Forest's natural resources are critical to the sustained delivery of nature-based recreation settings and opportunities. As such, recreation settings and opportunities need to be compatible with the landscape's ability to support associated types of activities, use levels, access, and infrastructure. Motorized recreation opportunity spectrum (ROS) classes are located on landscapes where the topography, geology, and soils can support motorized use and the associated roads and motorized trails. The ROS provides a framework where recreational opportunities, activities and expected experiences are integrated to ensure compatibility with the landscape's natural and cultural resource values. The ROS establishes recreational settings particularly informative for decisions on infrastructure and the built environment, but is not intended to be the sole framework for managing recreational uses and activities.

The Tahoe National Forest Land and Resource Management Plan (USDA Forest Service 1990) established public OSV use through standards and guidelines for each management area that were associated with ROS classifications. Management areas were open to OSV use or closed to OSV use or OSVs were restricted to designated routes only (FEIS, volume II, appendix B). To modernize the Tahoe National Forest's approach, the responsible official has proposed to adopt a forestwide standard to "manage over the snow vehicle (OSV) use through designation of areas and trails consistent with travel management regulations," which would replace the LRMP's 1990 standards and guidelines. Such an approach would continue to require project-level OSV use designation decisions to be consistent with management direction in the LRMP, as amended, including ROS classifications. However, adhering to the Travel Management Rule's designation criteria at 36 CFR 212.55, which requires a granular, site-specific approach to designating areas and trails for public OSV, enables the Forest Service to consider factors in addition to ROS that contribute to sustained delivery of nature-based recreation. In applying the Travel Management Rule's criteria for designating OSV trails, and areas (36 CFR 212.55), the Forest Service would be proposing, analyzing, and making OSV use designations in a manner that was not contemplated or required when the LRMP was adopted in 1990.

The proposed plan amendment would not change the existing LRMP's ROS classifications. Rather, the forest plan amendment would appropriately place OSV use designations at the project-level, with each designation requiring site-specific planning, environmental analysis, and decision-making. Project-level planning and analysis would allow the Responsible Official to more rapidly and efficiently make changes to OSV use designations as needed to respond to changing conditions and/or new monitoring information. The proposed amendment would allow the Forest Service to more rapidly adapt site-specific OSV use designations to new information and/or changed circumstances as a forest plan amendment would not be required to make changes in use designations.

Compliance with LRMP and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1, no action, would not comply with Subpart C of the Travel Management Rule that requires designation of roads, trails, and areas on National Forest System lands to provide for over-snow vehicle use.

Alternatives 2, 3, 4, and 5 would comply with Subpart C of the Travel Management rule. The Tahoe National Forest Land and Resource Management Plan would be amended under these alternatives to ensure the Subpart C Travel Management Rule designations would be consistent with the Forest Plan.

Other Relevant Mandatory Disclosures

Short-term Uses and Long-term Productivity

Short-term uses will not affect the long-term productivity of recreation resources.

Unavoidable Adverse Effects

Allowing motorized OSV use, which is an acceptable use of National Forest System lands, unavoidably affects non-motorized or quiet opportunities in some areas, as discussed in the analysis related to conflicts between motorized and non-motorized winter experiences.

Irreversible and Irretrievable Commitments of Resources

OSV trail and area designations are not irreversible and irretrievable commitments of resources.

Noise

Relevant Laws, Regulations, and Policy

Regulatory Framework

National Forest Management Act

Specifically for off-highway vehicle management, the National Forest Management Act requires that this use be planned and implemented to protect land and other resources, promote public safety, and minimize conflicts with other uses of the National Forest System lands. The National Forest Management Act also requires that a broad spectrum of forest and rangeland-related outdoor recreation opportunities be provided that respond to current and anticipated user demands.

Sierra Nevada Forest Plan Amendment

The Sierra Nevada Forest Plan Amendment established standards and guidelines specific to wheeled motor vehicle travel off of designated routes, trails, and limited OHV use areas. Unless otherwise restricted by current forest plans or other specific area standards and guidelines or Forest Orders, cross-country travel by OSVs would continue, Forestwide Standard and Guideline number 69 (USDA Forest Service 2009b).

Land and Resource Management Plan

The *Tahoe National Forest Land and Resource Management Plan* (LRMP) (USDA Forest Service 1990) as amended provides forestwide and management area-specific goals and strategies, desired future conditions, land allocation, and standards and guidelines relevant to this noise analysis as follows:

Management Goals and Strategies:

Recreation

Recognize the value of semi-primitive motorized (SPM) and non-motorized (SPNM) areas in the forest because of their scarcity and the demand for the few acres remaining. Closely monitor the loss of inventoried SPNM and SPM land that is not allocated in the Plan for these ROS classes. Where possible, avoid losing SPM and SPNM areas during the planning period by considering options that would not road the areas significantly.

Wilderness

Manage the Granite Chief Wilderness area to preserve the wilderness character of its living and nonliving components and to provide for compatible human use and enjoyment.

Provide quality wilderness experiences for the public.

Management Standards and Guidelines

OSV Use

The Tahoe National Forest LRMP uses standards and guidelines to establish OSV use designations across the Tahoe National Forest. Each of the forest's 109 management areas has a standards and guidelines that specifies whether: (1) the management area is open to OSV travel (for example, the Lavezzola Management Area, LRMP, pg. V-95) or (2) closed to OSV travel (for example, the Coolbrith Management Area, LRMP, pg. V-85) or (3) OSVs are restricted to designated routes (for example, the Queens Management Area, LRMP, pg. V-339). Some of the forest's management areas have a standard and guideline that closes a portion of the management area to OSVs, sometimes during a particular season (for example, the Pendola Management Area, LRMP, pg. V-174). Appendix B displays the Tahoe National Forest LRMP OSV use standards and guidelines for each of the Forest Plan's 109 management area.

Recreation Opportunity Spectrum

The Tahoe National Forest LRMP uses forestwide standards and guidelines to define the following Recreation Opportunity Spectrum classes: Primitive (P), Semi Primitive Non-Motorized (SPNM), Semi Primitive Motorized (SPM), Roaded Natural (RN), Rural (R), and Modern Urban (MU) (LRMP, Forestwide Standards and Guidelines #8 through #13, pp. V-20 through V-22). Each of the Forest Plan's 109 management areas is assigned an ROS class (LRMP, pp. V-69 through V-544).

Pacific Crest National Scenic Trail

The Tahoe National Forest LRMP applies the following management area-specific standard and guideline to the 13 management areas through which the Pacific Crest National Scenic Trail (PCT) traverses: "The standards and guidelines for location, design, signing, user facilities, and management of the PCNST [PCT] will be in accordance with the criteria established in the PCNST [PCT] Comprehensive Plan, 1/18/82" (LRMP, pg. V-64).

The 1982 Comprehensive Plan provides the following direction for winter use along the Pacific Crest National Scenic Trail:

Winter use (cross-country skiing and snowshoeing) should be accommodated where practical and feasible. Each agency should follow its own procedures for marking and signing the trail for winter use purposes. As a guideline, all trail markers should be at eye level (approximately 40 inches above average maximum snow depth). Sanitation facilities and snow removal for parking may be necessary. Any improvements, or alterations of the vegetation, should not detract from the quality of the recreation opportunities for other trail activities such as hiking and horseback riding.

Snowmobiling along the trail is prohibited by the National Trails System Act, P.L. 90-543, Section 7(c). Winter sports plans for areas through which the trail passes should consider this prohibition in determining areas appropriate for snowmobile use. Winter sports brochures should indicate designated snowmobile crossings on the Pacific Crest Trail where it is signed and marked for winter use. If cross-country skiing and/or snowshoeing is planned for the trail, any motorized use of adjacent land should be zoned to mitigate the noise of conflict.

Federal Law

The proposed OSV designations will be reviewed to determine their consistency with the following applicable laws, regulations and policies:

- Wilderness Act of 1964 and applicable Wilderness Implementation Plans
- National Trails System Act of 1968 (P.L. 90-543) and the Pacific Crest National Scenic Trail Comprehensive Plan
- 2005 Travel Management Rule – Subpart C (36 CFR Parts 212 and 261) as amended in 2015 - Use by Over-snow Vehicles (Travel Management Rule)

Executive Orders

Executive Order 11644 of February 8, 1972, as amended by Executive Order 11989 of May 24, 1977, and by Executive Order 12608 of September 9, 1987, requires certain Federal agencies, including the Forest Service, to “ensure that the use of off-road vehicles on public lands [is] controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands.”

State and Local Law

California Vehicle Code (CVC) Section 27200 – regulates noise emitted by vehicles.

CVC Section 27203 limits noise at 82 dBA for snowmobiles manufactured after 1972. Noise levels generated by OSVs are further limited through manufacturer restrictions. Snowmobiles produced since February 1, 1975, and certified by the Snowmobile Safety and Certification Committee’s independent testing company emit no more than 78 dBA from a distance of 50 feet while traveling at full throttle when tested under the Society of Automotive Engineers (SAE) J192 procedures. Additionally, those produced after June 30, 1976, and certified by the Snowmobile Safety and Certification Committee’s independent testing company emit no more than 73 dBA at 50 feet while traveling at 15 mph when tested under SAE J1161 procedures (California Department of Parks and Recreation 2010).

OSV use on county roads and National Forest System lands are subject to the State standards described above. The Tahoe LRMP does not identify standards and guidelines regulating noise emissions of forest activities (California Department of Parks and Recreation 2010).

Methodology

This analysis uses SPreAD-GIS: an ArcGIS toolbox for modeling the propagation of engine noise in a wildland setting Version 2.0. SPreAD-GIS is based on the System for the Prediction of Acoustic Detection, a model developed by the Forest Service and Environmental Protection Agency to predict and plan for recreation opportunities in national forests. Input data include commonly available datasets including:

- Digital elevation model (DEM)
- Land cover
- Local weather conditions (average air temp, relative humidity, wind speed and direction for given season)
- Sound source characteristics (from a table of built in source types)
- Ambient sound conditions (a tool is available to estimate this based on land cover and a table of background sound for various environmental conditions)

Resource Indicators and Measures

Resource indicators and measures shown in table 19 will be used to measure and disclose effects to noise related to OSV use designations and grooming trails for OSV use.

Table 33. Resource indicators and measures for noise

Resource Element	Resource Indicator	Measure (Quantify if possible)
Noise	Opportunities for motorized winter uses	Size of areas (acres) open to public, cross-country OSV use; percentage change compared to current management. Acres and percent of designated acres that are anticipated to have high to moderate OSV use levels and the associated potential for noise impacts.
	OSV designations	Length of snow trails (miles), groomed and ungroomed, designated and identified for public OSV use

Spatial and Temporal Context for Effects Analysis

Spatial Context

The spatial boundaries for analyzing the direct and indirect effects to noise are within the Tahoe National Forest boundary, because the proposed OSV designation decision would apply to OSV trails and areas within the forest boundary.

The spatial boundaries for analyzing cumulative effects to noise are within the Tahoe National Forest boundary, because the OSV designations would apply to OSV trails and areas within the forest boundary and have the potential to cumulatively impact OSV recreation experiences and opportunities across the forest.

Effects Timeframe

The temporal boundaries for analyzing the direct and indirect effects to noise are, in the short term, one year and in the long term up to 20 years. Short-term effects such as changes in the acres that could be impacted by OSV noise would occur upon implementation of the OSV designation decision. Long-term effects such as decreases in user conflicts due to effective management of OSV use through a designated OSV system of trails and areas would occur over the life of the decision.

The temporal boundaries for analyzing cumulative effects to noise are up to 20 years, because the OSV designations would remain in effect over the long term, and would therefore, overlap in time with other forest management activities with potential to cumulatively impact OSV recreation experiences and opportunities.

Affected Environment

Noise

The sounds associated with OSV use and the ancillary activities of operating plowing and grooming equipment associated with the winter OSV activities may be interpreted as noise with possible impacts to other recreational uses and wildlife resources. These effects are specifically addressed in the Recreation and Wildlife sections of this analysis.

Opportunities for quality recreation experiences depend on both the settings (physical, social, and managerial aspects), and on the desired experience of the visitor. Conflicts occur when one recreationist effects or degrades the experience of another. Many non-motorized recreationists experience conflict with motorized recreationists (Adams and McCool 2010). Conflict can result in displacement or the abandonment of the use of a particular trail or area, or a change in time of use (Adams and McCool 2010). Conflict related to noise may result if non-motorized recreationists are not able to achieve their desired experience due to the presence of noise from motorized use in the area.

Sound is a physical phenomenon, a vibration in the air that can be measured. Noise is an interpretation of sound, or a sound that has characteristics that may irritate or annoy a listener, interfere with a listener's activity, or in some other way be distinguished as unwanted (Harrison et al. 1980).

The acoustic impact of sound can be determined by measuring the inherent characteristics of the sound and considering that in conjunction with the setting in which the sound is heard and the individual attributes of the listener. Whether sounds are determined to be acceptable, or are interpreted as noise depends on the values and desires of the person making the judgement (Harrison et al. 1980).

As noted in the Recreation section of this document, conflict between motorized and non-motorized winter uses arise due to differing desired recreation experiences, public safety concerns, noise, air quality, and access issues. Public comments received during the scoping period for this analysis describe conflicts related to the creation of noise impacts that lead to the displacement of non-motorized recreationists.

Areas of specific concern to non-motorized enthusiasts who are typically seeking a quiet recreation setting that is not influenced by the sound of motorized vehicles include cross-country ski trails, the PCT, Wilderness, and Semi-Primitive Non-motorized ROS classes.

Generally, human-related sounds are more appropriate toward the rural and roaded end of the ROS spectrum and less toward the Semi-Primitive Non-motorized and Primitive end of the spectrum (Harrison et al. 2008). ROS classes are described in the Recreation section of this analysis.

California Vehicle Code Section 27203 limits noise at 82 dBA for snowmobiles manufactured after 1972. Noise levels generated by OSVs are further limited through manufacturer restrictions. Snowmobiles produced since February 1, 1975, and certified by the Snowmobile Safety and Certification Committee's independent testing company emit no more than 78 dBA from a distance of 50 feet while traveling at full throttle when tested under the Society of Automotive Engineers (SAE) J192 procedures. Additionally, those produced after June 30, 1976, and certified by the Snowmobile Safety and Certification Committee's independent testing company emit no more than 73 dBA at 50 feet while traveling at 15 mph when tested under SAE J1161 procedures (California Department of Parks and Recreation 2010).

Sound Propagation

Sound is measured by amplitude (decibels, dB) that determine loudness, frequency (Hertz, Hz) that determine pitch, and duration of the sound.

As sound waves travel away from the source, they lose energy (amplitude decreases). Several factors influence how far the sound will travel. Spherical spreading loss refers to the fact that a sound's loudness decreases as the distance between the source and the listener increases. Atmospheric absorption loss refers to sound waves being transferred to, or absorbed by, the atmosphere. This varies with air temperature, elevation, relative humidity, vegetation and ground cover. Long distance loss refers to refraction of sound due to varying air temperatures or wind directions and diffraction or scattering of sound waves around a barrier (Harrison et al. 1980).

Background or ambient sound levels influence how noticeable a given sound will be, and the setting in which it is heard influences how appropriate that sound may be.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under alternative 1, 641,952 acres would be designated for OSV use and the associated influence of OSV noise. Noise sources of multiple OSVs and vehicles would be concentrated at plowed OSV trailheads, and more dispersed along groomed trails. Approximately 216,950 acres, or 34 percent, of the 641,952 acres that would be designated for OSV use, are anticipated to have high to moderate OSV use levels and the associated potential noise impacts (such as areas adjacent to groomed OSV trails and areas with highly desirable slope and vegetation conditions).

Existing conflicts between motorized and non-motorized winter experiences within the Tahoe National Forest would continue and may increase as population and visitor use increase.

The Pacific Crest National Scenic Trail would continue to be managed as a non-motorized trail; however, OSV use adjacent to the trail could impact the winter non-motorized trail experience due to noise and the presence of OSVs near the trail, or crossing the trail. No OSV crossings of the PCT would be designated and OSVs would continue to cross the trail along existing OSV routes, and could cross the PCT at any location where the trail passes through areas designated for OSV use. The portion of the PCT within the Tahoe National Forest that passes through the Granite Chief Wilderness and other areas where OSV use is currently prohibited would continue to provide opportunities for quiet non-motorized trail experiences.

Ongoing OSV use near designated non-motorized areas could result in short-term impacts to solitude. OSV use across, and adjacent to the PCT would continue, with the potential for ongoing noise-related impacts to non-motorized trail visitors, when OSVs are present near the trail.

Table 34. Noise resource indicators and measures for alternative 1

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Existing Condition
Noise	Opportunities for motorized winter uses	Size of areas (acres) open to public, cross-country OSV use	641,952 acres designated for public, cross-country OSV use
		Acres and percent of designated acres that are anticipated to have high to moderate OSV use levels and the associated potential for noise impacts.	216,950 acres, 34 percent of the designated acres are anticipated to have high to moderate OSV use
	OSV designations	Length of snow trails (miles), groomed and ungroomed, designated and identified for public OSV use.	220 miles of designated trails available for grooming for OSV use 149miles of designated OSV trails not available for grooming

Cumulative Effects

In alternative 1, both motorized and non-motorized winter use would continue to occur on trails and in areas across the forest, existing conflicts between these uses and desired experiences would continue in some popular areas. Short-term and temporary impacts to opportunities for solitude (due to OSV noise, and the presence of people) may occur when OSVs are present adjacent to wilderness areas, within Inventoried Roadless Areas, or adjacent to the PCT. Noise from OSVs in areas and on trails across the forest would add to other sound sources, such as OSV grooming equipment, snow plows, vehicles on highways, vehicles on Forest roads, equipment being used for forest management projects, etc.

Alternative 2 – Modified Proposed Action

Direct and Indirect Effects

Under alternative 2, 410,703 acres would be designated for OSV use and the associated influence of OSV noise. Noise sources of multiple OSVs and vehicles would be concentrated at plowed OSV trailheads, and more dispersed along groomed trails and in designated areas. Approximately 194,130 acres, or 47 percent of the 410,703 acres that would be designated for OSV use, are anticipated to have high to moderate OSV use levels and the associated possible noise impacts (such as areas adjacent to groomed OSV trails and areas with highly desirable slope and vegetation conditions).

Using average environmental factors for the winter season within the Tahoe National Forest and the SPreAD-GIS model, figure 7, figure 8, and figure 9 show the anticipated sound propagation away from point source sound locations along OSV trails. The trail points represent a snapshot in time, and were selected based on important non-motorized trails and areas. OSV sound source points shown on figure 7, figure 8, and figure 9 include the Andesite Ridge OSV trail, locations of OSV trail crossings of the PCT, and areas near the Peter Grubb Hut in Round Valley could be impacted by OSV noise. The noise propagation contour lines on the maps show how the OSV sound is expected to spread out from the source location given unique environmental, vegetation, and terrain conditions. The maps also show noise levels where the introduced OSV noise would be in excess of ambient sound conditions.

Using average environmental factors for the winter season within the Tahoe National Forest and the SPreAD-GIS model, figure 7, figure 8, and figure 9 show the anticipated sound propagation away from point source sound locations along OSV trails. The trail points represent a snapshot in time, and were selected based on important non-motorized trails and areas. OSV sound source points shown on figure 7, figure 8, and figure 9 include Castle Pass and areas near the Peter Grubb Hut in Round Valley in the Donner Summit OSV area, designated crossing locations of the PCT in the Barker OSV area, and near French Meadows on the Mosquito Ridge trail in the Foresthill East OSV area that are potentially impacted by OSV noise. The noise propagation contour lines on the maps show how the OSV sound is expected to spread out from the source location given unique environmental, vegetation and terrain conditions. The contour lines are color coded to show the extent of noise levels where the introduced OSV noise would be above ambient sound conditions. Table 35 shows examples of common sounds and their decibel level.

Table 35. Examples of comparative sound levels*

Sound Source	Sound Level dB(A)
75-piece orchestra	130
Car horn, snow blower	110
Pre-1969 snowmobile	102
Blow dryer, diesel truck	100
Electric shaver, lawn mower	85
Garbage disposal, vacuum cleaner	80
Post-1975 snowmobile (full throttle and 50 feet; maximum allowed by law)	78
Alarm clock, city traffic	70
Dishwasher	60
Leaves rustling, refrigerator	40

*Table from American Council of Snowmobiles Associations Facts and Myths about Snowmobiling and Winter Trails, 2014

Figure 7 shows the sound of OSVs on the Andesite Ridge trail spreading primarily to the west, away from the Peter Grubb Hut area, although some noise disturbance is likely when OSVs are present on the groomed trail and adjacent areas that are designated for OSV use.

Although sounds of OSVs may be heard in the far western portion of the Granite Chief Wilderness (as shown in figure 8) when OSVs are present on designated trails, noise is not anticipated to negatively impact the wilderness area since the presence of OSV noise would be short-term and temporary when OSVs are present on these trails. Little OSV use is anticipated near the wilderness.

Alternative 2 would designate OSV use in areas adjacent to PCT segments within the Northeast Yuba, Sierraville West, Truckee, and Barker OSV analysis areas. Alternative 2 would not designate any areas for OSV use adjacent to the PCT segments within the Donner Summit, Summit West, and Granite Chief Wilderness OSV analysis areas. Alternative 2 would designate 34 OSV crossings of the PCT located in the Barker, Sierraville West and Yuba Northeast OSV analysis areas. Figure 9 shows the location of one of the designated crossings of the PCT in the Barker Area. Designating OSV crossings of the PCT would minimize the potential for motorized use to impact the trail experience, and is consistent with the PCT comprehensive management plan. Limiting the locations where OSVs cross the trail would enhance the

quiet, non-motorized experience while accommodating motorized access to OSV areas and maintaining OSV loop-riding opportunities.

The winter trailhead at Donner Summit is the most popular way to access the PCT going either north or south in the wintertime, and OSV use would not be designated in areas adjacent to the PCT where non-motorized recreationists would generally travel on a day-trip. Also, OSV use would not be designated in areas along the PCT (both north and south) where it crosses Highway 49 east of Sierra City, again to mitigate potential noise conflicts along the PCT where winter visitors might access the Trail. In response to comments to the DEIS the OSV use designations were changed for alternative 2 from the DEIS along the ridgeline between Tinker’s Knob, Anderson Peak and near Mount Lincoln, pulling the OSV use designation boundary off the ridge toward the east from 300 to 500 feet to reduce potential conflicts and noise impacts to non-motorized winter recreationists using the PCT in that area traveling to and from the Benson Hut, Squaw Valley and Highway 40 or I-80.

Alternative 2 would minimize potential motorized OSV impacts to the non-motorized PCT experience to a greater extent than alternatives 1 and 4, but does not provide as much protection of the non-motorized PCT experience as in alternatives 3 and 5. The areas proposed to be designated, and not designated for OSV use along the PCT would provide for multiple uses along the trail, while also considering the existence of the trail and uses of the trail, consistent with the management direction for the PCT in the Tahoe Forest Plan. The potential for noise impacts would be highest near the designated OSV crossings of the PCT because OSV use could be relatively more concentrated in those areas, at least temporarily while OSVs were crossing the trail.

Additionally, in alternative 2, OSV use would not be designated, and opportunities for solitude and quiet, non-motorized experiences would be enhanced in the following areas: High Loch Leven area and the individual parcels of National Forest System lands currently under long-term special use permits for Royal Gorge Cross Country Ski Area, Tahoe Donner Cross Country Ski Area, Boreal Ski Area, Donner Ski Ranch Ski Area, Sugar Bowl Ski Area, Alpine Meadows Ski Area and Squaw Valley Ski Area.

Ongoing monitoring for use conflicts would consider the influence of noise on recreational experiences. Site-specific sound modeling with the SPreAD-GIS program may be useful to analyze individual areas if future conflicts are identified through monitoring. The sound propagation model would help determine appropriate actions to help mitigate the conflicts related to noise.

Table 36. Resource indicators and measures for alternative 2 direct and indirect effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 2 Direct and Indirect Effects
Noise	Opportunities for motorized winter uses	Size of areas (acres) designated to public, cross-country OSV use; percentage change compared to current management Acres and percent of designated acres that are anticipated to have high to moderate OSV use levels and the associated potential for noise impacts.	410,703 acres designated for OSV use, 36 percent decrease from current management 194,130 acres, 47 percent of the designated acres are anticipated to have high to moderate OSV use
	OSV designations	Length of snow trails (miles), groomed and ungroomed, designated and identified for public OSV use	247 miles of designated trails available for grooming for OSV use 137 miles of designated trails not available for grooming

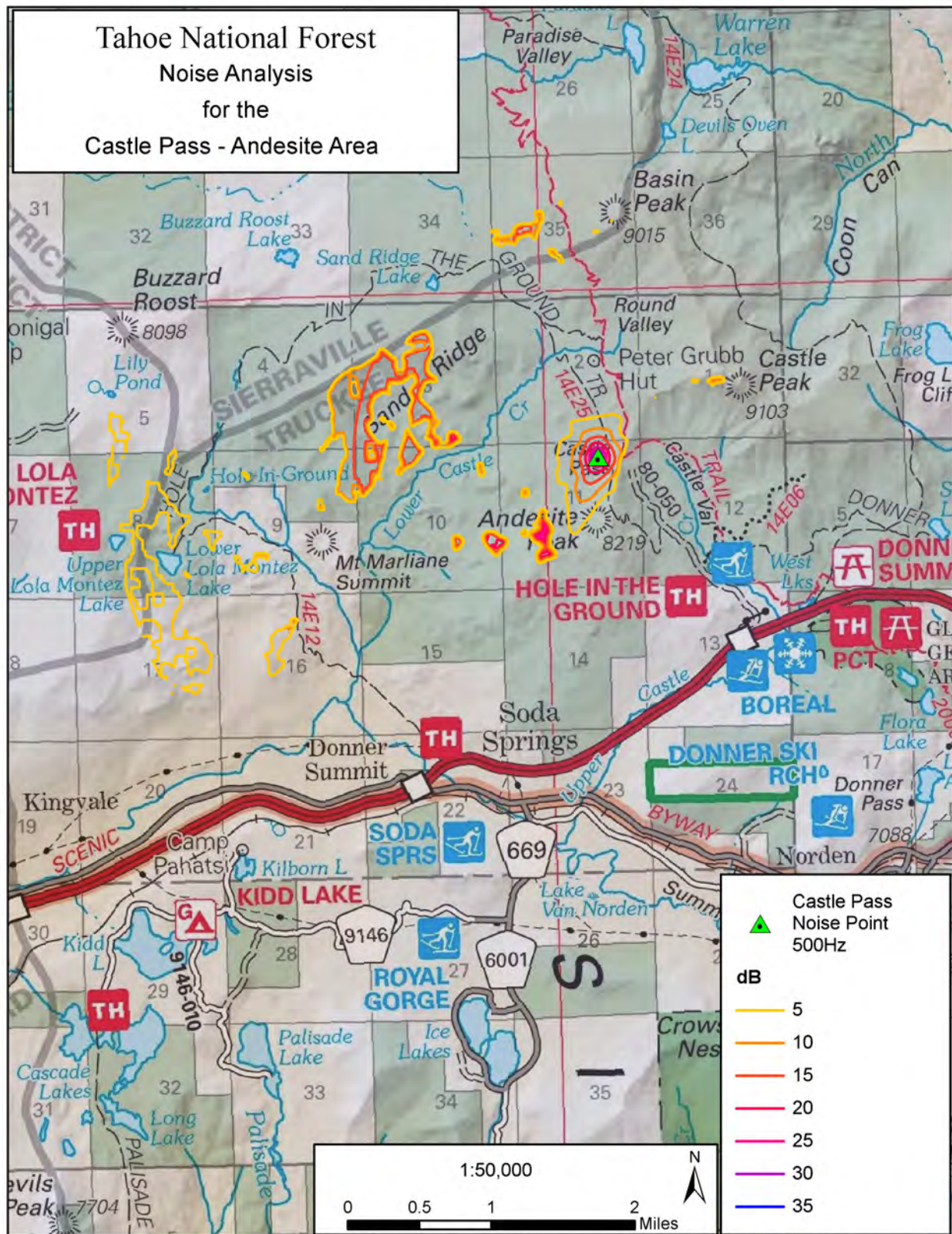


Figure 7. Noise analysis on the Andesite Ridge trail

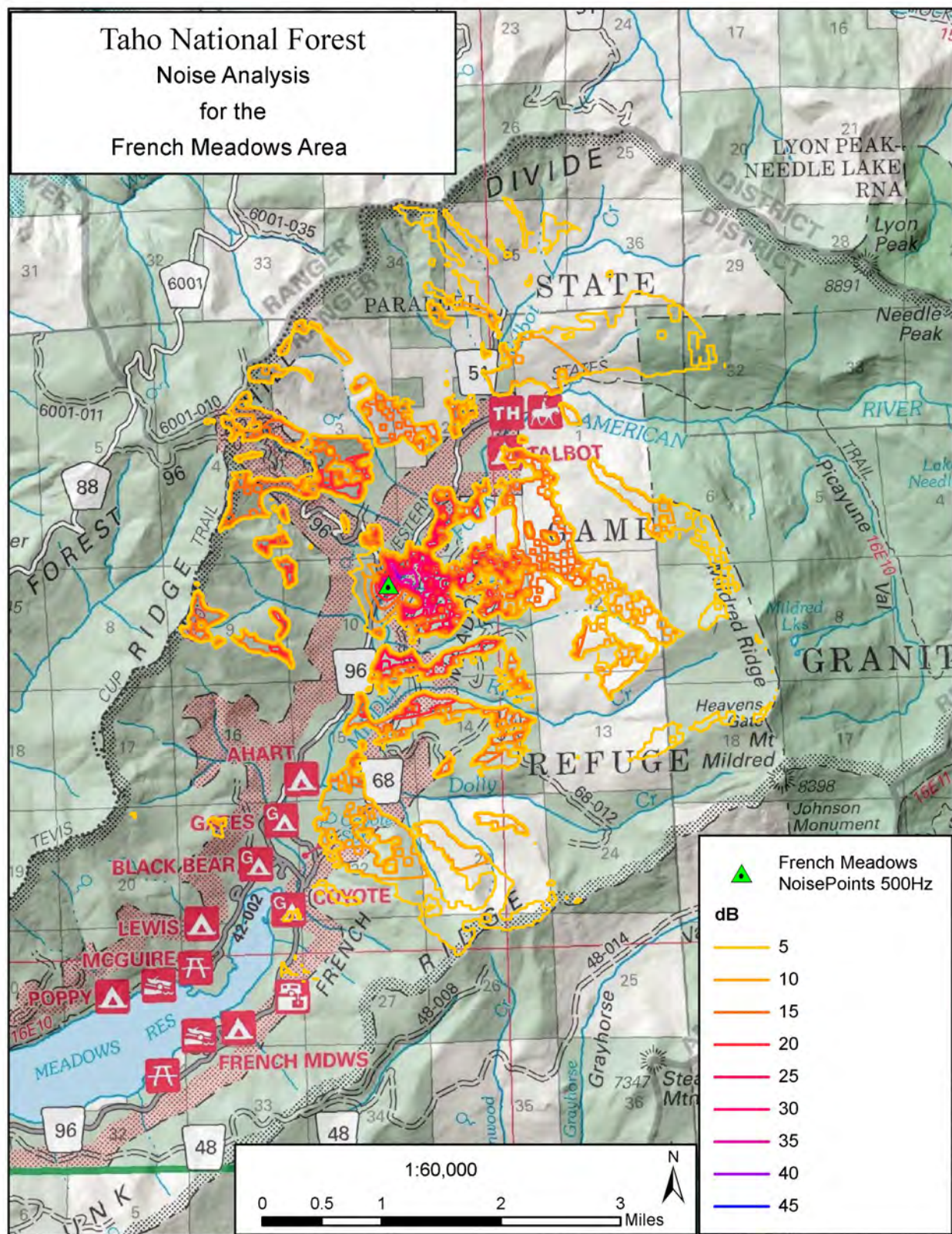


Figure 8. Noise analysis for the French Meadows Area

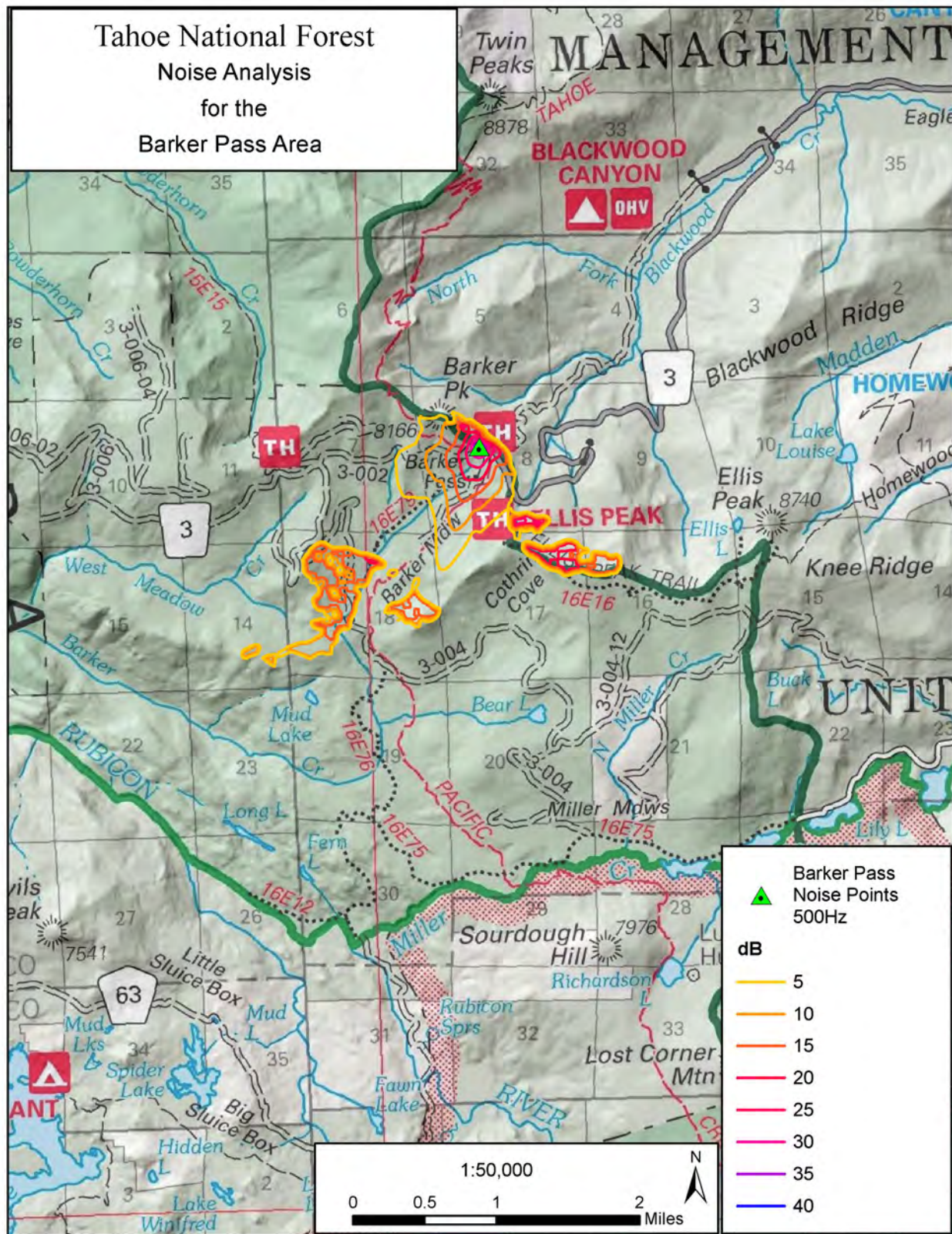


Figure 9. Noise analysis for the Barker Pass Area

Cumulative Effects

The trailhead and parking lot plowing activities and OSV trail grooming activities would increase the noise associated with motorized vehicles in the forest setting, however this would not be a change from existing conditions. Parking lot plowing occurs during the day when OSV use also typically occurs, so the sounds generated by each activity could be cumulative. OSV trail grooming generally occurs at night when very few or no OSVs are operating, therefore, the noise impacts from trail grooming would be less likely to be cumulative with other motor vehicle sounds, but may be more noticeable because the ambient sound conditions are typically quieter during the night.

Non-motorized winter visitors to the Tahoe National Forest could experience noise from OSVs, in addition to other noise such as snow plows, vehicles on roads, and aircraft that may be in the same area at the same time, cumulatively impacting the quiet recreation experience in the short term.

Alternative 3

Direct and Indirect Effects

Under alternative 3, 257,024 acres would be designated for OSV use and the associated influence of OSV noise. Noise sources of multiple OSVs and vehicles would be concentrated at plowed OSV trailheads, and more dispersed along groomed trails and in areas designated for OSV use. Approximately 151,215 acres, or 54 percent of the 277,584 acres that would be designated for OSV use, are anticipated to have high to moderate OSV use levels and the associated possible noise impacts (such as areas adjacent to groomed OSV trails and areas with highly desirable slope and vegetation conditions).

Noise impacts associated with the groomed and ungroomed OSV trail system in alternative 3 would be slightly less than in alternative 2.

Alternative 3 would designate OSV use on fewer acres than alternative 2. With additional areas where OSV use would not be designated, the opportunities for non-motorized use (in areas not influenced by the sounds of OSV use) are enhanced under this alternative.

Alternative 3 would substantially reduce the acres designated for OSV use in the Donner Summit area, and would not designate the Andesite West OSV Trail, thus reducing noise disturbance in this area, as shown in figure 7.

Although sounds of OSVs may be heard in the far western portion of the Granite Chief Wilderness (as shown in figure 8) when OSVs are present on trails outside the Wilderness, noise is not anticipated to negatively impact the Granite Chief Wilderness area because OSV noise would be short-term and temporary. Alternative 3 would substantially reduce the acres designated for OSV use in the Foresthill East OSV area, further reducing associated noise impacts in this area. OSV use would not be anticipated near the Wilderness due to its long distance away from designated OSV areas and trails.

Alternative 3 generally would not designate any OSV use in areas directly adjacent to the PCT. In the Northeast Yuba and Sierraville West OSV analysis areas, the closest proposed designated OSV areas would be approximately 0.25 to 0.5 mile away from the PCT, the proposed designated area closest to the PCT in the Donner Summit OSV area is approximately 1.5 miles away, and the proposed designated area closest to the Truckee OSV area is approximately 3 miles away. No OSV use would be designated in the Summit West, Granite Chief, or Barker OSV areas in alternative 3. Three OSV crossings of the PCT would be designated over roads that are on the Tahoe National Forest MVUM, in the Sierraville West OSV analysis area. Fewer OSV crossings of the PCT would be designated than in all other alternatives,

further minimizing the potential for OSVs to impact the non-motorized trail experience and would reduce OSV connectivity between designated areas on either side of the PCT. Alternative 3 would minimize impacts to the non-motorized PCT experience to a greater extent than alternatives 1, 2, and 4, and is similar to alternative 5.

Alternative 3 would not designate OSV use or OSV crossings of the PCT in the Barker OSV area, therefore, the experience of non-motorized visitors along the PCT south of the Granite Chief Wilderness would not be influenced by the noise from OSVs as shown in figure 9.

In addition to the areas described in alternative 2, OSV use would not be designated, and opportunities for solitude and quiet, non-motorized experiences would be enhanced in the following areas: expanded areas around Independence Lake and High Loch Leven (Sierraville West OSV area). New areas not proposed for OSV use designation under alternative 3 include Andesite Ridge and Summit Lake, Coon Canyon, Donner South, Sardine Lakes, Lunch Creek East, PCT/Grubb, and Devil's Oven (in the Donner Summit and Sierraville East OSV areas), further enhancing quiet, non-motorized opportunities in these areas.

Designating OSV use limited to designated trails through the Lunch Creek East, Southwest Andesite Ridge, and Prosser-Boca areas (Donner Summit and Reservoirs OSV areas) would provide an opportunity to minimize impacts on non-motorized recreation experience, while also maintaining access and opportunities for motorized OSV use.

Potential impacts from OSV noise would be reduced along the entire length of the PCT, different than described in alternative 2, which avoids designating OSV use in areas most likely to have noise conflicts between motorized and non-motorized winter recreation uses. With only three designated OSV crossings of the PCT, the potential noise disturbance near designated OSV trails across the PCT would be limited to a smaller portion of the PCT.

Table 37. Resource indicators and measures for alternative 3 direct and indirect effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 3 Direct and Indirect Effects
Noise	Opportunities for motorized winter uses	Size of areas (acres) designated for OSV use; percentage change compared to current management Acres and percent of designated acres that are anticipated to have high to moderate OSV use levels and associated noise impacts.	257,024 acres designated for OSV use, a 60 percent decrease from current management 151,215 acres, 54 percent of the designated acres are anticipated to have high to moderate OSV use
	OSV designations	Length of snow trails (miles), groomed and ungroomed, designated and identified for public OSV use	220 miles of designated trails available for grooming for OSV use 60 miles of designated OSV trails not available for grooming

Cumulative Effects

Activities contributing to potential cumulative effects of alternative 3 would generally be the same as those described for alternative 2; however, with fewer acres designated for cross-country OSV use and fewer miles of trail available for grooming, the potential for cumulative noise impacts is reduced under alternative 3 compared to alternatives 1, 2, and 4.

Alternative 4

Direct and Indirect Effects

Under alternative 4, 641,708 acres would be designated for OSV use and the associated influence of OSV noise. Noise sources of multiple OSVs and vehicles would be concentrated at plowed OSV trailheads, and more dispersed along groomed trails and in designated OSV use areas. Approximately 216,938 acres, or 34 percent of the 641,708 acres that would be designated for OSV use, are anticipated to have high to moderate OSV use levels and associated noise impacts (such as areas adjacent to groomed OSV trails and areas with highly desirable slope and vegetation conditions).

Alternative 4 would designate OSV use on more acres and miles of trail than all other alternatives therefore, it has the highest potential for conflicts with OSV noise across the forest.

Potential noise-related impacts as shown in figure 7, figure 8, and figure 9 would be essentially the same as described for alternative 2. Additional acres would be designated for OSV use in the Foresthill East OSV area, therefore, possibly increasing the impacts associated with noise in this area.

Alternative 4 would designate OSV use in areas adjacent to PCT segments within the Northeast Yuba, Sierraville West, Donner Summit, Summit West, Truckee, and Barker OSV analysis areas. Alternative 4 would not designate any areas for OSV use adjacent to the PCT segments within the Granite Chief Wilderness OSV analysis area. Alternative 4 would designate 21 OSV crossings of the PCT located in the Barker, Sierraville West, and Yuba Northeast OSV analysis areas. Potential impacts from OSV noise would continue along the PCT, similar to alternative 1. Potential impacts to the non-motorized trail experience along the PCT would be slightly more than in alternative 2, and substantially more than in alternatives 3 and 5.

Table 38. Resource indicators and measures for alternative 4 direct and indirect effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 4 Direct and Indirect Effects
Noise	Opportunities for motorized winter uses	Size of areas (acres) designated for OSV use; percentage change compared to current management	641,708 acres designated for OSV use, a 0.4 percent increase from current management.
		Acres and percent of designated acres that are anticipated to have high to moderate OSV use levels and associated noise impacts.	216,938 acres, 34 percent of the designated acres are anticipated to have high to moderate OSV use
	OSV designations	Length of snow trails (miles), groomed and ungroomed, designated and identified for public OSV use	262 miles of designated trails available for grooming for OSV use 64 miles of designated trails not available for grooming

Cumulative Effects

Activities contributing to potential cumulative noise effects of alternative 4 would be generally the same as those described for alternative 2. However, with acreages designated for cross-country OSV use and miles of trail available for grooming similar to alternative 1, the potential for cumulative noise impacts would be similar to alternative 1 and relatively higher, compared to alternatives 2, 3, and 5.

Alternative 5

Direct and Indirect Effects

Under alternative 5, 302,411 acres would be designated for OSV use and the associated influence of OSV noise. Noise sources of multiple OSVs and vehicles would be concentrated at plowed OSV trailheads, and more dispersed along groomed trails and in designated OSV use areas. Approximately 147,919 acres, or 49 percent of the 302,411 acres that would be designated for OSV use, are anticipated to have high to moderate OSV use levels and associated noise impacts (such as areas adjacent to groomed OSV trails and areas with highly desirable slope and vegetation conditions).

Alternative 5 would designate OSV use on slightly more acres than alternative 3, but on fewer miles of trail.

With additional areas not designated for OSV use, the opportunities for non-motorized use (in areas not influenced by sounds of OSV use) would be enhanced.

Potential impacts from noise would be substantially the same as described in alternative 3 for the Donner Summit and Foresthill East areas. Potential impacts from noise would be similar to those described in alternatives 2 and 4 for the Barker OSV area (figure 9), but on slightly fewer acres.

Quiet recreation opportunities would be maintained to the greatest extent of all alternatives along the PCT by not designating OSV use within the Forest Service Scenery Management System definition of foreground for the Pacific Crest National Scenic Trail. This area would be up to 0.5 mile in the visible lands on each side of the Pacific Crest National Scenic Trail or smaller as the visible landscape along the Trail would be less than 0.5 mile on each side of the trail due to topography (in the Northeast Yuba, Sierraville West, Donner Summit, Truckee, and Barker OSV analysis areas). Alternative 5 would not designate any OSV use areas in the Summit West and Granite Chief Wilderness OSV Analysis areas. This would protect the trail experience for PCT visitors and would eliminate the potential for OSV use to impact the trail experience (other than on the 10 designated OSV trails across the PCT) and reduce the potential for conflict between motorized and non-motorized uses. Overall, alternative 5 would minimize potential impacts from OSVs on the non-motorized trail experience to a similar extent as in alternative 3, and substantially more than in alternatives 1, 2, and 4.

Table 39. Resource indicators and measures for alternative 5 direct and indirect effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Alternative 5 Direct and Indirect Effects
Noise	Opportunities for motorized winter uses	Size of areas (acres) designated for OSV use; percentage change compared to current management Acres and percent of designated acres that are anticipated to have high to moderate OSV use levels and associated noise impacts.	302,411 acres designated for OSV use, a 53 percent decrease from existing conditions 147,919 acres, 49 percent of the designated acres are anticipated to have high to moderate OSV use
Noise	OSV designations	Length of snow trails (miles), groomed and ungroomed, designated and identified for public OSV use	215 miles of designated trails available for grooming for OSV use 72 miles of designated OSV trails not available for grooming

Cumulative Effects

Activities contributing to potential cumulative noise effects of alternative 5 would be generally the same as those described for alternative 2; however, with fewer acres designated for cross-country OSV use (with the fewest acres anticipated for moderate to high OSV use), and fewer miles of trail available for grooming, the potential for cumulative noise impacts is reduced to the greatest extent under alternative 5 of all alternatives.

Summary of Environmental Effects

Alternative 2 would provide approximately the same level of groomed motorized OSV trail opportunities, as found in current management, and therefore, the same degree of possible noise impacts associated with trail use. Alternative 4 would increase the miles of trails available for grooming, and therefore, increase the possibility of noise impacts associated with trail use. Cross-country travel, and use of OSV trails is limited by minimum snow depth requirements for all action alternatives; however, alternative 2 would provide the most flexibility in applying the snow depth requirements. This flexibility allows OSV access to higher elevations, provided snow depths are adequate to avoid resource damage, typically a minimum of 12 inches for cross-country OSV travel. Alternative 4 would designate the greatest acreage for OSV use forestwide, compared to alternatives 2, 3, and 5, and therefore, the greatest possibility of noise impacts across the forest. The acres and percentage of designated acres that are anticipated to have high to moderate OSV use in alternative 4, would be approximately the same as in alternative 1, existing conditions. Alternative 5 would be expected to have the least amount of acres that could be impacted by noise, because fewer acres are anticipated to receive high to moderate OSV use.

Compliance with LRMP and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1 would not comply with Subpart C of the Travel Management Rule that requires designation of roads, trails, and areas on National Forest System lands to provide for over-snow vehicle use.

Alternatives 2, 3, 4, and 5 would comply with Subpart C of the Travel Management rule and would require amendments to the Tahoe Forest Plan's standards and guidelines for OSV use designation.

Table 40. Summary comparison of how the alternatives address the key issues for noise

Issue	Indicator/Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Noise	Opportunities for motorized winter uses	641,952 acres designated for OSV use	410,703 acres designated for OSV use, a 36 percent decrease from existing conditions.	257,024 acres designated for OSV use, a 57 percent decrease from existing conditions.	641,708 acres designated for OSV use, a 0.4 percent increase from existing conditions.	302,411 acres designated for OSV use; a 53 percent decrease from existing conditions.
	Size of areas (acres) designated for OSV use that could be affected by noise; percentage change compared to current management	216,950 acres, 34 percent of the designated acres are anticipated to have high to moderate OSV use.	194,130 acres, 47 percent of the designated acres are anticipated to have high to moderate OSV use.	151,215 acres, 54 percent of the designated acres are anticipated to have high to moderate OSV use.	216,938 acres, 34 percent of the designated acres are anticipated to have high to moderate OSV use.	147,919 acres, 49 percent of the designated acres are anticipated to have high to moderate OSV use
	Acres and percent of designated acres that are anticipated to have high to moderate OSV use levels and associated noise impacts	194,321 acres not designated for OSV use and available for quiet recreation 1,218 acres seasonally designated for OSV use and available for quiet recreation when OSVs are not present	425,570 acres not designated for OSV use and available for quiet recreation	558,689 acres not designated for OSV use and available for quiet recreation 1,408 acres seasonally designated for OSV use and available for quiet recreation when OSVs are not present	194,565 acres not designated for OSV use and available for quiet recreation 1,218 acres seasonally designated for OSV use and available for quiet recreation when OSVs are not present	533,862 acres not designated for OSV use and available for quiet recreation
	OSV designations Length of snow trails (miles), groomed and ungroomed, designated and identified for public OSV use	220 miles available for grooming 7 miles designated, not available for grooming	247 miles available for grooming 70 miles designated, not available for grooming	220 miles available for grooming 25 miles designated, not available for grooming	262 miles available for grooming 5 miles designated, not available for grooming	215 miles available for grooming 17 miles designated, not available for grooming

Air Quality

Relevant Laws, Regulations, and Policy

Regulatory Framework

Land and Resource Management Plan

The Tahoe National Forest Land and Resource Management Plan (LRMP) (USDA Forest Service 1990) provides standards and guidelines for air quality.

- No quantifiable value is placed on air quality. The Federal Clean Air Act sets standards and guidelines for the attainment and maintenance of air quality (LRMP, page 63).

Federal Clean Air Act

In 1963, Congress passed the Federal Clean Air Act and amended it in 1970, 1977, and 1990. The purpose of the act is to protect and enhance air quality while ensuring the protection of public health and welfare. The 1970 amendments established National Ambient Air Quality Standards (NAAQS), which must be met by most state and Federal agencies, including the Forest Service.

States are given the primary responsibility for air quality management. Section 110 of the Clean Air Act requires states to develop state implementation plans that identify how the state will attain and maintain NAAQS. The Clean Air Act also allows states, and some counties, to adopt unique permitting procedures and to apply more stringent standards. California has set standards for certain pollutants, such as particulate matter and ozone, which are more protective of public health than respective Federal standards. California has also set standards for some pollutants that are not addressed by Federal standards including sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles.

The Clean Air Act requires that Forest Service actions have “no adverse effect” on air resources by meeting the NAAQS and non-degradation standards for Class 1 areas. Managers are further directed to improve existing substandard conditions and reverse negative trends where practicable. The NAAQS and California Ambient Air Quality Standards (CAAQS) for particle pollution as set by the Clean Air Act and California Air Resources Board can be viewed online at the California Air Resources Board webpage.¹⁷

National Ambient Air Quality Standards

NAAQS requirements were established to protect human health and the environment and acceptable maximum air quality concentrations. The NAAQS consist of numerical standards for air pollution, which are broken into “primary” and “secondary” standards for six major air pollutants described below. Primary standards protect public health (including sensitive populations such as asthmatics, children, and the elderly) and represent levels at which there are no known major effects on human health. Secondary standards are intended to protect the nation’s welfare, and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the environment. These standards are detailed in table 41 and accompanying footnotes.

California Air Resources Board

California law authorizes the California Air Resources Board to set ambient (outdoor) air pollution standards (California Health and Safety Code section 39606) in consideration of public health, safety, and

¹⁷ <http://www.arb.ca.gov/research/aaqs/aaqs2.pdf>

welfare. The Air Resources Board has established State Ambient Air Quality Standards (CAAQS) to identify outdoor pollutant levels considered safe for the public. After State standards are established, State law requires the Air Resources Board to designate each area as attainment, nonattainment, or unclassified for each State standard. The area designations, which are based on the most recent available data, indicate the healthfulness of air quality throughout the State (ARB 2015). The State and National Ambient Air Quality Standards are displayed in table 41 and accompanying footnotes.

The California Air Resources Board is responsible for meeting the Clean Air Act requirements. The Air Resources Board has further delegated the authority to local Air Pollution Control Districts (APCDs) or Air Quality Management Districts (AQMDs) for stationary sources, while retaining the authority for mobile sources. Air quality rules and regulations for California can be found at <http://www.arb.ca.gov/homepage.htm>. The APCD/AQMD has the primary responsibility for meeting the requirements of the Clean Air Act. This responsibility is carried out through the development and execution of state implementation plans, which must provide for the attainment and maintenance of air quality standards.

State implementation plans are comprehensive plans that describe how an area will attain NAAQS. The 1990 amendments to the Federal Clean Air Act set deadlines for attainment based on the severity of an area's air pollution problem.

State implementation plans are a compilation of new and previously submitted plans, programs, district rules, state regulations and Federal controls. State law makes the Air Resources Board the lead agency for all purposes related to the state implementation plan. Local air districts and other agencies prepare state implementation plan elements and submit them to the Air Resources Board for review and approval. The Air Resources Board forwards state implementation plan revisions to the Environmental Protection Agency (EPA) for approval and publication in the Federal Register. The Code of Federal Regulations Title 40, Chapter I, Part 52, Subpart F, Section 52.220 lists all of the items that are included in the California State Implementation Plan (<http://www.arb.ca.gov/planning/sip/background.htm>). The Forest Service is required to comply with all requirements of the California State Implementation Plan.

Table 41. State and national ambient air quality standards

Pollutant	Averaging Time	California Standards ¹		National Standards ²		
		Concentration ³	Method ⁴	Primary ^{3,5}	Secondary ^{3,6}	Method ⁷
Ozone (O ₃) ⁸	1 hour	0.09 ppm (180 µg/m ³)	Ultraviolet Photometry	---	Same as Primary Standard	Ultraviolet Photometry
	8 hour	0.070 ppm (137 µg/m ³)		0.070 ppm (137 µg/m ³)		
Respirable Particulate Matter (PM ₁₀) ⁹	24 hour	50 µg/m ³	Gravimetric or Beta Attenuation	150 µg/m ³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m ³		---		
Fine Particulate Matter (PM _{2.5}) ⁹	24 hour	---	---	35 µg/m ³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m ³	Gravimetric or Beta Attenuation	12.0 µg/m ³	15 µg/m ³	
Carbon Monoxide (CO)	1 hour	20 ppm (23 mg/m ³)	Non-dispersive Infrared Photometry	35 ppm (40 mg/m ³)	---	Non-dispersive
	8 hour	9.0 ppm(10 mg/m ³)		9 ppm (10 mg/m ³)	---	Infrared Photometry
	8 hour (Lake Tahoe)	6 ppm (7 mg/m ³)	(NDIR)	---	---	(NDIR)
Nitrogen Dioxide (NO ₂) ¹⁰	1 hour	0.18 ppm (339 µg/m ³)	Gas Phase	100 ppb (188 µg/m ³)	---	Gas Phase
	Annual Arithmetic Mean	0.030 ppm (57 µg/m ³)	Chemiluminescence	0.053 ppm (100 µg/m ³)	Same as Primary Standard	Chemiluminescence
Sulfur Dioxide (SO ₂) ¹¹	1 hour	0.25 ppm (655 µg/m ³)	Ultraviolet Fluorescence	75 ppb (196 µg/m ³)	---	Ultraviolet Fluorescence
	3 hour	---		---	0.5 ppm (1300 µg/m ³)	
	24 hour	0.04 ppm (105 µg/m ³)		0.14 ppm (for certain areas) ¹⁰	---	Spectrophotometry (Pararosaniline Method)
	Annual Arithmetic Mean	---		0.030 ppm (for certain areas) ¹⁰	---	
	30 Day Average	1.5 µg/m ³		---	---	
Lead ^{12,13}	Calendar Quarter	---	Atomic Absorption	1.5 µg/m ³	Same as Primary Standard	High Volume Sampler and Atomic Absorption
	Rolling 3-Month Average	---		0.15 µg/m ³		
Visibility Reducing Particles ¹⁴	8 hour	See footnote 14	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 hour	25 µg/m ³	Ion Chromatography			
Hydrogen Sulfide	1 hour	0.03 ppm (42 µg/m ³)	Ultraviolet Fluorescence			
Vinyl Chloride ¹²	24 hour	0.01 ppm (26 µg/m ³)	Gas Chromatography			

Source: California Air Resources Board (5/4/16). (See footnotes on next page.)

1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM₁₀, PM_{2.5}, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.
2. National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM₁₀, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m³ is equal to or less than one. For PM_{2.5}, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.
3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25 °C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.
4. Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.
5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.
6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse
7. Reference method as described by the U.S. EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the U.S. EPA.
8. On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.
9. On December 14, 2012, the national annual PM_{2.5} primary standard was lowered from 15 µg/m³ to 12.0 µg/m³. The existing national 24-hour PM_{2.5} standards (primary and secondary) were retained at 35 µg/m³, as was the annual secondary standard of 15 µg/m³. The existing 24-hour PM₁₀ standards (primary and secondary) of 150 µg/m³ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.
10. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.
11. On June 2, 2010, a new 1-hour SO₂ standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO₂ national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.
12. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.
13. The national standard for lead was revised on October 15, 2008, to a rolling 3-month average. The 1978 lead standard (1.5 µg/m³ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.
14. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

Regional Haze Rule (1990 Clean Air Act Amendments, 40 CFR Part 5)

The Federal Clean Air Act of 1977 declared a national goal to remedy existing visibility impairment and prevent future haze caused by man-made air pollution at selected national parks and wilderness areas of the United States, known as Class 1 Areas. California has 29 mandatory Class 1 Areas managed by either the National Parks Service or the U.S. Forest Service (more than any other state). In 1999, the Environmental Protection Agency promulgated a regional haze regulation (40 CFR 51.308-309) that calls for states to establish goals and emission reduction strategies to make initial improvements in visibility at their respective Class 1 Areas. Visibility variation occurs as a result of the scattering and absorption of light by particles and gases in the atmosphere. It also mandates each state to develop a Regional Haze State Implementation Plan to incorporate measures necessary to make reasonable progress toward national visibility goals. In 2009, the Air Resources Board prepared a Regional Haze Plan for California demonstrating reasonable progress in reducing haze by 2018, the first benchmark year on the path to improved visibility. The Environmental Protection Agency funded five Regional Planning Organizations throughout the country to coordinate regional haze rule-related activities between states in each region. California belongs to the Western Regional Air Partnership (WRAP), the consensus organization of western states, tribes, and Federal agencies, which oversees analyses of monitoring data and preparation of technical reports regarding regional haze in the western United States. (See figure 11.)

Criteria Pollutants Regulated by EPA

Ozone (O₃) is the most widespread air quality problem in the state. It is an important ingredient of smog and is a highly reactive and unstable gas capable of damaging the linings of the respiratory tract. This pollutant forms in the atmosphere through complex reactions between chemicals directly emitted from vehicles, industrial plants, and many other sources. Exposure to levels of ozone above the current ambient air quality standard can lead to human health effects such as lung inflammation and tissue damage and impaired lung functioning. The ozone that California Air Resources Board regulates as an air pollutant is produced close to the ground level, where people live, exercise and breathe. The concern about ozone pollution is its effects on the health of Californians and the environment (ARB 2015).

In April 2005, the Air Resources Board approved a new 8-hour standard of 0.070 ppm and retained the 1-hour ozone standard of 0.09 after an extensive review of the scientific literature. (ARB 2015)

Particulate Matter 2.5 (PM_{2.5}) is the term for particles found in the air, including dust, dirt, soot, smoke and liquid droplets. Many manmade and natural sources emit PM directly or emit other pollutants that react in the atmosphere to form PM. Particles less than 10 micrometers pose a health concern because they can be inhaled into and accumulate in the respiratory system. PM_{2.5} are referred to as “fine” particles and believed to pose the greatest health risks. Sources include motor vehicles, power plants, wood burning. (Source: EPA.gov)

Particulate Matter 10 (PM₁₀) are the larger particles between 2.5 and 10 micrometers found in the air including smoke and dust from factories, farming, roads, mold, spores and pollen. Major concerns for human health from exposure to PM₁₀ include: effects on breathing and respiratory systems, damage to lung tissue, cancer, and premature death. Acidic PM₁₀ can also damage human-made materials and is a major cause of reduced visibility in many parts of the U.S. (Source: EPA.gov)

Lead (Pb) is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been from fuels emitted by on-road motor vehicles

(such as cars and trucks) and industrial sources. As a result of the EPA's regulatory efforts to remove lead from on-road motor vehicle gasoline, emissions of lead from the transportation sector dramatically declined by 95 percent between 1980 and 1999, and levels of lead in the air decreased by 94 percent between 1980 and 1999. Today, the highest levels of lead in air are usually found near lead smelters. The major sources of lead emissions to the air today are ore and metals processing and piston-engine aircraft operating on leaded aviation gasoline. (Source: EPA.gov)

Nitrogen Dioxide (NO₂) is emitted from motor vehicles, industrial facilities, and power plants. Home heaters and gas stoves also produce substantial amounts of NO₂. In the summer months NO₂ is a major component of photochemical smog and an essential ingredient in the formation of ground-level ozone pollution. Exposure to NO₂ along with other traffic-related pollutants, is associated with respiratory symptoms, episodes of respiratory illness and impaired lung functioning. In February 2007, the Air Resources Board established a new annual average NO₂ standard of 0.030 ppm and lowered the 1-hour NO₂ standard to 0.18 ppm, after an extensive review of the scientific literature. (Source: ARB 2015).

Carbon Monoxide is a byproduct of incomplete combustion and is emitted directly into the atmosphere, primarily from motor vehicle exhaust. Carbon monoxide concentrations typically peak nearest a source, such as roadways, and decrease rapidly as distance from the source increases. Carbon monoxide is readily absorbed into the body from the lungs. It decreases the capacity of the blood to transport oxygen, leading to health risks for unborn children and people suffering from heart and lung disease. The symptoms of excessive exposure such as headaches, fatigue, slow reflexes, and dizziness also occur in healthy people. (Source: ARB 2015)

Sulfur Dioxide (SO₂) is primarily a combustion product of coal, fuel oil, and diesel fuel. Only small quantities of SO₂ come from gasoline fueled motor vehicle exhaust. Sulfur dioxide is emitted directly into the atmosphere and can remain suspended for days allowing for wide distribution of the pollutant. Sulfur dioxide can trigger constriction of the airways, causing particular difficulties for asthmatics. Children can experience increased respiratory tract infections and healthy people may experience sore throats, coughing, and breathing difficulties. Long-term exposure has been associated with increased risk of mortality from respiratory or cardiovascular disease. (Source: ARB 2015).

The California Air Resources Board has monitored the gaseous criteria pollutants carbon monoxide, nitrogen dioxide, ozone, and sulfur dioxide since its inception in 1968. Monitoring is performed to demonstrate attainment or non-attainment of national and state ambient air quality standards.

Desired Condition

Desired conditions are to manage activities so that air quality meets the standards under Federal, State, and local laws (LRMP page 99). Activities permitted on Tahoe National Forest System lands will support State and local objectives for air quality. As new technology is developed to control automobile and industrial emissions, air quality on the Tahoe should improve (LRMP page 103).

Resource Indicators and Measures

The air quality analysis is a qualitative discussion of the potential contribution of OSV emissions from the estimated number of visitors to the Tahoe National Forest each year.

Methodology

Information Sources

Information sources used for this analysis are listed below and represent some of best available information that was available at the time of report writing.

- ArcMap and relevant GIS data layers from the Tahoe National Forest, Environmental Protection Agency and the California Air Resources Board were used. Including county boundaries, air basin boundaries, air district boundaries and class 1 and 2 areas.
- GIS layer of proposed OSV designations and groomed trails.
- Tahoe National Forest Land and Resource Management Plan (USDA Forest Service 1990).
- Scientific literature cited in the References section.
- The National Visitor Use Monitoring information for the Tahoe National Forest.
- OSV use was from the 2009 OSV Winter Trailhead Survey conducted in support of the 2010 State OSV Program Environmental Impact Report for Program Years 2010-2020.
- Information and correspondence obtained from the California Air Resources Board.

OSV Use Assumptions for Analysis

For analysis purposes, snowmobile emission data used was obtained from the Environmental Protection Agency (EPA 2010). Analysis was based on emission estimates for a 2-stroke snowmobile (worst-case scenario). Snowmobile miles traveled per day was estimated at 50 miles per day and was averaged based on the responses received through a survey forum (snowest.com). Assuming a 4 percent average annual increase in use, the projected Seasonal OSV Use-days for the Tahoe National Forest for 2016 would be 20,859 for OSV program trailheads. Primarily day use (generally 10:00 am to 3:00 pm); grooming occurs at night. OSV use is highest on weekends and holidays. Highest concentration of OSV use occurs along groomed trails (supposed by research documented in State EIR (Valentine 2016a).

Spatial and Temporal Context for Effects Analysis

Spatial Context:

The spatial boundaries for analyzing the direct and indirect effects to air quality are within the Tahoe National Forest boundary, because the proposed OSV designation decision would apply to OSV use and its possible effects to air quality on the forest.

The spatial boundaries for analyzing cumulative effects to air quality are within the Tahoe National Forest boundary, because the proposed OSV designation decision would apply to OSV use and its potential to cumulatively impact air quality on the forest.

Effects Timeframe:

The temporal boundaries for analyzing the direct and indirect effects to air quality is one OSV season. This was chosen in order to analyze the effects of OSV emissions within the Tahoe for one winter season and used to compare emissions generated in air districts per year.

Affected Environment

Existing Condition

California is divided geographically into air basins for the purpose of managing the air resources of the state on a regional basis. An air basin generally has similar meteorological and geographic conditions throughout. The state is currently divided into 15 air basins, the Tahoe National Forest is located within the Mountain Counties Air Basin, with a small portion of Yuba County within the Sacramento Valley Air Basin (figure 10).



Figure 10. Designated air basins in California

Air Pollution Control Districts/Air Quality Management Districts

Air quality for the forest is managed and regulated by air pollution control or air quality management districts. These districts were created by state law to enforce local, state and Federal air pollution regulations. The Tahoe National Forest lies within Plumas, Placer, Sierra, Nevada and Yuba Counties. The Feather River Air Quality Management District administers air quality management programs for Yuba County within the Sacramento Valley Air Basin and encompasses a small western portion of the Tahoe National Forest. The Northern Sierra Air Quality Management District manages

air quality programs for Nevada, Sierra and Plumas Counties. The majority of the Tahoe National Forest lies within this district. The Placer Air Pollution Control District manages air quality programs and air standards for Placer County and lies within the approximate southern third of the Tahoe National Forest. Air quality rules and regulations for each air pollution control district can be found at their websites. Figure 11 depicts where the air pollution districts lie within the Tahoe National Forest.

Class I and II Areas

There is one Class I area, the Desolation Wilderness, lies south of the Tahoe National Forest boundary. All areas within the Tahoe National Forest are classified as Class II, including the Granite Chief Wilderness. The nearest source of local emissions is probably the Lake Tahoe basin, immediately east of the Desolation Wilderness. However, most of the wilderness is not part of the nearby Lake Tahoe airshed, although easternmost east-facing slopes are (ARB 2016). Section 160-169 of the Clean Air Act established a detailed policy and to protect the quality of the air in regions of the United States in which the air is cleaner than required by the NAAQS. One purpose of the Clean Air Act's regulatory program is the Prevention of Significant Deterioration and to preserve, protect and enhance air quality in national parks and national wilderness areas. Through this program, Congress established a land classification scheme for those areas with air quality better than the NAAQS. Class I allows very little deterioration of air quality, Class II allows moderate deterioration and Class III allows more deteriorations. In all cases, the pollution concentrations shall not violate NAAQS.

Visibility impairment is defined as any humanly perceptible change in visual air quality from that which would have existed under natural conditions (in other words, absent anthropogenic influence). Sources for visibility impairment in these Class I areas include, but are not limited to, industrial sources, on-road and off-road vehicle emissions, road dust, windblown dust, and smoke. Sources can be local or very distant. Progress toward better visibility is calculated from data collected at the Interagency Monitoring of Protected Visual Environments (IMPROVE) network. The IMPROVE monitors measure the concentration of each haze-causing pollutant every three days. There are 17 IMPROVE monitors representing one or more of the Class I Areas in California. The BLIS1 monitor location represents two wilderness areas located along the crest of the Sierra Nevada mountain range, just west of Lake Tahoe. The wilderness areas associated with the BLIS1 monitor are Desolation Wilderness area and Mokelumne Wilderness area (within the Stanislaus, Eldorado, and Toiyabe National Forests). The BLIS1 site has been operating since November 1990 (ARB 2016).

However, the Air Resources Board also noted, as evidenced by reductions in anthropogenic source emissions in California and the concurrent improvement in visibility at all of California's Class I Area IMPROVE monitors, that the current Regional Haze plan strategies are sufficient for California and its neighboring states to meet their 2018 Reasonable Progress Goals (ARB 2014).



Figure 11. Class I areas in California

Air Quality Standards

The Tahoe National Forest must comply with Federal and State ambient air quality standards as mandated by the Clean Air Act of 1963. These standards have been established for seven criteria air pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), PM₁₀, PM_{2.5}, ozone (O₃), and sulfur dioxide (SO₂). California also has standards in place for sulfates, hydrogen sulfide, visibility-reducing particles and vinyl chloride (ARB 2015).

These pollutants can affect human health, reduce visibility, and lead to acidic deposition in sensitive, high-elevation lakes. Air quality within the Tahoe National Forest could be affected by land management and development activities both on and off the forest. Sources of air pollutants include forest management activities such as wildland fires (both natural and management ignited), road dust, and vehicle emissions. These sources, as well as industrial sources and emissions from urban developments are also found outside Forest Service administered lands.

Currently, the Tahoe National Forest complies with Federal and State standards and there are no known violations of the Clean Air Act. According to the EPA, the Sacramento Metro area of Placer County is in nonattainment for 8-hour ozone and the western portion of Nevada County is also in nonattainment for ozone. The remaining counties and air districts are in attainment or unclassified for the other criteria pollutants. The concern for ozone is in the summer only according to the Air Pollution Specialist at the Air Resources Board (Lopina 2015). Please see table 42.

Table 42. Federal non-attainment areas for criteria pollutants

County and/or Air District	8-hour Ozone	Carbon Monoxide (CO)	Lead (Pb)	Particulate Matter 2.5 (PM _{2.5})	Particulate Matter 10 (PM ₁₀)	Nitrogen Dioxide (NO ₂)	Sulfur Dioxide (SO ₂)
Placer	N (Sacramento Metro area)	U/A	U/A	U	U	U/A	U
Plumas	U/A	U/A	U/A	U	U	U/A	U
Nevada	N (Western part of Co)	U/A	U/A	U	U	U/A	U
Sierra	U/A	U/A	U/A	U	U	U/A	U
Yuba	U/A	U/A	U/A	U	U	U/A	U

Source: <http://www.arb.ca.gov/ei/gislib/gislib.htm> (Accessed: June 2016)

A=Attainment; N=Non-attainment; U=Unclassified

Table 43 shows the California Ambient Air Quality Standards state designations for all criteria pollutants in California. The Air Resources Board makes state area designations for 10 criteria pollutants: ozone, suspended particulate matter (PM₁₀), fine suspended particulate matter (PM_{2.5}), carbon monoxide, nitrogen dioxide, sulfur dioxide, sulfates, lead, hydrogen sulfide, and visibility-reducing particles (ARB 2015). The Air Resources Board lists three counties in non-attainment for ozone. The remaining counties are in attainment or unclassified for the criteria pollutants.

For ozone, PM_{2.5}, and PM₁₀, the required minimum number of monitors is based on the population of the Core-Based Statistical Area (CBSA) and the severity of the pollutant concentrations of each CBSA. The table below summarizes the required and existing ozone, PM_{2.5}, and PM₁₀ monitors for 11 CBSAs. In all cases, sufficient monitoring exists and no additional monitoring is required (ARB 2015) (see table 44).

Table 43. State designated non-attainment areas for criteria pollutants

County and/or Air District	Ozone (O ₃)	Carbon Monoxide (CO)	Lead (Pb)	PM _{2.5}	PM ₁₀	Nitrogen Dioxide (NO ₂)	Sulfur Dioxide (SO ₂)	Sulfates	Hydrogen Sulfide	Visibility Reducing Particles
Placer	N	U	A	U	A	A	A	A	U	U
Plumas	U	A	A	U	A	A	A	A	U	U
Nevada	N	U	A	U	A	A	A	A	U	U
Sierra	U	U	A	U	A	A	A	A	U	U
Yuba	N-transitional	U	A	A	A	A	A	A	U	U

Source: <http://www.arb.ca.gov/ei/gislib/gislib.htm> Accessed: June 2016

A=Attainment; N=Non-attainment; U=Unclassified

Table 44. Number of required and existing sites by CBSA

CBSA	Population	<u>Ozone</u> Required	<u>Ozone</u> Existing	<u>PM_{2.5}</u> Required	<u>PM_{2.5}</u> Existing	<u>PM_{2.5}</u> Required	<u>PM_{2.5}</u> Existing	<u>PM₁₀ (SSI)³</u> Required	<u>PM₁₀ (SSI)³</u> Existing
		SLAMS ¹	SLAMS	SLAMS	SLAMS	Cont. ²	Cont.	SLAMS	SLAMS
Bakersfield*	839,361	2	8	2	5	1	3	4-8	4
Chico	220,000	1	2	0	1	1	3	N/A	N/A
Los Angeles-Long Beach-Anaheim*	12,828,837	4	16	3	11	2	7	2-4	8
Redding	177,223	1	4	0	1	0	0	0	3
Riverside-San Bernardino-Ontario*	4,224,851	3	21	3	10	2	8	6-10	12
Sacramento-Arden Arcade-Roseville*	2,149,127	2	17	3	6	2	9	6-10	10
Santa Rosa*	483,878	1	2	0	1	0	1	N/A	N/A
Vallejo-Fairfield^	413,344	2	3	0	1	0	1	0-1	1
Yuba City	166,892	1	2	0	1	0	1	N/A	N/A
El Centro	174,528	1	3	1	3	1	1	1-2	5
Oxnard-Thousand Oaks-Ventura	823,318	2	5	1	5	1	5	N/A	N/A

Source: ARB 2015

2012-2014 air quality data was used in determining the number of required sites. This table excludes tribal monitoring sites.

Population is based on year 2010 Census data.

*Parts of these MSAs are included in the geographical scope of this report, and parts are within the geographical scope of the reports being completed by the districts.

The numbers of sites listed are for the entire CBSA. See Table 3a for a completed list of CBAs in California.

¹ SLAMS: State and Local Air Monitoring Stations.

² Cont.: Refers to a continuous PM_{2.5} monitor, i.e., one that measures hourly data.

For this assessment, both continuous FEMs and non-FEMs are counted for each CBSA.

³ SSI: Size Selective Inlet. The SSI is an FRM for PM₁₀. N/A means there is no PM₁₀ monitor in the CBSA.

^The PM_{2.5} FRM monitor at Vallejo was discontinued in March 2011 and was replaced with a continuous PM_{2.5} FEM monitor.

Table 45 below displays the annual average emissions (tons per year) generated for the air districts within the Tahoe National Forest (EPA 2013).

Table 45. Estimated annual average emissions (tons per year) by air district for area-wide, stationary and mobile sources

Air District	TOG	ROG	CO	NOx	SOx	PM	PM ₁₀	PM _{2.5}
Placer APCD	22,403.7	7,639.45	31,922.9	8,230.75	98.55	9,453.5	5,445.8	1,781.2
Northern Sierra AQMD (Nevada, Sierra, Plumas Counties)	10,577.7	5,131.9	33,572.7	4,796.1	270.1	12,380.8	7,577.4	1,952.75
Feather River AQMD (Yuba County**)	11,453.7	5,500.55	19,520.2	73,070.3	204.4	10,318.55	5,653.85	1,843.25
TOTAL Emissions for Air Districts (tons/year)	44,435.1	18,271.9	85,015.8	86,097.15	573.05	32,152.85	18,677.05	5,577.2

Source: <http://www.arb.ca.gov/ei/maps/statemap/dismap.htm>. Accessed July 19, 2016

**Feather River emissions estimates also includes emissions from Sutter County, not within the Tahoe National Forest.

Snowmobile Emission Standards

In 2002, the EPA issued a regulation that imposed stringent pollution regulations on snowmobiles, requiring that snowmobiles fall under regulations of the Clean Air Act (Jehl 2002). In 2012, snowmobile manufacturers were required to meet one of two alternatives. One would require reductions in emissions of both hydrocarbons and carbon monoxide by 50 percent from current levels. The other is intended to encourage further reductions in hydrocarbons and would require a 70 percent reduction in hydrocarbons, the source of the more urgent health concerns, in return for a 30 percent reduction in carbon monoxide (Jehl 2002)

The EPA also requires that manufacturers ensure each new engine, vehicle, or equipment meets the latest emission standards. Once manufacturers sell a certified product, no further effort is required to complete certification. If products were built before EPA emission standards started to apply, they are generally not affected by the standards or other regulatory requirements (EPA 2015₃).

Best Available Technology

Snowmobiles must be certified by the National Park Service to enter some National Parks (Yellowstone, Grand Teton). Best available technology certification is one of the most stringent standards for air and noise emissions in the world, requiring hydrocarbon emissions of less than 15 g/kW-hr, carbon monoxide emissions of less than 120 g/kW-hr, and sound level limited to 73 decibels (BRP 2011). The use of certified snowmobiles, which result in lower CO and hydrocarbon emissions (NPS 2013), is not currently required within the Tahoe National Forest. The Forest Service has no regulatory jurisdiction over air quality or noise.

Table 46. Exhaust emission standards for snowmobiles

Phase	Model year	Phase-in (percent)	Emission standards		Maximum allowable family emission limits	
			HC	CO	HC	CO
Phase 1	2006	50	100	275		
Phase 1	2007-2009	100	100	275		
Phase 2	2010 and 2011	100	75	275		
Phase 3	2012 and later	100	(¹)	(¹)	150	400

Source: Code of Federal Regulations, Accessed November 2015

¹ See § 1051.103(a)(2):

(a) * * *

(1) Follow Table 1 of this section for exhaust emission standards. You may generate or use emission credits under the averaging, banking, and trading (ABT) program for HC and CO emissions, as described in subpart H of this part. This requires that you specify a family emission limit for each pollutant you include in the ABT program for each engine family. These family emission limits serve as the emission standards for the engine family with respect to all required testing instead of the standards specified in this section. An engine family meets emission standards even if its family emission limit is higher than the standard, as long as you show that the whole averaging set of applicable engine families meets the applicable emission standards using emission credits, and the vehicles within the family meet the family emission limit. The phase-in values specify the percentage of your U.S.-directed production that must comply with the emission standards for those model years. Calculate this compliance percentage based on a simple count of your U.S.-directed production units within each certified engine family compared with a simple count of your total U.S.-directed production units. Table 1 also shows the maximum value you may specify for a family emission limit, as follows:

(2) For Phase 3, the HC and CO standards are defined by a functional relationship. Choose your corporate average HC and CO standards for each year according to the following criteria: <https://www.federalregister.gov/articles/2008/06/25/E8-14411/exhaust-emission-standards-for-2012-and-later-model-year-snowmobiles>

Motorized Winter Recreation

Table 47 is derived from the OSV trailhead survey conducted for the State EIR, and based on data summarized in the State EIR (California Department of Park and Recreation 2010). The table shows the average number of vehicles at trailheads, and the average number of OSVs that would be expected on weekends and holidays versus weekdays. Based on this information, estimated use per winter season would be 22,410 OSV users forestwide. However, visitor use levels vary by season depending on the amount of snowfall, adequate snow depths, and length of season. The season is from mid-December through March (approximately 14 weeks), which is equivalent to approximately 33 weekend/holidays and 65 weekdays. In 2010, snowmobiling was reported as a main activity for 1.7 percent, and in 2005 snowmobiling was reported as a main activity for 7 percent (Valentine 2016b).

Table 47. Tahoe National Forest OSV visitor use

Location	Day description	Number of vehicles	Number of OSVs*
Forestwide	Weekend or holiday (approx. 33 per season)	202	404
Forestwide	Weekday (approx. 65 per season)	40	80

Grooming Activities

Currently, there are approximately 220 miles of National Forest System trails that are groomed for OSV use within the Tahoe National Forest. Snow trail grooming for OSV use typically occurs December through March. Snowcats are used for grooming OSV trails and grooming operations are typically

conducted during the night or during low use timeframes. The California OHMVR Division’s snowcat fleet is subject to emission regulation by the California Air Resources Board (CARB) as off-road equipment. The CARB sets an emission limit for the vehicle fleet as a whole rather than for individual pieces of equipment. Based on the total horsepower of the vehicle fleet, and the model and year of the individual equipment within the fleet, CARB determines how much horsepower per year must be repowered, retrofitted, or retired. The California OHMVR Division then determines what modifications to make to its fleet in order to satisfy CARB requirements.

Table 48. Resource indicators and measures for air quality, existing condition

Resource Element	Resource Indicator	Measure	Existing Condition/ Alternative 1
Air Quality	Estimate of change (increase or decrease) in emissions and the possibility of adversely impacting air quality.	Miles of trail designated for OSV use	3,693
	Estimate of change (increase or decrease) in emissions and the possibility of adversely impacting air quality.	Acres designated for OSV use	641,952
	Potential effects of OSV emissions to create adverse impacts to air quality.	OSV visitor use in relation to sensitive areas (Class I and II areas).	No known impacts to air quality or NAAQS/CAAQS violations exist.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Land management and development activities on and off the forest can affect the air quality within the Tahoe National Forest. Air pollution sources include emissions from mobile and stationary sources including industrial activity, highway vehicles, and off-road vehicles (all-terrain vehicles, aircraft, locomotives, construction machinery). Airborne dust and smoke from burning can also significantly impact air quality as they occur on and off the forest. These sources can emit a host of regulated pollutants in and around the forest. Currently, good dispersion and topographic influences on the forest have resulted in no violations of Federal and State Ambient Air Quality Standards and have not attained concentrations high enough to warrant measurement or to result in degradation of air quality in the Class I area.

Three factors, largely beyond State control, can interfere with air quality in Class I Areas: wildfire smoke, offshore shipping emissions, and Asian dust. These factors are either from natural sources (wildfire smoke), uncontrollable sources (shipping emissions beyond California’s jurisdiction), or both (Asian dust, a combination of anthropogenic and natural sources beyond California’s control) (ARB 2014).

Table 49 displays the potential contribution of snowmobile emissions from the estimated 22,410 OSV visitors that recreate within the Tahoe National Forest each year. All calculations were done using emission estimates from a 2-stroke snowmobile (EPA 2010). As shown in table 49, it is estimated current emissions generated as a result of OSV use within the Tahoe National Forest contributes approximately 0.43 percent of carbon monoxide (CO) to the air districts under alternative 1, and less than 0.01 percent of nitrogen oxide (NOx) and particulate matter (PM). These emissions are minor

compared to other sources of air pollution impacting the forest. Impacts to air quality include vehicle emissions such as nitrogen oxides, particulate matter, and carbon monoxide from all motorized vehicles including snowmobiles and snowcats. Diesel engines also emit sulfur oxides and particulates. Air quality impacts from vehicle emissions are influenced by the effectiveness of smog control devices on cars, amount of traffic, and how long engines idle. As people recreate in the forest during the winter months, the effects of vehicle exhaust on air quality may become a localized temporary issue where concentrated motorized use conflicts with non-motorized uses and nuisance smell occurs.

Table 49. Emission estimate (tons per year) for OSV use within the Tahoe National Forest

Source	Number of OSVs	Miles*	CO	NOx	PM
Snowmobile (2-stroke)	22,410	50	365.60	1.06	3.33
% Pollutant Contribution to Air Districts	-----	----	0.43%	Less than 0.01	Less than 0.01

*Assumes 22,410 OSVs recreate on the Tahoe per year and travel an average of 50 miles.

Alternative 2

Direct and Indirect Effects

Alternative 2 would designate OSV use on fewer acres than alternative 1 (406,895 acres versus 636,002 acres, respectively). This is approximately a 36 percent reduction in acres designated for OSV use forestwide as compared to the existing condition.

For the Tahoe National Forest, an estimated 22,410 OSV visitors forestwide for the winter season would equate to approximately 229 OSV visitors on the forest per day (using 33 weekend/holidays and 65 weekdays per season) utilizing 384 miles of trail and 410,703 acres for OSV use. That is equivalent to approximately one OSV visitor per 1,793 acres. It is expected OSV emissions would dissipate and the possibility of accumulation would be eliminated, based on topographic influences and wind dispersion. Non-motorized users' air quality concerns in parking lots, at trailheads and on trails would continue since non-motorized and motorized users would still share the same parking areas, trailheads and many of the same trails. The odor generated by emissions from combustion engines, particularly two-cycle engines, can diminish a non-motorized user's experience. However, this is likely a recreation (user satisfaction) issue rather than a general air quality issue (see Recreation report for more discussion on the topic of visitor experience). Bishop et al. (2006) found emissions were greatest during initial startup and idling, especially when the engine is cold. They also observed reducing wait times at entrance stations would further lower emissions and exposure. Implementing similar measures or idling limits at parking lots and trailheads, may address public concerns regarding nuisance smell and possible impacts to air quality in those areas. It is anticipated any impacts to air quality from winter motorized recreation under alternative 2 would not result in any violations to National and State Ambient Air Quality Standards.

Musselman and Korfmacher (2007) conducted a study in Wyoming to evaluate the effects of winter recreation snowmobile activity on air quality at a high-elevation site. They measured levels of nitrogen oxides (NOx, NO), carbon monoxide (CO), ozone (O3) and particulate matter (PM₁₀ mass). They found

nitrogen oxides and carbon monoxide were significantly higher on weekends than weekdays due to higher snowmobile use on weekends. Ozone and particulate matter were not significantly different during the weekend compared to weekdays. Air quality data during the summer were also compared to the winter data and they found carbon monoxide levels at the site were significantly higher during the winter than during the summer. Nitrogen oxides and particulates were significantly higher during the summer compared to winter. Nevertheless, air pollutants were well dispersed and diluted by strong winds common at the site, and snowmobile emissions did not have a significant impact on air quality at the site (Musselman and Korfmacher 2007).

Class I and II Areas

Implementation of alternative 2 is expected to maintain the same air quality conditions as compared to alternative 1 due to good dispersion characteristics across the forest, low inversion potential, and low emissions generated from OSVs as compared to other potential sources. It is anticipated that air quality of the Class I area and the Granite Chief Wilderness (Class II area) would be similar to the existing condition. Compliance with State and Federal air quality standards is expected to occur under alternative 2. Motorized recreation emission sources on the forest are localized, transient, and not expected to result in any significant air quality impacts under alternative 2. No violations of the Clean Air Act are expected to occur.

Cumulative Effects

Land management and development activities on and off the forest can affect air quality on the forest. Air pollution sources include emissions from industrial activity, highway vehicles, and off-road vehicles (all-terrain vehicles, aircraft, locomotives, construction machinery). Airborne dust and smoke from burning can also significantly impact air quality as they occur on and off the forest. None of the on-forest sources discussed in the existing condition are expected to increase or impact air quality when combined with alternative 2. In addition, emissions generated from snowcats plowing and grooming parking lots and trailheads could contribute to localized air pollution on the forest. However, it is estimated the contribution of administrative snowcat use to the overall cumulative impacts on air quality would be minimal.

Air quality impacts are expected to grow with continued growth of population around the Tahoe National Forest. Substantial impacts to air quality are not expected to occur during winter months on the forest due to regulations already in place by the EPA and the Clean Air Act. The past, present, and reasonably foreseeable future actions would be the primary contributors to air quality impacts on the forest. Due to the short-term and localized impact of OSV use, this alternative is not expected to result in a significant contribution to the cumulative impacts of other local and regional air pollution sources. However, it is impossible to predict future pollutant discharge from off-forest mobile and stationary sources and how those sources may contribute to, or impact air quality, on the forest. There are no known unavoidable adverse, irreversible, or irretrievable effects to air quality as a result of implementation.

Alternative 3

Direct and Indirect Effects

Alternative 3 would designate OSV use on fewer acres than alternative 1 (257,024 acres versus 641,952 acres, respectively). This is a reduction in acres designated for OSV use forestwide as compared to the existing condition.

Cumulative Effects

The cumulative effects discussed for alternative 2 would also apply for alternative 3.

Alternative 4

Direct and Indirect Effects

Under alternative 4 there would be approximately 326 miles of trail designated for OSV use and 641,708 acres designated for OSV use. The estimated 22,410 OSV visitors forestwide for the winter season would equate to approximately 229 OSV visitors on the forest per day (using 33 weekend/holidays and 65 weekdays per season) utilizing 326 miles of trail and 641,708 acres for OSV use. That is equivalent to approximately one OSV visitor per 2,802 acres. With the acres designated for OSV use, it is likely emissions generated as a result of OSVs would be similar to what is currently estimated under alternative 1.

Cumulative Effects

The cumulative effects discussed for alternative 2 above would also apply for alternative 4.

Alternative 5

Direct and Indirect Effects

Alternative 5 would prohibit OSV use on more acres than alternative 2. This is approximately a 53 percent reduction in acres designated for OSV use forestwide as compared to the existing condition (302,411 acres versus 641,952 acres, respectively). It is likely emissions generated as a result of OSVs would be less than what is currently estimated. Current emissions generated as a result of OSV use on the Tahoe are estimated to contribute less than approximately 0.0043 percent of carbon monoxide (CO) under alternative 1, less than 0.01 percent of nitrogen oxide (NOx), and less than 0.01 percent of particulate matter (PM) pollutants to the air districts within the Tahoe National Forest. These emissions are minor compared to other sources of air pollution impacting the forest.

Direct and Indirect Effects

The cumulative effects discussed for alternative 2 above would also apply for alternative 5.

Summary

It is expected the levels of pollutants for all the alternatives would fall within the ranges currently experienced and no violation of State or Federal ambient air quality standards would occur during the OSV season.

OSV use is not designated in Class I areas in all alternatives, and it is anticipated the impacts of OSV use on Class I areas would be fairly similar for all action alternatives. It is anticipated

Compliance with Relevant Laws, Regulations, Policies and Plans

No known violations of ambient air quality standards have occurred on the forest, nor have any activities on the forest caused violations of these standards elsewhere. The actions proposed in all alternatives would comply with the Clean Air Act, the National Ambient Air Quality Standards, and California Ambient Air Quality Standards for criteria pollutants.

Other Relevant Mandatory Disclosures

Unavoidable Adverse Effects

Authorized OSV use on National Forest System lands, may unavoidably affect the short-term air quality in some areas, specifically at trailheads and parking lots. However, it is likely this is a nuisance smell issue, rather than an air quality issue.

Hydrology

Relevant Laws, Regulations, and Policy

Regulatory Framework

Land and Resource Management Plan

The 1990 Tahoe National Forest LRMP (USDA Forest Service 1990) provides standards and guidelines for water-related concerns. The following list of standards and guidelines, are a subset of all applicable LRMP direction, and this project must be analyzed for consistency to all applicable LRMP standards and guidelines for hydrology.

Table 50. Tahoe National Forest LRMP guidelines relevant to watershed resources

Page	Forestwide Guidelines
LRMP, pg. V-35	Use best management practices (BMPs) to meet water quality objectives and maintain and improve the quality of surface water on the forest. BMPs are implemented as mitigation measures specified in Appendix A (Road Cards) for any motorized trail to be added to the National Forest Transportation or any lands to be established as "Open Areas." These mitigation measures will meet water quality objectives and maintain and improve the quality of surface water on the forest.
LRMP, pg. 27	<u>Current Management Direction</u> The water program mission is to afford optimum protection to the water resources compatible with other program practices, including timber, wildlife and fisheries, range, recreation, engineering, and mining. Where opportunities arise, watershed improvement measures will be implemented and water quantities and timing of flow will be improved. The water program on the Tahoe NF has primarily served as a support function for other resource activities. The various types of support include planning, inventories, analyzing project proposals, monitoring, and administration. All existing land management practices use the water quality protection measures that are specified as Best Management Practices (BMPs) in the R-5 document 'Water Quality Management for National Forest System Lands in California,' also referred to as the R-5 Forest Service 208 Plan.

Page	Forestwide Guidelines
LRMP, pg.V-9	Produce water of sufficient quality and quantity to meet or exceed identified use requirements and improve water quality by the year 2030. Maintain or improve soil productivity and prevent excessive, cumulative watershed impacts. Conserve soil and water resources and prevent activities that will significantly or permanently impair the productivity of the land. Protect streams, lakes, wetlands, streamside management zones, and other riparian areas.
LRMP, pg.V-9	<u>Desired Future Condition</u> Greater emphasis on environmental quality will have positive effects on the soil and water resources. Specific riparian and streamside guidelines will have maintained current riparian conditions. Direct soil and water improvement projects will have stopped the decline and in some cases restored or improved the productivity of key watersheds. Instream flow requirements will have protected riparian-dependent communities against incompatible water resource development. Greater emphasis on water resources, soil, and watershed management will have resulted in greater project success and less impact on soil and water resources. Monitoring will provide information on management-induced impacts on soil and water resources. This knowledge will be used to improve project implementation.
LRMP, pg.V-33	Disturbed Watershed Acres Restored by Limiting intensive Management. Limit intensive management (e.g., range, timber management, OW'S, etc.) on lands that are in a declining hydrologic condition
LRMP, pg.V-35	Water Quality Protection- Use Best Management Practices to meet water quality objectives and maintain and improve the quality of surface water on the forest. Methods and techniques for applying the BMP will be identified and documented during project level environmental assessments and incorporated into the associated project plan and implementation documents. (See Plan Appendix E.)
LRMP, pg.V-38	Soils/Watershed/Geology Support- Provide watershed input in support of other resource activities. This involves various EAs and planning efforts such as timber sales, recreation site developments, reforestation planning, range planning and improvement, material source development, groundwater development hydroelectric projects, mining explorations and operations, sale preparation and administration, and wildlife habitat improvement projects. Also, develop and administer plans for soil, water, and geologic resource projects (e.g., for special studies, demonstration soil areas, municipal watersheds, groundwater and aggregate sources, and river basin studies). Includes soils and water resource inventories, soils and water resource monitoring, geologic resources and hazards inventory, and water uses management (administration of water uses and water uses inventory)
LRMP, pg.V-61	Water Resource improvement- Implement activities to improve watershed conditions. These are usually major soil erosion and water quality problem areas that are on the forest WIN Inventory Includes erosion reduction: water flow improvement (e.g., reduced surface runoff): channel stabilization works; and sediment retention practices This involves revegetation with grasses, trees, and shrubs, and associated treatments such as mulching, spreading straw and jute: and improvements such as check dams, settling basins, and water spreading structures Involves developing water resource improvement plans, implementing restoration plans, and maintenance.

Sierra Nevada Forest Plan Amendment

The 2001 Sierra Nevada Framework modified forest plan guidance and established a comprehensive aquatic and riparian conservation strategy for all of the national forest lands in the Sierra Nevada. Key components of this strategy include riparian buffer zones, critical refuges for threatened and endangered aquatic species, special management for large meadows, and a watershed analysis process.

The framework includes standards and guidelines in national forests for construction and relocation of roads and trails and for management of riparian conservation areas. These standards and guidelines

require the Forest Service to avoid road construction, reconstruction, and relocation in meadows and wetlands; maintain and restore the hydrologic connectivity of streams, meadows, and wetlands by identify roads and trails that intercept, divert, or disrupt flows paths and implementing corrective actions; and determine if stream characteristics are within the range of natural variability prior to taking actions that could adversely affect streams.

The framework's standards and guidelines for riparian conservation areas are intended to minimize the risk of activity-related sediment entering aquatic systems. The framework established riparian conservation area widths for all Sierra Nevada forests: 300 feet on each side of perennial streams; 150 feet on each side of intermittent and ephemeral streams; and 300 feet from lakes, meadows, bogs, fens, wetlands, vernal pools, and springs.

Riparian Conservation Areas: Activity-related Standards and Guidelines

Where a proposed project encompasses riparian conservation areas or a critical aquatic refuge, conduct a site-specific project area analysis to determine the appropriate level of management within the riparian conservation area or a critical aquatic refuge. Determine the type and level of allowable management activities by assessing how proposed activities measure against the riparian conservation objectives and their associated standards and guidelines. Areas included in riparian conservation areas 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.

Riparian Conservation Objective 1

Ensure that identified beneficial uses for the water body are adequately protected. Identify the specific beneficial uses for the project area, water quality goals from the Regional Basin Plan, and the manner in which the standards and guidelines will protect the beneficial uses. Beneficial uses describe how water is used and vary by water body. Examples of beneficial uses include water for domestic water supply, fire suppression, fish and wildlife habitat, and contact recreation (swimming).

Riparian Conservation Objective 2

Maintain or restore: (1) the geomorphic and biological characteristics of special aquatic features, including lakes, meadows, bogs, fens, wetlands, vernal pools, and springs; (2) streams, including in stream flows; and (3) hydrologic connectivity both within and between watersheds to provide for the habitat needs of aquatic-dependent species.

Standard and Guideline 100: Maintain and restore hydrologic connectivity of streams, meadows, wetlands, and other special aquatic features by identifying roads and trails that intercept, divert, or disrupt natural surface and subsurface water flow paths. Implement corrective actions where necessary to restore connectivity.

Standard and Guideline 101: Ensure that culverts or other stream crossings do not create barriers to upstream or downstream passage for aquatic-dependent species. Locate water drafting sites to avoid adverse effects to stream flows and depletion of pool habitat. Where possible, maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows, wetlands, and other special aquatic features.

Standard and Guideline 102: Prior to activities that could adversely affect streams, determine if relevant stream characteristics are within the range of natural variability. If characteristics are outside of the range of natural variability, implement mitigation measures and short-term restoration actions needed to prevent further declines or cause an upward trend in conditions. Evaluate required long-term restoration actions and implement them according to their status among other restoration needs.

Standard and Guideline 103: Prevent disturbance to stream banks and natural lake and pond shorelines caused by resource activities (e.g., livestock, off-highway vehicles, and dispersed recreation) from exceeding 20 percent of stream reach or 20 percent of natural lake and pond shorelines. Disturbance includes bank sloughing, chiseling, trampling, and other means of exposing bare soil or cutting plant roots. This standard does not apply to developed recreation sites; sites authorized under special use permits, and designated OHV routes.

Riparian Conservation Objective 4

Ensure that management activities within riparian conservation areas and critical aquatic refuges enhance or maintain physical and biological characteristics associated with aquatic- and riparian-dependent species.

Standard and Guideline 116: Identify roads, trails, OHV trails and staging areas, developed recreation sites, dispersed campgrounds, special use permits, grazing permits, and day-use sites during landscape analysis. Identify conditions that degrade water quality or habitat for aquatic- and riparian-dependent species. At the project level, evaluate and consider actions to ensure consistency with standards and guidelines or desired conditions.

Riparian Conservation Objective 5

Preserve, restore, or enhance special aquatic features, such as meadows, lakes, ponds, bogs, fens, and wetlands, to provide the ecological conditions and processes needed to recover or enhance the viability of species that rely on these areas.

Standard and Guideline 118: Prohibit or mitigate ground-disturbing activities that adversely affect hydrologic processes that maintain water flow, water quality, or water temperature critical to sustaining bog and fen ecosystems and plant species that depend on these ecosystems. During project analysis, survey, map, and develop measures to protect bogs and fens from such activities as trampling by livestock, pack stock, humans, and wheeled vehicles. Criteria for defining bogs and fens include the presence of plants in the genus *Meesia*, and three sundew species (*Drosera* spp.). Complete initial plant inventories of bogs and fens within grazing allotments prior to re-issuing permits.

Riparian Conservation Objective 6

Identify and implement restoration actions to maintain, restore, or enhance water quality and maintain, restore, or enhance habitat for riparian and aquatic species.

Standard and Guideline 122: Recommend restoration practices in: (1) areas with compaction in excess of soil quality standards, (2) areas with lowered water tables, or (3) areas that are either actively down cutting or that have historic gullies. Identify other management practices that may be contributing to the observed degradation, such as road building, recreational use, grazing, and timber harvests.

State Laws

The California Water Code consists of a comprehensive body of law that incorporates all State laws related to water, including water rights, water developments, and water quality. The laws related to water quality (CWC Sections 13000 to 13485) apply to waters on the national forests and are directed at protecting the beneficial uses of water. Of particular relevance to the proposed action is Section 13369, which deals with non-point-source pollution and best management practices.

The Porter-Cologne Water-Quality Act, as amended in 2006, is included in the California Water Code. This act provides for the protection of water quality by the State Water Resources Control Board and the Regional Water Quality Control Boards, which are authorized by the U.S. Environmental Protection Agency to enforce the Federal Clean Water Act in California.

Sections 208 and 319 of the Federal Clean Water Act 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 Clean Water Act 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 BMPs. These BMPs, 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* (2000), constitute a portion of the State's Nonpoint Source Management Plan and comply with the requirements of Sections 208 and 319 of the Clean Water Act. The agreements include BMPs related to OSV use, and to road construction and maintenance. The implementation and effectiveness of the BMPs are reviewed annually. In recent years, the Forest Service has emphasized monitoring in national forests to ensure the implemented projects follow approved control measures (USDA Forest Service, 2004b).

Pacific Southwest Region Best Management Practices, and National Core Best Management Practices

The State and Regional Water Quality Control Boards entered into agreements with the Forest Service to control non-point-source discharges by implementing control actions certified by the State Water Quality Control Board and the Environmental Protection Agency as best management practices (USDA Forest Service R5 FSH 2509.22 - soil and water conservation handbook, 2011). These are designed to protect and maintain water quality and prevent adverse effects to beneficial uses, both on site and downstream. Further, the Washington Office has generated National Core BMPs that include the following BMP listed below for OSV uses.

Through the execution of a formal Management Agency Agreement with the Forest Service in 1981, the State Water Resources Control Board designated the Forest Service as the Water Quality Management Agency for National Forest System lands in California. The Forest Service BMPs are in conformance with the provisions and requirements of the Federal Clean Water Act and within the guidelines of the Basin Plans developed for the nine Regional Water Quality Control Boards in California. The BMPs most relevant to the OSV Program pertain to snow removal and monitoring and include the following:

BMP 2-25 (USDA Forest Service R5 FSH 2509.22 - Soil and Water Conservation Handbook, 2011): Snow Removal Controls to Avoid Resource Damage

a. Objective: To minimize the impact of snowmelt runoff on road surfaces and embankments and to consequently reduce the probability of sediment production resulting from snow removal operations.

b. Explanation: This is a preventative measure used to protect resources and indirectly to protect water quality. Forest roads are sometimes used throughout winter for a variety of reasons. For such roads the following measures are employed to meet the objectives of this practice.

1. The contractor will be responsible for snow removal in a manner which will protect roads and adjacent resources.

2. Rocking or other special surfacing and drainage measures will be necessary before the operator is allowed to use the roads.

3. Snow berms will be removed where they result in an accumulation or concentration of snowmelt runoff on the road and erosive fill slopes.

4. Snow berms will be installed where such placement will preclude concentration of snowmelt runoff and serve to rapidly dissipate melt water. If the road surface is damaged during snow removal, the purchaser or contractor will be required to replace lost surface material with similar quality of material and repair structures damaged in snow removal operations as soon as practical unless otherwise agreed to in writing.

c. Implementation: Project location and detailed mitigation will be developed by the interdisciplinary team during environmental analysis and incorporate into the project plan and/or contracts. Project crew leaders and supervisors will be responsible for implementing force account projects to construction specifications and project criteria.

BMP 4-7 (USDA Forest Service 2000): Water Quality Monitoring of OHV (and OSV) Use According to a Developed Plan

a. Objective: To provide a systematic process to determine when and to what extent OHV use will cause or is causing adverse effects on water quality.

b. Explanation: Each forest's OHV Plan [Travel Management Plan and LRMP] will:

1. Identify areas or routes where OHV use could cause degradation of water quality.

2. Establish baseline water quality data for normal conditions as a basis from which to measure change.

3. Identify water quality standards and the amount of change acceptable.

4. Establish monitoring measures and frequency.

5. Identify controls and mitigation appropriate in management of OHVs.

6. Restrict OHVs to designated routes.

c. Implementation: Monitoring results are evaluated against the OHV plan objectives for water quality and the LRMP objectives for the area. These results are documented along with actions necessary to correct identified problems. If considerable adverse effects are occurring, or are likely to occur, immediate corrective action will be taken. Corrective actions may include, but are not limited to, reduction in the amount of OHV use, signing, or barriers to redistribute use, partial closure of areas, rotation of use on areas, closure to causative vehicle type(s), total closure, and structural solutions such as culverts and bridges.

National Core BMP Rec-7. Over-Snow Vehicle Use

Reference: FSM 7718

Objective: Avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources from over-snow vehicle use.

Explanation: An over-snow vehicle is a motor vehicle that is designed for use over snow and that runs on a track or tracks and/or a ski or skis, while in use over snow. Over-snow vehicles include snowmobiles, snow cats, and snow grooming machines. Snowmobiles and snow cats are used for access and for recreational activities. Snow grooming machines are used to prepare snow on trails for downhill or cross-country skiing or snowmobile use.

An over-snow vehicle traveling over snow results in different impacts to soil and water resources than do motor vehicles traveling over the ground. Unlike other motor vehicles traveling cross-country, over-snow vehicles 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. Emissions from over-snow vehicles, 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. In addition, over-snow vehicles that fall through thin ice can pollute waterbodies.

Use of National Forest System lands and/or trails by over-snow vehicles may be allowed, restricted or prohibited at the discretion of the local line officer.

Practices:

Develop site-specific BMP prescriptions for the following practices, as appropriate or when required, using state BMPs, Forest Service regional guidance, Forest or Grassland Plan direction, BMP monitoring information and professional judgment:

- Use suitable public relations and information tools, and enforcement measures to encourage the public to conduct cross-country over-snow vehicle use and on trails in a manner that will avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources.
- ♦ Provide information on the hazards of running over-snow vehicles on thin ice.
- ♦ Provide information on effects on over-snow vehicle emissions on air quality and water quality.

- Use applicable practices of BMP Rec-4 (Motorized and Non-motorized Trails) when locating, designing, constructing and maintaining trails for over-snow vehicle use.
- Allow over-snow vehicle use cross-country or on trails when snow depths are sufficient to protect the underlying vegetative cover and soil or trail surface.
 - ♦ Specify the minimum snow depth for each type or class of over-snow vehicle to protect underlying resources as part of any restrictions or prohibitions on over-snow use.
 - ♦ Specify season-of-use to be at times when the snowpack is expected to be of suitable depth.
 - ♦ Specify over-snow vehicle class suitable for the expected snowpack and terrain or trail conditions.
- Use closure orders to mitigate effects when adverse effects to soil, water quality or riparian resources are occurring.
- Use applicable practices of BMP Rec-2 (Developed Recreation Sites) and BMP-10 when constructing and operating over-snow vehicle trailheads, parking and staging areas.
 - ♦ Use suitable measures to trap and treat pollutants from over-snow vehicle emissions in snowmelt runoff or locate the staging area at a sufficient distance from nearby waterbodies to provide adequate pollutant filtering.

Resource Indicators and Measures

Resource indicators and measures shown in table 19 will be used to measure and disclose effects to hydrology related to OSV use designations and grooming trails for OSV use.

Table 51. Resource indicators and measures used to determine impacts on water resources

Resource Element	Resource Indicator	Measure (Quantify if possible)
Water quality	Number of snowmobiles per year using trails across the forest	Total amount of use can be compared to use amounts in Yellowstone and other studies to gauge potential water quality effects
	Consistency with Riparian Conservation Objectives 1, 2, 4, 5, and 6	Evaluation of the effects to RCOs, water quality and beneficial uses of water

Methodology

Data on OSV routes and uses were compiled from GIS data obtained from the Tahoe National Forest include the following:

- GIS analyses of route miles and stream crossings in hydrologically sensitive areas.
- A variety of reports and assessments of OSV impacts, and professional experience and judgement using scientific literature on OSV impacts.
- Hydrologic data collected by the forest or other agencies, such as United States Geographical Survey (USGS), Environmental Protection Agency (EPA), and California Department of Fish and Wildlife, on streamflow, sediment loads, and stream biota and habitat.

- Air and ground photos and literature-based and anecdotal information documenting the impacts of OSV uses and how they may vary based on precipitation, elevation, aspect, and other factors within the Tahoe National Forest.

OSV Use Assumptions for Analysis

Assumptions used for the analysis are based on published literature and a Forest Service hydrologist's professional judgement based on experience. These sources of information framed the issues key indicators used for analyzing the environmental consequences of each alternative on watershed resources. They provide background information and conclusions regarding the effects of OSVs and other factors considered in this analysis, and apply to all alternatives.

Assumption 1

Snow Plowing and Removal. Snow plowing and removal occurs on paved surfaces in snow parks and does not cause soil disturbance, alter existing drainage patterns, or affect soil permeability. It is not part of the proposed action, but is an ongoing, and reasonably foreseeable action that should be considered especially for cumulative effects. Snow removal at trailhead parking areas has been occurring for decades. BMPs would be applied that ensure that snowmelt from snow storage areas does not result in erosion or impair quality of surface waters. The thaw rate in snow storage areas is typically slow, and snow is placed where the runoff percolates into the soil. High runoff rates are uncommon from snow storage areas. As a result, erosion or siltation from snow storage runoff is minimal. With implementation of BMPs, snow removal would not cause significant impacts from erosion. The snow removal operations at trailhead parking areas would not result in direct impacts on water quality. Snowmelt from snow storage areas could contain a more concentrated level of fuel deposits, oils, sand, and particulates. Snow is removed in designated storage areas where the snowmelt can percolate into the soil and sheet flow across parking areas is avoided; and direct discharge into surface water is avoided. As a result, the potential for water quality impacts associated with contaminants in the snow from plow equipment use is considered minimal. Snow removal operations are subject to BMPs, which ensure compliance with Federal Clean Water Act requirements. Consequently, project activities including snow removal are consistent with LRMP watershed management standard and guidelines and management prescriptions.

Assumption 2

Trail Grooming. Direct project activities of trail grooming occur over an existing road and trail network and do not alter landforms or result in significant soil disturbance that would change water flow patterns or quantities of surface water runoff. Provided there is adequate snow cover to prevent resource damage, trail grooming does not cause substantial impacts to water quality; perennial, intermittent, or ephemeral streams; wetlands; or other bodies of water. Consequently, project activities including snow removal, trail grooming, and OSV travel on groomed trails are consistent with LRMP watershed management standards and guidelines and management prescriptions.

Assumption 3

OSV Use on trails. Most OSV trails are snow-covered unpaved roads and trails. The primary pollutant of concern in forested environments is eroded sediment from unpaved roads, fill slopes, and cut slopes. According to West (2002), roads in forested lands are the primary source of possible non-point source of pollution. Fine-grained sediment from roads and trails that reaches waterbodies impairs water quality.

Much of the OSV use under this plan would occur on groomed trails where the plan calls for adequate snow cover, negligible anticipated contact with bare soil, and minimal disturbance of trail and road surfaces. OSV use on the groomed trail system, given adequate snow coverage, would not substantially impact water quality in perennial, intermittent or ephemeral streams, and in wetlands or other bodies of water.

Assumption 4

Cross-country off-trail riding by OSVs. With adequate snow depths, cross-country use of OSVs would have a negligible effect on ground disturbance that could lead to erosion and sedimentation in streams or other waterbodies, and minimal effect on vegetation, especially along streams and other waterbodies. Some researchers have found that snowmobiles can contribute to erosion of trails and steep slopes. The degree of potential erosion is dependent on site-specific factors such as slope, aspect, elevation, adjacent vegetation, level of use, and weather conditions. Olliff et al. (1999) found that if steep slopes are intensively used, snow may be removed and the ground surface exposed to extreme weather conditions and increased erosion by continued snowmobile traffic. Similar results could occur when snowmobiles use exposed southern exposures. Public OSV use in off-trail open riding areas where there is minimal snow cover or bare patches of ground could possibly result in destruction of vegetation, soil compaction, and erosion in areas of repeated and concentrated use.

Off-trail public 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 it 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 waterbodies by introducing sediment in water runoff.

Cross-country OSV use could affect woody riparian species by the bending and breaking of branches as recreationists run 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. Vegetation trampling from snowmobiles and impacts to riparian resources from public OSV use would be considered negligible with adequate snowpack coverage.

Widespread snow compaction from cross-country OSV uses can affect snowmelt patterns, and in turn, the hydrologic regime. Studies have found delayed snowmelt in areas compacted by snowmobiles 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.

When OSVs are operated on adequate snow depths, the effects of plan activities of cross-country OSV uses are consistent with the Tahoe National Forest LRMP including Riparian Conservation Objectives and watershed management standards and guidelines and management prescriptions.

Assumption 5

Exhaust emissions deposited in the snowpack in the amounts anticipated within the Tahoe National Forest from grooming equipment or public OSVs on trails or OSVs travelling cross-country would be considered minor and currently do not functionally impair water quality of adjacent waterbodies. In addition to exhaust emissions, grooming equipment and OSVs can leave behind unburned fuel, lubrication oil, and other compounds on the top layers of snow. Some of the unburned hydrocarbons would accumulate on the snow surface and could eventually wash into streams and lakes. This could cause localized degradation of water quality.

Concentrations of pollutants from OSVs have been observed in snowmelt runoff (Arnold and Koel 2006, McDaniel and Zielinska 2015). Discharge from two-stroke snowmobile engines can lead to indirect pollutant deposition into the top layer of snow and subsequently into the associated surface and ground water (Adams 1975). Hagemann and Van Mouweik (1999) found that there is a potential risk to aquatic life from snowmobile emissions, but that the risk could not be quantified because of a current lack of water quality data. Adams (1975) showed that high concentrations of lead and hydrocarbons were found in pond water adjacent to snowmobile trails during the weeks following ice melt. The study also found that juvenile brook trout had increased hydrocarbon intake and reduced stamina, from surface water and food chain feeding and hydrocarbon uptake.

Studies conducted in the Rocky Mountains region provide some indication of the possible effects of pollution deposition from public OSV use. The U.S. Geological Survey monitored snowpack throughout the northern Rocky Mountains over a period of several years to measure regional water quality trends, as well as the effect of OSV use. The monitoring showed a relationship between OSV use and pollutant deposition in the snowpack, but not more than negligible to minor quantities of OSV-related pollution in snowmelt. Detectable vehicle-related pollution in snowmelt was found to be in the range of background or near-background levels (Ingersoll et al. 2005 as cited in NPS 2007). A study in Yellowstone National Park analyzed snowmelt from four test locations adjacent to roadways and parking lots heavily used by OSVs between Yellowstone's West Entrance at West Yellowstone, Montana, and the Old Faithful visitor area. No cross-country OSV use was allowed, and OSVs were concentrated on one main trail in to the park. The purpose of the study was to evaluate whether increased snowmobile use within the Park was creating increased potential for emissions to enter pristine surface waters. Specific objectives were to (1) examine snowmelt runoff for the presence of specific volatile organic compounds (VOCs); (2) determine if concentrations of any VOCs exceed safe drinking water criteria; and (3) predict the potential for impacts by VOCs on the fauna of streams near roads heavily used by snowmobiles in the park. In spring 2003 and 2004, water samples were collected and tested. In situ water quality measurements (temperature, dissolved oxygen, pH, specific conductance, and turbidity) were collected; all were found within acceptable limits. Five VOCs were detected (benzene, ethylbenzene, m- and p-xylene, o-xylene, and toluene). The very low concentrations were found to be below EPA criteria and guidelines for the VOCs analyzed and were below levels that would adversely impact aquatic ecosystems (Arnold and Koel 2006).

The number of snowmobiles that entered Yellowstone in 2003 and 2004 at the West Yellowstone trailhead was 47,799 and 22,423, respectively (Arnold and Koel 2006); all routed through a single trailhead. In comparison, the 2009 estimated OSV day use per season across the Tahoe National Forest was around 20,000 OSVs, spread over 6 trailheads. These visitations were spread across multiple trailheads and trail systems and did not all occur in the same location. Use patterns based on

snowmobile registrations in local counties have remained about the same or slightly increased, and are likely to slowly increase in the future. Even with projected increases in OSV seasonal use levels at any Tahoe National Forest trailhead or trail system are considerably less than OSV use that occurred at Yellowstone National Park during the snowmelt studies, and use at Tahoe National Forest trailheads was considered comparatively low. Since Yellowstone OSV use levels studied had not resulted in impaired water quality, it follows that lower public OSV use at trailheads is not likely to adversely affect water quality of snowmelt. Therefore, due to very low concentrations of pollutants from OSV use such as VOCs, operation of public OSVs on system trails and cross-country is consistent with water quality objectives in the Tahoe National Forest LRMP including Riparian Conservation Objectives and watershed management standards and guidelines and management prescriptions.

Assumption 6

Other hydrology impacts. This plan would (1) not involve the construction of any structures which could impede or redirect flood flows, nor any ground surface modifications which could change drainage patterns, impervious surfaces, soil permeability, or other hydrological characteristics such as surface water volumes; (2) not expose people or property to a risk of flooding nor increase the risk of flooding for existing development in floodplains; (3) not place housing or other structures within a flood hazard area; (4) not involve a change in water use, affect a private or public water supply, or affect the quantity or quality of groundwater recharge, aquifer volume or cause a lowering of the local groundwater table level; (5) not involve an increase in impervious surfaces, and (6) not involve discharges of storm water or wastewater.

Assumption 7

The equivalent roaded acre (ERA). This model (FSH 1990a: chapter 20) was not used for this analysis to show cumulative watershed effects. Direct impacts to watersheds and stream courses that result from this project are limited. There are no new ground-disturbing activities proposed with this project. As long as adequate snow depths are maintained, because there are virtually no direct or indirect effects, using the ERA model will not show any detectable differences between alternatives and is not appropriate for this scale of analysis, which covers nearly a million acres. The ERA model is beneficial at demonstrating changes in ERA for plans that intend to disturb hundreds to thousands of acres for fuels reduction, travel management or timber harvest plans, or to show cumulative effects of wildfires. This plan is not creating a new disturbance on the landscape for any alternative. Changing the overall acreage of areas open for OSVs will not lead to increases or decreases in ground disturbance as long as OSVs are managed appropriately. Finally, the ERA method would not show any detectable differences within the sixth field watersheds in this analysis.

Assumption 8

Global climate change. Climate change is expected to substantially affect California over the next 50 years (<http://www.water.ca.gov/climatechange/docs/062807factsheet.pdf>). Precipitation is likely to become more variable from year to year. Warmer temperatures will reduce the proportion of precipitation that falls as snow and increase the proportion that falls as rain. This shift will result in later snowmelt accumulation, earlier snowmelt, higher peak flows, more frequent flooding, increased erosion, reduced summer baseflows, more frequent droughts, and increased summertime stream temperatures.

These expected changes have several implications for public OSV use effects on water resources on national forests:

- As floods become more frequent and of greater magnitude, roads and trails used for winter-time OSV use will likely be subjected to greater stresses from higher runoff. Erosion of route surfaces and route/stream crossings will become more common. Ephemeral channels will carry water more frequently than in the past.
- The road and trail networks used for winter-time OSV uses will have a role in increasing runoff and peak flows (Ziemer 1981, Jones and Grant 1996) in the runoff season. Cumulative watershed effects in watersheds near their thresholds of concern may become more common.
- Protection and restoration of meadows and other riparian areas that extend the duration of baseflows will be increasingly important as snowpack diminishes.
- Seasons of use for OSV routes may need to be modified as precipitation and temperature patterns change.

Assumption 9

Non-motorized uses. For the purposes of this analysis, non-motorized uses have very little to no effect on hydrology and will not be considered further in this analysis.

Spatial and Temporal Context for Effects Analysis

The spatial and temporal bounds for discussing and analyzing direct, indirect, and cumulative effects on water resources and associated riparian areas and wetlands would be the watersheds within the Tahoe National Forest.

Short-term effects are generally around up to one year in duration, and long-term effects are over one year in duration.

Affected Environment

The Tahoe National Forest is subdivided into 53 6th level watersheds. The watershed average size is about 32,000 acres. The existing condition of watersheds (watershed health) on the forest varies depending upon amount of disturbance found within each watershed and the degree of natural integrity of the system. Disturbance in the form of land management activities, such as timber management, road construction, livestock grazing, mining, recreation, and special-uses can adversely affect a watershed's condition. Past management activities have been concentrated within certain watersheds. Management activity effects are influenced in part by the local terrain, the precipitation regime, and other factors.

Table 52. Hydrologic characteristics of the OSV analysis area within Tahoe National Forest

Resource	Hydrologic Characteristics
Landscape	Sierra Nevada Mountains Elevation ranges between 1,040 feet (foothills) and 9,120 feet (Sierra Crest).
Climate	Highly variable across Tahoe National Forest due to elevation and orographic elevation effect of Sierra Nevada Mountain Range. Mediterranean climate, whereby most precipitation occurs between November and April. Winter precipitation below 3,500 feet is primarily rain, mixed rain and snow from 3,500 to 5,000 feet and above 5,000 feet is primarily snow. Mean annual precipitation ranges between: 30-40 inches at the Sacramento Valley foothills, 60-70 inches at the crest of the Sierra Nevada.

Resource	Hydrologic Characteristics
Aquatic features	1,365 miles of perennial streams. 6,480 miles of intermittent streams. 4,560 lakes with total acreage of 58,171 acres, ranging between <0.01 acres to 6,909 acres. 444 meadows with total acreage of 6,613 acres, ranging between <0.01 acres to 394 acres.
Beneficial Uses*	Varies by watershed: municipal water supplies for domestic use, fire protection, hydropower generation, irrigation, contact and non-contact recreation, cold freshwater habitat, spawning habitat, stock watering, and wildlife habitat.
Domestic use	Truckee River, which supplies water to the community of Reno-Sparks.
Watersheds	53 sixth-field watersheds within the Tahoe National Forest within the affected environment. Average size of entire watersheds (includes all ownerships): 31,610 acres Average watershed acreage within affected environment: 2,306 acres

* Source: Cal EPA CVWQCB 2007 or Source: Cal EPA LWRCB 2006

Surface Water

The Tahoe National Forest contains portions of headwaters of the American, Bear, Feather, Truckee and Yuba Rivers. The American, Bear and Yuba Rivers flow westward from the crest of the Sierra Nevada to the Sacramento River in the City of Sacramento. The headwaters of the Middle Fork Feather River are in the Sierra Valley area. The river is formed by the confluence of several streams draining the surrounding mountains and then flows west to join the Sacramento River near Marysville. The American, Bear, Feather, and Yuba rivers and their tributaries provide water for domestic, agricultural, environmental and industrial uses as well as power production. The Truckee River Basin covers an area from Lake Tahoe in California to Pyramid Lake, located approximately 50 air miles away in Nevada. Approximately 760 square miles (almost 25 percent of the basin), lie within California. Most of the precipitation and water storage occur within the California part of the Truckee River Basin. The Truckee River, south of Bear Creek confluence to the area near the California border near Floriston is within the Tahoe National Forest boundary.

Most of the watersheds within the Tahoe National Forest are highly regulated systems. FERC re-licensing is in process for the American, Yuba, and Bear River.

The hydrology of the plan area is dynamic and evolving. There can be significant annual variations in water availability and quality, seasonal flow rates, and water temperatures. Modern human activities have altered the natural dynamics of water through the construction of dams and diversions, watershed practices that alter water yields, temperature, and sedimentation, and the introduction of pollutants and exotic biota. Surface waters on the forest originate as runoff from snowmelt and rainfall. Snowfall is generally the greatest contributor to total runoff, while intense rainfall events can cause the largest floods. The major runoff season on the forest is from April through June. Snowmelt runoff peaks usually occur from late May into June.

Surface water quality

According to the California Water Plan Update (CA DWR 1998) the Tahoe National Forest is encompassed by three major hydrologic regions. One region is on the western side of the Sierra Nevada crest (the Sacramento River); the North and South Lahontan regions are on the eastern side. The Central Valley Regional Water Quality Control Board oversees and sets the standards for the Feather, Yuba, Bear, and American River systems. The Lahontan Regional Water Quality Control Board oversees and

sets the standards for the Truckee River. The Forest Service has a memorandum of understanding with the State that names the Forest Service as a “Designated Management Agency” that will prescribe and implement a water quality control program to protect the waters of the state to meet State and Federal regulations as well as the standards set in the Central Valley Water Quality Control Board Basin Plan as amended for commercial silvicultural practices by Resolution R5-2006-0026 (2006).

Compared to other parts of California and the United States, the Sierra Nevada overall has relatively low sediment yields (Kattelman 1996). General estimates show that the Sierra Nevada has the lowest sediment yield in California (generally less than 100 m³/km²/year). Sediment transport measurements in a variety of streams in the eastern Sierra Nevada were generally less than 10 m³/km²/year. A Soil Conservation Service report classified sediment yield below 150 m³/km²/year as “low” with respect to nationwide rates (Kattelman 1996). Table 53 shows some annual sediment yield data for watersheds within the Tahoe National Forest. These figures show that the Truckee River system has lower sediment yields than the rivers on the western side of the forest. The American, Yuba, and Feather River systems appear to have similar sediment yields.

Table 53. Sediment yields from reservoir surveys, suspended sediment records, and other estimates (Kattelman 1996)

Watershed	Annual Sediment Yield (m ³ /km ²)
American – Ralston	80
American – Auburn Dam Site	130
American – Folsom	250
Bear – Combie	360
Feather – Oroville	100
Truckee – Upper Truckee	21
Squaw Creek	93
Trout Creek	12
Yuba – Nonmining	160
Mining	3,300
North Yuba – Bullards Bar	130

Quality of surface water is affected by the integrity of the fluvial system. Some concerns exist for watersheds where watershed impacts have affected water quality and stream channel potential, including riparian conditions and streambank stability. These effects are in limited locations, and changes in management could improve existing conditions. Water quality within the Tahoe National Forest can be impacted by many activities. Most pollutants come from non-point sources, i.e., from diffuse sources not concentrated into pipes, drains, flumes, or ditches. Examples include erosion from roads and parking areas, and forest roads potentially adding more sediment to streams than any other forest operation. Sediment at levels above natural rates of erosion is the most common non-point source pollutant in forested ecosystems. Roads can pollute groundwater as well as surface water. Research has shown that 90 percent of the sediment that ends up in surface waters from forested lands is associated with improperly designed and maintained roads. Water quality in lakes, streams, springs, and wetlands can be protected by proper road location and construction and adequate maintenance. A few rural communities and abandoned mining sites within national forests constitute point sources of pollution.

Uses of OSVs has not been extensively monitored within the Tahoe National Forest. However, a monitoring study completed in 2011 (Tahoe National Forest 2011 OHV/OSV Monitoring and Management Program: 2011 Monitoring Results) showed no impact to riparian systems or meadows, and suggests that OSVs have a low risk to water quality under current use levels and levels of management. Monitoring of aquatic resources results are summarized in table 54.

Table 54. Tahoe National Forest 2011 OHV/OSV Monitoring and Management Program: 2011 Monitoring Results

Monitoring Accomplishments	Results	Were Objectives and Success Criteria Met?
American River RD OSV Monitoring of Aquatic Resources	Groomed OSV routes along the Foresthill Divide were monitored for resource damage during low-snow conditions over wetlands, riparian areas, and streams. No resource damage to aquatic resources was observed. An exceptionally deep snowpack in winter/spring 2011 contributed to the protection of aquatic resources.	Yes, monitoring determined OSV use in relation to aquatic resources. No effects to aquatic resources were identified and no management actions are needed.

Existing Landscape Erosion/Sedimentation Risk

Many factors can influence the risk of erosion and impacts to watershed resources including: soil erosion/sedimentation; stream density; and the type and density of roads on the landscape. The presence of highly erosive soils/landscapes or a high density of native-surfaced roads does not mean that there would be negative effects to soil resources. But the presence of both high erosion risk and a high density of forest roads indicate that there could be a higher risk of accelerated erosion and sediment production.

The inherent risk of erosion of the soils and subsequent sediment erosion and water quality impacts within the Tahoe National Forest was assessed using two methods: the R-5 soil erosion hazard rating (EHR) found in Tahoe National Forest Soil Resource Inventory and the Ecosystem Management Decision Support Model. The R-5 EHR ratings indicate that 82 percent of the soils within the Tahoe National Forest have a high to very high erosion risk. The model was used to refine the soil erosion risk analysis. The modelled erosion risk scores were averaged by HUC6 watershed to assess the motorized route related erosion risk at the landscape scale. The landscape erosion risk score were compared between individual watersheds. The Truckee River landscape erosion scores were the only average score in the bottom 25 percent, therefore, the Truckee River Basin has the lowest erosion risks within the Tahoe National Forest. Whereas the North Yuba River, which is much steeper, has more geo-debris slides, and more erosive soils, has the highest erosion risks within the Tahoe National Forest (figure 12).

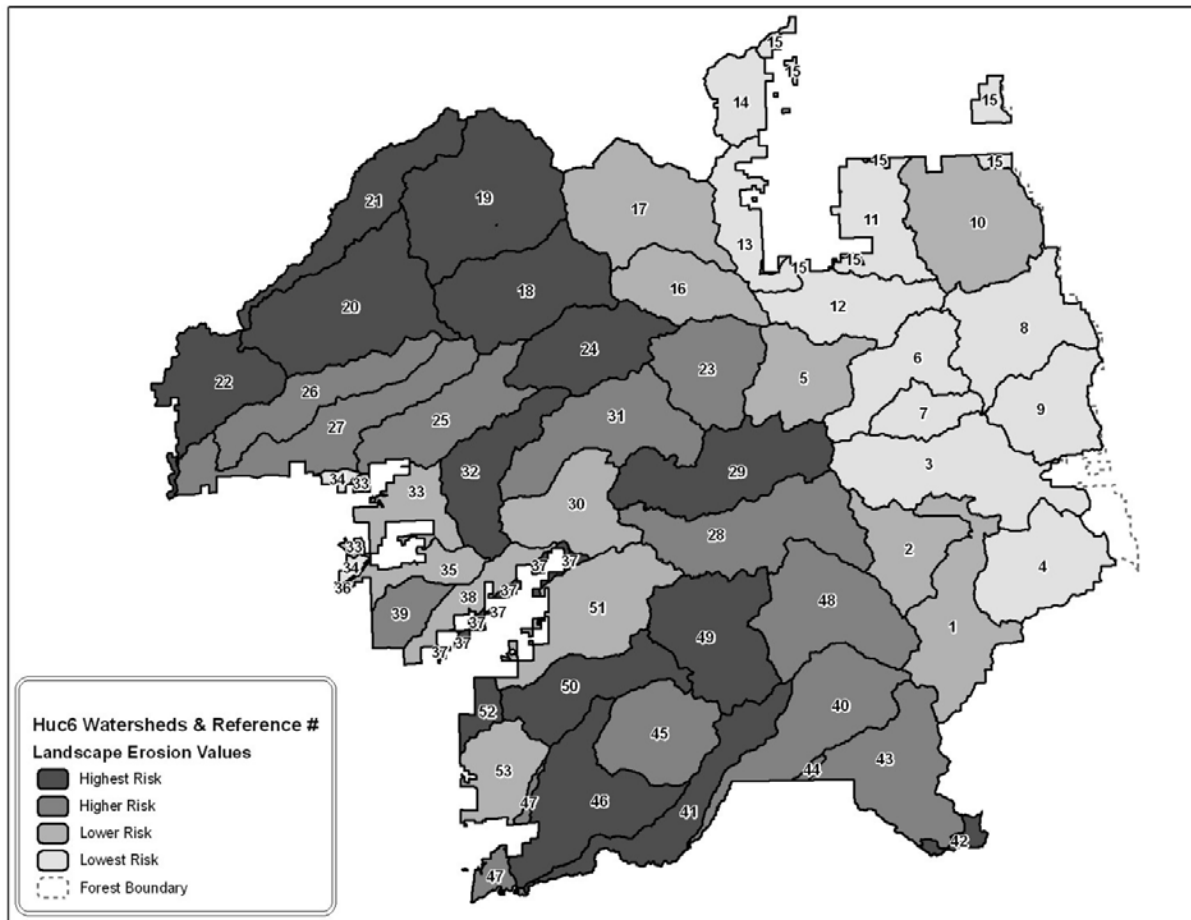


Figure 12. Modelled landscape erosion values by HUC6 watershed (USDA Forest Service 2012). Higher erosion risk watersheds have a higher risk of stream sedimentation.

Table 55. Modelled erosion risk rating by major river basin (USDA Forest Service 2012). Higher erosion rates can lead to increased risk of stream sedimentation.

River Basin	Erosion Risk Class
<i>Middle Truckee River</i>	0.58 (0-25%)
<i>Little Truckee River</i>	0.65 (0-25%)
Subtotal Truckee	0.61 (0-25%)
Feather	0.62 (0-25%)
<i>North Yuba</i>	0.40 (75-100%)
<i>Middle Yuba</i>	0.44 (50-75%)
<i>South Yuba</i>	0.48 (25-50%)
Subtotal Yuba	0.44 (50-75%)
Bear	0.44 (50-75%)
<i>Middle Fork American</i>	0.45 (50-75%)
<i>North Fork American</i>	0.42 (50-75%)
Subtotal American	0.43 (50-75%)
Tahoe National Forest	0.48 (25-50%)

Table 55 shows the average modelled erosion risk rating by major river basin. Erosion risk often correlates with increased risk of sedimentation. The erosion risks in the Truckee and Feather River basins are the lowest within the Tahoe National Forest. Erosion risk in the Middle Truckee River basin is in the lowest erosion risk class. The Bear River basin is in the higher erosion risk. The Yuba River and American River basins have similar erosion risks, with the South Yuba having a slightly lower erosion risk than the rest of the Yuba River basin.

Section 305(b) of the Clean Water Act requires states prepare and submit a water quality summary report every two years to the Environmental Protection Agency (EPA). In addition, Clean Water Act Section 303(d) requires states to submit to EPA lists of waterbodies that meet 303(d) listing criteria. This list identifies water quality-limited waterbodies. Water quality impacts can be from point and/or nonpoint sources of pollution, and may require additional controls to meet state water quality standards. These waterbodies are prioritized based on the severity of the pollution and other factors. Currently impaired waters include six waterbodies within the Tahoe National Forest that are listed as impaired on the EPA's 303(d) List. These are the Truckee River (sediment); Kanaka Creek (arsenic), Squaw Creek (sedimentation/siltation) and Humbug Creek (lead, sediment, etc.). Table 56 displays the 303(d) listed waterbodies and the reason for listing.

The Truckee River, Squaw Creek, and Humbug Creek (Middle Yuba River) are currently listed on the Impaired Water Body List (303(d)) for sediment. The Lahontan Regional Water Quality Control Board recently developed a Total Maximum Daily Load (TMDL) for sediment. Effects of this project on these watersheds are discussed under Environmental Consequences in the cumulative effects section.

Table 56. Impaired waterbodies within the Tahoe National Forest listed on the EPA 303(d) List

Water Body Name	Pollutant/Stressor	Source	Area Affected
Humbug Creek	Copper, Mercury, Zinc, Sedimentation/Siltation	Resource extraction abandoned mines	9 miles
Kanaka Creek	Arsenic	Resource extraction abandoned mines	1 mile
Squaw Creek	Sedimentation/Siltation	Construction/Land development, Other Urban Runoff, Hydro modification, Drainage/Filling of Wetlands, Highway Maintenance And Runoff, Natural Sources, Recreational Activities, Nonpoint Source	8 miles
Truckee River	Sedimentation/Siltation	Source Unknown	106 miles

Source: Cal EPA CVWQCB 2007; Source: Cal EPA LWRCB 2006

Surface Water Uses

Surface water from the forest is used both consumptively and non-consumptively. Uses in both categories depend on high-quality water. Non-consumptive water uses include recreation, wildlife, fisheries, and the aesthetic quality of this resource. Value on the forest is high for these uses. The Tahoe National Forest contains no municipal watersheds that are managed under any type of agreement. However, water generated from the forest is used for municipal supply for some areas, such as the City of Reno/Sparks, which uses the Truckee River for municipal water supply.

The Tahoe National Forest generally produces surface water of excellent quality, suitable for almost any use. Contaminant levels in most waters are lower than amounts specified in the states of California and Nevada stream quality standards (Kattelman 1996). Most runoff would be suitable as drinking water

except for the risk of bacteria and pathogens, such as *Giardia lamblia*, *Campylobacter* spp., and *Cryptosporidium* spp. In the backcountry, inadequate disposal of human waste and pathogens carried by mammals have caused sufficient contamination to make drinking untreated water risky. Low-level release of nutrients from human activities along wilderness lakes may have stimulated increased plant growth on some lake bottoms (Kattelman 1996) reducing clarity and causing shifts in aquatic communities as well as reducing the aesthetics of natural lake conditions. Generally, very little water from national forests in the Sierra Nevada region is heavily polluted or contaminated by chemicals, bacteria, or parasites at concentrations above background levels (Kattelman 1996). Most waters satisfy the fishable and swimmable objectives of the Clean Water Act.

Surface Water Protection Measures

Public water supplies are protected by the Safe Drinking Water Act, which was amended in 1996. The Safe Drinking Water Act does not require source areas to deliver water of potable quality with no need for treatment. In fact, waters in pristine areas usually need treatment due to natural waterborne parasites, such as giardia.

Best management practices have been adopted to protect water quality in compliance with the Clean Water Act. Best management practices cover a wide variety of land management actions on National Forest System lands, including watershed management, timber, transportation and facilities, pesticide-use, recreation, minerals, fish and wildlife habitat, and fire suppression and fuels management. When best management practices are properly applied, pollutant delivery to streams and lakes is minimal and recovery of waters and aquatic sites should be rapid. The physical, chemical, and biological integrity of waters in all watersheds should be as good as in watersheds that are managed exclusively for domestic and municipal supplies.

Groundwater

Rainfall and snowmelt, as well as producing surface runoff, also recharge groundwater sources on the forest. Groundwater aquifers release water during periods of low precipitation to maintain base flows of streams. Groundwater is of beneficial use both on and off-forest, in the form of water supply wells. Communities use groundwater for part or all of their municipal water supply, while other residents use individual domestic wells. Consumptive use of groundwater on the forest is low. Such use is limited to special-use permittees and Forest Service campgrounds and administrative sites with domestic wells. The existing condition of groundwater on the forest is good, although not all wells provide high-quality drinking water. Past management activities on the forest do not appear to have adversely affected groundwater quality. No groundwater contamination from recreation uses (toilets) has been recorded, with all road-accessible toilets being of the pump-vault type. Some potential for such ground water contamination exists at heavily used recreation sites with limited facilities.

Riparian Areas and Wetlands

Riparian areas are the transition zone between uplands and water in lakes and rivers. Riparian ecosystems are characterized by the presence of trees, shrubs, or herbaceous vegetation that require free or unbound water, or conditions that are moister than those of surrounding areas. Riparian ecosystems, aquatic ecosystems, wetlands, lakeside zones, and floodplains will be jointly referred to as riparian areas. The terms riparian zones and riparian areas are used interchangeably, but by strict ecological definition, may not be the same in all instances. Riparian areas occur in stream corridors, along lakeshores, and around springs, wetlands, and wet meadows. Vegetation in riparian areas can include

characteristic woody riparian hardwood types such as aspen, alder, or willow, or it can include larger and more vigorous trees of the same species as found on adjacent uplands.

The forest contains a variety of wetlands. Wetlands are defined in the 1987 Corps of Engineers Wetlands Delineation Manual (USDD Army Corps of Engineers 1989) as: “Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, fens, bogs, and similar areas.”

Riparian ecosystems are generally inclusive of wetlands. Healthy riparian areas, with an abundance of trees and other vegetation, slow flood waters and reduce the likelihood of downstream flooding. Riparian areas improve water quality by filtering runoff and sediment from flood flows and adjacent upland slopes. Healthy riparian areas act like a sponge, absorbing water readily during periods of excess. Water slowed by riparian areas enters the groundwater. Some of it is released later, increasing late summer and fall streamflow. Riparian areas produce an abundance of stream cover and shade, which in turn limit the amount of water temperature fluctuation in the stream. This limiting in water temperature is generally advantageous to cold-water fish species. Benefits provided by riparian areas include food, cover, and nesting habitat for birds. Many animals visit and live in riparian areas. They come for water, food, cover, and temperature moderation. Riparian areas often provide sheltered upstream and downstream transportation corridors to other habitats. Fish depend upon healthy riparian areas to provide stable channels, sustained water supply, clean and cool water, food, and streambank cover.

Riparian areas are attractive and inviting to forest visitors. Public OSVs often use existing roads and trails for snowmobile routes. The most serious impacts of roads and motorized trails within the Tahoe National Forest occur where they are in close proximity to streams or wetlands within RCAs. Native surface roads and motorized trails within RCAs can impact water resources including water quality. There are currently 1,054 miles of native surface roads and motorized trails within RCAs. The current density of native surface roads and motorized trails in RCAs within the Tahoe National Forest is 2.6 miles per square mile. The highest number of miles in RCAs is found in the Yuba River Basin and the lowest number of miles in RCAs is in the Feather Basin. The highest density of native surface roads and motorized trails is found in the Truckee and Feather River basins and the lowest in the American River and Bear River basins.

Environmental Consequences

Measures common to all action alternatives

BMPs would be used to mitigate effects to watershed resources from the use of OSVs for action alternatives. BMPs described in this FEIS, Volume II, Appendix D would be applied to all alternatives. Some of these practices are described below. Additional practices are included in BMP 2-25 (USDA Forest Service R5 FSH 2509.22 - Soil and Water Conservation Handbook, 2011) and National Core BMP Rec-7 and Road-10 regarding over-snow vehicle use and equipment refueling. The criteria would be applied to the 19 areas within the Tahoe National Forest that may be designated for OSV use under this project.

Groomed Snow Trails:

1. Impacts to watershed resources would be minimized by making spill containment equipment available at the facilities where grooming equipment is re-fueled.
2. Impacts to watershed resources would be minimized by designating equipment maintenance and refueling sites to ensure that they are located on gentle slopes, on uplands, and outside of RCAs and sensitive terrestrial wildlife habitats.

Cross-Country OSV Use:

1. Impacts to watershed resources would be minimized by prohibiting cross-country OSV use when and where there is less snow coverage than sufficient to prevent damage to underlying soil and vegetation resources.
2. Impacts to watershed resources would be minimized as a result of allowing for dispersed use in open areas. Off-trail OSV use would be generally dispersed and would not result in high concentration of OSV use on areas without snow cover. Also, travel over areas without snow cover can damage machines, so it is generally avoided by operators. With adequate snow levels, this plan would result in no soil erosion, and therefore, would not create water quality impacts to streams or waterbodies by introducing sediment in water runoff.
3. Impacts to watershed resources would be minimized by prohibiting OSV use on unfrozen lakes, reservoirs, ponds and any other open surface water.
4. Impacts to watershed resources would be minimized by providing information to the public of the hazards of running over-snow vehicles on thin ice and the effects of OSV emissions on air quality and water quality.
5. Impacts to watershed resources would be minimized by prohibiting OSV use and grooming in wetlands unless protected by adequate snow cover. If OSV trails must enter wetlands, impacts to watershed resources would be minimized by using bridges or raised prisms with diffuse drainage to sustain flow patterns, setting crossing bottoms at natural levels of channel beds and wet meadow surfaces, and avoiding actions that may dewater or reduce water budgets in wetlands.
6. Impacts to watershed resources would be minimized 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.

All Alternatives

Direct, Indirect and Cumulative Effects

Impacts- Projected Water Supply (direct, indirect, cumulative)

None of the action alternatives would increase impacts to water supplies, because this project would not affect water quantity in water supply watersheds.

Projected Water Quality

Four waterbodies within the Tahoe National Forest are listed as impaired on the EPA's 303(d) List. Table 56 displays the 303(d) listed waterbodies, the reason for listing, and any possible impacts from the proposed OSV plan that may contribute to the reasons for their listing.

Humbug Creek is listed as a 303(d) Impaired Water Body by EPA due to copper, mercury, zinc, sedimentation and siltation. While the source of the copper, mercury and zinc contamination is unknown, it is generally felt to be generated by abandoned mines. There is no change under any of the alternatives to the number of abandoned mines that could contribute to this contamination. The water body is also listed for sedimentation and siltation.

Kanaka Creek is listed as a 303(d) Impaired Water Body by EPA due to arsenic. While the source of the arsenic contamination is unknown, it is generally felt to be due to the number of abandoned mines in the area and the type of rock formations. None of the alternatives change the number of abandoned mines nor alter the rock formations.

Squaw Creek is listed as a 303(d) Impaired Water Body by EPA due to sedimentation and siltation. Native surface roads and trails and their season of use can contribute to sedimentation and siltation. Virtually all of the native surface roads in this watershed are privately owned. None of the proposed plan alternatives would contribute additional sediment.

The **Truckee River** is listed as a 303(d) Impaired Water Body by EPA due to sedimentation and siltation. Native surface roads and trails and their season of use can contribute to sedimentation and siltation in this watershed. No additional sedimentation is expected from OSV use under any alternative.

Alternative 1

Direct and Indirect Effects

Incidental direct effects including ground disturbance in low-snow areas may occur under current use. Snowmobiles and other OSVs have low ground pressure. However, in some instances snowmobile tracks have the capacity to break through thinner snowpacks and churn soil, litter or trail surfaces in to the snow, and create isolated ruts in the soil or trail surface. Churned soil may get incorporated in runoff when snow melts. Much of the current OSV use occurs on groomed trails where the California Off-Highway Vehicle Motor Recreation plan (OHVMR) calls for 12 to 18 inches of snow cover before grooming can occur, with low possibility of contact with bare soil and practically no disturbance of trail and road surfaces.

For public OSV use on trails, currently there is no standard minimum snow depth to protect and mitigate effects of OSVs. However, ground disturbance leading to water quality impacts such as stream sedimentation in perennial, intermittent or ephemeral streams, in wetlands or other bodies of water have not been observed, although effects may have occurred in areas not monitored. It is likely that for current minimum snow levels, current uses have not resulted in more than incidental and isolated direct effects such as soil erosion of groomed trail surfaces, and therefore, have not created indirect water quality impacts to streams or waterbodies by increasing sediment in water runoff.

Alternative 1 does not call for a specified snow depth for public OSV cross-country travel. OSV use in off-trail open riding areas where there is minimal snow cover or bare patches of ground could result in

direct effects including destruction of vegetation, soil compaction, and erosion in areas of repeated and concentrated use. However, with adequate snow depths, cross-country use of OSVs would have a negligible effect on ground disturbance that could lead to erosion and sedimentation in streams or other waterbodies, and likely would have a negligible effect on vegetation, especially along streams and other waterbodies. Monitoring has demonstrated that under current conditions, alternative 1, destruction of vegetation, soil compaction, and resulting erosion from OSV use have not occurred.

Under alternative 1, there likely has been and would continue to be incidental and isolated ground contact in areas where OSVs operating cross country would contact the ground surface due to variations in snow depths such as on high wind-exposed ridges, and southern-facing slopes. However, off-trail OSV use currently is generally dispersed and does not result in high concentration of ground disturbance from public OSV use on bare soil. As demonstrated by monitoring information, alternative 1 has not resulted in observed water quality impacts to streams or waterbodies from OSV activity-generated sediment reaching water runoff.

Cross-country OSV use can directly affect woody riparian species by trampling, including bending and breaking of branches by OSVs running over the branches. This could directly affect shade along streams by reducing vegetation cover. Direct effects to vegetation probably do occur under alternative 1 in isolated areas, but at this time, the effects from OSV use are limited. As a result, vegetation trampling from snowmobiles and impacts to riparian resources from OSV use would be considered negligible with adequate snowpack coverage, and no direct or indirect changes to vegetation would be expected from the no-action alternative. Riparian woody shrub species along streamcourses appear unaffected by direct physical trampling from snowmobiles on vegetation.

The direct effect of widespread snow compaction from cross-country OSV uses can create more dense snow that leads to an indirect effect of slower melt rate, and could, in turn, indirectly affect the hydrologic regime by delaying snowmelt rates. 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, measureable changes in hydrology on a watershed scale are not expected.

Direct and indirect effects from overall numbers of OSVs can be used to gauge water quality effects. In 2009, 20,000 OSV user days per year were estimated to be using Tahoe National Forest trailheads and would have access to cross-country use areas. Use numbers have likely gone up a few percent since 2009. Public OSV users would be spread over 6 trailheads, so actual user numbers will be lower for a particular area. Studies on OSV impacts on water quality indicate that even at much higher use levels, there would be no adverse effects on water quality from OSV exhaust emissions (Assumption 5). The number of snowmobiles that entered Yellowstone in 2003 and 2004 was 47,799 and 22,423, respectively. At Yellowstone, OSVs were confined to a few trails and use levels were monitored of high numbers of OSVs using a single trailhead. Since the much higher Yellowstone OSV use levels studied had not resulted in impaired water quality, it follows that the OSV use in the project area for this alternative would not likely adversely affect water quality of snowmelt from OSV exhaust emissions.

Activities such as “water skipping” or trying to snowmobile across open water have been observed in some areas. These efforts are not always successful resulting in snowmobiles abandoned in lakes or other open water. This increases effects to water quality from lubricants leaking into surface water, which can also affect aquatic biota. Similarly, during spring break-up, snowmobiles will cross open

streams and other waterbodies where snow cover is not present, which results in the deposition of pollutants directly in streamcourses and waterbodies.

Even though there is no specific snow depth standard, the effects of current operation of OSVs occurs over a protective layer of snow, and direct and indirect effects to hydrology are isolated and incidental. For existing minimum snow levels, the plan would not result in more than incidental soil erosion, and therefore, would not create water quality impacts to streams or waterbodies by introducing sediment in to water runoff. Therefore, with adequate snow depths current OSV use on trails is consistent with the Tahoe National Forest LRMP including Riparian Conservation Objectives and watershed management standards and guidelines and management prescriptions.

Currently, water quality effects from OSV exhaust stored in snowpack would be negligible and not exceed water quality standards. Therefore, as a result, current operation of public OSV use on system trails and cross-country is consistent with water quality objectives in the Tahoe National Forest LRMP including Riparian Conservation Objectives 1, 2, 4, 5, and 6 and watershed management standard and guidelines and management prescriptions.

The riparian conservation objectives apply to all routes that pass through RCAs and meadows. Under alternative 1, groomed and ungroomed OSV trails and cross-country travel would be allowed within RCAs, but because of the protective layer of snowpack protecting the ground surface, there is currently a very low resource damage potential. No restrictions on OSVs in riparian areas, lakes, or meadows are currently in place. No adverse impacts to these areas have been observed or monitored.

RCOs 1 and 6: Under alternative 1, beneficial uses of waterbodies would be protected and enhanced. There would be no changes in water storage, seasonal availability, and quality.

RCOs 2, 4, and 5: Under alternative 1, the geomorphic and biological characteristics of meadows, streams and RCAs would be protected. No sedimentation would likely result in no changes to aquatic primary productivity. Growing season water availability would remain unchanged and would not affect ecosystem integrity.

Cumulative Effects

Past, present, and reasonably foreseeable projects in the project area are listed in appendix C, and include the Truckee River Tributaries project, which is designed to decrease sediment sources in the Truckee River Watershed. There are many past, ongoing, and reasonably foreseeable projects identified by the Tahoe National Forest that may be ground-disturbing and could add sediment or other pollutants to surface waters within the forest. The Forest Service uses best management practices in compliance with the Clean Water Act to minimize water quality impacts. The Tahoe National Forest monitors roads and trails used for OSVs and implements best management practices to control erosion and other effects.

The risks of cumulative effects from this alternative are very low because current snow depths appear to be adequate 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 (ERA) calculations for any watersheds under this alternative. There would be negligible effects from exhaust emissions stored in snowpack. This alternative would not implement the recommended mitigations, and has the second highest amount of land area designated for OSV use. However, this alternative appears to have adequate

snow cover to protect soils and water 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, or riparian resources.

Alternative 2

Direct and Indirect Effects

The effects of alternative 2 would be similar to alternative 1, except fewer acres would be designated for OSV use, the 12-inch snow depth would be recommended for cross-country use, and the 6-inch snow depth would be recommended for OSV trails. Forest monitoring data has shown that under alternative 1, with no minimum snow depth, there has been no observed impacts to aquatic systems. It follows that with higher snow depth recommendations under alternative 2, there would continue to be negligible resource effects from trail use and cross-country OSV travel. Under this alternative, about 200,000 fewer acres of forest lands would be open to public OSV use compared to alternative 1. Because direct and indirect effects of this alternative are negligible, having less acreage designated for OSVs would not lead to an increase in direct or indirect effects on hydrology.

As in alternative 1, incidental direct effects including ground and vegetation disturbance in low-snow areas may occur under this alternative. One substantial difference in this alternative is the recommended minimum 6-inch snow depth for OSV use on designated trails and a minimum 12-inch snow depth recommended for cross-country OSV use. This snow depth is recommended to be either a 6-inch or 12-inch minimum, but the snow depth recommendation also requires there to be no resource damage. For all alternatives, BMPs would be applied to comply with the Clean Water Act and the LRMP. Resource damage created by OSVs would be primarily impacts to the trail surface or vegetation that could lead to water quality impacts. Because recommended minimum snow levels under alternative 2 are higher than alternative 1 on designated trails, there would be a lower risk of ground disturbance and subsequent water quality impacts.

On designated trails with 6 inches of snow cover, snowmobile tracks have a capacity to break through a thinner snowpack and churn soil, litter or trail surfaces in to the snow, and create isolated ruts in the trail surface. Higher snow amounts may be required to reduce the potential for resource damage. Modern OSVs with deep lugs on their treads can easily displace 4 inches of snow each pass, depending on snow moisture amounts. Ruts could channel runoff from road or trail surfaces, leading to stream sedimentation. Churned soil may get incorporated in runoff when snow melts. Currently, there are no studies or monitoring data that can provide information on direct or indirect effects of the recommended 6-inch snow depth on trails proposed for this alternative. However, snowmobile user web forums usually suggest about 6 inches as a minimum snow depth needed before snowmobile use (<http://www.snowmobileforum.com/general-sled-chat/25036-whats-minimum-amount-snow-you-should.html>). Snowmobilers hesitate to operate machines on soil because it would damage machinery.

The 6-inch snow depth may or may not be an adequate depth for hydrology resource protection, because direct effects of operation of OSVs on 6 inches of snow on trails may lead to possible trail surface displacement and rutting, leading to a slight chance of sediment erosion from the trail surface. Further, this 6-inch snow depth may be sufficient to operate a snowmobile, but other OSVs may need more depth to avoid ground disturbance. This alternative would require sufficient snowpack to prevent resource damage. Trail surface and vegetation monitoring with subsequent feedback to trail managers would be needed to ensure that resource damage is not occurring and that this standard is met.

For this alternative, as a result of the minimum 6-inch snow depth on trails, there would likely be a higher risk of causing direct trail impacts, such as displacement of the trail surface, compared with a 12-inch minimum snow depth for trail uses. A 6-inch snow depth can become much thinner and may not offer effective protection for the ground surface after several passes by OSVs. Overall however, OSV use in alternative 2 would occur over a protective layer of snow designed to avoid resource damage, and direct and indirect effects to hydrology would likely be isolated and incidental. As a result, for proposed minimum snow levels, alternative 2 would likely not result in more than incidental soil erosion, and therefore, would not create indirect water quality impacts to streams or waterbodies by introducing sediment in to water runoff. With adequate snow depths, OSV use on trails is consistent with the Tahoe National Forest LRMP including Riparian Conservation Objectives and watershed management standards and guidelines and management prescriptions.

As in alternative 1, much of the OSV use under this alternative would occur on OHVMR groomed trails where the plan calls for 12 to 18 inches of snow cover before grooming can occur, negligible possibility of contact with bare soil, and practically no disturbance of trail and road surfaces. For OSV use on the groomed OSV trail system, the minimum snow depth standard snow coverage would be adequate to mitigate and eliminate substantial indirect water quality impacts such as stream sedimentation in perennial, intermittent or ephemeral streams, in wetlands or other bodies of water.

Because vehicles would be dispersed, a proposed recommended 12-inch minimum snow depth for cross-country use would not result in more than incidental and isolated direct effects such as ground contact and disturbance to vegetation. Again, this standard would require avoiding resource damage, and would require deeper snowpack if resource damage is occurring. It is not anticipated that indirect water quality impacts to streams or waterbodies by increasing sediment in water runoff would occur as a result of cross-country OSV use under this alternative. There would continue to be incidental and isolated ground contact in areas where OSVs operating cross country would contact the ground surface, due to variations in snow depths such as on high wind-exposed ridges, and southern-facing slopes. Off-trail OSV use would be generally dispersed and would not result in a high concentration of ground disturbance from OSV use on bare soil. With adequate minimum snow levels, current conditions would result in no more than incidental surface disturbance and soil erosion, and therefore, would not create water quality impacts to streams or waterbodies by introducing sediment to water runoff.

Similar to alternative 1, cross-country OSV use could directly affect woody riparian species by trampling, including bending and breaking of branches by OSVs running over vegetation. This could directly affect shade along streams by reducing vegetation cover. Direct effects to vegetation probably would occur under alternative 2, but the effects would be limited by requiring adequate snow cover before allowing OSV use. As a result, vegetation trampling from snowmobiles and impacts to riparian resources from OSV use would be considered negligible with adequate snowpack coverage, and no direct or indirect changes to vegetation would be expected from this alternative. Riparian woody shrub species along stream courses would continue to be protected by the 12-inch snow cover no-resource-damage requirement by limiting the direct physical trampling effect from snowmobiles on vegetation.

The direct effect of widespread snow compaction from cross-country OSV uses under alternative 2 would create denser snow that could lead to an indirect effect of slower snowmelt rates, and could in turn indirectly affect the hydrologic regime by delaying snowmelt rates in localized areas. It is unknown how much OSV-related snow compaction would affect runoff rates and timing, and some studies suggest up to a 2-week delay in melting for heavily compacted snow such as on groomed OSV trails. It

is not expected that snowmobile cross-country uses would heavily compact snow over large areas. Because the areal extent of snow compaction from off-trail cross-country use combined with compacted snow on groomed trails would not be extensive on a watershed scale, measureable changes in hydrology are not expected.

As described in the assumptions for this plan, water quality effects from OSV exhaust hydrocarbon emissions stored in snowpack under alternative 2 would be negligible and would not be expected to exceed water quality standards.

Under alternative 2, operation of OSVs on system trails and cross country is consistent with water quality objectives in the Tahoe National Forest LRMP including Riparian Conservation Objectives 1, 2, 4, 5, and 6 and watershed management standards and guidelines and management prescriptions.

The riparian conservation objectives apply to all routes that pass through RCAs and meadows. Under alternative 2, groomed and ungroomed OSV trails and cross-country travel would be allowed within RCAs, but because of the layer of snowpack protecting the ground surface, there would be a negligible resource damage potential. No restrictions on OSVs in riparian areas, or meadows are currently in place, and no adverse impacts to these areas have been observed or monitored.

RCOs 1 and 6: Under alternative 2, beneficial uses of waterbodies would be protected and enhanced. There would be no changes in water storage, seasonal availability, and quality.

RCOs 2, 4, and 5: Under alternative 2, the geomorphic and biological characteristics of meadows, streams, and RCAs would be protected. No sedimentation would likely result in no changes to aquatic primary productivity. Growing season water availability would remain unchanged and would not affect ecosystem integrity.

Cumulative Effects

The Tahoe National Forest uses best management practices in compliance with the Clean Water Act to minimize water quality impacts. Projects whose best management practices monitoring results are not effective are addressed and improved.

Because there would be a low risk of direct and indirect effects, the risks of cumulative effects from this alternative are negligible. As a result of the 12-inch minimum snow depth/avoid resource damage standard for cross-country use and the 6-inch recommended minimum snow depth/avoid resource damage trail standard, there would continue to be only incidental ground disturbance. As a result, there would be no change to equivalent roaded acres (ERA) calculations for any watersheds under this alternative, and no change in detrimental cumulative watershed effects. There would be negligible effects from exhaust emissions stored in snowpack, low risk of damage to vegetation, and other direct and indirect effects. This alternative would implement the recommended project design criteria, or mitigation measures. This alternative would have adequate snow cover to protect soils and water resources to prevent resource damage, and to protect vegetation in riparian areas. This alternative would not directly conflict with Forest Plan standards and guidelines, and would not result in irreversible or irretrievable effects to soil, water, or riparian resources.

Alternative 3

Direct and Indirect Effects

Alternative 3 will be compared to alternative 2 because alternative 2 has a minimum snow depth. Alternative 3 would designate about 131,000 fewer acres for OSV use compared to alternative 2. Implementation of alternative 3 would have direct and indirect effects to hydrology similar to alternative 2.

Because minimum snow depths would be greater under alternative 3, there is more protection of ground surfaces during the OSV riding season, and during marginal snow depth conditions such as at the beginning and end of the riding season. As in alternative 2, incidental direct effects including ground disturbance in low-snow areas may occur. However, for proposed minimum snow levels, alternative 3 would not result in more than incidental ground disturbance or vegetation trampling and would not likely create water quality impacts to streams or waterbodies by introducing sediment to water runoff.

The riparian conservation objectives apply to all routes that pass through RCAs and meadows. Under alternative 3, groomed and ungroomed OSV trails and cross-country travel would be allowed within RCAs, but because of the protective layer of snowpack protecting the ground surface, there would be a negligible resource damage potential. No restrictions on public OSV operations in riparian areas, lakes or meadows are currently in place or are prescribed for this alternative, and no adverse impacts to these areas have been observed or monitored.

RCOs 1 and 6: Under alternative 3, beneficial uses of waterbodies would be protected and enhanced. There would be no changes in water storage, seasonal availability, and quality.

RCOs 2, 4, and 5: Under alternative 3, the geomorphic and biological characteristics of meadows, streams, and RCAs would be protected. No sedimentation would likely result in no changes to aquatic primary productivity. Growing season water availability would remain unchanged and would not affect ecosystem integrity.

Cumulative Effects

Risks of cumulative effects from this alternative are negligible. With the 18-inch minimum snow depth for cross-country use, there would continue to be only incidental ground disturbance. As a result, there would be no change to equivalent roaded acres (ERA) calculations for any watersheds under this alternative, and no change in detrimental cumulative watershed effects. There would be negligible effects from exhaust emissions stored in snowpack, low risk of damage to vegetation, and other direct and indirect effects. This alternative would implement the recommended project design criteria, or mitigation measures, and would have the lowest amount of land area designated for OSVs. Alternative 3 would provide adequate snow cover to protect soils and water resources, and to protect vegetation in riparian areas. This alternative would not directly conflict with Forest Plan standards and guidelines, nor would it result in irreversible or irretrievable effects to soil, water, or riparian resources.

Alternative 4

Direct and Indirect Effects

Under alternative 4, there would be the same number of acres open to OSVs as in alternative 1. Alternative 4 would provide approximately the same protection for the ground surface as in alternative 2. The end result of implementation of alternative 4 would be similar to alternative 2 because snow levels prescribed in alternative 2 are similar, leading to low risks of direct or indirect effects to hydrology. Risks of resource damage created by OSVs would be primarily impacts to the trail surface or vegetation that could lead to water quality impacts.

Implementation of alternative 4 would have direct and indirect effects to hydrology similar to alternative 2. However, minimum snow depths in alternative 2 are recommendations only, with a focus on avoiding resource damage. As a result, minimum snow depths under alternative 2 may in fact be deeper than the recommended minimum to protect resources and avoid damage. Alternative 4 differs from alternative 2 because alternative 2 minimum snow depths could be higher (or less) than alternative 4.

Alternative 4 for most conditions would provide protection of ground surfaces, with about the same risk for ground disturbance as in alternative 2. Like alternative 2, alternative 4 provides a minimum snowpack standard compared to current conditions that would likely avoid direct or indirect effects and resource damage from public OSV use. As a result of implementation, direct and indirect effects of this alternative on hydrology in areas designated for OSV use would be negligible. As in alternative 2, incidental direct effects including ground disturbance in low-snow areas may occur under this alternative. However, for proposed minimum snow levels, alternative 4 would likely not result in more than incidental ground disturbance or vegetation trampling, and would not likely create water quality impacts to streams or waterbodies by introducing sediment to water runoff.

The riparian conservation objectives apply to all routes that pass through RCAs and meadows. Under alternative 4, groomed and ungroomed OSV trails and cross-country travel would be allowed within RCAs, but because of the layer of snowpack protecting the ground surface, there would be a very low resource damage potential. No restrictions on OSVs in riparian areas, or meadows are currently in place, and no adverse impacts to these areas have been observed or monitored.

RCOs 1 and 6: Under alternative 4, beneficial uses of waterbodies would be protected and enhanced. There would be no changes in water storage, seasonal availability, and quality.

RCOs 2, 4, and 5: Under alternative 4, the geomorphic and biological characteristics of meadows, streams, and RCAs would be protected. No sedimentation would likely result in no changes to aquatic primary productivity. Growing season water availability would remain unchanged and would not affect ecosystem integrity.

Cumulative Effects

The risks of cumulative effects from alternative 4 are negligible. As a result of the 12-inch minimum snow depth for cross-country use, there would continue to be only incidental ground disturbance. As a result, there would be no change to equivalent roaded acres (ERA) calculations for watersheds under this alternative, and no change in detrimental cumulative watershed effects. There would be negligible effects from exhaust emissions stored in snowpack, low risk of damage to vegetation, and other direct and indirect effects. This alternative would implement the recommended project design criteria, or

mitigation measures, and would have nearly the highest amount of land area open to OSV use. This alternative would provide adequate snow cover to protect soils and water resources, and to protect vegetation in riparian areas. This alternative would not directly conflict with Forest Plan standards and guidelines, nor would it result in irreversible or irretrievable effects to soil, water, or riparian resources.

Alternative 5

Direct and Indirect Effects

Implementation of alternative 5 would have effects similar to alternative 2 in terms of overall effects and risks to hydrology. However, alternative 5 would provide more protection than alternative 2 for ground surfaces and vegetation, especially in situations where snow depth conditions in alternative 2 are near the minimum depths prescribed. Implementation of alternative 5 would cause low risks of direct or indirect effects to hydrology. Resource damage created by OSVs, when it occurs, would be primarily impacts to the trail surface or vegetation that could lead to water quality impacts.

Alternative 5 would provide higher levels of protection for the ground surface compared to alternative 2. Implementation of alternative 5 would lead to low risks of direct or indirect effects to hydrology.

The direct and indirect effects of alternative 5 would be lower than alternative 2. However, like alternative 2, alternative 5 provides a minimum snowpack standard compared to current conditions that would likely avoid direct or indirect effects and resource damage from OSV use. As a result of implementation of this alternative, direct and indirect effects on hydrology in areas designated for OSV use would be negligible. As in alternative 2, incidental direct effects including ground disturbance in low-snow areas may occur under this alternative. However, for proposed minimum snow levels, and decreased area of OSV use, alternative 5 would likely not result in more than incidental ground disturbance or vegetation trampling, and would not likely create water quality impacts to streams or waterbodies by introducing sediment to water runoff.

The riparian conservation objectives apply to all routes that pass through RCAs and meadows. Under alternative 5, groomed and ungroomed OSV trails and cross-country travel would be allowed within RCAs, but because of the protective layer of snowpack protecting the ground surface, there would be a very low resource damage potential. No restrictions on OSVs in riparian areas, or meadows are currently in place, and no adverse impacts to these areas have been observed or monitored.

RCOs 1 and 6: Under alternative 5, beneficial uses of waterbodies would be protected and enhanced. There would be no changes in water storage, seasonal availability, and quality.

RCOs 2, 4, and 5: Under alternative 5, the geomorphic and biological characteristics of meadows, streams, and RCAs would be protected. No sedimentation would likely result in no changes to aquatic primary productivity. Growing season water availability would remain unchanged and would not affect ecosystem integrity.

Cumulative Effects

The risks of cumulative effects from this alternative would be negligible. With the 24-inch minimum snow depth for cross-country use, there would continue to be only incidental ground disturbance. As a result, there would be no change to equivalent roaded acres (ERA) calculations for watersheds under this alternative, and no change in detrimental cumulative watershed effects. There would be negligible effects from exhaust emissions stored in snowpack, low risk of damage to vegetation, and other direct and indirect effects. This alternative would have adequate snow cover to protect soils and water

resources, and to protect vegetation in riparian areas. This alternative would not directly conflict with Forest Plan standards and guidelines, and would not result in irreversible or irretrievable effects to soil, water, or riparian resources.

Conclusions

Alternative 1 appears to protect water resources, but with the lowest level of protection:

OSV use on trails and cross-country has been observed to be adequate to mitigate and eliminate substantial water quality impacts such as stream sedimentation in perennial, intermittent or ephemeral streams, in wetlands or other bodies of water. This alternative would have a negligible impact on water quality as a result of hydrocarbon emissions from OSVs. Alternative 1 would be consistent with the Clean Water Act and Porter Cologne Water Act, as water quality would not be impaired and beneficial uses would be protected.

There would be no watersheds with a risk of cumulative watershed effects as result of this alternative, and would be consistent with all of the applicable RCOs in the 2004 Sierra Nevada Forest Plan Amendment. Beneficial uses of water would be protected.

Alternatives 2 and 4 would protect water resources:

The recommended or required 6-inch minimum on trails and 12-inch cross-country snow depth standard would be adequate to mitigate and eliminate substantial water quality impacts such as stream sedimentation in perennial, intermittent, or ephemeral streams, in wetlands or other bodies of water. However, consistent and timely monitoring would be needed as a mitigation to ensure that damage to trails would not occur. These alternatives would have a negligible impact on water quality as a result of hydrocarbon emissions from OSVs. Beneficial uses of waterbodies would be protected under these alternatives, as only 6 inches of snow would be recommended or required for use of designated OSV trails. As a result, alternatives 2 and 4 would be consistent with the Clean Water Act and Porter Cologne Water Act, as water quality and beneficial uses would be protected. There would be no watersheds with a risk of cumulative watershed effects as result of these alternatives, and it would be consistent with applicable RCOs in the 2004 Sierra Nevada Forest Plan Amendment.

Alternatives 3 and 5 would best protect water resources:

The 18- to 24-inch-minimum snow depth on trails and cross-country would be adequate to mitigate and eliminate substantial water quality impacts such as stream sedimentation in perennial, intermittent, or ephemeral streams, in wetlands or other bodies of water. However, consistent and timely monitoring would be recommended as a mitigation to ensure that damage to trails is not occurring. These alternatives would have a negligible impact on water quality as a result of hydrocarbon emissions from OSVs. Beneficial uses of waterbodies would be protected under these alternatives, as 18 to 24 inches or more of snow would be required for use of designated OSV trails. As a result, alternatives 3 and 5 would be consistent with the Clean Water Act and Porter Cologne Water Act, as water quality and beneficial uses would be protected. There would be no watersheds with a risk of cumulative watershed effects as result of these alternatives, and it would be consistent with applicable RCOs in the 2004 Sierra Nevada Forest Plan Amendment.

Riparian Conservation Objectives Analysis

The Sierra Nevada Forest Plan Amendment (SNFPA FSEIS ROD) requires that RCO analysis be conducted during environmental analysis for new proposed management activities within CARs and RCAs (Standard and Guideline #92). Consistency with the RCOs is an indicator to ensure that goals of the Aquatic Management Strategy are met (USDA FS PSW Region 2004: 32). For this project, allowing use of over-snow vehicles when the ground is covered with a protective layer of snow would have a negligible effect on RCAs because direct and indirect effects would be negligible, and OSV use would result in negligible effects to RCAs. Hydrocarbon pollution derived from OSVs and grooming equipment would have a negligible effect on water quality under this plan.

The above determinations are based on Standard and Guideline #92, which states “Evaluate new proposed management activities within CARs and RCAs during environmental analysis to determine consistency with the riparian conservation objectives at the project level and the AMS goals for the landscape.” Consequently, consistency with the RCOs is an indicator to ensure that goals of the Aquatic Management Strategy are met (USDA FS PSW Regulation 2004: 32).

Table 57. Riparian conservation areas (RCAs) adjacent to aquatic features as designated by the Sierra Nevada Forest Plan Amendment Record of Decision (SNFP ROD 2004)

Aquatic feature	Riparian Conservation Area
Perennial stream.	300 feet on each side of the stream, measured from the bank full edge of the stream.
Seasonally flowing streams.	150 feet on each side of the stream, measured from the bank full edge of the stream.
Special aquatic features (includes lakes, wet meadows, bogs, fens, wetlands, vernal pools, and springs).	300 feet from the edge of the features or riparian vegetation, whichever width is greater.
Perennial streams with riparian conditions extending more than 150 feet from the edge of the stream bank or seasonally flow streams extending more than 50 feet from the edge of the stream bank.	300 feet from the edge of the features or riparian vegetation, whichever width is greater.
Streams in inner gorge.	Top of inner gorge. (The inner gorge is defined by stream adjacent slopes greater than 70 percent gradient.)

Indicator: Consistency with Riparian Conservation Objectives 1, 2, 4 and 5 (Alternative 1)

The riparian conservation objectives apply to all OSV routes and cross-country use that passes through RCAs and meadows. Cross-country OSV routes would traverse meadows and streams with no restriction, and OSV trails in some areas are located in RCAs.

RCO 1: Under alternative 1, beneficial uses of waterbodies are protected. OSV uses do not impact beneficial uses of waterbodies, especially municipal watersheds. Beneficial uses within the major hydrologic areas, units, or creeks within the Tahoe National Forest, designated by the State Central Valley and Lahontan Regional Water Quality Control Boards, are shown in table 58. OSV uses do not impact Clean Water Act 303 (d) waterbodies.

RCO 2: Under alternative 1, the geomorphic and biological characteristics of meadows, perennial streams and RCAs are protected under this project. Under this RCO, the goal is to maintain or restore: (1) the geomorphic and biological characteristics of special aquatic features, including lakes, meadows, bogs, fens, wetlands, vernal pools, springs; (2) streams, including in stream flows; and (3) hydrologic connectivity both within and between watersheds to provide for the habitat needs of aquatic-dependent species. For this plan, criteria for establishing consistency are that OSV use would not cause accelerated erosion, such as head-cutting or the formation of gullies in meadows or spring ecosystems. Current OSV use does not lower water tables of meadows, does not alter the movement of surface water in meadows. OSV use does not de-water spring ecosystems, does not capture streams and divert them down roads, and OSV use does not disturb shorelines of natural and man-made lakes and ponds.

RCO 4: Under alternative 1, management activities within RCAs would enhance or maintain physical and biological characteristics associated with aquatic- and riparian-dependent species. For this project, criteria for establishing consistency are that OSV use does not degrade the water quality of hydrologically connected systems, and that OSV use does not modify channel morphology of streams.

RCO 5: Under alternative 1, efforts would be made to preserve, restore, or enhance special aquatic features, such as meadows, lakes, ponds, bogs, fens, and wetlands, to provide the ecological conditions and processes needed to recover or enhance the viability of species that rely on these areas

Indicator: Consistency with Riparian Conservation Objectives 1, 2, 4 and 5 (Alternatives 2, 3, 4, and 5)

The riparian conservation objectives apply to all routes that pass through RCAs and meadows. Cross-country OSV routes would traverse meadows and streams with no restriction. Snow cover would protect these resources, and OSV trails in some areas would be located in RCAs.

RCO 1: Under alternatives 2, 3, 4, and 5, beneficial uses of waterbodies would be protected. OSV uses would not impact beneficial uses of waterbodies, especially municipal watersheds. These alternatives would comply with the Clean Water Act. Beneficial uses within the major hydrologic areas, units, or creeks within the Tahoe National Forest, designated by the State Lahontan Regional Water Quality Control Board and Central Valley Regional Water Quality Control Board, have been identified in table 58. OSV uses do not impact Clean Water Act 303 (d) waterbodies.

RCO 2: Under alternatives 2, 3, 4, and 5, the geomorphic and biological characteristics of meadows, perennial streams and RCAs would be protected under this project. Under this RCO, the goal is to maintain or restore: (1) the geomorphic and biological characteristics of special aquatic features, including lakes, meadows, bogs, fens, wetlands, vernal pools, springs; (2) streams, including in stream flows; and (3) hydrologic connectivity both within and between watersheds to provide for the habitat needs of aquatic-dependent species. For this project, criteria for establishing consistency are that OSV use would not cause accelerated erosion, such as head-cutting or the formation of gullies in meadows or spring ecosystems. Current OSV use does not lower water tables of meadows and does not alter the movement of surface water in meadows. OSV use does not de-water spring ecosystems, does not capture streams and divert them down roads, and OSV use does not disturb shorelines of natural and human-made lakes and ponds.

RCO 4: Under alternatives 2, 3, 4, and 5, management activities within RCAs would enhance or maintain physical and biological characteristics associated with aquatic- and riparian-dependent species.

For this project, criteria for establishing consistency are that OSV use would not degrade the water quality of hydrologically connected systems, and that OSV use would not modify channel morphology of streams.

RCO 5: Under alternatives 2, 3, 4, and 5, efforts would be made to preserve, restore, or enhance special aquatic features, such as meadows, lakes, ponds, bogs, fens, and wetlands, to provide the ecological conditions and processes needed to recover or enhance the viability of species that rely on these areas.

Compliance with Relevant Laws, Regulations, Policies and Plans

This project is consistent with the Tahoe National Forest LRMP, which provides standards and guidelines for water-related concerns. The 2004 Sierra Nevada Forest Plan Amendment modified the forest plan guidance.

All alternatives would be consistent with the Clean Water Act and Porter Cologne Water Act because water quality and beneficial uses would be protected. Alternatives would be consistent with all applicable RCOs in the Sierra Nevada Forest Plan Amendment once mitigation measures have been implemented. Beneficial uses of waterbodies and water quality would be protected for all alternatives. Physical and biological properties of RCAs would be protected for all alternatives.

All alternatives are consistent with the 2004 Sierra Nevada Forest Plan Amendment. The riparian conservation objectives would apply to all routes that pass through RCAs and meadows. Under all alternatives, groomed and ungroomed OSV trails and cross-country travel would be allowed within RCAs, but because of the layer of snowpack protecting the ground surface, there is currently a very low resource damage potential. No restrictions on OSVs in riparian areas, on frozen lakes or meadows are currently in place. No adverse impacts to these areas have been observed or monitored.

RCOs 1 and 6: Under all alternatives, beneficial uses of waterbodies would be protected and enhanced. There would be no changes in water storage, seasonal availability, and quality.

RCOs 2, 4, and 5: Under all alternatives, the geomorphic and biological characteristics of meadows, streams and RCAs would be protected. No sedimentation would likely result in no changes to aquatic primary productivity. Growing season water availability would remain unchanged and would not affect ecosystem integrity.

This project would comply with the Clean Water Act as enforced through the Porter-Cologne Water-Quality Act for the State of California.

Short-term Uses and Long-term Productivity

There would be no impacts from short-term uses and long-term productivity on hydrologic resources.

Unavoidable Adverse Effects

There would be no unavoidable adverse effects from the effects of any alternative.

Irreversible and Irretrievable Commitments of Resources

There would be no irreversible or irretrievable commitment of resources for any alternatives.

Table 58. Compliance with beneficial uses of water within the Tahoe National Forest

Hydrologic Unit/Watershed	State HUC no.	Municipal and Domestic Supply	Agricultural Supply	Industrial Process Supply	Industrial Service Supply	Ground Water Recharge	Freshwater Replenishment	Navigation	Hydropower Generation	Water Contact Recreation	Non-contact Water Recreation	Commercial and Sport Fishing	Aquaculture	Warm Freshwater Habitat	Cold Freshwater Habitat	Inland Saline Water Habitat	Wildlife Habitat	Spawning, Reproduction and Development	Water Quality Enhancement	Flood Peak Attenuation/Flood Water Storage	Preservation of Biological Habitats of Special Significance	Migration of Aquatic Organisms	Rare, threatened and Endangered Species
Truckee River	635.20	x	x		x	x	x	x		x	x	x			x		x	x	x	x		x	x
¹ Humbug Creek	517	x	x			x	x		x	x	x				x		x	x					
¹ Kanaka Creek	517	x	x			x	x		x	x	x	x			x		x	x					
Donner Lake	635.20	x	x						x	x	x	x			x		x	x					
Stampede Res.	635.20	x	x						x	x	x				x		x	x					
Squaw Creek	635.20	x	x				x			x	x	x			x		x	x				x	x

¹ Cal LRWQCB EPA 1995

Table 59. Water quality standards of concern for OSVs

Category	Standard	Beneficial Uses Potentially Affected										
Floating Material	Water shall not contain floating material in amounts that cause nuisance or adversely affect beneficial uses.	Domestic or municipal Contact Recreation Non-contact Recreation Power										
Oil and Grease	Waters shall not contain oils, greases, waxes, or other materials that causes nuisance, a visible film or coating on the surface or on objects in water, or otherwise adversely affect beneficial uses.	All										
Total Dissolved Solids	Shall not exceed 125 mg/l (90 percentile).	Domestic or municipal Contact Recreation Aquatic organisms										
Sediment	The suspended sediment load and discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.	All										
Settleable Materials	Waters shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.	Domestic or municipal Power Aquatic organisms										
Suspended Material	Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.	All										
Turbidity	Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity shall not exceed the following Nephelometric Turbidity Units (NTUs): <table><tr><td colspan="2">For natural turbidity between:Increases shall not exceed</td></tr><tr><td>0 and 5 NTUs</td><td>1 NTU</td></tr><tr><td>5 and 50 NTUs</td><td>20 percent</td></tr><tr><td>50 and 100 NTUs</td><td>10 NTUs</td></tr><tr><td>Greater than 100 NTUs</td><td>10 percent</td></tr></table>	For natural turbidity between:Increases shall not exceed		0 and 5 NTUs	1 NTU	5 and 50 NTUs	20 percent	50 and 100 NTUs	10 NTUs	Greater than 100 NTUs	10 percent	All
For natural turbidity between:Increases shall not exceed												
0 and 5 NTUs	1 NTU											
5 and 50 NTUs	20 percent											
50 and 100 NTUs	10 NTUs											
Greater than 100 NTUs	10 percent											

Soils

Relevant Laws, Regulations, and Policy

Regulatory Framework

Land and Resource Management Plan

The Tahoe National Forest LRMP provides standards and guidelines for activities on the forest including OSV management.

- ◆ LRMP Standards and Guidelines pertinent to OSV management (USDA Forest Service 1990: Chapter 4):
 - Maintain or improve long term soil productivity on at least 85 percent of an activity area. Soil productivity includes three soil characteristics including soil porosity, soil cover and soil organic matter.
 - Soil Porosity: The soil is considered to be in an acceptable condition when compaction or puddling reduce total soil porosity by no more than 10 percent as compared to the undisturbed soil.
 - Soil Cover: The soil is considered to be in acceptable condition after a land-disturbing activity when the effective soil cover on an activity area is (1) the minimum amount shown in the following table, or (2) the minimum amount prescribed for a specific site by a qualified earth science specialist after an on-site investigation. The minimum effective soil cover prescribed for a specific site will vary from the values shown in the table due to local differences in slope, micro relief, surface rock fragments, detachability, and other factors that vary within soil types.

Minimum effective soil cover (percent) by slope group and soil group (LRMP Page V.37)

Slope (%)	< 35	35 to 50	>50
Soil Group A	70	80	90
Soil Group B	50	60	75
Soil Group C	40	50	65
Soil Group D	30	40	55

- Soil Group A: These soils are highly erodible, have developed from granitic parent material, have a short timber rotation length, and are at lower elevations on the west side of the forest. Included are the Hoda, Holland, Hotaw, and Musick series.
- Soil Group B: These soils have developed from a variety of parent materials. These soils erodibility, geographic location, and climate varies, and they have short to moderate timber rotation lengths. Included are the Alken, Boomer, Boomer Variant, Chalx, Cohasset, Delieker, Dubakella, Euer, Euer Variant, Forbes, Fugawee, Horseshoe, Hotaw Variant, Huysink, Jocal, JocalVariant, Jorge, Kinkel Variant, Lorack Variant, Mariposa, McCarthy, Ponto Variant, Putt, Sattley, Slerraville, Sltes, and Trojan series.

- Soil Group C: These soils have developed from a variety of parent materials. The erodibility, geographic location, and climate varies across these soil types, and they have moderate to long timber rotation lengths. Included are the Aspen Variant, Bucking Variant, Chaix Variant, Crozier, Haypress, Hurlbut, Jorge Variant Kyburz, Ledford, Ledford Variant, Neer, Smokey, Tahoma Variant, Tallac, Tinker, and Zeibright series.
- Soil Group D: These soils occur primarily in the true fir zone, have low erodibilities and have long timber rotations. Included are the Ahart, Bucking, Ceio Variant, Lorack, Smokey Variant, Tahoma, Umpa, Waca, and Windy series.
 - Soil Organic Matter:
 - Maintain an average of 5 logs per acre
 - Maintain forest duff over 80 percent of an activity area

Regional Direction

Pacific Southwest Region Soil Management Handbook Supplement (Pacific Southwest Region FSH Supplement No. 2509.18-95-1)

This supplement establishes regional soil quality analysis standards. The analysis standards address three basic elements for the soil resource: (1) soil productivity (including soil loss, porosity and organic matter), (2) soil hydrologic function, and (3) soil buffering capacity. The analysis standards are to be used for areas growing vegetation. They are not applied to lands with other dedicated uses, such as developed campgrounds, administrative facilities, or in this case, the actual land surface of routes authorized for travel by OSVs. This standard does apply to cross-country OSV travel.

Federal Law

National Forest Roads and Trails Act of 1964 (78 Stat. 1089; 16 U.S.C. 532-538)

Section 1 of the National Forest Roads and Trails Act states “Congress hereby finds and declares that the construction and maintenance of an adequate system of roads and trails within and near the national forests and other lands administered by the Forest Service is essential.” This system of roads is needed “to provide for intensive use, protection, development, and management of these lands under principles of multiple use and sustained yield of products and services.” (16 U.S.C. 532)

Section 2 of this act states, “The Secretary is authorized, under such regulations as he may prescribe, subject to provisions of this Act, to grant permanent or temporary easements for specified periods or otherwise for road rights-of-way (1) over national forest lands administered by the Forest Service.” (16 U.S.C. 533)

Implicit in this legal direction is Forest Service authority to withdraw lands from vegetation production and related soil productivity on the national forest for dedication to road and trail corridors for transportation and access uses.

National Environmental Policy Act of 1969

This document was developed using the principal elements from the National Environmental Policy Act (NEPA) of 1969 and the regulations for implementing the procedural provisions of the NEPA from the Council on Environmental Quality (40 CFR Parts 1500-1508) and Regulation 36 CFR Part 220.

National Forest Management Act of 1976 (90 Stat. 2949; 16 U.S.C. 1608)

Section 8(b) of the National Forest Management Act states, “any road constructed on land of the National Forest System in connection with a timber contract or other lease shall be designed with the goal of reestablishing vegetation cover on the roadway and areas where vegetation cover has been disturbed by the construction of the road, within ten years after the termination of the contract, permit, or lease.” This section of the act further states, “Such action shall be taken unless it is determined that the road is needed for use as a part of the National Forest Transportation System.”

This legal direction states that lands no longer needed for, and dedicated to, transportation or access uses should be returned to a vegetated state. Implicit in this legal direction is Forest Service responsibility to recover soil productivity on these lands, to the extent that vegetation can be re-established. Type and degree of soil recovery necessary for re-establishment of vegetation would depend on site-specific conditions and land management objectives for that area.

Section 8(c) of this act states “Roads constructed on National Forest System lands shall be designed to standards appropriate for the intended uses, considering safety, cost of transportation, and impacts on land resources.”

Resource Indicators and Measures

Resource indicators and measures shown in table 19 will be used to measure and disclose effects to soils related to OSV use designations and grooming trails for OSV use.

Table 60. Resource indicators and measures used to determine impacts on soil resources

Resource Element	Resource Indicator	Measure (Quantify if possible)
Soil Productivity and Soil Stability	OSV use on sensitive soils to include wet meadows, areas with low stability or erosion hazards.	Acres of cross-country travel open to OSV use on sensitive soils
Soil Stability	Minimum snow depths on trails designated for public OSV use	Depth of snow (inches)
Soil Productivity	Minimum snow depths in areas designated for cross-country OSV use	Depth of snow (inches)

Methodology

The soil resources were analyzed within the project area using GIS data, soils survey data, corporate soils data layers including the geology and geomorphology layers for the Tahoe National Forest, a variety of reports and assessments of OSV impacts, and professional experience and judgement using scientific literature on OSV impacts. To determine where sensitive soils might be located on the forest, the soils data and other corporate GIS layers were used to determine where wet meadow soils, soils with low stability, and soils with erosion potential might be located.

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 the soil resource are the area of land managed by the Tahoe National Forest.

The short-term temporal boundary for analyzing the direct, indirect, and cumulative effects to the soil resource is 1 year; the long-term temporal boundary is 10 years because climate changes, unforeseeable future projects, and other factors make assumptions beyond this timeframe speculative.

Affected Environment

Existing Condition

The Tahoe National Forest has diverse vegetation because of its wide ranges in precipitation and elevation. In the upper elevations between 3,500 and 6,000 feet on the western slopes of the Sierra Nevada Mountains, mixed conifer stands dominate. On the lower elevation areas and on south-facing slopes, ponderosa pine are most commonly found. California black oak, madrone and tanoak are hardwood species that are commonly found within the mixed conifer stands within the forest. Jeffrey pine is commonly found in association with the serpentine ultra-mafic soil types on the forest.

Soils and Geology

The western third of the Tahoe National Forest contains deep canyons separated by nearly level to sloping, broad ridgetops. Soils on the steep canyon side slopes have developed mainly from metasedimentary and ultrabasic (ultramafic) bedrock; soils on the ridgetops have developed primarily from andesitic tuff breccia mudflows of the Meherten Formation (approximately 168,232 acres or 20 percent of the forest). Soils in the vicinity of Bullards Bar Reservoir have developed mainly from granitic bedrock. The western third of the forest contains the most productive soils. Soils in the east third of the forest occur on gentle to steep slopes and in broad valleys. These soils have developed from rhyolitic and granitic bedrock and from alluvial deposits. Low precipitation is a major limitation to productivity in this area. Soils at higher elevations (5,500 to 9,500 feet) along the crest of the Sierra have developed from volcanic, metasedimentary, and granitic rocks, and from glacial-alluvial deposits. Steep slopes and shallow, rocky soils limit productivity in much of this central third of the forest.

Elevations throughout the forest range from 2,500 to 8,700 feet. The western and southern sections are composed of gentle to steep slopes; the northern and eastern sections have larger swaths of gently sloping and flatter stretches of land. The higher elevation portions of the forest were glaciated in the last ice age.

Soil Productivity

Soil organic matter and soil porosity are two indicators of soil productivity. The importance of soil organic matter cannot be overstated (Jurgensen et al. 1997). This organic component contains a large reserve of nutrients and carbon, and it is dynamically alive with microbial activity. The character of forest soil organic matter influences many critical ecosystem processes, such as the formation of soil structure, which in turn influences soil gas exchange, soil water infiltration rates, and soil water-holding capacity. Soil organic matter is also the primary location of nutrient recycling and humus formation, which enhances soil cation exchange capacity and overall fertility. Organic matter including the forest floor and large woody material are essential for maintaining ecosystem function by supporting moderate soil temperatures, improved water availability and bio-diversity (Page-Dumroese et al. 2010).

Soil porosity refers to the amount and character of void space within the soil. In a “typical” soil, approximately 50 percent of the soil volume is void space. Pore space is lost primarily through

mechanical compaction. Three fundamental processes are negatively impacted by compromised soil pore space:

- Gas exchange;
- Soil water infiltration rates; and
- Water-holding capacity.

Gas Exchange

Soil oxygen is fundamental to all soil biologic activity. Roots, soil fauna, and fungi all respire, using oxygen while releasing carbon dioxide. When gas exchange is compromised, biologic activity is also compromised. Maintaining appropriate soil biologic activity is paramount when considering long-term forest vitality.

Soil Water Infiltration Rates

Severely compacted soils do not allow appropriate water infiltration, leading to overland flow and associated erosion, sediment delivery, spring flooding, and low summer flows. Activities on moist soils are especially damaging. Activities on dry or frozen soils maintains much more of a soil's natural ability to quickly restore pore spaces.

Soil productivity within the Tahoe National Forest could be most affected by OSV use within sensitive soil types including wet meadow areas and soils that are prone to erosion. Wet meadows are located on less than 1 percent of the Tahoe National Forest (approximately 2,487 acres). Maintaining a minimum snow depth to not disturb the organic matter at the soil surface or compact the soil and reduce soil porosity are essential to reducing the effects of OSV use on the soil resource in these sensitive areas.

Soil Stability

Shallow debris slides are the most common and most destructive type of landslide found within the Tahoe National Forest, but deeper mass movements, road cut failures, stream channel instability, and rockfalls also occur. Land instability is not extensive on the forest. Most instability features are found in the steep canyons and inner gorges in the lower elevations of the western part of the forest. Preliminary landslide hazard work shows a higher rate of occurrence of land sliding in various contact zones beneath the Meherren Formation (volcanic mudflows, 168,232 acres or approximately 22 percent of the forest), more often on north-facing slopes where springs occur. Other potentially unstable areas on the forest include scree and talus deposits (1,691 acres). Generally, the instability and slumping only occurs when soils are excavated deeper than 2 feet. Most of the remaining portions of the forest have low-relief volcanic topography where the stability hazard is low. Old landslides are present within the project area on less than 1 percent of the forest (2,314 acres). None of the actual proposed snowmobile trails (groomed or ungroomed) occur on any mapped landslide deposits.

Approximately 285,134 acres (approximately 34 percent of the area) across the forest have a very severe erosion hazard rating when the soils have no vegetation present.

Existing roads could also have soil erosion (Cacek 1989). The dominant processes in roaded areas are surface erosion from bare soil areas of roads, including the cutslope, fillslope, and travelway. Snow cover on roads is an important component in reducing risks of erosion from roads due to OSV use.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Soil Productivity

Incidental direct effects of OSV use on and off trails could include compaction, rutting, and disturbance of the forest floor and organic matter within the soil in low-snow areas. Although snowmobiles generally have low ground pressure, the tracks on snowmobiles could churn soil and cause compaction with repeated travel over areas with low-snow conditions (Baker and Buthmann 2005; Gage and Cooper 2009). This type of incidental contact with the soil surface or low-snow conditions would likely occur during the fall or spring season, would more likely be found on ridges that are windy and exposed or on south-facing slopes, and would be very limited. Repeated compaction of snow can also alter soil temperatures, potentially changing or reducing microbial activity, but some research has shown that with repeated compaction, soil temperatures were not affected (Gage and Cooper 2009; Keller et al. 2004).

Currently, grooming generally occurs when there is 12 to 18 inches of snow on trails, meaning that there is little to no chance that soil will be exposed on groomed OSV trails.

Soils within the Tahoe National Forest that may be most prone to compaction and rutting include the soils located within the wet meadows. These soils tend to have more soil moisture for longer periods throughout the year with finer soil textures. Monitoring of wet meadow areas is recommended to ensure that OSV use is not occurring without adequate snow levels to protect these sensitive soil types that cover less than 1 percent of the forest.

Moderate snowpack levels have been shown to minimize the potential compaction from OSV use (Gage and Cooper 2009). With adequate snow depth, on-trail and off-trail OSV use would have minimal to no impact on the soil resource and would not likely lead to any loss of soil productivity. Because there is no minimum snow depth, loss of soil productivity is likely to occur in areas where the snow depth is less than 12 inches and cross-country OSV travel is occurring.

Soil Stability

With adequate snow depths, cross-country OSV use is unlikely to affect soil stability. Approximately 127,627 acres with landslide potential are designated for OSV use. Landslides within the Tahoe National Forest are generally caused by excavating soil to a depth greater than 2 feet. OSV use on these soils would not lead to excavated soils and would likely be widely spread out throughout the forest versus concentrated on landslide-prone areas. Even with concentrated use on sites where landslide potential is high, OSV use would not likely cause landslides.

Cross-country use of OSVs could have an effect on ground disturbance that could lead to erosion, especially on soils derived from granitic or rhyolitic parent materials where OSV use is allowed (61,388 acres). Depending on site-specific factors including slope, aspect, elevation, level of use, and weather conditions, trails and off-trail riding on steep slopes could contribute to erosion (Baker and Buthmann 2005, Olliff et al. 1999). Adequate snowpack would likely mitigate erosion on these sites, but with no minimum snow depth required under the current management, risk of erosion is increased if OSV use occurs on bare soil or in areas with less than 12 inches of snow. Generally, OSV operators avoid traveling over bare soil because it can damage their machines.

Trail Grooming

Trail grooming occurs over a National Forest System road or trail. Adequate snowpack is present on the trail prior to grooming, and grooming is not likely to cause impacts to the soil resource on trails or roads.

Table 61. Resource indicators and measures for alternative 1

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 1
Soil Productivity and Soil Stability	OSV use on sensitive soils including wet meadows, areas with low stability or erosion hazards.	Acres of cross-country travel open to OSV use on sensitive soils	190,169
Soil Stability	Minimum snow depths on trails	Inches of snow	0
Soil Productivity	Minimum snow depths for cross-country travel	Inches of snow	0

Alternatives 2, 3, 4, and 5

Minimization Measures under Alternative 2

Minimization measures will be used to minimize damage to soil resources including soils from the use of OSVs only under alternative 2. Appendices E and F of the FEIS include the minimization criteria for the soil resource.

Groomed Snow Trails:

- Impacts to soil would be minimized by grooming over the existing road and trail network, would not alter landforms or result in perceptible soil disturbance and therefore does not cause substantial impacts to water quality, perennial, intermittent or ephemeral streams, wetlands or other bodies of water.
- Impacts to soil would be minimized by grooming only when the ground surface is covered with adequate snowpack to prevent soil damage or soil rutting. The operator shall consider recent, current, and forecasted weather and snow conditions to ensure these conditions are met.
- Impacts to soils are minimized by OSV use of groomed trails where adequate snow cover ensures negligible potential for contact with bare soil and practically no disturbance of trail and road surfaces, and therefore, would not cause substantial impacts to water quality in perennial, intermittent, or ephemeral streams, or in wetlands or other bodies of water.

Cross-Country OSV use:

- Requiring that cross-country OSV use only occur when and where there is adequate snow coverage would minimize the likelihood of adverse impacts to soil and water resources from OSV use on routes and open areas.
- Impacts to soil from cross-country use would be minimized by clearly delineated and marked areas in the field where practical.
- Soil impacts would be minimized by managing designated OSV areas to mitigate adverse effects to soil, water quality, and riparian resources from over-use by adaptive management, changing season-of use periods as necessary to allow rehabilitation of an area, particularly hill climb areas.

- Soil impacts would also be minimized by closing an area if the designated use is causing unacceptable adverse effects to soil, water quality, and riparian resources.

Direct and Indirect Effects

The direct and indirect effects for these alternatives would be similar to alternative 1 except that alternative 1 has more acreage open to cross-country OSV use (except under alternative 4, which has slightly greater acreage designated for OSV use) with no minimum snow depth required to travel cross country or on trails, and could have the most impacts to the soil resource. Under alternatives 2, 3, 4, and 5, OSV use can occur cross country and on existing roads and trails with a minimum snow depth. Under alternative 1, there is no minimum snow depth, which could have the most impacts to the soil resource that could lead to localized soil disturbance where there is repeated use at lower snow depths. Under alternative 2, minimum snow depths would be guidelines only, with a focus on avoiding natural resource damage. As a result, minimum snow depths under alternative 2 may, in fact, be greater than the recommended minimum to protect resources and avoid damage. The effects of trail grooming would be similar to those effects described under alternative 1.

Soil Productivity

Impacts of OSV use on soil productivity would be similar to the impacts described under alternative 1. No new trail or road construction would occur under any of the alternatives. Because OSV use would occur with sufficient amounts of snow to protect the soil resource, there would not likely be soil disturbance including compaction or effects to soil porosity or the disturbance of organic matter including forest floor litter and large woody debris present on the soil surface. Existing regulations would allow the issuance of a closure order if snow cover had the potential to become inadequate during the open season. During times of the year when snowpacks are potentially more variable, there could be incidental indirect effects including some minor ground disturbance in low-snow areas. Under alternative 4, the acres open to cross-country OSV travel on sensitive soils would be slightly greater than under alternative 1, but that acreage would decrease under alternatives 2, 3, and 5 (table 62). Alternative 3 would have the least impact on sensitive soils, but alternative 5 would have slightly more acres of sensitive soils designated for OSV use, but with a greater minimum snow depth of 24 inches, this alternative would likely have the least impact on soil productivity overall.

Soil Stability

Impacts of OSV use on soil stability would be similar to the impacts described under alternative 1. OSV use would not increase landslide potential on low-stability sites across the forest. Erosion would likely not increase with adequate snow cover, although there is slightly more risk of having exposed bare soil on trails and roads under alternatives 2 and 4, because the minimum snow depth for OSV travel on existing roads and trails is reduced to 6 inches of unpacked snow. Monitoring under these alternatives would be important to determine the site-specific effects of a reduced minimum snow depth on the soil resource.

Table 62. Resource indicators and measures for soil resources direct and indirect effects, alternatives 2, 3, 4 and 5. (* under alternative 2 minimum snow depths are guidelines to avoid cultural and natural resource damage)

Resource Element	Resource Indicator	Measure	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Soil Productivity and Soil Stability	OSV use on sensitive soils including wet meadows, areas with low stability or erosion hazards.	Acres and percent designated for OSV use on sensitive soils	141,035 (35%)	89,037 (32%)	193,213 (30%)	92,100 (31%)
Soil Stability	Minimum Snow Depths on trails	Inches of snow	6*	18	6	24
Soil Productivity	Minimum snow depths for cross-country travel	Inches of snow	12*	18	12	24

Cumulative Effects

Vegetation Management

Several current and future vegetation management activities are occurring within the Tahoe National Forest. These ground-disturbing activities could have cumulative effects on the soil resource if the soil disturbance occurs in the same location as potential soil disturbance from OSV use. This is very unlikely, as effects of OSV use would be minimal throughout the forest. Potential road building, reconstruction, decommissioning and maintenance activities associated with vegetation management activities could increase soil disturbance and decrease soil productivity and stability where the roads are located. These vegetation management activities are regulated by Forest Plan standards and guidelines, Regional Standards, and best management practices to ensure soil productivity is maintained.

In general, snowmobiling is the primary winter recreational use in the action area. Snowmobiling primarily occurs on existing trails, naturally unforested areas, or in areas with limited forest cover or associated structural complexity at the ground level. Because snowmobiles operate over snow that protects the ground, it is unlikely that OSV use would have a significant direct impact upon soils, and therefore, cumulative effects would not be expected.

Parking Improvements for Winter Recreation

The parking lot at the Little Truckee Summit parking area is proposed for expansion to increase parking capacity. Approximately 10 acres of area will be disturbed during the expansion, but 5 of those acres will be temporarily disturbed and rehabilitated following the activities. Approximately 5 acres of soil disturbance will be permanent. These activities would occur during the spring/summer/fall when there is no snow on the ground, therefore, the impacts from parking lot improvements would not occur at the same time as the impacts from OSV use. Adequate snow levels on the disturbed, but rehabilitated soil areas would prevent further resource damage by OSV use.

Meadow Restoration Projects

One meadow restoration project is ongoing within the Tahoe National Forest; Folchi. No cross-country OSV use is permitted in the Folchi area; therefore, no overlap in time and space exists and no cumulative effects would be expected.

Other Recreation Activities

Disturbance from general motorized use and recreational access occurs and will continue to occur throughout the forest, indefinitely. We anticipate no changes in the existing recreation profile. Other recreational activities that take place off the developed roads, such as the gathering of miscellaneous forest products and hunting, occur within the project area, but because OSV use would generally occur on minimum snowpack, we anticipate no cumulative effects from other ongoing recreational activities.

Climate Change

Climate change affects and would continue to affect California and the Tahoe National Forest in the future. Precipitation events would likely become more unpredictable and warmer temperatures may decrease the amount of precipitation that falls as snow, likely decreasing the total snowpack and the amount of time that snow will be on the ground (State of California 2007). This could increase the amount of time the soil would be exposed to OSV impacts, and increase the impacts on sensitive soil sites including wet meadows and erosive sites because of increased soil exposure.

Compliance with Relevant Laws, Regulations, Policies and Plans

This project is consistent with the Tahoe National Forest Land and Resource Management Plan, which provides standards and guidelines to protect the soil resource and the Southwest Regional Soils Quality Standards by maintaining soil productivity.

Short-term Uses and Long-term Productivity

There would be no impacts from short-term uses and long-term productivity on the soil resource.

Unavoidable Adverse Effects

There would be no unavoidable adverse effects of any of the alternatives to the soil resource.

Irreversible and Irretrievable Commitments of Resources

There would be no irreversible and irretrievable commitments of resources for any alternatives.

Terrestrial Wildlife

The Fish and Wildlife Service list of Threatened, Endangered, and Proposed wildlife species for the Tahoe National Forest was obtained through the FWS Information for Planning and Conservation website (<https://ecos.fws.gov/ipac/>) from the Sacramento, and Nevada Fish and Wildlife Service offices, dated April 13, 2016, and again on August 21, 2016.

Relevant Laws, Regulations, and Policy

Regulatory Framework

Land and Resource Management Plan

The Tahoe National Forest LRMP provides standards and guidelines for activities on the forest including OSV management.

- LRMP Standards and Guidelines pertinent to OSV management (USDA Forest Service 1990: Chapter 4):
 - ◆ Coordination includes all activities needed to meet Regional standards and guidelines, legal mandates, planning direction for fish and wildlife, and to establish or maintain structural and nonstructural habitat improvements
 - ◆ Cooperation includes interactions with the U.S. Fish and Wildlife Service, other Federal agencies, California Department of Fish and Wildlife, County agencies, development interests, and universities
 - ◆ A biological evaluation will be prepared for each project involving suitable threatened and endangered or sensitive species habitat. The biological evaluation will address measures for maintaining viable population, potential impacts to the species, and possible alternatives to mitigate or avoid impacts
 - ◆ Develop programs for endangered, threatened, and sensitive fish and wildlife species as outlined in appendix D. Implement recovery plans and species management plans for threatened and endangered species

Land Allocations and Desired Conditions

California Spotted Owl Protected Activity Centers

Designation

California spotted owl protected activity centers (PACs) are delineated surrounding each territorial owl activity center detected on National Forest System lands since 1986. Owl activity centers are designated for all territorial owls based on: (1) the most recent documented nest site, (2) the most recent known roost site when a nest location remains unknown, and (3) a central point based on repeated daytime detections when neither nest or roost locations are known.

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, 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.

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.

Northern Goshawk Protected Activity Centers

Designation

Northern goshawk PACs are delineated surrounding all known and newly discovered breeding territories detected on National Forest System lands. Northern goshawk PACs are designated based upon the latest documented nest site and location(s) of alternate nests. If the actual nest site is not located, the PAC is designated based on the location of territorial adult birds or recently fledged juvenile goshawks during the fledgling dependency period.

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.

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.

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

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 2 conifers over 24 inches dbh per acre 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.

Aerial photography is used to delineate the core area. Acreage for the entire core area is identified on National Forest System 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 National Forest System 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.

Sierra Nevada Forest Plan Amendment

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 mitigation measures to retain suitable habitat within the estimated home range. Institute project-level surveys over the appropriate area, as determined by an interdisciplinary team.

Wolverine 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 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, prohibiting vegetation treatments within approximately ¼ mile of the activity center during the breeding season (March 1 through August 31), unless surveys confirm that California spotted owls are not nesting.
76. For northern goshawk PACs: Maintain a limited operating period, 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.
77. The [CSO or NGO] limited operating period 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 [CSO or NGO] 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 limited operating period 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 Marten Den Sites

- 87 and 89. Mitigate impacts where there is documented evidence of disturbance to the [fisher or marten] 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 a limited operating period (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 U.S. Fish and Wildlife Service (USFWS) 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 located in the project record.

Bald Eagle Protection Act

The 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 (USFWS 2007).

Resource Indicators and Measures

Resource indicators and measures shown in table 19 will be used to measure and disclose effects to terrestrial wildlife related to OSV use designations and grooming trails for OSV use.

Table 63. Resource indicators and measures for assessing effects to terrestrial wildlife

Resource Indicator	Measure (Quantify if possible)
Resource Element: Federally Listed, Proposed Species – North American wolverine	
Potential for disturbance to individuals from OSV use and increased human presence, or injury or mortality of individuals	Acres designated for OSV use and conducive to OSV use of habitat affected by OSV use
Resource Element: R5 Sensitive species – Pacific Marten	
Potential for injury or mortality of individuals from OSV use or related activities ¹⁸	Acres designated for OSV use and conducive to OSV use of habitat affected by OSV use
Potential for loss of habitat connectivity	Acres of corridors impacted by OSV use
Resource Element: R5 Sensitive species – California spotted owl (CSO), northern goshawk (NGO),	
Potential for disturbance to or displacement of individuals from noise and increased human presence, injury or mortality of individuals	Acres designated for OSV use and conducive to OSV use of important habitat impacted by OSV use
	Acres designated for OSV use and conducive to OSV use of buffered CSO and NGO activity centers impacted by OSV use
Resource Element: R5 Sensitive species – Bald Eagle	
Potential for disturbance to individuals from noise and increased human presence, injury or mortality of individuals	Acres open to OSV use and conducive to OSV use of high value reproductive habitat impacted by OSV use
Resource Element: R5 Sensitive species – Great Gray Owl	
Potential for disturbance to individuals from noise and increased human presence, injury or mortality of individuals, or habitat modification	Acres open to OSV use and conducive to OSV use of high-reproductive habitat impacted by OSV use
Resource Element: R5 Sensitive species – Willow Flycatcher, Greater Sandhill Crane, Western bumblebee, and Bats (Fringed Myotis, Pallid Bat, and Townsend's Big-eared Bat)	
Potential for habitat degradation	Qualitative comparison

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 Tahoe National Forest was disclosed. For quantitative assessment, the amount of suitable habitat that could be impacted by OSV use was used to measure effects to species for

¹⁸ Related activities include snow plowing of roads, parking lots, and trailheads (i.e., staging areas)

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 conducive to OSV use assumptions criteria (canopy cover less than 70 percent, slopes less than 20 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 [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 Tahoe 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 FEIS for mapped assumptions. Use patterns do not change with the additions of routes for any of the alternatives. Because of the knowledge-based low/moderate/high use assumptions (described below) that were in addition to the GIS-based assumptions, the routes that would receive high or moderate use were already accounted for in the Use Assumption exercise as high or moderate. Likewise, the routes that would receive low use were already accounted for in the Use Assumption exercise as low use. 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 State Environmental Impact Report (EIR). Generally, groomed routes 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).
- Ungroomed routes receive 50 percent less use than groomed routes (only 25,000 registered OSVs in California per State EIR, most use on groomed trails).
- 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 route access points, OSV use was documented until the end of April, at which point snow levels no longer allow continued use of designated OSV routes (California Department of Parks and Recreation 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 Conducive to OSV Use (Moderate to High 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 designated (not groomed) OSV trails (excludes easement trails added between DEIS and FEIS)
- 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 Not Conducive to OSV Use (Low-to-No Use):

Low Use:

- Areas below 3,500 feet elevation
- Canopy cover greater than 70 percent: CWHR vegetation 2D, 3D, 4D, 4M; vegetation size 5 and 6
- Slope greater than or equal to 20 percent
- 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 designated (not groomed) OSV trail (excludes easement trails added between DEIS and FEIS)

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 conducive to OSV use.

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 Tahoe 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.

Affected Environment and Environmental Consequences for Threatened, Endangered, or Proposed Species and/or their Designated Critical Habitat

Table 64 identifies wildlife species to consider because they may be present within the general area of the Tahoe National Forest.

Table 64. Terrestrial threatened, endangered, and proposed species and designated or proposed critical habitat considered within this analysis

Species Name	TEPC Status ¹⁹	Project Area Within Species' Range	Detections in or Near the Project Area	Suitable Habitat Present	Species Addressed Further/Rationale	Determination
Yellow-billed cuckoo (<i>Coccyzus americanus</i>)	FT	No	No	No	No; Project area is outside the known distribution of this species	NA
Yellow-billed cuckoo proposed critical habitat	NA	No	No	No	No; Project area is outside the proposed critical habitat	NA
California wolverine (<i>Gulo gulo luteus</i>)	FP/FSS	Yes	Yes	Yes	Yes	May affect individuals, but are not likely to lead to a loss of viability or a trend toward Federal listing

Species Analyzed in Detail

Direct and Indirect Effects

According to Gaines et al. (2003), the interactions between snowmobile routes 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 routes and wildlife that Gaines et al. (2003) documented from the literature included trapping as facilitated by winter human access, disturbance-based displacement and avoidance,²⁰ and disturbance at a

¹⁹ FE = federally endangered; FT = federally listed as threatened; FP = federal proposed for listing; FSS = Forest Service sensitive. Sources: Official federally endangered, threatened, proposed, and candidate species list obtained on August 21, 2016, from the Sacramento, and Nevada U.S. Fish and Wildlife Service (USFWS) Field Offices and USDA Forest Service, Pacific Southwest Region, Sensitive Animal Species by Forest, June 30, 2013.

²⁰ Spatial shifts in populations or individual animals away from human activities on or near roads, trails, or networks

specific site,²¹ usually wintering areas. To a lesser degree, hunting, trapping, poaching, collection, and habitat loss and fragmentation²² were other interactions identified. Specific types of habitat modification that occurred on winter recreation routes include the effect of snow compaction²³ on the subnivean sites used by small mammals and alteration of competitor/predator communities.²⁴ The same types of responses would be expected off of designated routes (i.e., cross country). Other interactions facilitated by linear recreation routes in general, but not specific to OSV use include vehicle collision and physiological response.²⁵

Trapping

Trapping of marten or 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. 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 impact 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 at all. However, 29 percent of snowmobilers report some nighttime riding (California Department of Parks and Recreation 2010) and resulting human disturbance could disrupt home range use by nocturnal species. Trail grooming activities occur at night, 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 species, trail grooming and OSV use may also result in animals avoiding areas frequented by snowmobilers and groomers.

²¹ Displacement of individual animals from a specific location that is being used for reproduction and rearing of young

²² Loss and resulting fragmentation of habitat owing modification to the establishment of roads, trails, or networks, and associated human activities

²³ Direct mortality of animals crushed or suffocated as a result of snow compaction from snowmobile routes or groomed ski trails

²⁴ A physical human-induced change in the environment that provides access for competitors or predators that would not have existed otherwise

²⁵ Increase in heart rate or stress hormones when near a road or trail or network of roads or trails

Physiological Response

Single or repeated interactions between OSVs and wildlife could lead to energy expenditures from flight or vigilance (orienting) 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. Snowmobile 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 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).

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 as a result of OSV program activities.

Avoidance

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

Snow Compaction

Mechanical snow compaction can crush, 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 medium sized 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

Wide-ranging Carnivores

North American Wolverine (*Gulo gulo luscus*)

Species Account

There have been 21 verified detections of wolverine on the forest and 12 are within one-quarter mile of snowmobile routes within the Tahoe National Forest. On February 28, 2008, a lone male wolverine was photographed at baited camera stations within the Tahoe National Forest and adjacent Sierra Pacific Industries land in 2008 through 2014 (Moriarty et al. 2009; USFWS 2010; USDA Forest Service NRIS records database 2012, CDFW 2014). These records are north of Interstate 80 in Nevada and Sierra counties, west and south of Sierraville, California. This was the first verified record of a wolverine in California since 1922. Although incidental, unconfirmed sightings of wolverine have been reported throughout the Sierra Nevada 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 (USFWS 2013). The USFWS considers the Sierra Nevada Mountains to be part of the wolverine's current range, but a population has not been reestablished (the single male identified in 2008 does not make a population) (USFWS 2010).

In February 2013, the USFWS published a proposed rule to list the North American Wolverine as a threatened distinct population segment (DPS) in the contiguous United States (Federal Register / Vol. 78, No. 23 / Monday, February 4, 2013 / Proposed Rules). On August 13, 2014, the USFWS withdrew its previous proposal (Federal Register / Vol. 79, No. 156 / Wednesday, August 13, 2014 / Proposed Rules). On April 14, 2016, the Court remanded the matter to the U.S. Fish and Wildlife Service for further consideration consistent with order CV 14-246-M-DLC (Consolidated with Case Nos. 14-247-M-DLC and 14-250-M-DLC). The species is currently considered proposed for Federal listing.

Habitat Status

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 menziesii*) and lodgepole pine (*Pinus contorta*) communities in winter. 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. The average size of wolverine's home range is between 300 and 500 square kilometers (186 to 310 square miles, USFWS 2013). Home range sizes within the Sierra Nevada remain unknown.

Wolverines have been known to occupy habitats from 4,000 to over 10,000 feet elevation in the Sierra Nevada. The presence of deep and persistent snow appears to 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). No records exist of wolverines denning in snow-free habitats, despite the wide availability of these habitats within their range (USFWS 2013). Wolverine 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 possible threats to this species include habitat loss and fragmentation and increasing human presence.

Breeding occurs from late spring to early fall and females give birth in 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 (USFWS 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 (USFWS 2013).

For this analysis, a total of 317,976 acres of habitat, based on the aforementioned criteria, is found within the project area (based on years of snow coverage greater or equal to one year to seven years).

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 USFWS (2013) noted climate change as the threat with the greatest potential to impact wolverine. A warming climate would likely result in a loss of suitable habitat due to increased summer temperatures and a reduced incidence of persistent spring snowpack. The USFWS (2013) noted recreation as an additional threat to wolverines because mother wolverines tend to move their kits to alternate denning areas once humans are 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 65.

Table 65. Resource indicators and measures for assessing effects to wolverine

Resource Indicator and Effect	Measure (Quantify if possible)	Alternatives 1 and 2	Alternative 3	Alternative 4	Alternative 5
Potential for disturbance to individuals from OSV use and increased human presence, or injury or mortality of individuals	Acres of habitat affected by OSV use	32,546	32,479	39,941	29,829

The most common interactions between snowmobile routes and wildlife that Gaines et al. (2003) documented from the literature included trapping as facilitated by winter human access, disturbance-based displacement and avoidance,²⁶ and disturbance at a specific site,²⁷ usually wintering areas.

Snowmobile use and associated activities within habitats for wide-ranging carnivores, such as wolverine, can affect individuals or their habitat (Gaines et al. 2003). Direct effects include: (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.

²⁶ Spatial shifts in populations or individual animals away from human activities on or near roads, trails, or networks

²⁷ Displacement of individual animals from a specific location that is being used for reproduction and rearing of young

There is also 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 wolverine would negatively affect that particular animal, but the likelihood of occurrence is assumed to be rare.

Direct 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 can affect wolverines (USFWS 2013), OSV use and related activities would not physically modify 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 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; 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 66 shows the acreage of wolverine habitat within the Tahoe National Forest where a wolverine could be subject to direct or indirect effects of OSV use and associated activities. Forty-four percent of suitable wolverine habitat would be designated for OSV use in alternatives 1 and 2. OSV-related noise-based disturbance, injury, or mortality impacting individual wolverines would be most likely to occur within that 44 percent of suitable habitat. In addition, of that 44 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 44 percent of wolverine habitat. Similarly, under alternatives 3 and 4, 45 percent and 48 percent, respectively, of wolverine habitat would be open and conducive to OSV use. Under alternative 5, 41 percent of wolverine habitat would be open to and conducive to OSV use.

Table 66. Acres of wolverine habitat by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated OSV Acres	315,209	315,209	315,734	315,079	305,423
Total acres of wolverine habitat	317,976	317,976	317,976	317,976	317,976
Designated for OSV use and conducive to OSV use	142,139	142,139	145,484	155,302	132,499
Miles of OSV trails within wolverine core areas	108	117	106	117	111

Cumulative Effects

Wolverine habitat overlaps with areas vegetation management projects, areas open to Christmas tree and firewood cutting and use of roads within wolverine suitable habitat after the termination date of the Forest Order closing roads for exclusive OSV use could occur. 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 National Forest System lands and may increase disturbance locally. However, the possibility of this type of disturbance is unknown.

In summary, ongoing and reasonably foreseeable actions may be additive locally, but are not expected to contribute significantly to impacts to wolverine discussed for the project under any of the alternatives. However, the cumulative effects would be slightly different by alternative, though not enough to be measurably different with alternative 5 having the least and alternative 4 having the most cumulative impacts.

Determination Statement

Alternatives 1, 2, 3, 4, and 5 of the Tahoe National Forest Over-snow Vehicle Use Designation Project *may affect, but are not likely to adversely affect* 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. **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.**
- 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 41 to 48 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.**
- Wolverines, 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.

Affected Environment and Environmental Consequences for Sensitive Species and/or their Suitable Habitat

Table 67 identifies sensitive wildlife species to consider, because they may be present within the general area of the Tahoe National Forest.

Table 67. 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	Determination
Late-successional forest species					
Fisher (<i>Pekania pennanti</i>)	No	No	No	No Project area is outside the known distribution of this species	NA
Pacific marten (<i>Martes caurina</i>)	Yes	Yes	Yes	Yes	May affect individuals, but not likely to lead to a loss of viability or a trend toward Federal listing
California spotted owl (<i>Strix occidentalis occidentalis</i>)	Yes	Yes	Yes	Yes	May affect individuals, but not likely to lead to a loss of viability or a trend toward Federal listing
Northern goshawk (<i>Accipiter gentilis</i>)	Yes	Yes	Yes	Yes	May affect individuals, but not likely to lead to a loss of viability or a trend toward Federal listing
Bats					
Fringed myotis (<i>Myotis thysanodes</i>)	Yes	Yes	Yes	Yes	May affect individuals, but not likely to lead to a loss of viability or a trend toward Federal listing
Pallid bat (<i>Antrozous pallidus</i>)	Yes	Yes	Yes	Yes	May affect individuals, but not likely to lead to a loss of viability or a trend toward Federal listing

Species Name	Project Area Within Species' Range	Detections in or Near the Project Area	Suitable Habitat Present	Species Addressed Further/ Rationale	Determination
Townsend's big-eared bat (<i>Corynorhinus townsendii</i>)	Yes	Yes	Yes	Yes	May affect individuals, but not likely to lead to a loss of viability or a trend toward Federal listing
Species that Utilize Riparian or Wetland Habitats					
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Yes	Yes	Yes	Yes	May affect individuals, but not likely to lead to a loss of viability or a trend toward Federal listing
Great gray owl (<i>Strix nebulosa</i>)	Yes	Yes	Yes	Yes	May affect individuals, but not likely to lead to a loss of viability or a trend toward Federal listing
Willow flycatcher (<i>Empidonax traillii</i>)	Yes	Yes	Yes	Yes	May affect individuals, but not likely to lead to a loss of viability or a trend toward Federal listing
Greater Sandhill crane (<i>Grus canadensis tabida</i>)	Yes	Yes	Yes	Yes	May affect individuals, but not likely to lead to a loss of viability or a trend toward Federal listing
Terrestrial Invertebrates					
Western bumble bee (<i>Bombus occidentalis</i>)	Yes	No	Yes	Yes	May affect individuals, but not likely to lead to a loss of viability or a trend toward Federal listing

Late-successional Forest Species

Pacific Marten (*Martes caurina*)

Species Account

There are numerous marten detections documented within the Tahoe National Forest, although there are currently no known marten dens sites identified. Moriarty (2011) indicates that various 4M, 4D,

5M, 5D, and 6 habitat types (lodgepole pine, montane riparian, red fir, subalpine conifer, and white fir) are considered “high-quality habitat” for marten.²⁸

Habitat Status

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. 1994, 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). There are 203,242 acres of suitable marten winter habitat on National Forest System lands within the Tahoe National Forest boundary.

Because marten predictive denning habitat models are currently lacking, the best that can be done at this point is to use the marten landscape-level habitat model produced by Kirk and Zielinski (2009) that identifies high predictability areas for martens. In doing so, one would assume that areas of high predicted suitability would also be indicative of where den sites would occur. However, this model has low spatial resolution and is probably no better than using the reproductive component of CWHR as a predictive model (B. Zielinski, pers. comm.). Based on CWHR habitat types, currently, there are 154,081 acres of high-capability reproduction habitat²⁹ within Tahoe National Forest.

Threats

Martens are 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). 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.

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

²⁸ Suitable marten winter habitat: Eastside pine, Jeffrey pine, lodgepole pine, montane hardwood, montane hardwood-conifer, montane riparian, ponderosa pine, red fir, Sierran mixed conifer, subalpine conifer, and white fir CWHR types 4M, 4D, 5M, 5D, 6 across entire forest (CWHR classification).

²⁹ High-capability reproduction habitat: Jeffrey pine, lodgepole pine, montane hardwood, montane hardwood-conifer, montane riparian, ponderosa pine, red fir, Sierran mixed conifer, subalpine conifer, and white fir CWHR types 4M, 4D, 5M, 5D, 6 mixed above 5,000 feet (SNFPA EIS 2001).

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. 2008).

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 within 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 Spencer and Rustigian-Romsos (2012) indicate that habitat connectivity for marten south of the Plumas National Forest, does not appear to be greatly limiting for martens, although the authors suggest that Interstate 80 may be a significant barrier to movement.

Under the assumption that OSV use would disrupt marten movement within connectivity corridors (even though there would be no changes in habitat), functional habitat connectivity for martens within the Tahoe National Forest was 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. 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 79,583 acres of 25 percent corridors on National Forest System lands within the Tahoe National Forest boundary.

Direct and Indirect Effects

Resource indicators and measures (FSH 1909.15, 12.5) used in this analysis to measure and disclose effects to marten using the methodology conducive to OSV use outlined above) are listed in table 68. Acres per alternative are derived from the overlap between high capability reproductive habitat and areas conducive to OSV use.

Table 68. 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, habitat modification (i.e., altered movement due to OSV use), or snow compaction effects to foraging or denning individuals	Acres of high capability reproductive habitat impacted by areas conducive to OSV use	4,831	4,831	4,826	4,831	4,460
Potential for loss of habitat connectivity	Acres of corridors impacted by OSV use	18,297	18,297	18,107	18,411 (	17,511

Marten associated with late-successional forests can be impacted by activities associated with routes. 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 routes and wildlife that Gaines et al. (2003) documented from the literature included trapping as facilitated by winter human access, disturbance-based displacement and avoidance,³⁰ and disturbance at a specific site,³¹ 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 an impact in this analysis.

Snowmobile use within late-successional forest habitats can have direct effects to individuals or their habitat (Gaines et al. 2003) by disturbance and possible 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.

³⁰ Spatial shifts in populations or individual animals away from human activities on or near roads, trails, or networks.

³¹ 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. This effect would be most specific to mammals.

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 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 and 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 OHVs and 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.

Potential for Injury or Mortality to Individuals from Vehicle Collision

Although there is a 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 be most pronounced. Presumably, a marten would hear an OSV and flee prior to injury or collision.

Competition and Predation

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 into 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 (USFWS 2015b) noted there isn't any information to indicate that coyotes are increasing at any of the Sierra Nevada red fox sighting areas that overlap with marten observation areas. It is unknown if or how much competition with or predation on martens by coyotes is occurring within the Tahoe 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 including rock crevices, for maternal den sites. Impacts related to OSV use on marten den sites are unknown at this time, but could be an issue given the overlap marten whelping (March/April) season with the OSV use season and the potential for compaction of subnivean habitat where natal and maternal dens may be found (B. Zielinski, pers. comm.). Although there currently are no documented marten den sites within the Tahoe National Forest, as they are located, Sierra Nevada Forest Plan Amendment standards and guidelines designed to protect marten den sites³² 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 crevice-based 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 or burying of 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). Alternative 5 would be least impactful for subnivean habitat, with alternative 4 having the most impact.

Comparison of the Alternatives

The potential for impacts to marten habitat would be greatest in areas most conducive to OSV use (high OSV-use areas). As described in the assumptions section, flatter areas with slopes less than 20 percent and canopy cover less than 70 percent, including the routes and staging areas, themselves, are more conducive to OSV 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 69, 95 percent of marten winter habitat is currently designated for OSV use (alternative 1). Under alternative 2, the acres represented are over 5,000 feet in elevation, and acres of marten winter habitat in table 69 are slightly different because the amount of "No Use Acres" varied by alternative. 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 9 percent of winter habitat. The amount

³² "Mitigate impacts where there is documented evidence of disturbance to the den site from existing recreations, off-highway vehicle routes, 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."

of habitat under the remaining alternatives is similar to alternative 1: alternative 2, 9 percent; alternative 3, 9 percent; alternative 4, 8 percent; and alternative 5, 9 percent. There are between 99 to 110 miles of OSV trail within marten winter habitat. If individuals are in the area at the same time as OSV users, this could result in short-term disturbance to the individual.

There are no known marten den sites within the Tahoe National Forest.

Table 69. Acres of marten winter habitat³³ by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	193,071	193,071	194,359	222,053	171,178
Total acres of marten winter habitat	203,424	203,424	203,843	233,800	205,323
Designated and conducive to OSV use	18,708	19,612	19,588	25,607	17,846
Miles of OSV trails within marten winter habitat	101	110	99	101	101

Marten whelping season (March – April) overlaps with the latter portion of the OSV season. Den sites occurring within the subnivean space could be physically impacted; minimum snow depth could be used to analyze impacts to marten denning and subnivean habitat by alternative to determine whether disturbance is occurring and if changes in management are necessary. As previously described, once OSV trail grooming season ends on March 31, trail use declines by roughly 50 percent and, therefore, the possibility of direct and indirect effects to marten dens is expected to be low.

Of the modeled marten connectivity habitat (dispersal corridors) within the Tahoe National Forest, 95 percent is currently designated for OSV use (table 70). Under alternative 2, the acres represented are over 5,000 feet in elevation, acres of marten winter habitat in Table 69 are slightly different because the amount of “No Use Acres” varied by alternative. However, 23 percent (38 percent under alternative 2) would be designated and conducive to OSV use. Of that 23 percent (and 38 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 would occur within less than 23 percent of marten habitat. This would be the same under alternative 2. There is little difference in the amount of marten connectivity habitat that would be open to and conducive to OSV use under the other three alternatives (23 percent under alternative 3, 23 percent under alternative 4, and 21 percent under alternative 5), but alternative 5 would have the least impact on marten connectivity habitat overall.

Table 70. Acres of marten habitat connectivity corridors³⁴, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	75,401	75,401	74,868	75,671	70,391
Total acres of marten habitat connectivity corridors	79,583	79,583	78,364	79,853	81,392
Designated and conducive to OSV use	18,297	18,297	18,107	18,411	17,511

³³ Rustigian-Romsos and Spencer (2010) Conservation Biology Institute Marten Habitat Suitability Model.

³⁴ Least Cost 25% Corridor Modeling (Kirk and Zielinski 2010).

As previously noted, data from the Lake Tahoe Basin Management Unit indicate that OHV and OSV use did not affect marten occupancy or probability of detection when overall OHV and OSV use in the study areas was low. 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 would occur within less than 8 to 9 percent of marten winter habitat or 21 to 23 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.

Cumulative Effects

Actions that could result in a cumulative impact to marten, when combined with alternatives 1, 2, 3, 4, or 5 include vegetation management projects and firewood and Christmas tree cutting. Vegetation management projects are very small in comparison to OSV areas and/or do not overlap with groomed and ungroomed OSV routes or staging areas where the highest OSV use occurs.

Other ongoing and foreseeable future activities include livestock grazing, recreation, timber harvest, fuel reduction, woodcutting activities, wildfire suppression, and other activities. These activities may affect some individuals, but no trends toward Federal listing or loss of species viability are expected due to protective measures deemed necessary during environmental analysis and implemented as required. Disturbance to individuals may be expected by the increase in OSV activities as the numbers of national forest visitors rise. 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. Timber harvest, fuel reduction, fire suppression, emergency responses, and other actions carried out by Federal workers or contractors are typically able to provide adequate protection for species. 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.

Determination Statement

Alternatives 1, 2, 3, 4 and 5 of the Tahoe 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 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.
- Although the potential for impacts to individuals within winter habitat ranges from 8 to 9 percent under all of the alternatives, and connectivity habitat ranges from 21 to 23 percent, it is unknown if OSV use or related activities within the Tahoe National Forest negatively impact marten using winter habitat or connectivity habitat, and the percentage of winter habitat and connectivity habitat impacted 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 routes and staging areas. Available research suggests that OHV and OSV use did not affect marten occupancy or probability of detection when overall OHV and OSV use in the study areas was low.

- Martens tend to avoid the open areas preferred by OSV users. Therefore, the potential for disturbance or collisions along existing roads and trails is expected to be low under all alternatives.
- Den sites within above-ground structures (trees, snags) would not be physically impacted due to the types of structures that are used.
- Marten prey species in meadow areas may be affected by OSV compaction with varying effects depending on minimum snow depth. Cross-country snow depth varies depending on the alternative, between 12 to 24 inches.
- Marten whelping season (March – April) overlaps with the latter portion of the OSV season. Den sites occurring within the subnivean space could be physically impacted, minimum snow depth could be used to analyze impacts to marten denning and subnivean habitat by alternative 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 within the Tahoe National Forest as the result of OSV-related snow compaction or other OSV-related activities.

California Spotted Owl (Strix occidentalis occidentalis)

Species Account

Natural Resource Manager (NRM)³⁵ currently has 190 recorded activity centers within the Tahoe National Forest. There are 663,936 acres of California spotted owl important habitat,³⁶ including high reproductive habitat, within the Tahoe National Forest.

Habitat Status

In the Sierra Nevada Province, 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 (CDFW 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,

³⁵ The Natural Resource Manager (NRM) is a system of database tools for managing agency data across the Forest Service. NRM includes: Forest Service ACTivity Tracking System (FACTS), Infrastructure (Infra), Natural Resource Information System (NRIS), and Timber Information Manager (TIM) applications. NRM applications provide tools for most of the agency's natural resource business areas.

³⁶ Habitat types important for late-successional forest species 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 (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).

Roberts and North 2012, Keane 2013). Large coarse woody debris is a key habitat feature of spotted owl prey.

Spotted owl nest stands may be occupied by breeding spotted owls from February until October. 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). 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). A spotted owl ecology study found that approximately 90 percent of juveniles fledged by July 8 (Blakesley et al. 2010).

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 home range core area includes its associated PAC, is 1,000 acres in size, and is composed of the best available contiguous habitat. 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 (Verner et al. 1992). Neal et al. (1990) reported that California spotted owl home ranges in Sierra Nevada mixed conifer forests averaged 3,400 acres, including about 460 acres in stands with 70 percent or greater canopy cover, and about 1,990 acres in stands with 40 to 69 percent canopy cover. Verner et al. (1992) generally concur with these data, indicating that Sierra National Forest owls were found to have a median home range for pairs of approximately 3,000 to 5,000 acres. 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.

Focused studies on northern spotted owls (Shasta-Trinity and Mendocino National Forests), 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). Results from this study indicate that there were reduced reproductive success, particularly in adult males in response to acute traffic exposure (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.).

Threats

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.

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 71.

Table 71. 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 of important habitat impacted by OSV use	6,262	6,262	6,262	8,453	5,411
Potential for disturbance to or displacement of individuals from OSV use and increased human presence, injury or mortality of individuals	Acres of buffered CSO activity centers impacted by OSV use	11,885	11,885	11,885	16,293	12,108

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. Impacts included 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 direct effects to individuals or their habitat (Gaines et al. 2003) by disturbance and 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 California spotted owls could collide with OSVs or grooming equipment, the likelihood is very low for the following reasons: spotted owls spend little time at ground level; they are nocturnal and most OSV use on the Tahoe 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 routes 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 (USFWS 2012a). 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 farther than 0.25 mile (400 meters) from a spotted owl nest site to have little chance of affecting nesting spotted owls. Snowmobiles passing within 0.25 mile of unsurveyed nesting/roosting habitat or an active nest could disturb nesting California spotted owls.

OSV use can affect California spotted owls either directly through disturbance or displacement of individuals from routes, breeding or rearing habitats, physiological response to disturbance or potential for injury or mortality from collision, or indirectly through altered or dispersed movement caused by a route or human activities on or near a route. However, due to the structural nature of suitable habitat (i.e., dense forested stands), the level of cross-country 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. Based on the OSV use assumptions, once OSV trail grooming ends, it is estimated that use of those trails declines by 50 percent. Therefore, the possibility of direct and indirect effects to csOPACs within 0.25 mile of groomed trails would decrease after March 31. Habitat would not be physically modified by OSV use and related activities.

Under all alternatives, groomed and ungroomed routes and staging areas occur within 0.25 mile of California spotted owl activity centers and/or important habitat. However, OSV use is not consistent across all available habitat. Although we don't know specifically where impacts will occur at any given time and we cannot quantify the amount of impact, we know the impacts would be greatest in areas most conducive to OSV use (high OSV-use areas). As described in the assumptions section, flatter areas with slopes less than 20 percent and canopy cover less than 70 percent, including the routes and staging areas, themselves, are more conducive to OSV than others and, therefore, likely to receive the highest use. Those assumptions have been incorporated into the following analysis.

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). 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 before May when breeding adult males are most sensitive to noise. 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 given area) and of intermittent intensity (amount of concentrated noise).

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. 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. Trail grooming would not physically modify habitat. Under all alternatives the grooming season generally begins in mid-December and continues through March. Start and stop times vary per trail location dependent upon snow presence. Grooming starts in most locations with minimum snow depth of 12 inches. Trails are prioritized for grooming based on visitor use. Grooming on priority trails occurs several times per week and after major storms. Trail grooming occurs as soon as possible after a storm in which snow accumulations have been substantial. The ideal air temperature for grooming is 35 degrees Fahrenheit or less with the temperature dropping. Wet snow requires a lower temperature to set and is best groomed at night. 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 frequency³⁷ 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 trail routes, 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 experience 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 conducive to OSV use.

Comparison of the Alternatives

Table 72 and table 73 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. The 0.70-mile buffer covers the protected activity center plus 0.25 mile to estimate potential impacts within the protected activity centers, the buffer, and the core area. Table 73 shows that approximately 30 percent of the total amount of important CSO habitat across the forest falls within the criteria used for the alternatives. Eight percent of California spotted owl activity centers buffered by 0.70 mile are currently designated for

³⁷ 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. 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).

OSV use (alternative 1). However, only 2 percent is designated and conducive to OSV use. Similarly, under alternative 2, 8 percent of important California spotted owl habitat would be designated for OSV use, but only 1 percent would be designated and conducive to OSV use. 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 conducive to OSV use. In addition, the buffered activity centers and the important habitat open to and conducive to OSV use, high OSV use would be 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 an even smaller percentage of each of those habitats. This would be similar under the other three alternatives. There is between 3 to 5 miles of OSV trail within 0.25 mile of spotted owl activity centers. If individuals are in the area at the same time as OSV users, this could result in short-term disturbance to the individual.

Table 72. Acres of known California spotted owl activity centers, buffered by 0.70 mile, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV Use	6,262	6,262	6,262	8,453	5,411
Total acres of California spotted owl activity center, buffered by 0.70 mile	75,684	73,179	75,684	84,542	74,833
Designated for OSV use and conducive to OSV use	1,605	963	1,605	2,093	1,344
Miles of OSV trails within 0.25 mile of activity center	3	5	3	5	3

Under alternative 2, 95 percent of important California spotted owl habitat would be designated for OSV use, and 3 percent of important California spotted owl habitat would be designated for and conducive to OSV use, over 5,000 feet elevational limit. The Forest 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 15 California spotted owl breeding season under all alternatives. 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 all alternatives.

Table 73. Acres of important California spotted owl habitat by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	188,610	188,610	189,959	218,213	166,943
Total acres of important CSO habitat	199,519	199,519	200,235	230,722	201,659
Designated and conducive to OSV use	6,262	6,262	6,262	8,453	5,411

Cumulative Effects

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 would not be 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 Tahoe 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 82 to 94 percent, and individuals within buffered PACs ranges from 2 to 3 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.
- 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 possibility of 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).
- The forest would use the results of ongoing inventory and monitoring of spotted owl activity centers to determine whether disturbance is occurring and if changes in management are necessary, thereby minimizing impacts to California spotted owl.
- 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 be limited primarily to areas adjacent to OSV trails and short-term in nature during trail grooming because the species is nocturnal and most OSV use occurs in the daytime.
- The potential for OSV collision with individual California spotted owls is very low because it is unlikely that an individual would stay in an area with the high noise disturbance.

Northern Goshawk (Accipiter gentilis)

Species Account

Goshawk territories within Tahoe National Forest are managed as protected activity centers (ngoPAC) under direction prescribed by the Sierra Nevada Forest Plan Amendment (USDA Forest Service 2004). Based upon the best available data, there are 16,085 acres of ngoPACs. Each of the 128 ngoPACs is buffered by 0.25 mile, and 673,767 acres of goshawk important habitat,³⁸ including high-reproductive habitat, within the Tahoe National Forest.

Habitat Status

The northern 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). The northern goshawk is a year-round resident throughout most of California.

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). The northern goshawk breeding season is February 15 through September 15.

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). 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).

Northern goshawk 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 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 northern 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).

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

³⁸ Habitat types important for late-successional forest species 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 (Sierra Nevada Forest Plan Amendment, USDA Forest Service 2004).

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).

It is important to note that goshawk PACs and territories do not correlate on a one-to-one basis. The territories currently recognized are based on retrospective examination of approximately 34 years (1977 to 2010) of surveys, whereas goshawk PACs are delineated prospectively as nesting and/or occupancy are discovered. The prospective delineation of PACs is a conservative management approach. The forest also follows a conservative approach in eliminating goshawk PACs, which in some cases results in multiple PACs within a single territory. To keep consistency for this analysis, a 0.25 buffer was used around a goshawk activity center, at the center of the ngoPAC.

Threats

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,³⁹ and noise generated by snowplows and snowcats used for OSV program operations ranges from 80 to 85 dBA⁴⁰ (California Department of Parks and Recreation 2010). Dunk et al. (2011) evaluated the possible 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 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

³⁹ 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).

⁴⁰ 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.

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 (ca. 16 kilometers per hour) and faster driving (ca. 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 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 within the Tahoe 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. 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 74.

Table 74. Resource indicators and measures for assessing effects to northern goshawk

Resource Indicator and Effect	Measure (Quantify if possible)	Alternatives 1 and 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 of important habitat impacted by OSV use	2,234	2,234	3,981	1,927
Potential for disturbance to individuals from OSV use and increased human presence, or injury or mortality of individuals	Acres of buffered NGO PACs impacted by OSV use	14,369	14,322	16,409 (100%)	14,661

Snowmobile use within late-successional forest habitats can have direct effects to individuals or their habitat (Gaines et al. 2003) by disturbance and 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

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 routes 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.

Activities greater than 0.25 mile (400 meters) from a goshawk nest site have little potential to affect nesting goshawks. The OSV season overlaps with the courtship through incubation phases of the goshawk breeding season (Woodbridge and Hargis 2006), so snowmobiles passing within 0.25 mile of unsurveyed nesting/roosting habitat or an active nest could 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 within the Tahoe 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 of designated OSV routes. 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 was recently occupied.

Although the possibility of 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 risk of 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). There is between 4 to 6 miles of OSV trail within the 0.25-mile buffer zone. If individuals are in the area at the same time as OSV users, this could result in short-term disturbance to the individual.

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 conducive to OSV.

Comparison of the Alternatives

Table 75 and table 76 show and compare, by alternative, the amount of northern goshawk acres within a buffered activity center 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-nine percent of goshawk activity centers buffered by 0.25 mile are currently designated for OSV use (alternative 1). However, 12 percent is designated and conducive to OSV use. 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 conducive to OSV use. In addition, of the 12 percent of buffered activity centers and the 12 percent of important habitat open to and conducive to OSV use, 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 an even smaller percentage of each of those habitats; 62 goshawk activity centers buffered by 0.25 mile (48 percent) fall within 0.5 mile of a groomed trail or OSV staging area. This would be similar under the other four alternatives.

Table 75. Acres of goshawk activity centers, buffered by 0.25 mile, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	5,643	2,258	5,519	6,393	5,546
Total acres of goshawk PACs, buffered by 0.25 mile	5,655	5,655	5,529	6,409	5,655
Designated and conducive to OSV use	700	420	700	778	632
Miles of OSV trails within 0.25-mile buffer	5	6	4	6	4

Under alternative 2, with the 5,000-foot elevational limit, 4 percent of important northern goshawk habitat and 7 percent of buffered activity centers would be open and conducive to OSV use. Similarly, 6 percent of important habitat and 12 percent of buffered activity centers would be open and conducive to OSV under alternative 3, 6 percent of important habitat and 12 percent of buffered activity centers under alternative 4, and 5 percent of important habitat and 11 percent of buffered PACs under alternative 5. The forest would use the results of ongoing inventory and monitoring of northern goshawk activity centers to determine whether disturbance is occurring and if changes in management are necessary. Noise-based disturbance would 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 all alternatives. The risk of 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 all alternatives.

Table 76. Acres of important goshawk habitat by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	365,625	288,632	356,624	365,625	279,058
Total acres of important goshawk habitat	481,053	481,053	481,053	481,053	481,053
Designated and conducive to OSV use	31,160	18,540	29,898	31,160	25,543

Cumulative Effects

Vegetation management and salvage projects are very small in comparison to the OSV use area and/or do not overlap with groomed and ungroomed OSV routes or staging areas where the highest OSV use occurs.

Goshawk habitat overlaps with areas open to Christmas tree cutting and firewood cutting. 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 all alternatives. 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 National Forest System 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 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 Tahoe 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 the northern goshawk in the Forest Plan 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 8 to 9 percent, and individuals within buffered activity centers ranges from 11 to 12 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 activity centers fall within 0.5 mile of a groomed trail or OSV staging area, the highest OSV use areas.
- 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 possibility of direct and indirect effects to goshawk activity centers within 0.25 mile of groomed trails would decrease by an estimated 50 percent after March 31 for all alternatives.
- The potential for OSV collision with individual northern goshawks is very low.

Bats

Fringed Myotis (Myotis thysanodes)

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 new subspecies, *M. t. vespertinus* (Manning and Jones 1988), although relatively few specimens have been examined and the boundary between subspecies has not been clearly delineated.

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).

Although nowhere common, the species occurs primarily from sea level to approximately 3,900 to 6,900 feet (O'Farrell and Studier 1980) with an isolated record from 9,500 feet in New Mexico (Barbour and Davis 1969). A lack 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).

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). *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, 1973), mines (Cahalane 1939, Cockrum and Musgrove 1964), buildings (Barbour and Davis 1969, Musser and Durrani 1960, O'Farrell and Studier 1980, Orr 1956, Studier 1968), 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). 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).

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. 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.

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 23 to 66 inches dbh) (Weller and Zabel 2001).

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. Urban expansion often leads to removal of older buildings that can provide 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.

Direct and indirect Effects

Public OSV use within the Tahoe National Forest would not change the habitat for fringed 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, if 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 Tahoe, 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 (USDA Forest Service National Core

BMP Rec-7: Over-Snow Vehicle Use; please refer to the project hydrology report for additional information). However, the minimum cross-country snow depth of 12 inches for all of the action alternatives is expected to be adequate to protect aquatic and riparian habitats from measurable impacts to vegetation or water quality (McNamara 2017).

Cumulative Effects

M. thysanodes habitat would have minimal overlap with areas open to Christmas tree cutting and firewood cutting (annually between November 1 and December 31) and OSV trail grooming season (beginning December 26), minimizing possible 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 slight possibility of an additive effect of 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 may impact habitat availability outside of National Forest System 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 Tahoe 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)

Species Account

Pallid bat has been documented within the Tahoe 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

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).

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, but ranged from 40 to 1,850 meters.

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 of the day roost. 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.

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 prior to 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.

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). 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 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.

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), even illegal poisoning.

Direct and indirect Effects

OSV use and related activities within the Tahoe National Forest would not change the habitat for pallid bat, as no habitat modifications are anticipated. Due to the behavior of pallid bats that 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 Tahoe, 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.

Pallid bats 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 (USDA Forest Service National Core BMP Rec-7: Over-Snow Vehicle Use; please refer to the project hydrology report for additional information). However, the minimum cross-country snow depth of 12 inches under all of the action alternatives is expected to be adequate to protect aquatic and riparian habitats from measurable impacts to vegetation or water quality (McNamara 2016).

Cumulative Effects

Cumulative effects for the pallid bat would be the same as fringed myotis (*Myotis thysanodes*).

Determination Statement

All alternatives of the Tahoe 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 Forest Plan 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 typically 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)

Species Account

There are historical and fairly recent (1997) records of Townsend's big-eared bat near the Tahoe National Forest as well as a documented maternity and hibernaculum in lava tubes in 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 range 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 1996). 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 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 1996). 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).

Specific roosts may be used only once a 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) (Sherwin et al. 2000). Males remain solitary during the maternity season.

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 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). *C. townsendii* has been known to travel up to 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).

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. 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 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 1996). Larger aggregations (75 to 460) are confined to areas that experience prolonged periods of freezing temperatures (Pierson and Rainey 1996). 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). 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 1996). 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.

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.

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).

Direct and Indirect Effects

OSV use within the Tahoe 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 Tahoe, 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 (USDA Forest Service National Core BMP Rec-7: Over-Snow Vehicle Use; refer to the project hydrology report for additional information). However, the minimum cross-country snow depth of 12 inches under all of the action alternatives is expected to be adequate to protect aquatic and riparian habitats from measurable impacts to vegetation or water quality (McNamara 2017).

Cumulative Effects

Cumulative effects for Townsend's big-eared bats are the same as fringed myotis (*Myotis thysanodes*).

Determination Statement

All alternatives of the Tahoe 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 Forest Plan 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 typically 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)

Species Account

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

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, Tahoe, Modoc, Plumas, Shasta, Siskiyou, and Trinity Counties), typically at low elevations; breeding in the high Sierra Nevada is rare (USDA Forest Service 2001).

Habitat Status

Bald eagles winter 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. Bald eagles require open water with juxtaposed mature trees or steep cliffs for nesting, perching, foraging, and roosting (Bent 1961 in Murphy and Knopp 2000). 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. On the Tahoe 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 are usually monogamous and pair for life, though re-pairing 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. 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).

There are 18 nest sites (565 acres) buffered by 660 feet⁴¹ and 22,022 acres of bald eagle reproductive habitat⁴² on National Forest System lands within the Tahoe National Forest boundary.

Threats

The Recovery Plan for the Pacific Bald Eagle (USFWS 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 reintroduction/expansion of 'breeders.' The most

⁴¹ 660 foot nest site buffers based on USFWS (2007)

⁴² 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.

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 (USFWS 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 (USFWS 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.

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.

Additional studies indicate that animals, including bald eagles, infrequently demonstrated active responses to OSVs and associated human presence (NPS 2013). In a study based on approximately 5,688 interactions⁴³ over four winters between groups of wildlife and groups of snowmobiles and/or snowcoaches, White et al. (2009) found the following observed responses of 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 (NPS 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 (USFWS 2007) include a buffer of 100 meters (330 feet) for off-road vehicle use, including snowmobiles, in forested landscapes and/or variable

⁴³ 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.

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 77.

Table 77. Resource indicators and measures for assessing effects to bald eagles

Resource Indicator and Effect	Measure (Quantify if possible)	Alternatives 1 and 2	Alternative 3	Alternative 4	Alternative 5
Potential for disturbance to individuals from noise and increased human presence, injury or mortality of individuals	Acres of high value reproductive habitat impacted by OSV use	4,124	4,748	4,259	4,124
Potential for disturbance to individuals from OSV use and increased human presence or injury or mortality of individuals	Acres of buffered bald eagle nests impacted by OSV use	18	18	18	18

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 possible 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. Possible 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 risk 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 78 and table 79 show and compare, by alternative, the amount of buffered bald eagle nest sites and high value reproductive habitat, respectively, with the potential for direct and indirect effects (disturbance, injury, or mortality) from OSV use and related activities.

Nine percent of eagle nest sites buffered by 660 feet are designated and conducive to OSV use under all alternatives. Similarly, 3 percent of buffered nest sites are currently designated and conducive to OSV use for all alternatives. The risk of OSV-related impacts to bald eagle, including noise-based disturbance or injury/mortality, would be most likely to occur in those areas conducive to OSV use. In addition, of the 9 percent of buffered activity centers and the 3 percent of buffered activity centers open to and conducive to OSV use, 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 in an even smaller percentage of each of those habitats; no nest sites are located within high OSV-use areas and only 1 nest site is 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. 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 would use the results of ongoing inventory and monitoring of bald eagle nest sites to determine whether disturbance is occurring and if changes in management are necessary

Table 78. Acres of bald eagle nest sites, buffered by 660 feet by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV Use	29	29	29	29	29
Designated for OSV use and conducive to OSV use	18	18	18	18	18 (3%)
Miles of OSV trails within 0.25 mile	0	0	0	0	0

Under alternatives 3, 4, and 5, reproductive habitat (9 percent) could be impacted by OSV use similar to alternative 1. Under alternative 2, above the 5,000-foot elevation, 4 percent of the reproductive habitat could be impacted by OSV use. Under all alternatives, only one eagle nest site is located within OSV moderate use areas and this nest site is located 1.3 miles away of any groomed OSV trails. No bald eagle nest sites are within 660 feet of high OSV use areas under all alternatives. Therefore, disturbance impacts to breeding bald eagles are expected to be low under all of the alternatives.

Table 79. Acres of high-value bald eagle reproductive habitat, by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	45,878	30,586	51,913	46,953	45,878
Total acres of high-value bald eagle reproductive habitat	45,878	30,586	51,913	46,953	45,878
Designated and conducive to OSV use	4,124	1,375	4,748	4,259	4,124

Cumulative Effects

Bald eagle habitat overlaps with areas open to Christmas tree and firewood cutting. 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 all alternatives. 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 0.25 mile of bald eagle nests may impact habitat outside of National Forest System lands and may increase disturbance locally. However, the potential for this type of disturbance is unknown. In summary, ongoing and reasonably foreseeable actions may locally increase 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 Tahoe 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 Forest Plan 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.
- The forest would use the results of ongoing inventory and monitoring of bald eagle nest sites to determine whether disturbance is occurring and if changes in management are necessary, thereby minimizing impacts to bald eagle.
- No bald eagle nest sites are within 660 feet of high OSV use areas under any of the alternatives. Although one nest site is located with the moderate use area, it is located 1.3 miles away from any groomed OSV trails. Therefore, disturbance to any individual is expected to be low.
- 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*)

Species Account

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. 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. There is one great gray owl PAC on the forest although the nest is on private land adjacent to the forest.

Habitat Status

As described by Beck and Winter (2000), great gray owls (*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. Located suitable nest sites 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 meadow voles; pocket gophers and meadow voles are believed to comprise the majority of the owl's diet (Kalinowski et al. 2014). Likely territories include meadows that total 10 acres or more 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.

Suitable habitat for the great gray owl is scattered across the Tahoe National Forest. There are 32,062 acres of great gray owl high-value reproductive habitat⁴⁴ on National Forest System lands within the project area.

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 80.

Resource Indicators and Measures for Assessing Effects to Great Gray Owl

Table 80. Resource indicators and measures for assessing effects to great gray owl

Resource Indicator and Effect	Measure (Quantify if possible)	Alternatives 1 and 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 of high-reproductive habitat impacted by OSV use	914	912	924	841

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 possible 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.

Although great gray owls have not been confirmed nesting within the Tahoe 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 of in or adjacent to those meadows. Like the other raptor species under consideration in this analysis, noise-based disturbance to breeding individuals is the primary concern. If great gray owls are present within the Tahoe National Forest, the 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 within the Tahoe National Forest, with the exception of trail grooming, occur during the daytime, so the risk of collisions of OSVs with great gray owls, should they be present, would be negligible and foraging behavior would generally not be interrupted.

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

⁴⁴ Areas less than 440 yards (approximately 400 meters) to montane meadows greater than 10 acres in size and between 2,000 and 8,000 feet in elevation with forest canopy closures greater than 60 percent (CWHR closure class “D”) in at least some portion of the forest stands adjacent to meadows; habitat query includes adjacent meadows that are foraging habitat.

foraging away from that particular area. However, due to the limited frequency⁴⁵ and duration of trail grooming at any trail segment location, noise disturbance from trail grooming would probably not significantly impact breeding or foraging great gray owls. Although night riding could have similar impacts to foraging owls, it would be uncommon, because most OSV use within the Tahoe 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 direct and indirect effects to activity centers within 0.25 mile of groomed trails would decrease substantially after March 31 for all alternatives.

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 conducive to OSV, including meadows used by great gray owls for foraging.

Comparison of the Alternatives

Table 81 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. Ninety-four percent of great gray owl reproductive habitat is currently designated for OSV use (alternative 1). However, 3 percent is designated and conducive to OSV use. 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 conducive to OSV use. In addition, of the 3 percent of habitat open to and conducive to OSV use, 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 an even smaller percentage of each of those habitats. This would be true under the other four alternatives. The only trail that is within 0.25 mile of a great gray owl observation is 0.46 mile of the Jackson Meadows-Little Truckee Trail. If an individual is in the vicinity at the same time as an OSV user it could result in disturbance of the individual.

Under alternative 2, 4 percent of great gray owl reproductive habitat would be open and conducive to OSV use, and under alternatives 3, 4, and 5, 3 percent of great gray owl reproductive habitat would be open and conducive to OSV use. In the event that great gray owls are found in the forest, as previously noted, the 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 could 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 the great gray owl.

⁴⁵ 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 Parks and Recreation 2010).

Table 81. Acres of high-value great gray owl reproductive habitat by alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV Use	30,193	21,135	30,193	30,193	30,264
Total acres of high-value great gray owl reproductive habitat	30,299	21,241	30,299	30,299	30,793
Designated for OSV use and conducive to OSV use	914	914	912	924	841
Miles of OSV trails within ¼ mile of GGO observation	0.46	0.46	0.46	0.46	0.46

Cumulative Effects

Vegetation management and salvage projects are very small in comparison to the OSV use area and/or do not overlap with groomed and ungroomed OSV routes or staging areas where the highest OSV use occurs. However, limited operating periods required for vegetation management and road construction prevent impacts to breeding great gray owls. In addition, vegetation and fuels management activities in recent years have included primarily thinned, masticated, and/or burned vegetation to reduce the risk of catastrophic wildfires that benefit the great gray owl. These projects are usually excluded from larger CWHR types.

Great gray owl habitat also overlaps with areas open to Christmas tree and firewood cutting. 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 all alternatives. 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 within the Tahoe 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 0.25 mile of great gray owl habitats may impact habitat availability outside of National Forest System lands and may increase disturbance locally. However, the potential for this type of disturbance is unknown. 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 Tahoe 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 the great gray owl in the Forest Plan 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 is 3 percent under all of the alternatives, great gray owl nesting has not been confirmed within the Tahoe National Forest. In the event that great gray owls nesting is found on the forest, the 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 the 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 minimal direct effects from snowmobiles or grooming equipment.

Willow Flycatcher (Empidonax trailii)

Species Account

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).

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. Nest predation is the leading cause of nest failure in willow flycatcher nests (Mathewson et al. 2011). Human activity (presence of people, dogs, and vehicles) has also been found to be a significant impact to land birds, surpassing that of habitat loss from development (Schlesinger et al. 2008).

Willow flycatchers currently occur and breed on the Tahoe National Forest, primarily in the upper Truckee River watershed where some of the largest montane meadow complexes occur, such as Perazzo Meadows. 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.

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.).

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).

Direct and Indirect Effects

There would be no direct effects to willow flycatchers from OSV use, since willow flycatchers arrive on their breeding grounds within the project area in mid to late May. The minimum cross-country snow depth varies between 12 to 24 inches under all the action alternatives and is expected to be adequate to protect vegetation from measurable impacts (McNamara 2017). Alternatives 3 and 5 would have the highest minimum snow depth and would likely protect willow flycatcher habitats the most compared to alternatives 1, 2 and 4.

Cumulative Effects

The Tahoe 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 Tahoe National Forest Over-snow Vehicle Use Designation Project would impact the willow flycatcher or its habitat 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 all of the action alternatives is expected to protect meadow and riparian habitats from measurable impacts to water quality or vegetation. However, the potential for snow compaction in willow flycatcher meadows is moderate to high particularly in larger meadows adjacent to OSV routes, with alternatives 3 and 5 providing the most protection.

Greater Sandhill Crane (*Grus Canadensis tabida*)

Species Account

Greater sandhill cranes have been documented within the Tahoe National Forest. Sandhill cranes are known to breed in the Sierraville Ranger District at Kyburz Meadow and Perazzo Meadow, and on private land at Sardine Valley.

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, CDFW 2013).

Much of the acres classified as wetlands on Tahoe National Forest, which are important to waterfowl and sandhill crane, are seasonal; breeding occurs in spring and early summer. 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, water diversions; predation; human disturbance of crane pairs during the nesting season; and the spread of invasive plants into greater sandhill crane habitats (USFWS 2015).

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 (USDA National Forest Service National Core BMP Rec-7: Over-Snow Vehicle Use; refer to the project hydrology report for additional information). However, the minimum cross-country snow depth varies between 12 to 24 inches under all the action alternatives is expected to be adequate to protect aquatic and riparian habitats from measurable impacts to vegetation or water quality (McNamara 2017).

Cumulative Effects

The Tahoe 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 Tahoe National Forest Over-snow Vehicle Use Designation Project would impact the greater sandhill crane or its habitat 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, even though the minimum cross-country snow depth varies between 12 to 24 inches under all the action alternatives and is expected to be adequate to protect wet meadow and fresh emergent wetland habitats utilized by this species from measurable impacts to vegetation or water quality.

Terrestrial Invertebrates

Western Bumble Bee (Bombus occidentalis)

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, 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 on 11 national forests in Region 5 (Hatfield 2012) including the Tahoe 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 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.

Queens overwinter in the ground in abandoned rodent (i.e., mouse, chipmunk or vole) burrows at depths from 6 to 18 inches. 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. 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.

Direct and Indirect Effects

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 varies between 12 to 24 inches under all the action alternatives and is expected to be adequate to protect vegetation from measurable impacts (McNamara 2017).

Cumulative Effects

The Tahoe 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 Tahoe National Forest Over-snow Vehicle Use Designation Project would impact the western bumble bee or its habitat 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 bumble bee 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 which varies between 12 to 24 inches to be maintained under all the action alternatives.

Terrestrial Wildlife Species of Public Interest

Table 82. Additional terrestrial species of interest identified during public scoping

Species Name	TEPCS Status	Project Area Within Species' Range	Detections in or Near the Project Area	Suitable Habitat Present	Species Addressed Further/Rationale
Mule deer (<i>Odocoileus hemionus</i>)	MIS	Yes	Yes	Yes	Yes/Addressed with respect to impacts associated with winter range.
Subnivean species: Shrews (<i>Sorex</i> spp.), Voles (<i>Microtus</i> spp.), and Deer mouse (<i>Peromyscus maniculatus</i>)	None	Yes	Yes	Yes	Yes

Mule Deer (*Odocoileus hemionus*)

Management indicator species for oak-associated hardwood and hardwood conifer in the Sierra Nevada bioregion.

Potential effects to mule deer on their winter range was identified as a non-significant issue during public scoping. Please refer to the Management Indicator Species section for mule deer population status and trend, habitat status and trend, and project-level habitat impacts.

Table 83. Resource indicators and measures for assessing effects to mule deer on winter range

Resource Indicator and Effect	Measure (Quantify if possible)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Potential for disturbance to individuals from OSV use and increased human presence, injury or mortality of individuals, or habitat modification (i.e., altered movement due to OSV use)	Acres of winter range affected by OSV use	2,915	2,915	2,915	3,975	2,337

Species Account

Mule deer range and habitat include coniferous forest, foothill woodland, shrubland, grassland, agricultural fields, and suburban environments (CDFW 2014). Many mule deer migrate seasonally between higher elevation summer range and low-elevation winter range (Ibid). On the west slope of the Sierra Nevada, oak-associated hardwood and hardwood/conifer areas are an important winter habitat (CDFW 1998).

Mule Deer Habitat Status

Tahoe National Forest contains 194,973 acres of mule deer winter range, with 32,674 (16 percent) acres conducive to OSV use.

Direct and Indirect Effects

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 (Gaines et al 2003). Based upon Freddy et al. (1986), the distance at which mule deer have been shown to be displaced by OSVs is 133 meters (436 feet).

Snowmobile use within mule deer winter range can have the following direct effects on individual mule deer or their habitat (Gaines et al. 2003): (1) displacement of populations or individual animals from a route, related to human activities; (2) disturbance and displacement of individuals from breeding or rearing habitats; (3) physiological response to disturbance, resulting in changes in heart rate or level of stress hormones; and (4) potential for injury or mortality to individuals from vehicle collision. Possible indirect effects include altered or dispersed movement as caused by a route or human activities on or near a route.

Table 84 displays the amount of deer winter range, by alternative, with the potential for direct (disturbance and vehicle collision) and indirect (habitat modification) effects as described above. 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 mule deer would negatively affect the individual, but the likelihood of occurrence is assumed to be rare.

Table 84. Acres of mule deer winter range

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated for OSV use	159,100	80,075	85,822	85,889	53,773
Total	194,973	194,973	194,973	194,973	194,973
Designated and conducive to OSV use	28,163	915	1,528	2,561	950
Miles of OSV trails within deer winter range	5	0	8	9	8

OSV use of existing linear routes and cross-country travel is allowed within winter range, at some level, under all alternatives. Under the current condition (alternative 1), 130,165 acres (66 percent) of mule deer winter range is not designated for OSV use. Therefore, deer using that portion of winter range would not be impacted by authorized OSV use. Roughly 34 percent of winter range is designated for OSV use. However, only 32,658 acres or 50 percent of winter range are designated and conducive to OSV use (slopes less than 20 percent and canopy cover less than 70 percent).

Subnivean Species

Subnivean habitats are important for small mammal species and may be indirectly affected by OSV use through snow compaction. For the alternatives, minimum snow depth was used to analyze the potential for snow compaction on subnivean habitat.

Table 85. Resource indicators and measures for assessing effects to subnivean species

Resource Indicator and Effect	Measure (Quantify if possible)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Potential for effects of snow compaction on subnivean species habitat	Acres and percentage of habitat impacted by OSV use [addressed under each applicable predator species (marten, CSO)]	With no minimum snow depth, damage to subnivean habitat could occur where snow levels are not sufficient to protect subnivean habitat.	Snow compaction on subnivean habitat is unlikely to occur when snow depth is at least 12 inches.	Snow compaction on subnivean habitat is least likely to occur when snow depth is at least 18 inches.	Snow compaction on subnivean habitats is unlikely to occur when snow depth is at least 12 inches	Snow compaction on subnivean habitat is least likely to occur when snow depth is at least 24 inches.

Species Account

Subnivean species [shrews (*Sorex* spp.), voles (*Microtus* spp.), and deer mouse *Peromyscus maniculatus*] do not warrant special status at this time because populations are assumed to be secure. However, Gaines et al. (2003) found an interaction that occurred on winter recreation routes 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.

Habitat Status

Adaptations to snowpack are an important component of the ecology of small mammals in temperate climates. Some small mammals, such as chipmunks (*Tamias* spp), hibernate and have limited interaction with the snowpack environment. However, shrews and voles stay active throughout the winter, and much of their activity occurs in the subnivean space under the snowpack. Other species (deer mouse) undergo bouts of torpor between periods of activity. Subnivean mammals are dependent on the subnivean space between the basal layer of snow and the ground for shelter, foraging and travel.

Subnivean space may be formed in one of two ways: mechanically or thermally, and varies by region and type of snow. Subnivean space forms mechanically when the weight of the snowpack is supported by vegetation, woody debris, or complex rocky environments. Extensive subnivean space may be formed thermally in environments with a temperature gradient between the bottom and top of the snowpack. As water vapor migrates up from warmer to colder regions of the snow, depth hoar forms just above the ground at the base of the snowpack. Depth hoar is brittle, loosely arranged crystals that create space in the subnivean environment and facilitate travel by small mammals that readily move through the fragile crystals. Depth hoar commonly forms and is most well-developed in cold, continental-type regions where temperature throughout the snowpack varies significantly. Depth hoar is rare to nonexistent in snow classified as maritime, such as that in the Sierra Nevada, which also tends to be more isothermal.

Studies cited as the basis for impacts to the subnivean environment and subnivean animals have generally been conducted in locations with continental snowpacks (e.g., alpine) where depth hoar develops (Wildlife Resource Consultants 2004). A lack of studies investigating the distribution of subnivean space and the effects of winter recreation on subnivean space in maritime snowpack conditions, such as those found in the Sierra Nevada Mountains, resulted in the Forest Service commissioning a study (Wildlife Resource Consultants 2004) designed to examine the distribution of subnivean space in Sierra meadows, how it is formed, and the impacts of winter recreation on snowpack characteristics and subnivean space. Key findings from the 65 snow pits examined for subnivean space, density characteristics, temperature, vegetation type, and the presence of small mammal sign included the following:

- The subnivean space did not contain depth hoar.
- Vegetation community types should be considered in managing winter recreation use in the Sierra Nevada; wet meadows at low elevations (1,917 to 1,933 meters; 6,289 to 6,342 feet in study) with low snow depth probably have the most subnivean space.
- Findings were not as conclusive regarding the effects of recreational use on subnivean space. But there is some suggestion that winter recreation may impact subnivean space at low elevations [pooled data for all sites were analyzed by recreational use category; pits classified

as concentrated over-snow vehicle use had the least subnivean space, an average of 6.0 percent (n=7)]. Winter recreation probably has the greatest effect at low snow depths (0 to 64 centimeters; 0 to 25 inches).

The habitat of species active in the winter includes mesic and dry meadows throughout the Sierra Nevada. With the exception of trails, meadows are where some of the highest OSV use occurs and, therefore, risk for effects to subnivean species is greatest.

Direct and Indirect Effects

Gaines et al. (2003) found an interaction that occurred on winter recreation routes 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 the impenetrable compact snow. As reflected in public comments during scoping, any adverse effects to subnivean animals could indirectly affect the prey base for many Forest Service sensitive species, including California spotted owl, northern goshawk, and marten.

Alternative 1 provides the least protection for subnivean species, where damage to subnivean resources could occur, since no minimum snow depth is required under existing Forest Plan direction. Under alternative 2, adequate snow cover (generally about 12 inches) would be required to prevent resource damage, and would potentially protect subnivean resources. Similarly, alternative 4 would likely protect subnivean habitat with a minimum snow depth of 12 inches. Alternatives 3 and 5 would provide the greatest protection of subnivean habitat with at least 18 and 24 inches snow depth, respectively.

Management Indicator Wildlife Species

The purpose of this analysis is to evaluate and disclose the impacts of the Tahoe National Forest Over-snow Vehicle Designation Project on the habitat of the 13 management indicator species (MIS) identified in the Land and Resource Management Plan (USDA Forest Service 1992) as amended by the Sierra Nevada Forests Management Indicator Species Amendment Record of Decision (USDA Forest Service 2007a).

Direction Regarding the Analysis of Project-level Effects on MIS Habitat

MIS are animal species identified in the Sierra Nevada National Forests MIS Amendment Record of Decision (ROD) signed December 14, 2007 (USDA Forest Service 2007a), which was developed under the 1982 National Forest System Land and Resource Management Planning Rule (1982 Planning Rule) (36 CFR 219). Guidance regarding MIS set forth in the 1990 LRMP (USDA Forest Service 1990) as amended by the 2007 Sierra Nevada National Forests 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 1990 LRMP as amended.

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 could be 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 Tahoe OSV Use Designation.

Direction Regarding Monitoring of MIS Population and Habitat Trends at the Bioregional Scale

The bioregional scale monitoring strategy for the Tahoe National Forest's MIS is found in the Sierra Nevada National Forests Management Indicator Species Amendment Record of Decision (ROD) of 2007 (USDA Forest Service 2007a). Bioregional scale habitat monitoring is identified for 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 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 Sierra Nevada National Forests 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 86. These habitats are defined using the 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 Sierra Nevada National Forests Bioregional MIS Report (USDA Forest Service 2010a).

Habitat status is the current amount of habitat on the Sierra Nevada National 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 Sierra Nevada National Forests 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 waterbodies. This monitoring consists of collecting aquatic macroinvertebrates and measuring stream habitat features according to the Stream Condition Inventory manual (Frasier 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

Management Indicator Species (MIS) for the Tahoe National Forest are identified in the 2007 Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment (USDA Forest Service 2007a). The habitats and ecosystem components and associated MIS analyzed for the project were selected from this list of MIS, as indicated in table 86. 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 or not the habitat of the MIS is potentially affected by the Tahoe OSV Use Designation (4th column).

Table 86. Selection of MIS for project-level habitat analysis for the Tahoe OSV Use Designation

Habitat or Ecosystem Component	CWHR Type(s) defining the habitat or ecosystem component ¹	Sierra Nevada Forests Management Indicator Species <i>Scientific Name</i>	Category for Project Analysis ²
Riverine and Lacustrine	lacustrine (LAC) and riverine (RIV)	aquatic macroinvertebrates	2

Habitat or Ecosystem Component	CWHR Type(s) defining the habitat or ecosystem component ¹	Sierra Nevada Forests Management Indicator Species <i>Scientific Name</i>	Category for Project Analysis ²
Shrubland (west-slope chaparral types)	montane chaparral (MCP), mixed chaparral (MCH), chamise-redshank chaparral (CRC)	fox sparrow <i>Passerella iliaca</i>	2
Sagebrush	Sagebrush (SGB)	greater sage-grouse <i>Centrocercus urophasianus</i>	2
Oak-associated Hardwood and Hardwood/conifer	montane hardwood (MHW), montane hardwood-conifer (MHC)	mule deer <i>Odocoileus hemionus</i>	2
Riparian	montane riparian (MRI), valley foothill riparian (VRI)	yellow warbler <i>Dendroica petechia</i>	2
Wet Meadow	wet meadow (WTM), freshwater emergent wetland (FEW)	Pacific tree (chorus) frog <i>Pseudacris regilla</i>	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 <i>Oreortyx pictus</i>	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 <i>Oreortyx pictus</i>	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 <i>Dendragapus obscurus</i>	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 <i>Strix occidentalis occidentalis</i>	2
		American marten <i>Martes americana</i>	
		northern flying squirrel <i>Glaucomys sabrinus</i>	
Snags in Green Forest	Medium and large snags in green forest	hairy woodpecker <i>Picoides villosus</i>	2
Snags in Burned Forest	Medium and large snags in burned forest (stand-replacing fire)	black-backed woodpecker <i>Picoides arcticus</i>	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.

Migratory Landbirds

Under the National Forest Management Act, 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 and the January 2004 Partners in Flight 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 U.S. Fish and Wildlife Service to Promote the Conservation of Migratory Birds was signed. 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.

Likely impacts to habitats the migratory birds depend on have been assessed in further detail within the Biological Assessment, Biological Evaluation and the Management Indicator Species reports for the Tahoe National Forest Over-snow Vehicle Designation Project. All reports found that effects to various habitats would be minimal to none considering that forested cover is not modified. Similarly, OSV use is concentrated between December 26 through and March 31, which predominately avoids overlap with the active breeding season for most migratory bird species. These reports found that the Tahoe National Forest Over-snow Vehicle Designation Project would not cause adverse effects (Biological Assessment), would not cause a trend toward a loss of viability (Biological Evaluation), nor would it degrade various MIS habitats to a level that affects trends in the Sierra Nevada bioregion. Also, possible impacts to migratory species are minimized through the adherence of LRMP standards and guidelines for snags and down woody debris, avoidance of streamside management zones, and no degradation in riparian areas and wetlands.

Therefore, the Tahoe National Forest Over-snow Vehicle Designation Project would have minimal impacts to individual migratory birds and would not adversely affect migratory landbird conservation. This finding is based on the results of analysis conducted in the Biological Assessment, Biological Evaluation, and Management Indicator Species reports, and that adherence to LRMP standards are adhered to, which in turn would maintain habitat diversity. The project meets the intent of the Migratory Landbird MOU.

Aquatics

Relevant Laws, Regulations, and Policy

Regulatory Framework

Land and Resource Management Plan

The Tahoe National Forest LRMP (USDA Forest Service 1990) 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 LRMP as well as in the Northwest Forest Plan 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 within the Tahoe National Forest. Aquatic Conservation Strategies are found in their entirety in each of the aforementioned amendments to the LRMP.

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 U.S. Fish and Wildlife Service and the National Marine Fisheries Service concerning 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.

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.

Forest Service Manual 2670.32 (USDA Forest Service 2005)

The manual 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)

The manual 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

The Sierra Nevada Forest Plan Amendment (2004b) 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: Activity-related Standards and Guidelines

Where a proposed project encompasses a riparian conservation area or a critical aquatic refuge, conduct a site-specific project area analysis to determine the appropriate level of management. Determine the type and level of allowable management activities by assessing how proposed activities measure against the riparian conservation objectives and their associated standards and guidelines. Areas included in riparian conservation areas 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.

Resource Indicators and Measures

Resource indicators and measures shown in table 19 will be used to measure and disclose effects to aquatic wildlife related to OSV use designations and grooming trails for OSV use.

Table 87. Aquatic indicators and measures for assessing effects

Resource Element	Resource Indicator	Measure
Aquatic species	Amphibian and Reptile Species and Habitat	Occurrence of federally listed or sensitive species or their habitat (aquatic and terrestrial acres) within cross-country OSV use areas.
		Occurrence of federally listed or sensitive species or their habitat (aquatic and terrestrial acres) in proximity to designated OSV routes.
Aquatic species	Fish and Aquatic Invertebrate Species and Habitat	Occurrence of federally listed or sensitive species or their habitat (stream and lake shoreline miles) within cross-country OSV use areas.
		Occurrence of federally listed or sensitive species or their habitat (stream and lake shoreline miles) in proximity to designated OSV routes.

Methodology

This analysis used relevant geographic information system (GIS) data layers from the Forest Service and other resource agencies. The GIS layers of proposed OSV designated OSV cross-country areas and trails under Forest Service jurisdiction were overlain with aquatic resource data layers to identify areas of potential effects. All GIS analyses was conducted using ArcGIS software version 10.3.

Water features (e.g., streams, springs, ponds, lakes, wetlands or marshes) were delineated using the U.S. Geological Survey’s National Hydrography and the U.S. Fish and Wildlife Service’s National Wetland Inventory datasets. Meadows occurring in the project area were delineated using a corporate dataset originally derived from the University of California at Davis. Project area elevations were derived from a U.S. Geological Survey seamless digital elevation model with 10-meter resolution. None of these datasets used were verified in the field.

To determine what federally listed or sensitive aquatic animal species may occur in the project area or be affected by the project, we reviewed relevant management documents (e.g., USDA Forest Service 1990, 2004, 2014a), natural resource agency websites and databases (e.g., California Department of Fish and Wildlife’s California Natural Diversity Database), and monitoring data stored in the Forest Service’s Natural Resource Management databases (accessed or re-accessed on May 14, 2018). We also obtained official federally threatened, endangered, and proposed species lists for the Tahoe National Forest Over-snow Vehicle Use Designation Project on April 13, 2016, and

August 21, 2016, from the Sacramento and Nevada Field Offices of the U.S. Department of the Interior, Fish and Wildlife Service. An updated list was obtained from the Sacramento and Nevada Fish and Wildlife offices on September 9, 2016, and during December 2017, through the U.S. Fish and Wildlife Service’s Environmental Conservation Online System Information for Planning and Consultation [IPAC] website (<https://ecos.fws.gov/ipac/>). The official lists from the U.S. Fish and Wildlife Service identified aquatic species to consider because they may be present within the Tahoe National Forest or may be affected by the project’s alternatives. The species and critical habitat listed in table 88 were evaluated for potential presence in the project area. Species that are not known or suspected to be absent in areas that may be open to OSV use were not analyzed for project-related effects. Federally listed species that may be affected by the preferred alternative will be analyzed in more detail within a biological analysis to ensure compliance with the Endangered Species Act.

Table 88. Threatened, endangered, proposed, and sensitive (TEPS) aquatic species considered and designated or proposed critical habitat considered in this analysis

	Species	Status	Known or Potential Occurrence	Species Addressed Further/Rationale
Amphibians/Reptiles				
1	California red-legged frog (<i>Rana draytonii</i>)	Federally Threatened	Potential Occurrence	Yes, discussed further in this document
2	Western pond turtle (<i>Actinemys marmorata</i>)	USDA FS Sensitive	Known Occurrence	Yes, discussed further in this document
3	Foothill yellow-legged frog (<i>Rana boylei</i>)	USDA FS Sensitive	Known Occurrence	Yes, discussed further in this document
4	Sierra Nevada yellow-legged frog (<i>Rana sierrae</i>)	Federally Endangered	Known Occurrence	Yes. Exist in only a few populations in ponds and streams and generally in small numbers on the forest.
Fishes				
5	Lahontan cutthroat trout (<i>Oncorhynchus clarkii henshawi</i>)	Federally Threatened	Known Occurrence	Yes, discussed further in this document
6	Hardhead (<i>Mylopharodon conocephalus</i>)	USDA FS Sensitive	Known Occurrence	Yes, discussed further in this document
7	Cui-ui (<i>Chasmistes cujus</i>)	Federally Endangered	No Potential Occurrence	No Effect. Species and habitat does not exist on Tahoe National Forest.
8	Lahontan Lake tui chub (<i>Siphatales bicolor pectinifer</i>)	USDA FS Sensitive	Potential Occurrence	Yes, discussed further in this document
9	Delta smelt (<i>Hypomesus transpacificus</i>)	Federally Threatened	No Potential Occurrence	No Effect. Species and habitat does not exist on Tahoe National Forest.
10	Central Valley steelhead (<i>Oncorhynchus (=salmo) mykiss</i>)	Federally Threatened	No Potential Occurrence	No Effect. Species and habitat does not exist on Tahoe National Forest.
Aquatic Invertebrates				
11	Great Basin rams-horn snail (<i>Helisoma newberryi</i>)	USDA FS Sensitive	Potential Occurrence	Yes, discussed further in this document
12	California floater (<i>Anodonta californiensis</i>)	USDA FS Sensitive	Potential Occurrence	Yes, discussed further in this document

	Species	Status	Known or Potential Occurrence	Species Addressed Further/Rationale
13	Black juga (<i>Juga nigra</i>)	USDA FS Sensitive	Potential Occurrence	Yes, present within stream located within project boundaries; considered in analysis.
Critical Habitats within the Project Area				
	Species	Status	Occurrence	Analysis
	California red-legged frog (<i>Rana draytonii</i>)	Final Designated	Known Occurrence on private land adjacent to NFS land	Yes
	Sierra Nevada yellow-legged frog (<i>Rana sierrae</i>)	Final Designated	Known Occurrence	Yes

Occupancy data for federally listed and Forest Service sensitive species in the project area was obtained from corporate Forest Service GIS data layers provided by the Natural Resource Manager and Natural Resource Information System. Additional occupancy data were obtained from the California Natural Diversity Database. Occupancy data were obtained from these databases during April 2018. For species that have been observed or are presumed to occur in the project area, suitable and critical (if designated for federally listed species) habitat data were either obtained from the Tahoe National Forest and the U.S. Fish and Wildlife Service, respectively. If suitable habitat data were not available, potentially suitable habitat was modeled using information contained in the scientific literature and the aforementioned environmental datasets. Definitions of species specific suitable habitat was presented within the Affected Environment and Existing Condition Section below. The number of stream or shoreline miles (fish and aquatic macroinvertebrates) or total acreage (amphibians and reptiles) of occupied, suitable, and/or critical habitat occurring in the project alternatives' effect boundaries were quantified separately for each species within their native range.

This report reviewed the Modified Proposed Action and alternatives in sufficient detail to determine the level of effect that would occur to federally listed and Forest Service sensitive species. One of four possible determinations was chosen for Forest Service sensitive species based on the available literature, an analysis of the potential effects of the project, and the professional judgment of the biologists who completed the evaluation. The determinations for federally listed or sensitive aquatic animal species were largely determined by accounting for both the magnitude and extent of the effects from OSV use that will likely occur within suitable or occupied habitats.

The three possible determinations for Forest Service sensitive species (from FSM 2672.42) are as follows:

1. "No impact" – where no impact is expected;
2. "May affect 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
3. "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.

The three possible determinations for species federally listed as threatened or endangered are as follows:

1. “No effect” – where no impact is expected;
2. “May affect, not likely to adversely affect” – where an impact may occur but is not expected to measurably or significantly adversely affect individuals or their habitat;
3. “May affect, likely to adversely affect” – where an impact may occur and is expected to measurably or significantly adversely affect individuals or their habitat.

OSV Use Assumptions for Analysis

Assumptions used for the analysis are based on published literature and professional judgement based on experience as an aquatics specialist with the USDA Forest Service. These sources of information framed the issues key indicators used for analyzing the environmental consequences of each alternative on aquatic resources. They provide background information and conclusions regarding the effects of OSVs and other factors considered in this analysis, and apply to all alternatives.

- The use of OSVs is more concentrated along designated trails and thus effect magnitude is higher.
- We presumed that snow depth has an inverse sigmoidal relationship to the majority of potential effects from OSV use within designated areas.
- Lower elevations generally have less OSV use – snow occurs at lower elevations less frequently and persists for shorter periods of time (e.g., 2 to 5 days).
- Higher minimum snow depth requirements are likely negatively correlated with the amount of OSV use during a year because fewer days or locations may be available for authorized OSV use in designated areas.
- Only authorized OSV uses were analyzed. In general, OSVs are not authorized to operate over bare ground or areas with inadequate snow depth that would cause resource damage as described in 36 CFR part 261.15. Concerns arising from unauthorized OSV uses will be addressed as law enforcement issues and may prompt corrective actions. Also, travel over bare soil can damage OSVs and thus is generally avoided by operators. Therefore, unauthorized OSV use was assumed to be rare and was not considered in the aquatic resource analysis.
- Indirect effects, such as those possibly resulting from snow compaction and vehicle emissions, are likely to be concentrated in the corridors along designated OSV trails (groomed or ungroomed) because OSV use is concentrated. These effects are assumed to occur within 100 feet of designated OSV trails and areas open to OSV use outside these concentrated use corridors are much less likely to experience measurable indirect effects.
- For the purposes of this analysis, non-motorized uses or activities were assumed to have very little to no effect on aquatic environments and were not considered further for this analysis.
- Future aquatic resource related monitoring may identify unexpected types or levels of impacts to aquatic resources, and may prompt corrective actions as warranted.

Spatial and Temporal Context for Effects Analysis

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. In general, the spatial effect boundary of designated cross-country OSV use areas was contained in the designated cross-country OSV use areas. However, the spatial effect boundary of designated OSV trails extended 100 feet on both sides of the trails. The general 100 feet effect boundary on each side of the trails was chosen using relevant scientific literature (Forman and Alexander 1998; Olliff et al. 1999; Baker and Buthmann 2005; Gage and Cooper 2009) and professional judgment to capture the majority of foreseeable direct and indirect effects (e.g., pollution and alterations in hydrology) of the project alternatives on aquatic animals within the project area.

Effects to aquatic species or their habitat would be expected to occur or become evident within 1 year post-disturbance, and this constitutes short-term effects. Effects that are observed after 1 year were considered long-term effects. Long-term effects beyond 2 years become increasingly difficult to predict due to unknown interactions among other environmental drivers and perturbations.

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 national forest boundary for the Tahoe National Forest 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 assumed effectiveness monitoring program to be designed and implemented and for results to be assessed.

If the proposed action or alternatives being analyzed in this environmental impact statement 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 an impact of a past, present, or reasonably foreseeable future actions, there would also be no potential for impacts to accumulate in time and geographic space.

Affected Environment and Environmental Consequences for Endangered, Threatened, Sensitive or Proposed Species and/or their Designated Critical Habitat

Federally Threatened, Endangered, and Proposed Aquatic Species

California Red-legged Frog (*Rana draytonii*)

The California red-legged frog, *Rana draytonii*, is endemic to California, listed as federally threatened (61 FR 25813), and considered a State Species of Special Concern by the California Department of Fish and Wildlife (CDFW 2018). The California Red-legged Frog Recovery Plan was released on September 12, 2002 (USDI Fish and Wildlife Service 2002; 67 FR 57830). The recovery objective is to reduce threats and improve the population status of the California red-legged frog

sufficiently to warrant de-listing. The strategy for recovery includes protecting existing populations by reducing threats, restoring and creating habitat that will be protected and managed in perpetuity, surveying and monitoring populations, conducting research on the biology of the species and threats to the species, and re-establishing populations of the species within the historic range. The western portion of the Tahoe National Forest falls within the Sierra Nevada recovery unit (recovery unit #1; USDI Fish and Wildlife Service 2002). The Plumas and Tahoe National Forests share core area #2 Yuba River-South Fork Feather River located in Yuba County (USDI Fish and Wildlife Service 2002). This core area includes a portion of the North Yuba River near New Bullards Bar Reservoir. While the goal of the recovery plan is to protect the long-term viability of all existing populations within each recovery unit, recovery actions would be focused within, but not limited to, core areas (USDI Fish and Wildlife Service 2002). The Tahoe National Forest currently has designated two critical aquatic refuges to help facilitate the recovery of, in part, the California red-legged frog: Oregon and Pine Grove.

Habitat and Life History

In the Sierra Nevada, the California red-legged frog historically occupied portions of the lower elevations west of the crest from Shasta County south to Tulare County (USDI Fish and Wildlife Service 2002). Almost all known California red-legged frog populations have been documented at elevations below about 3,500 feet with some historical sightings documented at elevations up to 5,200 feet (USDI Fish and Wildlife Service 2002). Suitable habitat above 3,500 feet in elevation may be more specific and may include such requirements as: quiet water refugia within 0.25 mile during high water flows, emergent vegetation present on a minimum of 25 percent of a pool or pond margin, and standing water that is retained into late July (USDI Fish and Wildlife Service 2002).

The California red-legged frog is generally found in or near water but may disperse away from water during or after rain storms (Bulger et al. 2003; Tatarian 2008), or in response to receding water during the driest time of year (USDI Fish and Wildlife Service 2002). Frogs may estivate in small mammal burrows and moist leaf litter up to 85 feet from water in dense riparian vegetation (61 FR 25813). This behavior occurs where the aquatic habitat is intermittent in nature. Bulger et al. (2003) found that upon onset of the winter wet season, non-migrating adults occupied terrestrial habitats up to approximately 420 feet from their aquatic site of residence until breeding activities commenced. Bulger et al. (2003) also found that during the wet season migrating adults may make long short or long distance movements (650 feet to 1.7 miles) between aquatic sites with apparent disregard to topography or vegetation type within upland habitats up to approximately 1,600 feet from water. In apparent contrast to coastal populations, which are rarely inactive, individuals from inland sites where temperatures are lower may become inactive for long periods (USDI Fish and Wildlife Service 2002).

Breeding habitat for the California red-legged frog is typically characterized as ponds and stream pools with depths exceeding 2.3 feet and with overhanging vegetation such as willows, as well as emergent and submergent vegetation (Hayes and Jennings 1988). Breeding occurs during the months of November through March in most of their current range (USDI Fish and Wildlife Service 2002). Breeding in the Sierra Nevada may occur later due to freezing temperatures between November and February. Breeding would likely occur between March and May at higher elevations (Freel 1997, personal communication). The shrubby riparian vegetation including willows, cattails and bulrushes seems to be most suitable for California red-legged frogs (Hayes and Jennings 1988). However, California red-legged frogs have been found in less than ideal habitats and a combination of these factors is more important than an individual habitat component (Hayes and Jennings 1988). Small to

medium perennial streams can also provide breeding habitat if the streams are not subjected to scouring flows during egg development. Streams in this category generally have the potential for deep pools and riparian vegetation to provide the habitat requirements for this frog. Emergent and overhanging vegetation is used as a brace for egg deposition and as cover by adult frogs. Permanent or nearly permanent pools are required for tadpole development, and adult frogs use emergent and overhanging vegetation as refugia. The amount of time to metamorphosis is highly dependent on temperature (Calef 1973). Tadpole development takes 11 to 20 weeks (Calef 1973). Water quality is also very important. Adult frogs normally become sexually mature in two (males) to three (females) years and can live as long as ten years or more. Adults feed primarily on aquatic and terrestrial invertebrates, but large adults will eat small rodents such as deer mice (Jennings 1997, personal communication; USDI Fish and Wildlife Service 2002).

Critical Habitat

On March 17, 2010, the U.S. Fish and Wildlife Service finalized the designation of critical habitat for the California red-legged frog (75 FR 12816). Based on the above needs and the current knowledge of the life-history, biology, and ecology of the California red-legged frog, the U.S. Fish and Wildlife Service determined the California red-legged frog's Primary Constituent Elements (PCEs) are:

- Aquatic Breeding Habitat (PCE 1) – Standing bodies of fresh water (with salinities less than 4.5 parts per trillion), including natural and manmade (e.g., stock) ponds, slow-moving streams or pools within streams, and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a minimum of 20 weeks in all but the driest of years.
- Aquatic Non-Breeding Habitat (PCE 2) – Freshwater pond and stream habitats, as described above, that may not hold water long enough for the species to complete its aquatic life cycle but which provide for shelter, foraging, predator avoidance, and aquatic dispersal of juvenile and adult California red-legged frogs. Other wetland habitats considered to meet these criteria include, but are not limited to: plunge pools within intermittent creeks, seeps, quiet water refugia within streams during high water flows, and springs of sufficient flow to withstand short-term dry periods.
- Upland Habitat (PCE 3) – Upland areas adjacent to or surrounding breeding and non-breeding aquatic and riparian habitat up to a distance of 1 mile (1.6 kilometers) in most cases (i.e., depending on surrounding landscape and dispersal barriers) including various vegetation types such as grassland, woodland, forest, wetland, or riparian areas that provide shelter, forage, and predator avoidance for the California red-legged frog. Upland features are also essential in that they are needed to maintain the hydrologic, geographic, topographic, ecological, and edaphic features that support and surround the aquatic, wetland, or riparian habitat. These upland features contribute to: (1) Filling of aquatic, wetland, or riparian habitats; (2) maintaining suitable periods of pool inundation for larval frogs and their food sources; and (3) providing nonbreeding, feeding, and sheltering habitat for juvenile and adult frogs (e.g., shelter, shade, moisture, cooler temperatures, a prey base, foraging opportunities, and areas for predator avoidance). Upland habitat should include structural features such as boulders, rocks and organic debris (e.g., downed trees, logs), small mammal burrows, or moist leaf litter.
- Dispersal Habitat (PCE 4) – Accessible upland or riparian habitat within and between occupied or previously occupied sites that are located within 1 mile (1.6 kilometers) of each other, and

that support movement between such sites. Dispersal habitat includes various natural habitats, and altered habitats such as agricultural fields, that do not contain barriers (e.g., heavily traveled roads without bridges or culverts) to dispersal. Dispersal habitat does not include moderate- to high-density urban or industrial developments with large expanses of asphalt or concrete, nor does it include large lakes or reservoirs over 50 acres (20 hectares) in size, or other areas that do not contain those features identified in PCE 1, 2, or 3 as essential to the conservation of the species.

Two critical habitat designations occur in the Tahoe National Forest: PLA-1 and Michigan Bluff, NEV-1, Sailor Flat (figure 13). Each of these critical habitat designated areas contains aquatic habitat for breeding and non-breeding activities (PCEs 1 and 2), contains upland habitat for foraging (PCE 3) and dispersal activities (PCE 4), and is considered occupied by the species. A total of 2,406 acres of occupied designated critical habitat occurs in the project area.

Threats/Management Concerns

Potential risk factors to the California red-legged frog from resource management activities include modification or loss of habitat or habitat components, primarily aquatic and adjacent riparian environments used for reproduction, cover, foraging, and aestivation. Egg survival can be impacted by mining and road/trail construction through increases in fine sediments. Livestock grazing directly affects riparian vegetation, emergent vegetation, causes nutrient loading, and also affects channel morphology and hydrology. Timber harvest can result in loss of riparian vegetation and increased erosion and siltation of aquatic habitats. Long range upwind pesticide use and local urbanization/habitat destruction have been found to be strongly correlated with declines of California red-legged frog across its range (Davidson et al. 2001, 2002; Davidson 2004). Habitat loss and alteration, the introduction of bullfrogs and other aquatic predators, and historic timber harvest have been implicated in the population decline (Moyle 1973; Jennings and Hayes 1985; Jennings 1988).

Local Information

Tahoe National Forest biologists regularly note amphibians found in aquatic habitats and annually conduct stream surveys across portions of the forests. In addition, intensive surveys for California red-legged frogs have occurred in the Tahoe National Forest from 1996 to present. Within potentially suitable habitat, most of these surveys have followed the U.S. Fish and Wildlife Service's California red-legged frog survey protocol(s) (1997, 2005). Potentially suitable habitat is defined within the Tahoe National Forest as lakes, ponds, perennial and intermittent streams, wetlands and marshes, and wet meadows on the west slope of the forest that are below 5,300 feet in elevation, and 300 feet of upland habitat surrounding these water features. A total of 102,437 acres of potentially suitable habitat occurs in the project area (see figure 13). Based on Forest Service and California Department of Fish and Wildlife databases, no California red-legged frogs have been detected within the Tahoe National Forest (figure 13). However, individuals have been detected near the Tahoe National Forest within private or other public lands (figure 13).

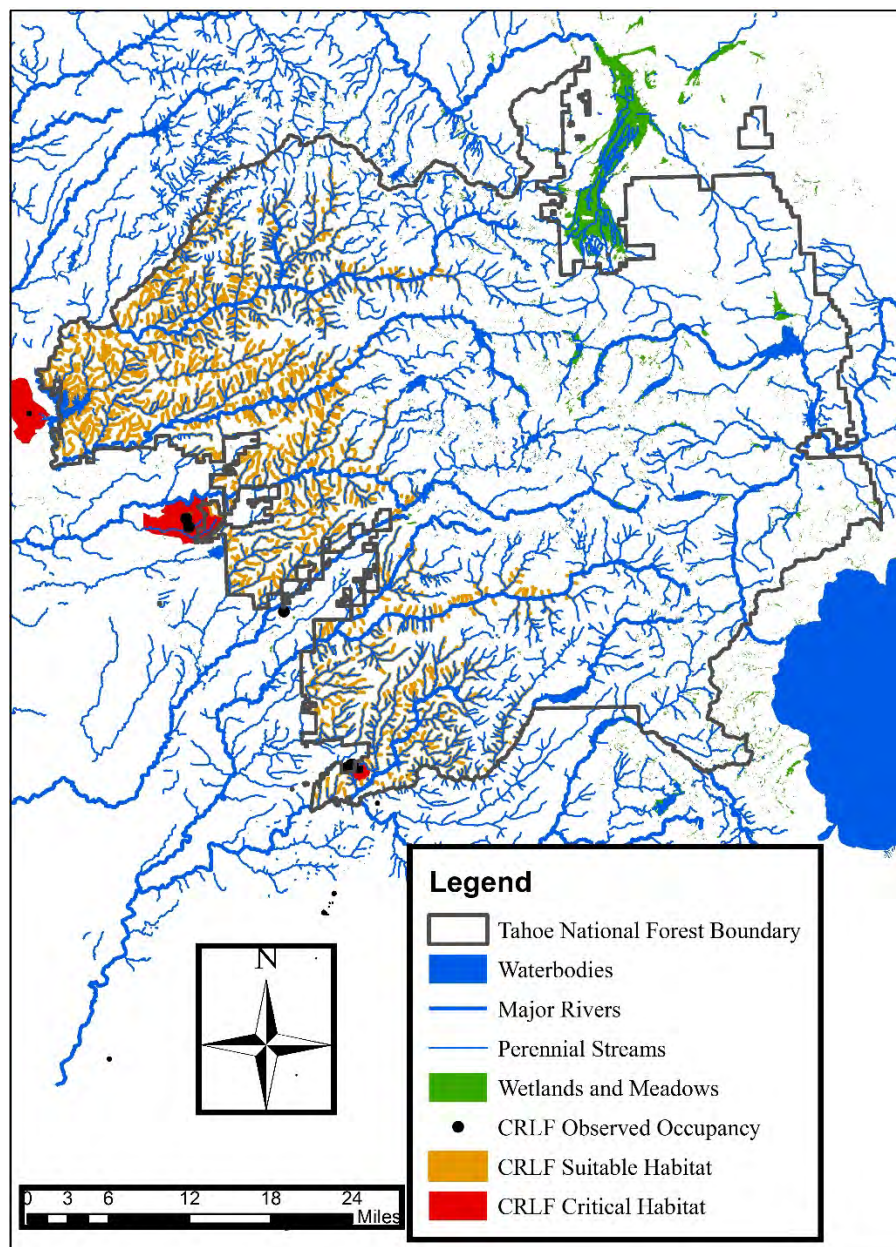


Figure 13. Location of critical and potentially suitable habitats for the California red-legged frog (CRLF) and where individuals have been detected relative to the location of major rivers, perennial streams, waterbodies (ponds, lakes, and reservoirs), wetlands, and meadows within and near the Tahoe National Forest boundary.

In 1997, Dr. Gary Fellers, USGS, Point Reyes, California, surveyed all known suitable California red-legged frog habitat within the Tahoe National Forest. Dr. Fellers is an expert herpetologist familiar with this species. His conclusion on the suitability of Tahoe National Forest lands for California red-legged frog was, "I am pretty comfortable with saying that there are few or no populations remaining on federal land that we visited. There remains a fair possibility that a few populations may exist on private lands, but those are largely inaccessible to us." On June 18, 2001, one female was detected in a pond on Ralston Ridge on the power line transmission corridor. The pond was dry several weeks later and dispersal of this individual remains unknown. This pond is

approximately one mile from the Tahoe National Forest. In 2003, a population of California red-legged frogs was found on private land in a permanent pond on an ephemeral tributary to the South Yuba River. This site is near the Rock Creek watershed at approximately 3,000 feet elevation. In 2006, a California red-legged frog site was discovered in the vicinity of Michigan Bluff on private land less than 0.2 mile from NFS lands within critical habitat (PLA-1) at an elevation of approximately 3,335 feet. Approximately 50 adults and several juveniles were observed at this site surrounded by the most southwest portion of the forest (figure 13), which constitutes the largest known Sierran population to date.

Sierra Nevada Yellow-legged Frog (*Rana sierrae*)

The Sierra Nevada yellow-legged frog, *Rana sierrae*, is an endangered species endemic to California. Historically, the Sierra Nevada yellow-legged frog and mountain yellow-legged frog (*Rana muscosa*) were found throughout the Sierra Nevada mountain range in California and Nevada and along the transverse range in southern California. Prior to 2007, these two species were considered to represent a single species; *Rana muscosa sensu lato* (Vredenburg et al. 2007). Frogs occurring in the northern Sierra Nevada are believed to be Sierra Nevada yellow-legged frogs based on their genetics, morphology and acoustics. The U.S. Fish and Wildlife Service classified the Sierra Nevada yellow-legged frog as endangered under the Endangered Species Act in 2014 (79 FR 24255) and the species' critical habitat was designated in 2016 (USDI Fish and Wildlife Service 2016; 81 FR 59045). The species is considered threatened by the California Department of Fish and Wildlife (CDFW 2018).

Habitat and Life History

The Sierra Nevada yellow-legged frog can be found on the El Dorado, Inyo, Lassen, Plumas, Sierra, Stanislaus, Tahoe and Lake Tahoe Basin National forests (USDA Forest Service 2014b). In general, the species occurs above 4,500 feet in elevation, and inhabit ponds, lakes, and streams with moderate to high gradient channels containing sufficient depth for overwintering (Jennings and Hayes 1994). Sierra Nevada yellow-legged frogs are highly aquatic, typically utilizing only the immediate bank and emergent rocks and logs. Historically streams with a bank of less than 10 inches in vertical height with a moderately rocky, sparsely vegetated bank harbored the densest populations (Mullally and Cunningham 1956). Frogs have not been detected greater than 75 feet (23 meters) from a stream bank (MGW Biological and Klamath Wildlife Resources 2006). They prefer well-illuminated, sloping banks of meadow streams, riverbanks, isolated pools, and lake borders with vegetation that is continuous to the water's edge (Zeiner et al. 1988; Martin 1992). In the fall, as temperatures decline, frogs have been observed to move as far as one mile downstream within the stream channel (MGW Biological and Klamath Wildlife Resources 2006). The occupancy patterns of frogs serve to fulfill three fundamental life history requirements: overwintering, breeding and foraging.

Frogs appear to be quite tolerant of variable water temperatures, as they are able to fully function in water as cold as 37.4 degrees Fahrenheit (3 degrees Celsius), and tadpoles have been found in water as warm as 80.6 degrees Fahrenheit (27 degrees Celsius); however, these values may represent maximum tolerances for this species (Mullally and Cunningham 1956). Body temperature is regulated by being primarily diurnal, basking throughout much of the day, utilizing the warmer shallow areas in lakes and streams, and occupying colder water areas to reduce body temperature when necessary (Bradford 1984).

Tadpoles (larvae), subadults, and adults overwinter in deep lakes or pools with undercut banks that provide cover (Martin 1992). Frogs (subadults and adults) may hibernate underwater during the

winter and mortality may occur from oxygen deprivation under ice (Bradford 1983). At least some of the population overwinters in shallow lakes (less than 1.5 meters) that likely freeze to the bottom most years. These frogs likely avoid freezing by utilizing underwater crevices (Pope and Matthews 2001). Frogs utilize near shore ledges and crevices in fractured bedrock along the shoreline which are close (less than 3 feet) to the water's surface. These crevices are typically very narrow, but may open to larger areas deeper within the rock and often contain multiple individuals indicating that this species overwinters in aggregations. Both aggregations and the surrounding granite likely insulate individual animals from temperature extremes throughout the winter (Matthews and Pope 1999). Site fidelity is high for breeding, foraging and overwintering for this species (Matthews and Preisler 2010).

Breeding occurs soon after spring thaw (Vredenburg et al. 2005). During spring thaw, frogs emerge to the surface to bask in the sun, or travel over ice and snow to other nearby bodies of water (Pope and Matthews 2001), while larvae seek warmer water near shore (after spring turnover in large bodies of water; Bradford 1984). Suitable breeding habitat is considered to be low gradient (up to 4 percent) perennial streams and lakes. Streams in this category generally have the potential for deep pools and undercut banks which provide the habitat requirements of this frog. At relatively high elevations, breeding occurs between May and August as soon as the meadows and lakes are free of snow and ice. At lower elevations, breeding occurs between March and June once high water in streams subsides. Sierra Nevada yellow-legged frogs usually lay their eggs in clusters submerged along stream banks or on vegetation. Tadpoles require at least 1 year before metamorphosis to the adult stage. Tadpoles in some high-elevation populations may require up to 3 years before undergoing metamorphosis (Knapp 1996). Metamorphosis occurs in July or August (Vredenburg et al. 2005). The time required to reach reproductive maturity is believed to vary between 3 and 4 years after metamorphosis (Vredenburg et al. 2005).

Adults primarily feed on aquatic and terrestrial invertebrates favoring terrestrial insects such as beetles, flies, ants, bees, and true bugs (Jennings and Hayes 1994). Adults also consume Pacific treefrog (*Pseudacris regilla*) tadpoles, which appears to be an important component of their diet in some populations (Zeiner et al. 1988; Pope and Matthews 2001). The Sierra Nevada yellow-legged frog tadpoles graze on algae and diatoms along rocky bottoms in streams, lakes and ponds. Gartersnakes and introduced trout prey upon Sierra Nevada yellow-legged frog tadpoles and adults (Zeiner et al. 1988; Knapp 1996).

Female frogs can live up to 14 years in age with males living up to 12 years in age (Matthews and Miaud 2007). Matthews and Preisler (2010) estimated over 11 percent of a population survived to an age of 10 years (N = 44 individuals). Males lack vocal sacks and do not produce the typical mating calls that are common in many frog species, nor do males form breeding aggregations (Matthews and Miaud 2007). Frogs grow faster and are generally larger at lower elevations, likely because the relatively longer summer at lower elevations provides greater time foraging and growth compared to higher elevation sites (Matthews and Miaud 2007). However, populations at higher elevations, where summer is relatively shorter, often exhibit higher annual survival rates in years with a relatively large snowpack.

Critical Habitat

On August 26, 2016, the U.S. Fish and Wildlife Service finalized designation of critical habitat for the Sierra Nevada yellow-legged frog (81 FR 59045). Physical or biological features for the Sierra Nevada yellow-legged frog were determined to be (1) space for individual and population growth

and for normal behavior, (2) food, water, air, light, minerals, or other nutritional or physiological requirements, (3) cover or shelter, (4) sites for breeding, reproduction or rearing (or development) of offspring, (5) habitats protected from disturbance or representative of the historical, geographic, and ecological distributions of the species (81 FR 59045). Based on our current knowledge of the physical or biological features and habitat characteristics required to sustain the species' life-history processes, the U.S. Fish and Wildlife Service determined that the PCEs specific to the Sierra Nevada yellow-legged frog are:

- Aquatic habitat for breeding and rearing (PCE 1) – Habitat that consists of permanent water bodies, or those that are either hydrologically connected with, or close to, permanent water bodies, including, but not limited to, lakes, streams, rivers, tarns, perennial creeks (or permanent plunge pools within intermittent creeks), pools (such as a body of impounded water contained above a natural dam), and other forms of aquatic habitat. This habitat must:
 - ♦ For lakes, be of sufficient depth not to freeze solid (to the bottom) during the winter (no less than 5.6 feet (1.7 meters), but generally greater than 8.2 feet (2.5 meters), and optimally 16.4 feet (5 meters) or deeper (unless some other refuge from freezing is available)).
 - ♦ Maintain a natural flow pattern, including periodic flooding, and have functional community dynamics in order to provide sufficient productivity and a prey base to support the growth and development of rearing tadpoles and metamorphs.
 - ♦ Be free of introduced predators.
 - ♦ Maintain water during the entire tadpole growth phase (a minimum of 2 years). During periods of drought, these breeding sites may not hold water long enough for individuals to complete metamorphosis, but they may still be considered essential breeding habitat if they provide sufficient habitat in most years to foster recruitment within the reproductive lifespan of individual adult frogs.
 - ♦ Contain:
 - Bank and pool substrates consisting of varying percentages of soil or silt, sand, gravel, cobble, rock, and boulders (for basking and cover);
 - Shallower microhabitat with solar exposure to warm lake areas and to foster primary productivity of the food web;
 - Open gravel banks and rocks or other structures projecting above or just beneath the surface of the water for adult sunning posts;
 - Aquatic refugia, including pools with bank overhangs, downfall logs or branches, or rocks and vegetation to provide cover from predators; and
 - Sufficient food resources to provide for tadpole growth and development.
- Aquatic nonbreeding habitat (including overwintering habitat; PCE 2) – This habitat may contain the same characteristics as aquatic breeding and rearing habitat (often at the same locale), and may include lakes, ponds, tarns, streams, rivers, creeks, plunge pools within intermittent creeks, seeps, and springs that may not hold water long enough for the species to complete its aquatic life cycle. This habitat provides for shelter, foraging, predator avoidance, and aquatic dispersal of juvenile and adult mountain yellow-legged frogs. Aquatic nonbreeding habitat contains:

- ♦ Bank and pool substrates consisting of varying percentages of soil or silt, sand, gravel, cobble, rock, and boulders (for basking and cover); perennial
 - ♦ Open gravel banks and rocks projecting above or just beneath the surface of the water for adult sunning posts;
 - ♦ Aquatic refugia, including pools with bank overhangs, downfall logs or branches, or rocks and vegetation to provide cover from predators;
 - ♦ Sufficient food resources to support juvenile and adult foraging;
 - ♦ Overwintering refugia, where thermal properties of the microhabitat protect hibernating life stages from winter freezing, such as crevices or holes within bedrock, in and near shore; and/or
 - ♦ Streams, stream reaches, or wet meadow habitats that can function as corridors for movement between aquatic habitats used as breeding or foraging sites.
- (3) Upland areas (PCE 3) –
 - ♦ Upland areas adjacent to or surrounding breeding and nonbreeding aquatic habitat that provide area for feeding and movement by mountain yellow-legged frogs.
 - For stream habitats, this area extends 82 feet (25 meters) from the bank or shoreline.
 - In areas that contain riparian habitat and upland vegetation (for example, mixed conifer, ponderosa pine, montane conifer, and montane riparian woodlands), the canopy overstory should be sufficiently thin (generally not to exceed 85 percent) to allow sunlight to reach the aquatic habitat and thereby provide basking areas for the species.
 - For areas between proximate (within 984 feet (300 meters)) water bodies (typical of some high mountain lake habitats), the upland area extends from the bank or shoreline between such water bodies.
 - Within mesic habitats such as lake and meadow systems, the entire area of physically contiguous or proximate habitat is suitable for dispersal and foraging.
 - ♦ Upland areas (catchments) adjacent to and surrounding both breeding and nonbreeding aquatic habitat that provide for the natural hydrologic regime (water quantity) of aquatic habitats. These upland areas should also allow for the maintenance of sufficient water quality to provide for the various life stages of the frog and its prey base.

Four critical habitat designations occur within the Tahoe National Forest for the Sierra Nevada yellow-legged frog: subunits 2B, 2C, 2D and 2E (figure 14). Although these critical habitat designated areas contain introduced fish, the subunits are occupied by the species and contain aquatic habitat for breeding and non-breeding activities (PCEs 1 and 2) and upland habitat for foraging (PCE 3). There are a total of 157,764 acres of critical habitat within the boundary of the forest.

Threats/Management Concerns

The decline of yellow-legged frogs in the Sierra Nevada has largely been attributed to the introduction of salmonid fishes during the last century (USDI Fish and Wildlife Service 2003). Prior to stocking, fish were generally historically absent from the mid to high elevations in the Sierra Nevada (Hayes and Jennings 1986; Bradford et al. 1993; Knapp 1996). Both distribution and

abundance of Sierra Nevada yellow-legged frog larvae are significantly reduced when trout are introduced to an area (Knapp et al. 2001). When fish are removed from an area, frog populations immediately begin to recover regardless of other habitat conditions (Knapp et al. 2001; Knapp et al. 2007). Additionally, when fish are removed, the larvae numbers mirror larvae numbers in lakes where fish were never introduced (Knapp et al. 2001).

Disease is another major source of concern for Sierra Nevada yellow-legged frogs. Two diseases are particularly hard on this species. The first is known as “red-leg” disease and is caused by the bacterium *Aeromonas hydrophila*. “Red-leg” disease is attributed to the die-off of approximately 800 adult frogs at a single location over the timespan of a single season (Bradford 1991). More recently, the disease chytridiomycosis has emerged as a significant threat to the species (Briggs et al. 2005; Ouellet et al. 2005; Wake and Vredenburg 2008). This second disease, amphibian chytridiomycosis, is caused by the fungus *Batrachochytrium dendrobatidis* (Bd). Chytridiomycosis is an emerging infection disease which has caused numerous declines and possible extinctions of amphibians globally. Mountain yellow-legged frogs are well documented as being sensitive to this disease. Animals are able to acquire Bd zoospores by simply being in an infected lake, frog-frog contact is not required (Rachowicz and Briggs 2007). Although Bd is considered a primary cause for many of the disappearances of mountain yellow-legged frogs, some populations are able to coexist with the fungus. At least 83 percent of all known sites currently have Bd present (Knapp et al. 2011).

Additional reasons for yellow-legged frog decline or contributing factors include airborne pesticides (Davidson et al. 2002; Davidson 2004; Davidson and Knapp 2007), loss of habitat, altered habitat, and grazing. Davidson and Knapp (2007) evaluated over 6,800 sites in the southern Sierra Nevada comparing mountain yellow-legged frog occupancy with presence of introduced fish, habitat conditions, and predicted exposure to airborne pesticides from agricultural lands upwind in California’s Central Valley, and found that airborne pesticides appeared to have a pronounced negative effect on mountain yellow-legged frog occupancy independent of the other factors examined.

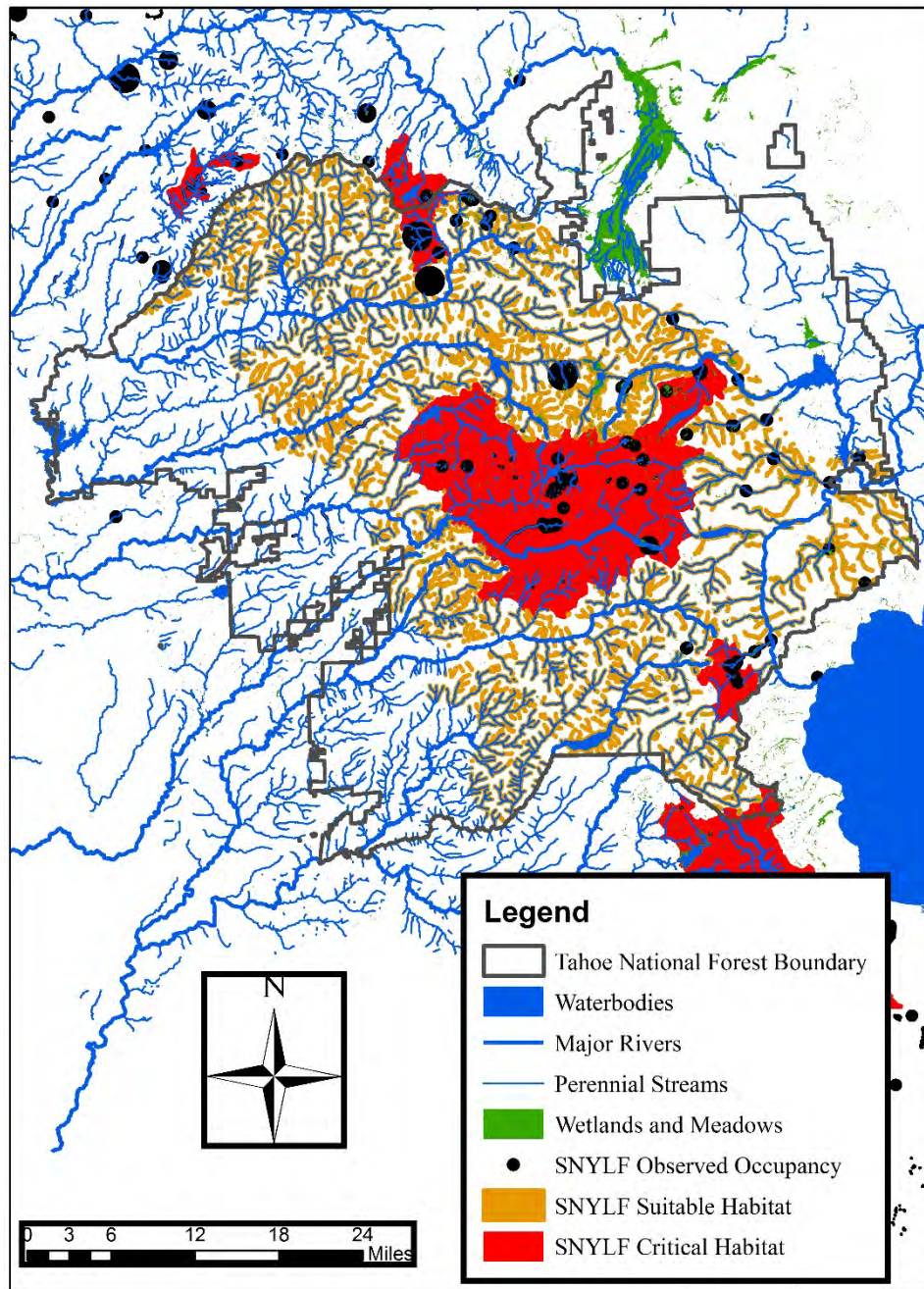


Figure 14. Location of critical and potentially suitable habitats for the Sierra Nevada yellow-legged frog (SNYLF) and where individuals have been detected relative to the location of major rivers, perennial streams, waterbodies (ponds, lakes, and reservoirs), wetlands, and meadows within and near the Tahoe National Forest boundary.

Local Information

The Tahoe National Forest initiated herpetological surveys in 1996 in cooperation with the California Academy of Sciences, which included areas likely to support Sierra Nevada yellow-legged frogs. These surveys continued through 1999, and included a systematic search of historical museum records for the four counties encompassing the Tahoe National Forest. The review of historical herpetological specimens found that mountain yellow-legged frogs were historically collected from

33 localities in the Tahoe National Forest. During ensuing surveys from 1997 to 1999, Sierra Nevada yellow-legged frogs were found in two additional localities. Sierra Nevada yellow-legged frog surveys were also conducted in cooperation with the U.S. Geological Survey Biological Division, Pt. Reyes, from 1997 through 2000, and continue periodically (data on file with the Tahoe National Forest). Since 1997, Sierra Nevada yellow-legged frog sightings have been routinely recorded, either incidentally during stream and other biological surveys or during amphibian-focused surveys.

Based on these surveys and records, the Sierra Nevada yellow-legged frog is known to occur among a number of locations containing suitable habitat within the Tahoe National Forest (figure 14). In general, suitable habitat was defined using the Regional Suitable Habitat dataset, which was derived using hydrology data within the species' range or distribution as defined by Roland Knapp during the summer of 2014. Potentially suitable habitat was defined within the Tahoe National Forest as lakes, ponds, perennial and intermittent streams, wetlands and marshes, and meadows that are above 4,500 feet in elevation, and 85 feet of upland habitat surrounding these water features and the area between proximate (within 984 feet) waterbodies (e.g., high mountain lakes; see figure 14). A total of 19,358 and 49,631 acres of potentially suitable habitat occurs in and outside of designated critical habitat within the project area, respectively (figure 14).

Lahontan Cutthroat Trout (Oncorhynchus clarkii henshawi)

The Lahontan cutthroat trout, *Oncorhynchus clarkii henshawi*, is an inland subspecies of cutthroat trout endemic to the Lahontan Basin of northern Nevada, eastern California, and southern Oregon. Based on a severe decline in distribution and abundance coupled with considerable population fragmentation, Lahontan cutthroat trout became at risk of extinction (USDI Fish and Wildlife Service 1995, 2009; Moyle et al. 2011). The species was first listed by the U.S. Fish and Wildlife Service as an endangered species in 1970 (35 FR 13520). The listing was later reclassified to threatened status in 1975 to facilitate recovery and management efforts and authorize regulated angling (40 FR 29864). Currently, no critical habitat has been designated for the Lahontan cutthroat trout.

The U.S. Fish and Wildlife Service developed a recovery plan for the species in 1995 (USDI Fish and Wildlife Service 1995). The USFWS believes that the establishment of lacustrine populations in Pyramid Lake and Lake Tahoe is necessary for the recovery of the species in the Western Geographic Management Unit. In addition, the Truckee River Basin Recovery Implementation Team (TRRIT) was assembled to develop restoration and recovery actions specifically for the Truckee River Basin. The TRRIT has developed a short-term action plan (USDI Fish and Wildlife Service 2003) and established recovery objectives for various reaches of the Truckee River and its tributaries. Important recovery areas that the TRRIT has initially identified as having immediate potential include: Independence Creek, upstream of Independence Lake; Pole Creek; Hunter Creek; Donner Creek; Perazzo Creek; Prosser Creek; and the Truckee River from its confluence with Donner Creek to the State line; Upper Truckee River; Truckee River from Tahoe Dam to Donner Creek; and, Independence Creek downstream from Independence Lake to the Little Truckee River. Despite being outside of the species' native range, the TRRIT has identified Macklin and East Fork creeks and an unnamed tributary to the East Fork Creek in the Yuba River system as necessary populations for the recovery of Lahontan cutthroat trout because they contain remnants of indigenous Truckee River Basin strains.

Habitat and Life History

In northern California and western Nevada, Lahontan cutthroat trout were thought to occupy approximately 656 miles of the Truckee River watershed, 400 miles of the Carson River watershed, and 570 miles of the Walker River watershed (USDI Fish and Wildlife Service 2009). Lahontan cutthroat trout historically occurred in Tahoe, Cascade, Fallen Leaf, Upper Twin, Lower Twin, Pyramid, Winnemucca, Summit, Donner, Walker, and Independence Lakes (Moyle 2002; Gerstung 1988). At the turn of the century, Lake Tahoe and Pyramid Lake supported commercial and sport fisheries for Lahontan cutthroat trout. Self-sustaining populations of Lahontan cutthroat trout are now extirpated from these lakes with the exception of Independence and Summit lakes (Behnke 1992). The Pyramid Lake Lahontan cutthroat trout fishery is sustained by hatchery stocking (Somer 1998). Lahontan cutthroat trout has been extirpated from most of the western portion of its range in the Truckee, Carson, and Walker river basins, and from much of its historic range in the Humboldt basin (Coffin 1988; Gerstung 1988; USDI Fish and Wildlife Service 2009). Existing self-sustaining stream habitat in the Truckee, Carson and Walker River basins totals approximately 57 miles in headwater streams of northern California (USDI Fish and Wildlife Service 2009). Currently, many of the stream populations occupy isolated segments of larger river systems with no opportunity for natural recolonization.

The life history of Lahontan cutthroat trout resembles that of other subspecies of interior cutthroat trout. Lacustrine Lahontan cutthroat trout mature at 3 to 5 years of age (Gerstung 1988). In stream environments, males frequently mature at age 2, and females mature at age 3 (Coffin 1981). Lahontan cutthroat trout are obligatory stream spawners, with spawning occurring during spring months (generally April to July) depending on streams flow and water temperatures. Spawning Lahontan cutthroat trout prefer gravel sizes ranging from 6 to 50 millimeters in diameter and water velocities ranging from 4 to 6 centimeters per second (Gerstung 1988). Spawning gravels must be clean and well oxygenated. Fecundity of 600 to 8,000 eggs per female has been reported for lacustrine populations (Lea 1968; Cowan 1983; Sigler et al. 1983). However, fluvial females from small Nevada streams only had 100 to 300 eggs per fish (Cowan 1983). Fecundity and egg size are positively correlated with length, weight, and age (Sigler et al. 1983). Water temperatures of less than 13 degrees Celsius and intragravel dissolved oxygen levels in excess of 5 milligrams per liter are required during the April through mid-August egg incubation period (USDI Fish and Wildlife Service 1995). Lahontan cutthroat trout eggs generally hatch in 4 to 6 weeks, depending on water temperature, and fry emerge 13 days later (Lea 1968; Rankel 1976). Fry require habitats that include riffles, glides, and small pools. Fry prefer water depths of 6 to 43 centimeters and water velocities of less than 9 centimeters per second. Fry movement is density-dependent and correlated with fall and winter freshets (Johnson et al. 1983). Some fluvial adapted fish remain for 1 or 2 years in nursery streams before emigrating in the spring (Rankel 1976; Coffin 1983; Johnson et al. 1983). Growth rate is variable with faster growth occurring in larger, warmer waters and particularly where forage fish are utilized (Sigler et al. 1983). Growth rates for stream dwelling Lahontan cutthroat trout are fairly slow (USDI Fish and Wildlife Service 1995). Lahontan cutthroat trout may live 5 to 9 years in lake environments (Lea 1968; Rankel 1976; Rissler et al. 2006) while stream-dwelling Lahontan cutthroat trouts are generally less than 6 years of age (Ray et al. 2007). Lahontan cutthroat trout may live 5 to 9 years in lake environments (Lea 1968; Rankel 1976; Rissler et al. 2006), while stream dwelling Lahontan cutthroat trout are generally less than 6 years of age (Ray et al. 2007).

Optimal habitat for Lahontan cutthroat trout is characterized by 1 to 1 pool-riffle ratios; well vegetated, stable streambanks; over 25 percent cover; and relatively silt free rocky substrates (Hickman and Raleigh 1982). In general, Lahontan cutthroat trout inhabit areas with overhanging

banks, vegetation, or woody debris. In-stream cover (brush, aquatic vegetation, and rocks) is particularly important for juveniles (Sigler and Sigler 1987; Gerstung 1988). Lahontan cutthroat trout are unique since they can tolerate much higher alkalinities than other trout species (Koch et al. 1979). Adults can tolerate temperatures exceeding 27 degrees Celsius for short periods of time and seem to survive daily temperature fluctuations of 14 to 20 degrees Celsius (Coffin 1983; French and Curran 1991). Lahontan cutthroat trout do best in waters with average maximum water temperatures of less than 22 degrees Celsius and average water temperatures of 13 degrees Celsius. Stomach analysis of fluvial Lahontan cutthroat trout showed that they are opportunistic feeders whose diets consist of organisms (typically insects) most commonly found in drift (Moyle 2002). In lakes, small Lahontan cutthroat trout feed largely on insects and zooplankton (McAfee 1966; Lea 1968), and large Lahontan cutthroat trout (greater than 500 millimeters) feed on fish (Sigler et al. 1983).

Threats/Management Concerns

The severe decline in range and abundance of Lahontan cutthroat trout has been attributed to a number of factors including hybridization and competition with introduced trout species; alteration of stream channels and morphology; loss of spawning habitat due to pollution and sediment inputs from logging, mining, grazing and urbanization; migration blockage due to dams; reduction of lake levels and concentrated chemical components in natural lakes; loss of habitat due to channelization; de-watering due to irrigation and urban demands; and overfishing (Gerstung 1986, 1988; Coffin 1988; USDI Fish and Wildlife Service 1995, 2009). The U.S. Fish and Wildlife Service states that non-native fish, particularly nonnative salmonids, are the primary threat to Lahontan cutthroat trout (USDI Fish and Wildlife Service 2009). This is based on, in part, the understanding that Lahontan cutthroat trout evolved in the absence of other trout species and do not compete well for food and habitat. In stream environments within the western portion of the Lahontan drainage, Lahontan cutthroat trout have seldom been able to co-exist with non-native trout for longer than a decade.

Local Information

Within the Tahoe National Forest, Lahontan cutthroat trout occur or have been detected in approximately 4.7 miles of stream and 8 waterbodies (Stampede Reservoir, Independence Lake, Prosser Reservoir, Martis Creek Reservoir, Lake of the Woods, Little Truckee River, Boca Reservoir, and Donner Lake) within the species' native range (figure 15). The Independence Lake population is the only population considered to be self-sustaining. Lahontan cutthroat trout also occur in approximately 6.0 miles of stream and 4 lakes (Meadow Lake, Penner Lake, Deadman Lake, and Saxonia Lake) within the Yuba River Basin outside of the species' native range (figure 15). In general, these populations are considered valuable to the recovery of the species. Tahoe National Forest has designated Independence Lake and the stream flowing into it (Upper Independence Creek) as a critical aquatic refuge.

Periodically, the California Department of Fish and Wildlife conducts surveys using electrofishing methodologies to determine population trends. All populations in Tahoe National Forest have been stable and vary in numbers near carrying capacity for the habitat in the streams. However, the populations are relatively small and may not be large enough to support genetic diversity in the long-term, which may leave them more at risk for genetic drift and bottlenecks (Somer, California Department of Fish and Wildlife, personal communication, 2014).

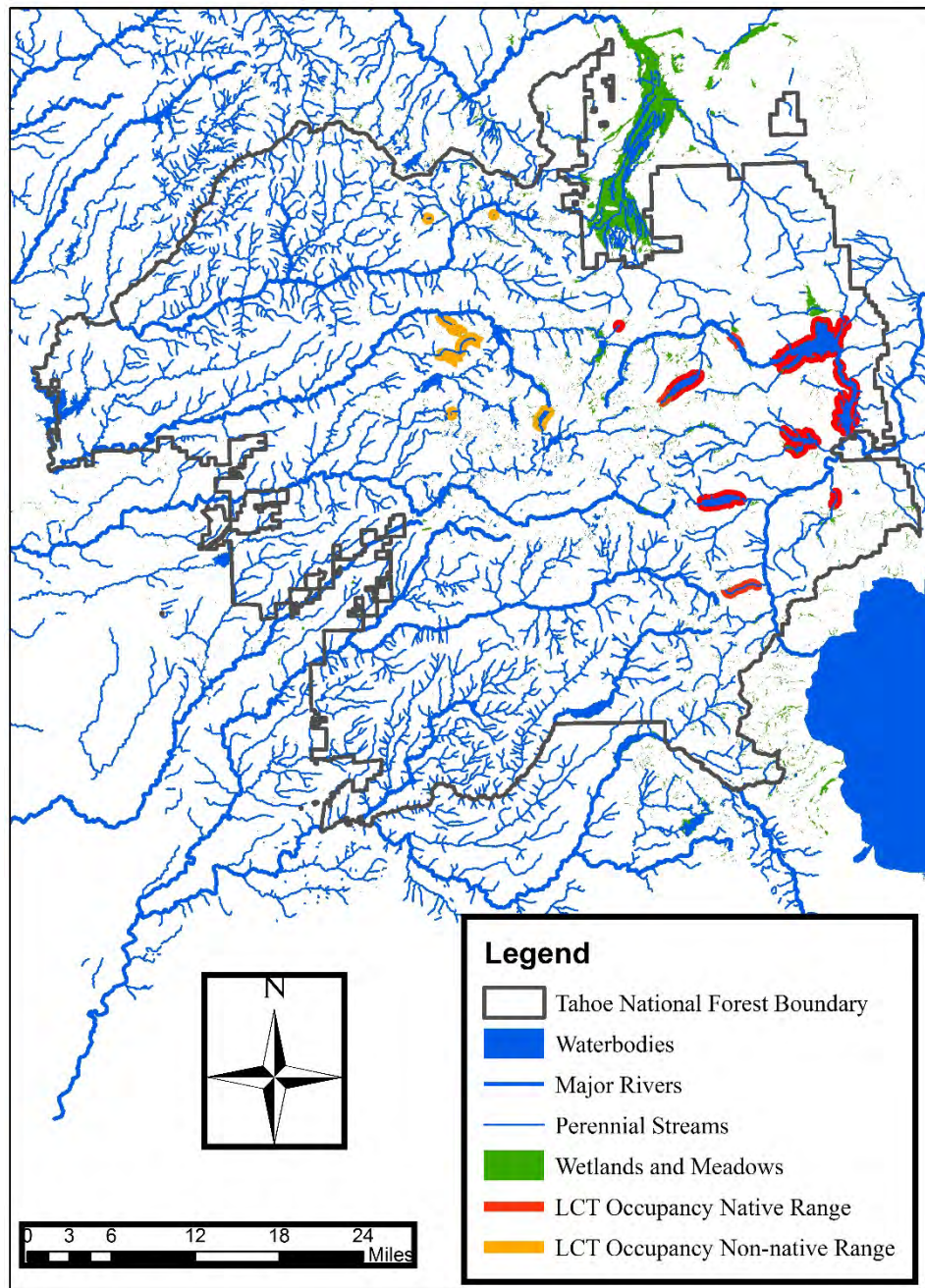


Figure 15. Locations where Lahontan cutthroat trout (LCT) have been detected within the species' native and non-native range relative to the location of major rivers, perennial streams, waterbodies (ponds, lakes, and reservoirs), wetlands, and meadows within and near the Tahoe National Forest boundary.

Forest Service Sensitive Aquatic Species

Western Pond Turtle (Actinemys marmorata)

The western pond turtle (*Actinemys marmorata*) is listed as sensitive on the Region 5 Forester's Sensitive Species List (USDA Forest Service 2014a). In addition, the species is currently classified as a State Species of Special Concern by the California Department of Fish and Wildlife (CDFW

2018) and being considered for federal listing by the U.S. Fish and Wildlife Service (80 FR 19259). The Tahoe National Forest LRMP, as amended, does not provide specific management guidelines for this species. The USDA Forest Service (2004) presents standards and guidelines for Riparian Conservation Areas for California red-legged frogs that likely provide relevant management direction for western pond turtles.

Habitat and Life History

The western pond turtle occurs 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). Fossil fragments have been found east of the current range indicating that the species was once more widespread (Buskirk 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 currently unclear if these are relictual or introduced populations (Lovich and Meyer 2002). Modern distribution is limited to parts of Washington, Oregon, California and northern Baja California (Buskirk 2002). Western pond turtles are the only native aquatic turtle in California and southern Oregon, in the northern part of its range it co-occurs with only the western painted turtle (*Chrysemys picta bellii*; Germano and Rathbun 2008). In California, the turtle can be found on all National Forests, except the Inyo and Lake Tahoe Basin.

Western pond turtles are long lived (up to 40 years) habitat generalists that occur in a wide variety of permanent and intermittent aquatic habitats (Bury and Germano 2008). Abundance for the species has been well studied and densities often range from 23 to 214 turtles per hectare throughout most of the range (Lovich and Meyer 2002; Germano 2010). Aquatic habitats utilized by the western pond turtle include lakes, natural ponds, rivers, oxbows, permanent streams, intermittent streams, marshes, freshwater and brackish estuaries and vernal pools (Buskirk 2002; Bury and Germano 2008; Germano and Rathbun 2008). Individuals often favor habitats containing refugia from predators (e.g., deep pools) and basking sites composed of logs, snags, boulders, emergent vegetation, large logs and boulders. The known elevation range of the species in California extends from sea level to 4,690 feet (1,430 meters; Jennings and Hayes 1994). Although the species has been detected in higher elevations, these occurrences may be the result of introduction (Jennings and Hayes 1994).

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 (Buskirk 2002; Bury and Germano 2008). Buskirk (2002) reported that wild western pond turtles have not been observed feeding out of the water in terrestrial habitat. Growth and maturation in western pond turtles is heavily influenced by food availability, basking behaviors, and ambient air and water temperatures (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).

The home range of western pond turtles is extensive and individuals have been observed to travel considerable distances in excess of 3,281 feet (1,000 meters; Buskirk 2002; Bury and Germano 2008). In California, the home range of males and females were observed to average 1 hectares and 0.3 hectares, respectively (Bury 1979). Western pond turtles have been observed to occur in terrestrial habitats as far as 1,640 feet (500 meters) from aquatic habitats (Reese and Welsh 1997). Adults can use terrestrial habitat frequently for prolonged periods of time (greater than 7 months per

year) while nesting and overwintering (Reese and Welsh 1997). Individuals have been observed to overwinter under leaf litter or fine soil in locations with level or upland slopes containing dense understory vegetation (Bury and Germano 2008). Individuals can move upland as early as September, but typically move following the first winter storm in November or December. Not all individuals move upland to overwinter, some move to nearby ponds for the winter (Davis 1998). Animals have been observed moving underneath ice in ponds and potentially congregate in shallow areas (Buskirk 2002).

Nesting often occurs in locations approximately 164 feet (50 meters) or less from perennial stream courses that are dominated by gentle slopes (less than 15 degrees), and dry and well drained soils containing grasses and herbaceous annual vegetation with few shrubs (Holland 1994; Reese and Welsh 1997; Lovich and Meyer 2002). As a result, roads or small plantations can be used for nesting or overwintering (Buskirk 2002). 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). As a result, roads or small plantations can be used for nesting or overwintering. Clutch size varies significantly among drainages; however, it does not differ significantly across years or within individual drainages (Germano and Rathbun 2008). Mean clutch size ranges from 4.5 +/- 0.25 on the Santa Rosa Plateau to 7.3 +/- 1.18 in southern Oregon. Average annual egg production for 39 individuals in southern California was 7.2 +/- 3.9 eggs. When double clutching occurs, the first clutch typically contains more eggs than the second clutch (Scott et al. 2008). 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).

Threats/Management Concerns

Western pond turtles have significantly declined in number with many populations representing less than 10 percent of the historical population size (Buskirk 2002). In California alone there has been a loss of 80 to 85 percent of western pond turtles since the 1850s. The primary threat to the species is considered to be habitat loss or degradation (Buskirk 2002; Lovich and Meyer 2002). Most of the historical habitat for this species has been permanently lost as a result of development for human occupancy. Riparian and wetland habitats have been cleared for agriculture use, destroyed by cattle, channelized and stripped of vegetation, or impacted by invasive plants that degrade water quality, alters stream structure and dries streams. Gold and gravel mining can both directly destroy habitat as well as introduce toxins through toxic spills and illegal dumping of chemicals. Ground water pumping lowers water tables and further stresses riparian plant communities. Dehydration and pollution also pose a threat to turtles by making them more susceptible to disease (Vander Haegen et al. 2009; Polo-Cavia et al. 2010). Turtles of all life stages can be injured or killed by cattle occurring or vehicles operating in suitable habitat. Modern watercourse recreation also impacts these turtles. Recreational activities that interfere with basking or causes direct injury or mortality include high-speed boating, water skiing, jet skiing, and fishing where animals may be directly caught or killed because they are viewed as competition (Buskirk 2002).

Local Information

Few turtle surveys have been conducted in the Tahoe National Forest. However, the California Academy of Sciences has conducted herpetological surveys from 1997 to 1999 in areas likely to provide habitat for western pond turtles. Primarily, western pond turtle observations have been made during other aquatic surveys or other forest activity surveys. Based on Forest Service and California

Department of Fish and Wildlife databases, western pond turtles have been detected within the Tahoe National Forest boundary at over 20 sites since 1991 (figure 16).

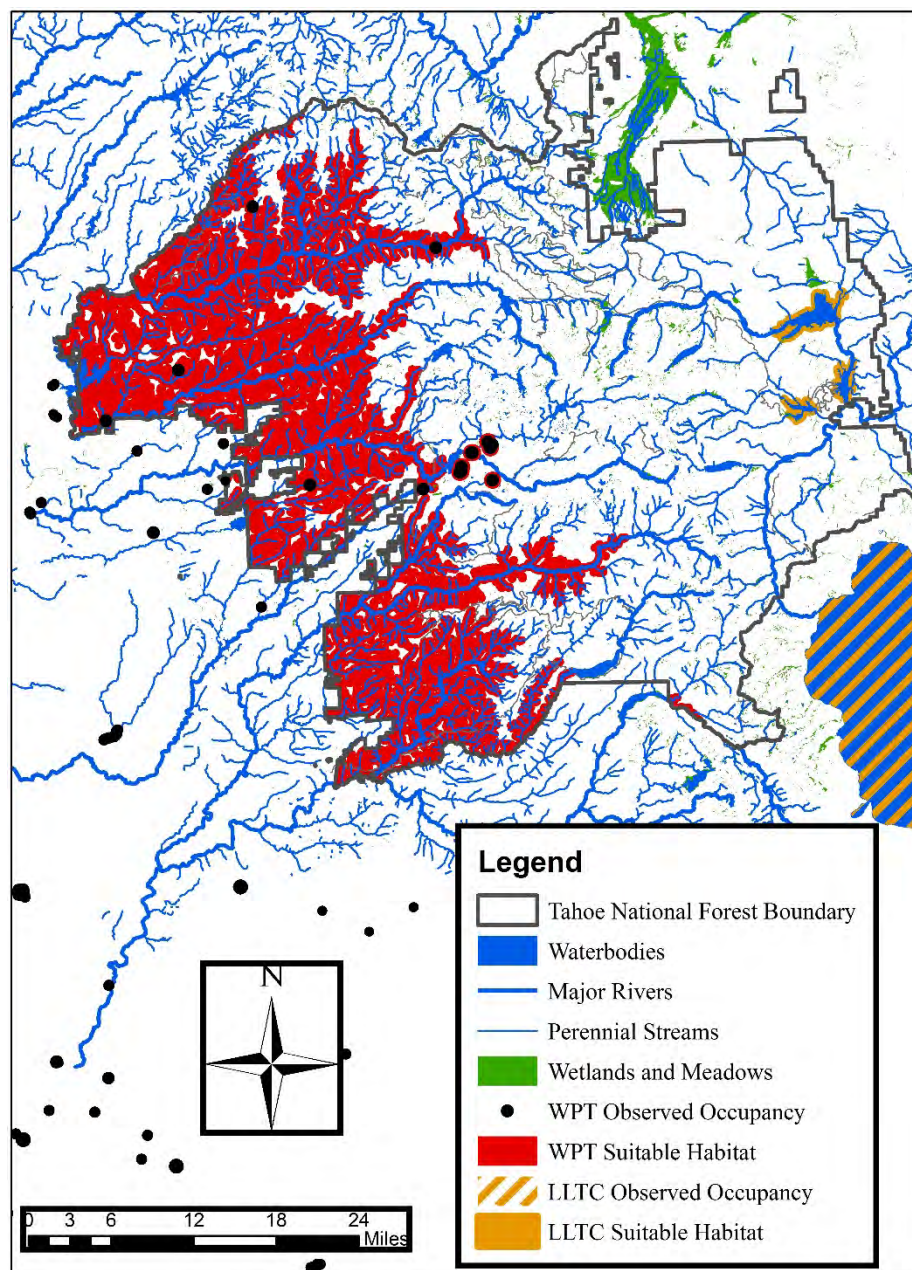


Figure 16. Location of potentially suitable habitat for the western pond turtle (WPT) and Lahontan Lake tui chub (LLTC), and where these species have been detected relative to the location of major rivers, perennial streams, waterbodies (ponds, lakes, and reservoirs), wetlands, and meadows within and near the Tahoe National Forest boundary.

All detections in the Tahoe National Forest occurred in the Yuba River Basin within mostly aquatic (i.e., ponds) and some upland habitats deemed potentially suitable for the species. In general, potentially suitable habitat was defined within the Tahoe National Forest to include perennial and intermittent streams, wetlands, ponds, and lakes on the west slope of the forest that are below 4,690 feet (1,430 meters) in elevation, and 1,640 feet (500 meters) of upland habitat surrounding

these water features to account for the species' extensive use of upland areas (Reese and Welsh 1997; Bury and Germano 2008). We also included 3,281 feet (1,000 meters) surrounding sites where turtles have been detected above 4,690 feet (1,430 meters) in elevation (a total of 10 sites clustered near Lake Spaulding) as suitable habitat. We estimated that the project area contains approximately 402,514 acres of potentially suitable western pond turtle habitat (figure 16).

Foothill Yellow-legged Frog (*Rana boylei*)

The foothill yellow-legged frog (*Rana boylei*) is listed as sensitive on the Region 5 Forester's Sensitive Species List (USDA Forest Service 2014a). Foothill yellow-legged frogs have experienced significant population declines across the majority of the known range (Hayes et al. 2016). As a result, the species is currently classified as a State Species of Special Concern by the California Department of Fish and Wildlife (CDFW 2018) and being considered for federal listing by the U.S. Fish and Wildlife Service (80 FR 19259) and state listing by the California Department of Fish and Wildlife (CDFW 2017). The Tahoe National Forest LRMP, as amended, does not provide specific management guidelines for this species. The standards and guidelines for Riparian Conservation Areas provide direction for foothill yellow-legged frog management on National Forest System lands (USDA Forest Service 2004). In 2016, a Conservation Assessment was published that provides further management direction on National Forest System lands for the species (Hayes et al. 2016).

Habitat and Life History

Historically, this frog was found across most of southwestern Oregon west of the Cascades Mountains crest south through California to Baja California (Jennings and Hayes 1994; Fellers 2005). The species is found in most of northern California west of the Cascade Mountains crest, in the Coast Ranges from the California-Oregon border south to the Transverse Mountains in Los Angeles County and along the western slope of the Sierra Nevada mountains south to Kern County. Isolated populations have been reported from the San Joaquin Valley and the mountains near Los Angeles County. Foothill yellow-legged frogs can be found from near sea level to 6,370 feet (1,940 meters) where habitat is suitable (Jennings and Hayes 1994; Figure 5). Within California, the frog occurs or may occur in all national forests except for the Cleveland, Inyo, Modoc, and Lake Tahoe Basin National Forests. Although there are numerous occupied streams, only 30 of the 213 sites in California where frogs occur have 20 or more adults (Fellers 2005; Hayes et al. 2016).

Foothill yellow-legged frogs are found in partially shaded rocky streams in a variety of habitats including: valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral and wet meadows and appear to be highly dependent on free water for all life stages (Jennings and Hayes 1994; Hayes et al. 2016). The habitat characteristics of non-breeding adult foothill yellow-legged frogs have not been fully evaluated. Leidy et al. (2009) observed a group of six adults aggregated on a vertical ledge over a meter away from water in late summer. The location of this aggregation also indicates that adults may migrate up tributaries containing large-sized boulders and bedrock to utilize the cooler air and water temperatures, and to avoid predators and high water flows (Leidy et al. 2009). Hayes et al. (2016) reported that adult frogs remain near (within 39 feet or 12 meters from) the stream channel, use watercourses as movement corridors (Bourque 2008), and that these movements are greatest in the spring when moving to and away from breeding sites (Van Wagner 1996; Wheeler et al. 2008). Overwintering behavior is poorly understood, but adults are commonly found in tributaries prior to being found in mainstem waterways. They are rarely seen more than a few meters away from water, but it remains unknown if they utilize upland areas during winter months (Kupferberg 1996; Hayes

et al. 2016). Habitat use of juvenile frogs is also largely unknown. Some evidence indicates that they potentially use smaller waterways such as springs or small tributary streams (Lind et al. 2011).

Frogs can initiate breeding during the spring when air and water temperatures increase to at least 50 degrees Fahrenheit (10 degrees Celsius) and stream flows subside (Hayes et al. 2016), and typically continues at least a month, with an average duration of 50 days between first and last egg depositions (Kupferberg 1996; Wheeler and Welsh 2008). Breeding habitat is typically classified as shallow portions of a stream with riffles containing cobble-sized or larger rocks as substrate (Jennings and Hayes 1994; Hayes et al. 2016). These streams are further defined by having low water velocities near tributary confluences in shallow reaches and are wider and shallower than non-breeding sites, have emergent rocks and are typically asymmetrical with cobble or small boulder bars (Kupferberg 1996; Wheeler and Welsh 2008). Egg attachment sites are usually cobbles or boulders, but frogs may sometimes utilize bedrock or vegetation. These sites are often on the lee side of rocks or beneath overhangs with a narrow range of low-water velocities. Coarse sediment enables frogs to choose the best oviposition site to shield egg masses from high-flows. The reproductive strategy of the foothill yellow-legged frog is well suited to rivers with predictable winter flooding and summer droughts (Kupferberg 1996). Females lay a single annual clutch of between 300 and 2,000 eggs (Jennings and Hayes 1994; Kupferberg 1996). The critical thermal maximum for embryos is approximately 78 degrees Fahrenheit (26 degrees Celsius) and eggs are typically found from 48 to 70 degrees Fahrenheit (9 to 21.5 degrees Celsius; Jennings and Hayes 1994; Kupferberg 1996). Incubation lasts between 5 and 37 days, depending on water temperature and position within the clutch. Eggs near the attachment point and eggs in the center of the clutch typically hatch later than eggs on the periphery of the clutch (Kupferberg 1996; Fellers 2005). After hatching, tadpoles move away from the egg mass. As with egg development, larval development is temperature-dependent with metamorphosis typically occurring 3 to 4 months after hatching with no documented overwintering of larvae.

Larval foothill yellow-legged frogs primarily consume algae and will preferentially graze on epiphytic diatoms as this food item allows them to grow more rapidly (Jennings and Hayes 1994). Post-metamorphs likely consume both aquatic and terrestrial insects, but there is little research on the subject (Jennings and Hayes 1994). Adult diet is thought to include: flies, moths, hornets, ants, beetles, grasshoppers, water striders and snails with a terrestrial arthropod composition of 87.5 percent insects and 12.6 percent arachnids (Fellers 2005; Hayes et al. 2016).

Threats/Management Concerns

Potential risk factors to the foothill yellow-legged frog include water development and diversion, climate change, modification or loss of habitat or habitat components from urbanization, the presence of non-native species, and mining (Hayes et al. 2016). High mortality in this species occurs during the egg and larval life stages, and mortality has been associated with alterations in hydrologic regimes and degraded water quality (Kupferberg 1996; Lind et al. 1996; Hayes et al. 2016). Loss of genetic diversity due to habitat loss or fragmentation is a major threat to foothill yellow-legged frogs. Populations that are fragmented (more than 10 kilometers (6.2 miles) apart) are prone to genetic drift when barriers such as dams may prevent dispersal between isolated populations (Dever 2007). Pesticides can also impact these frogs in both original and derived forms. Air-borne pesticides are implicated as the most significant threat to this species, especially for Sierra Nevada populations which are directly impacted by pesticide drift from the central valley (Fellers 2005). The introduced species primarily implicated to consume, compete with, or expose foothill yellow-legged frogs to parasites include smallmouth bass (*Micropterus dolomieu*), American bullfrogs (*Rana catesbiana*),

and a variety of crayfish species (*Pacifastacus spp.*; Fellers 2005; Hayes et al. 2016). Several parasites pose an additional threat to foothill yellow-legged frogs. Perhaps the most significant parasite that impacts this species is *Batrachochytrium dendrobatidis* which causes amphibian chytridomycosis. This parasite has been found in this species and has had significant impacts to the similar mountain yellow-legged frog and other amphibian species worldwide (Fellers 2005).

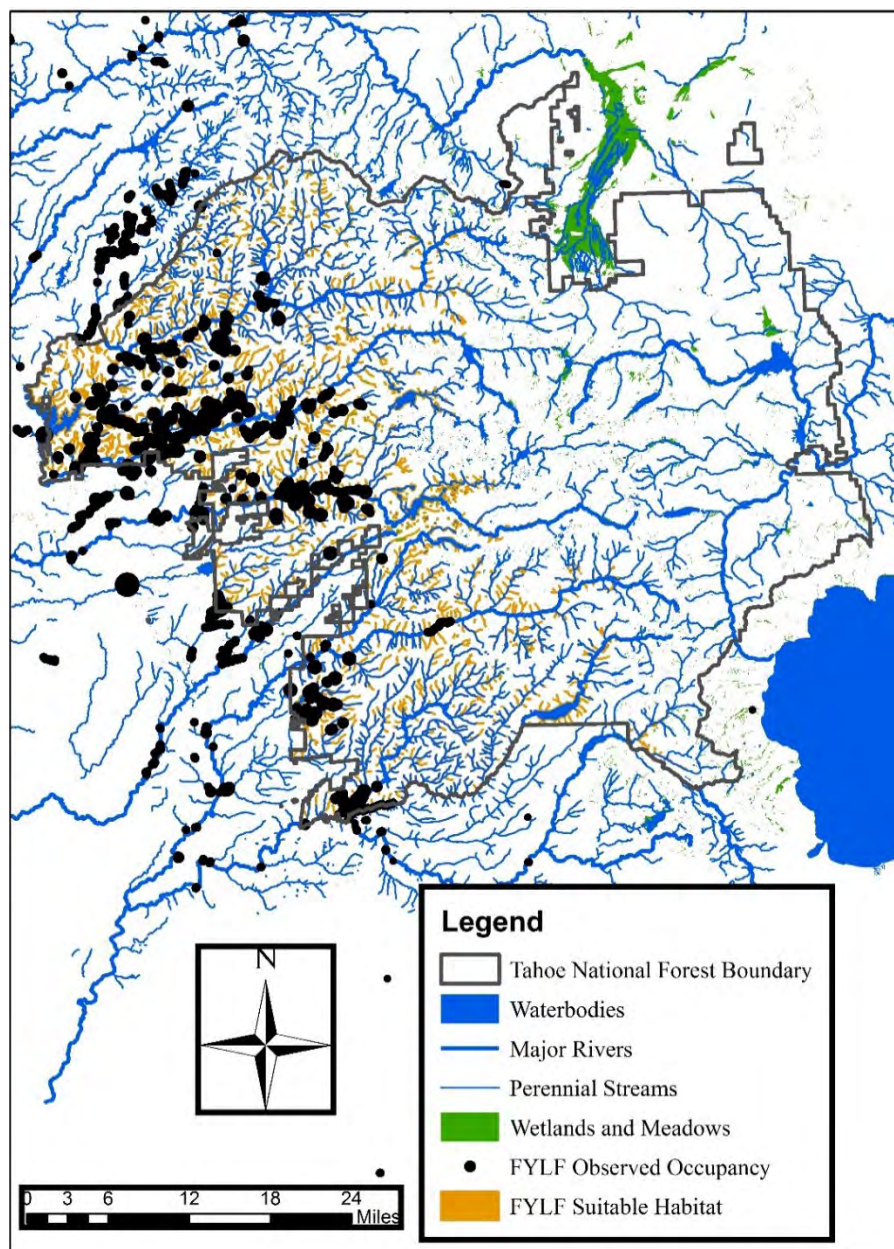


Figure 17. Locations of potentially suitable habitat for the foothill yellow-legged frog (FYLF) and where the species has been detected relative to the location of major rivers, perennial streams, waterbodies (ponds, lakes, and reservoirs), wetlands, and meadows within and near the Tahoe National Forest boundary.

Local Information

In the Tahoe National Forest, foothill yellow-legged frog surveys have been conducted in cooperation with the U.S. Geological Survey's Biological Division, Pt. Reyes from 1997 through 2000. In addition, California Academy of Sciences has conducted herpetological surveys from 1997 to 1999 in areas likely to provide habitat for foothill yellow-legged frogs. Amphibian occurrence has also been documented during fish stream surveys and other field activities. Based on Forest Service and California Department of Fish and Wildlife databases, foothill yellow-legged frogs have been detected within the Tahoe National Forest boundary at several sites occurring in suitable habitat (figure 17). In general, potentially suitable habitat was defined within the Tahoe National Forest to include perennial and intermittent streams, ponds, and lakes on the west slope of the forest that are below 6,000 feet (1,829 meters) in elevation, and 100 feet (30 meters) of upland habitat surrounding these water features to account for the species' limited use of upland areas (see Hayes et al. 2016). We estimated that the project area contains approximately 58,860 acres of potentially suitable habitat for the foothill yellow-legged frog (figure 17).

Hardhead (Mylopharodon conocephalus)

The hardhead (*Mylopharodon conocephalus*) is a minnow endemic to California and is listed as sensitive on the Region 5 Forester's Sensitive Species List (USDA Forest Service 2014a). In addition, the species is currently considered a State Species of Special Concern by the California Department of Fish and Wildlife (CDFW 2018). The Tahoe National Forest LRMP, as amended, does not provide specific management guidelines for this species. The USDA Forest Service (2004) does not present standards and guidelines for Riparian Conservation Areas associated with the hardhead, but the standards and guidelines likely provide management direction for the species.

Habitat and Life History

Hardhead are widely distributed in large undisturbed low to mid-elevation streams (up to 4,921 feet or 1,500 meters) in the main Sacramento-San Joaquin drainage as well as the Russian River drainage (Reeves 1964; Moyle and Nichols 1973; Moyle 2002; Moyle et al 2015). Their range extends from the Kern River, Kern County, in the south to the Pit River, Modoc County, in the north (Moyle et al. 2015). In the Sacramento River drainage, hardhead are present in most of the larger tributary streams as well as the Sacramento River. In the lower reaches of the South Fork Yuba River, hardhead make up a substantial portion of the fish assemblage (Gard 2002).

Most streams occupied by hardhead have summer temperatures commonly around 68 degrees Fahrenheit (20 degrees Celsius). Optimal temperatures for the species ranges between 75 to 82 degrees Fahrenheit (24 to 28 degrees Celsius; Knight 1985). Hardhead are relatively intolerant of low oxygen levels, especially at higher temperatures (Cech et al. 1990). Individuals prefer clear deep (greater than 1 meter) pools with sand-gravel-boulder substrates and slow water velocities (Moyle and Nichols 1973, Knight 1985, Moyle and Baltz 1985). In streams, adult hardhead tend to remain in the lower half of the water column, rarely moving into the upper levels (Knight 1985), while juveniles concentrate in shallow water close to the stream edges (Moyle and Baltz 1985; Moyle et al 2015). Hardhead are generally found in association with Sacramento pikeminnow (*Ptychocheilus grandis*) and Sacramento suckers (*Catostomus occidentalis*; Moyle 2002). Hardhead also tend to be absent from streams introduced with exotics, especially centrarchids (Moyle and Nichols 1973), or streams that have been severely altered by human activity (Baltz and Moyle 1993).

Hardhead mature after their second year and most likely spawn in the spring (April and May) or summer (Reeves 1964; Moyle et al. 2015). Adults occurring in large rivers may migrate to spawn in

tributary streams (Moyle et al. 1995, 2015). Although hardhead spawning has not been observed, spawning habitat likely consists of sand or gravel in riffles, runs, or heads of pools (Wang 1986; Moyle 2002). Hardhead reach 7 to 8 centimeters (3 inches) by their first year, but growth slows in subsequent years. In the American River, hardhead reach 30 centimeters (12 inches) standard length in 4 years, whereas, in Pit and Feather Rivers it takes 6 years to reach that length (Moyle et al. 2015). Hardhead largely forage for benthic invertebrates and aquatic plant material in quiet water (Moyle et al. 2015). However, individuals will occasionally feed on plankton, surface insects, crayfish, and small fish. Smaller individuals (less than 20 centimeters (8 inches) standard length) feed primarily on mayfly larvae, caddisfly larvae, and small snails (Reeves 1964).

Threats/Management Concerns

Historically, hardhead have been regarded as a widespread and locally abundant species (Moyle 2002; Moyle et al 2015). Ongoing declines of the species are the result of habitat loss, fragmentation, degraded water quality, and invasions of non-native species. Moyle et al. (2015) reported that the threats to hardhead include, but are not limited to, (1) dams and diversions, (2) agriculture, (3) urbanization, (4) instream mining, (5) stream modification for transportation, (6) fisheries management ('harvest' associated with past eradication to benefit recreational fisheries), and (7) introduced non-native species.

Local Information

Hardhead have been detected in the Yuba River immediately downstream of Bullard's Bar Reservoir, which occurs along the boundary of the Tahoe National Forest (figure 18). However, hardhead have not been detected within the Tahoe National Forest boundary. For this analysis, we defined potentially suitable habitat within the Tahoe National Forest as large rivers below 4,921 feet (1,500 meters) in elevation within the Sacramento River Basin (i.e., Yuba and American River basins; figure 18). The majority of these river reaches are occupied by either the Sacramento pikeminnow or Sacramento sucker, which are species that often co-occur with hardhead. We estimated that the project area contains approximately 147 miles of potentially suitable hardhead stream habitat (figure 18).

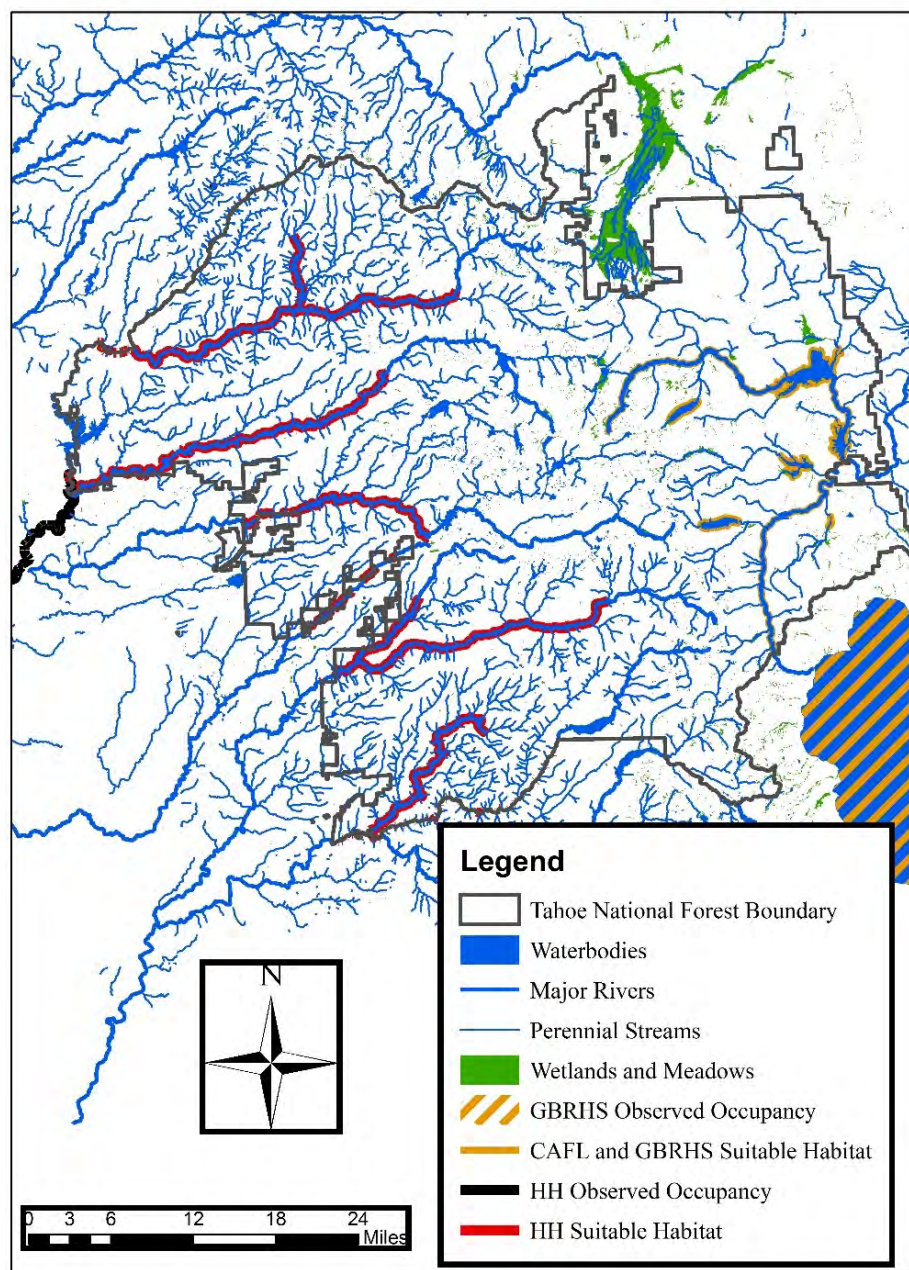


Figure 18. The location of potentially suitable habitat for the hardhead (HH), Great Basin rams-horn snail (GBRHS) and California floater (CAFL), and where these species have been detected relative to the location of major rivers, perennial streams, waterbodies (ponds, lakes, and reservoirs), wetlands, and meadows within and near the Tahoe National Forest boundary.

Lahontan Lake Tui Chub (Siphateles bicolor pectinifer)

The Lahontan Lake tui chub (*Siphateles bicolor pectinifer*) is a cyprinid subspecies that has verified populations only in Lake Tahoe (California), Pyramid Lake (Nevada), and Walker Lake (Nevada). The subspecies is listed as sensitive on the Region 5 Forester's Sensitive Species List (USDA Forest Service 2014a). In addition, the species is currently considered a State Species of Special Concern by

the California Department of Fish and Wildlife (CDFW 2018). The Tahoe National Forest LRMP, as amended, does not provide specific management guidelines for this species.

Habitat and Life History

In general, Lahontan Lake tui chub are schooling fish that grow up to 8.2 inches (21 centimeters) in standard length and inhabit large and deep lakes (Moyle 2002; Moyle et al. 2015). It is believed the species can tolerate a wide range of physicochemical water conditions based on occupying widely diverse habitats such as Lake Tahoe and Pyramid Lake (Moyle et al. 2015). In Lake Tahoe, larger fish occur in deeper water (deeper than 50 meters) during the day and move into shallower water at night (Miller 1951). It has also been noted that a seasonal migration occurs within the water column. Deeper water is often utilized during winter months, and summer months show use of shallower habitat (Snyder 1917; Miller 1951). Algal beds in shallow inshore areas seem necessary for spawning, egg hatching, and larval survival.

Lahontan Lake tui chub are long-lived and adults may exceed 30 years in age (Moyle et al. 2015). Linear growth of tui chubs occurs until about age 4; then mass is accumulated rapidly. Lahontan Lake tui chub are mid-water feeders that consume primarily zooplankton (cladocerans and copepods), but also eat benthic insects when available (Miller 1951; Marrin and Erman 1982). Adults typically reach sexual maturity once they are 11 centimeters in standard length (Miller 1951). Adults may spawn at night during the spring (Miller 1951) and are likely capable of spawning several times during a season (Moyle 2002). Spawning occurs near-shore over beds of aquatic vegetation, to which the eggs adhere (Snyder 1917). Young individuals typically remain near-shore until winter and thereafter migrate into deeper water. Based on their size, individuals are predated upon mostly by large trout, and rarely by birds and snakes (Miller 1951).

Threats/Management Concerns

Potential risk factors to the Lahontan Lake tui chub include, but are not limited to, a limited distribution paired with the existence of water pollution from urbanization and rural development, introduced species, and marshland degradation. Moyle et al. (2015) reported that the primary threat to the species is from the introduction of non-native fish and invertebrates. In Lake Tahoe, kokanee salmon (*Oncorhynchus nerka*) and opossum shrimp (*Mysis relicta*) have greatly reduced prey availability. In addition, introduced trout consume tui chub in deep and open water habitats, while introduced bass consume tui chub in shallower spawning and rearing habitats (Moyle et al. 2015).

Local Information

No Lahontan Lake tui chub have been detected in the Tahoe National Forest according to data contained in Forest Service and California Department of Fish and Wildlife databases. However, surveys targeting this species have not been conducted in the Tahoe National Forest. According to Moyle et al. (2015), populations of plankton-feeding chub occurring in Stampede, Boca, and Prosser reservoirs may be Lahontan Lake tui chub, based on behavioral and morphological similarities (Marrin and Erman 1982; Moyle et al. 1995); but genetic studies are needed to confirm species identification (Moyle et al. 2015). These lakes occur in the project area, and thus, we considered the lakes as potentially suitable and occupied habitat for the species during our analysis (figure 18).

Great Basin Rams-horn Snail (*Helisoma newberryi newberryi*)

The Great Basin rams-horn snail (*Helisoma newberryi newberryi*) is listed as sensitive on the Region 5 Forester's Sensitive Species List (USDA Forest Service 2014a). The Tahoe National Forest LRMP, as amended, does not provide specific management guidelines for this species. The USDA Forest Service (2004) does not present standards and guidelines for Riparian Conservation Areas associated with the Great Basin rams-horn snail, but the standards and guidelines likely provide management direction for the species.

Habitat and Life History

The Great Basin Rams-horn snail is a freshwater aquatic snail that occurs in a highly restrictive distribution, but is often locally abundant. Historically, the snail occurred throughout the Great Basin at sites in Wyoming, Utah, Oregon, and California. In California, the snail was known to occur in six local drainages in which the species probably survives in four of these drainages. The life history and habitat use of this species is not well understood and requires further investigation. The limited knowledge of the species is presented below.

The Great Basin rams-horn snail typically occurs in large lakes, rivers, and spring-fed streams (Frest and Johannes 1998). These snails characteristically burrow in soft mud near macrophytes and may be invisible even when abundant (Taylor 1981), which likely make them difficult to detect. Additional habitat requirements include cold, clean, and highly oxygenated water with relatively low velocity. Springs containing soft sediment and large pools are preferred, but the snail will use river margins. Individuals occur in relatively shallow water habitats in lakes and springs, but have been observed in Eagle Lake where they occurred on sandy substrate that was more than 10 feet in depth (Brim-Box et al. 2005). Like other snails, the Great Basin rams-horn snail consumes detritus (Frest and Johannes 1996). The Great Basin ram-shorn snail can co-occur with other mollusks including *Pisidium ultramontanum*, *Lanx klamathensis*, *Juga acutifilosa*, and *Fluminicola seminalis* (Frest and Johannes 1996).

Threats/Management Concerns

Threats to this species include, but are not limited to, water diversions changing flow regimes and pollution (e.g., eutrophication) from urban, agriculture, and industrial land use. Mitigations for desirable fish species, such as adding spawning gravels, may also harm this species by smothering soft mud habitats.

Local Information

Historically, the Great Basin rams-horn snail has been observed in the Truckee River directly downstream of Lake Tahoe within the Lake Tahoe Basin Management Unit. Currently, this snail has not been sighted or surveyed for in the Tahoe National Forest. Based on what is known about the species and the lack of surveys conducted within the Tahoe National Forest, we considered the Truckee and Little Truckee Rivers along with the lakes on the east slope of the forest (i.e., Donner Lake, Boca Reservoir, Stampede Reservoir, Independence Lake, Prosser Reservoir, Martis Creek Reservoir) to be potentially suitable Great Basin rams-horn snail habitat. As a result, we estimated that the project area contains approximately 45 miles of stream and 6 lakes as potentially suitable habitat (figure 18).

California Floater (*Anodonta californiensis*)

The California floater (*Anodonta californiensis*) is listed as sensitive on the Region 5 Forester's Sensitive Species List (USDA Forest Service 2014a). The Tahoe National Forest LRMP, as amended, does not provide specific management guidelines for this species. The USDA Forest Service (2004) does not present standards and guidelines for riparian conservation areas associated with the California floater, but the standards and guidelines likely provide management direction for the species.

Habitat and Life History

The type locality of this species is the "Rio Colorado, a former tributary of the river, New River, Imperial County, California" (Taylor 1981). Historically, this species was distributed on the lower Willamette and lower Columbia Rivers in Oregon and Washington. In addition, individuals occurred in larger slow streams of northern California south to the northern San Joaquin Valley (Frest and Johannes 1995). The current distribution indicates this species has probably been eliminated from much of its former range (Taylor 1981). It is apparently extinct in the upper Sacramento River and appears to be extinct in Utah, with a limited distribution in Arizona. The current known distribution in California includes the Lassen, Modoc, and Shasta-Trinity National forests. The species has been reported to occur in the Truckee River within Nevada, based on records contained in the Nevada Natural Heritage Database.

The California floater is a freshwater mussel found in fairly large lakes and rivers containing muddy or sandy substrates and slow currents (Taylor 1981; Frest and Johannes 1995). Howard and Cuffey (2003) found that the California floater was almost exclusively found in pools and in very few in runs in the south fork of the Eel River in Oregon. Adults may occur in complex side channels to avoid stranding or displacement after or during high flow events, respectively (Spring Rivers Ecological Sciences 2007).

Individuals can live up to 10 to 20 years and may reach sexual maturity in 7 years. The species may be capable of spawning throughout the year (Spring Rivers Ecological Sciences 2007). Females can produce multiple consecutive broods and have been observed to release their glochidia (mussel larvae) in mucous threads to entangle nearby fishes. At the point of contact, the glochidia attach to the gills, fins, and body of their fish hosts to begin parasitism. In general, the California floater is not considered a host-specific species because their glochidia have been observed to encyst on variety of fish species (Spring Rivers Ecological Sciences 2007). There is some evidence that the California floater may abort egg masses and prematurely become non-gravid when water temperatures approach 81.1 degrees Fahrenheit (27.3 degrees Celsius; Spring Rivers Ecological Sciences 2007).

Threats and Management Concerns

In general, California floater distribution has been severely restricted and fragmented, based on populations becoming extirpated from most of California and several other states. Similar to most aquatic mussels, threats to this species include, but are not limited to, water diversions changing flow regimes, dam construction, and pollution (e.g., eutrophication, sedimentation) from urban, agriculture, and industrial land use (see Furnish and Monthey 1998). Based on having relatively thin shells, California floaters may be more susceptible to predation and desiccation while stranded (Matteson 1955; Spring Rivers Ecological Sciences 2007).

Local Information

Recent surveys targeting the California floater were conducted at 250 sites within the Lassen, Plumas, Tahoe, and Eldorado National Forests and the Lake Tahoe Basin Management Unit. To date, no living specimens have been observed on National Forest System lands within the boundary of the Tahoe National Forest. However, Donner Lake is reported as the locality of an unconfirmed sighting recorded in a mollusk database created by Dr. Jayne Brim-Box and Jeff Kershner. During 2006, empty floater (*Anodonta spp.*) shells were observed in Donner Lake at a depth of 30 feet while SCUBA diving, indicating their recent presence in the lake, or perhaps its tributaries. Based on the uncertainty surrounding the species' occupancy within the Tahoe National Forest, we considered the Truckee and Little Truckee Rivers along with the lakes on the east slope of the forest (i.e., Donner Lake, Boca Reservoir, Stampede Reservoir, Independence Lake, Prosser Reservoir, Martis Creek Reservoir) to be potentially suitable California floater habitat. As a result, we estimated that the project area contains approximately 45 miles of stream and 6 lakes as potentially suitable habitat (figure 18).

Environmental Consequences

Effects Common to All Alternatives

In general, the differences in the alternatives would result in mostly small differences in the degree of possible effects. Therefore, each alternative's effects described below will mainly summarize the extent of aquatic resources affected, and provide the basis for determinations.

Direct and Indirect Effects

Direct effects are caused by the action and occur at the same time as the action wherever the action occurs, which instantaneously affects individuals of a species. Potential direct effects of designated OSV use on fish, amphibians, and other aquatic species considered in this analysis included injury or mortality from collision and harassment from noise disturbance (Bowles 1995; Dooling et al. 2015; Lima et al. 2015).

The risk of OSVs colliding with or crushing aquatic animals is likely low for semi-aquatic species (amphibians and western pond turtle) and discountable for completely aquatic species (fish and aquatic invertebrates). OSVs would have to travel in and through water to collide with fish and other fully aquatic species (Lima et al. 2015). This was considered to be unlikely based on the assumption that OSV operators would avoid riding in streams (i.e., in the water column below snow or ice cover) to prevent damaging their OSVs. In addition, semi-aquatic species are typically dormant and less active during the majority of the OSV season of use, limiting the risk of being crushed by OSVs. However, most amphibians become immobile if they are frightened or stressed, which makes them more susceptible to OSV collisions. In addition, some semi-aquatic animals may overwinter in upland habitat underneath the snow or may travel over the melting snow during the spring breeding season (Pope and Matthews 2001; Vredenburg et al. 2005), which makes them at risk of coming in contact with OSVs. If OSVs collide or make contact with semi-aquatic animals in occupied habitat, individuals can become injured and stressed or killed from the impact or from being crushed by the OSV or compaction of the snow under the OSV. Wildlife Resource Consultants (2004) observed that OSVs operating in the Sierra Nevada had compacted the snow and often reduced the amount of space between the soil and snow or ice in areas devoid of woody vegetation, which suggests that semi-aquatic animals overwintering in these habitats (e.g., wet meadows) can be affected. Injured or stressed individuals can have reduced rates of survival and fitness (Gabrielson and Smith 1995).

Currently, there is considerable uncertainty how and to what extent fish may be affected by noise disturbance, thus we relied on the results of research largely conducted on other wildlife (Dooling et al. 2015). Noise generated from OSVs can affect aquatic animals by interfering with auditory communication, increasing stress, and altering behavior, which may negatively affect fitness and reproductive success (Bowles 1995; Gabrielson and Smith 1995; Dooling et al. 2015; Lima et al. 2015). The effects of noise generated from OSV use are likely minimal if the exposure to an individual is not recurring regularly and prolonged or if the individual has been habituated to the disturbance (Bowles 1995). Because few or no new designated trails or cross-county areas are being proposed relative to the existing condition (see alternative 1), individuals that over-winter in or near OSV designated areas may be already exposed and possibly habituated to the OSV-related noise disturbances during the winter. In general, the effect of noise disturbance was considered negligible in designated cross-country OSV use area based on OSV use being more dispersed. Conversely, OSV use along designated trails may subject primarily semi-aquatic animals to repeated noise disturbance, and thus, was considered in species-specific analyses. Indirect effects are caused by the action and occur later in time or are farther removed in space. Potential indirect effects of designated OSV use on fish, amphibians, and other aquatic species considered in this analysis, common to most alternatives, included ground disturbance, snow compaction, and chemical pollution, which can influence aquatic animal species by impacting their habitat. None of the alternatives involve the construction of structures that could impede or redirect flood flows, nor any ground surface modifications that could change drainage patterns, impervious surfaces, soil permeability, or surface water volumes.

Ground Disturbance and Snow Compaction

Snow compaction and soil disturbance related to OSV use would likely indirectly and insignificantly affect aquatic animal species through delaying snowmelt, reducing or degrading subnivean habitats, and increasing erosion into the aquatic environment. Wildlife Resource Consultants (2004) observed that OSVs operating in the Sierra Nevada had compacted the snow and reduced the amount of space between the soil and snow or ice in areas containing low snow cover and no woody vegetation. This suggests that semi-aquatic animals overwintering in these areas (e.g., wet meadows) can experience small-scale reductions in subnivean habitat availability. We presume this effect is mostly discountable, because it would likely occur along heavily used designated OSV trails where semi-aquatic animals are unlikely to be overwintering in subnivean habitats.

Although snowmobiles and other OSVs exert relatively low ground pressure, studies have found that snowmobiles compact snow, and this can delay snowmelt by up to 2 weeks (Neumann and Merriam 1972; Keddy et al. 1979). Snow compaction can reduce the ability of the snow to melt and run off slowly, which can alter the flow regime in streams at local scales. Because OSV use would likely not be heavily concentrated throughout the designated OSV use areas (i.e., would be dispersed and mostly concentrated along the trails), widespread snow compaction is unlikely. As a result, measureable changes in hydrology on a watershed scale are not expected because snow compaction from OSV use would likely not affect an entire watershed (McNamara 2017).

Changes in marsh or wetland vegetation communities from OSV use has not been documented (Keddy et al. 1979; Wildlife Resource Consultants 2004). Further, the current and proposed OSV designated trails within the Tahoe National Forest are underlain by existing roads and trails that are already compacted and/or disturbed, and little, if any, additional impacts are expected to the vegetation. Davidson (2017) concluded that vegetation trampling from snowmobiles and potential

impacts to riparian resources from OSV use in the Tahoe National Forest would be discountable and extremely unlikely to occur with adequate snow cover.

Disturbance to soil can also be caused by OSV use, but the disturbance or damage to soil is much more likely when OSV use is concentrated and occurs under low snow conditions (Fahey and Wardle 1998). Although OSV use is avoided on bare soil or ground, based on current regulations and management guidelines, OSV tracks have a capacity to break through thin snow cover, disturb soil, and create isolated ruts in the trail surface (McNamara 2017), especially after repeated passes that may displace snow cover. McNamara (2017) reported that “modern OSVs with deep lugs on their treads can easily displace 4 inches of snow each pass, depending on snow moisture amounts.” These ruts can channelize surface runoff and the churned soil can become mobilized, leading to increases in stream sedimentation. Thus, the minimum snow depth requirements equal to or exceeding 6 inches are expected to prevent or minimize damage to soil and vegetation (Davidson 2017; McNamara 2017). However, there may be some risk of inadvertent and isolated disturbance to soils when OSV use occurs during the fall or spring when snow depths vary such as on high wind-exposed ridges or southern-facing slopes and are below 4 to 6 inches in some locations along travel pathways.

McNamara (2017) reported that cross-country use of OSVs would have a discountable effect on ground disturbance that could lead to erosion and measurable increases in sedimentation in streams, based on dispersed use coupled with the assumption that operators would avoid bare soils in fear of damaging their OSV. Based on the limited amount of OSV-related monitoring conducted in the Tahoe National Forest (see table 89), no measurable effects on aquatic resources, riparian systems, or meadows have been observed within the American River Ranger District during one heavy snow year. Although the monitoring results may be biased to an unknown degree (data being collected in one area in one district during one year), the monitoring results are largely supported by the OSV-related research conducted within the Yellowstone National Park where OSV use is higher, more concentrated, and was still found to not impair water quality (see Olliff et al. 1999).

In general, trail grooming within the Tahoe National Forest occurs over an existing road and trail network and would likely not alter landforms or result in significant soil disturbance that would change water flow patterns or erosion. McNamara (2017) reported that trail grooming would not cause substantial impacts to water quality, perennial, intermittent or ephemeral streams, wetlands or other bodies of water because grooming would occur on existing trails or roads only when there is 12 to 24 inches of snow cover among the alternatives. As a result, the effects from trail grooming were considered discountable.

Ground Disturbance and Snow Compaction Effects Summary

The effects from OSV-related snow compaction and surface disturbance are more likely to occur along designated OSV trails compared to areas open to cross-country OSV use because OSV use would be more concentrated. Outside the designated OSV trail corridors, 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. Although snow compaction along designated OSV trails may occur, its impact to aquatic species or their habitats is likely negligible based on, in part, snow compaction not occurring throughout an entire watershed. Because soil disturbance is expected to only inadvertently occur along OSV designated trails in isolated locations when snow cover is less than 4 to 6 inches, we presume that measurable increases in erosion and stream sedimentation would not occur for alternatives 2 through 5 based on requiring 6- to 24-inch minimum snow depths for OSV use. We also presume that measurable increases in stream sedimentation would be minimal for alternative 1, because the trails are largely distributed among

multiple watersheds and OSV operators may voluntarily restrict use when there is less than 6 inches of snow cover to avoid damaging their equipment. Therefore, snow compaction and surface disturbance were not considered further in this analysis as a reasonably foreseeable source of indirect effects to aquatic animal species.

Chemical Pollutants

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. However, 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 within the Tahoe National Forest (considerably less than those observed in Yellowstone National Park) are not expected to impair water quality (McNamara 2017).

Outside the designated OSV trail corridors, 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 further in this analysis as a potential 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 within the Tahoe National Forest at OSV trailheads are less than OSV use levels occurring at Yellowstone during the study period, McNamara (2017) determined that water quality is not and would not be impaired by the project alternatives.

The alternatives of the project are expected to have discountable effects to water quality and fish because OSV use within the Tahoe 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 Adams (1975) support this contention. Adams (1975) stated 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 generally not expected to result in the death of any federally listed or sensitive aquatic animal species within the Tahoe National Forest based on the studies described and the findings related to water quality impacts. Therefore, the level of effect to federally listed or sensitive aquatic animal species from OSV pollutants is expected to be minimal.

Table 89. Tahoe National Forest 2011 OHV/OSV monitoring and management program: 2011 monitoring results

Monitoring Accomplishments	Results	Were Objectives and Success Criteria Met?
American River Ranger District OSV Monitoring of Aquatic Resources	Groomed OSV routes along the Foresthill Divide were monitored for resource damage during low-snow conditions over wetlands, riparian areas, and streams. No resource damage to aquatic resources was observed. An exceptionally deep snowpack in winter/spring 2011 contributed to the protection of aquatic resources.	Yes, monitoring determined OSV use in relation to aquatic resources. No effects to aquatic resources were identified and no management actions are needed.

Effects to Specific Aquatic Species

California Red-legged Frog (*Rana draytonii*)

Direct and Indirect Effects (All Alternatives)

Direct effects from OSV-related collisions and noise disturbance could occur during dispersal activities when adults move over snow during the spring within occupied habitat. Bulger et al. (2003) found that migrating adults may make long short or long distance movements (650 feet to 1.7 miles) between aquatic sites during the wet season. Within the Tahoe National Forest, only designated critical habitat areas were considered occupied by the species. There are no proposed designated OSV trails within California red-legged frog designated critical habitat for any of the alternatives. Alternatives 2, 3, and 5 would have no acres open to cross-country OSV use inside designated critical habitat within the Tahoe National Forest (table 90). There are approximately 923 acres of critical habitat occurring in designated cross-county OSV use areas for both alternatives 1 and 4. However, the probability of OSV vehicle collision under alternatives 1 and 4 was considered low and discountable for the following reasons:

1. California red-legged frog occupied critical habitats would not be affected by concentrated OSV use along designated trails, thus the risk of collision and noise disturbances would be very low.
2. California red-legged frogs breed at temperatures above freezing and in snow-free areas where OSV use is unlikely to occur. Populations are typically found at elevations below about 3,500 feet.
3. California red-legged frogs typically breed in snow-free areas in pond and stream pools exceeding 0.7-meter (28-inch) depths in areas away from any roads or trails and where OSV use would generally occur.
4. Cross-country OSV operators generally avoid travel over bare ground or soil because it is prohibited and can damage their machines.

Approximately 62,473 and 47,213 acres of suitable habitat for the California red-legged frog can be affected by designated OSV use associated with alternatives 1 and 4, respectively (table 91). This equates to more than 45 percent of suitable habitat in the Tahoe National Forest (figure 13).

Considerably less suitable habitat (between 2,065 and 2,843 acres) can be affected by designated OSV use associated with alternatives 2, 3, and 5, which equates to less than 3 percent of suitable habitat in the Tahoe National Forest. Alternative 2 has the least amount of suitable habitat acreage within areas open to cross-country OSV use (table 91). However, the acreage of suitable habitat affected by OSV trails is the highest for alternative 2 relative to the other alternatives because it has a greater mileage of designated OSV trails within lower elevations.

In general, it is unlikely that OSV use would measurably affect suitable habitat. McNamara (2017) concluded that water quality would not be impaired by any of the alternatives. Therefore, it is expected that OSV-related pollutant concentrations or sedimentation would be insignificant and would not impair suitable California red-legged frog habitat. However, the indirect effects from pollution and surface disturbance may have some risk of isolated negative effects to suitable habitat along designated OSV trails associated with alternative 1 based on having no minimum snow depth requirements. The risk of these effects would be negligible for the other alternatives because the

other alternatives would prohibit OSV use when snow cover is less than 6 inches in depth. The risk of degrading California red-legged frog habitat is the lowest under alternative 5 based on requiring the deepest minimum snow depth for OSV use (24 inches) and having the least total amount of suitable habitat that could be affected by designated OSV use within designated cross-country areas and trails.

Critical Habitat

There are a total of 2,406 acres of California red-legged frog critical habitat within the Tahoe National Forest (figure 13). These acres are contained within the NEV-1 and PLA-1 critical habitat subunits (75 FR 12816). There are no proposed designated OSV trails within California red-legged frog designated critical habitat for any of the alternatives (table 91). Therefore, there would be no effect of OSV trail use to aquatic breeding or non-breeding habitat, dispersal habitat, or upland habitat within California red-legged frog critical habitat designated areas.

Table 90. Amount of critical habitat (acres) for the California red-legged frog that occurs within the project's effect boundary for each project element among the alternatives

Project Elements	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated Cross-country OSV Use Areas	923	0	0	923	0
Designated OSV Trails	0	0	0	0	0

Table 91. Amount of potentially suitable habitat (acres) for the California red-legged frog not within designated critical habitat that occurs within the project's effect boundary for each project element among the alternatives

Project Elements	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated Cross-country OSV Use Areas	62,473	2,065	2,843	47,213	2,081
Designated OSV Trails	167	340	40	107	57

Alternatives 2, 3, and 5 have no acres open to cross-country OSV use inside designated critical habitat within the Tahoe National Forest (table 90). For alternatives 2, 3, and 5, critical habitat is over 5 miles in distance to the nearest open OSV use area. For alternatives 1 and 4, a total of 923 acres or approximately 38 percent of the total acres of critical habitat within the Tahoe National Forest occurs within areas open to cross-country OSV use (table 90).

In general, cross-country OSV use during the winter is not expected to result in measurable habitat disturbance for any alternative because OSV use would be dispersed, not occur on bare soil or ground based on current regulations, and not compact snow with enough intensity and repetition to measurably affect ground vegetation or the hydrologic regime. However, there is less risk of incidental and isolated ground disturbance under alternative 4, based on having a minimum snow depth requirement. The implementation of water quality best management practices would further ensure controls to avoid resource damage within the occupied critical habitat in the Tahoe National Forest. Additionally, it is likely that most OSV operators would not ride with less than adequate snow depth to prevent damage to their OSVs. As a result, none of the alternatives are expected to adversely affect designated critical habitat for the California red-legged frog. Continued monitoring procedures by recreation and forest staff, law enforcement, and investigation officers would further add to a better understanding of the relation between OSV use and aquatic habitats, and help facilitate better resource protection.

Cumulative Effects

Historically, California red-legged frogs have been affected by habitat degradation caused by increases in anthropogenic development and activities including the development of roads, urbanization, agriculture, mining, timber harvest, and non-native invasive species (USDI Fish and Wildlife Service 2002). There are many past, ongoing, and reasonably foreseeable projects identified by the Tahoe National Forest which may degrade the species habitat by causing ground disturbance (sedimentation), affecting riparian vegetation communities and introducing pollutants to surface waters within the forest. These activities include, but are not limited to, ancillary snow plowing at the established OSV trailheads, livestock grazing, timber harvest, fuels reduction, woodcutting activities, wildfire suppression, and recreation including camping, non-motorized winter recreational activities, and use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. In general, the Forest Service utilizes BMPs in compliance with the Clean Water Act to minimize water quality impacts. Further, the Tahoe National Forest monitors roads and trails used for OSVs and implements BMPs as needed to control erosion and other effects. Projects whose BMP monitoring shows results that are not effective are addressed and improved.

Although the risk of degrading California red-legged frog habitat is greatest under alternative 1 and lowest under alternative 5, none of the alternatives would result in measurable, irreversible or irretrievable effects to soil, water, aquatic, or riparian resources (McNamara 2017). Despite habitat occurring in the effect boundaries for every alternative, there would be only be incidental and isolated ground disturbance, negligible risk of vegetation damage, and negligible effects from exhaust pollution. Because all the alternatives are expected to have minimal direct or indirect effects on the California red-legged frog and its habitat, the alternatives would likely have no measurable negative cumulative effects on the viability of the California red-legged frog or its habitat in combination with ongoing, future, and past activities.

Sierra Nevada Yellow-legged Frog (*Rana sierrae*)

Direct and Indirect Effects (All Alternatives)

Direct effects from OSV-related collisions and noise disturbance could occur when adult Sierra Nevada yellow-legged frogs disperse over snow during the spring thaw period within occupied habitat (Pope 1999; Pope and Matthews 2001; Vredenburg et al. 2005). There is little risk of direct effects while individuals overwinter and during the breeding season. In general, individuals of all life stages overwinter in deep lakes or pools with undercut banks that provide cover (Martin 1992) and breeding occurs after the spring thaw period (Vredenburg et al. 2005).

Within the Tahoe National Forest, we presumed that suitable habitat in and outside of designated critical habitat was occupied based on the spatial extent of historical detections (Figure 14). All alternatives have designated OSV trails and cross-country areas within suitable (presumed occupied) habitat (table 92 and table 93). There are 8,141 to 33,458 acres of suitable habitat in designated cross-country areas and 277 to 420 acres of suitable habitat in the effect boundary of the designated trails among all the alternatives (table 92 and table 93). Because cross-country OSV use would likely be dispersed, the risk of direct effects from these activities was considered to be negligible. However, the risk of frogs being affected by collisions and noise disturbances from concentrated OSV use along designated trails was considered to be moderate. This risk did not vary among the alternatives because little variability exists for the amount of habitat potentially affected by trails among the alternatives. If OSVs collide with or come near adult Sierra Nevada yellow-legged frogs, individuals can become stressed, injured, and/or killed from the contact with or noise disturbance from the OSVs.

traveling along designated trails (Bowles 1995; Gabrielsen and Smith 1995; Lima et al. 2015). This would result in the direct harassment, harm, injury or death of individuals from the designated OSV trail activities.

Approximately 33,500 and 31,550 acres of suitable habitat for the Sierra Nevada yellow-legged frog could potentially be affected by designated OSV use associated with alternatives 1 and 4, respectively (table 92 and table 93). This equates to approximately 46 to 49 percent of suitable habitat in the Tahoe National Forest. Between 8,141 and 23,981 acres of suitable habitat could potentially be affected by designated OSV use associated with alternatives 2, 3, and 5. Alternative 3 would have the least amount of suitable habitat acreage within areas open to cross-country OSV use (table 92 and table 93), which equates to approximately 12 percent of suitable habitat in the Tahoe National Forest (figure 14). In general, little variation exists among alternatives relative to the amount of habitat that can be affected by designated OSV trails. A total of 277 to 420 acres of presumed occupied habitat occur in the effect boundary of the designated trails among the alternatives (table 92 and table 93).

Table 92. Amount of potentially suitable habitat (acres) for the Sierra Nevada yellow-legged frog not within designated critical habitat that occurs within the project's effect boundary for each project element among the alternatives

Project Elements	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated Cross-country OSV Use Areas	25,560	16,861	6,244	23,959	12,565
Designated OSV Trails	329	340	235	306	251

Similar to the indirect effects described for the California red-legged frog, it is unlikely that OSV use would measurably affect Sierra Nevada yellow-legged frog suitable habitat, thus indirect effects were considered to be discountable. McNamara (2017) concluded that water quality would not be impaired by any of the alternatives. Therefore, it is expected that OSV-related pollutant concentrations or sedimentation would be insignificant and would not impair suitable frog habitat. Cross-country OSV use during the winter is not expected to result in measurable habitat disturbance for any alternative because OSV use would be dispersed, not occur on bare soil or ground based on current regulations, and not compact snow with enough intensity and repetition to measurably affect ground vegetation or the hydrologic regime. In addition, designated OSV trails among the alternatives would be underlain by existing roads or trails which likely do not provide suitable habitat for the Sierra Nevada yellow-legged frog. However, the indirect effects from pollution and surface disturbance may have some risk of isolated negative effects to suitable habitat along designated OSV trails associated with alternative 1 based on having no minimum snow depth requirement. The risk of these effects would be negligible for the other alternatives because the other alternatives would prohibit OSV use when snow cover is less than 6 inches in depth. The risk of degrading Sierra Nevada yellow-legged frog habitat is the lowest under alternatives 3 and 5, based on having the least amount of suitable habitat that could be affected by designated OSV use and requiring the deepest minimum snow depth for OSV use (18 or 24 inches).

Critical Habitat

There are a total of 157,764 acres of critical habitat designated for the species within the Tahoe National Forest. These affected acres are within critical habitat subunits 2B, 2C, 2D and 2E (81 FR 59045). Approximately 19,358 acres of the designated critical habitat was considered suitable

habitat. Between 22 and 58 percent of the acres designated as critical habitat within the Tahoe National Forest would potentially be affected by the alternatives (table 93). All alternatives have designated OSV trails and cross-country areas in suitable habitat within designated critical habitat (table 93). There are 1,897 to 7,898 acres of suitable habitat within designated critical habitat in designated cross-country areas and 42 to 91 acres of suitable habitat within designated critical habitat in the effect boundary of the designated trails among all the alternatives (table 93). Alternative 3 would affect the least amount of suitable critical habitat acreage within designated trail effect boundaries and cross-country areas open to OSV use (table 93), which equates to approximately 10 percent of suitable habitat within designated critical habitat occurring in the Tahoe National Forest. Alternatives 1 and 4 have nearly identical acreages of critical habitat in their designated OSV use areas and affect the most critical habitat relative to the other alternatives.

As described earlier, it is unlikely that OSV use would measurably affect Sierra Nevada yellow-legged frog habitat under any of the alternatives, thus indirect effects on critical habitat including principle constituent elements would be discountable. The use of OSVs during the winter is not expected to result in habitat disturbance because minimum snow depths and restriction of OSV use that causes resource damage are expected to be sufficient to prevent any measurable impacts to frog habitat. However, snow depth requirements vary by alternative, therefore alternatives requiring the greatest snow depths (alternatives 3 and 5) would likely have the least risk to aquatic habitat impacts compared to the alternatives 1, 2, and 4, with alternative 1 likely having the greatest risk to Sierra Nevada yellow-legged frog habitat.

The implementation of water quality best management practices would further ensure controls to avoid resource damage in the future within the occupied critical habitat in the Tahoe National Forest. Additionally, it is likely that most OSV operators would not ride with less than adequate snow depth to prevent damage to their OSVs. As a result, none of the alternatives are expected to adversely affect areas designated as critical habitat for the Sierra Nevada yellow-legged frog. Continued monitoring procedures by recreation and forest staff, law enforcement, and Investigation Officers would further add to a better understanding of the relation between OSV use and aquatic habitats, and help facilitate better resource protection.

Table 93. Amount of critical habitat and potentially suitable critical habitat (acres) for the Sierra Nevada yellow-legged frog that occurs within the project's effect boundary for each project element among the alternatives

Project Elements	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Critical Habitat					
Designated Cross-country OSV Use Areas	91,248	78,253	41,786	87,047	34,434
Designated OSV Trails	1,142	938	789	996	946
Potentially Suitable Critical Habitat					
Designated Cross-country OSV Use Areas	7,898	7,120	1,897	7,580	3,438
Designated OSV Trails	91	63	42	70	70

Cumulative Effects

Historically, Sierra Nevada yellow-legged frogs have been affected by diseases and habitat degradation attributed to non-native invasive species, agriculture, grazing, timber harvest, and urbanization (USDI Fish and Wildlife Service 2002). Wildfires are unforeseeable events that may directly impair water quality until vegetation recovers. Additionally, a changing climate may result in less high mountain meadow habitat and more frequent droughts in the Sierra Nevada, decreasing the quantity and quality of aquatic habitat depending on many factors. This could cumulatively contribute to the direct and indirect effects to the Sierra Nevada yellow-legged frog by decreasing suitable habitat and stressing existing populations. However, it is impossible to quantify changes in habitat or populations in the project area based on the uncertainty of exactly where, what, and when climatic changes could occur in the project area.

There are many past, ongoing, and reasonably foreseeable projects identified by the Tahoe National Forest which may degrade the species habitat by causing ground disturbance (sedimentation), affecting riparian vegetation communities, introducing pollutants to surface waters within the forest, and introducing additional non-native fish. These activities include, but are not limited to, state fish stocking, ancillary snow plowing at the established OSV trailheads, livestock grazing, timber harvest, fuels reduction, woodcutting activities, wildfire suppression, and recreation including camping, non-motorized winter recreational activities, and use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. In general, the Forest Service utilizes BMPs in compliance with the Clean Water Act to minimize water quality impacts. Further, the Tahoe National Forest monitors roads and trails used for OSVs and implements BMPs as needed to control erosion and other effects. Projects whose BMP monitoring shows results that are not effective are addressed and improved.

Although the risk of degrading Sierra Nevada yellow-legged frog habitat is greatest under alternative 1 and lowest under alternatives 3 and 5, none of the alternatives would result in measurable, irreversible or irretrievable effects to soil, water, aquatic, or riparian resources (McNamara 2017). Despite habitat occurring in the effect boundaries for every alternative, there would be only be incidental and isolated ground disturbance (associated with alternative 1), negligible risk of vegetation damage, and negligible effects from exhaust pollution. Because all the alternatives are expected to have limited direct and minimal indirect effects on the Sierra Nevada yellow-legged frog and its habitat, the alternatives would likely have no measurable negative cumulative effects on the viability of the Sierra Nevada yellow-legged frog, or its suitable or critical habitat in combination with ongoing, future, and past activities occurring on Federal, State, or private lands.

Lahontan Cutthroat Trout (*Oncorhynchus clarkii henshawi*)

Direct and Indirect Effects

The direct effects to Lahontan cutthroat trout from designated OSV use would be discountable for all alternatives. In general, OSVs would have to travel in and through water to collide with individuals (Lima et al. 2015). This was considered to be highly unlikely based on the assumption that OSV operators would likely avoid riding in streams (i.e., in the water column below snow or ice cover) to prevent damaging their OSVs and comply with existing regulations (e.g., 36 CFR part 261.15). Further, no designated OSV use areas occur over any lakes or reservoirs, which eliminates any risk of collision and reduces the likelihood of individuals being affected by OSV-related noise disturbance. Because no designated OSV trail use would occur near any occupied stream and lake or

reservoir for any of the alternatives within the Tahoe National Forest (table 94), there is only discountable risk of individuals being harassed by noise generated from OSV use.

A total of 10.8 stream miles and 12 lakes or reservoirs were considered to be suitable and occupied by Lahontan cutthroat trout within the Tahoe National Forest (figure 15). In general, no occupied lakes or reservoirs would be affected by any OSV use under alternatives 1, 2, 4, and 5. However, approximately 0.4 shoreline miles occurring in Boca Reservoir would potentially be affected by OSV trail use for alternative 3. Less than 0.1 miles of Lahontan cutthroat trout streams would be affected by OSV trail use under alternatives 1, 2, 4 and 5, and no streams would be affected by OSV trail use under alternative 3. Less than or equal to 1 stream mile of occupied habitat within the species' native range and less than or equal to 3.3 stream miles of occupied habitat outside of the species' native range would be affected by cross-country OSV use among the alternatives (table 94).

Alternative 3 has the least amount of occupied habitat (0.4 shoreline mile in Boca Reservoir) within areas open to designated OSV use (table 94), which equates to less than 1 percent of habitat occupied in the Tahoe National Forest. Alternatives 1 and 4 would affect the largest amount of occupied habitat based on cross-country OSV use. Under these alternatives, approximately 4.3 stream miles of habitat (3.3 stream miles occurring in East Fork and Macklin creeks in the Middle Yuba River Basin and 1 stream mile occurring in the Little Truckee River; table 94), which equates to approximately 40 percent of the species' occupied stream habitat in the Tahoe National Forest.

In general, cross-country OSV use during the winter is not expected to result in measurable aquatic habitat disturbance for any alternative because OSV use would be dispersed, not occur on bare soil or ground based on current regulations, and not compact snow with enough intensity and repetition to measurably affect ground vegetation or the hydrologic regime (Davidson 2017; McNamara 2017). Therefore, it is expected that OSV-related pollutant concentrations or sedimentation would be insignificant and would not impair occupied Lahontan cutthroat trout habitat. However, alternative 3 does have the least risk of incidental and isolated ground disturbance based on affecting the least amount of occupied habitat and having a minimum snow depth requirement of 18 inches, whereas alternative 1 has the most risk of incidental and isolated ground disturbance based on affecting an equal amount of habitat compared to alternatives 2, 4, and 5, and having no minimum snow depth requirement.

Table 94. Amount of potentially suitable and occupied habitat (stream and waterbody shoreline miles)* for the Lahontan cutthroat trout within the project's effect boundary for each project element among the alternatives

Project Elements	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
<i>In Native Range</i>					
Designated Cross-country OSV Use Areas	1.0	1.0	0	1.0	1.0
Designated OSV Trails	0	0	0.4	0	0
<i>Outside of Native Range (Yuba River Basin)</i>					
Designated Cross-country OSV Use Areas	3.3	2.8	0	3.3	2.7
Designated OSV Trails	< 0.1	< 0.1	0	< 0.1	< 0.1

*The amount of habitat is presented for habitat occurring in species' native and non-native range that was associated with populations identified as being valuable to the recovery of the species (see figure 15).

Cumulative Effects

Historically, Lahontan cutthroat trout have been affected by hybridization and competition with introduced trout species, overfishing, and habitat degradation attributed to logging, mining, grazing, urbanization, and the development of dams (USDI Fish and Wildlife Service 1995, 2009). Wildfires are unforeseeable events that may directly impair water quality until vegetation recovers. Additionally, a changing climate may result in more frequent and severe droughts in the Sierra Nevada, which may potentially decrease the quantity and quality of aquatic habitat. These could cumulatively contribute to the direct and indirect effects to the Lahontan cutthroat trout by decreasing suitable habitat and stressing existing populations. However, it is impossible to quantify changes in habitat or populations in the project area based on the uncertainty of exactly where, what, and when climatic changes could occur in the project area.

There are many past, ongoing, and reasonably foreseeable projects identified by the Tahoe National Forest that may degrade the species' habitat by causing ground disturbance (sedimentation), affecting riparian vegetation communities, introducing pollutants to surface waters within the forest, and introducing additional non-native fish. These activities include, but are not limited to, State fish stocking, ancillary snow plowing at the established OSV trailheads, livestock grazing, timber harvest, fuels reduction, woodcutting activities, wildfire suppression, non-motorized winter recreational activities, and use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. In general, the Forest Service utilizes BMPs in compliance with the Clean Water Act to minimize water quality impacts. Further, the Tahoe National Forest monitors roads and trails used for OSVs and implements BMPs as needed to control erosion and other effects. Projects whose BMP monitoring shows results that are not effective are addressed and improved.

Although the risk of degrading Lahontan cutthroat trout habitat is greatest under alternative 1 and lowest under alternative 3, none of the alternatives would result in measurable, irreversible or irretrievable effects to soil, water, aquatic, or riparian resources (McNamara 2017). Despite habitat occurring in the effect boundaries for every alternative, there would be only be incidental and isolated ground disturbance, negligible risk of vegetation damage, and negligible effects from exhaust pollution. Because all the alternatives are expected to have minimal direct or indirect effects on the Lahontan cutthroat trout and its habitat, the alternatives would likely have no measurable negative cumulative effects on the viability of the Lahontan cutthroat trout or its habitat in combination with ongoing, future, and past activities occurring on federal, state, or private lands.

Western Pond Turtle (Actinemys marmorata)

Direct and Indirect Effects (All Alternatives)

Direct effects from OSV-related collisions and noise disturbance could impact adult western pond turtles while nesting or overwintering, and hatchlings while emerging. Nesting often occurs in locations approximately less than 164 feet (50 meters) from perennial streams or ponds in habitats dominated by gentle dry slopes containing primarily grasses and herbaceous annual vegetation (Holland 1994; Reese and Welsh 1997; Lovich and Meyer 2002). Adults can move upland following the first winter storm in November or December whereas hatchlings may emerge during the spring snowmelt. Adults have been observed to overwinter under leaf litter or fine soil in locations, including roads, with level or upland slopes containing dense understory vegetation (Buskirk 2002; Bury and Germano 2008). Therefore, adults overwintering under snow on roads and elsewhere and emerging hatchlings can be harassed, injured, or killed from designated OSV use occurring overtop occupied habitat or in close proximity. The risk of direct effects was considered high for areas

heavily used by OSVs such as the designated trails, whereas cross-country areas were associated with relatively low risk of direct effects.

Within the Tahoe National Forest, we presumed that suitable habitat was occupied, but consisted of relatively low abundance in the majority of locations based on available monitoring count data. All alternatives would have designated OSV trails and cross-country areas within suitable habitat (table 95). In general, alternatives 3 and 5 would have the least risk of direct effects on western pond turtles based impacting the least amount of suitable habitat and having relatively high minimum snow depth requirements (18 to 24 inches). In areas containing deeper snow, the weight of the OSVs would be more attenuated when occurring over deeper snow and the risk of individuals being crushed would be lessened. Alternatives 1 and 4 would have the highest risk of direct effects based on not having a minimum snow depth and affecting the largest amounts of suitable habitat, respectively (table 95). Although it is unlikely that all alternatives would result in the physical injury of individuals, all alternatives are likely to cause stress to individuals based on noise disturbance, which is likely not ameliorated by deeper minimum snow cover requirements.

In general, a total of 245,154 and 193,781 acres of suitable habitat for the species could potentially be affected by designated cross-country OSV use associated with alternatives 1 and 4, respectively (table 95), which equates to 48 to 61 percent of suitable habitat in the Tahoe National Forest (Figure 16). Considerably less suitable habitat (between 24,473 and 44,178 acres) would be affected by designated OSV use associated with alternatives 2, 3, and 5, which equates to less than 11 percent of suitable habitat in the Tahoe National Forest. Alternative 3 would have the least amount of suitable habitat acreage within designated trails and areas open to cross-country OSV use (table 95). The acreage of suitable habitat affected by OSV trails would be the highest for alternative 2 relative to the other alternatives, because it would have more mileage of designated OSV trails within lower elevations. In general, indirect effects to western pond turtles associated with chemical pollution and ground disturbance impacting their habitat would be mostly associated with designated OSV trail use. For all alternatives, designated OSV trail use would affect less than 1 percent of the suitable habitat in the Tahoe National Forest. This amount of habitat affected would be insignificant.

Similar to the indirect effects described for the California red-legged frog, it is expected that OSV-related pollutant concentrations or sedimentation would be insignificant and would not impair or degrade suitable western pond turtle habitat. For all alternatives, OSV trails use would affect only an insignificant amount of suitable habitat (less than 1 percent of the suitable habitat in the Tahoe National Forest). Further, cross-country OSV use during the winter is not expected to result in measurable aquatic habitat disturbance for any alternative because OSV use would be dispersed, not occur on bare soil or ground based on current regulations, and not compact snow with enough intensity and repetition to measurably affect ground vegetation or the hydrologic regime (Davidson 2017; McNamara 2017). However, alternative 3 would have the least risk of incidental and isolated ground disturbance based on affecting the least amount of stream habitat and having a minimum snow depth requirement of 18 inches, whereas alternative 1 would have the most risk of incidental and isolated ground disturbance based on affecting the largest amount of suitable habitat and having no minimum snow depth requirement.

Table 95. Amount of potentially suitable habitat (acres) for the western pond turtle within the project's effect boundary for each project element among the alternatives

Project Elements	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated Cross-country OSV Use Areas	245,154	44,178	24,473	193,781	36,367
Designated OSV Trails	1,324	1,534	494	737	517

Cumulative Effects

Historically, western pond turtles have been affected by habitat degradation attributed to logging, mining, agriculture (e.g., grazing), road development, urbanization, ground water pumping, and water recreation activities (Buskirk 2002; Lovich and Meyer 2002). Wildfires are unforeseeable events that may directly impair water quality until vegetation recovers. Additionally, a changing climate may result in more frequent and severe droughts in the Sierra Nevada, which may potentially decrease the quantity and quality of aquatic habitat. These could cumulatively contribute to the direct and indirect effects to the western pond turtle by decreasing suitable habitat and stressing existing populations. However, it is impossible to quantify changes in habitat or populations in the project area based on the uncertainty of exactly where, what, and when climatic changes could occur in the project area.

There are many past, ongoing, and reasonably foreseeable projects identified by the Tahoe National Forest which may degrade the species' habitat by causing ground disturbance (sedimentation), affecting riparian vegetation communities and introducing pollutants to surface waters within the forest. These activities include, but are not limited to, ancillary snow plowing at the established OSV trailheads, livestock grazing, timber harvest, fuels reduction, woodcutting activities, wildfire suppression, non-motorized winter recreational activities, and use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. In general, the Forest Service utilizes BMPs in compliance with the Clean Water Act to minimize water quality impacts. Further, the Tahoe National Forest monitors roads and trails used for OSVs and implements BMPs as needed to control erosion and other effects. Projects whose BMP monitoring shows results that are not effective are addressed and improved.

Although the risk of degrading western pond turtle habitat is greatest under alternatives 1 and 4, and lowest under alternative 3, none of the alternatives would result in measurable, irreversible or irretrievable effects to soil, water, aquatic, or riparian resources (McNamara 2017). Despite habitat occurring in the effect boundaries for every alternative, there would be only be incidental and isolated ground disturbance, negligible risk of vegetation damage, and negligible effects from exhaust pollution. Because all the alternatives are expected to have minimal direct or indirect effects on the western pond turtle and its habitat, the alternatives would likely have no measurable negative cumulative effects on the viability of the western pond turtle or its habitat in combination with ongoing, future, and past activities.

Foothill Yellow-legged Frog (Rana boylei)

Direct and Indirect Effects – (All alternatives)

Direct effects from OSV-related noise disturbance could impact foothill yellow-legged frogs while overwintering. Foothill yellow-legged frogs are typically found in partially shaded rocky streams and are highly dependent on water during each life-stage (Hayes et al. 2016). Adults remain near (within

39 feet or 12 meters from) the stream channel and use watercourses as movement corridors during the spring when moving to and away from breeding sites (Van Wagner 1996; Wheeler et al. 2006; Bourque 2008; Hayes et al. 2016). Although overwintering behavior is poorly understood, adults are still commonly found in water within tributaries prior to being found in main stem streams or rivers. In general, OSVs would have to travel in and through water to collide with individuals occurring and overwintering in streams. This was considered to be highly unlikely based on the assumption that OSV operators would avoid riding in streams to prevent damaging their OSVs and ensure compliance with existing regulations (e.g., 36 CFR part 261.15).

It is likely that individuals would have increased stress from noise disturbance in high OSV use area such as along designated OSV trails. Between 73 and 205 acres of suitable habitat could potentially be affected by designated OSV trail use among the alternatives (table 96). As a result, noise generated from OSVs in these high use areas could affect foothill yellow-legged frogs by interfering with auditory communication, increasing stress, and altering behavior, which may negatively affect fitness and reproductive success (Bowles 1995; Gabrielsen and Smith 1995; Dooling et al. 2015; Lima et al. 2015). However, for all alternatives, proposed designated OSV trails would affect less than 1 percent of the suitable habitat in the Tahoe National Forest. This amount of habitat affected would be insignificant.

Table 96. Amount of potentially suitable habitat (acres) for the foothill yellow-legged frog within the project's effect boundary for each project element among the alternatives

Project Elements	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated Cross-country OSV Use Areas	32,820	10,455	2,299	26,906	7,320
Designated OSV Trails	168	205	73	138	80

A total of 32,820 and 26,906 acres of suitable habitat for the species would potentially be affected by designated cross-country OSV use associated with alternatives 1 and 4, respectively (table 96), which equates to 46 to 56 percent of suitable habitat in the Tahoe National Forest (Figure 17). Considerably less suitable habitat (between 2,330 and 10,455 acres) would be affected by designated OSV use associated with alternatives 2, 3, and 5, which equates to less than 18 percent of suitable habitat in the Tahoe National Forest. Alternative 3 would have the least amount of suitable habitat acreage within designated trails and areas open to cross-country OSV use (table 96). The acreage of suitable habitat affected by OSV trails would be highest for alternative 2 relative to the other alternatives because it has more mileage of designated OSV trails within lower elevations.

Similar to the indirect effects described for the western pond turtle, it is expected that OSV-related pollutant concentrations or sedimentation would be insignificant and would not impair suitable foothill yellow-legged frog habitat. For all alternatives, proposed designated OSV trails use would affect only an insignificant amount of suitable habitat (less than 1 percent of the suitable habitat in the Tahoe National Forest). Further, cross-country OSV use during the winter is not expected to result in measurable aquatic habitat disturbance for any alternative because OSV use would be dispersed, not occur on bare soil or ground based on current regulations, and not compact snow with enough intensity and repetition to measurably affect ground vegetation or the hydrologic regime (Davidson 2017; McNamara 2017). The short delay of snowmelt and colder soil temperatures from OSV-compacted snow would not likely delay, reduce, or affect the species' breeding season.

Therefore, none of the alternatives are expected to measurably affect foothill yellow-legged frog habitats.

Similar to most species, alternative 3 would pose the least risk of incidental and isolated ground disturbance based on affecting the least amount of stream habitat and having a minimum snow depth requirement of 18 inches. Whereas, alternative 1 would have the most risk of incidental and isolated ground disturbance based on having no minimum snow depth requirement and affecting the largest amount of suitable habitat.

Cumulative Effects

Historically, the foothill yellow-legged frog has been affected by habitat degradation attributed to water development and diversion, urbanization, non-native species, and mining (Hayes et al. 2016). Wildfires are unforeseeable events that may directly impair water quality until vegetation recovers. Additionally, a changing climate may result in more frequent and severe droughts in the Sierra Nevada, which may potentially decrease the quantity and quality of aquatic habitat. These could cumulatively contribute to the direct and indirect effects to the foothill yellow-legged frog by decreasing suitable habitat and stressing existing populations (Hayes et al 2016). However, it is impossible to quantify changes in habitat or populations in the project area based on the uncertainty of exactly where, what, and when climatic changes could occur in the project area.

There are many past, ongoing, and reasonably foreseeable projects identified by the Tahoe National Forest which may degrade the species' habitat by causing ground disturbance (sedimentation), affecting riparian vegetation communities and introducing pollutants to surface waters within the forest. These activities include, but are not limited to, ancillary snow plowing at the established OSV trailheads, livestock grazing, timber harvest, fuels reduction, woodcutting activities, wildfire suppression, non-motorized winter recreational activities, and use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. In general, the Forest Service utilizes BMPs in compliance with the Clean Water Act to minimize water quality impacts. Further, the Tahoe National Forest monitors roads and trails used for OSVs and implements BMPs as needed to control erosion and other effects. Projects whose BMP monitoring shows results that are not effective are addressed and improved.

Although the risk of degrading foothill yellow-legged frog habitat is greatest under alternative 1 and lowest under alternative 3, none of the alternatives would result in measurable, irreversible or irretrievable effects to soil, water, aquatic, or riparian resources (McNamara 2017). Despite habitat occurring in the effect boundaries for every alternative, there would be only be incidental and isolated ground disturbance, negligible risk of vegetation damage, and negligible effects from exhaust pollution. Because all the alternatives are expected to have minimal direct or indirect effects on the foothill yellow-legged frog and its habitat, the alternatives would likely have no measurable negative cumulative effects on the viability of the foothill yellow-legged frog or its habitat in combination with ongoing, future, and past activities.

Hardhead (Mylopharodon conocephalus)

Direct and Indirect Effects – (All Alternatives)

The direct effects to hardhead from designated OSV use would be nonexistent for alternative 3 and discountable for all other alternatives. No major rivers considered suitable for hardhead occur in the effect boundary of designated OSV trails or cross-country areas under alternative 3 (table 97). In

general, OSVs would have to travel in and through water to collide with individuals (Lima et al. 2015). This was considered to be highly unlikely based on the assumption that OSV operators would avoid riding in major rivers (i.e., in the water column below snow or ice cover) to prevent damaging their OSVs and to ensure compliance with existing regulations (e.g., 36 CFR part 261.15). Further, heavy OSV use along designated trails has the potential to affect individuals based on noise disturbances. However, no major rivers considered suitable for hardhead occur in the effect boundary of designated OSV trails.

A total of 147 river miles were considered to be suitable for hardhead within the Tahoe National Forest (figure 18). Practically none of this habitat would be affected by any designated OSV use under alternatives 2, 3, and 5 (table 97). Thus, no indirect effects to hardhead habitat from OSV use would be expected for these alternatives. Alternatives 1 and 4 would affect 82 and 53 miles of suitable river habitat, respectively, in the Yuba River Basin based on cross-country OSV use, which equates to approximately 36 to 56 percent of the species' suitable habitat in the Tahoe National Forest. In general, cross-country OSV use during the winter is not expected to result in measurable aquatic habitat disturbance for any alternative because OSV use would be dispersed, not occur on bare soil or ground based on current regulations, and not compact snow with enough intensity and repetition to measurably affect ground vegetation or the hydrologic regime (Davidson 2017; McNamara 2017). Therefore, it is expected that the effects of OSV-related chemical pollution, ground disturbance, and snow compaction would be insignificant and would not impair suitable hardhead habitat.

Table 97. Amount of potentially suitable habitat (stream miles) for hardhead within the project's effect boundary for each project element among the alternatives

Project Elements	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated Cross-country OSV Use Areas	82.1	< 0.1	0	52.6	< 0.1
Designated OSV Trails	0	< 0.1	0	0	0

Cumulative Effects

Historically, hardhead have been affected by dams and diversions, agriculture, urbanization, mining, road development, management related eradication, and introduced non-native species (Moyle et al. 2015). There are many past, ongoing, and reasonably foreseeable projects identified by the Tahoe National Forest which may further degrade the species' habitat by causing ground disturbance (sedimentation), affecting riparian vegetation communities and introducing pollutants to surface waters within the forest. These activities include, but are not limited to, ancillary snow plowing at the established OSV trailheads, livestock grazing, timber harvest, fuels reduction, woodcutting activities, wildfire suppression, non-motorized winter recreational activities, and use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. In general, the Forest Service utilizes BMPs in compliance with the Clean Water Act to minimize water quality impacts. Further, the Tahoe National Forest monitors roads and trails used for OSVs and implements BMPs as needed to control erosion and other effects. Projects whose BMP monitoring shows results that are not effective are addressed and improved.

Although the risk of degrading hardhead habitat is greatest under alternative 1 and lowest under alternative 3, none of the alternatives would result in measurable, irreversible or irretrievable effects to soil, water, aquatic, or riparian resources (McNamara 2017). Despite habitat occurring in the effect

boundaries for some alternatives, there would be only be incidental and isolated ground disturbance, negligible risk of vegetation damage, and negligible effects from exhaust pollution under these alternatives. Therefore, the alternatives would likely have no measurable negative cumulative effects on the viability of the hardhead or its habitat in combination with ongoing, future, and past activities.

Lahontan Lake Tui Chub (Siphateles bicolor pectinifer)

Direct and Indirect Effects – (All Alternatives)

Direct effects to the Lahontan Lake tui chub from designated OSV use would be nonexistent for alternatives 1, 2, 4, and 5, and discountable for alternative 3. Lahontan Lake tui chub inhabit large and deep lakes (figure 15; Moyle 2002; Moyle et al. 2015). No designated OSV use areas occur over any lakes or reservoirs, which eliminates any risk of collision and reduces the likelihood of individuals being affected by OSV-related noise disturbance. Alternative 3 would affect approximately 0.4 mile of shoreline habitat in Boca Reservoir (table 98). This equates to less than 3 percent of the shoreline habitat around Boca Reservoir, which is one of three lakes considered to be suitable habitat and potentially occupied by the species in the Tahoe National Forest (figure 16). We considered this amount of affected habitat to be insignificant and thus the risk of individuals being harassed by noise generated or indirectly affected from OSV trail use would be discountable. Pollutants that are trapped and later released during snowmelt could have some isolated adverse indirect effects to the species if in close proximity to suitable or occupied habitat. However, the probability of this occurring and the potential resultant pollutant concentration is expected to be very low. This conclusion was reached based on, in part, the large volume of suitable habitat in the lakes or reservoirs coupled with the dispersed nature of cross-country OSV use and few designated OSV trails occurring in close proximity to the lakes or reservoirs.

Table 98. Amount of potentially suitable and occupied habitat (waterbody shoreline miles) for Lahontan Lake tui chub within the project's effect boundary for each project element among the alternatives

Project Elements	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated Cross-country OSV Use Areas	0	0	0	0	0
Designated OSV Trails	0	0	0.4	0	0

Cumulative Effects

Historically, Lahontan Lake tui chub have been affected by water pollution from urbanization and rural development, introduced species, and marshland degradation (Moyle et al. 2015). There are many past, ongoing, and reasonably foreseeable projects identified by the Tahoe National Forest which may further degrade the species' habitat by causing ground disturbance (sedimentation), affecting riparian vegetation communities and introducing pollutants to surface waters within the forest. These activities include, but are not limited to, ancillary snow plowing at the established OSV trailheads, livestock grazing, timber harvest, fuels reduction, woodcutting activities, wildfire suppression, non-motorized winter recreational activities, and use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. However, none of the project alternatives would result in measurable, irreversible or irretrievable effects to soil, water, aquatic, or riparian resources (McNamara 2017). Therefore, the alternatives would likely have no measurable negative cumulative effects on the viability of the Lahontan Lake tui chub or its habitat in combination with ongoing, future, and past activities.

Great Basin Rams-horn Snail (*Helisoma newberryi newberryi*)

Direct and Indirect Effects – (All Alternatives)

Direct effects to the Great Basin rams-horn snail from designated OSV use would be discountable for all alternatives. In general, OSVs would have to travel through or in close proximity to water to collide with or harass individuals (Lima et al. 2015), which would be unlikely based on the assumption that OSV operators would avoid riding in streams (i.e., in the water column below snow or ice cover) to prevent damaging their OSVs and comply with existing regulations (e.g., 36 CFR part 261.15). Further, no designated OSV use areas occur over any lakes or reservoirs, which eliminates any risk of collision in these habitats and reduces the likelihood of individuals being affected by OSV-related noise disturbance. Cross-country OSV use would affect between 14 and 28 stream miles of habitat under alternatives 1, 2, 4, and 5 (table 99). Because cross-country OSV use would likely be dispersed, the risk of noise disturbing individuals during these activities in affected habitat is negligible. The risk of noise disturbance is considered higher for areas heavily used by OSVs such as the designated trails. Alternative 3 is the only alternative that would result in habitat being affected by designated OSV trail use. This affected habitat constitutes only 0.4 mile (3 percent) of shoreline habitat in Boca Reservoir (table 99), which is one of six lakes considered to be suitable habitat and potentially occupied by the species in the Tahoe National Forest (figure 18). We considered this amount of affected habitat to be insignificant relative to direct and indirect effects.

Table 99. Amount of potentially suitable habitat (stream and waterbody shoreline miles) for the Great Basin rams-horn snail and California floater within the project's effect boundary for each project element among the alternatives

Project Elements	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Designated Cross-country OSV Use Areas	28.2	20.1	2	22	14.0
Designated OSV Trails	0	0	0.4	0	0

A total of 28 and 22 miles of suitable habitat within the Little Truckee and Truckee rivers could potentially be affected by designated OSV use associated with alternatives 1 and 4, respectively (table 99). This equates to 47 and 63 percent, respectively, of suitable stream habitat in the Tahoe National Forest and represents the largest amount of suitable habitat that would be affected by designated OSV use (figure 18). Alternative 3 would have the least amount (solely 0.4 shoreline miles occurring in Boca Reservoir) of suitable habitat within areas designated for OSV use (table 99).

In general, OSV-related pollutant concentrations or ground disturbance would be insignificant and would not impair suitable Great Basin rams-horn snail habitat. Alternative 3 would have designated OSV trail use affect only an insignificant amount of suitable habitat (less than 1 percent of the suitable habitat in the Tahoe National Forest). Further, cross-country OSV use during the winter is not expected to result in measurable aquatic habitat disturbance for any alternative because OSV use would be dispersed, not occur on bare soil or ground based on current regulations, and not compact snow with enough intensity and repetition to measurably affect ground vegetation or the hydrologic regime (Davidson 2017; McNamara 2017). Therefore, none of the alternatives are expected to measurably affect Great Basin rams-horn snail habitats. However, alternative 3 does have the least risk of incidental and isolated ground disturbance based on affecting the least amount of habitat and

having a minimum snow depth requirement of 18 inches, whereas alternative 1 has the most risk of incidental and isolated ground disturbance based on affecting the most amount of stream habitat and having no minimum snow depth requirement.

Cumulative Effects

Historically, the Great Basin rams-horn snail has likely been affected by climate change, water diversions, dam construction, and pollution (e.g., eutrophication, sedimentation) from urban, agriculture, and industrial land use. There are many past, ongoing, and reasonably foreseeable projects identified by the Tahoe National Forest which may further degrade the species' habitat by causing ground disturbance (sedimentation), affecting riparian vegetation communities and introducing pollutants to surface waters within the forest. These activities include, but are not limited to, ancillary snow plowing at the established OSV trailheads, livestock grazing, timber harvest, fuels reduction, woodcutting activities, wildfire suppression, non-motorized winter recreational activities, and use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. However, none of the project alternatives would result in measurable, irreversible or irretrievable effects to soil, water, aquatic, or riparian resources (McNamara 2017). Therefore, the alternatives would likely have no measurable negative cumulative effects on the viability of the Great Basin rams-horn snail or its habitat in combination with ongoing, future, and past activities.

California Floater (Anodonta californiensis)

Direct and Indirect Effects – (All Alternatives)

The risk and significance of direct and indirect effects to the California floater are identical to those described for the Great Basin rams-horn snail. Therefore, these effects were considered to be unlikely and discountable. However, the risk of isolated and insignificant effects to the species was considered to be the highest under alternative 1 and the least under alternative 3 based on required minimum snow depths (0 versus 18 inches) and the minimal extent of potentially affected suitable habitat (21.2 miles versus 0.4 mile; table 99).

Cumulative Effects

Historically, the California floater has been affected by water diversions, dam construction, and pollution (e.g., eutrophication, sedimentation) from urban, agriculture, and industrial land use (Furnish and Monthey 1998). There are many past, ongoing, and reasonably foreseeable projects identified by the Tahoe National Forest which may further degrade the species' habitat by causing ground disturbance (sedimentation), affecting riparian vegetation communities and introducing pollutants to surface waters within the forest. These activities include, but are not limited to, ancillary snow plowing at the established OSV trailheads, livestock grazing, timber harvest, fuels reduction, woodcutting activities, wildfire suppression, non-motorized winter recreational activities, and use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles. However, none of the project alternatives would result in measurable, irreversible or irretrievable effects to soil, water, aquatic, or riparian resources (McNamara 2017). Therefore, the alternatives would likely have no measurable negative cumulative effects on the viability of the California floater or its habitat in combination with ongoing, future, and past activities.

Cumulative Effects Summary

Past activities are considered part of the existing condition and were discussed within the Affected Environment section for each species. This is because existing conditions reflect the aggregate

impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

Cumulative environmental effects can be defined as effects on the environment which are caused by the combined results of past, current and future activities. Over time, direct and indirect human activities combine to collectively impact the environment. These effects may differ from the original, individual activities. Ongoing and foreseeable future actions identified that are reasonably certain to occur within the aquatic analysis area of the OSV Designation Project include, but are not limited to, snow plowing, livestock grazing, timber harvest, fuels reduction, woodcutting activities, wildfire suppression, non-motorized winter recreational activities, and use of roads by wheeled vehicles during the season of overlap between OSVs and wheeled vehicles.

Snow plowing at the established OSV trailheads is an ancillary activity associated with the Tahoe National Forest OSV Designation project, and was not analyzed as a part of the proposal. In general, snow plowing is not expected to affect aquatic resources (McNamara 2017). Ongoing and reasonably foreseeable vegetation management projects are very small in comparison to the OSV Use Designation project area and/or do not overlap with 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 often have management prescriptions emphasizing the recruitment of large snags and logs, as well as retention of large conifer that are attributes habitat for the aquatic species discussed in this report. In general, timber harvest, fuel reduction fire suppression, emergency responses, and other actions carried out by Federal workers or contractors are typically able to provide adequate protection for sensitive and federally listed aquatic animal habitats using flagging and avoidance measures designed for species protection.

Collectively, these activities, along with those proposed by the alternatives, may affect some aquatic sensitive or federally listed species individually at various scales, but no trends toward Federal listing or loss of species viability are expected for any alternative based on, in part, the implementation of project-specific minimization measures.

Determination Statements

*California Red-legged Frog (*Rana draytonii*)*

It is our determination that all the project's alternatives **“may affect, not likely to adversely affect”** the California red-legged frog. Despite occupied habitat occurring in the effect boundaries for alternatives 1 and 4, the risk of individuals being directly affected by OSV collisions or noise disturbance was considered to be discountable because occupied habitat would not be affected by concentrated OSV use along designated trails, adult frogs breed and generally occur in snow-free areas, and cross-country OSV operators generally avoid traveling over snow-free areas because it is prohibited and can damage their machines. Although OSV designated areas occur within suitable habitat under each of the alternatives, there would only be incidental and isolated ground disturbance, negligible risk of vegetation damage, and negligible effects from exhaust pollution within the potentially affected habitats. Therefore, the alternatives would not likely to adversely affect the species or its habitat.

California Red-legged Frog (*Rana draytonii*) Critical Habitat

Designated critical habitat for the California red-legged frog is located within the project area and could be directly affected by the OSV area designations prescribed by alternatives 1 and 4 (table 90). However, none of the alternatives are expected to adversely affect areas designated as critical habitat for the California red-legged frog because designated OSV use would be prohibited on bare ground, there would be only be incidental and isolated ground disturbance, negligible risk of vegetation damage, and negligible effects from exhaust pollution within the potentially affected habitats. Therefore, it is our determination that the alternatives “**may affect, not likely to adversely affect**” the critical habitat designated for the California red-legged frog.

Sierra Nevada Yellow-legged Frog (*Rana sierrae*)

The proposed OSV designated areas among all the alternatives may adversely affect individual Sierra Nevada yellow-legged frogs because OSVs may harass or collide with adults traveling over ice or snow during the early portion of the breeding season. However, the probability of vehicle collision is likely low because authorized activities would mostly occur at a time of year when the amphibians are likely hibernating. In general, the species’ breeding season occurs when temperatures are above freezing and breeding occurs in snow-free areas where OSV use is unlikely to occur. In general, OSV use is not expected to result in any measurable changes to soils, vegetation, or hydrology and thereby the species’ habitat. Under all of the alternatives, the use of OSVs is prohibited over areas with inadequate snow depth or exposed ground that would cause resource damage. In addition, alternatives 2, 3, 4, and 5 have required minimum snow depths under which OSV use can operate that would provide further protection to the underlying ground and thereby frog habitat. It is our determination that the alternatives “**may affect, likely to adversely affect**” the Sierra Nevada yellow-legged frog based on the potential to directly impact individuals moving over snow or ice during the early portion of the breeding season.

Sierra Nevada Yellow-legged Frog (*Rana sierrae*) Critical Habitat

Designated critical habitat for the Sierra Nevada yellow-legged frog is located within the project area and could be directly affected by the OSV area designations prescribed by all of the alternatives (table 92). However, none of the alternatives are expected to adversely affect areas designated as critical habitat for the Sierra Nevada yellow-legged frog because designated OSV use would be prohibited on bare ground, there would be only be incidental and isolated ground disturbance, negligible risk of vegetation damage, and negligible effects from exhaust pollution within the potentially affected habitats. Therefore, it is our determination that the alternatives “**may affect, not likely to adversely affect**” the critical habitat designated for the Sierra Nevada yellow-legged frog.

Lahontan Cutthroat Trout (*Oncorhynchus clarkii henshawi*)

The direct effects to Lahontan cutthroat trout from designated OSV use would be discountable for all alternatives. Because no designated OSV trail use would occur near any occupied stream for any of the alternatives within the Tahoe National Forest (table 18), there is only discountable risk of individuals being harassed by noise generated from OSV use. Further, it would be highly unlikely for any OSV to travel through the aquatic environment and impact or collide with individuals because no designated OSV areas would occur over lakes or reservoirs and OSV operators would avoid riding in streams (i.e., in the water column below snow or ice cover) to prevent damaging their OSVs and to ensure compliance with existing regulations (e.g., 36 CFR part 261.15). Although OSV designated areas occur near relatively small amount of suitable habitat under each of the alternatives, there would only be incidental and isolated ground disturbance, negligible risk of vegetation damage,

and negligible effects from exhaust pollution within the potentially affected habitats. In general, the proposed designated OSV use is not expected to result in any measurable changes to soils, vegetation, or hydrology and thereby the species' habitat. Therefore, it is our determination that the alternatives “**may affect, not likely to adversely affect**” the Lahontan cutthroat trout.

Western Pond Turtle (Actinemys marmorata)

Within the Tahoe National Forest, we presumed that suitable western pond turtle habitat was occupied and consisted of relatively low abundances in the majority of locations. All alternatives had designated OSV trails and cross-country areas within presumed occupied habitat (table 95). Direct effects from OSV-related collisions and noise disturbance could harass or injure adult western pond turtles while nesting or overwintering underneath snow, and hatchlings while emerging. Although it is unlikely that all alternatives would result in the physical injury of individuals, all alternatives are likely to cause stress to individuals based on noise disturbance. The risk of direct effects was considered high for areas heavily used by OSVs such as the designated trails, whereas cross-country areas were associated with relatively low risk of direct effects. All alternatives would have designated OSV trail use affect less than 1 percent of the suitable habitat in the Tahoe National Forest. This amount of habitat is considered insignificant. Further, there would only be incidental and isolated ground disturbance, negligible risk of vegetation damage, and negligible effects from exhaust pollution within the potentially affected habitat. In general, the proposed designated OSV use among the alternatives is not expected to result in any measurable changes to soils, vegetation, or hydrology and thereby the species' habitat. Therefore, it is our determination that the alternatives “**may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**” for the western pond turtle.

Foothill Yellow-legged Frog (Rana boylei)

Within the Tahoe National Forest, we presumed that suitable foothill yellow-legged frog habitat was occupied. All alternatives had designated OSV trails and cross-country areas within presumed occupied habitat (table 96). Direct effects from OSV-related noise disturbance could harass adult frogs while occurring near OSV designated trails. However, all alternatives would have designated OSV trails use affect less than 1 percent of the suitable habitat in the Tahoe National Forest. This amount of habitat is considered insignificant. Further, there would only be incidental and isolated ground disturbance, negligible risk of vegetation damage, and negligible effects from exhaust pollution within the potentially affected habitat. As a result, the proposed designated OSV use among the alternatives is not expected to cause in any measurable changes to soils, vegetation, or hydrology and thereby the species' habitat. Therefore, it is our determination that the alternatives “**may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**” for the foothill yellow-legged frog.

Hardhead (Mylopharodon conocephalus)

The direct effects to hardhead from designated OSV use would be discountable under all the alternatives. Because no designated OSV trail use would occur near any known occupied stream for any of the alternatives within the Tahoe National Forest, there is only discountable risk of individuals being harassed by noise generated from OSV use. Further, it would be highly unlikely for any OSV to travel through the aquatic environment and impact or collide with individuals because OSV operators would avoid riding in major rivers to prevent damaging their OSVs and to ensure compliance with existing regulations (e.g., 36 CFR part 261.15). Designated OSV areas prescribed by all of the alternatives would affect none or negligible amounts of the suitable habitat in the Tahoe

National Forest because there would only be incidental and isolated ground disturbance, negligible risk of vegetation damage, and negligible effects from exhaust pollution within the potentially affected habitat. In general, the proposed designated OSV use among the alternatives is not expected to result in any measurable changes to soils, vegetation, or hydrology and thereby the species' habitat. Therefore, it is our determination that the alternatives **“may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area”** for the hardhead.

Lahontan Lake Tui Chub (Siphateles bicolor pectinifer)

The Lahontan Lake tui chub inhabits only large and deep lakes or reservoirs. No designated OSV use areas occur over any lakes or reservoirs, which eliminates any risk of collision and reduces the likelihood of individuals being affected by OSV-related noise disturbance. In general, there is some risk of suitable habitat being affected by OSV-related chemical pollution under each of the alternatives. However, the probability of this occurring and the potential resultant pollutant concentrations are expected to be low. Further, there would only be incidental and isolated ground disturbance and negligible risk of vegetation damage within the watersheds containing suitable habitat. Therefore, it is our determination that the alternatives **“may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area”** for the Lahontan Lake tui chub.

Great Basin Rams-horn Snail (Helisoma newberryi)

Direct effects to the Great Basin rams-horn snail from designated OSV use would be discountable for all alternatives. In general, OSVs would have to travel through or in close proximity to water to collide with or harass individuals (Lima et al. 2015), which would be unlikely based on the assumption that OSV operators would avoid riding in streams (i.e., in the water column below snow or ice cover) to prevent damaging their OSVs and comply with existing regulations (e.g., 36 CFR part 261.15). In addition, no designated OSV use areas occur over any lakes or reservoirs, which eliminates any risk of collision in these habitats and reduces the likelihood of individuals being affected by OSV-related noise disturbance. Further, there would only be incidental and isolated ground disturbance, negligible risk of vegetation damage, and negligible effects from exhaust pollution within the potentially affected habitat. As a result, the proposed designated OSV use among the alternatives is not expected to cause in any measurable changes to soils, vegetation, or hydrology and thereby the species' habitat. Therefore, it is our determination that the alternatives **“may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area”** for the Great Basin rams-horn snail.

California Floater (Anodonta californiensis)

Direct effects to the California floater from designated OSV use would be discountable for all alternatives. In general, OSVs would have to travel through or in close proximity to water to collide with or harass individuals (Lima et al. 2015), which would be unlikely based on the assumption that OSV operators would avoid riding in streams (i.e., in the water column below snow or ice cover) to prevent damaging their OSVs and comply with existing regulations (e.g., 36 CFR part 261.15). In addition, no designated OSV use areas occur over any lakes or reservoirs, which eliminates any risk of collision in these habitats and reduces the likelihood of individuals being affected by OSV-related noise disturbance. Further, there would only be incidental and isolated ground disturbance, negligible risk of vegetation damage, and negligible effects from exhaust pollution within the potentially affected habitat. As a result, the proposed designated OSV use among the alternatives is not expected

to cause in any measurable changes to soils, vegetation, or hydrology and thereby the species' habitat. Therefore, it is our determination that the alternatives “**may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**” for the California floater.

Compliance with Relevant Laws, Regulations, Policies and Plans

The proposed project effects on threatened, endangered, proposed, and sensitive 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 Tahoe National Forest Land and Resource Management Plan and the Sierra Nevada Forest Plan Amendment because sensitive aquatic species populations would remain viable and their habitats would be maintained.

Botany – Listed and Sensitive Species

Effects to special interest plants, research natural areas, special interest areas, and noxious weeds are addressed in the Other Botanical Resources section.

Consultation to Date

No previous consultation with the Fish and Wildlife Service has taken place for the proposed OSV designation.

The Fish and Wildlife Service is contacted on a regular basis to obtain a current list of threatened, endangered, and proposed species and critical habitats that may be present within the Tahoe National Forest. The most recent lists, from May 15, 2017, are maintained at the Supervisors Office. The following plant species are included:

- *Calystegia stebbinsii* (Stebbins' morning-glory) – from the Sacramento office
- *Fremontodendron californicum* ssp. *decumbens* (Pine Hill flannelbush) – from the Sacramento office
- *Orcuttia tenuis* (slender Orcutt grass) – from the Reno office
- *Packera layneae* (Layne's butterweed) – from the Sacramento office

The threatened plant, *Packera layneae*, is known from two occurrences on serpentine/gabbro soils on the American River Ranger District.

Three plants, *Calystegia stebbinsii* (endangered), *Fremontodendron californicum* ssp. *decumbens* (endangered), and *Orcuttia tenuis* (threatened) are not present and are not suspected to occur within the Tahoe National Forest. Therefore, they are not carried further into the effects analysis.

An additional threatened species, *Ivesia webberi*, has been considered as potentially present during previous Tahoe National Forest project planning, but all known populations and its designated critical habitat units are outside the Tahoe National Forest. Therefore, *Ivesia webberi* and its critical habitat would not be affected and are not analyzed in detail.

The candidate species, *Pinus albicaulis*, exists within the Tahoe National Forest at high elevations, and is addressed as a Forest Service Sensitive Species.

Relevant Laws, Regulations, and Policy

Federal Law and Policy

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 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.

Forest Service Manual and Handbooks (FSM/H 2670). Forest Service Sensitive species are plant 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.

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.

Land and Resource Management Plan

Tahoe National Forest Land and Resource Management Plan as amended by the Sierra Nevada Forest Plan Amendment (USDA Forest Service 2001) and Sierra Nevada Forest Plan Amendment, Final Supplemental Environmental Impact Statement and Record of Decision (USDA Forest Service 2004). The LRMP states that all necessary steps will be taken to ensure that agency actions do not jeopardize the continued existence of these species, and that viable populations of sensitive plants will be maintained. Therefore, the forest has developed a sensitive plant program that provides an operational framework with an objective of maintaining a viable population of sensitive plant species by assuring that they receive full consideration in all forest planning and project efforts. There are no specific standards or guidelines for threatened, endangered, proposed, or sensitive (TEPS) plants.

Sierra Nevada Forest Plan Amendment. The January 2004 Record of Decision (ROD) for the Sierra Nevada Forest Plan Amendment (USDA Forest Service 2004) replaces the January 2001 Record of Decision for the Sierra Nevada Forest Plan Amendment in its entirety. Detailed information including specific standards and guidelines for species management can be found in the

Sierra Nevada Forest Plan Amendment Record of Decision and Final Supplemental Environmental Impact Statement. The standards and guidelines in the January 2004 Sierra Nevada Forest Plan Amendment ROD are incorporated by reference.

General Forest Service direction for sensitive species is summarized below:

1. Assist states in achieving their goals for conservation of endemic species.
2. As part of the NEPA process, review programs and activities, through a biological evaluation, to determine their potential effect on sensitive species.
3. Avoid or minimize impacts to species whose viability has been identified as a concern.
4. If impacts cannot be avoided, analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole.
5. Establish management objectives in cooperation with the states when a project on National Forest System (NFS) lands may have a significant effect on sensitive species population numbers or distribution. Establish objectives for Federal candidate species, in cooperation with the Fish and Wildlife Service and the states.

Resource Indicators and Measures

Resource indicators and measures shown in table 19 will be used to measure and disclose effects to botanical resources of threatened, endangered, and proposed species and critical habitats related to OSV use designations and grooming trails for OSV use.

Table 100. Botanical resources indicators and measures for assessing effects

Resource Element	Resource Indicator	Measure
Threatened, endangered and sensitive plants	Species presence	Total acres on Tahoe National Forest
		Acres in designated OSV areas
		Acres in high-use OSV designated areas

Methodology

This analysis uses ArcMap and relevant GIS data layers from the Tahoe National Forest. The GIS layers of proposed OSV designations and groomed trails were overlain with the TEPS plant data layers to identify areas where effects could occur.

Table 101 lists Fish and Wildlife Service threatened, endangered or proposed plants and their critical habitats that may be present or are known within the planning area. The potential effects to each species were evaluated based on growth form, timing of important life cycle elements (i.e., emergence, flowering, seed production, germination, etc.), identified threats, important habitat components, and the expected interaction with disturbances associated with OSV use and snow trail grooming.

This biological evaluation/biological assessment reviews the modified proposed action and alternatives in sufficient detail to determine the level of effect that would occur to federally listed plants and Region 5 sensitive plant species. For 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 botanist who completed the evaluation. The three possible determinations are:

- No effect
- May affect individuals, but not likely to trend toward Federal listing or result in the loss of viability in the planning area of the Tahoe National Forest
- May affect individuals, and likely to trend toward Federal listing or result in the loss of viability in the planning area of Tahoe National Forest

Similar categories for federally listed threatened and endangered species and critical habitats are:

- No effect
- May affect, but is not likely to adversely affect
- May affect, and is likely to adversely affect

Information used in this analysis includes pertinent scientific literature, project-specific botanical data, results of surveys and site revisits, and GIS layers of the following data: project boundary, actions by alternative, Tahoe National Forest TEPS plant occurrences, and critical habitat information from the Fish and Wildlife Service.

Assumptions Specific to the TEPS Plant Analysis

- Plants are unlikely to be directly affected by authorized OSV use (with the specified requirements of specific snow depths or adequate snow depth to avoid damage to resources – typically 12 inches) when their living tissues are not present above ground. Therefore, only shrub or tree species are likely to be directly affected by OSV use.
- Indirect effects, such as those possibly resulting from snow compaction and vehicle emissions, are likely to be concentrated in high-use areas. Therefore, an area within one-half mile of designated OSV trails is assumed to be affected by snow compaction and vehicle emissions. Because OSV use is expected to be concentrated in designated OSV trail corridors, and grooming activities are restricted to identified trails, plants in areas designated for OSV use outside these concentrated use corridors are much less likely to experience measurable indirect effects.
- Only authorized OSV uses will be analyzed. Concerns arising from unauthorized uses will be addressed as law enforcement issues and may prompt corrective actions.
- Alternative 1 has no minimum snow depth requirement for OSV use, but riders still must not damage the underlying soil and vegetation resources because causing resource damage is illegal. It is assumed that a minimum of 12 inches of snow is typically needed to avoid damaging resources, and on trails with underlying roads, a minimum of 6 inches is typically needed to avoid damage to the underlying road surface.

Spatial and Temporal Context for Effects Analysis

Direct/Indirect Effects Boundaries

The spatial boundary for analyzing the direct and indirect effects to TEPS plants is the project area boundary, because all expected effects relevant to these resources would occur and remain within this area. Effects to vegetation 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, and may extend to decades or centuries. Such long-term effects beyond 20 years become increasingly difficult to predict due to unknown interactions and the many environmental variables with numerous possible outcomes.

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. Cumulative effects are considered for a time period within 20 years of project implementation.

Affected Environment

Species Considered in the Analysis

Table 101. Threatened, endangered or proposed plant species considered

Scientific Name Common Name	Habitat	Species present?	Habitat present?	Effects analysis needed?
Threatened Plants				
<i>Calystegia stebbinsii</i> Stebbin's morning-glory Endangered	600-3,600 feet; chaparral or cismontane woodland on gabbroic or serpentine substrates. Perennial herb.	No	No	No. No Effect. Species is not suspected to occur in project area.
<i>Fremontodendron californicum</i> ssp. <i>decumbens</i> Pine Hill flannelbush Endangered	1,400-2,500 feet; chaparral or cismontane woodland on gabbroic or serpentine, rocky substrates. Shrub.	No	No	No. No Effect. Species is not suspected to occur in project area.
<i>Ivesia webberi</i> Webber's ivesia	4,500-6,500 feet; shallow clay soils in Lassen, Plumas, Sierra, Washoe, and Douglas Counties in CA and NV.	No	No	No. No Effect. Species is not suspected to occur in project area.
<i>Orcuttia tenuis</i> Slender Orcutt grass Threatened	Vernal pools, in oak and/or pine woodlands. Below 5,800 feet. Critical habitat is designated, but is not present on the forest.	No	No	No. No Effect. Species is not suspected to occur in project area.
<i>Packera layneae</i> Layne's butterweed Threatened	650-3,600 feet; Tuolumne - Nevada counties; ultramafic soils (gabbro and serpentine); chaparral, conifer forest or woodland edges/openings.	Yes	Yes	Yes
Sensitive Plants				
<i>Astragalus lemmonii</i> Lemmon's milkvetch	4,000-7,000 feet in California; east of Sierra crest; lakeshores, meadows and seeps among Great Basin scrub.	No	Potential	Yes
<i>Astragalus pulsiferae</i> var. <i>coronensis</i> Modoc Plateau milk-vetch	4,400-6,200 feet; Modoc – Plumas and Sierra Counties; Sandy or gravelly soils, often with juniper, pine or sagebrush.	No	Potential	Yes

Scientific Name Common Name	Habitat	Species present?	Habitat present?	Effects analysis needed?
<i>Astragalus webberi</i> Webber's milkvetch	2,400-4,100 feet; known only from Plumas County; dry forest openings/edges and semi-disturbed areas. Perennial herb.	No	Potential	Yes
<i>Boechnera rigidissima</i> (<i>Arabis rigidissima</i> var. <i>demota</i>) Galena Creek rockcress	Above 7,500 feet; known only in Placer County, California and Washoe County, Nevada; mesic areas (sometimes rocky) at red fir forest to aspen/meadow transitions.	No	Potential	Yes
<i>Botrychium ascendens</i> upswept moonwort	Above 4,000 feet (generally 5,000-7,500 feet on TNF); wet habitats (riparian, seeps, meadows, etc.).	Yes	Yes	Yes
<i>Botrychium crenulatum</i> scalloped moonwort	Above 4,000 feet (generally 5,000-7,500 feet on TNF); wet habitats (riparian, seeps, meadows, etc.).	Yes	Yes	Yes
<i>Botrychium lunaria</i> common moonwort	Above 6,000 feet; wet habitats (riparian, seeps, meadows, etc.).	No	Potential	Yes
<i>Botrychium minganense</i> Mingan moonwort	Above 4,000 feet (generally 5,000-7,500 feet on TNF); wet habitats (riparian, seeps, meadows, etc.).	Yes	Yes	Yes
<i>Botrychium montanum</i> western goblin	Above 4,000 feet; wet habitats (riparian, seeps, meadows, etc.).	No	Potential	Yes
<i>Bruchia bolanderi</i> Bolander's bruchia	Above 5,000 feet; montane meadows, stream banks, drying lake beds; on bare, semi-disturbed wet soils where competition is minimal. Bryophyte, Moss (perennial).	Yes	Yes	Yes
<i>Cudonia monticola</i> large cudonia	No elevation restriction, in duff; usually within old-growth conifer forests. Fungi (perennial).	No	Potential	Yes
<i>Cypripedium fasciculatum</i> clustered lady's-slipper	Below 6,000 feet; mesic, mid-to late-succession conifer or conifer-hardwood forests; north aspects; sometimes found with yew.	Yes	Yes	Yes
<i>Cypripedium montanum</i> mountain lady's-slipper	1,500-6,500 feet; mesic to wet, mid-to late- succession conifer or conifer-hardwood forests; north aspects; often found under montane dogwood.	No	Potential	Yes
<i>Dendrocollybia racemosa</i> branched collybia	No elevation restriction; on decayed fungi or occasionally in duff; usually within old growth conifer or conifer-hardwood forests. Fungi (perennial)	No	Potential	Yes
<i>Erigeron miser</i> starved daisy	6,200-8,500 feet; known only from Placer and Nevada counties; gravelly soils in crevices of near-vertical granite cliffs/faces.	Yes	Yes	Yes
<i>Eriogonum umbellatum</i> var. <i>torreyanum</i> Donner Pass buckwheat	Above 6,800 feet; dry, unstable, gravelly or stony soils; often on harsh exposures (e.g., ridge tops, steep slopes).	Yes	Yes	Yes
<i>Fritillaria eastwoodiae</i> Butte County fritillary	Below 4,900 feet; full to partial sun; chaparral, woodland and conifer forest.	Yes	Yes	Yes

Scientific Name Common Name	Habitat	Species present?	Habitat present?	Effects analysis needed?
<i>Helodium blandowii</i> Blandow's bog moss	Above 6,100 feet in California; usually found in bogs and fens, but sometimes seeps, wet meadows and under willows in riparian. Bryophyte, Moss.	No	Potential	Yes
<i>Ivesia aperta</i> var. <i>aperta</i> Sierra Valley ivesia	5,000-6,000 feet; east of Sierra crest; known only from Sierra and Dog Valleys; meadow edges, ephemeral stream channels, vernal wet flats and gentle, rocky slopes near springs.	No	Potential	Yes
<i>Ivesia aperta</i> var. <i>canina</i> Dog Valley ivesia	5,000-6,000 feet; east of Sierra crest; known only from Dog Valley; meadow edges, ephemeral stream channels, vernal wet flats and gentle, rocky slopes near springs.	No	Potential	Yes
<i>Ivesia sericoleuca</i> Plumas ivesia	5,000-6,500 feet; east of Sierra Crest; Plumas and Placer counties; vernal wet meadows and alkali flats.	Yes	Yes	Yes
<i>Juncus luciensis</i> Santa Lucia dwarf rush	4,500-6,300 feet; known only from southern California coast, Modoc Plateau and eastern Nevada County; wet, sandy soils of seeps, meadows, vernal pools, streams, and roadsides.	No	Potential	Yes
<i>Lewisia cantelovii</i> Cantelow's lewisia	1,000-4,500 feet; known only from Yuba River drainage; wet rock cliffs and outcrops; usually with moss or club moss.	Yes	Yes	Yes
<i>Lewisia kelloggii</i> ssp. <i>hutchisonii</i> Hutchison's lewisia	4,800-7,000 feet; ridgetops or relatively flat open areas; generally full sun; gravelly soils.	Yes	Yes	Yes
<i>Lewisia kelloggii</i> ssp. <i>Kelloggii</i> Kellogg's lewisia	Above 6,500 feet; ridgetops or relatively flat open areas; generally full sun; gravelly or sandy soils.	Yes	Yes	Yes
<i>Lewisia longipetala</i> long-petaled lewisia	Above 8,300 feet; El Dorado – Nevada counties; north-facing slopes and ridge tops often found in wet soils near margins of persistent snow banks.	Yes	Yes	Yes
<i>Lewisia serrata</i> saw-toothed lewisia	3,000-5,000 feet; known only from American River drainage; wet rock cliffs and outcrops; usually with moss.	Yes	Yes	Yes
<i>Meesia uliginosa</i> broad-nerved hump moss	Above 6,000 feet; usually found in bogs or fens, but also very wet meadows. Bryophyte, Moss	Yes	Yes	Yes
<i>Mielichhoferia elongate</i> elongate copper-moss	Below 3,500 feet; soils with copper or heavy metals; moist to wet rock cliffs/outcrops. Bryophyte, Moss	No	Potential	Yes
<i>Monardella follettii</i> Follett's monardella	2,500-5,600 feet; known only from Plumas County; serpentine soils; partial to full sun; conifer forest edges/openings.	No	Potential	Yes
<i>Peltigera gowardii</i> Goward's waterfan	1,150-7,000 feet, cold, clear, unpolluted streams; often found on rocks in cascades. Aquatic jelly lichen	No	Potential	Yes

Scientific Name Common Name	Habitat	Species present?	Habitat present?	Effects analysis needed?
<i>Penstemon personatus</i> closed-throated beardtongue	4,500-6,500 feet; Plumas – north Nevada County; partial sun; north aspects; conifer forest edges and openings.	Yes	Yes	Yes
<i>Phacelia stebbinsii</i> Stebbins' phacelia	2,000-6,700 feet; known only in Rubicon and American River drainages partial to full sun; generally in rocky openings/outcrops, but also woodland or conifer forest edges/openings.	Yes	Yes	Yes
<i>Phaeocollybia olivacea</i> olive phaeocollybia	No elevation restriction; Yuba County and north; on roots of Pinaceae and Fagaceae; usually within old growth conifer or conifer-hardwood forests. Fungi	No	Potential	Yes
<i>Pinus albicaulis</i> whitebark pine	Above 6,500 feet on TNF; subalpine and at timberline on rocky, well-drained soils. Coniferous tree.	Yes	Yes	Yes
<i>Poa sierra</i> Sierra bluegrass	1,000-5,500 feet; shady moist slopes; conifer forest edges/openings.	Yes	Yes	Yes
<i>Pyrrocoma lucida</i> sticky pyrrocoma	4,500-6,000 feet on TNF; east of Sierra crest; known only from Plumas and Sierra Counties; vernal wet meadows and alkali flats.	Yes	Yes	Yes
<i>Sowerbyella rhenana</i> stalked orange-peel fungus	No elevation restriction; in duff; wet mossy areas; usually within old-growth conifer forests. Fungi	No	Potential	Yes
<i>Tauschia howellii</i> Howell's tauschia	5,500-8,500 feet in California; xeric ridge summits and slopes; decomposed granite gravel or sand; red fir and subalpine forest edges/openings.	Yes	Yes	Yes

Threatened Species Information

Packera layneae (Layne's butterweed)

Status and Distribution

Layne's butterweed, a perennial herb, is listed by the Fish and Wildlife Service as a threatened species (USFWS 1996). It is known from several localities within the foothills of El Dorado, Tuolumne, and Yuba Counties (USFWS 2002) and in Placer County near Foresthill, California. The latter occurrence in Placer County is located just west of Sage Hill, within the Tahoe National Forest. This occurrence covers approximately 11 acres on open, gabbro soils at approximately 3,600 feet elevation, and includes about 100 plants in widely scattered clumps.

This early seral species occurs in temporary openings in chaparral plant communities on gabbro and serpentine soils and "is eliminated as vegetation grows up around it" (USFWS 2002). Based on the associated plant community and management history of the local population of this species near Sage Hill, Layne's butterweed appears adapted to a slight to moderate degree of disturbance (i.e., processes such as wildland fire that result in early seral vegetation).

Habitat loss, habitat fragmentation, alteration of natural fire regime, and suppression of disturbance (all mainly due to urbanization) are the major threats facing this species (USFWS 2002). In this project area, because of its relatively low elevation, Layne's butterweed occurrence does not consistently receive enough snowfall to allow OSV use on a regular basis.

Sensitive Species Information

Aggregating Species for Analysis of Effects

Due to the large number of sensitive plant species to address, and because OSV effects to various plant species are expected to be most similar according to their life form and growth habits, the 39 sensitive species considered in this analysis are grouped into the following categories:

- **Trees, shrubs, or sub-shrub species**, whose living tissues may be present above or within the snow column, and thus, may experience direct effects from OSV uses (physical damage or immediate exposure to exhaust). On the Tahoe National Forest, *Eriogonum umbellatum* var. *torreyanum*, *Monardella follettii*, and *Pinus albicaulis* are the sensitive plants in this category.
- **Perennial herbaceous species**, including grasses, mosses, and in this case, fungi, whose living tissues are at or below the soil surface in winter, and thus, are unlikely to experience direct effects, but they will be evaluated for impacts by exhaust contaminants trapped by the snow cover or by possible effects from snow compaction. On the Tahoe National Forest, there are 34 sensitive plants in this category.
- **Annual plant species** are generally not growing during the period of authorized OSV use, and thus would not experience direct effects. This group is the least likely to be impacted by the indirect effects of exhaust contaminants and snow compaction. *Phacelia stebbinsii* is the only annual sensitive plant within the Tahoe National Forest.
- **Aquatic plant species** grow under water and would not be directly affected by OSV use. If an occurrence is located in high-use areas, it is possible that snowpack contaminants could reach the occupied aquatic habitat when the snow melts. Snow compaction is not expected to affect aquatic habitats in any meaningful or predictable manner. Although many sensitive plants may be found in wet habitats, *Peltigera gowardii* is the only aquatic species.

Environmental Consequences

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 possible effects. Therefore, each alternative's effects will mainly summarize the extent of TEPS plants affected, and provide the basis for determinations. A summary comparison of alternatives will follow, providing the decision-maker a quick reference for evaluating the alternatives along with the other resources that need to be considered.

Effects analyses for TEPS plants are presented in categories of plant life forms because the greatest possible impacts from OSV activities are dependent upon the presence of their living tissues within the snow or above the snow surface and whether each species is biologically active during the times

that direct and indirect effects may occur. Effects to each life form category are presented after an introduction of direct and indirect effects.

Direct Effects

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). OSV use and grooming of OSV trails can damage vegetation through direct contact with plant tissues that are present above the snow or within the snow column that is compacted by the vehicles. Because woody species (trees, shrubs, and sub-shrubs) are the only plants present within the snow, they are the only plants that may be directly damaged. All other plant life forms are not expected to be directly affected by OSV use.

It is generally recognized that 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 requirement of adequate snow to avoid damage to resources for alternative 2, and the specific minimum snow depths for alternatives 3, 4, and 5 are expected to prevent or minimize damage to soil and vegetation.

In a study on Niwot Ridge in the Front Range of the Colorado Rocky Mountains, repeated snowmobile use occurred on snow-covered and snow-free areas between two weather stations, and the effects of this use were evaluated (Greller et al. 1974). General conclusions included: (1) in communities that are snow-free in winter, damage by snowmobiles was severe to lichens, *Selaginella*, and to relatively prominent, rigid cushion-plants. Part of the damage to these communities may have been due to the manual removal of rocks, necessary for the operation of snowmobiles in snow-free areas. (2) *Kobresia*, present in isolated tussocks in a cushion-plant community, absorbed the major portion of snowmobile impact. As *Kobresia* is thought to form the climatic climax community in this ecosystem, differential damage to it could seriously retard succession. (3) Snowmobile travel in uniform, closed *Kobresia* meadows inflicted much less damage to most plants, including *Kobresia* itself, than did similar travel on a sparsely vegetated community. (4) Plants best able to survive the heaviest snowmobile impact were those with small stature and little woodiness, or with buds well-protected at or below the soil surface. (5) Snowmobile traffic should be carefully restricted to snow-covered areas. Whenever this is not feasible, the least destructive and easiest alternative is travel on mature, well-vegetated *Kobresia* meadows or similar well-drained plant communities.

On the Tahoe National Forest, OSV travel on snow-free areas is prohibited under alternatives 2 through 5 and restricted under the alternative 1 because doing so would cause unauthorized damage to vegetation and soil resources. By not allowing OSV use when and where there is less than adequate snow to avoid damage to resources (typically 12 inches for cross-country use) or designating specific snow depth requirements, the Tahoe National Forest minimizes the possibility of direct damage to soils and ground vegetation.

Indirect Effects

Three specific topics of indirect effects were identified: snow compaction, pollutants, and invasive plant species. For areas designated for cross-country OSV use, these indirect effects are expected to

be more dispersed and repeated less often than along trail corridors. There may be some meadows and other open areas where OSV use is more attractive to riders, and these may experience more concentrated use. However, OSV use has not been identified as a threat and is unlikely to cause damage to any non-woody TEPS plants in areas of dispersed use within the Tahoe National Forest.

Snow Compaction

Snow is compacted by any of the allowed OSVs, including snowmobiles, snowcats, and snow grooming equipment. Snow compaction mechanically alters snow grains and redistributes them. This mechanical disturbance breaks off the small points of new snow crystals, destroying the weak existing bonds between them, and bringing the new grains into much closer contact than occurs naturally. Snow metamorphism is artificially accelerated, and snow density and hardness are increased. In addition, the layered structure of the snowpack is changed (Fahey and Wardle 1998). All this has both thermal and hydrological implications, resulting in lower soil temperatures (Fahey and Wardle 1998, Eagleston and Rubin 2013) and delayed snowmelt (Keddy et al. 1979, Fahey and Wardle 1998, Davenport and Switalski 2006, Gage and Cooper 2013). The thermal conductivity of compacted snow is greater than undisturbed snow, and can reduce the buffering effect against temperature extremes and fluctuations. Thermal conductivity of compacted snow was 11.7 times greater than non-compacted snow (Neumann and Merriam 1972).

Keddy et al. (1979) studied the effects of snowmobile use on snow compaction, vegetation composition, and soil temperatures on an abandoned farm in Nova Scotia. They found that snow melted later in areas with compacted snow and that some species showed differences in cover between treatments. Considering the multitude of possible effects and the variety of plant structures and life histories, they were not surprised to find no overall trend for species composition changes. They also noted that the first pass by a snowmobile caused the greatest increase in snow compaction—roughly 75 percent of that observed after 5 sequential passes. While some species composition changes were observed in old field vegetation, they found no changes in species composition in a marsh area, possibly because of solid ice cover during the winter.

In a study of the impact of snowshoe and cross-country ski compaction and snowmelt erosion on groomed trails, Eagleston and Rubin (2013) reported that these non-motorized uses caused snow to remain on the compacted areas an average of 5 days longer than non-compacted areas. They also found that the compacted snow caused increased erosion. Soil temperatures under compacted snow stayed frozen for 3 days longer, and, averaged over the entire winter season, remained 0.1 degree Celsius colder than soil under non-compacted snow.

Fahey and Wardle (1998) examined the effects of snow grooming for downhill ski areas in subalpine and alpine environments. They found that the compacted snow increased frost penetration and delayed snowmelt.

However, research does not always support the generalization of lower soil temperatures and delayed snowmelt due to snow compaction. In a study of snow compaction effects from snowmobiles on fens on the Routt National Forest, Gage and Cooper (2009) found no statistically significant differences in the temperature of peat soils between compacted and non-compacted areas. They also found no differences in timing of snowmelt, biomass production, or plant phenology. From additional, unpublished data from the Telluride Ski Area, where intense compaction occurred daily, they observed a delayed snowmelt and thawing of the soil of about one month in compacted areas. They noted that the continuous influx of groundwater in fens may limit freezing and maintain more

constant soil thermal conditions. They found no evidence conclusively linking snowmobile compaction to impairment of fen function.

Different plants have different levels of vulnerability and ability to recover from the effects of snow compaction. The characteristics that determine their vulnerability are the timing of flowering, and growth form and size (Fahey and Wardle 1998). Prolonged snow may adversely affect early spring flowering plants because they could have a shorter growing season and thus possibly reduced seed production due to delayed phenology and perhaps a misalignment of timing with their preferred pollinators. 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 within the Tahoe National Forest occurs almost entirely 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 is not expected to cause substantial impacts to water quality, perennial, intermittent or ephemeral streams, wetlands or other bodies of water.

In summary, the available research supports the assumption that more intensive snow compaction occurring along groomed or heavily used trails would have considerably greater effect on soil temperatures and delayed snowmelt than the compaction caused by dispersed uses in areas open to cross-country OSV use. Due to the intensive, repetitive, and predictable compaction of snow along designated OSV trails (groomed or not), these areas are much more likely to have a degree of compaction that could adversely influence vegetation. Therefore, in this analysis, areas within a half mile of designated OSV trails are assumed to be at risk from the effects of snow compaction. Outside the designated OSV trail corridors, dispersed OSV travel is much less likely to compact snow with enough intensity and repetition to measurably or predictably affect ground vegetation, and therefore, is not considered in this analysis as an expected source of indirect effects.

Pollutants

Emissions from 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 snowmobile engines produce considerably lower amounts of pollutants.

Pollutants emitted from exhaust can cause a variety of impacts on vegetation. Carbon dioxide may function as a fertilizer and cause changes in plant species composition (Bazzaz and Garbutt 1998); nitrogen oxides also may function as fertilizers, producing similar effects along roadsides (Falkengren-Grerup 1986). Sulfur dioxide, which can be taken up by vegetation, may result in altered photosynthetic processes (Winner and Atkison 1986, Mooney et al. 1988). Other toxic compounds may result in reduced metabolism or retarded growth.

Although a large portion of OSV exhaust is expected to be dissipated into the air, some of the airborne pollutants would enter the snowpack and be released during snowmelt. Similar responses can be assumed to occur in plants 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 snowmelt, can temporarily lower the pH of surface waters in a process known as “episodic acidification” (Blanchard et al. 1988). Soil acidification and vegetation changes were examined in southern Sweden, where Falkengren-Grerup (1986) found that increased nitrogen deposition and the increased acidity in the humus layer may have caused changes in plant cover, with some species increasing and some species decreasing.

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 snowmobile 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 U.S. 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 found were 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 snowmobiles in the Snowy Range, Wyoming, Musselman and Korfmacher (2007) found that heavier snowmobile 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 snowmobile emissions. Pollutant concentrations were generally low in both winter and summer. These results differ from those studies examining air pollution from snowmobiles 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 snowmobile trails was more acidic with higher amounts of sodium, ammonium, calcium, magnesium, fluoride, and sulfate. Snowmobile activity apparently had no effect on nitrate levels in the snow.

In the winter, plant metabolic rates are drastically reduced. Airborne compounds would only be taken up by respiring woody plants. Airborne pollutants normally disperse quickly in mountain

environments that are prone to windy conditions, such as the Sierra Nevada. Different plants may have different responses to the different pollutants in the snowpack, including damage from toxic, volatile compounds and possibly some benefits from additional nutrients and trace minerals. The levels of OSV exhaust contaminants within the Tahoe National Forest (considerably less than those observed in Yellowstone National Park) are not expected to impair water quality (McNamara 2016).

In a natural plant community with many species competing for resources, and very little research done on each species' responses to OSV emissions or the competitive interactions that may be affected, it is nearly impossible to predict what changes, if any, would occur. It can only be reasonably assumed that there may be some changes in plant species cover and composition. The uptake of harmful pollutants is not expected to result in the death of any individual plants. On the Tahoe National Forest, mortality of roadside TEPS plants due to vehicle pollutants has not been observed, even considering year-round vehicle uses. Therefore, the level of effect to TEPS plants from OSV pollutants is expected to be minimal, and would not result in loss of individuals.

The available research on OSV pollutants (both airborne and in the snowpack) indicate that some effects to vegetation may occur in the immediate vicinity of heavy use areas. Pollutants that become trapped in the snowpack are also expected to be concentrated in areas of heavy OSV use. Therefore, in this analysis, areas within a half mile of designated OSV trails (groomed or not) are assumed to be reasonably at risk from the effects of OSV pollutants. Outside the designated OSV trail corridors, dispersed OSV travel is much less likely to contribute harmful contaminants with high enough levels and repetition to measurably or predictably affect ground vegetation, and therefore is not considered in this analysis as an expected source of indirect effects.

Relative Potential Effects to Plant Life Forms

Considering the combination of direct and indirect effects described above, and the requirement of adequate snow to avoid resource damage or minimum snow depths of the alternatives, the effects of proposed OSV uses can be broken down into relative categories of potential damage to the major plant life forms. From the most likely to least likely to experience measurable effects:

- Evergreen trees and shrubs – most likely to be directly affected, due to mechanical damage; indirect effects are expected if the species occurs near designated OSV trails. Effects may occur in all areas designated for OSV use.
- Deciduous trees and shrubs – somewhat less likely, due to winter dormancy; indirect effects are expected if the species occurs near designated OSV trails. Effects may occur in all areas designated for OSV use.
- Sub-shrubs (low-growing woody species) – less likely due to less exposure to direct effects (but still expected); indirect effects may be expected if the species occurs near designated OSV trails. Effects may occur in all areas designated for OSV use.
- Perennial herbaceous species – direct effects are not expected to occur due to the requirement of adequate snow to avoid resource damage or minimum snow depths; indirect effects may be expected if the species occurs near designated OSV trails. Effects may occur along designated OSV trails, but are not likely in areas designated for OSV use.
- Annual species – direct effects are highly unlikely due to the requirement of adequate snow to avoid resource damage or minimum snow depths; indirect effects might be expected if the species occurs near designated OSV trails and spring flowering could be altered by persistent

compacted snow. Effects may occur along designated OSV trails, but are not likely in areas designated for OSV use.

- Aquatic species – direct effects would not occur because OSV use is not allowed over open water; indirect effects from pollutants might be expected if the species occurs near designated OSV trails. Effects may occur along designated OSV trails, but are not likely in areas designated for OSV use.

Threatened and Endangered Plants

Packera layneae (Layne's butterweed)

Direct Effects

Layne's butterweed is an herbaceous perennial that dies back to the ground each year. Because of the plant's dormancy during the winter OSV use period and the requirement of adequate snow to avoid resource damage or minimum snow depths preventing OSV contact with soil and ground vegetation, Layne's butterweed would not be directly affected by OSV use or snow trail grooming activities.

The two occurrences within the Tahoe National Forest are present in an area that is designated for OSV use only in alternatives 1 and 4, and public OSV use would only occur only when these areas accumulate adequate snow to avoid resource damage; therefore, soil and vegetation resources would likely be protected from damage.

Indirect Effects

The Layne's butterweed occurrences do not exist in high-use areas, where snow compaction and pollutants would be concentrated. There would be no indirect effects to Layne's butterweed because dispersed OSV use as described for all alternatives would not likely cause any noticeable changes from compaction of snow or pollutants. In alternatives 1 and 4, the area where Layne's butterweed is located would be open to dispersed OSV use, whereas in alternatives 2, 3, and 5, this area is not designated for public OSV use.

Trees, shrubs, or sub-shrub species

Direct Effects

Snowmobile activities may damage vegetation on and along trails and in areas open to cross-country OSV use. The most commonly observed effect from snowmobiles has been the physical damage to shrubs, saplings, and other vegetation (Neumann and Merriam 1972, Wanek 1971). Winter Wildland Alliance (WWA) analyzed the Gallatin National Forest regeneration survey data collected between 1983 and 1996 in areas that were harvested and replanted. That survey data indicated snowmobiles had damaged between 12 and 720 trees per acre (WWA 2009). Damage to vegetation has been observed in the Greater Yellowstone Area that is caused by winter recreational activities that occur off trail. For example, branches of willows (*Salix* spp.) and sagebrush (*Artemisia* spp.) have been broken, and leaders have been removed from conifers (Stangl 1999). Neumann and Merriam (1972) found that rigid woody stems up to 1 inch in diameter were very susceptible to damage. Stems were snapped off in surface packed or crusted snow. Neumann and Merriam (1972) also observed that compacted snow conditions caused twigs and branches to bend sharply and break. Stems that were more pliable bent and sprang back although the snowmobile track often removed bark from the stems' upper surfaces. Sub-zero temperatures make stems more prone to snapping rather than

bending. Direct mechanical effects by snowmobiles on vegetation at and above snow surface can be severe. After only a single pass by a snowmobile, more than 78 percent of the saplings on a trail were damaged, and nearly 27 percent of them were damaged seriously enough to cause a high probability of death (Neumann and Merriam 1972). Young conifers were found to be extremely susceptible to damage from snowmobiles. Broken stems of any woody species would provide places for pathogens to enter the plant tissues and would reduce the integrity of developing stems or trunks, both of which could lead to additional damage or death of individuals.

Direct damage to woody plants may occur with OSV use on any snow depth. When OSVs are operated on low snow depths, shorter woody plants (including sub-shrubs, shrubs, and young trees) are more prone to damage because their living stems are present in the snow column that could be churned by OSV tracks and paddles or disrupted by OSV skis as they are ridden across the landscape. During the middle portion of the OSV season, snowpack is typically several feet deep and the shorter woody plants would not be directly affected. There would still be considerable possibility for damage to taller shrubs and tree species (most notably *Pinus albicaulis*, whitebark pine) with deeper snowpack, with potential for unintentional breakage and abrasion of branches and leader growth. These direct effects are expected to be localized, would affect only individuals due to the dispersed nature of open area OSV use, and would not result in loss of entire occurrences.

On the Tahoe National Forest, OSV use may directly damage individuals of the Region 5 sensitive species *Eriogonum umbellatum* var. *torreyanum* and *Pinus albicaulis*, due to their presence in areas designated for OSV use.

For *Pinus albicaulis*, because many occurrences are not yet tracked spatially, it is worth mentioning that over 13,000 acres of subalpine conifer forest within the Tahoe National Forest likely provide considerably more suitable habitat and additional occurrences beyond the few acres specifically mapped as a special status species. Each of the alternatives proposes to allow OSV use on approximately 2,300 to 5,200 of these acres. Additional habitat is also present but not mapped or tallied for the other sensitive plant species.

Indirect Effects

Airborne pollutants from OSVs would be concentrated along OSV trails. Because deciduous trees and shrubs lose their leaves in the winter months, they cannot photosynthesize during fall and winter; thus respiration is dramatically reduced for deciduous trees and shrubs. Although evergreen trees and shrubs retain their leaves and are thus capable of photosynthesis and respiration during winter, these processes are also considerably reduced during the cold season. Reduced respiration during the winter means that smaller amounts of the airborne pollutants would be ingested through gas exchange. For low-growing woody species that are generally covered by snow when OSV use would occur (*Eriogonum umbellatum* var. *torreyanum*), the exposure to airborne pollutants would be negligible.

Pollutants which are trapped and then released during snowmelt may (or may not) have some adverse and some beneficial effects, however the extent and direction of specific effects is unknown. It is expected that pollutant concentrations would be low enough that water quality would not be impaired, and thus it is likely that plant responses, if any, would not be noticeable.

Perennial herbaceous species (including bryophytes and fungi)

Direct Effects

With the requirement of adequate snow to avoid resource damage in alternatives 1 and 2 or the minimum snow depths specified in alternatives 3, 4, and 5 providing protection of the soil surface and ground vegetation, perennial herbaceous species (which die back each year to buds at or below the soil surface) would not be directly affected by current or proposed OSV uses.

Indirect Effects

Snow compaction from dispersed OSV use is not expected to affect perennial herbaceous species because the possible delayed snowmelt (usually a week or two) and small degree of colder soil temperatures in the compacted snow areas would be within the normal range of variation that they experience within the Tahoe National Forest. Where it occurs each year, compacted snow may alter the timing of new foliage emergence in the spring due to delayed snowmelt and colder soil temperatures, but perennial herbaceous plants in the Sierra Nevada are assumed to be adapted to a wide variety of natural snowmelt times and the effects of compacted snow would likely be masked by the annual variation in snowpack.

Pollutants from dispersed OSV use (both airborne and those small amounts that become entrapped in the snow) would also not likely affect perennial herbaceous species because living plant tissues are not present above ground during the winter and pollutants are not expected to accumulate within the snow column or in run-off at high enough concentrations to cause noticeable changes.

Where occurrences exist in high-use areas, compaction and pollutants may be concentrated enough to cause some small magnitude changes to plant growth and community interactions. No populations are expected to decline with any of the proposed OSV uses.

Annual plant species

Direct Effects

Plant species that complete their life cycle within one growing season would not be directly affected by current or proposed OSV uses because they are normally not growing during the authorized period of OSV use.

Indirect Effects

Snow compaction from dispersed OSV use is not expected to affect annual species because the possible delayed snowmelt (usually a week or two) and small degree of colder soil temperatures in the compacted snow areas would be within the normal range of variation. Compacted snow may slightly alter the timing of seed germination and plant growth in the spring, due to delayed snowmelt and colder soil temperatures in the compacted areas. This is not expected to noticeably affect annual plants because they are assumed to be adapted to a wide variety of natural snowmelt times within their ranges of distribution. The annual variation in snowpack and temperatures would likely mask any differences in phenology due to OSV uses.

Pollutants from dispersed OSV use (both airborne and those small amounts that become entrapped in the snow) would also not likely affect annual species because living plant tissues are not present above ground during the winter and pollutants are not expected to accumulate within the snow column or in run-off at high enough concentrations to cause any noticeable changes.

Where occurrences exist in high-use areas, compaction and pollutants may be concentrated enough to cause some small magnitude changes to plant community interactions. *Phacelia stebbinsii* is the only annual sensitive plant species within the Tahoe National Forest. Some occupied areas are within high-use areas, but no populations are expected to decline with any of the proposed OSV uses.

Aquatic Species

Direct Effects

Aquatic plant species would not be directly affected by current or proposed OSV uses, because OSVs are not authorized to operate over or within aquatic habitats.

Indirect Effects

Delayed snowmelt and transfer of sub-freezing temperatures from snow compaction is not expected to affect aquatic plant species.

Airborne pollutants would not affect aquatic species because the plants grow underwater. In dispersed open areas, pollutants are not expected to accumulate within the snow column or in run-off at high enough concentrations to cause any noticeable changes to vegetation.

Peltigera gowardii is the only aquatic sensitive plant species suspected, but it has not yet been found within the Tahoe National Forest, and thus would not be affected.

Cumulative Effects

Past activities are considered part of the existing condition and are discussed within the Affected Environment section. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed to those effects. Sensitive plant occurrences that exist today within the Tahoe National Forest are the result of these species' interactions with past environmental conditions and natural and human disturbances. In terms of sensitive plant habitats, past actions have resulted in an increase in densely forested stands, an increase in decadent shrubs, a decrease in key early-seral habitat components such as aspen stands, meadows, grasses and forbs, and young brush fields, and changed historic flow regimes in meadows/riparian habitats.

Snow plowing at the established OSV trailheads is an ancillary activity associated with the Tahoe National Forest OSV Use Designation project, and is not analyzed as a part of the proposal. Snow plowing is not expected to affect TEPS plants.

Other ongoing and foreseeable future activities include livestock grazing, recreation, timber harvest, fuel reduction, woodcutting activities, wildfire suppression, and other activities. These activities may affect some sensitive plants individually, but no trends toward Federal listing or loss of species viability are expected due to protective measures deemed necessary during environmental analysis and implemented as required. Impacts related to hikers and OHV activities (trampling, soil disturbance, dust accumulation on plants, etc.) are ongoing and are expected to increase as the numbers of national forest visitors rise. Timber harvest, fuel reduction, fire suppression, emergency responses, and other actions carried out by Federal workers or contractors are typically able to

provide adequate protection for sensitive plant occurrences using flag and avoid methods or other specific measures designed for species protection. See appendix C for details on specific activities.

Threatened and Endangered Plants

Ongoing activities and natural growth and succession would contribute to some changes to *Packera layneae* habitat as they have in the past. Future actions are also not expected to adversely affect this species because avoidance measures would be incorporated into the planning and implementation of the projects. Since there would be no direct or indirect effects to *Packera layneae* or their associated critical habitat, there are no cumulative effects to consider for this species.

Sensitive Plants

All current and reasonably foreseeable future projects include mitigations, such as avoidance measures or other project design features, to minimize adverse impacts to Region 5 sensitive plant species.

These sensitive plants are currently experiencing the everyday stresses of life in the wild, with drought likely impacting their growth and seed production in recent years. Besides the threat of physical damage from many of the contributing actions, these species are also threatened by invasive plant encroachments. Continuing pressures on sensitive plant habitats include wildfire, early or late freezing, severe wind or winter storms, flooding, insect population fluxes, and other natural events. These events may also cause damage or death to sensitive plant individuals or cause habitat changes.

Effects may include damage to or death of individuals, through project actions and possible effects from introduced invasive species, increased soil erosion, and other changes to habitat characteristics. All of these projects would include reasonable mitigations to minimize or reduce impacts and monitor for concerns to help manage impacts to sensitive plant species habitat and occurrences. Through project design features, the potential for these impacts to occur is small. If impacts still occur, only low intensity, localized effects are expected for the sensitive plant species.

The annual, seasonal timing of OSV effects does not eliminate the chance of direct and indirect effects accumulating. Broken branches of woody plants and any deceased individual plants would require one to several years to recover, and additional actions would be taking place during this recovery time.

Individually and collectively, the magnitude of effects from these actions would remain relatively low. Natural disturbances, such as fire, wind and ice storms, and drought are much more likely to impact sensitive plant species, and their effects would be considerably greater. With cumulative effects considered, sensitive plant species viability in the OSV project area would be maintained and no trend toward Federal listing would occur. When effects from other projects are combined and if they overlap with the effects from the Tahoe OSV Use project, there would still be no loss of viability for any plant species and none would trend toward Federal listing, for all alternatives.

Alternative 1 – No Action

Alternative 1 Effects to TEPS plants

The following table summarizes the measures by the major analysis topics.

Table 102. TEPS plant indicators and measures for alternative 1

Analysis Topic	Total acres in Tahoe National Forest	Acres in high-use areas	Acres in designated OSV areas
Threatened and endangered plants	57	0	57
Sensitive plants	2,496	308	2,051

There are no additional types of effects to TEPS plants beyond those described in Effects Common to All Alternatives that are specific to alternative 1. Under this alternative, direct effects to these botanical resources would be more likely due to larger areas open to OSV use.

Threatened and Endangered Plants

As described above in Effects Common to All Alternatives, there would be no direct effects to *Packera layneae*.

Sensitive Plants

Sensitive plant species in the various plant life form categories would be affected differently, as described above in Effects Common to All Alternatives. Trees, shrubs, and sub-shrubs (woody plants) may be directly damaged by OSVs where they occur in areas designated for OSV use, and they may also experience indirect effects from snow compaction and pollutants, most likely to be noticeable where they occur near designated OSV trails. Perennial herbaceous species, annual species and aquatic species would not be directly affected, but they too may also experience noticeable indirect effects if they occur near designated OSV trails.

Indirect effects from snow compaction are expected to be greater with alternatives 1, 2, and 4 because only a minimal protection is afforded to ground vegetation. Alternative 1 also provides a minimal protection for woody sensitive plants because, although a minimum snow depth is not identified, enforcement of a reasonable avoidance of resource damage is the management tool used to keep OSV use from occurring when snow depths are too low.

Sensitive Plant Determinations for Alternative 1:

For two of the three sensitive woody plant species, *Eriogonum umbellatum* var. *torreyanum* and *Pinus albicaulis*, due to the possibility of direct damage to individuals and minor indirect effects from snow compaction and OSV pollutants where they occur in areas designated for OSV use, alternative 1 of the Tahoe 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 planning area. The third sensitive woody plant species considered, *Monardella follettii*, is not known to occur within the Tahoe National Forest, and would not be affected.

After evaluating the specific habitat requirements of each species and likely interactions with OSV use, minor indirect effects from snow compaction and OSV pollutants would be possible for any of the sensitive plant species present in areas of high OSV use. Therefore, alternative 1 of the Tahoe 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 planning area for *Botrychium crenulatum*, *Botrychium minganense*, *Bruchia bolanderi*, *Erigeron miser*, *Ivesia sericoleuca*, *Lewisia kelloggii* ssp. *hutchisonii*, *Meesia uliginosa*, *Phacelia stebbinsii*, and *Poa sierrae*.

Because the following species are not known to exist in areas of high OSV use, alternative 1 of the Tahoe OSV Use Designation project would have **no effect** on *Botrychium ascendens*, *Cypripedium fasciculatum*, *Fritillaria eastwoodiae*, *Ivesia aperta* var. *aperta*, *Lewisia cantelovii*, *Lewisia kelloggii* ssp. *kelloggii*, *Lewisia longipetala*, *Lewisia serrata*, *Peltigera gowardii*, *Penstemon personatus*, *Phaeocollybia olivaceae*, *Pyrrocoma lucida*, and *Tauschia howellii*.

Because the following species are not known to exist at all within the Tahoe National Forest, alternative 1 of the Tahoe OSV Use Designation project would have **no effect** on *Astragalus lemmonii*, *Astragalus pulsiferae* var. *coronensis*, *Astragalus webberi*, *Boechera rigidissima*, *Botrychium lunaria*, *Botrychium montanum*, *Cudonia monticola*, *Cypripedium montanum*, *Dendrocollybia racemosa*, *Helodium blandowii*, *Ivesia aperta* var. *canina*, *Juncus luciensis*, *Mielichhoferia elongata*, *Monardella follettii*, *Peltigera gowardii*, and *Sowerbyella rhenana*.

Alternative 2 – Modified Proposed Action

Alternative 2 Effects to TEPS Plants

The following table summarizes these measures by the major analysis topics.

Table 103. TEPS plant indicators and measures for alternative 2

Analysis Topic	Total acres on Tahoe National Forest	Acres in high-use areas	Acres in designated OSV areas
Threatened and Endangered plants	57	0	0
Sensitive plants	2,496	253	1,294

No additional types of effects to TEPS plants and other botanical resources beyond those described in Effects Common to All Alternatives are specific to alternative 2.

In comparison with other alternatives, alternative 2 would be relatively equal with alternatives 1 and 4 in providing the minimum snow depth needed to prevent damage to resources (typically 12 inches). In contrast, alternatives 3 and 5 would increase minimum snow depths to 18 inches and 24 inches, respectively, and would provide additional degrees of protection and assurance that soil and vegetation resources are not damaged.

Threatened and Endangered Plants

As described above in Effects Common to All Alternatives, there would be no direct effects to *Packera layneae*. The two occurrences on Tahoe National Forest are not near any OSV trail. Indirect effects are not likely to occur from the small amounts of snow compaction and pollutants associated with dispersed OSV use. Because no direct, indirect, or cumulative effects to this species are expected, alternative 2 of the Tahoe OSV Use Designation project would have **no effect** on *Packera layneae*.

Sensitive Plants

Sensitive plant species in the various plant life form categories would be affected differently, as described above in Effects Common to All Alternatives. Trees, shrubs, and sub-shrubs (woody plants) may be directly damaged by OSVs where they occur in areas designated for OSV use, and they may also experience indirect effects where they occur near designated OSV trails. Perennial

herbaceous species, annual species and aquatic species would not be directly affected, but they may also experience indirect effects if they occur near designated OSV trails.

With alternative 2, a snow depth to prevent resource damage, typically a 12-inch minimum, is expected to prevent direct effects to non-woody sensitive plants.

Indirect effects from snow compaction are expected to be greater with alternatives 1, 2, and 4 because 12 inches is considered a minimal protection afforded to ground vegetation. Alternative 2 would provide minimal protection for non-woody sensitive plants because cross-country travel is allowed when there is adequate snow depth to avoid damage to (soil and ground vegetation) resources. However, there could still be considerable direct damage to woody species throughout the OSV season, with possible unintentional breakage and abrasion of branches and leader growth.

Because the amount of area designated for OSV use is relatively moderate at 410,703 acres, alternative 2 would have less impacts to sensitive plant occurrences than alternatives 1 and 4, but more than alternatives 3 and 5.

Sensitive Plant Determinations for Alternative 2:

For two of the three sensitive woody plant species, *Eriogonum umbellatum* var. *torreyanum* and *Pinus albicaulis*, due to the possibility of direct damage to individuals and minor indirect effects from snow compaction and OSV pollutants where they occur in areas designated for OSV use, alternative 2 of the Tahoe 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 planning area.**

After evaluating the specific habitat requirements of each species and potential interactions with OSV use, minor indirect effects from snow compaction and OSV pollutants would be possible for any of the sensitive plant species present in areas of high OSV use. Therefore, alternative 2 of the Tahoe 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 planning area** for *Botrychium crenulatum*, *Botrychium minganense*, *Bruchia bolanderi*, *Erigeron miser*, *Ivesia sericoleuca*, *Lewisia kelloggii* ssp. *hutchisonii*, *Lewisia serrata*, *Phacelia stebbinsii*, and *Poa sierrae*.

Because the following species are not known to exist in areas of high OSV use, alternative 2 of the Tahoe OSV Use Designation project would have **no effect** on *Botrychium ascendens*, *Cypripedium fasciculatum*, *Fritillaria eastwoodiae*, *Ivesia aperta* var. *aperta*, *Lewisia cantelovii*, *Lewisia kelloggii* ssp. *kelloggii*, *Lewisia longipetala*, *Meesia uliginosa*, *Peltigera gowardii*, *Penstemon personatus*, *Phaeocollybia olivaceae*, *Pyrrocoma lucida*, and *Tauschia howellii*.

Because the following species are not known to exist at all within the Tahoe National Forest, alternative 2 of the Tahoe National Forest OSV Designation Use project would have **no effect** on *Astragalus lemmonii*, *Astragalus pulsiferae* var. *coronensis*, *Astragalus webberi*, *Boechea rigidissima*, *Botrychium lunaria*, *Botrychium montanum*, *Cudonia monticola*, *Cypripedium montanum*, *Dendrocollybia racemosa*, *Helodium blandowii*, *Ivesia aperta* var. *canina*, *Juncus luciensis*, *Mielichhoferia elongata*, *Monardella follettii*, *Peltigera gowardii*, and *Sowerbyella rhenana*.

Alternative 3

Alternative 3 Effects to TEPS Plants

The following table summarizes these same measures by the major analysis topics.

Table 104. TEPS plant indicators and measures for alternative 3

Analysis Topic	Total acres on Tahoe National Forest	Acres in high-use areas	Acres in designated OSV areas
Threatened and Endangered plants	57	0	0
Sensitive plants	2,496	102	829

No additional types of effects to TEPS plants and other botanical resources beyond those described in Effects Common to All Alternatives are specific to alternative 3.

In comparison with alternatives 1, 2, and 4, because of its 18-inch minimum snow depth, alternative 3 would provide a low to moderate degree of additional protection and assurance that soil and vegetation resources are not damaged. However, alternative 5 would increase minimum snow depths to 24 inches and would provide further protection of resources.

Threatened and Endangered Plants

As described above in Effects Common to All Alternatives, there would be no direct effects to *Packera layneae*. The two occurrences on Tahoe National Forest are not near any OSV trail. Indirect effects are not likely to occur from the small amounts of snow compaction and pollutants associated with dispersed OSV use. Because no direct, indirect, or cumulative effects to this species are expected, alternative 3 of the Tahoe OSV Use Designation project would have **no effect** on *Packera layneae*.

Sensitive Plants

Sensitive plant species in the various plant life form categories would be affected differently, as described above in Effects Common to All Alternatives. Trees, shrubs, and sub-shrubs (woody plants) may be directly damaged by OSVs where they occur in areas designated for OSV use, and they may also experience indirect effects where they occur near designated OSV trails. Perennial herbaceous species, annual species and aquatic species would not be directly affected, but they also may experience indirect effects if they occur near designated OSV trails.

In comparison with alternatives 1, 2, and 4, increasing minimum snow depths to 18 inches for cross-country travel would add an extra measure of protection for TEPS plants and their habitats, but effects already described would still be possible.

Alternative 3 provides a moderate level of protection for all sensitive plants because an additional 6 inches of snow is required for OSV use, providing a deeper cushion to absorb snow compaction and further protection from direct effects to the shortest woody plant species. Non-woody sensitive plants are not expected to be directly affected. However, there could still be damage to woody species throughout the OSV season, with possible unintentional breakage and abrasion of branches and leader growth.

Because alternative 3 would allow cross-country OSV travel in the least area (257,024 acres), it would impact the fewest sensitive plant occurrences.

Sensitive Plant Determinations for Alternative 3:

For two of the three sensitive woody plant species, *Eriogonum umbellatum* var. *torreyanum* and *Pinus albicaulis*, due to possible direct damage to individuals and minor indirect effects from snow compaction and OSV pollutants where they occur in areas designated for OSV use, alternative 3 of the Tahoe 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 planning area.**

After evaluating the specific habitat requirements of each species and potential interactions with OSV use, minor indirect effects from snow compaction and OSV pollutants would be possible for any of the sensitive plant species present in areas of high OSV use. Therefore, alternative 3 of the Tahoe 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 planning area** for *Botrychium crenulatum*, *Botrychium minganense*, *Bruchia bolanderi*, *Erigeron miser*, *Ivesia sericoleuca*, *Lewisia kelloggii* ssp. *hutchisonii*, *Meesia uliginosa*, *Phacelia stebbinsii*, and *Poa sierrae*.

Because the following species are not known to exist in areas of high OSV use, alternative 3 of the Tahoe OSV Use Designation project would have **no effect** on *Botrychium ascendens*, *Cypripedium fasciculatum*, *Fritillaria eastwoodiae*, *Ivesia aperta* var. *aperta*, *Lewisia cantelovii*, *Lewisia kelloggii* ssp. *kelloggii*, *Lewisia longipetala*, *Lewisia serrata*, *Peltigera gowardii*, *Penstemon personatus*, *Phaeocollybia olivaceae*, *Pyrrocoma lucida*, and *Tauschia howellii*.

Because the following species are not known to exist at all within the Tahoe National Forest, alternative 3 of the Tahoe OSV Use Designation project would have **no effect** on *Astragalus lemmonii*, *Astragalus pulsiferae* var. *coronensis*, *Astragalus webberi*, *Boechera rigidissima*, *Botrychium lunaria*, *Botrychium montanum*, *Cudonia monticola*, *Cypripedium montanum*, *Dendrocollybia racemosa*, *Helodium blandowii*, *Ivesia aperta* var. *canina*, *Juncus luciensis*, *Mielichhoferia elongata*, *Monardella follettii*, *Peltigera gowardii*, and *Sowerbyella rhenana*.

Alternative 4

Alternative 4 Effects to TEPS Plants

The following table summarizes the measures by the major analysis topics.

Table 105. TEPS plant indicators and measures for alternative 4

Analysis Topic	Total acres on Tahoe National Forest	Acres in high-use areas	Acres in designated OSV areas
Threatened and endangered plants	57	0	57
Sensitive plants	2,496	354	1,847

No additional types of effects to TEPS plants and other botanical resources beyond those described in Effects Common to All Alternatives are specific to alternative 4.

With a 12-inch minimum snow depth, alternative 4 is similar to alternatives 1 and 2, providing the minimum snow depth needed to prevent damage to resources (assumed to be 12 inches). However,

alternatives 3 and 5 would increase minimum snow depths to 18 inches and 24 inches, respectively, and would provide additional degrees of protection and assurance that soil and vegetation resources are not damaged.

Threatened and Endangered Plants

As described above in Effects Common to All Alternatives, there would be no direct effects to *Packera layneae*. The two occurrences on Tahoe National Forest are not near any OSV trail. Indirect effects are not likely to occur from the small amounts of snow compaction and pollutants associated with dispersed OSV use. Because no direct, indirect, or cumulative effects to this species are expected, alternative 4 of the Tahoe OSV Use Designation project would have **no effect** on *Packera layneae*.

Sensitive Plants

Sensitive plant species in the various plant life form categories would be affected differently, as described above in Effects Common to All Alternatives. Trees, shrubs, and sub-shrubs (woody plants) may be directly damaged by OSVs where they occur in areas designated for OSV use, and they may also experience indirect effects where they occur near designated OSV trails. Perennial herbaceous species, annual species and aquatic species would not be directly affected, but they too may also experience indirect effects if they occur near designated OSV trails.

Alternative 4 would require a minimum of 12 inches of snow for cross-country OSV use. This is considered to be a minimum reasonable protection for soil and ground vegetation. A 12-inch minimum snow depth is expected to prevent direct effects to non-woody sensitive plants.

Indirect effects from snow compaction are expected to be greater with alternatives 1, 2, and 4 because only a minimal protection is afforded to ground vegetation. Alternative 4 would provide minimal protection for woody sensitive plants because cross-country travel is allowed when there is just adequate snow depth to avoid damage to (soil and ground vegetation) resources, but there could still be damage to woody species throughout the OSV season, with unintentional breakage and abrasion of branches and leader growth.

Because alternative 4 would allow cross-country OSV use on the greatest area (640,708 acres), it would have the potential to impact the most area of sensitive plant occurrences.

Sensitive Plant Determinations for Alternative 4:

For two of the three sensitive woody plant species, *Eriogonum umbellatum* var. *torreyanum* and *Pinus albicaulis*, due to possible direct damage to individuals and minor indirect effects from snow compaction and OSV pollutants where they occur in areas designated for OSV use, alternative 4 of the Tahoe 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 planning area.**

After evaluating the specific habitat requirements of each species and potential interactions with OSV use, minor indirect effects from snow compaction and OSV pollutants would be possible for any of the sensitive plant species present in areas of high OSV use. Therefore, alternative 4 of the Tahoe 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 planning area** for *Botrychium crenulatum*, *Botrychium minganense*, *Bruchia bolanderi*, *Erigeron miser*, *Ivesia sericoleuca*, *Lewisia kelloggii* ssp. *hutchisonii*, *Meesia uliginosa*, *Phacelia stebbinsii*, and *Poa sierrae*.

Because the following species are not known to exist in areas of high OSV use, alternative 4 of the Tahoe OSV Use Designation project would have **no effect** on *Botrychium ascendens*, *Cypripedium fasciculatum*, *Fritillaria eastwoodiae*, *Ivesia aperta* var. *aperta*, *Lewisia cantelovii*, *Lewisia kelloggii* ssp. *kelloggii*, *Lewisia longipetala*, *Lewisia serrata*, *Peltigera gowardii*, *Penstemon personatus*, *Phaeocollybia olivaceae*, *Pyrrocoma lucida*, and *Tauschia howellii*.

Because the following species are not known to exist at all within the Tahoe National Forest, alternative 4 of the Tahoe OSV Use Designation project would have **no effect** on *Astragalus lemmonii*, *Astragalus pulsiferae* var. *coronensis*, *Astragalus webberi*, *Boechera rigidissima*, *Botrychium lunaria*, *Botrychium montanum*, *Cudonia monticola*, *Cypripedium montanum*, *Dendrocollybia racemosa*, *Helodium blandowii*, *Ivesia aperta* var. *canina*, *Juncus luciensis*, *Mielichhoferia elongata*, *Monardella follettii*, *Peltigera gowardii*, and *Sowerbyella rhenana*.

Alternative 5

Alternative 5 Effects to TEPS Plants

The following table summarizes the measures by the major analysis topics.

Table 106. TEPS plant indicators and measures for alternative 5

Analysis Topic	Total acres on Tahoe National Forest	Acres in high-use areas	Acres in designated OSV areas
Threatened and endangered plants	57	0	0
Sensitive plants	2,496	237	986

No additional types of effects to TEPS plants and other botanical species beyond those described in Effects Common to All Alternatives are specific to alternative 5. Increasing the minimum snow depth requirement to 24 inches would add a moderate extra measure of protection for TEPS plants and their habitats, but effects already described would still be possible.

Threatened and Endangered Plants

As described above in Effects Common to All Alternatives, there would be no direct effects to *Packera layneae*. The two occurrences on Tahoe National Forest are not near any OSV trail. Indirect effects are not likely to occur from the small amounts of snow compaction and pollutants associated with dispersed OSV use. Because no direct, indirect, or cumulative effects to this species are expected, alternative 5 of the Tahoe OSV Use Designation project would have **no effect** on *Packera layneae*.

Sensitive Plants

Sensitive plant species in the various plant life form categories would be affected differently, as described above in Effects Common to All Alternatives. Trees, shrubs, and sub-shrubs (woody plants) may be directly damaged by OSVs where they occur in areas designated for OSV use, and they may also experience indirect effects where they occur near designated OSV trails. Perennial herbaceous species, annual species and aquatic species would not be directly affected, but they too may also experience indirect effects if they occur near designated OSV trails.

Alternative 5 provides the highest level of protection for sensitive plants in areas designated for OSV use because an additional 12 inches of snow is required, providing a deeper cushion to absorb snow

compaction and further protection from direct effects to the shorter woody plant species. Non-woody sensitive plants are not expected to be directly affected. However, there could still be considerable damage to woody species throughout the OSV season, with unintentional breakage and abrasion of branches and leader growth.

Because there would be a smaller area open to cross-country OSV use (302,411 acres), alternative 5 would have a smaller potential for impacts to sensitive plant occurrences than other alternatives, except alternative 3.

Sensitive Plant Determinations for Alternative 5:

For two of the three sensitive woody plant species, *Eriogonum umbellatum* var. *torreyanum* and *Pinus albicaulis*, due to the possibility of direct damage to individuals and minor indirect effects from snow compaction and OSV pollutants where they occur in areas designated for OSV use, alternative 5 of the Tahoe 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 planning area.**

After evaluating the specific habitat requirements of each species and potential interactions with OSV use, minor indirect effects from snow compaction and OSV pollutants would be possible for any of the sensitive plant species present in areas of high OSV use. Therefore, alternative 5 of the Tahoe 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 planning area** for *Botrychium crenulatum*, *Botrychium minganense*, *Bruchia bolanderi*, *Erigeron miser*, *Ivesia sericoleuca*, *Lewisia kelloggii* ssp. *hutchisonii*, *Phacelia stebbinsii*, and *Poa sierrae*.

Because the following species are not known to exist in areas of high OSV use, alternative 5 of the Tahoe OSV Use Designation project would have **no effect** on *Botrychium ascendens*, *Cypripedium fasciculatum*, *Fritillaria eastwoodiae*, *Ivesia aperta* var. *aperta*, *Lewisia cantelovii*, *Lewisia kelloggii* ssp. *kelloggii*, *Lewisia longipetala*, *Lewisia serrata*, *Meesia uliginosa*, *Peltigera gowardii*, *Penstemon personatus*, *Phaeocollybia olivaceae*, *Pyrrocoma lucida*, and *Tauschia howellii*.

Because the following species are not known to exist at all within the Tahoe National Forest, alternative 5 of the Tahoe OSV Use Designation project would have **no effect** on *Astragalus lemmonii*, *Astragalus pulsiferae* var. *coronensis*, *Astragalus webberi*, *Boechera rigidissima*, *Botrychium lunaria*, *Botrychium montanum*, *Cudonia monticola*, *Cypripedium montanum*, *Dendrocollybia racemosa*, *Helodium blandowii*, *Ivesia aperta* var. *canina*, *Juncus luciensis*, *Mielichhoferia elongata*, *Monardella follettii*, *Peltigera gowardii*, and *Sowerbyella rhenana*.

Summary of TEPS Plant Effects

Summary of TEPS Plant Measures and Determinations

Table 107. TEPS plant summary of measures for all alternatives

Analysis Topic	Total acres on Tahoe National Forest	Acres in high-use areas	Acres in designated OSV areas
Threatened and endangered plants	57	0 all alternatives	57 Alt. 1 0 Alt. 2 0 Alt. 3 57 Alt. 4 0 Alt. 5

Analysis Topic	Total acres on Tahoe National Forest	Acres in high-use areas	Acres in designated OSV areas
Sensitive plants	2,496	308 Alt. 1 253 Alt. 2 102 Alt. 3 354 Alt. 4 237 Alt. 5	2,051 Alt. 1 1,294 Alt. 2 829 Alt. 3 1,847 Alt. 4 986 Alt. 5

Threatened and Endangered Plants

There would be no direct effects to *Packera layneae* from the proposed OSV uses. The two occurrences on Tahoe National Forest are not within 0.5 mile of any OSV trail, in any alternative, and thus, are not in the assumed high-use areas. Indirect effects from snow compaction and pollutants associated with dispersed OSV use are not expected to affect this perennial herbaceous species.

Therefore, for all alternatives, there would be **no effect** to *Packera layneae* from the Tahoe OSV Use Designation project.

Sensitive Plants

Sensitive woody plant species may be directly affected by crushing, breaking, or abrasion of stems and evergreen foliage where they occur in any areas designated for OSV use. Plants of other life form categories would not be directly affected because their living tissues are not present above ground, and would not be directly damaged by OSVs. Any of the sensitive plants may be indirectly affected by snow compaction and/or OSV emissions containing pollutants where they occur in areas of high-use (open areas within 0.5 mile of designated OSV trails). Thus, these plant species are reasonably at risk to some level of effects, dependent on their life forms, timing of growth, and proximity to heavy OSV use. Indirect effects are expected to be minor, and all effects would be minimized by the required minimum snow depths or conditional requirements proposed. Although some individuals may be severely damaged and may eventually die from intensive OSV damage (*Pinus albicaulis* is the most likely species to be damaged to this extent), OSV use is not expected to result in a trend toward Federal listing or loss of viability for any sensitive plants.

Minimum snow depths or requirements to avoid resource damage vary among the alternatives, with alternatives 1, 2, and 4 having similar minimal requirements that are expected to prevent direct effects to non-woody sensitive plants. Alternative 3 would require a moderate snow depth of 18 inches for OSV use, and this adds a degree of protection for the shorter woody sensitive plants. Alternative 5 proposes the deepest snow depth of 24 inches for OSV use, and this adds an extra degree of protection for the shorter woody sensitive plants. Indirect effects for all species would be less in alternatives 3 and 5 due to deeper snow requirements.

Sensitive Plant Determinations:

For two of the three sensitive woody plant species, *Eriogonum umbellatum* var. *torreyanum* and *Pinus albicaulis*, due to the possibility of direct damage to individuals and minor indirect effects from snow compaction and OSV pollutants where they occur in areas designated for OSV use, all alternatives of the Tahoe OSV Use Designation project **may affect individuals, but are not likely to result in a trend toward Federal listing or loss of viability in the planning area.**

After evaluating the specific habitat requirements of each species and potential interactions with OSV use, minor indirect effects from snow compaction and OSV pollutants would be possible for any of the Sensitive plant species present in areas of high OSV use. Therefore, all alternatives of the Tahoe OSV Use Designation project **may affect individuals, but are not likely to result in a trend toward Federal listing or loss of viability in the planning area** for *Botrychium crenulatum*, *Botrychium minganense*, *Bruchia bolanderi*, *Erigeron miser*, *Ivesia sericoleuca*, *Lewisia kelloggii* ssp. *hutchisonii*, *Phacelia stebbinsii*, and *Poa sierrae*.

For *Lewisia serrata*, alternatives 1, 3, 4, and 5 would have **no effect** because the species is not known to be present in areas of high OSV use. Because it is present in areas of high OSV use in alternative 2, this alternative **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area** for *Lewisia serrata*.

For *Meesia uliginosa*, alternatives 2 and 5 would have **no effect** because the species is not known to be present in areas of high OSV use. Because it is present in areas of high OSV use in alternatives 1, 3, and 4, these alternatives **may affect individuals, but are not likely to result in a trend toward Federal listing or loss of viability in the planning area** for *Meesia uliginosa*.

Because the following species are not known to exist in areas of high OSV use, all alternatives of the Tahoe OSV Use Designation project would have **no effect** on *Botrychium ascendens*, *Cypripedium fasciculatum*, *Fritillaria eastwoodiae*, *Ivesia aperta* var. *aperta*, *Lewisia cantelovii*, *Lewisia kelloggii* ssp. *kelloggii*, *Lewisia longipetala*, *Meesia uliginosa*, *Peltigera gowardii*, *Penstemon personatus*, *Phaeocollybia olivaceae*, *Pyrrocoma lucida*, and *Tauschia howellii*.

Because the following species are not known to exist at all within the Tahoe National Forest, all alternatives of the Tahoe OSV Use Designation project would have **no effect** on *Astragalus lemmonii*, *Astragalus pulsiferae* var. *coronensis*, *Astragalus webberi*, *Boechera rigidissima*, *Botrychium lunaria*, *Botrychium montanum*, *Cudonia monticola*, *Cypripedium montanum*, *Dendrocollybia racemosa*, *Helodium blandowii*, *Ivesia aperta* var. *canina*, *Juncus luciensis*, *Mielichhoferia elongata*, *Monardella follettii*, *Peltigera gowardii*, and *Sowerbyella rhenana*.

Compliance with Relevant Laws, Regulations, Policies and Plans

All alternatives would comply with the Endangered Species Act because no federally listed or proposed species would be affected. With the biological evaluation and biological assessment, the proposed project effects on TEPS plants have been evaluated and measures taken to ensure that sensitive plants do not become threatened or endangered because of Forest Service actions. All alternatives would maintain viable populations of all native and desired nonnative plants, and the proposed activities were reviewed for potential effects on rare species, and thus would be compliant with Forest Service Manual direction. All alternatives would also comply with the Tahoe National Forest Land and Resource Management Plan and the Sierra Nevada Forest Plan Amendment because sensitive plant populations would remain viable and their habitats would be maintained.

Other Relevant Mandatory Disclosures

Unavoidable Adverse Effects

As described in Effects Common to All Alternatives, listed plants would not be affected. Some adverse effects may occur to some sensitive plants, but are not likely to cause a trend toward Federal listing or a loss of viability.

Irreversible and Irretrievable Commitments of Resources

Although some adverse effects to sensitive plants may occur, these plants are a renewable resource and thus there would be no irreversible commitments of the resource. Excessive damage to individuals could cause mortality, and thus, may constitute an irretrievable commitment.

Other Botanical Species

Special Interest Plants

Because OSV use and snow trail grooming may harm special interest plants and other botanical resources, this analysis will evaluate the direct, indirect, and cumulative effects of the alternatives on these botanical resources that could result from the following proposed actions:

- Designating roads, trails and areas for over-snow vehicle use
- Identification of snow trails for grooming for OSV use
- Ancillary activities such as the plowing of related parking lots and trailheads (analyzed as cumulative impacts)

An assessment of effects to Special Aquatic Features (Fens) is included as a subtopic within Special Interest Plants.

Special Interest Areas

Special interest areas (SIAs) that are designated with a botanical emphasis will be evaluated for consistency with maintaining the vegetation and habitat characteristics for which the SIAs were created.

Noxious Weeds

A Noxious Weed Risk Assessment (see Noxious Weed Risk Assessment in the Project File) presents the weed species that exist in the project area and contains an analysis of effects from weeds and a determination of each alternative's risk of introducing and/or spreading weed species in the project area.

Relevant Laws, Regulations, and Policy

Federal Law and Policy

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 special interest or watch list species.

Forest Service Manual 2900 (USDA Forest Service 2011) contains national direction for noxious weed management. Specific policies included in FSM 2900 include:

- Determine the risk of introducing, establishing, or spreading invasive species associated with any proposed action, as an integral component of project planning and analysis, and where

necessary provide for alternatives or mitigation measures to reduce or eliminate that risk prior to project approval.

- Ensure that all Forest Service management activities are designed to minimize or eliminate the possibility of establishment or spread of invasive species on the National Forest System, or to adjacent areas. Integrate visitor use strategies with invasive species management activities on aquatic and terrestrial areas of the National Forest System. At no time are invasive species to be promoted or used in site restoration or re-vegetation work, watershed rehabilitation projects, planted for bio-fuels production, or other management activities on national forests and grasslands.
- Use contract and permit clauses to require that the activities of contractors and permittees are conducted to prevent and control the introduction, establishment, and spread of aquatic and terrestrial invasive species. For example, where determined to be appropriate, use agreement clauses to require contractors or permittees to meet Forest Service-approved vehicle and equipment cleaning requirements/standards prior to using the vehicle or equipment in the National Forest System.

Executive Order 13112 (USDA Forest Service 1999) was originally signed on Feb 3, 1999, and amended by **Executive Order 13751** (USDA Forest Service 2016) on December 5, 2016, establishing the National Invasive Species Council to ensure that Federal programs and activities to prevent and control invasive species are coordinated, effective and efficient. EO 13112 defines an invasive species as "...an alien (or non-native) species whose introduction does, or is likely to cause economic or environmental harm or harm to human health". The Executive Orders direct Federal agencies to prevent the introduction of invasive species, detect and respond rapidly to and control such species, not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species unless the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.

Land and Resource Management Plan

Noxious weeds are identified in the Tahoe National Forest LRMP as one of five problem areas to be addressed with management goals and strategies. Goals for noxious weed management are to manage weeds using an integrated weed management approach according to the priority set forth in FSM 2081.2:

- Priority 1. Prevent the introduction of new invaders.
- Priority 2. Conduct early treatment of new infestations.
- Priority 3. Contain and control established infestations.

Provisions for implementing these goals are embodied in the following applicable noxious weeds management standards and guidelines in the Forest Plan:

- As part of project planning, conduct a noxious weed risk assessment to determine risks for weed spread (high, moderate, or low) associated with different types of proposed management activities. Refer to weed prevention practices in the Regional Noxious Weed Management Strategy to develop mitigation measures for high and moderate risk activities.

- When recommended in project-level noxious weed risk assessments, consider requiring off-road equipment and vehicles (both Forest Service and contracted) used for project implementation to be weed free. Refer to weed prevention practices in the Regional Noxious Weed Management Strategy.
- Minimize weed spread by incorporating weed prevention and control measures into ongoing management or maintenance activities that involve ground disturbance or the possibility of spreading weeds. Refer to weed prevention practices in the Regional Noxious Weed Management Strategy.
- Routinely monitor noxious weed control projects to determine success and to evaluate the need for follow-up treatments or different control methods. Monitor known weed infestations, as appropriate, to determine changes in weed population density and rate of spread.

Sierra Nevada Forest Plan Amendment (SNFPA). The Record of Decision (ROD) for the 2004 Sierra Nevada Forest Plan Amendment includes the following direction applicable to motorized travel management and noxious weeds:

- Goals for noxious weed management are to manage weeds using an integrated weed management approach. Priority 1 is to prevent the introduction of new invaders. Priority 2 is to conduct early treatment of new infestations. Priority 3 is to contain and control established infestations (SNFPA ROD page 36). Applicable Standards and Guidelines for noxious weed management (SNFPA ROD pages 54-55, #36-41, 47-49) are listed below.
 36. Inform forest users, local agencies, special use permittees, groups, and organizations in communities near national forests about noxious weed prevention and management.
 37. Work cooperatively with California and Nevada State agencies and individual counties (for example, Cooperative Weed Management Areas) to: (1) prevent the introduction and establishment of noxious weed infestations and (2) control existing infestations.
 38. As part of project planning, conduct a noxious weed risk assessment to determine risks for weed spread (high, moderate, or low) associated with different types of proposed management activities. Refer to weed prevention practices in the Regional Noxious Weed Management.
 39. When recommended in project-level noxious weed risk assessments, consider requiring off-road equipment and vehicles (both Forest Service and contracted) used for project implementation to be weed free. Refer to weed prevention practices in the Regional Noxious Weed Management Strategy.
 40. Minimize weed spread by incorporating weed prevention and control measures into ongoing management or maintenance activities that involve ground disturbance or the possibility of spreading weeds. Refer to weed prevention practices in the Regional Noxious Weed Management Strategy.
 41. Conduct follow-up inspections of ground disturbing activities to ensure adherence to the Regional Noxious Weed Management Strategy.
 47. Complete noxious weed inventories, based on regional protocol. Review and update these inventories on an annual basis.
 48. As outlined in the Regional Noxious Weed Management Strategy, when new, small weed infestations are detected, emphasize eradication of these infestations while providing for the safety of field personnel.
 49. Routinely monitor noxious weed control projects to determine success and to evaluate the need for follow-up treatments or different control methods. Monitor known weed

infestations, as appropriate, to determine changes in weed population density and rate of spread.

Special Area Designations

SIAs may have specific management objectives for unique botanical features or other features of interest. Botanical SIAs have been specifically designated to conserve and manage unique botanical communities, rare species, or other elements of biological diversity, and to provide for public enjoyment of these areas in a manner that is consistent with the values for which the areas were established. On the Tahoe National Forest, no management plans are available for established Botanical SIAs. The Placer County Big Tree Grove is a proposed Botanical Special Interest Area assumed to be reserved for the protection and public enjoyment of the most northerly grove of giant sequoias.

Desired Condition

One stated goal in the Tahoe National Forest LRMP is to manage National Forest System lands so that management activities do not introduce or spread noxious or invasive exotic weeds.

Maintaining viable populations of all native and desired nonnative plant species is the underlying goal of Forest Service Manual 2670.

Topics and Issues Addressed in This Analysis

Purpose and Need

Botanical resources are not directly related to the purpose and need for action, but several public comments raised concerns about OSV damage to vegetation. Concerns for botanical resources are not among the key issues that drove development of additional action alternatives.

Issues

OSV uses may cause direct and indirect effects to survey and manage plants, special interest plants, and invasive plants, but are most likely to affect those that have living tissues present within the snow column each season (such as trees or shrubs). Several public comments have been received that raise concerns about the effects of OSV use on general vegetation and rare species. Effects may be either direct by damage or death to individual plants from OSV (stem breaking, crushing, etc.), or indirect by increasing the opportunity for pathogens to attack damaged plant tissues or by altering habitat. Possible effects include but are not limited to: physical damage to plants and habitats; reduced seed production; decreased plant vigor; changes in hydrology; changes to soils, especially erosion and sedimentation; changes in physiological responses; and increases in risk of weed introduction and spread. These effects become much more likely if OSV use occurs where or when there is inadequate snow depth.

Some plant species emerge from the ground very early in the growing season and subsequent snowfall may accumulate enough afterward to allow authorized OSV use. In these cases, living plant tissues may also be impacted by OSV use. Compaction of snow may lead to changes in plant composition and habitat suitability. Weed seeds may be transported into areas designated for OSV use. When snow cover is not adequate, OSV use on and off established routes can affect some survey and manage plants, special interest plants, and their habitats. The proposed minimum snow depth requirements are presumed to be sufficient to protect the majority of plant species from damage.

Resource Indicators and Measures

Resource indicators and measures shown in table 19 will be used to measure and disclose effects to botanical resources related to OSV use designations and grooming trails for OSV use.

Table 108. Botanical resources indicators and measures for assessing effects

Resource Element	Resource Indicator	Measure
Vegetation	Species presence	Acres of special interest plant occurrences within open OSV use areas. Acres of special interest plant occurrences within high-use areas.
	Qualitative discussion of species' responses to proposed activities	Special interest plants effects determination.
	Noxious/invasive weed presence	Acres of weed infestations within open OSV use areas. Acres of weed infestations within high-use areas.
	Noxious/invasive weed response to proposed activities	Level of risk (high, moderate, low) for the project introducing or spreading weeds.
	Presence of designated botanical resource areas	Acres of botanical resource areas within open OSV use areas. Acres of botanical resource areas within high-use areas.

Methodology

This analysis used ArcMap and relevant Geographic Information System (GIS) data layers from the Tahoe National Forest. The GIS layers of proposed OSV designations and groomed trails were overlain with the botanical resource layers to identify areas of potential effects.

Special interest plants that are known to occur within the planning area are presented in table 109. Effects to each special interest species were evaluated based on growth form, timing of important life cycle elements (i.e. emergence, flowering, seed production, germination, etc.), identified threats, important habitat components, and the expected interaction with disturbances associated with OSV use and snow trail grooming.

Information Sources

Information used in this analysis includes pertinent scientific literature, project-specific botanical data, results of surveys and site revisits, and GIS layers of the following data: project boundary, actions by alternative, and Tahoe National Forest TEPS/special interest plant occurrences. Because some special interest plant occurrence data is lacking in the Tahoe National Forest data (specifically for *Carex davayi*, *Corallorhiza trifida*, *Rhamnus alnifolia*, *Schoenoplectus subterminalis*, *Stachys pilosa*, and *Stuckenia filiformis*), supplemental data is provided by the California Natural Diversity Database (October 2017 Monthly Update).

Incomplete and Unavailable Information

There is little research and information available regarding the responses of each plant species or whole plant communities to OSV uses, including indirect effects from snow compaction and vehicle emissions during the winter.

Assumptions specific to the botanical resources analysis:

- High-use areas are defined in this analysis as open areas within 0.5 mile of designated OSV trails. The trails themselves are considered high-use regardless of designation of adjacent areas.
- Plants are unlikely to be directly affected by authorized OSV use (with the specified requirements of specific snow depths or adequate snow depth to avoid damage to resources – typically 12 inches) when their living tissues are not present above ground. Therefore, typically, only shrub or tree species are likely to be directly affected by OSV use.
- Indirect effects, such as those possibly resulting from snow compaction and vehicle emissions, are likely to be concentrated in the corridors along designated OSV trails (groomed or ungroomed). Therefore, an area within 0.5 mile of designated OSV trails is reasonably assumed to be affected by snow compaction, emissions, or other contamination. Because OSV use is expected to be concentrated in the designated OSV trail corridor, and grooming activities are restricted to identified trails, areas designated for OSV use outside these concentrated use corridors are much less likely to experience measurable indirect effects.
- Over-snow vehicles, towing vehicles, or trailers may carry mud or other debris containing weed seeds from infested areas to trailheads and possibly indirectly into any areas designated for OSV use.
- Only authorized OSV uses will be analyzed. Concerns arising from unauthorized uses will be addressed as law enforcement issues and may prompt corrective actions.
- Resource monitoring will identify unexpected types or levels of impacts to botanical resources, and may also prompt corrective actions as warranted.

Spatial and Temporal Context for Effects Analysis

Direct and Indirect Effects Boundaries

The spatial boundary for analyzing the direct and indirect effects to these botanical resources is the project area boundary, because all expected effects relevant to these resources would occur and remain within this area. Effects to vegetation 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, and may extend to decades or centuries. Such long-term effects beyond 20 years become increasingly difficult to predict due to unknown interactions and the many environmental variables with numerous possible outcomes.

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. Cumulative effects are considered for a time period within 20 years of project implementation.

Affected Environment

Existing Condition

Special Interest Plants

Often referred to as “watch list” species, Special interest plants are species that do not meet all of the criteria to be included on the Regional Forester’s sensitive plant list, but are of sufficient concern to consider them in the planning process. The Tahoe National Forest watch list includes species that are newly described; locally rare; range extensions or disjunct populations; species of specific public interest; or species with too little information to determine their appropriate status. Watch lists are dynamic and updated as the need arises to reflect changing conditions and new information. Such species make an important contribution to forest biodiversity and are addressed as appropriate through the NEPA process. Sixty-one special interest plants are known or suspected to occur within the Tahoe National Forest. Special aquatic features (fens) are also included in this topic. See table 109.

Table 109. Special Interest plant species and communities considered

Scientific Name Common Name	Habitat	Life Form
<i>Allium jepsonii</i> Jepson's onion	Foothill woodland, lower montane coniferous forest, serpentine or volcanic soils. 900-4,400 feet. Flowers April-August.	Perennial herb
<i>Allium sanbornii</i> var. <i>congdonii</i> Congdon's onion	Serpentinite or volcanic substrates in chaparral or cismontane woodland. 1,000–5,000 feet. Flowers April-July.	Perennial herb
<i>Allium sanbornii</i> var. <i>sanbornii</i> Sanborn's onion	Usually serpentinite, gravelly areas in chaparral, cismontane woodland, or lower montane coniferous forest. 1,000–5,000 feet. Flowers May-September.	Perennial herb
<i>Arctostaphylos mewukka</i> ssp. <i>Truei</i> True's manzanita	Sometimes roadside, in chaparral or lower montane coniferous forest. 1,400–4,560 feet. Flowers February-July.	Evergreen shrub
<i>Arctostaphylos nissenana</i> Nissenan manzanita	Chaparral/closed-cone pine forest. 1,500–3,500 feet. Flowers February-March.	Evergreen shrub
<i>Calochortus clavatus</i> ssp. <i>avius</i> Clubhair mariposa lily	Forest edges, lava caps, 3,000–5,800 feet. Flowers May-July.	Perennial herb
<i>Calystegia vanzuukiae</i> Van Zuuk's morning-glory	Serpentine/gabbro soils, 1,640–3,875 feet.	Perennial herb
<i>Cardamine pachystigma</i> var. <i>dissectifolia</i> serpentine bittercress	Openings, usually serpentinite, rocky, in chaparral or lower montane coniferous forest. Below 6,900 feet. Flowers February-May.	Perennial herb
<i>Carex davyi</i> Davy's sedge	Dry, often sparse meadows and slopes, subalpine/red fir forest, 4,800–10,600 feet. Flowers May-Aug.	Perennial herb
<i>Carex lasiocarpa</i> woolly fruit sedge	Fens, wet areas, 1,900–6,900 feet. Flowers June-July.	Perennial herb
<i>Carex limosa</i> Mud sedge	Fens, wet areas, 4,000–8,700 feet. Flowers June-August.	Perennial herb
<i>Carex praticola</i> Meadow sedge	Meadows/wet areas, 1,600–10,500 feet. Flowers May-July.	Perennial herb

Scientific Name Common Name	Habitat	Life Form
<i>Carex sheldonii</i> Sheldon's sedge	Wet areas, 4,000–5,000 feet. Flowers May-Aug.	Perennial herb
<i>Ceanothus arcuatus</i> Arching ceanothus	Serpentine soils, 1,900–7,025 feet. Flowers April-June.	Shrub
<i>Chlorogalum grandiflorum</i> Red hills soaproot	Serpentine, gabbroic soils, 800–4,100 feet. Flowers May-June.	Perennial herb
<i>Clarkia biloba</i> ssp. <i>Brandegeae</i> Brandegee's clarkia	Forest edges/openings, less than 3,100 feet. Flowers May-July.	Annual herb
<i>Clarkia mildrediae</i> ssp. <i>Lutescens</i> Mildred's clarkia	Woodland/forest edges, less than 5,750 feet. Flowers June-August.	Annual herb
<i>Clarkia mildrediae</i> ssp. <i>Mildrediae</i> Mildred's clarkia	Woodland/forest edges, 800–5,650 feet. Flowers May-August.	Annual herb
<i>Claytonia megarhiza</i> Alpine springbeauty	Talus/rock crevices, above 8,000 feet. Flowers July–September.	Perennial herb
<i>Corallorhiza trifida</i> Yellow coralroot	Wet areas. 4,450-5,750 feet. Flowers June–July.	Perennial herb
<i>Darlingtonia californica</i> California pitcherplant	Wetlands/riparian, 0-8,500 feet. Flowers April–July.	Perennial herb
<i>Drosera anglica</i> English sundew	Bogs, fens, wetland/riparian, less than 8,500 feet. Flowers June-September.	Perennial herb
<i>Epilobium howellii</i> Yuba Pass willowherb	Meadows and seeps, wetland/riparian. 6,000–9,000 feet. Flowers July-August.	Perennial herb
<i>Epilobium luteum</i> Yellow willowherb	Wetland areas, 4,900-5,600 feet. Flowers July–September.	Perennial herb
<i>Eremogone cliftonii</i> Clifton's eremogone	Openings, usually granitic, in chaparral and montane coniferous forests. 1,490–5,850 feet. Flowers April–September.	Perennial herb
<i>Erigeron petrophyllus</i> var. <i>sierrensis</i> northern Sierra daisy	Serpentine soils, 900–5,700 feet. Flowers June–October.	Perennial herb
<i>Eriogonum umbellatum</i> var. <i>ahartii</i> Ahart's buckwheat	Serpentine, slopes, openings in chaparral or cismontane woodlands, below 5,600 feet. Flowers June–September.	Perennial herb/subshrub
<i>Glyceria grandis</i> American mannagrass	Riparian/wetland areas, below 6,890 feet. Flowers June–August.	Perennial herb
<i>Hemieva ranunculifolia</i> Buttercup-leaf suksdorfia	Riparian/wetland/mesic, rocky, granitic areas, 4,900–8,200 feet. Flowers June-August.	Perennial herb
<i>Horkelia parryi</i> Parry's horkelia	Grows in openings and edges, on lone formation and other soils, in chaparral or cismontane woodland, below 3,400 feet. Flowers April-September.	Perennial herb
<i>Lilium humboldtii</i> ssp. <i>humboldtii</i> Humboldt lily	Openings in chaparral, cismontane woodland, or lower montane conifer forests. Flowers May–August.	Perennial herb
<i>Lycopus uniflorus</i> Northern bugleweed	Fens, marshes, swamps, below 6,600 feet. Flowers July-September.	Perennial herb

Scientific Name Common Name	Habitat	Life Form
<i>Meesia longiseta</i> Meesia moss	Carbonate substrates, on soil in fens, meadows, and seeps in upper montane coniferous forest, all elevations.	Bryophyte, moss (perennial herb)
<i>Meesia triquetra</i> Meesia moss	Fens, meadows, and seeps in upper montane coniferous forest or subalpine areas, 4,200–9,700 feet.	Bryophyte, moss (perennial herb)
<i>Micranthes howellii</i> Howell's saxifrage	Wetland/riparian areas, sometimes serpentinite, in cismontane woodland, below 3,000 feet. Flowers March–May.	Perennial herb
<i>Mimulus glaucescens</i> Shieldbract monkeyflower	Serpentinite seeps, sometimes streambanks, in chaparral, cismontane woodland, lower montane coniferous forest, or valley and foothill grassland habitats, below 4,100 feet. Flowers February–September.	Annual herb
<i>Mimulus laciniatus</i> Cutleaf monkeyflower	Granitic seeps in chaparral or montane coniferous forest, 3,300–8,700 feet. Flowers April–July.	Annual herb
<i>Oreostemma elatum</i> Plumas alpine aster	Fens, meadows, and seeps in upper montane coniferous forest, 3,200–6,700 feet. Flowers June–August.	Perennial herb
<i>Packera eurycephala</i> var. <i>lewisroei</i> Lewis' groundsel	Serpentine soils in chaparral, cismontane woodland, or lower montane coniferous forest, 900–6,200 feet. Flowers March–September.	Perennial herb
<i>Penstemon sudans</i> Susanville beardtongue	Volcanic, rocky places, sometimes roadsides, in Great Basin scrub, lower montane coniferous forest, or pinyon and juniper woodland, 3,900–8,000 feet. Flowers June–September.	Perennial herb
<i>Perideridia bacigalupi</i> Mother lode yampah	Serpentine soils, in chaparral and pine woodlands, 1,400–3,400 feet. Flowers June–August.	Perennial herb
<i>Piperia colemanii</i> Coleman's piperia	Chaparral, duff in lower montane coniferous forest, often shaded. 3,900–7,600 feet. Flowers June–August.	Perennial herb
<i>Potamogeton praelongus</i> whitestem pondweed	Deep water, lakes. 5,900–9,850 feet. Flowers July–August.	Aquatic perennial herb
<i>Pseudostellaria sierra</i> pseudostellaria	Forest edges/openings, 4,000–7,200 feet. Flowers May–August.	Perennial herb
<i>Rhamnus alnifolia</i> Alderleaf buckthorn	Wetland/riparian areas, 4,500–7,000 feet. Flowers May–July.	Deciduous shrub
<i>Rhynchospora alba</i> white beaksedge	Wetland/riparian areas, 150–6,700 feet. Flowers July–August.	Perennial herb
<i>Rhynchospora capitellata</i> Brownish beaksedge	Wetland/riparian areas, 150–6,600 feet. Flowers July–August.	Perennial herb
<i>Sanicula tracyi</i> Tracy's blacksnakeroot	Openings/edges in cismontane woodland or montane coniferous forest. 300–5,200 feet. Flowers April–July.	Perennial herb
<i>Schoenoplectus subterminalis</i> Swaying bulrush	Fens, montane lake margins. 2,400–7,400 feet. Flowers June–September.	Aquatic perennial herb
<i>Scutellaria galericulata</i> marsh skullcap	Streambanks, marshes, swamps, meadows, seeps. 4,000–7,000 feet. Flowers June–September.	Perennial herb
<i>Sidalcea gigantea</i> Giant checkerbloom	Wetland/riparian areas, meadows and seeps in montane coniferous forest. 2,100–6,400 feet. Flowers January–October.	Perennial herb

Scientific Name Common Name	Habitat	Life Form
<i>Sedum albomarginatum</i> Feather River stonecrop	Steep cliffs and mountain slopes in rocky serpentine substrates, riparian/river canyons, 850–6,400 feet. Flowers May–June.	Perennial herb
<i>Silene occidentalis</i> ssp. <i>Longistipitata</i> Western catchfly	Forest edges/openings in chaparral or montane coniferous forest, 3,200–6,600 feet. Flowers June–August.	Perennial herb
<i>Silene occidentalis</i> ssp. <i>Occidentalis</i> Western catchfly	Forest edges/openings in chaparral or montane coniferous forest, 4,000–6,900 feet. Flowers June–August.	Perennial herb
<i>Sphagnum</i> species Peat moss	Fens/ peatlands, all elevations.	Perennial herb
<i>Stachys pilosa</i> Hairy hedgenettle	Wetland/riparian areas in Great Basin scrub. 3,900–5,850 feet. Flowers June–August.	Perennial herb
<i>Stellaria obtusa</i> Rocky Mountain chickweed	Forest edges/openings, 5,200–6,600 feet. Flowers June–August.	Perennial herb
<i>Stuckenia filiformis</i> Fineleaf pondweed	Marshes and swamps (assorted shallow freshwater), 980–7,055 feet. Flowers May–July.	Aquatic perennial herb
<i>Tonestus eximius</i> Lake Tahoe serpentweed	Granitic, subalpine forest, 8,000–10,000 feet. Flowers July–August.	Perennial herb
<i>Utricularia minor</i> lesser bladderwort	Shallow water, above 1,500 feet. Flowers in May–August.	Aquatic perennial herb
<i>Veronica cusickii</i> Cusick's speedwell	Moist soils, alpine boulder and rock fields, meadows, and seeps, above 6,500 feet. Flowers July–August.	Perennial herb
Special Aquatic Features - Fens	Wet areas, all elevations. Approximately 52 acres of fen habitats are mapped within the Tahoe National Forest.	-

Special Interest Species Information

Aggregating Species for Analysis of Effects

Because OSV effects to various plant species are expected to be most similar according to their life form and growth habits, the species considered in this analysis are grouped into the following categories:

- **Trees, shrubs, or sub-shrub species**, (woody plants) whose living tissues may be present above or within the snow column, and thus could experience direct effects from OSV uses (physical damage or immediate exposure to exhaust). On the Tahoe National Forest, five special interest plants are in this category.
- **Perennial herbaceous species**, including grasses, fungi, and mosses, whose living tissues are at or below the soil surface, and thus are unlikely to experience direct effects, but they will be evaluated for impacts by exhaust contaminants trapped by the snow cover or by possible effects from snow compaction. Forty-seven special interest plant species in this category are considered.
- **Annual plant species** are generally not growing during the period of authorized OSV use, and thus would not experience direct effects. This group is the least likely to be impacted by the

indirect effects of exhaust contaminants and snow compaction. Five annual special interest plant species are considered in this analysis.

- **Aquatic plant species** grow underwater and would not be directly affected by OSV use. If an occurrence is located within high-use areas, it is possible that snowpack contaminants could reach the occupied aquatic habitat when the snow melts. Snow compaction is not expected to affect aquatic habitats in any meaningful or predictable manner. In this analysis, four aquatic special interest plant species are considered.

Special Aquatic Features – Fens

Fens are peat-forming wetlands, supported by nearly constant groundwater inflow. Their permanent saturation creates oxygen-deprived soils with very low rates of decomposition, allowing the accumulation of organic matter produced by wetland plants. Fens also are hotspots of biological diversity. In California, the perennial supply of water provides refugia for plant and animal species that persist only in fens. Fens were determined to be particularly important for their biological diversity and as habitat for species of *Sphagnum*, *Meesia*, and other bryophytes.

Special Interest Areas

One special interest area is designated as a Botanical Area, and it is not designated for OSV use.

Placer County Big Trees Grove is the most northerly stand of naturally occurring Giant Sequoias, *Sequoiadendron giganteum*, and is 357 acres in size and is located 22 miles east of Foresthill overlooking the Middle Fork American River. The northern end of this SIA is bordered by a designated OSV trail. This area has been designated as a Botanical Special Interest Area. The trees have been a popular tourist attraction since the 1800s, and each bears the name of a prominent American. A nature trail and picnic area offer visitors a nice lunch or rest stop.

Environmental Consequences

Please refer to the Botany – Listed and Sensitive Species section for the discussion of effects common to all alternatives and effects by the various plant life forms.

Special Aquatic Features – Fens

Fens can be threatened by resource use affecting the watershed such as livestock grazing and trampling, timber harvest, road building, off-road vehicle use, water pumping, and water pollution. Any condition or activity that disturbs the hydrologic regime or soil temperature of a fen, causing drying or warming, may threaten the function of that fen (Sikes et al. 2013). Fifty-two acres of fen habitats are mapped.

Direct Effects

Because adequate snow to avoid resource damage or minimum snow depths would prevent direct disturbance of soils or ground vegetation, there would be no direct effects to fen habitats.

Indirect Effects

Snow compaction poses the greatest threat from the proposed OSV uses. Delayed snowmelt and colder temperatures under compacted snow may cause changes to fen communities. The effects vary with differing usage patterns. A single snowmobile pass is far less likely to significantly affect hydrologic or ecological processes in wetlands than a series of intensely-used snowmobile trails

(Gage and Cooper 2009). Effects are much more likely to occur where fens are present near designated OSV trails, and would be more dispersed in areas open to cross-country travel. Possible changes to the fen communities could include shifts in species composition due to colder temperatures and disruption of the insulating space that naturally develops beneath the snow. For species composition to change as a result of snow compaction, the same specific areas would need to be compacted year after year, and the likelihood of this occurring is much greater where OSV use is concentrated, such as along the designated OSV trails. Because so many site-specific variables are involved, compositional changes due to snow compaction are not possible to predict. Where fen habitats exist within high-use areas, some compositional changes could result from snow compaction, but these are expected to be minor and not impair the function of the fen habitat.

Airborne pollutants would not affect fens because these communities would be under a blanket of snow when the emissions are produced. As with any of the plant groups, pollutants which are trapped and then later released during snowmelt may (or may not) have some adverse and some beneficial effects, however the extent and direction of specific effects is unknown. It is expected that pollutant concentrations would be low enough that water quality would not be impaired, and thus it is likely that fen responses, if any, would not be noticeable.

Invasive Species

On the Tahoe National Forest, 19 invasive plant species are documented. Appendix B of the Botany Specialist Report includes a list of each species and their acreage of mapped infestations in high-use areas and in areas designated for OSV use. Six additional invasive plant species are likely present (*Bromus tectorum*, *Berteroa incana*, *Hydrilla verticillata*, *Myriophyllum spicatum*, *Phalaris arundinacea*, and *Rubus armeniacus*), but mapped locations are not available.

Although seed dispersal by vehicles is a major vector for weed invasions (Ouren et al. 2007, Von der Lippe and Kowarik 2007, Taylor et al. 2011), no literature or observational evidence was found to support the idea that invasive plants are spread by OSV use or grooming activities. However, it is possible that some weed introduction or expansion could result from these uses. OSVs could bring weed seeds into the project area, especially if the OSVs and/or their trailers are stored outside near weed infestations. Throughout the seasons of non-use (spring, summer, and fall), weed species are actively growing and producing seed, which may get deposited on OSVs and trailers that are stored outside, particularly during windy conditions or if weeds are growing in close proximity. Weed introductions are most likely to occur at trailheads, where seeds may be brought into the area on trailers, towing vehicles, and OSVs. The movement and jarring of this equipment during unloading may dislodge soil and other debris containing weed seeds. Less likely, but still possible, is that weed seeds may be deposited by the OSVs as they travel along designated trails and through areas open to cross-country travel, although it is unknown whether weed seeds deposited on the snow surface would remain viable and germinate when spring arrives. It is possible that the majority of weed seeds that may be brought into the area would be eaten by birds, mice, or other animals before spring conditions arrive.

Weeds usually gain a foothold in natural communities where soil disturbance has provided suitable conditions for weed seed germination, where ground vegetation is disturbed and unable to outcompete the invaders, and (in forested areas) where tree canopy removal or thinning has allowed additional sunlight to reach the forest floor. Aside from the possible introduction of weed seeds described above, none of the other typical factors promoting weed infestations are expected with OSV use.

The most likely places for possible weed introductions is in areas of concentrated OSV use. OSV trailheads are also accessible by wheeled vehicles during the summer seasons, so the presence of weeds does not necessarily indicate that they were brought to the sites as a result of OSV activities. Although there are some differences in designated OSV trails in each alternative, the locations and uses of seven OSV trailheads would be the same for all alternatives. The following weed species have been found at the OSV trailheads:

- Bassetts – no weeds documented
- China Wall – yellow starthistle and spotted knapweed are present
- Cisco Grove – no weeds documented
- Little Truckee Summit - no weeds documented
- Prosser – no weeds documented
- Sand Shed/Bassetts – no weeds documented
- Yuba Pass – no weeds documented

Given the lack of evidence that OSV use contributes to weed infestations, and the low risk of the proposed activities, the overall risk of weed increases due to OSV use is expected to be **low** for all alternatives.

Special Interest Areas

The purpose of this SIA analysis is to determine compliance with the intended focus of Botanical Special Interest Areas. There is no variation between alternatives regarding OSV uses in this SIA, so this section will apply for all alternatives.

No cross-country OSV use would be allowed in Placer County Big Tree Grove under any of the alternatives. No designated OSV trails are proposed within this SIA, but one trail (Mosquito Ridge Trail, SNO-12E16) is adjacent to the northern boundary of Placer County Big Tree Grove, and OSV use is expected to remain within the designated trail corridor. No damage to the giant sequoia resource is anticipated. With OSV access prohibited, no direct or indirect effects are expected to occur to the Placer County Big Tree Grove, and OSV use would not alter any of the vegetation and habitat characteristics for which the SIA was established.

Cumulative Effects

Past activities are considered part of the existing condition and are discussed within the Affected Environment section. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed to those effects.

Snow plowing at the established OSV trailheads is an ancillary activity associated with the Tahoe National Forest OSV Use Designation project, and is not analyzed as a part of the proposal. Snow plowing is not expected to affect botanical resources, other than providing an additional vector for the possible transport of noxious/invasive weed species. The risk of weed invasion by this means is relatively low in comparison with total vehicle uses throughout the year.

Special Interest Plants

Because the current Tahoe OSV use analysis identifies likely potential effects to 13 special interest plants (*Arctostaphylos mewukka* ssp. *truei*, *Arctostaphylos nissenana*, *Allium sanbornii* var. *sanbornii*, *Carex davyi*, *Chlorogalum grandiflorum*, *Epilobium howellii*, *Meesia triquetra*, *Pseudostellaria sierrae*, *Schoenoplectus subterminalis*, *Sphagnum* species, *Stachys pilosa*, *Rhamnus alnifolia*, and *Stuckenia filiformis*), it would only be for these species that effects from other activities could accumulate.

For these 13 special interest plants that may experience overlapping effects, the extent, intensity, and type of contributing impacts must be considered. They are currently experiencing the everyday stresses of life in the wild, with drought likely impacting their growth and seed production in recent years. Besides the threat of physical damage from many of the contributing actions, these species are also threatened by invasive plant encroachments. Continuing pressures on special interest plant habitats include wildfire, early or late freezing, severe wind or winter storms, flooding, insect population fluxes, and other natural events. These events may also cause damage or death of special interest plant individuals or cause habitat changes.

As present and future activities take place, effects to the identified species may include damage to or death of individuals, through project actions and possible effects from introduced invasive species, increased soil erosion, and other changes to habitat characteristics. It is expected that all of these projects would include reasonable mitigations to minimize or reduce impacts and monitor for concerns to help manage impacts to Tahoe National Forest special interest plant species habitat and occurrences. Mitigations to reduce the risk of spreading weeds are required for all the contributing actions considered, thereby making these impacts less likely to occur. If impacts still occur, only low-intensity, localized effects are expected for the special interest plant species.

The annual, seasonal timing of OSV effects does not eliminate the chance of direct and indirect effects accumulating. Broken branches of woody plants and any deceased individual plants would require one to several years to recover, and additional actions would be taking place during this recovery time. Individually and collectively, the magnitude of effects from these actions would remain relatively low. Natural disturbances, such as fire, wind and ice storms, and drought are much more likely to impact sensitive plant species, and their effects would be considerably greater. With cumulative effects considered, special interest plant species viability in the OSV project area would be maintained and no trend toward Federal listing would occur. When the effects from other projects and activities are combined where and when they overlap with the effects from the Tahoe OSV Use Designation Project, there would still be no loss of viability for any plant species and none would trend toward Federal listing, for all alternatives.

Invasive Plants

Invasive plants are also analyzed for each project, and mitigations are typically incorporated into project plans where ground disturbance may occur. In addition, weeds are routinely treated each year as part of the Tahoe National Forest weeds program. The low weed risk of this project would add minimal risk to the ongoing and foreseeable actions in the planning area.

Special Interest Areas

Because OSV use would not have direct or indirect effects to botanical special interest areas, there would be no cumulative effects from OSV use.

Alternative 1 Effects to Botanical Resources

Detailed indicators and measures for botanical resources are presented in table 110, which summarizes the measures by major analysis topics.

Table 110. Botanical resources indicators and measures for alternative 1

Analysis Topic	Total acres on Tahoe National Forest	Acres within high-use areas	Acres in designated OSV areas
Special interest plants	3,990	1,052	3,632
Fens, bogs	52	12	52
Invasive plants	1,440	14	759
Special interest areas	357	0	0

No additional types of effects to botanical resources beyond those described in Effects Common to All Alternatives are specific to alternative 1. This alternative would generally have greater potential for effects to these botanical resources due to larger areas of open OSV use.

Special Interest Plants

Special interest plant species in the various plant life form categories would be affected differently, as described above in Effects Common to All Alternatives. Trees, shrubs, and sub-shrubs (woody plants) may be directly damaged by OSVs where they occur in areas designated for OSV use, and they may also experience indirect effects from snow compaction and pollutants, most likely to be noticeable where they occur near designated OSV trails. Perennial herbaceous species, annual species and aquatic species would not be directly affected, but they too may also experience noticeable indirect effects if they occur near designated OSV trails.

Indirect effects from snow compaction are expected to be greater with alternatives 1, 2, and 4 because only a minimal protection is afforded to ground vegetation. Alternative 1 provides minimal protection for woody sensitive plants because, although a minimum snow depth is not identified, enforcement of a reasonable avoidance of resource damage is the management tool used to keep OSV use from occurring when snow depths are too low.

Because direct damage can happen where they occur in areas designated for OSV use and indirect effects to occurrences within high-use areas, three of the five special interest woody plant species considered, *Arctostaphylos mewukka* ssp. *truei*, *Arctostaphylos nissenana*, and *Rhamnus alnifolia*, **may be affected** by alternative 1 of the Tahoe OSV Use Designation project, but the possible effects would not contribute to a downward trend or the species being added to the Regional Forester's Sensitive Plant List.

Because there could be indirect effects to occurrences within high-use areas, seven of the special interest perennial herbaceous plant species (*Carex davayi*, *Epilobium howellii*, *Meesia triquetra*, *Pseudostellaria sierrae*, *Sphagnum* species, *Stachys pilosa*, and *Stellaria obtusa*) and one of the special interest aquatic plant species (*Stuckenia filiformis*) **may be affected** by alternative 1 of the Tahoe OSV Use Designation project, but the possible effects would not contribute to a downward trend or the species being added to the Regional Forester's Sensitive Plant List.

For all other special interest plants not specifically mentioned above, because they are not known to be present within high-use areas, alternative 1 of the Tahoe OSV Use Designation project **will not affect** these species.

Special Aquatic Features – Fens

Because some fens are present within high-use areas, alternative 1 could result in some minor changes in plant community interactions due to indirect effects of snow compaction and/or OSV-generated pollutants. Twelve of the total 52 acres of mapped fen habitats may be affected, but the function of the fens is not expected to be impaired.

Invasive Species

As described above in Effects Common to All Alternatives, the risk of weed introduction and/or spread due to OSV use is very low.

Special Interest Areas

With OSV access prohibited, no direct or indirect effects are expected to occur to the Placer County Big Tree Grove, and OSV use would not alter any of the vegetation and habitat characteristics for which the SIA was established.

Alternative 2 Effects to Botanical Resources

Detailed indicators and measures for botanical resources are presented in table 111, which summarizes the measures by major analysis topics.

Table 111. Botanical resources indicators and measures for alternative 2

Analysis Topic	Total acres on Tahoe National Forest	Acres within high-use areas	Acres in designated OSV areas
Special interest plants	3,990	1,121	3,015
Fens, bogs	52	12	51
Invasive plants	1,440	59	450
Special interest areas	357	0	0

No additional types of effects to botanical resources beyond those described in Effects Common to All Alternatives are specific to alternative 2.

In comparison with other alternatives, alternative 2 would be relatively equal with alternatives 1 and 4 in providing the minimum snow depth needed to prevent damage to resources (assumed to be 12 inches). In contrast, alternatives 3 and 5 would increase minimum snow depths to 18 inches and 24 inches, respectively, and would provide additional degrees of protection and assurance that soil and vegetation resources are not damaged.

Special Interest Plants

Direct effects to special interest plant species in the various plant life form categories would be affected differently, as described above in Effects Common to All Alternatives. Trees, shrubs, and sub-shrubs (woody plants) may be directly damaged by OSVs where they occur in areas designated for OSV use, and they may also experience indirect effects from snow compaction and pollutants, most likely to be noticeable where they occur near designated OSV trails. Perennial herbaceous

species, annual species and aquatic species would not be directly affected, but they too may also experience noticeable indirect effects if they occur near designated OSV trails.

With alternative 2, OSV use would not be allowed when resource damage (including damage to soil and ground vegetation) is likely to occur. The proposed action states that a minimum of 12 inches of snow is typically needed to avoid damaging resources, and on trails with underlying roads, a minimum of 6 inches is typically needed to avoid damage to the underlying road surface. Enforcement in low-snow conditions would be at the discretion of the law enforcement officer on site, and the interpretation of resource damage is expected to consider mainly damage to soil and ground vegetation. This level of resource protection is expected to prevent direct effects to non-woody special interest plants.

Indirect effects from snow compaction are expected to be greater with alternatives 1, 2, and 4 because only a minimal protection is afforded to ground vegetation. Alternative 2 provides minimal protection for woody special interest plants because cross-country travel is allowed when there is adequate snow depth to avoid damage to (soil and ground vegetation) resources. However, there could still be considerable damage to woody species throughout the OSV season, with unintentional breakage and abrasion of branches and leader growth.

Because there could be direct damage where they occur in areas designated for OSV use and indirect effects to occurrences within high-use areas, three of the five special interest woody plant species considered, *Arctostaphylos mewukka* ssp. *truei*, *Arctostaphylos nissenana*, and *Rhamnus alnifolia*, **may be affected** by alternative 2 of the Tahoe OSV Use Designation project, but the possible effects would not contribute to a downward trend or the species being added to the Regional Forester's Sensitive Plant List.

Because there could be indirect effects to occurrences within high-use areas, 10 of the special interest perennial herbaceous plant species (*Allium sanbornii* var. *sanbornii*, *Carex davyi*, *Chlorogalum grandiflorum*, *Epilobium howellii*, *Meesia triquetra*, *Pseudostellaria sierrae*, *Schoenoplectus subterminalis*, *Sphagnum* species, *Stachys pilosa*, and *Stellaria obtusa*) and one of the special interest aquatic plant species (*Stuckenia filiformis*) **may be affected** by alternative 2 of the Tahoe OSV Use Designation project, but the possible effects would not contribute to a downward trend or the species being added to the Regional Forester's Sensitive Plant List.

For all other special interest plants not specifically mentioned above, because they are not present within high-use areas, alternative 2 of the Tahoe OSV Use Designation project would **not affect** these species.

Special Aquatic Features – Fens

Same as alternative 1.

Invasive Species

As described above in Effects Common to All Alternatives, the risk of weed introduction and/or spread due to OSV use is very low.

Special Interest Areas

Same as alternative 1.

Alternative 3 Effects to Botanical Resources

Detailed indicators and measures for botanical resources are presented in table 112, which summarizes the measures by major analysis topics.

Table 112. Botanical resources indicators and measures for alternative 3

Analysis Topic	Total acres on Tahoe National Forest	Acres within high-use areas	Acres in designated OSV areas
Special interest plants	3,990	757	2,382
Fens, bogs	52	12	41
Invasive plants	1,440	107	180
Special interest areas	357	0	0

There are no additional types of effects to botanical resources beyond those described in Effects Common to All Alternatives that are specific to alternative 3.

In comparison with alternatives 1, 2, and 4, because of its 18 inch minimum snow depth, alternative 3 would provide a low to moderate degree of additional protection and assurance that soil and vegetation resources are not damaged. However, alternative 5 would increase minimum snow depths to 24 inches and would provide further protection of resources.

Special Interest Plants

Special Interest plant species in the various plant life form categories would be affected differently, as described above in Effects Common to All Alternatives. Trees, shrubs, and sub-shrubs (woody plants) may be directly damaged by OSVs where they occur in areas designated for OSV use, and they may also experience indirect effects from snow compaction and pollutants, most likely to be noticeable where they occur near designated OSV trails. Perennial herbaceous species, annual species and aquatic species would not be directly affected, but they too may also experience noticeable indirect effects if they occur near designated OSV trails.

In comparison with alternatives 1, 2, and 4, increasing minimum snow depths to 18 inches for cross-country travel would add an extra measure of protection for Special Interest plants, but effects already described would still be possible.

Alternative 3 provides a moderate level of protection for all Special Interest plants because an additional 6 inches of snow is required for OSV use, providing a deeper cushion to absorb snow compaction and further protection from direct effects to the shortest woody plant species. Non-woody Sensitive plants are not expected to be directly affected. However, there could still be damage to woody species throughout the OSV season, with unintentional breakage and abrasion of branches and leader growth.

Because alternative 3 would allow cross-country OSV travel in the least area (257,024 acres), it would impact the fewest special interest plant occurrences.

Because there could be direct damage where they occur in areas designated for OSV use and indirect effects to occurrences within high-use areas, three of the five special interest woody plant species considered (*Arctostaphylos mewukka* ssp. *truei*, *Arctostaphylos nissenana*, and *Rhamnus alnifolia*) **may be affected** by alternative 3 of the Tahoe OSV Use Designation project, but the possible effects

would not contribute to a downward trend or the species being added to the Regional Forester’s Sensitive Plant List.

Because there could be indirect effects to occurrences within high-use areas, seven of the special interest perennial herbaceous plant species (*Carex davyi*, *Epilobium howellii*, *Meesia triquetra*, *Pseudostellaria sierrae*, *Sphagnum* species, *Stachys pilosa*, and *Stellaria obtusa*) and one of the Special Interest aquatic plant species (*Stuckenia filiformis*) **may be affected** by alternative 3 of the Tahoe OSV Use Designation project, but the possible effects would not contribute to a downward trend or the species being added to the Regional Forester’s Sensitive Plant List.

For all other special interest plants not specifically mentioned above, because they are not known to be present within high-use areas, alternative 3 of the Tahoe OSV Use Designation project **will not affect** these species.

Special Aquatic Features – Fens

Because some fens are present within high-use areas, alternative 3 could result in some minor changes in plant community interactions due to indirect effects of snow compaction and/or OSV-generated pollutants. Twelve of the total 52 acres of mapped fen habitats may be affected, but the function of the fens is not expected to be impaired.

Invasive Species

As described above in Effects Common to All Alternatives, the risk of weed introduction and/or spread due to OSV use is very low.

Special Interest Areas

With OSV access prohibited, no direct or indirect effects are expected to occur to the Placer County Big Tree Grove, and OSV use would not alter any of the vegetation and habitat characteristics for which the SIA was established.

Alternative 4 Effects to Botanical Resources

Detailed indicators and measures for botanical resources are presented in table 113, which summarizes the measures by major analysis topics.

Table 113. Botanical resources indicators and measures for alternative 4

Analysis Topic	Total acres on Tahoe National Forest	Acres within high-use areas	Acres in designated OSV areas
Special interest plants	3,990	1,052	3,632
Fens, bogs	52	12	52
Invasive plants	1,440	195	759
Special interest areas	357	0	0

No additional types of effects to botanical resources beyond those described in Effects Common to All Alternatives are specific to alternative 4.

With a 12-inch minimum snow depth, alternative 4 is similar to alternatives 1 and 2, providing the minimum snow depth needed to prevent damage to resources (assumed to be 12 inches). However,

alternatives 3 and 5 would increase minimum snow depths to 18 inches and 24 inches, respectively, and would provide additional degrees of protection and assurance that soil and vegetation resources are not damaged.

Special Interest Plants

Special interest plant species in the various plant life form categories would be affected differently, as described above in Effects Common to All Alternatives. Trees, shrubs, and sub-shrubs (woody plants) may be directly damaged by OSVs where they occur in areas designated for OSV use, and they may also experience indirect effects from snow compaction and pollutants, most likely to be noticeable where they occur near designated OSV trails. Perennial herbaceous species, annual species and aquatic species would not be directly affected, but they too may also experience noticeable indirect effects if they occur near designated OSV trails.

Alternative 4 requires a minimum of 12 inches of snow for cross-country OSV use. This is considered to be a minimum reasonable protection for soil and ground vegetation. A 12-inch minimum snow depth is expected to prevent direct effects to non-woody special interest plants.

Indirect effects from snow compaction are expected to be greater with alternatives 1, 2, and 4 because only a minimal protection is afforded to ground vegetation. Alternative 4 provides a minimal protection for woody sensitive plants because cross-country travel is allowed when there is just adequate snow depth to avoid damage to (soil and ground vegetation) resources, but there could still be damage to woody species throughout the OSV season, with unintentional breakage and abrasion of branches and leader growth.

Because alternative 4 would allow cross-country OSV use on the greatest area (640,708 acres), it could impact the most area of special interest plant occurrences.

Because there could be direct damage where they occur in areas designated for OSV use and indirect effects to occurrences within high-use areas, three of the five special interest woody plant species considered (*Arctostaphylos mewukka* ssp. *truei*, *Arctostaphylos nissenana*, and *Rhamnus alnifolia*) **may be affected** by alternative 4 of the Tahoe OSV Use Designation project, but the possible effects would not contribute to a downward trend or the species being added to the Regional Forester's Sensitive Plant List.

Because there could be indirect effects to occurrences within high-use areas, seven of the special interest perennial herbaceous plant species (*Carex davyi*, *Epilobium howellii*, *Meesia triquetra*, *Pseudostellaria sierrae*, *Sphagnum* species, *Stachys pilosa*, and *Stellaria obtusa*) and one of the special interest aquatic plant species (*Stuckenia filiformis*) **may be affected** by alternative 4 of the Tahoe OSV Use Designation project, but the possible effects would not contribute to a downward trend or the species being added to the Regional Forester's Sensitive Plant List.

For all other special interest plants not specifically mentioned above, because they are not known to be present within high-use areas, alternative 4 of the Tahoe OSV Use Designation project **will not affect** these species.

Special Aquatic Features – Fens

Same as alternative 1.

Invasive Species

As described above in Effects Common to All Alternatives, the risk of weed introduction and/or spread due to OSV use is very low.

Special Interest Areas

Same as alternative 1.

Alternative 5 Effects to Botanical Resources

Detailed indicators and measures for botanical resources are presented in table 114, which summarizes the measures by major analysis topics.

Table 114. Botanical resources indicators and measures for alternative 5

Analysis Topic	Total acres on Tahoe National Forest	Acres within high-use areas	Acres in designated OSV areas
Special interest plants	3,990	976	2,678
Fens, bogs	52	16	39
Invasive plants	1,440	9	365
Special interest areas	357	0	0

No additional types of effects to botanical resources beyond those described in Effects Common to All Alternatives are specific to alternative 5.

Special Interest Plants

Special interest plant species in the various plant life form categories would be affected differently, as described above in Effects Common to All Alternatives. Trees, shrubs, and sub-shrubs (woody plants) may be directly damaged by OSVs where they occur in areas designated for OSV use, and they may also experience indirect effects from snow compaction and pollutants, most likely to be noticeable where they occur near designated OSV trails. Perennial herbaceous species, annual species and aquatic species would not be directly affected, but they too may also experience noticeable indirect effects if they occur near designated OSV trails.

Alternative 5 provides the highest level of protection for sensitive plants in areas designated for OSV use because an additional 12 inches of snow is required, providing a deeper cushion to absorb snow compaction and further protection from direct effects to the shorter woody plant species. Non-woody sensitive plants are not expected to be directly affected. However, there could still be damage to woody species throughout the OSV season, with unintentional breakage and abrasion of branches and leader growth.

Because a smaller area would be open to cross-country OSV use (302,411 acres), alternative 5 would have less possibility for impacts to sensitive plant occurrences than other alternatives, except alternative 3.

Because there could be direct damage where they occur in areas designated for OSV use and indirect effects to occurrences within high-use areas, three of the five special interest woody plant species considered (*Arctostaphylos mewukka* ssp. *truei*, *Arctostaphylos nissenana*, and *Rhamnus alnifolia*) **may be affected** by alternative 5 of the Tahoe OSV Use Designation project, but the possible effects

would not contribute to a downward trend or the species being added to the Regional Forester’s Sensitive Plant List.

Because there could be indirect effects to occurrences within high-use areas, seven of the special interest perennial herbaceous plant species (*Carex davyi*, *Epilobium howellii*, *Meesia triquetra*, *Pseudostellaria sierrae*, *Sphagnum* species, *Stachys pilosa*, and *Stellaria obtusa*) and one of the special interest aquatic plant species (*Stuckenia filiformis*) **may be affected** by alternative 5 of the Tahoe OSV Use Designation project, but the possible effects would not contribute to a downward trend or the species being added to the Regional Forester’s Sensitive Plant List.

For all other special interest plants not specifically mentioned above, because they are not known to be present within high-use areas, alternative 5 of the Tahoe OSV Use Designation project **will not affect** these species.

Special Aquatic Features – Fens

Because some fens are present within high-use areas, alternative 5 could result in some minor changes in plant community interactions due to indirect effects of snow compaction and/or OSV-generated pollutants. Sixteen of the total 52 acres of mapped fen habitats may be affected, but the function of the fens is not expected to be impaired.

Invasive Species

As described above in Effects Common to All Alternatives, the risk of weed introduction and/or spread due to OSV use is very low.

Special Interest Areas

Same as alternative 1.

Summary of Effects

Summary of Botanical Resource Measures and Determinations

Table 115. Botanical resources summary of measures for all alternatives

Analysis Topic	Total acres on Tahoe National Forest	Acres within high-use areas	Acres in designated OSV areas
Special interest plants	3,990	1,052 Alt. 1 1,121 Alt. 2 757 Alt. 3 1,052 Alt. 4 976 Alt. 5	3,632 Alt. 1 3,015 Alt. 2 2,382 Alt. 3 3,632 Alt. 4 2,678 Alt. 5
Special aquatic features - fens	52	12 Alt. 1 12 Alt. 2 12 Alt. 3 12 Alt. 4 16 Alt. 5	52 Alt. 1 51 Alt. 2 41 Alt. 3 52 Alt. 4 39 Alt. 5
Invasive plants	1,440	14 Alt. 1 59 Alt. 2 107 Alt. 3 195 Alt. 4 9 Alt. 5	759 Alt. 1 450 Alt. 2 180 Alt. 3 759 Alt. 4 365 Alt. 5
Special interest areas	357	0 all alternatives	0 all alternatives

Special Interest Plants

Special interest woody plant species may be directly affected by crushing, breaking, or abrasion of stems and evergreen foliage where they occur in any areas designated for OSV use. Plants of other life form categories would not be directly affected because their living tissues are not present above ground, and would not be directly damaged by OSVs. Any of the special interest plants may be indirectly affected by snow compaction and/or OSV emissions containing pollutants where they occur in close proximity to areas of high-use (within 0.5 mile of designated OSV trails). Thus, these plant species are reasonably at risk to some level of effects, dependent on their life forms, timing of growth, and proximity to heavy OSV use. Potential indirect effects are expected to be minor, and all effects would be minimized by the required minimum snow depths proposed. Although some individuals may be damaged or lost, OSV use is not expected to result in a trend toward Federal listing or loss of viability for any Special Interest plants.

Special Interest Plant Determinations:

Because there could be direct damage where they occur in areas designated for OSV use and indirect effects to occurrences within high-use areas, three of the five special interest woody plant species considered (*Arctostaphylos mewukka* ssp. *truei*, *Arctostaphylos nissenana*, and *Rhamnus alnifolia*) **may be affected** by all alternatives of the Tahoe OSV Use Designation project, but the possible effects would not contribute to a downward trend or the species being added to the Regional Forester's Sensitive Plant List.

Because there could be indirect effects to occurrences within high-use areas, seven of the special interest perennial herbaceous plant species (*Carex davyi*, *Epilobium howellii*, *Meesia triquetra*, *Pseudostellaria sierrae*, *Sphagnum* species, *Stachys pilosa*, and *Stellaria obtusa*) and one of the special interest aquatic plant species (*Stuckenia filiformis*) **may be affected** by alternatives 1, 3, 4, and 5 of the Tahoe OSV Use Designation project, but the possible effects would not contribute to a downward trend or the species being added to the Regional Forester's Sensitive Plant List.

Because there could be indirect effects to occurrences within high-use areas, 10 of the special interest perennial herbaceous plant species (*Allium sanbornii* var. *sanbornii*, *Carex davyi*, *Chlorogalum grandiflorum*, *Epilobium howellii*, *Meesia triquetra*, *Pseudostellaria sierrae*, *Schoenoplectus subterminalis*, *Sphagnum* species, *Stachys pilosa*, and *Stellaria obtusa*) and one of the Special Interest aquatic plant species (*Stuckenia filiformis*) **may be affected** by alternative 2 of the Tahoe OSV Use Designation project, but the possible effects would not contribute to a downward trend or the species being added to the Regional Forester's Sensitive Plant List.

For all other special interest plants not specifically mentioned above, because they are not known to be present within high-use areas, all alternatives of the Tahoe OSV Use Designation project **will not affect** these species.

Special Aquatic Features – Fens

Direct effects to fens are unlikely to occur due to authorized public OSV use as proposed in any of the alternatives. Minor indirect effects are possible from snow compaction and/or OSV-generated pollutants, but fen function would not be altered.

Invasive Plants

Nineteen invasive plant species are documented in the project area, and many infestations along roadsides are treated each year. Weeds may be introduced to OSV trailheads and into areas

designated for OSV use (possibly transported on trailers, towing vehicles, or OSVs), but the other typical factors promoting the spread and establishment of weeds (soil disturbance and vegetation cover reductions) are not expected to occur with the proposed OSV uses. There have been no observations or literature found that point to OSV use causing introduction or spread of invasive plants, but it may be possible, especially at trailheads, where vehicle use is concentrated. Given this uncertainty and the overall lack of evidence of OSV use contributing to weed infestations, the risk of weed increases due to OSV use is expected to be **low** for all alternatives.

Special Interest Areas

For all alternatives, the vegetation and habitat characteristics for which the Placer County Big Tree Grove was established would be maintained. The required minimum snow depths for OSV use, and a prohibition of OSV use within this SIA would prevent damaging effects from occurring to the giant sequoia resource.

Compliance with LRMP and Other Relevant Laws, Regulations, Policies and Plans

All alternatives would maintain viable populations of all native and desired nonnative plants, and the proposed activities were reviewed for possible effects on special interest species, and thus, would be compliant with Forest Service Manual direction. In addition, noxious/invasive weeds were evaluated for effects from the proposed actions and suitable prevention measures taken, thus complying with the Tahoe National Forest LRMP and Forest Service Manual direction, as well as Executive Orders 13112 and 13751.

Special interest areas with a botanical focus would be managed to preserve the characteristics for which the areas were established, and thus, would comply with the Tahoe National Forest LRMP.

Other Relevant Mandatory Disclosures

Unavoidable Adverse Effects

As described in Effects Common to All Alternatives, special interest woody plants and other special interest plants in high-use areas may be affected by OSV use. Without placing restrictions in areas where these species occur, there could be unavoidable adverse effects to some individuals.

Irreversible and Irretrievable Commitments of Resources

Although some adverse effects to special interest plants may occur, these plants are a renewable resource, and thus, there would be no irreversible commitments of the resource. To a small extent, excessive unauthorized damage to individuals could cause mortality, and thus, may constitute an irretrievable commitment for special interest plant species.

Socioeconomic Conditions

Relevant Laws, Regulations, and Policy

Regulatory Framework

Land and Resource Management Plan

The Tahoe LRMP identifies goals for recreation as well as the economic and social environment. In particular, the following goals help to frame the social and economic analysis in this report:

- “The Forest will provide a variety of opportunities for developed and dispersed recreation experiences.”
- “Make programs and activities of the Tahoe National Forest available to all persons regardless of race, color, sex, religion, or national origin.”

Additionally, the LRMP identifies standard and guidelines related to address recreation user conflict, which are relevant for the social analysis:

- “Separation of the users is preferable, offering both types of users a satisfying recreational experience.”
- Consider “safety of the users.”

Travel Management Rule Subpart C

The Forest Service’s 2005 Travel Management Rule requires the designation of roads, trails, and areas on national forests and grasslands that are open to motor vehicle use. Subpart C mandates the designation of routes and areas for over-snow vehicle use.

Federal Law

Multiple Use and Sustained Yield Act

The Multiple Use and Sustained Yield Act requires that economic impacts are considered when establishing management plans or decisions that may affect the management of renewable forest and rangeland resources. This report meets the requirements of this law by addressing the economic impacts of OSV use designation on the local economy.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires that economic and social impacts of Federal actions be considered as part of the environmental analysis. This section includes analysis on social and economic issues identified during the scoping process to meet the terms of NEPA and regulations.

National Forest Management Act

The National Forest Management Act and regulations require that the economic impacts of decisions or plans affecting the management of renewable resources are analyzed and that the economic stability of communities whose economies are dependent on national forest lands is considered. This analysis meets the requirements of the National Forest Management Act by specifically considering the economic impacts of the implementation of the OSV use designation project and its impacts on local communities and minority populations.

Executive Orders

Environmental Justice, EO 12898 of February 11, 1994

Executive Order 12898 directs Federal agencies to identify and address any adverse human health and environmental effects of agency programs that disproportionately impact minority and low-income populations. This section identifies minority and low-income populations in the analysis area and addresses the potential for disproportionate and adverse effects to these populations.

Resource Indicators and Measures

Resource indicators and measures shown in table 19 will be used to measure and disclose effects to socioeconomic resources related to OSV use designations and grooming trails for OSV use.

Table 116. Socioeconomic resource indicators and measures for assessing effects

Resource Element	Resource Indicator	Measure (Quantify if possible)
Economic activity	Employment	Number of jobs and amount of labor income
Quality of life	Recreation visitation	Number of recreation visits
Quality of life	Values, beliefs, and attitudes	Qualitative evaluation of public values, beliefs, and attitudes
Environmental Justice	Effects to low-income and minority populations	Qualitative evaluation of disproportionate effects to low-income and minority populations

Methodology

Economic Analysis

Economic impacts were modeled using IMPLAN Professional Version 3.0 with 2014 data. IMPLAN is an input-output model, which estimates the economic impacts of projects, programs, policies, and economic changes on a region. IMPLAN analyzes the direct, indirect, and induced economic impacts. Direct economic impacts are generated by the activity itself, such as visitor spending associated with OSV use within the Tahoe National Forest. Indirect employment and labor income contributions occur when a sector purchases supplies and services from other industries to produce their product. Induced contributions are the employment and labor income generated as a result of spending new household income generated by direct and indirect employment. The employment estimated is defined as any part-time, seasonal, or full-time job. In the economic impact tables, direct, indirect and induced contributions are included in the estimated impacts. The IMPLAN database describes the economy in 536 sectors using Federal data from 2014.

Data on use levels under each alternative were collected from Forest Service resource specialists. In most instances, the precise change is unknown. Therefore, the changes are based on the professional expertise of Forest Service resource specialists. Regional economic impacts are estimated based on the assumption of full implementation of each alternative. The actual changes in the economy would depend on individuals taking advantage of the resource-related opportunities that would be supported by each alternative. If market conditions or trends in resource use were not conducive to developing some opportunities, the economic impact would be different from what is estimated in this analysis.

Social Analysis

Social effects analysis uses the baseline social conditions presented in the Affected Environment section, National Visitor Use Monitoring (NVUM) profiles (USDA Forest Service 2016b), and public comments to discern the primary values that the Tahoe National Forest provides to area residents and visitors. Social effects are based on the interaction of the identified values with estimated changes to resource availability and uses. Key determinants of quality of life that may be affected by OSV route and area designation were identified through the scoping process.

Information Sources

Key data sources for the social and economic analysis include:

- Economic Profile System (EPS), Headwaters Economics
- U.S. Census Bureau, American Community Survey
- U.S. Forest Service, Ecosystem Management Coordination, National Forest Recreation Economic Contributions website
- National Visitor Use Monitoring program data for the Tahoe National Forest, last collected in FY 2010
- Public scoping comments

Spatial and Temporal Context for Effects Analysis

Most of the Tahoe National Forest lands are located within Nevada, Placer, Sierra, and Yuba Counties. However, the geographic footprint of national forests does not always correspond with functional economic areas affected by forest management. Forest Service economists have defined economic analysis areas for all national forests and grasslands using a protocol that identifies interactions between Forest Service resource management and local economic activity. Based on this protocol, the Tahoe National Forest’s economic area of influence encompasses Butte, El Dorado, Lassen, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Sutter, Trinity, and Yuba Counties. These 12 counties form the social and economic analysis area for this report.

The temporal boundaries for analyzing effects to the social and economic environment extend 10 years into the future (2026). This is the period for which social and economic consequences are foreseeable. Social and economic change, including changes in recreation preferences, cannot plausibly be predicted outside this temporal frame.

Affected Environment

Existing Condition

Table 117. Resource indicators and measures for socioeconomic resources, existing condition

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)
Economic activity	Employment	Number of jobs and amount of labor income
Quality of life	Recreation visitation	Number of recreation visits
Quality of life	Values, beliefs, and attitudes	Qualitative evaluation of public values, beliefs, and attitudes
Environmental Justice	Low-income and minority populations	Identification of low-income and minority populations in the analysis area

Demographic and Economic Characteristics

The area around the Tahoe National Forest is a mixture of metropolitan and non-metropolitan areas. The forest is located between two major metropolitan areas – Sacramento, California, and Reno, Nevada. However, much of the area immediately around the forest is rural.

The analysis area has higher shares of older residents than the state. Nevada, Plumas, Sierra, and Trinity Counties have about double the share of residents over the age of 65, compared to the entire state of California. Older populations may have different recreational preferences. For instance, mobility limitations associated with age may increase the importance of easy access to recreational sites.

Table 118. Demographic characteristics by county

Location	Population (ACS 2014 5-year Estimate)	Rural-Urban Continuum Code (ERS 2013)	Share of Population Over 65 (ACS 2014 5-year Estimate)
Butte County	221,578	3 (Metro, less than 250,000)	16.1%
El Dorado County	181,465	1 (Metro, more than 1 million)	16.3%
Lassen County	33,356	7 (Nonmetro, not adjacent to metro)	10.9%
Nevada County	98,606	4 (Nonmetro, adjacent to metro)	21.4%
Placer County	361,518	1 (Metro, more than 1 million)	16.6%
Plumas County	19,286	7 (Nonmetro, not adjacent to metro)	23.2%
Sacramento County	1,450,277	1 (Metro, more than 1 million)	12.0%
Shasta County	178,520	3 (Metro, less than 250,000)	18.1%
Sierra County	3,019	8 (Nonmetro, completely rural)	23.1%
Sutter County	95,067	3 (Metro, less than 250,000)	13.7%
Trinity County	13,515	8 (Nonmetro, completely rural)	22.1%
Yuba County	73,059	3 (Metro, less than 250,000)	10.9%
California	38,066,920	--	10.7%

Source: U.S. Census Bureau 2016a and USDA ERS 2013

The 12 counties in the analysis area experience a greater degree of economic insecurity than the state overall. Median household incomes are lower and unemployment rates are higher in most of the counties within the planning area compared to the state. These economic characteristics suggest that changes in local employment and income may be felt acutely. Tahoe National Forest recreation visitors spend money on lodging, food, fuel, and other goods and services in the economic analysis area. The designation of OSV routes and areas may affect recreation visitation and spending. As a result, local employment and income may change. Additionally, visitor spending contributes to county and municipal revenue from lodging and sales taxes. Tax revenues are used to fund essential public services, such as emergency management. The environmental consequences analysis addresses possible changes in employment, income, and public finances in the context of local economic characteristics.

Much of the Tahoe National Forest recreation visitor spending contributes to economic activity in travel and tourism-related sectors. These sectors include retail trade, passenger transportation, accommodation and food, and arts, entertainment, and recreation. Travel and tourism sectors account for a larger share of employment in the analysis area counties than in California overall. This suggests that the analysis area economy is reliant on tourism (including outdoor recreation).

Table 119. Economic characteristics by county

Location	Median Household Income (ACS 2014 5-year Estimate)	Unemployment Rate (ACS 2014 5-year Estimate)	Share of Tourism-related Employment (County Business Patterns 2013, accessed via EPS)
Butte County	\$43,165	13.1%	18.6%
El Dorado County	\$68,507	11.3%	27.8%
Lassen County	\$53,351	13.4%	20.4%
Nevada County	\$56,949	10.7%	26.9%
Placer County	\$73,747	9.3%	23.0%
Plumas County	\$48,032	16.7%	15.4%
Sacramento County	\$55,615	13.1%	16.0%
Shasta County	\$44,556	12.2%	17.8%
Sierra County	\$43,107	7.0%	31.8%
Sutter County	\$51,527	14.0%	17.6%
Trinity County	\$36,862	13.0%	19.8%
Yuba County	\$45,470	17.3%	16.0%
California	\$61,489	11.0%	16.3%

Source: U.S. Census Bureau 2016a and U.S. Census Bureau 2016b

Recreation Visitors

National Visitor Use Monitoring (NVUM) data was last collected within the Tahoe National Forest in fiscal year 2010. Approximately 1.8 million visits to the Tahoe National Forest occur each year (USDA Forest Service 2016b). Approximately 2 percent of survey respondents indicate that they participate in snowmobiling during their trip, with 1.7 percent reporting that snowmobiling is the primary purpose of their trip (USDA Forest Service 2016b). The majority of forest visitors (70.8 percent) traveled fewer than 100 miles to reach the site. Nearly 40 percent of visits originated from a single zip code (96161), which covers the city of Truckee, California (USDA Forest Service 2016b). The NVUM data does not break out visitor origin by activity type. Therefore, the analysis assumes that OSV and non-motorized winter recreation visitors reside in the same areas as forest visitors overall.

Economic Contributions

National forest recreation visitor spending support employment and income in communities that surround National Forest System lands. Visitor spending is influenced by both the type of trip (local or non-local; day or overnight) and the type of recreation activities. Snowmobilers spend more than most other recreation visitors (White and Stynes 2010). The NVUM survey collects data on “previous and planned spending of the entire recreation party within 50 miles of the interview site during the trip to the area” (White and Stynes 2010). This data indicates that a snowmobiler spends an average of \$642 on a non-local overnight trip and \$74 on a local day trip, compared to \$366 and \$34 for the same types of trips among participants of all recreation activities (White and Stynes 2010). Therefore, snowmobilers spend nearly twice what an average recreation user spends on their trip.

Recreation visitation (all activities and trip types) within the Tahoe National Forest supports approximately 807 jobs⁴⁶ and \$28.6 million in labor income on an average annual basis (USDA Forest Service 2016a). The largest contributions are to the retail trade and accommodation and food services sectors (USDA Forest Service 2016a). Due to the high spending of snowmobilers, changes to over-snow vehicle opportunities within the Tahoe National Forest could measurably affect economic contributions associated with national forest recreation. The environmental consequences analysis addresses the economic impact of over-snow vehicle route and area designations.

Values, Beliefs, and Attitudes

Values are “relatively general, yet enduring, conceptions of what is good or bad, right or wrong, desirable or undesirable.”

Beliefs are “judgments about what is true or false – judgments about what attributes are linked to a given object. Beliefs can also link actions to effects.”

Attitudes are “tendencies to react favorably or unfavorably to a situation, individual, object, or concept. They arise in part from a person’s values and beliefs regarding the attitude object” (Allen et al. 2009).

OSV designation may affect nearby residents and visitors to the Tahoe National Forest. Public comments received during the scoping process provide insight into the values, beliefs, and attitudes of stakeholders in the OSV designation process. These comments reflect diverse opinions on the costs and benefits of various types of winter recreation within the Tahoe National Forest.

The contribution of OSV use to local economic activity and the possibility of restrictions decreasing these economic contributions was noted during the scoping period: “Tourism and OSV recreation is the main source of income for the local economy in Sierra County. This income provides jobs and tax revenues for the County. Many in the OSV community purchase their snowmobiles, parts, supplies, and fuel from Tom's Snowmobile & Service in Sierra City. The OSV community supports the local restaurants and places to stay in Sierra City and Bassett's Station. Fuel is purchased at Bassett's. Without this winter revenue, these fragile businesses may collapse, thus causing a hardship on the summer visitors and the local economy” (letter 174, comment 10). However, other commenters noted that OSV use may crowd out visitor spending by non-motorized winter recreation users: “If there is too much noise from snowmobiles, I will look for other recreational destinations, taking my vacation money used to support many small businesses near Tahoe National Forest elsewhere” (letter 176, comment 2).

Another commenter noted the importance of motorized recreation opportunities to individuals with limited mobility: “I am a retired law enforcement officer who enjoys being able to access wilderness areas in the winter. However, I am also disabled, which prevents me from doing so unless I have motorized access. I can no longer ski or snowshoe into these areas to enjoy them. Please don't lock me out of these wilderness areas to satisfy anti-motorized sports groups with an agenda. I have just as much right to access these public lands as they do” (letter 17, comment 1).

⁴⁶ The economic modeling software (IMPLAN) reports jobs as average annual full-time and part-time jobs. No distinction is made between full-time and part-time employment, so the job calculations in this report are not full-time equivalents (FTEs). However, the duration of employment is used to calculate the number of jobs. Therefore, 1 full-time or part-time job lasting 1 year is equivalent to 2 full-time or part-time jobs lasting 6 months each. Both of these examples will be reported as 1 job in this analysis.

Some commenters noted that motorized and non-motorized recreationists face asymmetrical user conflict: “The newer snowmobiles of today are capable of high-speed travel, and encourage riders to ‘high mark. The snowmobilers’ very goal is to get to a pristine bowl and leave their machines’ tracks as high up in the bowl as possible. I have personally been on the north bowl of Castle Peak and watched two machines high mark the bowl repeatedly, and in less than one hour, completely obliterate the bowl for skiers. After a fresh snowfall, these bowls normally provide weeks of backcountry recreation for skiers and boarders, but a couple of machines can ruin it in the first hour of the day, leaving behind a slope obliterated by two-foot trenches that are difficult or impossible to ski through” (letter 149, comment 1).

In contrast, many OSV users believe that “the groomed trails that the skiers and other Nordic sport enthusiasts use are groomed exclusively by OSV users. They also provide faster and easier access for local search and rescue” (letter 197, comment 4). Furthermore, one commenter argues that “the ‘conflict of uses’ issue has generally been created and emphasized by anti-OSV advocates who are looking for any opportunity to restrict or eliminate OSV use. Despite their aggressive litigation efforts, there are few, if any, court decisions that have forced an agency to restrict any motorized recreation based on alleged ‘conflict.’ There are many strategies that can be employed to manage the ever-growing human population that desires to recreate in the National Forest System. We generally support the concept of ‘shared use.’ As long as overall visitation numbers are appropriate for the affected resources, motorized and non-motorized users can be compatible with one another so long as individual users understand designations and plan their activities accordingly” (letter 150, comment 14).

Additionally, some commenters believe that motorized and non-motorized winter recreation users have unbalanced opportunities within the Tahoe National Forest. For example, one comment noted that “From Yuba Pass south plus from the Little Truckee Summit west, there is again vast lands that are open to motorized winter use. This includes many miles of groomed snowmobile trails. In contrast, between Highway 80 and Highway 49, the only non-motorized winter area is the Castle Valley and Round Valley area north of Donner Summit. On a fair-weather Saturday or Sunday, 300 skiers and snowshoers venture into this area. That is a huge number of users for such a small area. It is also an unwarranted situation given that expansion of this non-motorized area to the west side of Andesite Peak would not significantly reduce snowmobile opportunities given the lands from Yuba Pass south plus from Little Truckee Summit west” (letter 212, comment 5).

In contrast, some OSV users believe that “there is an immense amount of terrain west, south and east of the lake that is easily accessible for skiers that want to get away from the noise or smell. I have been to many of these without the sled. Once areas are closed, they are never re-opened to sleds. So we lose more and more terrain as these proposals come through. The area proposed by a commenter online of Castle Peak is a prime example. There has already been a designated no sled area in this area due to prior agreements. That is a great sled skiing area and we see plenty of skiers that enjoy it simultaneously when we are out there. The argument of being close to the trail head goes for us too. If I want to get a few runs in before work on my sled, I can’t head 20 miles back into the wilderness, I need something close by” (letter 158, comment 3).

Snow depth restrictions were controversial among some commenters with one noting that “setting a specific depth is dangerous and will lead to area closure based on a single measurement, more negative interactions between snowmobiles and skiers and a level of mistrust between the FS and recreation groups” (letter 222, comment 4) and that restrictions are unnecessary because

“snowmobile riders won't ruin their OSVs on bare ground” (letter 60, comment 2). Another commenter was concerned that proposed snow depth restrictions were inadequate, arguing that “Limiting off trail OSV use to areas covered by at least 12" of snow does little to protect the natural environment. A minimum of 30" of snow depth would be a more reasonable standard. Many times, 12" of snow is not sufficient to prevent a 130 pound skier from disturbing buried vegetation. OSVs obviously penetrate much more deeply through the snow surface” (letter 72, comment 2).

Some commenters are also concerned about the environmental implications of OSV use within the Tahoe National Forest, arguing that pollution and noise due to OSV use can harm drinking water quality (letter 183, comment 55) and affect wildlife habitat (letter 147, comment 32).

The relationship between OSV users and Pacific Crest Trail users was highlighted in several comments. For some, OSV use near the Pacific Crest Trail disturbs skiers and other non-motorized winter recreation users (letter 39, comment 1). Other commenters; however, argued that “The Pacific Crest Trail Association's request for 1/2 mile wide corridor on the PCT is ludicrous and should be disregarded by the Forest Service” (letter 172, comment 3) and that limiting PCT crossing is “impractical and senseless” (letter 95, comment 6).

Environmental Justice

In 1994, President Clinton issued Executive Order 12898. This order directs Federal agencies to focus attention on the human health and environmental conditions in minority and low-income communities. The purpose of EO 12898 is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations.

Environmental justice is the fair treatment and meaningful involvement of people of all races, cultures, and incomes, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The goal of environmental justice is for Federal agency decision-makers to identify impacts that are disproportionately high and adverse with respect to minority and low-income populations and identify alternatives that will avoid or mitigate those impacts. According to USDA DR5600-002 (USDA Forest Service 1997), environmental justice, minority, minority population, low-income, and human health and environmental effects, are defined as follows:

Environmental Justice means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on, are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by, government programs and activities affecting human health or the environment.

Minority means a person who is a member of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.

Minority Population means any readily identifiable group of minority persons who live in geographic proximity to, and, if circumstances warrant, migrant farm workers and other geographically dispersed/transient persons who will be similarly affected by USDA programs or activities.

Low-income Population means any readily identifiable group of low-income persons who live in geographic proximity to, and, if circumstances warrant, migrant farm workers and other geographically dispersed/transient persons who will be similarly affected by USDA programs or

activities. Low-income populations may be identified using data collected, maintained and analyzed by an agency or from analytical tools such as the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty.

Human Health and/or Environmental Effects as used in this Departmental Regulation include interrelated social and economic effects.

The emphasis of environmental justice is on health effects and/or the benefits of a healthy environment. The Council on Environmental Quality (CEQ) has interpreted health effects with a broad definition: “Such effects may include ecological, cultural, human health, economic or social impacts on minority communities, low-income communities or Indian Tribes...when those impacts are interrelated to impacts on the natural or physical environment” (CEQ 1997).

As noted above, residents of the analysis area counties typically have lower median household incomes and higher rates of unemployment than California residents overall. Poverty rates vary substantially within the planning area. Some counties, such as El Dorado, Nevada, and Placer have much lower rates of poverty than the state overall. In contrast, more than one-fifth of Butte and Yuba County residents live in poverty. These data suggest that the planning area contains an environmental justice population based on poverty status.

However, the analysis area counties have lower shares of minority residents than the state. In California, about 60 percent of the population identifies as a racial or ethnic minority (other than white, non-Hispanic). In the analysis area counties, the shares of minority residents are considerably lower, except in Sacramento and Sutter counties, where approximately half of the residents identify as racial or ethnic minorities. These data indicate that the planning area does not contain environmental justice populations based on race and ethnicity.

Table 120. Environmental justice characteristics by county

Location	Poverty Rate⁴⁷ (ACS 2014 5-year Estimate)	Share Other than White Alone, Non-Hispanic (ACS 2014 5-year Estimate)
Butte County	21.5%	25.8%
El Dorado County	10.3%	20.7%
Lassen County	17.1%	34.0%
Nevada County	12.4%	14.0%
Placer County	8.9%	25.0%
Plumas County	15.9%	15.5%
Sacramento County	18.1%	52.7%
Shasta County	18.0%	19.5%
Sierra County	16.3%	12.7%
Sutter County	16.8%	51.0%

⁴⁷ “Following the Office of Management and Budget's (OMB) Statistical Policy Directive 14, the Census Bureau uses a set of money income thresholds that vary by family size and composition to determine who is in poverty. If a family's total income is less than the family's threshold, then that family and every individual in it is considered in poverty. The official poverty thresholds do not vary geographically, but they are updated for inflation using Consumer Price Index (CPI-U). The official poverty definition uses money income before taxes and does not include capital gains or noncash benefits (such as public housing, Medicaid, and food stamps)” (U.S. Census Bureau 2016a).

Location	Poverty Rate ⁴⁷ (ACS 2014 5-year Estimate)	Share Other than White Alone, Non-Hispanic (ACS 2014 5-year Estimate)
Trinity County	18.6%	16.9%
Yuba County	22.2%	42.6%
California	16.4%	60.8%

Source: U.S. Census Bureau 2016a

Given the high rates of poverty in the analysis area, the environmental consequences analysis will address the possibility that management actions could disproportionately and adversely affect low-income individuals. Low-income individuals may be less able to adapt to changes in employment, income, and recreation opportunities within the Tahoe National Forest.

Environmental Consequences

Alternative 1 – No Action

Economic Activity

Alternative 1 would not affect forest recreation use or visitor spending. Therefore, this alternative would not affect the number of jobs, amount of labor income, or tax revenue in the local economy. Visitor use is expected to increase over time due to factors outside the control of the Forest Service (e.g., population growth), which would increase employment, labor income, and tax revenue. However, these increases in visitor use would not be affected by the selection of any of the alternatives.

Quality of Life

The values, beliefs, and attitudes discussion above identified several key issues related to OSV use within the Tahoe National Forest and quality of life for visitors and area residents. In particular, commenters discussed recreation opportunities and user conflict. Alternative 1 would not implement management activities that affect recreation opportunities or user conflict. User conflict may increase as population and visitor use increase. As a number of commenters noted, user conflict is often asymmetrical (motorized use inhibit non-motorized use, but not the reverse). Therefore, the possibility of increased user conflict may affect quality of life for non-motorized winter recreation users.

Environmental Justice

Alternative 1 would not affect the cost of participating in recreation activities on the forest. Therefore, this alternative would not disproportionately and adversely affect the low-income individuals and households in the analysis area. However, climate change may reduce the areas on the forest that are suitable for winter recreation due to reduced precipitation and warmer winters. This could slightly increase the travel costs (i.e., in terms of time and fuel) for accessing winter recreation opportunities on the forest. Low-income individuals and households have fewer financial resources and, thus, may be disproportionately affected by increased recreational travel costs.

Table 121. Socioeconomic resource indicators and measures for alternative 1

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 1
Economic activity	Employment, income, tax revenue	Number of jobs, amount of labor income, tax revenue	No change due to management; increased visitor use over time would increase number of jobs, labor income, and tax revenue
Quality of life	Recreation visitation	Number of recreation visits	No change due to management; visitor use expected to increase over time
Quality of life	Values, beliefs, and attitudes	Qualitative evaluation of public values, beliefs, and attitudes	User conflict may increase due to population growth and increased visitor use
Environmental Justice	Low-income and minority populations	Change in cost of participating in recreation activities	No change due to management; climate change may increase distances winter recreation users must travel for adequate snow depth

Alternative 2 – Modified Proposed Action

Direct and Indirect Effects

Economic Activity

Alternative 2 would decrease the acres designated for cross-country OSV use from 638,002 to 410,703, a 36 percent reduction from existing conditions. However, this alternative would increase the miles of trail available for grooming from 220 miles under alternative 1 to 247 miles, an increase of 27 miles or 12 percent. Based on observational evidence, OSV visitor use is driven by the miles of groomed trails. However, data do not exist to quantify the relationship between the additional 27 miles of trails available for grooming and OSV visitation. Nevertheless, alternative 2 is expected to increase OSV use within the Tahoe National Forest relative to the alternative 1. Current OSV users account for approximately 36,000 visits to the forest each year. Increased OSV visitation would support additional recreation-related employment, labor income, and tax revenue in the local area.

However, as discussed in the Values, Beliefs, and Attitudes section, non-motorized winter recreation users may be crowded out due to OSV use. Therefore, an increase in OSV use may be offset by a decline in non-motorized winter use. This would lower the gains in employment, labor income, and tax revenue associated with increased OSV use within the Tahoe National Forest.

Quality of Life

The values, beliefs, and attitudes discussion above identified several key issues related to public OSV use within the Tahoe National Forest and quality of life for visitors and area residents. In particular, commenters discussed recreation opportunities and user conflict. Alternative 2 would decrease the share of acres designated for cross-country OSV use relative to existing conditions. However, as mentioned above, this alternative would make 27 additional miles of trails available for grooming relative to current management. Trail grooming is expected to make the Tahoe National Forest more appealing for OSV recreation users. Increased OSV visitation would increase the

likelihood of conflict between motorized and non-motorized winter recreation users. Since OSV use can make areas unappealing to non-motorized winter recreation users due to safety concerns and preferences for quiet, alternative 2 could adversely affect non-motorized winter recreation users' quality of life.

Environmental Justice

Alternative 2 would not affect the cost of participating in recreation activities on the forest relative to current conditions. Therefore, this alternative would not disproportionately and adversely affect low-income individuals and households in the analysis area. However, climate change may reduce the areas on the forest that are suitable for winter recreation due to reduced precipitation and warmer winters. This could increase the travel costs (i.e., in terms of time and fuel) for accessing winter recreation opportunities on the forest. Low-income individuals and households have fewer financial resources and, thus, may be disproportionately affected by increased recreational travel costs.

Table 122. Socioeconomic resource indicators and measures for alternative 2 direct and indirect effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2 Direct and Indirect Effects
Economic activity	Employment, income, tax revenue	Number of jobs, amount of labor income, tax revenue	Increased OSV visitation would support additional employment, labor income, and tax revenue in the local area; possibility that reduced non-motorized winter recreation visitation could offset increased economic activity
Quality of life	Recreation visitation	Number of recreation visits	OSV visitation expected to increase due to more miles of trail available for grooming; increased OSV visitation may crowd out some non-motorized winter recreation users
Quality of life	Values, beliefs, and attitudes	Qualitative evaluation of public values, beliefs, and attitudes	Increased OSV visitation may adversely affect non-motorized winter recreation users' quality of life
Environmental Justice	Low-income and minority populations	Change in cost of participating in recreation activities	No change in cost due to management; climate change may increase distances winter recreation users must travel for adequate snow depth

Cumulative Effects – Alternative 2

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Past, present, and reasonably foreseeable projects in the planning area include vegetation management, livestock grazing allotment management, and recreation site improvements. These actions may temporarily restrict or displace recreation use. However, none of the actions are expected to measurably affect annual recreation use, visitor spending, and associated employment, labor income, and tax revenue. Therefore, no cumulative effects related to economic activity are anticipated. The temporary displacement of recreation use may affect quality of life if preferred sites

are temporarily unavailable. However, such effects are expected to be infrequent and minor. Temporary displacement is not expected to increase conflict between motorized and non-motorized recreation users. Finally, these past, present, and reasonably foreseeable actions may affect travel costs if visitors must travel farther because preferred recreation sites are temporarily unavailable. However, since displacement would be infrequent and minor, effects to travel costs are not expected to meaningfully add to the potential environmental justice effects described in the direct and indirect effects analysis.

Long-term, a number of ongoing and reasonably foreseeable activities are expected to improve opportunities for recreation visitor use within the Tahoe National Forest. The Little Truckee Summit Parking Area improvement project would expand parking capacity and improve facilities to better satisfy demand for winter recreation opportunities within the Tahoe National Forest. The Sugarplum project is improving recreation site conditions for winter recreation users within the Tahoe National Forest. The effects of ongoing and reasonably foreseeable activities related to winter recreation may interact with OSV use designation to affect visitation beyond what is estimated here. Trailhead improvements are expected to increase participation in winter motorized and non-motorized activities within the Tahoe National Forest.

Table 123. Socioeconomic resource indicators and measures for alternative 2 cumulative effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2 Cumulative Effects
Economic activity	Employment, income, tax revenue	Number of jobs, amount of labor income, tax revenue	No measurable effects to employment, labor income, and tax revenue are expected
Quality of life	Recreation visitation	Number of recreation visits	Short-term infrequent and minor displacement of recreation visitors. Long-term increase in recreation visitation due to recreation site improvements.
Quality of life	Values, beliefs, and attitudes	Qualitative evaluation of public values, beliefs, and attitudes	Infrequent and minor displacement not expected to change winter recreation users conflict or quality of life
Environmental Justice	Low-income and minority populations	Change in cost of participating in recreation activities	No measurable change in travel costs

Alternative 3

Direct and Indirect Effects

Economic Activity

Alternative 3 would decrease the acres designated for OSV use from 638,002 to 277,584, a 57 percent reduction from existing conditions. However, alternative 3 would not change the miles of OSV trails available for grooming relative to alternative 1, current management (220 miles). Based on observational evidence, OSV visitor use is primarily driven by the miles of groomed trails. However, due to the amount and locations of the reduction in areas available to OSV use, Alternative

3 may affect OSV use within the Tahoe National Forest relative to the Alternative 1. As a result, there may be a slight reduction in local economic activity associated with recreational visitation to the Tahoe National Forest.

Quality of Life

The values, beliefs, and attitudes discussion above identified several key issues related to public OSV use within the Tahoe National Forest and quality of life for visitors and area residents. In particular, commenters discussed recreation opportunities and user conflict. Alternative 3 would substantially reduce the share of acres designated for cross-country OSV use relative to alternative 1, including some areas popular with both advanced OSV riders and non-motorized recreationists (i.e., bowls north of Castle Peak, bowl areas east of Anderson Peak, Sierra Buttes area), which would slightly enhance the quality of life for non-motorized winter recreationists. Alternative 3 would not change the miles of OSV trails available for grooming. Therefore, despite the relatively large decrease in acres designated for cross-country OSV use, overall recreation visitation is only expected to decrease slightly relative to current conditions within the Tahoe National Forest. In terms of winter recreation visitors' quality of life, alternative 3 would have similar consequences as alternative 1.

Environmental Justice

Alternative 3 would not affect the cost of participating in recreation activities on the forest relative to current conditions. Therefore, this alternative would not disproportionately nor adversely affect the low-income individuals and households in the analysis area. However, climate change may reduce the areas on the forest that are suitable for winter recreation due to reduced precipitation and warmer winters. This could increase the travel costs (i.e., in terms of time and fuel) for accessing winter recreation opportunities on the forest. Low-income individuals and households have fewer financial resources and, thus, may be disproportionately affected by increased recreational travel costs.

Table 124. Socioeconomic resource indicators and measures for alternative 3 direct and indirect effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 3 Direct and Indirect Effects
Economic activity	Employment, income, tax revenue	Number of jobs, amount of labor income, tax revenue	No change in the miles of groomed OSV trails; however, a decrease in OSV acres and specific popular locations available for OSV use may result in minor changes in motorized winter recreation visitation that may have a minor effect on recreation-related employment, labor income, or tax revenue in local area
Quality of life	Recreation visitation	Number of recreation visits	Due to a reduction in acres where OSV is allowed and the locations of OSV designated areas, non-motorized users' quality of life may improve slightly and OSV user's quality of life may decrease slightly.
Quality of life	Values, beliefs, and attitudes	Qualitative evaluation of public values, beliefs, and attitudes	Due to the quantity and locations of OSV designated area reduction may slightly enhance non-motorized quality of life and slightly reduce OSV user's quality of life.
Environmental Justice	Low-income and minority populations	Change in cost of participating in recreation activities	No change in cost due to management; climate change may increase distances winter recreation users must travel for adequate snow depth

Cumulative Effects

The cumulative effects under alternative 3 would be similar to the cumulative effects described under the alternative 2.

Alternative 4

Direct and Indirect Effects

Economic Activity

Relative to current conditions, alternative 4 would slightly increase the acres designated for cross-country OSV use from 638,002 to 641,708, or 0.5 percent. Additionally, alternative 4 would increase the total miles of trails available for grooming from 220 miles under the alternative 1 to 262 miles, an increase of 43 miles or 20 percent. Based on observational evidence, OSV visitor use is primarily driven by the miles of groomed trails. Current OSV users account for approximately 36,000 visits, out of 1.8 million total recreation visits, to the Tahoe National Forest each year. Although OSV users account for a small share of total recreation visitation on the forest, Forest Service survey data indicate that OSV users typically spend more than other recreation users (White et al. 2013).

As discussed in the Values, Beliefs, and Attitudes section, non-motorized winter recreation users typically prefer to recreate at sites without OSV users. Therefore, an increase in OSV use lead to reductions in non-motorized winter use. This would moderate the gains in employment, labor income, and tax revenue associated with increased OSV use within the Tahoe National Forest. However, due to the relatively high spending of OSV visitors, overall, alternative 4 is expected to support higher levels of employment, labor income, and tax revenue in the local area compared to all other considered alternatives.

Quality of Life

The effect on motorized and non-motorized winter recreation visitors' quality of life would be the same as described under alternative 2.

Environmental Justice

The environmental justice consequences of alternative 4 would be the same as those described for alternative 2.

Table 125. Socioeconomic resource indicators and measures for alternative 4 direct and indirect effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 4 Direct and Indirect Effects
Economic activity	Employment, income, tax revenue	Number of jobs, amount of labor income, tax revenue	Increased OSV visitation would support additional employment, labor income, and tax revenue in the local area; possibility that reduced non-motorized winter recreation visitation could offset increased economic activity
Quality of life	Recreation visitation	Number of recreation visits	OSV visitation expected to increase due to more miles of trail available for grooming; increased OSV visitation may crowd out some non-motorized winter recreation users

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 4 Direct and Indirect Effects
Quality of life	Values, beliefs, and attitudes	Qualitative evaluation of public values, beliefs, and attitudes	Increased OSV visitation may adversely affect non-motorized winter recreation users' quality of life
Environmental Justice	Low-income and minority populations	Change in cost of participating in recreation activities	No change in cost due to management; climate change may increase distances winter recreation users must travel for adequate snow depth

Cumulative Effects

The cumulative effects under alternative 4 would be similar to the cumulative effects described under alternative 2.

Alternative 5

Direct and Indirect Effects

Economic Activity

Alternative 5 would decrease the acres designated for OSV use to 302,411 acres, a 53 percent reduction from alternative 1. However, alternative 5 would make 215 miles of trails available for grooming, which is 24 miles fewer than alternative 1, or a 2 percent reduction. Based on observational evidence, OSV visitor use is primarily driven by the miles of groomed trails. However, due to the amount of reduction in areas available to OSV use, Alternative 5 may affect OSV use within the Tahoe National Forest relative to the Alternative 1. As a result, there may be a slight reduction in local economic activity associated with recreational visitation to the Tahoe National Forest.

Quality of Life

The values, beliefs, and attitudes discussion above identified several key issues related to OSV use within the Tahoe National Forest and quality of life for visitors and area residents. In particular, commenters discussed recreation opportunities and user conflict. Alternative 5 would make the fewest miles of trails available for grooming and would designate the second fewest acres for cross-country OSV use. Therefore, alternative 5 would improve quality of life for non-motorized winter recreation users relative to the Alternative 1 and other action alternatives. The decrease in acres designated for cross-country OSV use may alleviate concerns expressed by non-motorized winter recreation users related to vehicle exhaust fumes, disparities in speed, noise, and competition for fresh powder. The reduction in miles of trail available for grooming and acres designated for OSV use within the Tahoe National Forest may adversely affect OSV users' quality of life if they cannot access preferred sites, face more competition at existing sites, or need to travel further to recreate on the forest. However, the miles of trail available for grooming is only slightly below current conditions. Therefore, effects to OSV users' quality of life are expected to be minor.

Environmental Justice

Alternative 5 would reduce opportunities for OSV recreation within the Tahoe National Forest relative to current conditions. Alternative 5 may require some OSV users to travel farther to recreate on the forest. Additionally, like all alternatives, climate change may affect travel costs due to reduced precipitation and warmer winters. Overall, alternative 5 is expected to increase the travel costs of OSV visitors to the Tahoe National Forest. Low-income individuals and families would be disproportionately affected by increased travel costs.

Table 126. Socioeconomic resource indicators and measures for alternative 5 direct and indirect effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 5 Direct and Indirect Effects
Economic activity	Employment, income, tax revenue	Number of jobs, amount of labor income, tax revenue	Two percent decrease in groomed OSV trails and the decrease in acreage available to OSV use may result in minor changes in motorized winter recreation visitation that may have a minor effect recreation-related employment, labor income, or tax revenue in local area
Quality of life	Recreation visitation	Number of recreation visits	Minor adverse effect to OSV users due to 2 percent decrease in groomed trails and decrease in acreage available to OSV use.
Quality of life	Values, beliefs, and attitudes	Qualitative evaluation of public values, beliefs, and attitudes	OSV users' quality of life may decline if they travel farther or face site competition; non-motorized winter recreation users would benefit from decreased likelihood of user conflict
Environmental Justice	Low-income and minority populations	Change in cost of participating in recreation activities	OSV users would have to travel farther to access open areas or groomed trails; increased travel costs would disproportionately affect lower income individuals and families

Cumulative Effects

Past, present, and reasonably foreseeable projects may temporarily restrict or displace recreation use. However, none of the actions are expected to measurably affect annual recreation use, visitor spending, and associated employment, labor income, and tax revenue. Therefore, no cumulative effects related to economic activity are anticipated. The temporary displacement of recreation use may affect quality of life if preferred sites are temporarily unavailable. However, such effects are expected to be infrequent and minor. Temporary displacement is not expected to increase conflict between motorized and non-motorized recreation users. Finally, these past, present, and reasonably foreseeable actions may affect travel costs if visitors must travel farther because preferred recreation sites are temporarily unavailable. This effect would be the most pronounced for OSV users under alternative 5 because management actions would limit opportunities for OSV recreation within the Tahoe National Forest. Therefore, further displacement due to ongoing and reasonably foreseeable activities could cause further reduction in OSV opportunities and increased crowding at available sites.

Long term, a number of ongoing and reasonably foreseeable activities are expected to improve opportunities for recreation visitor use on the forest. The Little Truckee Summit Parking Area improvement project would expand parking capacity and improve facilities to better satisfy demand for winter recreation opportunities. The Sugarplum project is improving recreation site conditions for winter recreation users on the forest. The interaction of these activities with the actions proposed under alternative 5 would affect winter recreation users' quality of life beyond what is estimated in the direct and indirect effects analysis. Expanded parking capacity would lessen the possibility of recreation site crowding adversely affecting visitors' quality of life.

Table 127. Socioeconomic resource indicators and measures for alternative 5 cumulative effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 5 Cumulative Effects
Economic activity	Employment, income, tax revenue	Number of jobs, amount of labor income, tax revenue	Visitor displacement is possible, but no measurable effects to employment, labor income, and tax revenue beyond what is described in direct and indirect effects analysis
Quality of life	Recreation visitation	Number of recreation visits	Possible displacement of recreation visitors in the short-term; long-term site improvements could lessen potential for site competition to reduce OSV visitation
Quality of life	Values, beliefs, and attitudes	Qualitative evaluation of public values, beliefs, and attitudes	Site improvements could improve quality of life for OSV users with fewer opportunities under alternative 5
Environmental Justice	Low-income and minority populations	Change in cost of participating in recreation activities	No measurable change in travel costs

Compliance with LRMP and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1 would not be in compliance with Subpart C of the Travel Management rule, which requires designation of roads, trails, and areas on National Forest System lands to provide for OSV use.

Alternatives 2, 3, 4, and 5 would be in compliance with Subpart C of the Travel Management rule. These alternatives would also be in compliance with Forest Plan goals to provide a variety of recreation opportunities.

Summary of Environmental Effects

Table 128. Summary comparison of socioeconomic effects

Resource Element	Indicator/ Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Economic activity	Employment, income, tax revenue	No change due to management; increased visitor use over time would increase number of jobs, labor income, and tax revenue	Increased OSV visitation would support additional employment, labor income, and tax revenue in the local area; possible reduction in non-motorized winter recreation visitation could offset increased economic activity	No change in miles of groomed OSV trails; however, a decrease in quantity and the locations of OSV areas may result in minor changes in motorized winter recreation visitation that may have a minor effect recreation-related employment, labor income, or tax revenue in local area	Increased OSV visitation would support additional employment, labor income, and tax revenue in the local area; possible reduction in non-motorized winter recreation visitation could offset increased economic activity	Two percent decrease in groomed OSV trails and acreage of OSV use available may result in minor changes in motorized winter recreation visitation that may have a minor effect recreation-related employment, labor income, or tax revenue in local area
Quality of life	Recreation visitation	No change due to management; visitor use expected to increase over time	OSV visitation expected to increase due to more miles of trail available for grooming; increased OSV visitation may crowd out some non-motorized winter recreation users	Minor adverse effect to OSV users due to the reduction in quantity and locations of OSV designated areas.	OSV visitation expected to increase due to more miles of trail available for grooming; increased OSV visitation may crowd out some non-motorized winter recreation users	Minor adverse effect to OSV users due to 2 percent decrease in groomed trails and reduction in OSV designated use areas available.
Quality of life	Values, beliefs, and attitudes	User conflict may increase due to population growth and increased visitor use	Increased OSV visitation may adversely affect non-motorized winter recreation users' quality of life	Due to a reduction in acres where OSV is allowed and the locations of OSV designated areas, non-motorized users' quality of life may improve slightly and OSV user's quality of life may decrease slightly.	Increased OSV visitation may adversely affect non-motorized winter recreation users' quality of life	OSV users' quality of life may decline if they travel farther or face site competition; non-motorized winter recreation users would benefit from decreased likelihood of user conflict

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Resource Element	Indicator/ Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Environmental Justice	Low-income and minority populations	No change due to management; climate change may increase distances winter recreation users must travel for adequate snow depth	No change in cost due to management; climate change may increase distances winter recreation users must travel for adequate snow depth	No change in cost due to management; climate change may increase distances winter recreation users must travel for adequate snow depth	No change in cost due to management; climate change may increase distances winter recreation users must travel for adequate snow depth	OSV users would have to travel farther to access open areas or groomed trails; increased travel costs would disproportionately affect lower income individuals and families

Cultural Resources

Relevant Laws, Regulations, and Policy

Federal Law

National Historic Preservation Act

The National Historic Preservation Act of 1966, as amended, directs all Federal agencies to take into account the effects of their undertakings (actions, financial support, and authorizations) on properties included in or eligible for the National Register of Historic Places. Implementing regulations are found at 36 CFR 800.

Land and Resource Management Plan

The Tahoe National Forest Land and Resource Management Plan (USDA Forest Service 1990) as amended by the Sierra Nevada Forest Plan Amendment Supplemental Final Environmental Impact Statement and Record of Decision (USDA Forest Service 2004a, 2004b), provides management direction and standards and guidelines for vegetation, watershed, and recreation management activities. Forest Plan guidance relevant to heritage resources are described in more detail below.

Section 106 of the National Historic Preservation Act of 1966 and implementing regulations requires the agency official to determine if the undertaking is a type of activity that could affect historic properties. If the nature of the undertaking has the potential to affect cultural resources, there must be identification efforts that may include survey. The undertaking's area of potential effects would be surveyed for cultural resources in order to comply with 36 CFR 800 – Protection of Historic Properties, and the National Environmental Policy Act. Compliance with National Historic Preservation Act of 1966 and 36 CFR 800 regulations includes all historic properties be evaluated for the National Register of Historic Places.

Relevant Standards and Guidelines

The Sierra Nevada Forest Plan Amendment described the following elements of managing cultural resources (Volume 2, Chapter 3, Part 5.8, p. 510):

- Conducting inventories of proposed undertakings within the area of potential effects to identify types and locations of historic properties.
- Determining which historic properties are eligible for the National Register of Historic Places.
- Assessing potential project effects on eligible historic properties.
- Avoiding or mitigating adverse effects on historic properties eligible for the National Register or other significant sites.
- Follow-up monitoring to assess the effectiveness of management procedures such as implementing site protection measures.

Region 5 Programmatic Agreement

The Tahoe National Forest has consulted with the State Historic Preservation Officer on the application of this undertaking with stipulations in the Region 5 Programmatic Agreement.⁴⁸ SHPO concurred that requiring at least 12 inches of snow or ice (based on weather, Forest Service personnel and public observations), be present in order to authorize cross-country OSV use in designated OSV use areas would sufficiently prevent surface and subsurface impacts to historic properties and constitutes a finding of No Historic Properties Affected, consistent with section 7.8(b) of the Regional Programmatic Agreement.

Executive Orders

Protection and Enhancement of the Cultural Environment

The Protection and Enhancement of the Cultural Environment, Executive Order 11593 of May 13, 1971, directs Federal agencies to inventory cultural resources under their jurisdiction, nominate all federally owned properties that meet the criteria to the National Register of Historic Places, use due caution until the inventory and nomination processes are completed, and assure that Federal plans and programs contribute to preservation and enhancement of non-federally owned properties.

Indian Sacred Sites, Executive Order of May 24, 1996

The Indian Sacred Sites, Executive Order of May 24, 1996, directs Federal land management agencies, to the extent permitted by law, and not clearly inconsistent with essential agency functions, to accommodate access to and use of Indian sacred sites, to avoid affecting the physical integrity of such sites wherever possible, and, where appropriate, to maintain the confidentiality of sacred sites. Federal agencies are required to establish a process to assure that the affected Indian tribes are provided reasonable notice of proposed Federal actions or policies that may affect Indian Sacred sites.

Executive Order 13175 of November 6, 2000

In Executive Order 13175 of November 6, 2000, Section 5 states there should be a process to ensure meaningful and timely input in the development of regulatory policies that have tribal implications.

Executive Memorandum from April 29, 1994

In Executive Memorandum from April 29, 1994, President Clinton discusses the unique legal relationship between Native American Tribal governments and the U.S. Government. He requires each executive department and agency to consult, to assess the impact of Federal Government plans, and to remove impediments from consultation with tribes.

Executive Memorandum from November 5, 2009

Executive Memorandum from November 5, 2009, President Obama supports and reaffirms Executive Order 13175 and gives specific directions on how plans should be developed and when they must be submitted to the Director of the Office of Management and Budget.

⁴⁸ Programmatic Agreement Among U.S.D.A. Forest Service, Pacific Southwest Region (Region 5), California State Historic Preservation Officer, Nevada State Historic Preservation Officer, Advisory Council on Historic Preservation Regarding the Processes for Compliance with Section 106 of the National Historic Preservation Act for Management of Historic Properties by the National Forests of the Pacific Southwest Region, February 2013 (Region 5 PA)

Analysis Assumptions

The assumptions used in this effects analysis include:

- Snowpack creates a protective barrier between vehicles and archaeological sites. Snow levels at 12 inches provide adequate protection.
- All trails are located on engineered roads or trails with gravel, pavement or other base material or an existing hardened surface. This material acts as a cap for archaeological sites that are bisected by the road, thus providing protection to historic properties when snow levels are less than 12 inches. [Regional PA stipulation 2.1(c)(1-6)]
- Use of maintained designated roads by OSVs with 6 inches of snow has similar effects to vehicles and OHV use on the same road.

Affected Environment

With over 4,000 recorded sites on National Forest System land, the Tahoe National Forest contains a variety of pre-contact and historic archaeological sites and buildings. Research of cultural resources discovered within the boundaries of the Tahoe National Forest indicate people have been using the forest for over 8,000 years with intensification occurring within the last 5,000 to 4,000 years. By 5,000 years ago on the western side of the forest, permanent villages were established at elevations generally below 3,500 feet (snow line). On the eastern side of the forest, winter villages were located in the lower-elevation valleys where Reno and Carson City, Nevada, are located. Prior to the crossing of the Sierra Nevada by emigrant parties, an extensive trail system was established by Native people for travel and trade. Many of these trails became major travel routes into California during the historic era. Two Native American ethnographic groups, the Nisenan Maidu and the Washoe, have direct ties to land now managed by the National Forest System under the administration of the Tahoe National Forest. To date, no traditional cultural properties or sites of religious or cultural importance have been identified within the Tahoe National Forest.

Environmental Consequences

Alternative 1 – No Action

Direct and Indirect Effects

Under no action, no new direct effects would occur. Cultural resources would continue to be vulnerable to the effects of unregulated over-snow recreation. Sites would continue to be impacted when OSVs are used when snow is less than 12 inches. In addition, cultural resources would continue to naturally deteriorate over time. Cultural resources would continue to be threatened by natural processes (wildfire, erosion, flooding) and from recreational activities that bring people in contact with cultural sites.

Alternatives 2, 3, and 5

Direct and Indirect Effects

Direct effects to cultural resources are those that physically alter, damage, or destroy all or part of a resource; alter characteristics of the surrounding environment that contribute to the resource's significance; introduce visual or audible elements out of character with the property or that alters its setting; or resource neglect to the extent that it deteriorates or is destroyed.

Under alternatives 2, 3, and 5, direct effects would not likely occur because known sites would be covered by 12 inches or more of snow. In addition, all alternatives would not designate cross-country OSV use within a 1-acre area near Robinson Flat to protect historic structures. Therefore, these alternatives would not directly affect cultural resources within the proposed project area.

Cumulative Effects

Since alternatives 2, 3, and 5 would not have direct or indirect effects on cultural resources, no cumulative effects are anticipated.

Alternative 4

Direct and Indirect Effects

This alternative would allow for designated cross-country OSV areas only when 12 or more inches of snow or ice cover the landscape; however, on designated snow trails with underlying roads, a minimum of 6 or more inches of snow covering is typically needed to avoid damage to the underlying road surface. As long as trails with gravel or paved or hardened surface are used, there would be no effect.

This alternative could directly affect cultural resources along two trails that partially do not contain an underlying road surface: (1) the Howard Creek OSV Trail overlays National Forest System Road 28. The portion of the trail that creates a connection from the Gold Lake Highway (groomed) to Haskell Peak OSV Trail does not have a paved road, gravel or road with other base material; and (2) the Andesite West OSV Trail partially overlays the National Forest System Road 14E07. The portion of trail that does not overlay this road does not have a paved road, gravel or road with other base material.

Indirect effects can occur when site visitation increases due to identification of cultural resources during recreation activities. Site visitation increases the likelihood for direct effects from looting or physically altering the resource.

Cumulative Effects

The cumulative effects include increased site visitation which results in other sites being identified. These cumulative effects may result in overall heritage resource landscapes being affected.

Compliance with LRMP and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1 would not be in compliance with Subpart C of the Travel Management Rule, which requires designation of roads, trails, and areas on National Forest System lands to provide for OSV use. Alternative 1 would also not comply with the Region 5 Programmatic Agreement because it does not establish a minimum snow depth for trail or cross-country public OSV use.

Alternative 4 would not comply with the Region 5 Programmatic Agreement [Regional PA stipulation 2.1(c)(1-6)], which requires all trails be on paved roads, gravel or roads with other base material. This material acts as a cap for archaeological sites, thus, providing protection to historic properties when snow levels are less than 12 inches. Portions of two trails (Howard Creek and the Andesite West OSV Trail) do not have a paved road, gravel or road with other base material underneath.

Alternatives 2, 3, and 5 would be in compliance with Subpart C of the Travel Management Rule, the Region 5 Programmatic Agreement, and Forest Plan goals to provide a variety of recreation opportunities.

Engineering and Roads

Relevant Laws, Regulations, and Policy

National Forest Roads and Trails Act of October 13, 1964, as amended (16 U.S.C. 532-538)

This act authorizes road and trail systems for the national forests. It also authorizes granting of easements across National Forest System lands, construction and financing of maximum economy roads (FSM 7705), and imposition of requirements on road users for maintaining and reconstructing roads, including cooperative deposits for that work.

Annual Department of the Interior, Environment, and Related Agencies Appropriations Act

This act appropriates funds for the Forest Service's road and trail programs.

Organic Administration Act of 1897 (16 U.S.C. 551).

This act authorizes the regulation of national forests.

National Trails System Act of October 2, 1968(16 U.S.C. 1241-1249)

This act established the National Trails System and authorizes planning, right-of-way acquisition, and construction of trails established by Congress or the Secretary of Agriculture.

Federal Regulations

Code of Federal Regulations

- 36 CFR 212 (Forest Service travel management)
- 36 CFR 251 (Land Uses)
- 36 CFR 261 (Prohibitions)

Forest Service Manual and Handbooks

- FSM 7700 Travel Management
- FSM 7730 Transportation System Operation and Maintenance
- FSH 7709.55 Chapter 10- Travel Planning for Designations
- FSH 7709.59 Chapter 20- Traffic Management

State Direction

- California Snowmobile Trail Grooming (1997 Grooming Standards)
- Over Snow Vehicle Program Final Environmental Impact Report, Program Years 2010 – 2020 (OHMVR California Department of Parks and Recreation, Off Highway Motor Vehicle Recreation Division 2010)

- California OSV laws

Land and Resource Management Plan

Tahoe National Forest Plan

Forestwide transportation system management standards and guidelines (Forest Plan page 40).

Restrict road, trail, and off-highway use to the extent necessary for protection of:

- Threatened, endangered, and sensitive plants or animals
- Essential wildlife functions
- Cultural resources
- Riparian zones and wetlands

Eliminate motorized vehicle use in riparian areas and wetlands except on system roads and designated routes and stream crossings

Maintain the transportation system to a standard that is commensurate with user types and amount of use. Closure of roads and trails will be appropriate if the cost for maintenance and resource protection exceeds the benefits received or the financial ability of the forest to pay for these services.

Seasonal road and trail restriction are preferred over permanent closure.

Before deciding to regulate by signing and public announcements as opposed to physical barriers, consider the risk to resource values and the magnitude of maintenance costs resulting from violations. If physical barriers are used, make sure that private land access needs or cooperative agreements requirements are met.

Regulating for single purpose use is not an acceptable objective if only enacted to meet one group's desire. A need to regulate because of user conflict will be evaluated on a case by case basis.

Close roads and trails or regulate traffic when necessary to protect the safety of forest users. Candidates for regulation or closure include roads with hazards such as avalanche, landslides, forest fires, flooding, timber operations etc.

Conduct a separate analysis to correlate land capability, user needs, and user or landowner conflicts forestwide for all dispersed recreation travelways.

Consider the need to protect administrative or special-use facilities when deciding whether to close certain roads. Lookouts, guard stations, and transmission sites are examples of such facilities.

Consider the quality of dispersed recreation opportunities when deciding whether to close a road. It may be beneficial, for example, to separate four-wheeled motorized recreation use from other forms of motorized recreation, especially when simultaneous use diminishes the quality of the recreation experience for both users.

Based on the results of a transportation analysis, close and obliterate roads that are not necessary for resource management, private land uses, or public uses. Bring the roadbed into resource production. Prevent potential resource damage by the obliterated road.

Construct the minimum number of miles of road and meet the minimum design standard possible while still meeting safety, user, and resource needs with economic efficiency. Logging system design, timber sale design, and transportation planning must be emphasized on all timber sales to comply with this policy. No new roads will be constructed or reconstructed without an approved transportation plan and environmental assessment, or environmental impact statement, if required.

Proposal for subdivision access over existing National Forest System roads will be addressed.

When planning recreation development projects and resource management activities, coordinate with State and local road agencies to address potential traffic impacts and mitigation measures.

Cooperate with the State, other agencies, and user groups to identify, and where compatible with Forest Plan management objectives, develop segment of trail that would contribute to a statewide trail system. A statewide system would connect use areas and provide the opportunity for long-distance trail touring.

Sierra Nevada Forest Plan Amendment

- No applicable direction

Methodology

The Forest Transportation Atlas was the primary data used, along with professional expertise. The atlas is primarily composed of roads and motorized trail information as contained in GIS spatial data and Forest Service Infrastructure (INFRA) tabular data. In addition, the proposed over-snow vehicle route network for designation, by alternative (GIS data) were included. Last of all, the existing National Forest System roads and OSV-related engineering facilities, including snow parks, warming huts, parking areas (GIS data) were considered.

All distance figures are approximate values based on the Forest Transportation Atlas (including spatial GIS data and tabular INFRA data) and are limited to the accuracy of those sources which includes measurements from GIS, GPS, field instruments and aerial photography. Mileages have been updated throughout the planning process as better information has been made available and may change slightly with additional field verification and project implementation.

Assumptions

- All OSV users would follow applicable laws and designations as described under each alternative.
- All proposed and analyzed OSV trails would be located where the Forest Service has jurisdiction.

Spatial and Temporal Context for Effects Analysis

The affected spatial area where direct, indirect, and cumulative transportation effects may be caused by proposed activities involves the project area (Tahoe National Forest).

The temporal boundaries for transportation effects from the proposed activities are indefinite, as long as snow conditions exist to provide for the designations as described under each alternative.

Resource Indicators and Measures

Resource indicators and measures shown in table 19 will be used to measure and disclose effects to engineering and roads resources related to OSV use designations and grooming trails for OSV use.

Table 129. Engineering and roads resource indicators and measures for alternative 1

Resource Element	Resource Indicator	Measure
Safety	Public Safety and Traffic	Qualitative effects to motor vehicle operators and other users of the trail system
Cost	Affordability	Qualitative effects to the total cost of maintaining the Forest transportation system that will be open to motor vehicle use
Transportation property	Effects to underlying NFS roads and trails	Wear and tear that may affect wheeled motor vehicle use

Affected Environment

The Tahoe National Forest current management for snow trail grooming when using OHMVR Division funds and equipment is to follow OHMVR snow depth standards.

When grooming occurs using other funds and equipment there is currently no minimum snow depth.

The following summarizes how the Forest Service currently manages OSV use on the approximately 836,273-acre Tahoe National Forest:

- Approximately 641,925 acres of National Forest System land are designated for off-trail cross-country OSV use;
- Approximately 1,218 acres of National Forest System lands designated for OSV use from January 1 through September 14;
- 369 miles of trails for OSV use:
 - ◆ Approximately 220 miles of designated National Forest System OSV trails available for grooming;
 - ◆ 140 miles of trails not available for grooming located on easements across private lands;
 - ◆ 9 miles of designated OSV trails not available for grooming with 3 of these miles located within OSV Use Areas;
- OSV use on the PCT is prohibited. There are currently no designated crossings. There is currently no OSV prohibition on lands adjacent to the PCT.
- Forest Plan does not establish a minimum snow depth for public OSV cross-country or trail use.

Desired Condition

The desired condition involves providing a stable and cost-efficient road system through appropriate construction, reconstruction, maintenance; providing a stable and cost-efficient trail system through appropriate construction, reconstruction, maintenance; and providing administrative sites and facilities that effectively and cost-efficiently serve the public and the Forest Service workforce.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

The current Tahoe National Forest Winter Recreation Guide map provides adequate information to maintain a reasonable level of public safety and avoid traffic conflicts. There would be minor adverse effects (minor costs) due to over-snow vehicle use on access roads to popular parking and staging areas. Current snow trail grooming management using OHMVR Division funds and equipment follows OHMVR snow depth standards. Snow depth requirement provides adequate protection of roads under the snow. Table 130 displays alternative 1 effects on public safety and traffic, OSV use effects on the cost of maintaining the transportation system and effects on road and trail surfaces.

Table 130. Engineering and roads resource indicators and measures for alternative 1

Resource Element	Resource Indicator	Measure	Alternative 1
Safety	Public Safety and Traffic	Qualitative effects to motor vehicle operators and other users of the trail system	The current Tahoe National Forest Winter Recreation Guide map provides adequate information to maintain a reasonable level of public safety and avoid traffic conflicts
Cost	Affordability	Qualitative effects to the total cost of maintaining the Forest transportation system (FTS) that will be open to motor vehicle use	Minor effects (minor costs) due to over-snow vehicle use for access roads to popular parking and staging areas.
Transportation property	Effects to underlying NFS roads and trails	Wear and tear that may affect wheeled motor vehicle use	The Tahoe National Forest current management for snow trail grooming using OHMVR Division funds and equipment follows OHMVR snow depth standards. This snow depth requirement provides adequate protection of underlying roads.

Alternative 2

Direct and Indirect Effects

Effects under alternative 2 would be similar to alternative 1. The Tahoe National Forest Winter Recreation Guide map would provide adequate information to maintain a reasonable level of public safety and avoid traffic conflicts. There would be minor adverse effects (minor costs) due to over-snow vehicle use on access roads to popular parking and staging areas.

A standard of 12 to 18 inches of snow depth would be required for snow trail grooming when funds and equipment are used from sources other than the OHMVR Division. The snow depth requirement would provide adequate protection of roads under the snow.

Minor additional maintenance costs may occur from over-snow vehicle use of access roads, parking and staging areas due to:

- Freezing and thawing of road subgrade resulting in asphalt cracking
- Exposure of native surface or asphalt due to grooming, use or rain-on-snow events resulting in shortened life-cycle of the infrastructure
- Improvements or maintenance to the storm drainage system may be required due to increased runoff and/or earlier snowmelt

Table 131 displays effects on public safety and traffic, OSV use effects on the cost of maintaining the transportation system and wear and tear effects on road and trail surfaces.

Cumulative Effects

There would be negligible cumulative effects under alternative 2. Effects on public safety, road maintenance costs and effects on underlying roads and trails would be negligible. Measurement indicators are shown in table 132.

Table 131. Resource indicators and measures for alternative 2

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2
Safety	Public Safety and Traffic	Qualitative effects to motor vehicle operators and other users of the trail system	The over-snow vehicle use map would provide adequate information to maintain a reasonable level of public safety and avoid traffic conflicts; this would also improve understanding of allowed uses and prohibitions.
Cost	Affordability	Qualitative effects to the total cost of maintaining the forest transportation system (FTS) that will be open to motor vehicle use	Minor effects (additional maintenance costs) due to over-snow vehicle use on access roads to popular parking and staging areas.
Transportation property	Effects to underlying NFS roads and trails	Wear and tear that may affect wheeled motor vehicle use	Public, cross-country OSV use in designated OSV areas would only be allowed when there is adequate snow depth to avoid damage to natural and cultural resources. A minimum of 12 inches of moderate to heavy, density uncompacted snow is typically needed. A minimum 6 inches of snow depth would provide adequate protection of underlying roads. Underlying roads would be protected with a standard of 12 to 18 inches of snow depth would be required for snow trail grooming when funds and equipment are used from sources other than the OHMVR Division.

Table 132. Engineering and roads resource indicators and measures for alternative 2 cumulative effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2
Safety	Public Safety and Traffic	Qualitative effects to motor vehicle operators and other users of the trail system	Negligible cumulative effects; temporary closures for logging and other forest operations activities would eliminate conflicts.
Cost	Affordability	Qualitative effects to the total cost of maintaining the forest transportation system that will be open to motor vehicle use	Negligible cumulative effects.
Transportation property	Effects to underlying NFS roads and trails	Wear and tear that may affect wheeled motor vehicle use	Negligible cumulative effects; use of temporary closures and proper use of snow plowing requirements for harvest and other forest operations activities would minimize cumulative effects.

Alternative 3

Direct and Indirect Effects

Effects under alternative 3 would be similar to alternative 1. The over-snow vehicle use map would provide adequate information to maintain a reasonable level of public safety and avoid traffic conflicts. There would be minor adverse effects (additional costs) due to over-snow vehicle use on access roads to popular parking and staging areas.

Adequate snow on roads, 18 inches minimum snow depth for trail grooming and cross-country OSV use (OSV use on underlying routes) would provide adequate protection of underlying roads and trails.

Minor additional maintenance costs may occur from over-snow vehicle use of access roads, parking and staging areas due to:

- Freezing and thawing of road subgrade resulting in asphalt cracking
- Exposure of native surface or asphalt due to grooming, use or rain-on-snow events would shortened life-cycle of the infrastructure
- Improvements to the storm drainage system may be required due to increased runoff and/or earlier snowmelt

Table 133 displays effects on safety, associated transportation costs and effects on road surfaces under alternative 3.

Table 133. Engineering and roads resource indicators and measures for alternative 3

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 3
Safety	Public Safety and Traffic	Qualitative effects to motor vehicle operators and other users of the trail system	The over-snow vehicle use map would provide adequate information to maintain a reasonable level of public safety and avoid traffic conflicts; this would also improve understanding of allowed uses and prohibitions.
Cost	Affordability	Qualitative effects to the total cost of maintaining the forest transportation system that will be open to motor vehicle use	Minor effects (additional maintenance costs) due to over-snow vehicle use for access roads to popular parking and staging areas.
Transportation property	Effects to underlying NFS roads and trails	Wear and tear that may affect wheeled motor vehicle use	Adequate snow on roads, 18 inches for grooming, trail use and cross-country travel snow depth requirements would provide adequate protection of underlying roads.

Cumulative Effects

Cumulative effects of related projects described under alternative 2 would apply to alternative 3. Table 134 displays cumulative effects under alternative 3.

Table 134. Engineering and roads resource indicators and measures for alternative 3 cumulative effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 3
Safety	Public Safety and Traffic	Qualitative effects to motor vehicle operators and other users of the trail system	Negligible cumulative effects; use of temporary closures for logging and other forest operations activities would eliminate conflicts.
Cost	Affordability	Qualitative effects to the total cost of maintaining the forest transportation system that will be open to motor vehicle use	Negligible cumulative effects.
Transportation property	Effects to underlying NFS roads and trails	Wear and tear that may affect wheeled motor vehicle use	Negligible cumulative effects; use of temporary closures and proper use of snow plowing requirements for harvest and other forest operations activities would minimize cumulative effects.

Alternative 4

Direct and Indirect Effects

The over-snow vehicle use map would provide adequate information to maintain a reasonable level of public safety and avoid traffic conflicts. The map and information would also improve understanding of allowed OSV uses and prohibitions. Snow depth requirement, 12 inches for grooming and 6 inches for OSV use on designated trails would provide adequate protection of underlying roads and trails.

Minor additional maintenance costs may occur from over-snow vehicle use of access roads, parking and staging areas due to:

- Freezing and thawing of road subgrade resulting in asphalt cracking
- Exposure of native surface or asphalt due to grooming, use or rain-on-snow events would shortened life-cycle of the infrastructure
- Improvements to the storm drainage system may be required due to increased runoff and/or earlier snowmelt

Table 135 displays effects on safety, associated transportation costs and effects on road surfaces under alternative 4.

Table 135. Engineering and roads resource indicators and measures for alternative 4

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 4
Safety	Public Safety and Traffic	Qualitative effects to motor vehicle operators and other users of the trail system	The over-snow vehicle use map would provide adequate information to maintain a reasonable level of public safety and avoid traffic conflicts; this would also improve understanding of allowed uses and prohibitions.
Cost	Affordability	Qualitative effects to the total cost of maintaining the forest transportation system that will be open to motor vehicle use	Minor effects (additional maintenance costs) due to over-snow vehicle use for access roads to popular parking and staging areas.
Transportation property	Effects to underlying NFS roads and trails	Wear and tear that may affect wheeled motor vehicle use	12 inches for grooming and general OSV use, and 6 inches for OSV use, on underlying routes, snow depth requirements would provide adequate protection of underlying roads.

Cumulative Effects

Cumulative effects of related projects described under alternative 2 would apply to alternative 4. Table 136 displays alternative 4 cumulative effects.

Table 136. Engineering and roads resource indicators and measures for alternative 4 cumulative effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 4
Safety	Public Safety and Traffic	Qualitative effects to motor vehicle operators and other users of the trail system	Negligible cumulative effects; use of temporary closures for logging and other forest operations activities would eliminate conflicts.
Cost	Affordability	Qualitative effects to the total cost of maintaining the forest transportation system that will be open to motor vehicle use	Negligible cumulative effects.
Transportation property	Effects to underlying NFS roads and trails	Wear and tear that may affect wheeled motor vehicle use	Negligible cumulative effects; use of temporary closures and proper use of snow plowing requirements for harvest and other forest operations activities would minimize cumulative effects.

Alternative 5

Direct and Indirect Effects

The over-snow vehicle use map would provide adequate information to maintain a reasonable level of public safety and avoid traffic conflicts; this would also improve understanding of allowed uses and prohibitions. There would be minor costs on access roads to popular parking and staging areas due to over-snow vehicle use.

Minimum snow depth requirements would avoid damage to resources, a minimum of 24 inches (OSV use on underlying routes) would provide more than adequate protection of underlying roads. A minimum of 12 inches of snow depth would be required for snow trail grooming regardless of funding. Snow depth requirement would provide adequate protection of roads under the snow.

Minor additional maintenance costs may occur from over-snow vehicle use of access roads, parking and staging areas due to:

- Freezing and thawing of road subgrade resulting in asphalt cracking
- Exposure of native surface or asphalt due to grooming, use or rain-on-snow events would shortened life-cycle of the infrastructure
- Improvements to the storm drainage system may be required due to increased runoff and/or earlier snowmelt

Table 137 displays effects on safety, associated transportation costs and effects on road surfaces under alternative 5.

Table 137. Engineering and roads resource indicators and measures for alternative 5

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 5
Safety	Public Safety and Traffic	Qualitative effects to motor vehicle operators and other users of the trail system	The over-snow vehicle use map would provide adequate information to maintain a reasonable level of public safety and avoid traffic conflicts; this would also improve understanding of allowed uses and prohibitions.
Cost	Affordability	Qualitative effects to the total cost of maintaining the forest transportation system that will be open to motor vehicle use	Minor effects (additional maintenance costs) due to over-snow vehicle use for access roads to popular parking and staging areas.
Transportation property	Effects to underlying NFS roads and trails	Wear and tear that may affect wheeled motor vehicle use	12 inches (grooming, general OSV use) and 24 inches of (OSV use on underlying routes) snow depth requirements would provide protection of underlying roads.

Cumulative Effects

Cumulative effects of projects described under alternative 2 would apply to alternative 5. Table 138 displays alternative 5 cumulative effects.

Table 138. Engineering and roads resource indicators and measures for alternative 5 cumulative effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 5
Safety	Public Safety and Traffic	Qualitative effects to motor vehicle operators and other users of the trail system	Negligible cumulative effects; use of temporary closures for logging and other forest operations activities would eliminate conflicts.
Cost	Affordability	Qualitative effects to the total cost of maintaining the forest transportation system that will be open to motor vehicle use	Negligible cumulative effects.
Transportation property	Effects to underlying NFS roads and trails	Wear and tear that may affect wheeled motor vehicle use	Negligible cumulative effects; use of temporary closures and proper use of snow plowing requirements for harvest and other forest operations activities would minimize cumulative effects.

Compliance with LRMP and Other Relevant Laws, Regulations, Policies and Plans

Alternatives 2, 3, 4 and 5 are compliant with all applicable direction, since they all involve production of a motor vehicle use map as required in Subpart C of the travel management regulations (36 CFR 212).

Alternative 1 does not involve production of a motor vehicle use map as required in Subpart C of the travel management regulations. Alternative 1 is otherwise compliant with applicable direction.

Summary of Environmental Effects

A summary of transportation related environmental effects of alternatives 1 through 5 are shown in table 139.

Table 139. Summary comparison of environmental effects to transportation and engineering resources

Resource Element	Indicator/ Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Safety	Public Safety and Traffic	The current Tahoe National Forest Winter Recreation Guide map provides adequate information to maintain a reasonable level of public safety and avoid traffic conflicts	The over-snow vehicle use map would provide adequate information to maintain a reasonable level of public safety and avoid traffic conflicts; this would also improve understanding of allowed uses and prohibitions.	The over-snow vehicle use map would provide adequate information to maintain a reasonable level of public safety and avoid traffic conflicts; this would also improve understanding of allowed uses and prohibitions.	The over-snow vehicle use map would provide adequate information to maintain a reasonable level of public safety and avoid traffic conflicts; this would also improve understanding of allowed uses and prohibitions.	The over-snow vehicle use map would provide adequate information to maintain a reasonable level of public safety and avoid traffic conflicts; this would also improve understanding of allowed uses and prohibitions.
Cost	Affordability	Minor effects (additional maintenance costs) due to over-snow vehicle use on access roads to popular parking and staging areas.	Minor effects (additional maintenance costs) due to OSV use on access roads to popular parking and staging areas.	Minor effects (additional maintenance costs) due to over-snow vehicle use on access roads to popular parking and staging areas.	Minor effects (additional maintenance costs) due to over-snow vehicle use on access roads to popular parking and staging areas.	Minor effects (additional maintenance costs) due to over-snow vehicle use on access roads to popular parking and staging areas.

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Resource Element	Indicator/ Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Transportation property	Effects to underlying NFS roads and trails	The Tahoe National Forest current management for snow trail grooming using OHMVR Division funds and equipment follows OHMVR snow depth standards. This snow depth requirement provides adequate protection of underlying roads.	Adequate snow depth requirement, typically a minimum of 6 inches would provide adequate protection of underlying roads. Under lying road would be protected with 12 to 18 inches snow depth required for grooming when funds and equipment are used from sources other than the OHMVR Division. Public, cross-country OSV use in designated OSV areas would only be allowed when there is adequate snow depth to avoid damage to natural and cultural resources. To avoid damaging resources, a minimum of 12 inches of moderate to heavy density, uncompacted snow is typically needed.	Adequate snow on roads, 18 inches for grooming, trail use and cross-country travel snow depth requirements would provide adequate protection of underlying roads.	Twelve inches for grooming, general OSV use and 6 inches for OSV use on underlying routes, snow depth requirements would provide adequate protection of underlying roads.	Twelve inches for grooming, and 24 inches for cross-country travel and trail OSV use requirement would provide protection of underlying roads.

Chapter 4. List of 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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Distribution of the Environmental Impact Statement to Federal agencies, Tribes, elected officials and State and local governments pursuant to 40 CFR 1502.19.

Federal, State and Local Agencies

Federal Agencies

Advisory Council on Historic Preservation, Director, Planning and Review
U. S. Army Corp of Engineers
Chief of Naval Operations, Energy and Environmental Readiness Division
Environmental Protection Agency, Region 9, EIS Review Coordinator
Environmental Protection Agency, Office of Federal Activities, EIS Filing Section
Federal Aviation Administration, Regional Administrator, Western-Pacific Region
Federal Energy Regulatory Commission
Federal Highway Administration
National Marine Fisheries Service Habitat Conservationists Division, SW Region
Natural Resources Conservation Service, National Environmental Coordinator
Northwest Power Planning Council
Rural Utilities Service
Susquehanna River Basins Commission
USDA APHIS PPD/EAD
USDA National Agricultural Library Head Acquisitions and Serials Branch
USDA Natural Resources Conservation Service, National Environmental Coordinator
US Coast Guard, Environmental Management
US Department of Energy, Director, Office of NEPA Policy and Compliance
USDI Bureau of Land Management
USDI Fish and Wildlife Service
USDI Office of Environmental Policy and Compliance

California State Agencies

California Air Resources Board
California Department of Fish and Wildlife
California Department of Parks and Recreation OHMVR
California Water Resources Control Board

Local Agencies

Foresthill Divide Chamber of Commerce
Placer County Air Pollution Control District
Placer County Public Works
Pacific Gas & Electric
Sierra Avalanche Center
Nevada Irrigation District

Elected Officials

Federal Officials

U.S. Senators

Diane Feinstein
Kamala Harris

U.S. House of Representatives

Tom McClintock
Doug LaMalfa

California State Officials

Brian Dahle, California Assembly
Kristen Olsen, California Assembly
Tom Berryhill, California Assembly

Local Officials

Nevada County Board of Supervisors
Placer County Board of Supervisors
Sierra County Board of Supervisors

Tribes

Colfax-Todd Valley Consolidated Tribe
Nevada City Rancheria
Todd Valley Miwok-Maidu Cultural Foundation
United Auburn Indian Community of the Auburn Rancheria
Washoe Tribe of Nevada and California

Distribution of the Environmental Impact Statement to Individuals and Organizations

The following individuals and organizations were either contacted directly in the scoping process, or made themselves known to the Forest Service by submitting comments during scoping for the Tahoe National Forest OSV Designation analysis. These individuals and organizations were notified of the availability of the draft environmental impact statement and the 45-day comment period pursuant to 36 CFR 218.24 (a)(3).

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Over-Snow Vehicle Use Designation – Final Environmental Impact Statement – Volume I
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Organizations

AAUW Outdoor Enthusiasts

American Council of Snowmobile Associations

Birch, Horton, Bittner & Cherot, P.C.

Blue Ribbon Coalition

CNSA/Off Road Business Association

California Wilderness Society

Clearstream Consulting

Cragmont Climbing Club

Disabled Sports USA

Friends of Independent Lake

High Camp Hut
International Snowmobile Manufacturers Association
Methoe Trails
Nordic Skiers of Nevada
North Fork American River Alliance
North Shore Adventures
Off Road Business Association
Pacific Crest Trail Association
Sierra Access Coalition
Sierra Foothills Audubon Society
Sierra Club, Bay Chapter
Sierra Club, Placer Group
Sierra Club Snowcamping
Sierra Pacific Industries
Snowlands Network
Tahoe Sierra Snowmobiling Club
The Trust for Public Land
Truckee Donner Land Trust
Upper American River Foundation
Winter Wildlands Alliance
Wilderness Society

References

Air Quality

- Bishop, G.A., D.A. Burgard, T.R. Dalton, and D.H. 2006. In-use Emission Measurements of Snowmobiles and Snowcoaches in Yellowstone National Park. University of Denver, Department of Chemistry and BioChemistry. Denver, CO.
- BRP. 2011. BRP SKI-DOO Snowmobiles: 10 Models BAT Certified for Yellowstone and Grand Teton National Parks. Valcourt, Quebec. www.brp.com
- California Air Resource Board (ARB). 2014. Appendix B. California Class I Area Visibility Descriptions. www.arb.ca.gov/planning/reghaze/final/appb.pdf. Accessed June 20, 2016.
- California Air Resources Board. 2015. California Ambient Air Quality Standards. Online at: <http://www.arb.ca.gov/desig/desig.htm>
- California Air Resource Board. 2016. Annual Network Plan. Covering Monitoring Operations in 25 California Air Districts. June. California Environmental Protection Agency, Air Resources Board. <https://www.arb.ca.gov/aqd/amnr/amnr2016.pdf>
- Environmental Protection Agency (EPA). 2010. Exhaust Emission Factors for Non-road Engine modeling- Spark-Ignition NR-010f. Assessment of Standards Division, Office of Transportation and Air Quality.
- EPA. 2015a. AIR Data. Non-attainment listings for criteria pollutants. <https://www.epa.gov/green-book/green-book-pm-25-2012-area-information>
- EPA. 2015b. Office of Transportation and Emission Standards for nearly all types of non-road engines, vehicles and equipment. FAQs.
- Jehl, D. 2002. Air Pollution Regulations Extended to Snowmobiles. The New York Times. <http://www.nytimes.com/2002/09/14/us/air-pollution-regulations-extended-to-snowmobiles.html>
- Lopina, C., Air Pollution Specialist, California Air Resources Board. 2015. Personal and email communications.
- Millner, J. 2015. Snowmobiles in Yellowstone National Park: An American right, or wrong? Geoscience Education Web Development Team, Montana State University.
- Musselman, R.C. and J.L. Korfmacher. 2007. Air quality at a snowmobile staging area and snow chemistry on and off trail in a Rocky Mountain subalpine forest, Snowy Range, Wyoming.
- Northern Sierra Air Quality Management District. <http://myairdistrict.com/>
- National Park Service (NPS). 2000. Air quality concerns related to snowmobile usage in National Parks. Air Resources Division, Denver, CO. http://www2.nature.nps.gov/air/Pubs/pdf/yell/Snowmobile_Report.pdf.
- Placer County Air Pollution Control District. <https://www.placer.ca.gov/departments/air>

- U.S. Department of Agriculture Forest Service (USDA Forest Service). 2007. Tahoe National Forest's Land and Resource Management Plan (LRMP). USDA-Forest Service, PSW Region, Tahoe National Forest, California
- U.S. Government Publishing Office. 2015. Electronic Code of Federal Regulations. Accessed November 2015 at: http://www.ecfr.gov/cgi-bin/text-idx?SID=debd659dece22de01aab5b6a8745c76&mc=true&node=se40.33.1051_1103&rgn=div8
- Valentine, S. 2016a. Five Forest Over-snow Vehicle Tahoe Recreation Report. USDA Forest Service. Enterprise Unit.
- Valentine, S. 2016b. Email communication- Visitor use data for Tahoe National Forest. June 6, 2016.

Botany

- Arnold, J.L., and T.M. Koel. 2006. Effects of Snowmobile Emission on the Chemistry of Snowmelt Runoff in Yellowstone National Park. Final Report. Fisheries and Aquatic Sciences Section, Center for Resources, Yellowstone National Park, Wyoming. YCR-2006-1.
- Bazzaz, F.A. and K. Garbutt. 1998. The Response of Annuals in Competitive Neighborhoods: Effects of Elevated CO₂. *Ecology* 69(4): 937-946.
- Blanchard, C., H. Michaels, A. Bradman, and J. Harte. 1988. Episodic Acidification of a Low-alkalinity Pond in Colorado. *Energy and Resources Group*, Berkeley, California. ERG-88-1. 15 pp.
- Davenport J. and T.A. Switalski. 2006. Environmental impacts of transport related to tourism and leisure activities. Chapter 14 in J. Davenport and J.A. Davenport (eds.) *The ecology of transportation: managing mobility for the environment*. Springer, Dordrecht. Netherlands.
- Davidson, B. 2017. Botany Specialist Report for Tahoe OSV Use Designation project DEIS. Unpublished report. USDA Forest Service, Tahoe National Forest, Nevada City, California.
- Eagleston, H. and C. Rubin. 2013. Non-motorized winter recreation impacts to snowmelt erosion, Tronsen Basin, Eastern Cascades, Washington. *Environmental Management* 51: 167-181.
- Fahey, B. and K. Wardle. 1998. Likely impacts of snow grooming and related activities in the West Otago ski fields. *Science for Conservation*: 85. New Zealand Department of Conservation.
- Falkengren-Grerup, U. 1986. Soil acidification and vegetation changes in deciduous forest in southern Sweden. *Oecologia* 70:339-347.
- Gage, E. and D.J. Cooper. 2013. Evaluating snow compaction effects to fen wetlands on Rabbit Ears and Buffalo Pass of the Routt National Forest. Prepared for the Arapaho-Roosevelt National Forests, the White River National Forest, and the Black Hills National Forest.
- Greller, A.M., M. Goldstein, and L. Marcus. 1974. Snowmobile impact on three alpine tundra plant communities. *Environmental Conservation* 1(2): 101–110.
- Ingersoll, G. 1998. Effects of snowmobile use on snowpack chemistry in Yellowstone National Park, USGS, Department of Interior, Water-Resources Investigation Report 99-4148.

- Ingersoll, G., J. Turk, C. McClure, S. Lawlor, D. Clow, and A. Mast. 1997. Snowpack chemistry as an indicator of pollutant emission levels from motorized winter vehicles in Yellowstone National Park, *Proceedings of 65th Annual Meeting of Western Snow Conference*, May 4-8, 1997, Banff, Alberta.
- Keddy, P.A., A.J. Spavold, and C.J. Keddy. 1979. Snowmobile Impact on Old Field and March Vegetation in Nova Scotia Canada: An Experimental Study. *Environmental Management* 3(5): 409-415.
- McNamara, M. 2016. Hydrology Report for Tahoe National Forest Over-Snow Vehicle Use Designation DEIS. Unpublished report. USDA Forest Service, Tahoe National Forest, Nevada City, California.
- Mooney, H.A., M. Kueppers, G. Koch, J. Gorham, C. Chu, and W.E. Winner. 1988. Compensating effects to growth of carbon partitioning changes in response to SO₂-induced photosynthetic reduction in radish. *Oecologia*, Vol. 75, No. 4, p. 502–506.
- Musselman, R.C., and J.L. Korfmacher. 2007. Air quality at a snowmobile staging area and snow chemistry on and off trail in a Rocky Mountain subalpine forest, Snowy Range, Wyoming. *Environmental monitoring and assessment* 133(1-3), 321-334.
- NatureServe. 2016. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available online at: <http://explorer.natureserve.org> (Information for *Ivesia webberi* and *Senecio layneae* accessed: June 15, 2016).
- Neumann, P.W., and H.G. Merriam. 1972. Ecological effects of snowmobiles. *Canadian Field Naturalist* 86:207-212.
- Stangl, J.T. 1999. Effects of Winter Recreation on Vegetation. Pages 119-121 in Effects of winter recreation on wildlife of the Greater Yellowstone Area: a literature review and assessment. *Report to the Greater Yellowstone Coordinating Committee*. Olliff, T., K. Legg, and B. Kaeding, editors. Yellowstone National Park, Wyoming. 315 p.
- U.S. Department of Agriculture Forest Service (USDA Forest Service). 2001. Tahoe National Forest Land and Resource Management Plan. Tahoe National Forest. Nevada City, California.
- USDA Forest Service. 2004. Sierra Nevada Forest Plan Amendment, Final Environmental Impact Statement and Record of Decision. Pacific Southwest Region, Vallejo, California.
- USDA Forest Service. 2014. Use by Over-snow Vehicles (Travel Management Rule). *Federal Register*, June 18, 2014. 79(117): 34678-34681.
- USDA Forest Service. 2016. Tahoe National Forest Threatened, Endangered and Forest Service Sensitive Botanical Species. Unpublished document. On file with: Tahoe National Forest, Nevada City, California.
- U.S. Department of the Interior, Fish and Wildlife Service (USFWS). 1996. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Four Plants and Threatened Status for One Plant From the Central Sierran Foothills of California. *Federal Register*, October 18, 1996. 61(203): 54346-54358.

- USFWS. 2002. Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills. Portland, Oregon. 220 pp.
- Wanek, W.J. 1971. Snowmobile impacts on vegetation, temperatures, and soil microbes. Pp. 116–129 in Chubb, M (Ed.), Proceedings of the 1971 snowmobile and off-road vehicle research symposium, Michigan State University Department of Parks and Recreation Resources Technical Report No.8, Michigan State University, East Lansing.
- Williams, M.S. 2014. The ecology and distribution patterns of a rare serpentine endemic, *Packera layneae*. Doctoral dissertation, California State University, Chico.
- Winner, W.E., and C.J. Atkison. 1986. Absorption of Air Pollution by Plants, and Consequences for Growth. *Trends in Ecology and Evolution*. Vol. 1, p. 15–18.
- Winter Wildlands Alliance (WWA). 2009. Seeing the Forest and the Trees – Assessing Snowmobile Damage in National Forests. A Report by Winter Wildlands Alliance. November, 2009. 3 pp.

Other Botanical Species

- Archer, A.J. 2001. *Taeniatherum caput-medusae*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/> [2016, February 5].
- Arnold, J.L., and Koel, T.M. 2006. Effects of Snowmobile Emission on the Chemistry of Snowmelt Runoff in Yellowstone National Park. Final Report. Fisheries and Aquatic Sciences Section, Center for Resources, Yellowstone National Park, Wyoming. YCR-2006-1.
- Bazzaz, F. A. and K. Garbutt. 1998. The Response of Annuals in Competitive Neighborhoods: Effects of Elevated CO₂. *Ecology* 69(4): 937-946.
- Blanchard, C., H. Michaels, A. Bradman, and J. Harte. 1988. Episodic Acidification of a Low-alkalinity Pond in Colorado. *Energy and Resources Group*, Berkeley, California. ERG-88-1. 15 p.
- California Invasive Plant Council (CIPC). 2016. Invasive Plant Profiles. Available online at http://www.cal-ipc.org/ip/management/plant_profiles/ (accessed 8/9/2016).
- Davenport, J. and T.A. Switalski. 2006. Environmental impacts of transport related to tourism and leisure activities. Chapter 14 in J. Davenport and J.A. Davenport (eds.) *The ecology of transportation: managing mobility for the environment*. Springer, Dordrecht. Netherlands.
- Eagleston, H. and C. Rubin. 2013. Non-motorized winter recreation impacts to snowmelt erosion, Tronsen Basin, Eastern Cascades, Washington. *Environmental Management* 51: 167-181.
- Fahey, B. and K. Wardle. 1998. Likely impacts of snow grooming and related activities in the West Otago ski fields. *Science for Conservation*: 85. New Zealand Department of Conservation.
- Falkengren-Grerup, U. 1986. Soil acidification and vegetation changes in deciduous forest in southern Sweden. *Oecologia* 70:339-347.

- Gage, E. and D.J. Cooper. 2013. Evaluating snow compaction effects to fen wetlands on Rabbit Ears and Buffalo Pass of the Routt National Forest. Prepared for the Arapaho-Roosevelt National Forests, the White River National Forest, and the Black Hills National Forest.
- Greller, A.M., M. Goldstein, and L. Marcus. 1974. Snowmobile impact on three alpine tundra plant communities. *Environmental Conservation* 1(2): 101–110.
- Ingersoll, G., J. Turk, C. McClure, S. Lawlor, D. Clow, and A. Mast. 1997. Snowpack chemistry as an indicator of pollutant emission levels from motorized winter vehicles in Yellowstone National Park, *Proceedings of 65th Annual Meeting of Western Snow Conference*, May 4-8, 1997, Banff, Alberta.
- Ingersoll, G. 1998. Effects of snowmobile use on snowpack chemistry in Yellowstone National Park, USGS, Department of Interior, *Water-Resources Investigation Report* 99-4148.
- Keddy, P.A., A.J. Spavold, and C.J. Keddy. 1979; Snowmobile Impact on Old Field and March Vegetation in Nova Scotia Canada: An Experimental Study. *Environmental Management* 3(5): 409-415.
- McNamara, M. 2016. Hydrology Report for Tahoe National Forest Over-Snow Vehicle Use Designation DEIS. Unpublished report. USDA Forest Service, Tahoe National Forest, Nevada City, California.
- Mooney, H.A., M. Kueppers, G. Koch, J. Gorham, C. Chu, and W.E. Winner. 1988. Compensating effects to growth of carbon partitioning changes in response to SO₂-induced photosynthetic reduction in radish. *Oecologia*, Vol. 75, No. 4, p. 502–506.
- Musselman, R.C., and J.L. Korfmacher. 2007. Air quality at a snowmobile staging area and snow chemistry on and off trail in a Rocky Mountain subalpine forest, Snowy Range, Wyoming. *Environmental monitoring and assessment* 133(1-3), 321-334.
- Neumann, P.W., and H.G. Merriam. 1972. Ecological effects of snowmobiles. *Canadian Field Naturalist* 86:207-212.
- Ouren, D.S., C. Haas, C.P. Melcher, S.C. Stewart, P.D. Ponds, N.R. Sexton, L. Burris, T. Fancher, and Z.H. Bowen. 2007. Environmental effects of off-highway vehicles on Bureau of Land Management lands: A literature synthesis, annotated bibliographies, extensive bibliographies, and internet resources. Open-File Report 2007-1353. U.S. Geological Survey, Reston, Virginia.
- Sikes, K., D. Cooper, S. Weis, T. Keeler-Wolf, M. Barbour, D. Ikeda, D. Stout, and J. Evens. 2013. Fen Conservation and Vegetation Assessment in the National Forests of the Sierra Nevada and Adjacent Mountains, California. Unpublished report to the U.S. Forest Service, Region 5.
- Stangl, J. T. 1999. Effects of Winter Recreation on Vegetation. Pages 119-121 in Effects of winter recreation on wildlife of the Greater Yellowstone Area: a literature review and assessment. *Report to the Greater Yellowstone Coordinating Committee*. Olliff, T., K. Legg, and B. Kaeding, editors. Yellowstone National Park, Wyoming. 315 p.

- Taylor, K., J. Mangold, and L.J. Rew. 2011. Weed Seed Dispersal by Vehicles. Montana State University Extension. MT201105AG. June, 2011.
- U.S. Department of Agriculture Forest Service (USDA Forest Service). 1999. Executive Order 13112. Presidential Documents, Invasive Species, President William Clinton. Federal Register Vol. 64, No. 25, February 8, 1999.
- USDA Forest Service. 2005. Forest Service Manual 2670-2671. Threatened, Endangered and Sensitive Plants and Animals. Chapter 2670. National Headquarters, Washington, DC. Effective: September 23, 2005.
- USDA Forest Service. 1990. Tahoe National Forest Land and Resource Management Plan. Tahoe National Forest. Nevada City, California.
- USDA Forest Service. 2011. Forest Service Manual 2900 – Invasive Species Management. Chapter – Zero Code. National Headquarters, Washington DC. Effective: December 5, 2011.
- USDA Forest Service. 2014. Use by Over-snow Vehicles (Travel Management Rule). Federal Register, June 18, 2014. 79(117): 34678-34681.
- USDA Forest Service. 2016. Executive Order 13751. Presidential Documents, Invasive Species, President Barack Obama. Federal Register Vol. 81, No. 236, December 8, 2016.
- Von der Lippe, M. and Kowarik, I. 2007. Long-distance dispersal of plants by vehicles as a driver of plant invasions. *Conservation Biology*. 21(4): 986-996.
- Wanek, W.J. 1971. Snowmobile impacts on vegetation, temperatures, and soil microbes. Pp. 116–129 in Chubb, M. (Ed.), *Proceedings of the 1971 snowmobile and off-road vehicle research symposium*, Michigan State University Department of Parks and Recreation Resources Technical Report No.8, Michigan State University, East Lansing.
- Winner, W.E., and C.J. Atkison. 1986. Absorption of Air Pollution by Plants, and Consequences for Growth. *Trends in Ecology and Evolution*. Vol. 1, p. 15–18.
- Winter Wildlands Alliance (WWA). 2009. Seeing the Forest and the Trees – Assessing Snowmobile Damage in National Forests. A Report by Winter Wildlands Alliance. November, 2009. 3 pp.

Aquatic Resources

- Adams, E.S. 1975. Effects of lead and hydrocarbons from snowmobile exhaust on brook trout (*Salvelinus fontinalis*). *Transactions of the American Fisheries Society* 104(2): 363–373.
- Arnold, J.L. and T.M. Koel. 2006. Effects of Snowmobile Emission on the Chemistry of Snowmelt Runoff in Yellowstone National Park. Final Report. Fisheries and Aquatic Sciences Section, Center for Resources, Yellowstone National Park, Wyoming. YCR-2006-1. 12 pp.
- Baker E. and E. Buthmann 2005. Snowmobiling in the Adirondack Park: Environmental and Social Impacts. St. Lawrence University, Department of Biology. 47 pp.
- Baltz, D. M. and P. B. Moyle. 1993. Invasion resistance by an assemblage of native California stream fishes. *Ecological Applications* 3(2): 246–255.

- Behnke, R.J. 1992. *Native trout of western North America*. American Fisheries Society, Bethesda, Maryland. 275 pp.
- Bourque, R.M. 2008. Spatial ecology of an inland population of the Foothill yellow-legged frog (*Rana boylei*) in Tehama County, California. Thesis. Humboldt State University, Arcata, California. 93 pp.
- Bowles, A.E. 1995. Responses of wildlife to noise. Pages 109–156 in R.L. Knight and K.J. Gutzwiller. *Wildlife and recreationists coexistence through management and research*. Island Press. Washington, DC.
- Bradford, D.F. 1984. Temperature modulation in a high-elevation amphibian, *Rana muscosa*. *Copeia* 1984(4): 966–976.
- Bradford, D.F. 1991. Mass mortality and extinction in a high-elevation population of *Rana muscosa*. *Journal of Herpetology* 25(2): 174–177.
- Bradford, D.F., F. Tabatabai, and D.M. Graber. 1993. Isolation of remaining populations of the native frog, *Rana muscosa*, by introduced fishes in Sequoia and Kings Canyon National Parks, California. *Conservation Biology* 7(4): 882–888.
- Briggs, C.J., V.T. Vredenburg, R.A. Knapp, and L.J. Rachowicz. 2005. Investigating the population-level effects of chytridiomycosis: an emerging infectious disease of amphibians. *Ecology* 86(12): 3149–3159.
- Brim-Box, J., S. Chappell, M. McFarland, and J. Furnish. 2005. The aquatic mollusk fauna of the Lassen National Forest in northeastern California. Final report prepared under contract FSA 01-IA-11050650-020. 117 pp.
- Bulger, J.B., N.J. Scott Jr., and R.B. Seymour. 2003. Terrestrial activity and conservation of adult California red-legged frogs *Rana aurora draytonii* in coastal forests and grasslands. *Biological Conservation* 110: 85-95.
- Bury, R.B. 1979. Population ecology of freshwater turtle. In: Harless, M. and H. Morlock (editors). Pages 571–602 in *Turtles: Perspectives and research*. John Wiley and Sons, New York.
- Bury, R.B., and D.J. Germano. 2008. *Actinemys marmorata* (Baird and Girard 1852) - western pond turtle, Pacific pond turtle. Pages 001.1-001.9 in A. G. Rhodin, P. C. H. Pritchard, P. P. van Dijk, R. A. Saumure, K. A. Buhlmann, and J. B. Iverson, editors. *Conservation Biology of Freshwater Turtles and Tortoises: a compilation project of the IUCN-SSC Tortoise and Freshwater Turtle Specialist Group*. Chelonian Research Monograph No. 5.
- Buskirk, J. 2002. The western pond turtle, *Emys marmorata*. *Radiata* 11(3): 3–30.
- Calef, G.W. 1973. Natural Mortality of Tadpoles in a Population of *Rana Aurora*. *Ecology* 54(4):741–758.
- California Department of Fish and Wildlife (CDFW). 2017. Notification of status review for foothill yellow-legged frog. California Department of Fish and Wildlife, Wildlife Branch, Sacramento, California. July 24, 2017. 1 pp.

- California Department of Fish and Wildlife (CDFW). 2018. Special Animal List. California Department of Fish and Wildlife, California Natural Diversity Database, Periodic publication. 66 pp
- California Off-Highway Motor Vehicle Recreation Division (OHMVR). 2010. Over Snow Vehicle Program Final Environmental Impact Report, Program Years 2010-2020. State of California, Department of Parks and Recreation. Sacramento, California. December 2010. 156 pp.
- Cech, J.J., S.J. Mitchell, D.T. Castleberry, and M. McEnroe. 1990. Distribution of California stream fishes: influence of environmental temperature and hypoxia. *Env. Biol. Fish.* 29: 95–105.
- Coffin, P.D. 1981. Distribution and life history of the Lahontan/Humboldt cutthroat trout, Humboldt River drainage basin. Nevada Department of Wildlife, Reno, Nevada. 69 pp.
- Coffin, P.D. 1983. Lahontan cutthroat trout fishery management plan for the Humboldt River Basin. Federal Aid to Fish Restoration Project Report F-20-17, Study 1X, Job No. 1-P-1. Nevada Department of Wildlife, Reno, Nevada. 33 pp.
- Coffin, P.D. 1988. Nevada's native salmonid program status, distribution and management. Nevada Department of Wildlife, Reno, Nevada. 400 pp.
- Cowan, W. 1983. Annual fisheries management report FY-83 Summit Lake Indian Reservation, Humboldt County, Nevada. Unpublished report. Summit Lake Paiute Tribe, Winnemucca, Nevada. 37 pp.
- Crump, D.E. 2001. Western pond turtle (*Clemmys marmorata pallida*) nesting behavior and habitat use. San Jose State University. Master's Thesis. Paper 2210. 64 pp.
- Davidson, C. 2004. Declining Downwind: Amphibian Population Declines in California and Historical Pesticide Use. *Ecological Applications* 14(6):1892–1902.
- Davidson, B. 2017. Botany Report for Tahoe National Forest Over-Snow Vehicle Use Designation Draft Environmental Impact Statement. Unpublished report. USDA Forest Service, Tahoe National Forest.
- Davidson, C. and R.A. Knapp. 2007. Multiple stressors and amphibian declines: dual impacts of pesticides and fish on yellow-legged frogs. *Ecological Applications* 17(2): 587–597.
- Davidson, C., H.B. Shaffer, and M.R. Jennings. 2001. Declines of the California Red-Legged Frog: Climate, UV-B, Habitat, and Pesticides Hypotheses. *Ecological Applications* 11(2):464–479.
- Davidson, C., H.B. Shaffer, and M.R. Jennings. 2002. Spatial Tests of the Pesticide Drift, Habitat Destruction, UV-B, and Climate-Change Hypotheses for California Amphibian Declines. *Conservation Biology* 16(6): 1588–1601.
- Davis, C.J. 1998. Western pond turtle (*Clemmys marmorata*). San Jose State University. Master's Thesis. Paper 1694. 65 pp.
- Dever, J.A. 2007. Fine-scale genetic structure in the threatened foothill yellow-legged frog (*Rana boylei*). *Journal of Herpetology* 41(1): 168–173.

- Dooling, R.J., M.R. Leek, and A.N. Popper. 2015. Effects of noise on fishes: what we can learn from humans and birds. *Integrated Zoology* 10(1): 29–37.
- Fahey, B. and K. Wardle. 1998. Likely impacts of snow grooming and related activities in the West Otago ski fields. *Science for Conservation*: 85. New Zealand Department of Conservation. Wellington, New Zealand. 51 pp.
- Fellers, G.M. 2005. *Rana boylei* Baird 1854, Foothill yellow-legged frog. Pages 534–536 in *Amphibian declines: the conservation status of United States species, Volume 2: species accounts*. University of California Press. Berkeley, California.
- Forman, R.T.T. and L.E. Alexander. 1998. Roads and their major eco-logical effects. *Annual Review of Ecology and Systematics* 29: 207–231.
- Freel, K. 1997. Herpetologist with U.S. Geological Survey, Point Reyes, California [personal communication with Tahoe National Forest Fisheries Biologist].
- French, J. and J. Curran. 1991. Draft Lahontan cutthroat trout fishery management plan for the Quinn River drainage basin. Nevada Department of Wildlife, Reno, Nevada. 46 pp.
- Frest, T.J. and E.J. Johannes. 1995. Freshwater Mollusks of the Upper Sacramento System, California, with Particular Reference to the Cantara Spill. 1994 Yearly report to California Department of Fish & Game. Deixis Consultants, Seattle, Washington. Contract #FG2106R1. 88 pp.
- Frest, T.J. and E.J. Johannes. 1996. Fresh Water Mollusks of the Upper Klamath Lake Drainage, Oregon. 1996 yearly report to Oregon Natural Heritage Program. Deixis Consultants, Seattle, Washington.
- Frest, T.J. and E.J. Johannes. 1998. Fresh Water Mollusks of the Upper Klamath Lake Drainage, Oregon. 1998 yearly report to Oregon Natural Heritage Program. Deixis Consultants, Seattle, Washington.
- Furnish, J.L. and R. Monthey. 1999. Management recommendations for Survey and Manage aquatic mollusks, version 2.0, December 1998. USDA Forest Service (Regions 5 and 6) and USDI Bureau of Land Management (Oregon, Washington, California). 124 pp.
<http://www.blm.gov/or/plans/surveyandmanage/MR/AQMollusks/section4.htm>
- Gabrielson, G.W. and E.N. Smith. 1995. Physiological responses of wildlife to disturbance. Pages 109-156 in R.L. Knight and K.J. Gutzwiller. *Wildlife and recreationists coexistence through management and research*. Island Press. Washington, DC.
- Gard, M.F. 2002. Effects of sediment loads on fish and invertebrates of a Sierra Nevada river, California. *Journal of Aquatic Ecosystem Stress and Recovery* 9: 227–238.
- Gage, E. and D. J. Cooper. 2009. Winter recreation impacts to wetlands: a technical review. Report for Arapaho-Roosevelt National Forests, White River National Forest and Black Hills National Forest. Department of Forest, Rangeland and Watershed Stewardship. Colorado State University, Fort Collins, Colorado. 29 pp.

- Germano, D.J. 2010. Ecology of western pond turtles (*Actinemys marmorata*) at sewage-treatment facilities in the San Joaquin Valley, California. *The Southwestern Naturalist*, 55(1): 89–97.
- Germano, D.J. and G.B. Rathbun. 2008. Growth, population structure, and reproduction of western pond turtles (*Actinemys marmorata*) on the central coast of California. *Chelonian Conservation and Biology* 7(2): 188–194.
- Gerstung, E.R. 1986. Fishery management plan for Lahontan cutthroat trout (*Salmo clarki henshawi*) in California and western Nevada water. Inland Fisheries Administrative Report No. 86, Federal Aid Project F33-R-11, The Resources Agency, California Department of Fish and Game. 54 pp.
- Gerstung, E.R. 1988. Status, life history, and management of the Lahontan cutthroat trout. *American Fisheries Society Symposium* 4: 93–106.
- Greller, A.M., M. Goldstein, and L. Marcus. 1974. Snowmobile impact on three alpine tundra plant communities. *Environmental Conservation* 1(2): 101–110.
- Hayes, M.P. and M.R. Jennings. 1986. Decline of ranid frog species in western North America: are bullfrogs (*Rana catesbeiana*) responsible? *Journal of Herpetology* 20(4): 490–509.
- Hayes, M.P. and M.R. Jennings. 1988. Habitat correlates of distribution of the California red-legged frog (*Rana aurora draytonii*) and the foothill yellow-legged frog (*Rana boylei*): implications for management. Pages 144–158 in R.C. Szaro, K.E. Severson, and D.R. Patton. *Management of Amphibians, Reptiles, and Small Mammals in North America*. Proceedings of the Symposium July 19-21, 1988, Flagstaff, Arizona.
- Hayes, M.P., C.A. Wheeler, A.J. Lind, G.A. Green, and D.C. Macfarlane. 2016. *Foothill yellow-legged frog conservation assessment in California*. General Technical Report PSW-GTR-248. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, California. 193 pp.
- Hickman, T., and R.F. Raleigh. 1982. Habitat suitability index models: cutthroat trout. Report number USFWS/OBS-82/10.5. USDI, Fish and Wildlife Service, Western Energy and Land Use Team, Office of Biological Services, Washington, D.C. 38 pp.
- Holland, D.C. 1994. The western pond turtle: Habitat and history. Final Report to the U.S. Department of Energy, Bonneville Power Administration, Environment, Fish and Wildlife. Portland, Oregon. 303 pp.
- Howard, J. K. and K. M. Cuffey. 2003. Freshwater mussels in a California North Coast Range river: occurrence, distribution, and controls. *Journal of the North American Benthological Society* 22(1): 63–77.
- Ingersoll, G., J. Turk, C. McClure, S. Lawlor, D. Clow, and A. Mast. 1997. Snowpack chemistry as an indicator of pollutant emission levels from motorized winter vehicles in Yellowstone National Park, Proceedings of 65th Annual Meeting of Western Snow Conference, May 4-8, 1997, Banff, Alberta, p. 103–113.
- Jennings, M.K. 1988. Natural history and decline of native ranids in California. Proceedings of the Conference on California Herpetology. *Southwestern Herpetologists Society*: 61–72.

- Jennings, M.R. 1997. Research Associate with California Academy of Sciences, San Francisco, CA [personal communication with Tahoe National Forest Biologist].
- Jennings, M.R. and M.P. Hayes. 1985. Pre-1900 overharvest of California red-legged frogs (*Rana aurora draytonii*): the inducement for bullfrog (*Rana catesbeiana*) introduction. *Herpetologica* 41(1): 94–103.
- Jennings, M.R. and M.P. Hayes. 1994. Amphibian and reptile species of special concern in California. California Department of Fish and Game, Final Report. 255 pp.
- Johnson, G., D. Bennett, and T. Bjornn. 1983. Juvenile emigration of Lahontan cutthroat trout in the Truckee River/Pyramid Lake system. Pages 90-175 in Restoration of a Reproductive Population of Lahontan Cutthroat Trout (*Salmo clarki henshawi*) to the Truckee River/Pyramid Lake System. Special Report U.S. Department of the Interior, Fish and Wildlife Service, Great Basin Complex Office, Reno, Nevada.
- Keddy, P.A., A.J. Spavold, and C.J. Keddy. 1979. Snowmobile Impact on Old Field and March Vegetation in Nova Scotia Canada: An Experimental Study. *Environmental Management* 3(5): 409–415.
- Knapp, R.A. 1996. Non-native trout in natural lakes of the Sierra Nevada: an analysis of their distribution and impacts on native aquatic biota. Pages 363–407 In *Sierra Nevada Ecosystem Project: final report to Congress*. Volume III, Chapter 8. Centers for Water and Wildland Resources, University of California, Davis.
- Knapp, R.A., D.M. Boiano, and V.T. Vredenburg. 2007. Removal of nonnative fish results in population expansion of a declining amphibian (mountain yellow-legged frog, *Rana muscosa*). *Biological Conservation* 135(1): 11–20.
- Knapp, R.A., K.R. Matthews, and O. Sarnelle. 2001. Resistance and resilience of alpine lake fauna to fish introductions. *Ecological Monographs* 71: 401–421.
- Knight, N.J. 1985. Microhabitats and temperature requirements of hardhead (*Mylopharodon conocephalus*) and Sacramento squawfish (*Ptychocheilus grandis*), with notes for some other native California stream fishes. Unpubl. PhD Dissertation, University of California, Davis. 161 pp.
- Koch, D.L., and J.J. Cooper, E.L. Lider, R.L. Jacobson, and R.J. Spencer. 1979. *Investigations of Walker Lake, Nevada: Dynamic ecological relationships*. Desert Research Center, University of Nevada, Reno. 191 pp.
- Kupferberg, S.J. 1996. Hydrologic and geomorphic factors affecting conservation of a river-breeding frog (*Rana boylei*). *Ecological Applications* 6(4): 1332–1344.
- Lea, T.N. 1968. Ecology of the Lahontan cutthroat trout, *Salmo clarki henshawi*, in Independence Lake, California. Master's thesis. University of California, Berkeley. 95 pp.
- Leidy, R.A., E. Gonsolin, and G.A. Leidy. 2009. Late-summer aggregation of the foothill yellow-legged frog (*Rana boylei*) in central California. *The Southwestern Naturalist* 54(3): 367–368.

- Lima, S.L., B.F. Blackwell, T. L. DeVault, and E. Fern'andez-Juricic. 2015. Animal reactions to oncoming vehicles: a conceptual review. *Biological Reviews* 90: 60–76.
- Lind, A.J., P.Q. Spinks, G. M. Fellers, and H. B. Shaffer. 2011. Rangewide phylogeography and landscape genetics of the Western U.S. endemic frog *Rana boylei* (Ranidae): implications for the conservation of frogs and rivers. *Conservation Genetics* 12: 269–284.
- Lind, A.J., H.H. Welsh Jr., and R.A. Wilson. 1996. The effects of a dam on breeding habitat and egg survival of the foothill yellow-legged frog (*Rana boylei*) in northwestern California. *Herpetological Review* 27(2): 62–67.
- Lovich, J. and K. Meyer. 2002. The western pond turtle (*Clemmys marmorata*) in the Mojave River, California, USA: highly adapted survivor or tenuous relict? *Journal of Zoology London* 256: 537–545.
- Lubcke, G.M. and D.S. Wilson. 2007. Variation in shell morphology of the western pond turtle (*Actinemys marmorata* Baird and Girard) from three aquatic habitats in northern California. *Journal of Herpetology* 41(1): 107–114.
- Marrin, D.L. and D.C. Erman. 1982. Evidence against competition between trout and nongame fish in Stampede Reservoir, California. *North American Journal of Fisheries Management* (2): 262–269.
- Martin, D.L. 1992. Sierra Nevada anuran survey: an investigation of amphibian population abundance in the National Forests of the Sierra Nevada of California. Summer 1992 survey. Prepared for the U.S. Forest Service. 76 pp.
- Matteson, M.R. 1955. Studies on the natural history of the Unionidae. *The American Midland Naturalist* 53(1): 126–145.
- Matthews, K.R. and C. Miaud. 2007. A skeletochronological study of the age structure, growth, and longevity of the mountain yellow-legged frog, *Rana muscosa*, in the Sierra Nevada, California. *Copeia* 2007: 986–993.
- Matthews, K.R. and K.L. Pope. 1999. A telemetric study of the movement patterns and habitat use of *Rana muscosa*, the Mountain Yellow-Legged Frog, in a high-elevation basin in Kings Canyon National Park, California. *Journal of Herpetology* 33(4): 615–624.
- Matthews, K.R. and H.K. Preisler. 2010. Site fidelity of the declining amphibian *Rana sierrae* (Sierra Nevada yellow-legged frog). *Canadian Journal of Fisheries and Aquatic Sciences* 67: 243–255.
- McAfee, W.R. 1966. Lahontan cutthroat trout. Pages 225–231 in A. Calhoun, editor. *Inland Fisheries management*. California Department of Fish and Game, Sacramento, California.
- McDaniel, M. and B. Zielinska. 2015. Polycyclic aromatic hydrocarbons in the snowpack and surface water in Blackwood Canyon, Lake Tahoe, CA, as related to snowmobile activity. *Polycyclic Aromatic Compounds* 35(1): 102–119.

- McNamara, M. 2017. Hydrology Report for Tahoe National Forest Over-Snow Vehicle Use Designation Draft Environmental Impact Statement. Unpublished report. USDA Forest Service, Tahoe National Forest, California.
- MGW Biological and Klamath Wildlife Resources. 2006. Habitat use, home range, and movements of Mountain Yellow-legged Frogs (*Rana muscosa*) in Bean Creek on the Plumas National Forest, Final Report. 33 pp.
- Miller, R.G. 1951. The natural history of Lake Tahoe fishes. Unpublished. Dissertation. Stanford University. 160 pp.
- Moyle, P.B. 1973. Effects of introduced bullfrogs, *Rana catesbeiana*, on the native frogs of the San Joaquin Valley, California. *Copeia*: 18–22.
- Moyle, P.B. 2002. *Inland Fishes of California*. University of California Press, Berkeley, California. 502 pp.
- Moyle, P.B. and D.M. Baltz. 1985. Microhabitat Use by an Assemblage of California Stream Fishes: Developing Criteria for Instream Flow Determinations. *Transactions of the American Fisheries Society* 114(5): 695–704.
- Moyle, P.B., J.V.E. Katz, and R.M. Quiñones. 2011. Rapid decline of California's native inland fishes: a status assessment. *Biological Conservation* 144: 2414–2423.
- Moyle, P.B. and R.D. Nichols. 1973. Ecology of some native and introduced fishes of the Sierra Nevada Foothills in Central California. *Copeia* 1973(3): 478–490.
- Moyle, P.B., R.M. Quiñones, J.V. Katz and J. Weaver. 2015. *Fish Species of Special Concern in California*. Sacramento: California Department of Fish and Wildlife. 842 pp.
www.wildlife.ca.gov
- Mullally, D.P. and J.D. Cunningham. 1956. Ecological relations of *Rana muscosa* at high elevations in the Sierra Nevada. *Herpetological* 12:189–198.
- Musselman, R.C. and J.L. Korfmacher. 2007. Air quality at a snowmobile staging area and snow chemistry on and off trail in a Rocky Mountain subalpine forest, Snowy Range, Wyoming. *Environmental monitoring and assessment* 133: 321–334.
- Neumann, P.W. and H.G. Merriam. 1972. Ecological effects of snowmobiles. *Canadian Field Naturalist* 86: 207–212.
- Olliff, T., K. Legg, and B. Kaeding, editors. 1999. *Effects of winter recreation on wildlife of the Greater Yellowstone Area: a literature review and assessment*. Report to the Greater Yellowstone Coordinating Committee. Yellowstone National Park, Wyoming. 315 pp.
- Ouellet, M., I. Mikaelian, B.D. Pauli, J. Rodrigue, and D.M. Green. 2005. Historical evidence of widespread chytrid infection in North American amphibian populations. *Conservation Biology* 19(5): 1431–1440.
- Polo-Cavia, N., T. Engstrom, P. Lopez, and J. Martin. 2010. Body condition does not predict immunocompetence of western pond turtles in altered versus natural habitats. *Animal Conservation* 13: 256–264.

- Pope, K. 1999. Mountain yellow-legged frog habitat use and movement patterns in a high elevation basin in Kings Canyon National Park. Unpublished Thesis, California State Polytechnic University, San Luis Obispo. 64 pp.
- Pope, K.L. and K.R. Matthews. 2001. Movement ecology and seasonal distribution of mountain yellow-legged frogs, *Rana muscosa*, in a high-elevation Sierra Nevada basin. *Copeia*, 2001:787–793.
- Rachowicz, L.J. and C.J. Briggs. 2007. Quantifying the disease transmission function: effects of density on *Batrachochytrium dendrobatidis* transmission in the mountain yellow-legged frog *Rana muscosa*. *Journal of Animal Ecology* 76(4): 711-721.
- Rankel, G.L. 1976. Fishery management program, Summit Lake Indian Reservation, Humboldt County, Nevada. Special Report of the U.S. Fish and Wildlife Service, Division of Fishery Services, Reno, Nevada. 35 pp.
- Ray, C., M.M. Peacock, and J.B. Dunham. 2007. Demographic and population dynamics of Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) stream populations in eastern Nevada. Final Report to the U.S. Fish and Wildlife Service, Reno, Nevada. Cooperative Agreement FSW 14-48-0001-95646. 205 pp.
- Reese, D.A. and H.H. Welsh. 1997. Use of terrestrial habitat by western pond turtles, *Clemmys marmorata*: implications for management. Proceedings of the Conservation, Restoration, and Management of Tortoises and Turtles. An International Conference: 352–357.
- Reeves, J.G. 1964. Age and growth of the hardhead minnow *Mylopharodon conocephalus* in the American River basin of California, with notes on its ecology. M.S. Thesis. University of California, Berkeley. 90 pp.
- Rissler, P.H., G.G. Scoppettone, and S. Shea. 2006. Life history, ecology, and population viability analysis of the Independence Lake strain Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*). Final Report. U.S. Geological Survey, Western Fisheries Research Center, Reno, Nevada. 68 pp.
- Scott, N.J., G.B. Rathbun, T.G. Murphy, and M.B. Harker. 2008. Reproduction of pacific pond turtles (*Actinemys marmorata*) in coastal streams of central California. *Herpetological Conservation and Biology* 3(2): 143–148.
- Sigler, W.F., W.T. Helm, P.A. Kucera, S. Vigg, and G.W. Workman. 1983. Life history of the Lahontan cutthroat trout, *Salmo clarki henshawi*, in Pyramid Lake, Nevada. *Great Basin Naturalist* 43: 1–29.
- Sigler, W.F. and J.W. Sigler. 1987. *Fishes of the Great Basin: A Natural History*. University of Nevada Press, Reno, Nevada. 425 pp.
- Snyder, J.O. 1917. Fishes of the Lahontan system of Nevada and northeastern California. *Bulletin of the Bureau of Fisheries* 35: 31–87.
- Somer, W. 1998. *Lahontan cutthroat trout: a threatened resource*. California Department of Fish and Game, Wild Trout Project winter 1998. Vol. 3, No. 2.

- Spring Rivers Ecological Services. 2007. Reproductive Timing of Freshwater Mussels and Potential Impacts of Pulsed Flows on Reproductive Success. California Energy Commission, PIER Energy-Related Environmental Research Program. CEC-500-2007-097. 86 pp.
- Tatarian, P.J. 2008. Movement patterns of California red-legged frogs (*Rana draytonii*) in an inland California environment. *Herpetological Conservation and Biology* 3(2): 155–169.
- Taylor, D.W. 1981. Freshwater mollusks of California: a distributional checklist. *California Department of Fish and Game* 67(3): 140–163.
- U.S. Department of Agriculture, Forest Service (USDA Forest Service). 1990. Tahoe National Forest Land and Resource Management Plan. Tahoe National Forest, Nevada City, California. 737 pp.
- USDA Forest Service. 2004. Sierra Nevada Forest Plan Amendment. Final Environmental Impact Statement, Record of Decision, USDA Forest Service, Pacific Southwest Region, Vallejo, California. 72 pp.
- USDA Forest Service. 2005. Forest Service Manual 2670-2671. Threatened, Endangered and Sensitive Plants and Animals. Chapter 2670. National Headquarters, Washington, DC. Effective: September 23, 2005.
- USDA Forest Service. 2012. National best management practices for water quality management on National Forest System Lands. Volume 1: National Core BMP Technical Guide. U.S. Forest Service, FS-990a. 165 pp.
- USDA Forest Service. 2014a. Sensitive animal species list. U.S. Forest Service, Pacific Southwest Region. 3 pp.
- USDA Forest Service. 2014b. Mountain yellow-legged frog conservation assessment for the Sierra Nevada mountains of California, USA. Pacific Southwest Region, Vallejo, California. 137 pp.
- U.S. Department of Interior, Fish and Wildlife Service (USDI Fish and Wildlife Service). 1995. Recovery Plan for the Lahonton cutthroat trout. U.S. Fish and Wildlife Service, Portland, Oregon. 157 pp.
- USDI Fish and Wildlife Service. 1997. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Three Plants and Threatened Status for Five Plants from Vernal Pools in the Central Valley of California. Federal Register, March 26, 1997. 62(58): 14338–14352.
- USDI Fish and Wildlife Service. 2002. Recovery Plan for the California red-legged frog (*Rana aurora draytonii*). U.S. Fish and Wildlife Service, Portland, Oregon. 173 pp.
- USDI Fish and Wildlife Service. 2003. Short-term action plan for Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) in the Truckee River Basin. Developed by the Truckee River Basin Recovery Implementation Team for U.S. Fish and Wildlife Service, Reno, Nevada. 71 pp.

- USDI Fish and Wildlife Service. 2009. Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*) 5-year review: summary and evaluation. U.S. Fish and Wildlife Service, Nevada Fish and Wildlife Office, Reno, Nevada. 198 pp.
- USDI Fish and Wildlife Service. 2014a. U.S. Department of the Interior, Fish and Wildlife Service Endangered and Threatened Wildlife and Plants; Final Rule to List the Sierra Nevada Yellow-Legged Frog (*Rana sierrae*). Federal Register. Vol. 79 FR 24255: 24310.
<https://www.federalregister.gov/articles/2014/04/29/2014-09488/endangered-and-threatened-wildlife-and-plants-endangered-species-status-for-sierra-nevada>
- USDI Fish and Wildlife Service. 2014b. U.S. Department of the Interior, Fish and Wildlife Service Endangered and Threatened Wildlife and Plants; Programmatic Biological Opinion on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-legged Frog, Endangered Northern Distinct Population Segment of the Mountain Yellow-legged Frog, and Threatened Yosemite Toad. December 19, 2014.
- USDI Fish and Wildlife Service. 2016. U.S. Department of the Interior, Fish and Wildlife Service Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Sierra Nevada Yellow-Legged Frog (*Rana sierrae*), the Northern DPS of the Mountain Yellow-Legged Frog, and the Yosemite Toad; Final Rule. Federal Register. Vol. 81 No. 166 (81 FR 59045 59119). <https://www.gpo.gov/fdsys/pkg/FR-2016-08-26/pdf/2016-20352.pdf>
- Van Wagner, T.J. 1996. [Sierra Nevada] Selected life-history and ecological aspects of a population of foothill yellow-legged frogs (*Rana boylei*) from Clear Creek, Nevada County, California. Masters Thesis. Department of Biological Sciences. California State University, Chico. 143 pp.
- Vander Haegen, W.M., S.L. Clark, K.M. Perillo, D.P. Anderson, and H.L. Allen. 2009. Survival and causes of mortality of head-started western pond turtles on Pierce National Wildlife Refuge, Washington. *Journal of Wildlife Management* 73(8): 1402–1406.
- Vredenburg, V.T., G.M. Fellers, and C. Davidson. 2005. *Rana muscosa* Camp, 1917b: Mountain Yellow-legged Frog. Pages 563–566 in M. Lannoo, editor. *Amphibian declines: the conservation of United States species*. Smithsonian Institution Press, Washington, D.C.
- Vredenburg, V.T., R. Bingham, and R.A. Knapp. 2007. Concordant molecular and phenotypic data delineate new taxonomy and conservation priorities for the endangered mountain yellow-legged frog. *Journal of Zoology*. 271: 361–374.
- Wake, D.B. and V.T. Vredenburg. 2008. Are we in the midst of the sixth mass extinction? A view from the world of amphibians. *Proceedings of the National Academy of Sciences* 105(1): 11466–11473.
- Wang, J.C.S. 1986. Fishes of the Sacramento-San Joaquin estuary and adjacent waters, California: A guide to the early life histories. Interagency Ecological Study Program for the Sacramento-San Joaquin Estuary. Interagency Ecological Program, Technical Report No. 9. 680 pp.
- Wheeler, C.A. and H.H. Welsh, Jr. 2008. Mating strategy and breeding patterns of the foothill yellow-legged frog (*Rana boylei*). *Herpetological Conservation and Biology* 3(2): 128-142.

- Wildlife Resource Consultants. 2004. Winter recreation effects on the subnivean environment of five Sierra Nevada meadows. Project No. OR-2-LT B-49. Report prepared for Lake Tahoe Basin Management Unit, South Lake Tahoe, California. 28 pp.
- Zeiner, D.C., W.F. Laudenslayer, Jr., and K.E. Mayer, Compiling Editors. 1988. California's Wildlife, Volume I: Amphibian and Reptiles. State of California, Resources Agency, Department of Fish and Game, Sacramento, CA. 272 pp.

Hydrology

- Adams, E.S. 1975. Effects of lead and hydrocarbons from snowmobile exhaust on brook trout (*Salvelinus fontinalis*). *Trans Amer. Fisheries Soc.* 104(2): 363-373.
- Arnold, J.L. and T.M. Koel. 2006. Effects of Snowmobile Emissions on the Chemistry of Snowmelt Runoff in Yellowstone National Park. Yellowstone National Park, Center for Resources – Fisheries and Aquatic Sciences Section.
http://www.nps.gov/yell/parkmgmt/upload/snwmbil_snwmlt_rpt.pdf
- Hagemann, M., and M. Van Mouwerik. 1999. Potential water quality concerns related to snowmachine usage. Internal memo. USDI, National Park Service, Water Resources Division
- Ingersoll, G.P. 1998. Effects of snowmobile use on snowpack chemistry in Yellowstone National Park. US Geological Survey Water Resources Investigations Report 99-4148. 24 pp.
- Jones, J.A. and G.E. Grant. 1996. Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon. *Water Resources Research*. 32(4): 959-974.
- Kattelman, R. 1996. Hydrology and water resources. In: Sierra Nevada Ecosystem Project: Final report to Congress, Vol. II. Davis: University of California; 855-920.
- Keddy, P.A., A.J. Spavold, and C.J. Keddy. 1979. Snowmobile impact on old field and marsh vegetation in Nova Scotia, Canada: an experimental study. *Environmental Management* 3(5): 409-415.
- McDaniel, M.R. 2002. Determination of SVOC in snowmobile exhaust and the driven snow to estimate emission and degradation rates of snowmobile-derived contaminants in the winter environment. Prepared for ATMS 792, DRI Storm Peak Laboratory, CO. January 2002.
- Neumann P.W., and H.G. Merriam. 1972. Ecological effects of snowmobiles. *Canadian Field Naturalist*, volume 86: 207-212.
- National Park Service. 2002. Environmental assessment for the management of snowmobiles in Rocky Mountain National Park. Prepared by the Dept. of Interior National Park Service, Rocky Mountain National Park, Colorado. June 2002.
- Olliff, T., K. Legg, and B. Kaeding. 1999. Effects of winter recreation on wildlife of the Greater Yellowstone Area: a literature review and assessment. Report to the Greater Yellowstone Coordinating Committee. Yellowstone National Park.
- Snow Mobile Forum. 2008. Available online at <http://www.snowmobileforum.com/general-sled-chat/25036-whats-minimum-amount-snow-you-should.html>. Accessed 2015.

- U.S. Army Corps of Engineers, 1987. Wetlands delineation manual, Technical report Y-87-1.
- USDA Forest Service. 2001. Sierra Nevada Forest plan amendment: final environmental impact statement. Pacific Southwest Region. Vallejo, CA. Available online at <http://www.fs.fed.us/r5/snfpa/library/archives/feis/index.htm> (accessed May 14, 2009).
- USDA Forest Service. 2004. Sierra Nevada Forest plan amendment: final supplemental environmental impact statement; record of decision. Pacific Southwest Region. Vallejo, CA. Available online at: <http://www.fs.fed.us/r5/snfpa/final-seis/index.html> (accessed May 14, 2009).
- Ziemer, R.R. 1981. Storm flow response to road building and partial cutting in small streams of Northern California. *Water Resources Research* 17(4): 907-917.

Noise

- California Department of Parks and Recreation. Off Highway Motor Vehicle Recreation Division. Over Snow Vehicle Program. Draft Environmental Impact Report Program Years 2010 – 2020. State Clearinghouse # 2009042113. October 2010.
- Harrison, R.T., R.N. Clark, and G.H. Stankey. 1980. Predicting impact of noise on recreationists. ED&T Project No. 2688: Noise Pollution Prediction Method. USDA Forest Service, Equipment Development Center, San Dimas, CA.
- RAWS USA Climate Archive. 2015. <http://www.raws.dri.edu>. Station maps data. California, Northern. Chester and Blacks Mountain.
- Reed, S.E., Ph.D., Jennifer L. Boggs, Jacob P. Mann. 2010. SPreAD-GIS: an ArcGIS toolbox for modeling the propagation of engine noise in a wildland setting. Version 2.0. The Wilderness Society, San Francisco, CA. October 1, 2010
- Reed, S.E., Ph.D., Jennifer L. Boggs, Jacob P. Mann. 2012. A GIS tool for modeling anthropogenic noise propagation in natural ecosystems. *Environmental Modelling & Software* 37 (2012). P. 1-5
- U.S. Department of Agriculture. Forest Service (USDA Forest Service) 2001. Sierra Nevada Forest plan amendment: final environmental impact statement. Pacific Southwest Region. Vallejo, CA. <http://www.fs.fed.us/r5/snfpa/library/archives/feis/index.htm>.
- USDA Forest Service. 2010. Pacific Southwest Region. R5-MB-122b. Final Environmental Impact Statement. Motorized Travel Management. Tahoe National Forest.

Recreation

- Adams, J.C. and S.F. McCool. 2010. Finite Recreation Opportunities: The Forest Service, the Bureau of Land Management, and Off-Road Vehicle Management. *Natural Resources Journal*. Vol. 49.
- California Department of Parks and Recreation. Off Highway Motor Vehicle Recreation Division. 2010. Over Snow Vehicle Program. Draft Environmental Impact Report Program Years 2010 – 2020. State Clearinghouse # 2009042113.

Code of Federal Regulations. 36 CFR 212. Travel Management Regulations

Rolloff, D.B., E. Erickson, and B. Niles. 2009. California Department of Parks and Recreation. Off-Highway Motor Vehicle Recreation Division. 2009 Winter Trailhead Survey. Dept. of Recreation, Parks, and Tourism Administration. College of Health and Human Services. California State University, Sacramento.

Snowlands Network. 2014. Analyzing Snowmobile Impacts to Other Winter Recreation Users in the Sierra Nevada and Southern Cascades. December 2014.

U.S. Department of Agriculture, Forest Service (USDA Forest Service). 2005. Natural Resource Manager. National Visitor Use Monitoring Program. Visitor Use Report. Tahoe National Forest. Data Collected in 2005.

USDA Forest Service. 1990. Pacific Southwest Region Tahoe National Forest. Land and Resource Management Plan as Amended.

USDA Forest Service. 2007. Recreation Facility Analysis. 5-year Proposed Program of Work and Programmatic Effects of Implementation. Tahoe National Forest. September 2007.

USDA Forest Service. 2010. Natural Resource Manager. National Visitor Use Monitoring Program. Visitor Use Report. Tahoe National Forest. Data Collected in 2010.

USDA Forest Service. 2010. Tahoe National Forest and Lakes Basin Winter Recreation Guide. California.

USDA Forest Service. 2011. IRA 2001 Roadless Acres per Forest (Corrected). Accessed online: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5433333.pdf, 06/09/2016.

USDA Forest Service. 2012. National Best Management Practices for Water Quality Management on National Forest System Lands. FS-990a.

USDA Forest Service. 2015. Natural Resource Manager. National Visitor Use Monitoring Program. Visitor Use Report. Tahoe National Forest. Data Collected in 2015.

USDA Forest Service. 2016. Tahoe National Forest Recreation Website. <http://www.fs.usda.gov/recmain/tahoe/recreation>, accessed 6/9/2016.

Socioeconomic

Allen, S.D., D.A. Wickwar, F.P. Clark, R.R. Dow, R.Potts, and S.A. Snyder. 2009. Values, Beliefs, and Attitudes Technical Guide for Forest Service Land and Resource Management, Planning, and Decisionmaking. General Technical Report PNW-GTR-788. U.S. Forest Service, Pacific Northwest Research Station: Portland, OR. 120 pp.

U.S. Census Bureau. 2016a. American Community Survey, 2010-2014 5-year Estimates. Accessed June 16, 2016 at <http://factfinder.census.gov>.

U.S. Census Bureau. 2016b. County Business Patterns 2013. Accessed June 16, 2016 from EPS <http://www.headwaterseconomics.org/tools/economic-profile-system>.

- U.S. Department of Agriculture, Economic Research Service (USDA ERS). 2013. Rural-Urban Continuum Codes. Accessed July 23, 2015 at <http://www.ers.usda.gov/data-products/rural-urban-continuum-codes/.aspx>.
- U.S. Department of Agriculture, Forest Service (USDA Forest Service). 2016a. Ecosystem Management Coordination, National Forest Recreation Economic Contributions. Accessed June 14, 2016 at <http://www.fs.fed.us/emc/economics/recreation-contributions>.
- USDA Forest Service. 2016b. National Visitor Use Monitoring for the Tahoe National Forest, Data Collected FY 2010. Accessed June 10, 2016
<http://www.fs.fed.us/recreation/programs/nvum/>.
- White, E.M. and D.J. Stynes. 2010. Updated Spending Profiles for National Forest Recreation Visitors by Activity. Accessed July 23, 2015 Available online at:
http://www.fsl.orst.edu/lulcd/Publicationsalpha_files/White_Stynes_NVUM2010b.pdf.
- White, E.M., D.B. Gooding, and D.J. Stynes. 2013. Estimation of National Forest Visitor Spending Averages from National Visitor Use Monitoring: Round 2. General Technical Report PNW-GTR-883. U.S. Forest Service, Pacific Northwest Research Station: Portland, OR. 71 pp.

Soils

- Baker, E. and E. Buthmann. 2005. Snowmobiling in the Adirondack Park: Environmental and Social Impacts. St. Lawrence University, Department of Biology, Canton, New York.
- Cacek, C.C. 1989. The relationship of mass wasting to timber harvest activities in the Lightning Creek basin. Master Thesis, Eastern Washington University. pp. ii-iv.
- Gage, E. and D.J. Cooper. 2009. Winter recreation impacts to wetlands: a technical review. Report for Arapaho-Roosevelt National Forests, White River National Forest and Black Hills National Forest. Department of Forest, Rangeland and Watershed Stewardship. Colorado State University, Fort Collins, Colorado 80523.
- Jurgensen, M.F., A.E. Harvey, R.T. Graham, D.S. Page-Dumrose, J.R. Tonn, M.J. Larson, and T.B. Jain. 1997. Impacts of timber harvests on soil organic matter, nitrogen, productivity and health of inland northwest forests. *Forest Science* 43: 234-251.
- Keller, T., C. Pielmeier, C. Rixen, F. Gadiant, D. Gustafsson, and M. Stahli. 2004. Impact of artificial snow and ski-slope grooming on snowpack properties and soil thermal regime in a sub-alpine ski area. *Annals of Glaciology* 38: 314-318.
- Olliff, T., K. Legg, and B. Kaeding. 1999. Effects of winter recreation on wildlife of the Greater Yellowstone Area: a literature review and assessment. Report to the Greater Yellowstone Coordinating Committee. Yellowstone National Park.
- Page-Dumroese, D.S., M. Jurgensen, and T. Terry. 2010. Maintaining soil productivity during forest or biomass-to-energy thinning harvests in the Western United States. *Western Journal of Applied Forestry* 25 (1): 5-11.
- State of California, Department of Water Resources. 2007. Climate change in California.
<http://www.water.ca.gov/climatechange/docs/062807factsheet.pdf>.

- USDA Forest Service and Soil Conservation Service. 1967. Soil Survey: Tehama County California. 130 pp.
- U.S. Department of Agriculture, Forest Service (USDA Forest Service). 1990. Tahoe National Forest Land and Resource Management Plan. Nevada City, California.
- USDA Forest Service. 1995. Forest Service Handbook, R-5 Supplement 2509.18-95-1. Soil Management Handbook. San Francisco, California. 10 pp.
- USDA Forest Service. 2012. National Best Management Practices for Water Quality Management on National Forest System Lands. Volume 1: National Core BMP Technical Guide. FS-990a. 177 pp.

Transportation/Engineering

- CA. 2010. Over Snow Vehicle Program Final Environmental Impact Report, Program Years 2010 – 2020. California Department of Parks and Recreation, Off-Highway Motor Vehicle Recreation Division, Sacramento, CA.
- CA. 2012. Off-Highway Vehicle Law Enforcement Information (Quickbook). California Department of Parks and Recreation, Off-Highway Motor Vehicle Recreation Division, Sacramento, CA.
- U.S. Department of Agriculture, Forest Service (USDA Forest Service). 1990. Tahoe National Forest Land and Resource Management Plan. Tahoe National Forest, Nevada City, CA.
- USDA Forest Service. 2015. Forest Service Directive System, Forest Service Manuals and Handbooks, 7700 Series: Travel Management. USDA Forest Service. Available at <http://www.fs.fed.us/im/directives/>, accessed October 31, 2015.
- USDA Forest Service. 2016. Forest transportation atlas – GIS Spatial and INFRA Tabular Data, Tahoe National Forest. USDA Forest Service, Tahoe National Forest, Nevada City, CA.
- U.S. Government. 2015. Code of Federal Regulations. Government Printing Office. Available at <http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR>, accessed October 31, 2015.

Terrestrial Wildlife

- Allen, A.W. 1987. The relationship between habitat and furbearers. Pages 164-179, In: Novak, M., J.A. Baker, and M.E. Obbard, eds. Wildland furbearer management and conservation in North America. Ontario Ministry of Natural Resources.
- Anthony, R.G., R.L. Knight, G.T. Allen, B.R. McClelland, and J.I. Hodges. 1982. Habitat use by nesting and roosting bald eagles in the Pacific Northwest. U.S. Fish and Wildlife Publications, p. 34.
- Baker, J.K. 1962. The manner and efficiency of raptor depredations on bats. *Condor* 64(6):500-504.
- Baker, M.D., M.J. Lacki, and G.A. Falxa. 2008. Habitat use of pallid bats in coniferous forests of northern California. *Northwest Science* 82: 269-275.

- Barbour, R.W., and W.H. Davis. 1969. Bats of America. University of Kentucky Press, Lexington, KY. 286 pp.
- Beck, T.W. and J. Winter. 2000. Survey protocol for the great gray owl in the Sierra Nevada of California. USDA Forest Service, Pacific Southwest Region, Vallejo, CA. 38 pp.
- Bent, A.C. 1961. Life histories of North American birds of prey, Part 1. Dover Publications Inc. New York, NY U.S.A.
- Blakesley, J.A., M.E. Seamans, M.M. Conner, A.B. Franklin, G.C. White, R.J. Gutiérrez, J.E. Hines, J.D. Nichols, T.E. Munton, D.W.H. Shaw, J.J. Keane, G.N. Steger, and T.L. McDonald. 2010. Population dynamics of spotted owls in the Sierra Nevada, California. *Wildlife Monographs*. 174: 1–36.
- Bond, M.L., M.E. Seamans, and R.J. Gutierrez. 2004. Modeling nesting habitat selection of California spotted owls (*Strix occidentalis occidentalis*) in the central Sierra Nevada using standard forest inventory metrics. *Forest Science* 50(6):773-780.
- Brown, P.E., R. Berry, and C. Brown. 1994. Foraging behavior of Townsend's big-eared bats (*Plecotus townsendii*) on Santa Cruz Island. Pages 367-369 in W.L. Halvorson and G.J. Maender, editors. Fourth California islands symposium: update on the status of resources. Santa Barbara Museum of Natural History, Santa Barbara, CA.
- Buehler, D.A., T.J. Mersmann, J.D. Fraser, and J.K. Seegar. 1991. Effects of human activity on bald eagle distribution on the northern Chesapeake Bay. *The Journal of Wildlife Management* 55(2):282-290.
- Bull, E.L. and T.W. Heater. 2000. Resting and denning sites of American marten in northeastern Oregon. *Northwest Science* 74(3):179–185.
- Bunnell, K.D., J.T. Flinders, and M.L. Wolfe. 2006. Potential impacts of coyotes and snowmobiles on lynx conservation in the intermountain west. *Wildlife Society Bulletin*, 34(3), pp. 828-838.
- Buskirk, S.W. and R.A. Powell. 1994. Habitat ecology of fishers and American martens. In: Ruggiero, L.F., Aubry, K.B., Buskirk, S.W. [et al.], tech. eds. 1994. American marten, fisher, lynx and wolverine in the western United States: the scientific basis for conserving forest carnivores. Gen. Tech. Rep. RM-254. Ft. Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Research Station. 184 pp.
- Cahalane, V.H. 1939. Mammals of the Chiricahua Mountains, Cochise County, Arizona. *Journal of Mammalogy*, 20(4):418-440.
- Cain, J.W. and M.L. Morrison. 2003. Reproductive ecology of dusky flycatchers in montane meadows of the central Sierra Nevada. *Western North American Naturalist* 63(4):507-512.
- California Department of Fish and Wildlife. California Interagency Wildlife Task Group. 2014. CWHR Version 9.0 personal computer program. Sacramento, California.
- California Department of Fish and Wildlife (CDFW). 2015a. SNRF species report comments. Email w attachment from Chris Stermer, May 29, 2015. 4 pp total In USFWS 2015b.

- California Wildlife Habitat Relationships (CWHR). 2013. Species information reports. California Wildlife Habitat Relationships Database Version 9.0.
- California Department of Parks and Recreation. 2010. Over-snow vehicle program final environmental impact report, program years 2010-2020. California Department of Parks and Recreation, Off-highway Motor Vehicle Recreation Division. 156 pp.
- Call, M.W. 1978. Nesting habits and survey techniques for common western raptors. U. S. Dep. Inter., Bur. Land Manage, Portland, OR. Tech. Note No. 316. 115 pp.
- Cameron, S.A., J.D. Lozier, J.P. Strange, J.B. Koch, N. Cordes, L.F. Solter, and T.L. Griswold. 2011. Patterns of widespread decline in North American bumble bees. Proceedings of the National Academy of Sciences 108:662-667.
- Chandler, S.K., J.D. Fraser, D.A. Buehler, and J.K. Seegar. 1995. Perch trees and shoreline development as predictors of bald eagle distribution on Chesapeake Bay. *The Journal of Wildlife Management* 59(2):325-332.
- Chatfield, A.H. 2005. Habitat selection by a California spotted owl population: a landscape scale analysis using resource selection functions. Dept. Fisheries, Wildlife, and Conservation Biology, University of Minnesota, St. Paul, Minnesota. 59 pp.
- Chung-MacCoubrey, A. L. 1996. Bat species composition and roost use in pinyon-juniper woodlands of New Mexico. Pp. 118–123 in Bats and forests symposium (Barclay R. M. R., Brigham R. M., eds.). British Columbia Ministry of Forests, Victoria, Canada.
- Clark B.S., D.M. Leslie Jr., and T.S. Carter. 1993. Foraging activity of adult female Ozark big-eared bats (*Plecotus townsendii* ingens) in summer. *Journal of Mammalogy* 74:422–427.
- Clark, D.R., and R.L. Hothem. 1991. Mammal mortality at Arizona, California and Nevada gold mines using cyanide extraction. *Calif. Fish and Game*, 77:61-69.
- Cockrum, E.L. and B.F. Musgrove. 1964. Additional records of the Mexican big-eared bat, *Plecotus phyllotis* (Allen), from Arizona. *Journal of Mammalogy* 45(3):472-474.
- Cockrum, E.L. and E. Ordway. 1959. Bats of the Chiricahua Mountains, Cochise County, Arizona. American Museum novitates; no. 1938.
- Commissaris, L.R. 1961. The Mexican big-eared bat in Arizona. *J. Mammal.* 42, 61–65.
- Conner, M.M., J.J. Keane, C.V. Gallagher, G. Jehle, T.E. Munton, P.A. Shaklee, and R.A. Gerrard. 2013. Realized population change for long-term monitoring: California spotted owl case study. *The Journal of Wildlife Management*, 77(7):1449-1458.
- Copeland, J.P., K.S. McKelvey, K.B. Aubry, A. Landa, J. Persson, R.M. Inman, J. Krebs, E. Lofroth, H. Golden, J.R. Squires, and A. Magoun. 2010. The bioclimatic envelope of the wolverine (*Gulo gulo*): do climatic constraints limit its geographic distribution? *Canadian Journal of Zoology*, 88(3):233-246.
- Copeland, J.P., J.M. Peek, C.R. Groves, W.E. Melquist, K.S. McKelvey, G.W. McDaniel, C.D. Long, and C.E. Harris. 2007. Seasonal habitat associations of the wolverine in central Idaho. *Journal of Wildlife Management* 71:2201-2212.

- Cryan, P. 1997. Distribution and roosting habits of bats in the southern Black Hills, South Dakota. Unpublished Master's Thesis, University of New Mexico, Albuquerque, NM. 96 pp.
- Dalquest, W.W. 1947. Notes on the natural history of the bat *Corynorhinus rafinesquii* in California. *Journal of Mammalogy* 28(1):17-30.
- Detrich, P.J. and B. Woodbridge. 1994. Territory fidelity, mate fidelity, and movements of color-marked northern goshawks in the southern Cascades of California. *Studies in Avian Biology* 16:130-132.
- Dobkin D.S., R.G. Gettinger, and M.G. Gerdes. 1995. Springtime movements, roost use, and foraging activity of Townsend's big-eared bat (*Plecotus townsendii*) in central Oregon. *Great Basin Naturalist* 55:315–321.
- Dunk, J.R, J.J. Keane, A.E. Bowles, T. Narahashi, D.L. Hansen, S. Vigallon, and J.J.V.G Hawley. 2011. Experimental effects of recreation on northern goshawks – final report submitted to the USDA Forest Service Region 5 Office. 71 pages.
- Easterla, D.A. 1966. Yuma myotis and fringed myotis in southern Utah. *Journal of Mammalogy*, 47(2):350-351.
- Esmoil, B.J., and S.H. Anderson. 1995. Wildlife mortality associated with oil pits in Wyoming. *Prairie Naturalist*, 27:81-88.
- Evans, E., R. Thorp, S. Jepsen, and S.H. Black. 2008. Status Review of Three Formerly Common Species of Bumble Bee in the Subgenus *Bombus*: *Bombus affinis* (the rusty patched bumble bee), *B. terricola* (the yellowbanded bumble bee), and *B. occidentalis* (the western bumble bee). The Xerces society, Portland, OR.
- Fellers, G.M., and E.D. Pierson. 2002. Habitat use and foraging behavior of Townsend's big-eared bat (*Corynorhinus townsendii*) in coastal California. *Journal of Mammalogy* 83:167-177.
- Findley, J.S., and N.C. Negus. 1953. Notes on the mammals of the gothic region, Gunnison County, Colorado. *Journal of Mammalogy*, 34(2):235-239.
- Flickinger, E.L., and C.M. Bunck. 1987. Number of oil-killed birds and fate of bird carcasses at crude oil pits in Texas. *Southwestern Nat.*, 32:377-381.
- Forsman, E.D., E.C. Meslow, and H.M. Wight. 1984. Distribution and biology of the spotted owl in Oregon. *Wildlife Monographs*. 87:1–64.
- Fraser, J.D., L.D. Frenzel, and J.E. Mathisen. 1985. The impact of human activities on breeding bald eagles in north-central Minnesota. *The Journal of Wildlife Management* 49(3):585-592.
- Frost, D.R., and R.M. Timm. 1992. Phylogeny of plecotine bats (Chiroptera: "Vespertilionidae"): proposal of a logically consistent taxonomy. *Am. Mus. Novitates* 3034:1-16.
- Gaines, W.L., P.H. Singleton, and R.C. Ross. 2003. Assessing the Cumulative Effects of Linear Recreation Routes on Wildlife Habitats on the Okanogan and Wenatchee National Forests. Gen. Tech. Rep. PNW-GTR-586. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 79 pp.
<http://www.fs.fed.us/pnw/pubs/gtr586.pdf>.

- Graham, R.T., R.T. Reynolds, M.H. Reiser, R.L. Bassett, D.A. Boyce. 1994. Sustaining forest habitat for the Northern goshawk: A Question of Scale. *Studies of Avian Biology*. No.16
- Green, G.A., H.L. Bombay, and M.L. Morrison. 2003. Conservation assessment of the willow flycatcher in the Sierra Nevada. Foster Wheeler Environmental Corporation and the University of California. 67 pp.
- Grubb, T.G. and R.M. King. 1991. Assessing human disturbance of breeding bald eagles with classification tree models. *The Journal of Wildlife Management* 55(3):500-511.
- Grubb, T.G., A.E. Gatto, L.L. Pater, and D.K. Delaney. 2012. Response of nesting northern goshawks to logging truck noise, Kaibab National Forest, Final Report. USDA Forest Service, Southwest Region. 31 pp.
- Gutierrez R.J. and G.F. Barrowclough. 2005. Redefining the distributional boundaries of the northern and California spotted owls: implications for conservation. *Condor* 107:182-187.
- Gutierrez, R.J., A.B. Franklin, and P.C. Carlson. 1995a. Population ecology of the northern spotted owl (*Strix occidentalis caurina*) in northwestern California: annual results, 1994. Annual Progress Report (Contract #53-91S8-4-FW20) to Region 5, USDA Forest Service. Contractor: Humboldt State University, Arcata, CA.
- Gutierrez R.J., A.B. Franklin, and W.S. LaHaye. 1995b. Spotted owl (*Strix occidentalis*). The birds of North America, number 179. The American Ornithologists' Union, Washington D.C. USA, and the Academy of Natural Sciences, Philadelphia, Pennsylvania.
- Gutierrez, R.J., M.Z. Peery, D.J. Tempel, and W.J. Berigan. 2012. Population ecology of the California spotted owl in the central Sierra Nevada: annual results 2011. USDA Forest Service, Region 5. 39 pp.
- Hatfield, R. 2012. Records of western and Franklin's bumble bees in the western United States. Database records provided by the Xerces Society, Portland, OR on 2/29/12.
- Hayward, L.S., A.E. Bowles, J.C. Ha, and S.K. Wasser. 2011. Impacts of acute and long-term vehicle exposure on physiology and reproductive success of the northern spotted owl. *Ecosphere*. 2(6): article 65.
- Hermanson, J.W., and T.J. O'Shea. 1983. *Antrozous pallidus*. American Society of Mammalogists, *Mammalian Species* 213:1-8.
- Hirshfeld, J.R. and M.J. O'Farrell. 1976. Comparisons of differential warming rates and tissue temperatures in some species of desert bats. *Comparative Biochemistry and Physiology Part A: Physiology*, 55(1):83-87.
- Hopwood, J., M. Vaughan, M. Shepherd, D. Biddinger, E. Mader, S. Hoffman Black and C. Mazzacano. 2012. Are Neonicotinoids Killing Bees? A Review of Research into the Effects of Neonicotinoid Insecticides on Bees, with Recommendations for Action. Xerces Society, Portland, OR. Available at http://www.xerces.org/wp-content/uploads/2012/03/Are-Neonicotinoids-Killing-Bees_Xerces-Society1.pdf

- Hornocker, M.G. and H.S. Hash. 1981. Ecology of the wolverine in northwestern Montana. *Canadian Journal of Zoology*, 59(7):1286-1301.
- Humphrey, S.R., and T.H. Kunz. 1976. Ecology of a Pleistocene relict, the western big-eared bat (*Plecotus townsendii*), in the southern great plains. *Journal of Mammalogy* 57(3):470-494.
- Johnston, D.S. and J.R. Gworek. 2006. Pallid bat (*Antrozous pallidus*) habitat use in a coniferous forest in northeastern California. *Bat Research News* 47:114.
- Johnston, D.S., B. Hepburn, J. Krauel, T. Stewart, and D. Rambaldini. 2006. Winter ecology of pallid bats in central coastal California. *Bat Research News* 47:115.
- Johnston, D.J., G. Tatarian, and E.D. Pierson. 2004. California bat mitigation: techniques, solutions, and effectiveness. Contract Report #2394-01 for California Department of Transportation, Sacramento, CA, 125 pp.
- Jones, C., and R.D. Suttikus. 1972. Notes on netting bats for eleven years in western New Mexico. *Southwestern Naturalist* 16(3/4):261-266.
- Kalinowski, R.S., M.D. Johnson, and A. Rich. 2014. Habitat relationships of great gray owl prey in meadows of the Sierra Nevada mountains. *Wildlife Society Bulletin* 38(3):547-556.
- Kirk, T.A. and W.J. Zielinski. 2009. Developing and testing a landscape habitat suitability model for the American marten (*Martes americana*) in the Cascades mountains of California. *Landscape Ecology* 24:759–773.
- Knight, R.L., and S.K. Knight. 1984. Responses of wintering bald eagles to boating activity. *Journal of Wildlife Management* 48:999-1004.
- Knight, R.L. and S.K. Skagen. 1988. Agonistic Asymmetries and the Foraging Ecology of Bald Eagles. *Ecology* 69(4):1188-1194.
- Koch, J., J. Strange, and P. Williams. 2012. Bumble Bees of the Western United States. U.S. Forest Service and the Pollinator Partnership, Washington, D.C. 144 pp.
- Kunz, T.H., and R.A. Martin. 1982. *Plecotus townsendii*. American Society of Mammalogists, *Mammalian Species* 175:1-6.
- Lewis, S.E. 1994. Night roosting ecology of pallid bats (*Antrozous pallidus*) in Oregon. *American Midland Naturalist* 132(2):219-226.
- Lewis, S.E. 1996. Low roost-site fidelity in pallid bats: associated factors and effect on group stability. *Behavioral Ecology and Sociobiology* 39(5):335-344.
- Magoun, A.J. and J.P. Copeland. 1998. Characteristics of wolverine reproductive den sites. *The Journal of Wildlife Management*, pp. 1313-1320.
- Marcot B. G. 1984. Winter use of some northwestern California caves by western big-eared bats and long-eared Myotis. *Murrelet* 65:46.

- Mathewson, H.A., M.L. Morrison, H.L. Loffland, and P.F. Brussard. 2013. Ecology of Willow Flycatchers (*Empidonax traillii*) in the Sierra Nevada, California: Effects of Meadow Characteristics and Weather on Demographics. Ornithological Monographs 75.
- Mazurek, M.J. 2004. A maternity roost of Townsend's big-eared bats (*Corynorhinus townsendii*) in coast redwood basal hollows in northwest California. *Northwestern Naturalist* 85: 60-62.
- McNamara, M. 2015. Over-snow Vehicle Use Designation Environmental Impact Statement Hydrology Report.
- Miller, G.S. 1989. Dispersal of juvenile northern spotted owls in western Oregon. M.S. Thesis, Oregon State Univ. Corvallis. 139 pp.
- Moriarty, K. 2011. Decline in American marten occupancy rates at Sagehen Experimental Forest, California. *The Journal of Wildlife Management* 75(*):1774-1787.
- Moriarty, K., W.J. Zielinski, A.G. Gonzales, T.E. Dawson, K.M. Boatner, C.A. Wilson, F.V. Schlexer, K.L. Pilgrim, J.P. Copeland, and M.K. Schwartz. 2009. Wolverine confirmation in California after nearly a century: native or long-distance immigrant? *Northwest Science* 83(2):154-162.
- Morrison, M.L., R.J. Young, J.S. Rosmos, and R. Golightly. 2011. Restoring forest raptors: Influence of human disturbance and forest condition on northern goshawks. *Restoration Ecology* 19(2):273-279.
- Murphy, D.D., and C.M. Knopp. 2000. Lake Tahoe watershed assessment. General Technical Report-Pacific Southwest Research Station, USDA Forest Service.
- O'Farrell, M.J., and W.G. Bradley. 1970. Activity patterns of bats over a desert spring. *Journal of Mammalogy* 51(1):18-26.
- O'Farrell, M.J., W.G. Bradley, and G.W. Jones. 1967. Fall and winter bat activity at a desert spring in southern Nevada. *Southwestern Naturalist* 12:163-171.
- O'Farrell, M.J. and E.H. Studier. 1980. *Myotis thysanodes*. *Mammalian Species* 137:1-5.
- Olson, L.E., J.D. Sauder, N.M. Albrecht, R.S. Vinkey, S.A. Cushman, and M.K. Schwartz. 2014. Modeling the effects of dispersal and patch size on predicted fisher (*Pekania [Martes] pennanti*) distribution in the U.S. Rocky Mountains. *Biological Conservation* 169:89-98.
- Pearson, O.P., M.R. Koford, and A.K. Pearson. 1952. Reproduction of the lump-nosed bat (*Corynorhinus rafinesquei*) in California. *Journal of Mammalogy* 33(3):273-320.
- Purcell, K.L., C.M. Thompson, and W.J. Zielinski. 2012. Fishers and American martens. Pp. 47-60 In Managing Sierra Nevada forests (M. North, editor). USDA Forest Service, Pacific Southwest Research Station Albany, CA. General Technical Report PSW-GTR-237.
- Rabe, M.J., T.E. Morrell, H. Green, J.C. deVos, Jr., and C.R. Miller. 1998. Characteristics of ponderosa pine snag roosts used by reproductive bats in northern Arizona. *Journal of Wildlife Management* 62(2):612-621.
- Roberts, S. and M. North. 2012. California Spotted Owls. Chapter 5 in PSW-GTR-237 Managing Sierra Nevada Forests, USDA Forest Service, Pacific Southwest Research Station.

- Roest, A.I. 1951. Mammals of the Oregon Caves area, Josephine County. *Journal of Mammalogy* 32:345-351.
- Ruggiero, L.F., D.E. Pearson, S.E. Henry. 1998. Characteristics of American marten den sites in Wyoming. *Journal of Wildlife Management* 62(2):663–673.
- Rustigian-Romsos, H.L. and W.D. Spencer. 2010. Predicting habitat suitability for the American marten on the Lassen National Forest, final report. Produced by Conservation Biology Institute. 33pp.
- Sample B.E. and R.C. Whitmore. 1993. Food habits of the endangered Virginia big-eared bat in West Virginia. *Journal of Mammalogy* 74:428–435
- Sherwin, R.E., D. Stricklan, and D.S. Rogers. 2000. Roosting affinities of Townsend's big-eared bat (*Corynorhinus townsendii*) in northern Utah. *Journal of Mammalogy* 81:939-947.
- Siegel, R.B. R.L. Wilkerson, and D. DeSante. 2008. Extirpation of the willow flycatcher from Yosemite National Park. *Western Birds* 39:8-21.
- Spencer, W. and H. Rustigian-Romsos. 2012. Decision support maps and recommendations for conserving rare carnivores in the interior mountains of California. Conservation Biology Institute. 36 pp. + Appendices.
- Spencer, W.D., R.H. Barrett, and W.J. Zielinski. 1983. Marten habitat preferences in the northern Sierra Nevada. *Journal of Wildlife Management* 47(4):1181-1186.
- Squires, J.R. and R.T. Reynolds. 1997. Northern Goshawk (*Accipiter gentilis*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/298>.
- Stalmaster, M.V. and J.L. Kaiser. 1998. Effects of recreational activity on wintering bald eagles. *Wildlife Monographs* 137:1-46.
- Stalmaster, M.V., and J.R. Newman. 1978. Behavioral responses of wintering bald eagles to human activity. *Journal of Wildlife Management* 42:506-13.
- Stefani, R.A., H.L. Bombay, and T.M. Benson. 2001. Willow Flycatcher. Pages 143- 195 in USDA Forest Service, Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement, vol. 3, Ch. 3, Part 4.4. USDA Forest Service, Pacific Southwest and Intermountain Regions, Sacramento, CA.
- Tempel, D.J. and R.J. Gutierrez. 2003. Fecal corticosterone levels in California spotted owls exposed to low-intensity chainsaw sound. *Wildlife Society Bulletin* 31(3):698-702.
- Tempel, D.J. and R.J. Gutiérrez. 2004. Factors related to fecal corticosterone levels in California spotted owls: implications for assessing chronic stress. *Conservation Biology* 18(2):538-547.
- Thorp, R.W., and M.D. Shepherd. 2005. Profile: Subgenus *Bombus*. In Shepherd, M.D., D.M. Vaughan, and S.H. Black (eds). Red List of Pollinator Insects of North America. The Xerces Society for Invertebrate Conservation, Portland, OR.

- Thorp, R. 2015. Personal communication between R. Thorp (Distinguished Professor Emeritus, Department of Entomology and Nematology, University of California Davis) and Katherine Malengo regarding hibernation habitat for western bumble bee (*Bombus occidentalis*). October 19, 2015.
- Tommasi, D., A. Miro, H.A. Higo, and M.L. Winston. 2004. Bee diversity and abundance in an urban setting. *The Canadian Entomologist* 136:851–869.
- U.S. Department of Agriculture, Forest Service (USDA Forest Service). 2001. Sierra Nevada Forest plan amendment: final environmental impact statement. Department of Agriculture, Forest Service, Pacific Southwest Region [USDA FS PSW Region]. 2001. Vallejo, CA.
<http://www.fs.usda.gov/detail/r5/landmanagement/planning/?cid=stelprdb5415847>.
- USDA Forest Service. 2004. Record of Decision for Sierra Nevada Forest Plan Amendment.
- USDA Forest Service. 2007. Land and Resource Management Plan Tahoe National Forest (Amended). Pacific Southwest Region.
- U.S. Department of the Interior, Fish and Wildlife Service (USFWS). 1986. Pacific Bald Eagle Recovery Plan. U.S. Fish and Wildlife Service, Portland, Oregon.
- USFWS. 1998. Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act.
- USFWS. 2006. 50 CFR Part 17. Endangered and Threatened Wildlife and Plants; 12-month finding for a petition to list the California spotted owl (*Strix occidentalis occidentalis*) as threatened or endangered. Federal Register. Vol 71, No 100, May 24, 2006.
- USFWS. 2007. Bald eagle management guidelines and conservation measures.
- USFWS 2012. Federal Register, Department of the Interior, 50 CFR Part 17. Endangered and Threatened Wildlife and Plants; Designation of Revised Critical Habitat for the Northern Spotted Owl; Final Rule. Vol 77, No 233.
- USFWS. 2013. Endangered and Threatened Wildlife and Plants; Threatened Status for the Distinct Population Segment of the North American Wolverine Occurring in the Contiguous United States. Federal Register 78(23):7864-7890.
- USFWS. 2016. Tahoe National Forest over-snow vehicle use designation updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project. Sacramento Fish and Wildlife Office.
- USDI National Park Service. 2013. Yellowstone National Park Winter Use Plan /Supplemental Environmental Impact Statement Wyoming, Montana, Idaho. Chapter 3, Pages 90-91.
- Van Riper, C. III, J.J. Fontaine, and J.W. van Wagtendonk. 2013. Great gray owls (*Strix nebulosa*) in Yosemite National Park: on the importance of food, forest structure, and human disturbance. *Natural Areas Journal* 33(3):286-295.
- Vaughan, T.A., and T.J. O'Shea. 1976. Roosting ecology of the pallid bat, *Antrozous pallidus*. *Journal of Mammalogy* 57(1):19-42.

- Verner, J., K.S. McKelvey, B.R. Noon, R.J. Gutiérrez, G.I. Gould, and T.W. Beck. 1992. The California spotted owl: a technical assessment of its current status. Gen. Tech. Rep. PSW-GTR-133. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 285 pp.
- Wasser, S.K., K. Bevis, G. King, and E. Hanson. 1997. Noninvasive physiological measures of disturbance in the Northern Spotted Owl. *Conservation Biology* 11(4):1019-1022.
- Weller, T.J. and C.J. Zabel. 2001. Characteristics of fringed myotis day roosts in northern California. *Journal of Wildlife Management* 66(3):489-497.
- White, P.J., J.J. Borkowski, T. Davis, R.A. Garrott, D.P. Reinhart, and D.C. McClure. 2009. Chapter 26: Wildlife Responses to Park Visitors in Winter. In *Terrestrial Ecology: The Ecology of Large Mammals in Central Yellowstone—Sixteen Years of Integrated Field Studies*, vol. 3, edited by R.A. Garrott, P.J. White, and F.G.R. Watson, 581–601. Elsevier. San Diego, California.
- Whitaker, J.O. Jr., C. Maser, and L.E. Keller. 1977. Food habits of bats of western Oregon. *Northwest Scientist* 51:46–55.
- Whitaker, J.O. Jr., C. Maser, and S.P. Cross. 1981. Food habits of eastern Oregon bats, based on stomach and scat analyses. *Northwest Scientist* 55:281–292.
- Williams, P.J., R.J. Gutierrez, and S.A. Whitmore. 2011. Home range and habitat selection of spotted owls in the central Sierra Nevada. *Journal of Wildlife Management* 75(2):333-343.
- Woodbridge, B., and C.D. Hargis. 2006. Northern Goshawk inventory and monitoring technical guide. USDA Forest Service, WO GTR-71. 63 pp.
- Wu, J.X., R.B. Siegel, H.L. Loffland, M.W. Tingley, S.L. Stock, K.N. Roberts, J.J. Keane, J.R. Medley, R. Bridgman, and C. Stermer. 2015. Diversity of Great Gray Owl Nest Sites and Nesting Habitats in California. *Journal of Wildlife Management* 79(6):937-947.
- Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White, eds. 1990. California's Wildlife. Volume III. Mammals. California Statewide Wildlife Habitat Relationship System. Department of Fish and Game, The Resources Agency, Sacramento, California. 407 pp.
- Zielinski, W.J. 2014. The forest carnivores: marten and fisher. In: Long, J.W.; Quinn-Davidson, L.; Skinner, C.N., eds. Science synthesis to support socioecological resilience in the Sierra Nevada and southern Cascade Range. Gen. Tech. Rep. PSW-GTR-247. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 393-435. Chap. 7.1.
- Zielinski, W. 2015. Personal communication between William (Bill) Zielinski (Research Ecologist, PSW Redwood Sciences Lab) March 26, 2015, with Katherine Malengo regarding potential impacts of OSV use on martens and marten den sites in the Sierra Nevada of California.
- Zielinski, W.J., K.M. Slauson, and A.E. Bowles, 2008. Effects of off-highway vehicle use on the American marten. *Journal of Wildlife Management* 72(7):1558-1571.

Zielinski, W.J., R.L. Truex, F.V. Schlexer, L.A. Campbell, and C. Carroll. 2005. Historical and contemporary distribution of carnivores in forests of the Sierra Nevada, California, USA. *Journal of Biogeography* 32:1385-1407.

Management Indicator Species

California Department of Fish and Game (CDFG). 2005. California Department of Fish and Game and California Interagency Wildlife Task Group. California Wildlife Habitat Relationships (CWHR) version 8.1. Personal computer program. Sacramento, California. On-Line version. <http://www.dfg.ca.gov/biogeodata/cwhr/cawildlife.asp>. (Accessed: January 3, 2008).

Hawkins, C.P. 2003. Development, evaluation, and application of a RIVPACS-type predictive model for assessing the biological condition of streams in Region 5 (California) national forests. Completion Report. Western center for Monitoring and Assessment of Fresh Water Ecosystems. Utah State University. Logan, Utah 23 pp.

Mayer, K.E., and W.F. Laudenslayer, eds. 1988. A Guide to Wildlife Habitats of California. California Department of Forestry and Fire Protection, Sacramento, CA. 166 pp.
http://www.dfg.ca.gov/biogeodata/cwhr/wildlife_habitats.asp

U.S. Department of Agriculture (USDA Forest Service). 2001. Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement. Forest Service, Pacific Southwest Region. January 2001. <http://www.fs.fed.us/r5/snfpa/library/archives/feis/index.htm>

USDA Forest Service. 2006a. Draft - MIS Analysis and Documentation in Project-Level NEPA, R5 Environmental Coordination, May 25, 2006. Pacific Southwest Region. 3 pp.

USDA Forest Service. 2007a. Record of Decision, Sierra Nevada Forests Management Indicator Species Amendment. U.S. Forest Service, Pacific Southwest Region. December 2007. 18 pp.

USDA Forest Service. 2010a. Sierra Nevada Forests Bioregional Management Indicator Species (MIS) Report: Life history and analysis of Management Indicator Species of the 10 Sierra Nevada National Forests: Eldorado, Inyo, Tahoe, Modoc, Plumas, Sequoia, Sierra, Stanislaus, and Tahoe National Forests and the Lake Tahoe Basin Management Unit. Pacific Southwest Region, Vallejo, CA. December 2010. 132 pp.

Glossary

Administrative Use	Motorized vehicle use vehicle use associated with management activities or projects on National Forest System land administered by the Forest Service or under authorization of the Forest Service. Management activities include but are not limited to: law enforcement, timber harvest, reforestation, cultural treatments, prescribed fire, watershed restoration, wildlife and fish habitat improvement, private land access, allotment management activities, and mineral exploration and development that occur on National Forest land administered by the Forest Service or under authorization of the Forest Service.
Area	A discrete, specifically delineated space that is smaller, and, except for over-snow vehicle use, in most cases much smaller, than a ranger district.
Designated Road or Trail or Area	A National Forest System road, National Forest System trail, or an area on National Forest System lands that is designated for over-snow vehicle use pursuant to 36 CFR 212.51 on an over-snow vehicle use map (36 CFR 212.1).
Designation of over-snow vehicle use	Designation of a National Forest System road, a National Forest System trail, or an area on National Forest System lands where over-snow vehicle use is allowed pursuant to 212.81.
Forest road or trail	A road or trail wholly or partially within or adjacent to and serving the [National Forest System (NFS)] that is determined to be necessary for the protection, administration, and utilization of the NFS and the use and development of its resources (36 CFR 212.1)
Non-motorized use	A term used in this document to refer to travel other than that defined as motorized. For example, hiking, riding horses, or mountain biking.
Over-snow vehicle (OSV)	A motor vehicle that is designed for use over snow and that runs on a track or tracks and/or a ski or skis, while in use over snow (36 CFR 212.1)
Over-snow vehicle use map	A map reflecting roads, trails, and areas designated for over-snow vehicle use on an administrative unit or a ranger district of the National Forest System.
Resource Damage	<u>Cultural Resources</u> : Physical remains of districts, sites, structures, buildings, networks or objects that were used by humans. They may be historic, prehistoric, archaeological or architectural in nature. Cultural resources are non-renewable.

Natural Resources: 42 U.S.C. § 9601 the term natural resources means "land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States.

Damage: 36 CFR §261.2 Definitions. Damaging means to injure, mutilate, deface, destroy, cut, chop, girdle, dig, excavate, kill or in any way harm or disturb.

In the context of over-snow vehicle use, examples of resource damage may include (but is not limited to) the following: road and trail rutting, uprooted or vegetation and soil mixed with snow, crushing small mammal tunnels in meadows (subnivean zone) and damage to other natural or cultural resources.

Trail

A route 50 inches wide or less or a route over 50 inches wide that is identified and managed as a trail (36 CFR 212.1).

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