United States Department of Agriculture

Lassen National Forest Over-snow Vehicle Use Designation

Draft Environmental Impact Statement

Forest Service

Lassen National Forest

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Botany

Threatened, Endangered, Proposed, and Sensitive Plants

Because OSV use and snow trail grooming may have potential to harm Threatened, Endangered, Proposed or Sensitive (TEPS) species, this analysis will evaluate the direct, indirect, and cumulative effects of the alternatives on these botanical resources that could result from the proposed actions.

Survey and Manage and Special Interest Plants

Because OSV use and snow trail grooming may have potential to harm Survey and Manage plants and Special Interest plants, this analysis will evaluate the direct, indirect, and cumulative effects of the alternatives on these botanical resources that could result from the proposed actions.

Noxious Weeds

Noxious/invasive weeds sections present the weed species that are present and contain 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.

Other Botanical Resources

In addition, an evaluation of designated areas pertaining to botanical resources, such as Research Natural Areas (RNAs) and Special Interest Areas (SIAs) is presented in Other Botanical Resources sections.

Relevant Laws, Regulations, and Policy

Federal Law and Policy

Endangered Species Act (ESA). The Endangered Species Act of 1973 (16 USC 1531 et seq.) requires that any action authorized by a federal agency not be likely to jeopardize the continued existence of a threatened or endangered (TE) species, or result in the destruction or adverse modification of critical habitat for these species. Section 7 of the ESA, as amended, requires the responsible federal agency to consult the USFWS and the National Marine Fisheries Service concerning TE species under their jurisdiction. It is Forest Service policy to analyze impacts to TE species to ensure management activities are not likely to jeopardize the continued existence of a TE species, or result in the destruction or adverse modification of critical habitat for these species. This assessment is documented in a Biological Assessment (BA).

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 (BE).

Forest Service Manual 2670.32 (USDA Forest Service 2005) directs the Forest to avoid or minimize impacts to species whose viability has been identified as a concern, and therefore listed as Sensitive by the Regional Forester. If impacts cannot be avoided then the Forest must analyze the significance of the potential adverse effects on the population or its habitat within the area of concern and on the species as a whole. Impacts may be allowed but the decision must not result in a trend toward federal listing.

Forest Service Manual 2670.22 (USDA Forest Service 2005) directs national forests to “maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands.” To comply with this direction, Forests are encouraged to track and evaluate effects to additional species that may be of concern even though they are not currently listed as Sensitive. Such plant species are referred to as 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 signed on Feb 3, 1999, establishing the National Invasive Species Council (NISC) 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".

Land and Resource Management Plan

The Lassen National Forest Land and Resource Management Plan (LRMP 1993) provides standards and guidelines for the following botanical resources:

TEPS plants (LRMP p. 4-36)

a. Maintain habitat and viable populations to contribute to eventual de-listing of Sensitive plants that are found on the Forest.

    1. Identify, preserve, or enhance Sensitive plant populations.

    2. Restrict vegetative or soil disturbance in areas occupied by Sensitive plants, unless manipulation is needed to perpetuate the species.

3. Within the planning period, develop Species Management Guides for Sensitive plants that identify population goals and compatible management activities.

b. Manage Sensitive plants to insure that species do not become Threatened or Endangered because of Forest Service actions.

1. Evaluate all proposed projects for potential Sensitive plant habitat. Conduct surveys at the correct time of year for species identification if potential habitat exists in a project area.

2. If Sensitive plants are found in a proposed project, modify the project or take mitigative action as necessary to protect the habitat.

Noxious/Invasive Weeds (LRMP p. 4-25)

a. Reduce impacts of forest pests on all resources to acceptable levels through integrated pest management.
   1. Use an integrated pest management (IPM) approach to managing pests during the planning and implementation of all activities that influence vegetation. Consider a full range of pest management alternatives for each project. Select treatment methods through an environmental analysis process that considers the environmental effects, treatment efficacy, and cost effectiveness of each alternative. Determine monitoring and enforcement plans during this site-specific process. Also use pest detection, surveillance, evaluation, prevention, suppression and post-action evaluation as integral components of this IPM approach.
   3. Cooperate with the State and counties in control of noxious weeds and predation.

Survey and Manage species

Forest-wide standards and guidelines for “Survey & Manage” old-growth associated species were revised in January 2001 and described in the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures, Standards and Guidelines (2001 ROD) (USDA FS and USDI BLM 2001). Category A and C species that are considered to be within the California Klamath Province require pre-disturbance field survey prior to implementing management actions that could significantly, negatively affect the species’ habitat or persistence of the species on the site. Pre-disturbance surveys are not required if delay in implementation of a proposed action to perform surveys would result in an unacceptable environmental risk. The adopted standards and guidelines for Survey and Manage species only applies within the area of the Northwest Forest Plan (NWFP), which, on the Lassen National Forest, encompasses approximately 41,893 acres in the northwest portion of the Hat Creek Ranger District.

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:

- Bog and Fen Habitat (SNFPA ROD page 65, S&G #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.

- Sensitive Plant Surveys (Corrected Errata, April 19, 2005): Conduct field surveys for TEPS plant species early enough in project planning process that the project can be designed to conserve or enhance TEPS plants and their habitat. Conduct surveys according to procedures outlined in the Forest Service Handbook (FSH 2609.25.11). If additional field surveys are to be conducted as part of project implementation, survey results must be documented in the project file. (Management Standard & Guideline 125). The standards and guidelines provide direction for conducting field surveys, minimizing or eliminating direct and indirect impacts from management activities, and adherence to the Regional Native Plant Policy (USDA Forest Service 2004).
- 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

Research Natural Areas (RNAs) and Special Interest Areas (SIAs) may have specific management objectives for unique botanical features or other features of interest. On the Lassen National Forest, no management plans are available for RNAs or SIAs.

The Lassen LRMP (1993, pp. 4-99 to 4-102) contains a prescription for special areas, including Experimental Forests, RNAs, SIAs, and Wild and Scenic Rivers. The purpose of the prescription is to preserve areas with unusual historical, geological, botanical, zoological, paleontological, or other special characteristics for public enjoyment and research. These areas are managed primarily to produce benefits other than timber, range, forage, minerals, and other commodities. Off-road vehicle use is not allowed in

RNAs, and so these areas should be excluded from OSV use. Restricted off-road vehicle use is allowable in other types of special areas. This prescription applies to both designated and proposed special areas. Standards and Guidelines are also described for these special areas, and those that apply to OSV use are presented below:

- Manage recreation according to the designated Recreation Opportunity Spectrum classes.
- Prohibit motorized vehicles within Research Natural Areas.

Desired Condition

One goal of the Lassen National Forest Botany Program is to maintain viable populations of TEPS plants, Survey and Manage plants, and Special Interest plants. In addition, it is desired that invasive weed species are reduced by a combination of control methods along with prevention practices including education and requirements for weed-free materials and equipment.

Topics and Issues Addressed in This Analysis.

Issues

OSV uses may have potential to cause direct and indirect effects to TEPS plants, Survey and Manage plants, Special Interest plants, and invasive plants, but are most likely to affect those which 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. Potential 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 potential effects become much more likely if OSV use occurs where/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 afterwards 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 open to OSV use. When snow cover is not adequate, OSV use on and off established routes has potential to 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.

Possible effects from invasive plant species will be addressed. The proposal and alternatives will also be evaluated for appropriate management and Forest Plan consistency for Research Natural Areas (RNAs) and those Special Interest Areas (SIAs) with a focus on botanical resources.

Resource Indicators and Measures

Table 106. Botanical resources indicators and measures for assessing effects

Resource Element	Resource Indicator	Measure	Used to address: P/N, or key issue?	Source (LRMP S/G; law or policy, BMPs, etc.)?
Vegetation	Species presence	Acres of TEPS, Survey and Manage, and Special Interest plant occurrences within open OSV use areas. Acres of TEPS, Survey and Manage, and Special Interest plant occurrences within 100 feet of designated OSV routes.	No	FSM 2670
Vegetation	Qualitative discussion of species' responses to proposed activities	TEPS, Survey and Manage, and Special Interest plants effects determination.	No	FSM 2670
Vegetation	Noxious/invasive weed presence	Acres of weed infestations within open OSV use areas. Acres of weed infestations within 100 feet of designated OSV routes.	No	FSM 2900
Vegetation	Noxious/invasive weed response to proposed activities	Level of risk (high, moderate, low) for the project introducing or spreading weeds.	No	FSM 2900
Vegetation	Presence of designated botanical resource areas (RNAs, SIAs)	Acres of botanical resource areas within open OSV use areas. Acres of botanical resource areas within 100 feet of designated OSV routes.	No	LRMP pp. 4-99 to 4-102

Environmental Consequences

Methodology

This analysis uses ArcMap and relevant Geographic Information System (GIS) data layers from the Lassen National Forest and the California Natural Diversity Database (CDFG CNDDB 2015). The GIS layers of proposed OSV designations and groomed trails were overlain with the botanical resource layers to identify areas of potential effects.

A full list of plant species was considered for possible effects from the Proposed Action and alternatives. Table 107 lists USFWS Threatened, Endangered or Proposed plants and their critical habitats, as well as Region 5 Sensitive plants that may be present or are known within the planning area. Survey and Manage plants considered in this analysis are presented in Table 108. Special Interest plants that are known to occur within the planning area are presented in Table 112. The possibility of effects to each species was 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 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. 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 four possible determinations (from FSM 2672.42) are:

- No impact
- Beneficial impact
- May affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area
- May affect individuals, and is likely to result in a trend toward Federal listing or loss of viability in the planning area

Similar categories for federally listed threatened and endangered species are:

- No effect
- Beneficial effect
- May affect, not likely to adversely affect
- May affect, likely to adversely affect

Information Sources

Information used in this analysis includes pertinent scientific literature, project specific botanical data, results of surveys and site revisits, local knowledge of Lassen National Forest botanists, and GIS layers of the following data: project boundary, actions by alternative, Lassen National Forest TEPS plant occurrences, and the California Natural Diversity Database (CDFG CNDDB 2015).

Incomplete and Unavailable Information

There is little research and information available regarding the responses of each plant species or whole plant communities from OSV uses, including indirect effects from snow compaction and vehicle emissions during the winter.

Assumptions specific to the botanical resources analysis

- Plants are unlikely to be directly affected by authorized OSV use (with the specified snow depth requirements) 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 the corridors along designated OSV trails (groomed or ungroomed). Therefore, an area within 100 feet of designated OSV trails is reasonably foreseeable to be affected by snow compaction, emissions, or other contamination. Areas open to 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 into any areas open to 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

The project area boundary serves as the analysis boundary for direct, indirect, and cumulative effects. 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.

Direct/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.

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.

Affected Environment

Existing Condition

Threatened, Endangered, and Proposed Plants

Official species lists for this project were obtained on September 29, 2015, from the Klamath Falls, Sacramento, Yreka, and Nevada Field Offices of the United States Department of the Interior, Fish and Wildlife Service (USDI FWS 2015a, USDI FWS 2015b, USDI FWS 2015c, USDI FWS 2015d). The lists identify seven plant species to consider, because they may be present within the general area of the Lassen National Forest:

- *Calochortus persistens* (Candidate)
- *Chamaesyce hooveri* (Threatened)
- *Fritillaria gentneri* (Endangered)
- *Limnanthes floccosa* ssp. *californica* (Endangered)
- *Orcuttia tenuis* (Threatened)
- *Pinus albicaulis* (Candidate)
- *Tuctoria greenei* (Endangered)

The candidate species *Pinus albicaulis* (whitebark pine) and *Calochortus persistens* (Siskiyou Mariposa Lily) are addressed as Region 5 Sensitive species in this analysis. *Calochortus persistens* is not suspected to occur on Lassen National Forest lands, but *Pinus albicaulis* does occur at some higher elevations on the Forest.

Chamaesyce hooveri (Hoover’s spurge) occurs in vernal pools from Tehama to Merced counties below 1,000 feet in elevation. Designated critical habitat does not occur on the Lassen National Forest (USDI FWS 2003a), and suitable habitat for the species is also not present.

Fritillaria gentneri (Gentner’s fritillary) is endemic grows in grassland and chaparral habitats primarily in Jackson and Josephine counties in southwestern Oregon. It also occurs in northern California very close to the Oregon border, and all occurrences are within about a 30-mile radius of Jacksonville, Oregon

(USDI FWS 2003b). The Lassen National Forest is well outside the suspected distributional range for this species.

Limnanthes floccosa ssp. *californica* (Butte County meadowfoam) has not been found here and does not have designated critical habitat on the Forest (USDI FWS 2003a). The project area is outside the range for this species which is known only to valley and foothill grasslands of the lower elevations of Butte County.

Orcuttia tenuis (slender Orcutt grass) and *Tuctoria greenei* (Greene's tuctoria) are the only listed or proposed plant species whose range or critical habitat is present on the Lassen National Forest. Critical habitat has been designated for *Orcuttia tenuis* and *Tuctoria greenei* including approximately 25,000 acres located within or adjacent to the boundaries of the Lassen National Forest (USDI FWS 2003a).

Region 5 Sensitive Plants

There are currently 49 Region 5 Sensitive plant species known to occur in the project area. See Table 107 below for the complete list and evaluation of TEPS species and habitat presence.

Table 107. TEPS plant species considered

Scientific Name Common Name	Habitat	Species present ?	Habitat present ?	Effects analysis needed?
Threatened Plants				
Chamaesyce hooveri Hoover's spurge	Vernal pools, typically on alluvial fans or terraces of ancient rivers or streams, along the eastern margin of California's Central Valley, from Tehama County to Merced County. Below 1,000 ft. Flowers July-October. Annual herb.	No	No	No. No Effect. Habitat does not exist on Lassen National Forest.
Chamaesyce hooveri designated critical habitat	Critical habitat is designated in Tehama, Butte, Stanislaus, Merced, and Tulare Counties.	No	No	No. No Effect. Critical habitat does not exist on the Lassen National Forest.
Orcuttia tenuis slender orcutt grass	Vernal pools, in oak and/or pine woodlands. Below 5,800 ft. Flowers May-July. Annual grass. Species occurs on Lassen National Forest.	Yes	Yes	Yes
Orcuttia tenuis designated critical habitat	Critical habitat units are designated in Siskiyou, Modoc, Shasta, Lassen, Tehama, Plumas, Lake, and Sacramento Counties. 23,317 acres of critical habitat occurs on the Lassen National Forest.	Yes	Yes	Yes
Endangered Plants				
Fritillaria gentneri Gentner's Fritillary	Grassland and chaparral habitats within, or on the edges of, dry, open, mixed-species woodlands at elevations below 1,544 meters (5,064 feet). The species is highly localized within about a 30-mile radius of Jacksonville, Oregon (USFWS 2003a).	No	No	No. No Effect. Habitat does not exist on Lassen National Forest.
Limnanthes floccosa ssp. californica Butte County Meadowfoam	Vernal pools in valley and foothill grasslands of Butte County, below about 3,000 feet. Flowers March-May. Annual herb. It is known or suspected to occur in Butte, Glenn, and Tehama Counties. Habitat does not occur on Lassen National Forest.	No	No	No. No Effect. Habitat does not exist on Lassen National Forest.
Limnanthes floccosa ssp. californica designated critical habitat	Critical habitat is designated in Tehama and Butte Counties. No critical habitat exists on the Lassen National Forest.	No	No	No. No Effect. Critical habitat does not exist on the Lassen National Forest.
Tuctoria greenei Greene's tuctoria	Vernal Pools. On private land at Murken Lake. 3,500 ft. and below. Flowers May-July. Annual grass. No known occurrences exist on the Lassen National Forest, but suitable habitat is present.	No	Yes	Yes

Scientific Name Common Name	Habitat	Species present ?	Habitat present ?	Effects analysis needed?
Tuctoria greenei designated critical habitat	Critical habitat is designated in Shasta, Tehama, Butte, Stanislaus, Tuolumne, Merced, Mariposa, and Madera Counties. 1,551 acres of critical habitat occurs on the Lassen National Forest.	No	Yes	Yes.
Sensitive Plants				
Astragalus pulsiferae var. suksdorfii Suksdorf's milk-vetch	Sandy volcanic soils in sagebrush or pine within a 25-mile radius of Mt. Lassen; Pine Creek Valley and near Bogard Buttes; 4,500-6,500 ft. Flowers May-Aug., Perennial herb.	Yes	Yes	Yes
Boechera constancei Constance's rockcress	Habitat of serpentine soils or rock outcrops; 3,500-6,750 ft. Flowers May-June. Perennial herb.	Yes	Yes	Yes
Botrychium ascendens upswept moonwort	Perennially wet springs, seeps, and streambanks in mixed coniferous forests; 5,200-6,240 ft. Flowers July-Aug. Perennial herb.	Yes	Yes	Yes
Botrychium crenulatum scalloped moonwort	Perennially wet springs, seeps, and streambanks in mixed coniferous forests well-surveyed; 5,040-6,000 ft. Flowers June-July. Perennial herb.	Yes	Yes	Yes
Botrychium lunaria common moonwort	Habitat of moist subalpine meadows, stream banks, springs or seeps; 7,000-10,000 ft. Flowers July-Aug. Perennial herb.	No	Possible	Yes
Botrychium minganense Mingan moonwort	Perennially wet springs, seeps, and streambanks in mixed coniferous forests; 5,240-6,250 ft. Flowers July-Aug. Perennial herb.	Yes	Yes	Yes
Botrychium montanum western goblin	Perennially wet springs, seeps, and streambanks in mixed coniferous forests; 5,200-6,250 ft. Flowers July-Aug. Perennial herb.	Yes	Yes	Yes
Botrychium pedunculosum stalked moonwort	Springs, seeps or streambanks in upper montane conifer forest. Flowers in August. Perennial herb.	No	Possible	Yes
Botrychium pinnatum northwestern moonwort	Perennially wet springs and streambanks in mixed coniferous forests; 5,200-6,250 ft. Flowers July-Oct. Perennial herb.	Yes	Yes	Yes
Bruchia bolanderi Bolander's bruchia	Habitat of bare soil along westside montane stream banks in mixed conifer forests; One occurrence reported, but unconfirmed. 3800-8200 ft. Bryophyte, Moss (perennial).	No	Possible	Yes
Buxbaumia viridis green bug-on-a-stick	Habitat of highly decayed logs, peaty soil or humus in westside, moist, shaded conditions. Bryophyte, Moss (perennial).	No	Possible	Yes
Calochortus longebarbatus var. longebarbatus long haired star tulip	Habitat of eastside seasonally wet meadows north of Highway 299; 4,000-6,300 ft. Flowers June-July. Perennial herb.	Yes	Yes	Yes
Calochortus persistens Siskiyou mariposa lily	Open, rocky areas, NE Klamath Ranges (Siskiyou County); 3,280-4,921 ft. Flowers June-July. Perennial herb.	No	No	No. No Impact. Not suspected to occur on the Lassen National Forest.
Clarkia gracilis ssp. albicaulis white-stemmed clarkia	Habitat of low-elevation westside foothill open areas; 500-3,600 ft. Flowers May-July. Annual herb.	Yes	Yes	Yes
Clarkia mildrediae ssp. mildrediae Mildred's clarkia	Habitat of sandy, often granitic or disturbed soils in lower montane mixed conifer forests; 1,500-5,200 ft. Flowers June-July. Annual herb.	Yes	Yes	Yes
Collomia larsenii talus collomia	Loose volcanic gravel on talus slopes of alpine fell-fields; 7,250-11,500 ft. Flowers July-Oct. Perennial herb. The single known occurrence on LNF is within the Thousand Lakes Wilderness.	No	No	No. No Impact. Not suspected to occur in areas proposed for OSV use.
Cryptantha crinita silky cryptantha	Habitat of foothill gray pine forest and blue oak woodlands near the Ishi Wilderness; below 3,700 ft. Flowers April-May. Annual herb.	Yes	Yes	Yes
Cypripedium fasciculatum clustered lady's-slipper	Habitat of mid to late seral westside mixed conifer forest south of Lake Almanor; 2,000-6,000 ft. Flowers March-July. Perennial herb.	Yes	Yes	Yes

Scientific Name Common Name	Habitat	Species present ?	Habitat present ?	Effects analysis needed?
Cypripedium montanum mountain lady's-slipper	Habitat of moist mixed coniferous forest and riparian areas with high canopy cover, north of Burney (Hat Creek RD); 2,800-6,000 ft. Flowers March-July. Perennial herb.	Yes	Yes	Yes
Eremogone cliftonii *Clifton's eremogone*	Chaparral and coniferous forests, on granitic sand of road cutbanks and forest openings. Flowers April-Aug. Perennial herb.	Yes	Yes	Yes
Eriastrum tracyi *Tracy's eriastrum*	Chaparral and cismontane woodland, in gravelly clay, in open areas. 1200-5300 ft. Flowers June-July. Annual herb.	Yes	Yes	Yes
Eriogonum prociduum prostrate buckwheat	Habitat of eastside juniper woodland or low sage flats; Harvey Valley; 4,200-8,900 ft. Flowers June-July. Perennial mat/subshrub.	Yes	Yes	Yes
Eriogonum spectabile Barron's buckwheat	Habitat of glaciated andesite soil in open red fir/lodgepole forest south of Lassen Volcanic NP; 6,600-6,640 ft. Flowers July-Aug. Shrub	Yes	Yes	Yes
Frangula purshiana ssp. ultramafica *caribou coffeeberry*	On substrates of serpentinized peridotite in the Bucks Lake area, Red Hill. 2,700-5,150 ft. Flowers May-July. Shrub.	Yes	Yes	Yes
Fritillaria eastwoodiae Butte County fritillary	Habitat of lower westside mixed conifer or brushy areas; 100-4,000 ft. One occurrence reported in Indian Creek RNA, but is unconfirmed. Flowers March-June. Perennial herb.	No	Possible	Yes
Helodium blandowii Blandow's bog moss	Habitat of wet meadows, seeps or fens in westside subalpine coniferous forest or alpine; 6,000-8,100 ft. Bryophyte, Moss (perennial).	No	Possible	Yes
Juncus leiospermus var. *leiospermus* Red Bluff dwarf rush	Habitat of lower elevation vernal pool or seasonally wet flats north of Hwy 299; 175-3,300 ft. Flowers April-June. Perennial herb.	Yes	Yes	Yes
Juncus luciensis *Santa Lucia dwarf rush*	Wet, sandy soils of seeps, meadows, vernal pools, streams, and roadsides. 985-6,695 ft. Flowers April-July. Perennial herb. One reported occurrence at Papoose Meadows has not been relocated.	No	Yes	Yes
Lewisia kelloggii ssp. hutchisonii Hutchison's lewisia	Ridge tops or relatively high elevations in Sierran or Klamath mountains; 5,100-7,000 ft. Flowers July-Aug. Perennial herb.	Yes	Yes	Yes
Limnanthes floccosa ssp. bellingeriana Bellinger's meadowfoam	Seasonally wet areas in oak or oak/juniper woodlands north of Highway 299, below 3,600 ft. Flowers April-June. Annual herb.	Yes	Yes	Yes
Lomatium roseanum adobe parsley	Shallow, rocky soil on open, wind-swept ridge tops, Diamond Mountains. 5880-7280 ft. Flowers April-May. Perennial herb.	Yes	Yes	Yes
Meesia uliginosa broad-nerved hump moss	Habitat of logs in westside fens; 4,300-8,200 ft. Bryophyte, Moss (perennial).	Yes	Yes	Yes
Mimulus evanescens ephemeral monkeyflower	Seasonal lake margins or vernally wet areas in sagebrush/ juniper zone. 3900-5580 ft. Flowers June-Aug. Annual herb.	Yes	Yes	Yes
Monardella follettii Follett's monardella	Habitat of serpentine soil; 2,800-5,500 ft. Flowers June-Aug. Sub-shrub.	Yes	Yes	Yes
Oreostemma elatum Plumas aster	Habitat of westside wet meadows and fens; 3,800-6,200 ft. Flowers in August. Perennial herb. One occurrence reported but unconfirmed.	No	Yes	Yes
Packera eurycephala var. *lewisrosei* cut-leaved ragwort	Habitat of serpentine soil; 1,000-6,200 ft. Flowers April-June. Perennial herb.	Yes	Yes	Yes
Peltigera gowardia veined water lichen	Habitat of cool, clear and shallow spring-fed westside streams. Aquatic jelly lichen.	Yes	Yes	Yes
Penstemon personatus closed-throated beardtongue	North-facing slopes in upper mixed conifer forest, southern Almanor RD; 4,500-6,500 ft. Flowers July-Sept. Perennial herb.	Yes	Yes	Yes

Scientific Name Common Name	Habitat	Species present ?	Habitat present ?	Effects analysis needed?
Penstemon sudans Susanville beardtongue	Open, rocky volcanic soils in yellow pine forest or juniper woodlands near Susanville; 3,900-5,600 ft. Flowers June-July. Perennial herb.	Yes	Yes	Yes
Phacelia inundata playa phacelia	Habitat of eastside subalkaline flats; 5,000-6,600 ft. Flowers May-July. Annual herb.	Yes	Yes	Yes
Pinus albicaulis whitebark pine	Upper red fir forest to timberline. 6,560-12,140 ft. Coniferous tree.	Yes	Yes	Yes
Poa sierra Sierra bluegrass	Steep, shady, rocky slopes in lower montane conifer forest. 1,195-3,805 ft. Flowers April-June. Perennial grass (herb).	No	Possible	Yes
Pyrrocoma lucida sticky pyrrocoma	Spring-wet, alkaline, clay soils below 6,000 ft., especially in sagebrush-meadow ecotone. Flowers July-Oct. Perennial herb.	Yes	Yes	Yes
Rorippa columbiae Columbia yellow cress	Habitat of large, open, seasonally wet eastside flats (playas); 4,000-5,950 ft. Flowers May-July. Perennial herb.	Yes	Yes	Yes
Rupertia hallii Hall's rupertia	Lower westside mixed conifer forest in Campbellville/Butte Meadows area; below 4,800 ft. Flowers June-Aug. Perennial herb.	Yes	Yes	Yes
Scheuchzeria palustris American scheuchzeria	Habitat of floating sphagnum fens in cold, moderately high elevation lakes; 3,000-9,000 ft. Flowers July. Perennial herb.	Yes	Yes	Yes
Sedum albomarginatum Feather River stonecrop	Habitat of serpentine rock outcrops; 1,500-6,400 ft. Flowers June. Perennial herb.	Yes	Yes	Yes
Silene occidentalis ssp. longistipitata long-stiped campion	Openings in mid-elevation, westside mixed coniferous forests south of Highway 36. 3,300-6,100 ft. Flowers July-Aug. Perennial herb.	Yes	Yes	Yes
Thelypodium howellii ssp. howellii Howell's thelypody	Alkaline meadows, seeps and pastures, sagebrush/rabbitbrush scrub. One occurrence at Dow Butte reported, but unconfirmed. 4,100-6,700 ft. Flowers May-June. Perennial herb.	No	Possible	Yes

Most species which have no known occurrences in the planning area are omitted from detailed analysis because it is not known whether the species could exist on the Lassen National Forest and there is considerable uncertainty about whether suitable habitats are present. The exception is for two Sensitive *Botrychium* species, which are more likely to occur due to their tendency to occur together with other *Botrychium* species that are known on the Lassen National Forest. Their small size also makes them very easy to overlook.

Because they are not present and not suspected of occurring within areas currently or proposed for OSV use, the following species would not be affected and are not carried forward into the effects analysis:

Threatened or Endangered Plants

Chamaesyce hooveri
Chamaesyce hooveri designated critical habitat
Fritillaria gentneri
Limnanthes floccosa ssp. *californica*
Limnanthes floccosa ssp. *californica* designated critical habitat

Sensitive Plants

Calochortus persistens
Collomia larsenii

Listed Species and Critical Habitat Information

***Orcuttia tenuis* (slender orcutt grass)**

Habitat Description

Orcuttia tenuis is a small, annual grass that occupies portions of drying and dried beds of relatively deep vernal pools or vernal pool type habitat with clay soils. The main habitat requirement for *Orcuttia tenuis* is standing water of sufficient quantity and duration to drown out most competition and supply *Orcuttia tenuis'* physiological requirements for prolonged inundation, followed by a period of gradual (becoming total) desiccation (USDA FS and USDI BLM 2012).

Status and Distribution

Orcuttia tenuis was listed as Threatened by the USFWS on March 26, 1997, along with other members of the Orcuttiae grass tribe and two vernal pool herbs (USFWS 1997).

Orcuttia tenuis is endemic to northern California, with the majority of occurrences in Tehama and Shasta Counties, mostly found on private lands, but it also extends into the Modoc Plateau. It is currently known from 82 occurrences, of which 76 are presumed to be extant (USFWS 2005). The 21 occurrences of *Orcuttia tenuis* on the Lassen National Forest (totaling 74 acres) are known from all three Ranger Districts. Seven of these are not found within designated critical habitat.

Life History

Orcuttia tenuis seeds germinate in the spring while under water, and plants send up long, floating leaves. As the pool dries, plants produce shorter terrestrial leaves, and then flowering stalks. *Orcuttia tenuis* plants generally mature later than other vernal pool annuals, so often they are the only vegetation still green by mid-summer on the vernal pool bed. As an annual, *Orcuttia tenuis* depends on seed production to replenish the seed bank for continued survival. Population sizes can fluctuate dramatically with differing amounts of precipitation each year.

Threats

Habitat loss and fragmentation is the single largest threat to the survival and recovery of listed vernal pool plants (USFWS 2005). Habitat loss generally is a result of urbanization, agricultural conversion, and mining. The principal threats to Modoc-Cascades occurrences of *Orcuttia tenuis* are associated with human-caused hydrologic alterations, livestock activity, recreational/OHV use, and vegetative competition (USDA FS and USDI BLM 2012). Nine of the 21 occurrences on the Lassen National Forest have been at least partially fenced to protect them from livestock and OHV impacts (USDA FS and USDI BLM 2012).

When wheeled vehicles are driven through vernal pools, they may impair hydrological functions by displacing soil, causing erosion, or damaging the swale or riparian connectivity, thus resulting in hydrological changes to these systems. In addition, poorly designed trail and roads systems near vernal pools may cause additional erosion and result in siltation of the vernal pool, which may inhibit germination of listed plant species. Impacts from trampling of plants by OHVs may reduce the reproductive output of vernal pool species, and plants may be crushed or killed (USDI FWS 2005). All of these impacts may have occurred to *Orcuttia tenuis* and its habitat (Sanger 2010) before cross-country travel was discontinued on the Lassen National Forest in 2010 (USDA FS 2010), and some of their effects may be persisting to the present day.

Existing Conservation Documents/Agreements

- ***Orcuttia tenuis* Species Management Guide (USDA FS and USDI BLM 1989):**1) All populations will be protected from direct disturbance by Forest Service management activities. Disturbance here includes excessive grazing, vehicle traffic within vernal pools, and hydrologic manipulation within pools. When necessary, fencing will be the primary method of protection. 2) Vernal pool hydrology of all pools containing *Orcuttia tenuis* will be maintained by designing all earth-moving projects within the drainage area to allow unchanged drainage into the vernal pools.
- **Conservation Strategy for *Orcuttia tenuis* on Federal Lands of the Southern Cascades and Modoc Plateau (USDA FS and USDI BLM 2012):** 1) Protect all occurrences of *O. tenuis* from direct disturbance by Forest Service management activities. Disturbance as defined here may include, for example, vehicle impacts or hydrologic manipulations that negatively affect vernal pool habitat. When necessary, fencing will be the primary method of protection. 2) During project design, identify any sources of potentially detrimental hydrologic impacts to vernal pools, such as borrow pits or stream headcuts. If needed, identify measures to restore vernal pool hydrology at sites where *O. tenuis* habitat has been degraded by hydrologic alteration. 3) During project planning, evaluate existing recreational impacts to vernal pool areas, and incorporate measures to eliminate these impacts, where possible. If necessary, fence or use barriers to eliminate impacts.

***Orcuttia tenuis* Designated Critical Habitat**

Critical habitat was designated in 2003, with the Primary Constituent Elements (PCEs) including (USFWS 2003b):

1. Vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths and the adjacent upland margins of these depressions that sustain *Orcuttia tenuis* germination, growth and reproduction, including but not limited to, Northern Volcanic Ashflow and Northern Volcanic Mudflow vernal pools with iron-silica and bedrock hardpan impervious layers, and that typically become inundated during winter rains, but are dry during the summer and do not necessarily fill with water every year.

2. The associated watershed(s) and hydrologic features, including the pool basin, swales, and surrounding uplands (which may vary in extent depending on pool size and depth, soil type and depth, hardpan or claypan type and extent, topography, and climate) that contribute to the filling and drying of the vernal pool or ephemeral wetland, and that maintain suitable periods of pool inundation, water quality, and soil moisture for *Orcuttia tenuis* germination, growth and reproduction, and dispersal, but not necessarily every year.

Eleven of the 21 critical habitat units occur on the Lassen National Forest, with a total of 22,258 acres. The threats to *Orcuttia tenuis* critical habitat on the Lassen National Forest are also human-caused hydrologic alterations, livestock activity, recreational/OHV use, and vegetative competition (USDA FS and USDI BLM 2012).

***Tuctoria greenei* (Greene's tuctoria)**

Habitat Description

Similar to *Orcuttia tenuis*, *Tuctoria greenei* is a summer annual grass that grows in vernal pool habitats. *Tuctoria greenei* is partially differentiated from Orcutt grasses by the spiral arrangement of spikelets and lack of floating juvenile leaves. *Tuctoria greenei* adults are unable to tolerate prolonged periods of inundation. Thus, *Tuctoria greenei* in the Central Valley tends to occur in relatively small, early-drying

pools. When *Tuctoria greenei* is found in larger pools, these are either the shallow playa type or the species is restricted to the shallow pool margins.

Status and Distribution

In 1997, *Tuctoria greenei*, Greene's tuctoria, was federally listed as Endangered (USFWS 1997) and it is State-listed as Rare. There are currently 44 known occurrences, but only 23 are presumed to be extant. Within the administrative boundary of the Lassen National Forest, there is one known occurrence of *Tuctoria greenei*, found on private lands within the Murken Lake Vernal Pool. This occurrence is disjunct from the other populations within the Central Valley and two occurrences recently found in Modoc County. Despite numerous surveys within vernally wet areas across the forest, no occurrences have been found on Lassen National Forest lands.

Life History

Tuctoria greenei seeds do not germinate while the vernal pool is still full, but only after they are exposed to light, when the water is almost completely evaporated (USFWS 2005). Germination occurs about 2 months following inundation. During the warm growing season, plants grow and produce seeds for the next year. Individual plants die at the end of the growing season.

Threats

Habitat loss and fragmentation is the single largest threat to the survival and recovery of listed vernal pool plants (USFWS 2005). Habitat loss generally is a result of urbanization, agricultural conversion, and mining. Specific threats to *Tuctoria greenei* are agricultural conversion, urbanization, inappropriate livestock grazing, small population sizes, and herbivory by grasshoppers (USFWS 2005). The Murken Lake Vernal Pool was completely fenced from livestock and OHV in 2010.

Tuctoria greenei Designated Critical Habitat

In 2003 the Fish and Wildlife Service designated 12 critical habitat units for *Tuctoria greenei* (USDI FWS 2003a). One of the 12 units is located partially on the Lassen National Forest. In the Murken Lake area, 1,702 acres of critical habitat was designated on both Lassen National Forest and private lands; however, only the Murken Lake Vernal Pool itself is believed to contain the primary constituent elements needed to support this species within this critical habitat unit. The Lassen National Forest has approximately 1,551 acres of critical habitat for this species, which includes all Forest Service lands within and adjacent to Murken Lake. The large area of unoccupied habitat was included in the unit to provide protection of the hydrologic processes supporting the species (USDI FWS 2003a).

The Primary Constituent Elements (PCEs) of designated *Tuctoria greenei* critical habitat include (USFWS 2003b):

1. Vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths and the adjacent upland margins of these depressions that sustain *Tuctoria greenei* germination, growth and reproduction, including but not limited to, Northern Claypan, Northern Hardpan, and Northern Basalt flow vernal pools that typically become inundated during winter rains, but are dry during the summer and do not necessarily fill with water every year.

2. The associated watershed(s) and hydrologic features, including the pool basin, swales, and surrounding uplands (which may vary in extent depending on pool size and depth, soil type and depth, hardpan or claypan type and extent, topography, and climate) that contribute to the filling and drying of the vernal pool or ephemeral wetland, and that maintain suitable periods of pool

inundation, water quality, and soil moisture for *Tuctoria greenei* germination, growth and reproduction, and dispersal, but not necessarily every year.

The threats to *Tuctoria greenei* critical habitat on the Lassen National Forest include human-caused hydrologic alterations, livestock activity, recreational/OHV use, and vegetative competition from invasive species.

Existing Condition

Survey and Manage Plants

Manage Known Sites Requirement

The 2001 ROD requires management of known sites of any Category A, B, or E species and high-priority sites of Category C or D species. High-priority sites are those that are needed to provide for reasonable assurance of species persistence. No high-priority sites are located on the Lassen National Forest.

Category A, C, and E species

Currently, nine species requiring pre-disturbance surveys are considered to have suitable habitat within the California Klamath Province. The Lassen OSV Designation Project planning area falls within the range of all of these except *Eucephalus vialis*, *Schistostega pennata*, and *Tetraphis geniculata*.

Table 108. Survey and manage plant species, categories A, C, and E

Scientific Name Common Name	Habitat	Known sites within NWFP portion of project?	Potential habitat present?
Botrychium minganense Mingan moonwort Category A	Edge of willow thickets in coniferous forest. No known sites in NWFP area. Also a Region 5 Sensitive species.	No	Yes
Botrychium montanum western goblin Category A	Edge of willow thickets in coniferous forest. No known sites in NWFP area. Also a Region 5 Sensitive species.	No	Yes
Buxbaumia viridis green bug-on-a-stick Category E	Large decay class 3 or 4 logs in streams in coniferous forest. No known sites in NWFP area. Also a Region 5 Sensitive species.	No	Yes
Cypripedium fasciculatum clustered lady's-slipper Category C	Mesic conifer and/or hardwood forest, especially riparian zones. No known sites in NWFP area. Also a Region 5 Sensitive species.	No	Yes
Cypripedium montanum mountain lady's-slipper Category C	Mesic conifer and/or hardwood forest, especially riparian zones. One site known in NWFP area. Also a Region 5 Sensitive species.	Yes	Yes
Eucephalus vialis wayside aster Category A	Grassy, fire-disturbed openings, sometimes within conifer forest.	No	No
Ptilidium californicum California fuzzwort Category A	Lower tree trunks of large-diameter fir or white fir, 3000 to 5000 feet.	Yes	Yes
Schistostega pennata luminous moss Category A	Moist rootwads in shady coniferous forest.	No	No
Tetraphis geniculata Tetraphis moss Category A	Decay Class 3 or 4 logs and stumps in shady, moist forest.	No	No

There are known sites for *Cypripedium montanum* and *Ptilidium californicum* within the NWFP portion of the Lassen National Forest. Because *Cypripedium montanum* is also a Region 5 Sensitive species, it is also being addressed forest-wide in the Biological Assessment/Biological Evaluation for the Lassen OSV Designation Project.

Category B species

The 2001 ROD provides direction to perform equivalent effort (project level) field surveys for all Category B Survey and Manage fungi in old-growth habitat in which province-wide strategic surveys (broad scale) have not been completed by September 30, 2010, when ground-disturbing actions are proposed. In 2001, there were 124 Category B fungi on the Survey and Manage list. Strategic survey requirements have been met for 66 of these species, leaving 58 species that call for equivalent effort surveys prior to completion of NEPA analysis. These species are listed in table 109.

Table 109. Survey and manage category B fungi with equivalent effort survey requirement

Albatrellus caeruleoporus	*Gymnopilus punctifolius,* In California	*Ramaria coulterae*
Albatrellus ellisii	*Gyromitra californica*	*Ramaria cyaneigranosa*
Albatrellus flettii, In Washington and California	*Helvella elastica*	*Ramaria maculatipes*
Alpova olivaceotinctus	*Hydnotrya inordinata* (*Hydnotrya* sp. nov. #Trappe 787, 792)	*Ramaria rainierensis*
Balsamia nigrens (Balsamia nigra)	*Hydropus marginellus (Mycena marginella)*	*Ramaria rubribrunnescens*
Chamonixia caespitosa (*Chamonixia pacifica* sp. nov. #Trappe #12768)	*Hypomyces luteovirens*	*Ramaria stuntzii*
Choiromyces venosus	*Leucogaster microsporus*	*Ramaria verlotensis*
Chrysomphalina grossula	*Marasmius applanatipes*	*Rhizopogon abietis*
Clavariadelphus ligula	*Martellia fragrans*	*Rhizopogon brunneiniger*
Clavariadelphus subfastigiatus	*Martellia idahoensis*	*Rhizopogon chamaleontinus* (*Rhizopogon* sp. nov. #Trappe 9432)
Cortinarius boulderensis	*Octavianina cyanescens* (*Octavianina* sp. nov. #Trappe 7502)	*Rhizopogon ellipsosporus* (*Alpova* sp. nov. # Trappe 9730)
Cortinarius cyanites	*Otidea smithii*	*Rhizopogon evadens* var. *subalpinus*
Cudonia monticola	*Phaeocollybia californica*	*Rhizopogon exiguus*
Destuntzia fusca	*Phaeocollybia piceae*	*Rhizopogon flavofibrillosus*
Destuntzia rubra	*Phaeocollybia scatesiae*	*Rhodocybe speciosa*
Entoloma nitidum (Rhodocybe nitida)	*Phaeocollybia sipei*	*Rickenella swartzii (Rickenella setipes)*
Gastroboletus ruber	*Podostroma alutaceum*	*Sarcodon fuscoindicus*
Gastroboletus vividus (*Gastroboletus* sp. nov. #Trappe 2897; *Gastroboletus* sp. nov. #Trappe 7515)	*Polyozellus multiplex*	*Sedecula pulvinata*
Gastrosuillus umbrinus (*Gastroboletus* sp. nov. #Trappe 7516)	*Ramaria aurantiisiccescens*	*Tricholomopsis fulvescens*
		Tuber asa (*Tuber* sp. nov. #Trappe 2302)

The following seven Category B fungi are known to occur within the NWFP portion of the Lassen National Forest:

- *Alpova olivaceotinctus*
- *Bondarzewia mesenterica*
- *Clavariadelphus truncatus*
- *Mythicomyces comeipes*
- *Ramaria rubrievanescens*
- *Rhizopogon truncatus*
- *Spathularia flavida*

As an alternative to equivalent effort surveys at the project level, proposed actions may incorporate project design features that meet the management recommendations for conserving fungi habitat in the following ways (derived from Castellano et al. 1999, Castellano et al. 2003, and USDA FS and USDI BLM 1994):

- retention of overstory canopy cover to maintain shade and soil moisture
    - 50% or higher canopy cover will be maintained in all thinning units
- retention of a component of older overstory host trees specific to each fungi species to provide for nutrient transfer
    - the largest/oldest trees in each unit will be retained, as well as trees with large cavities and other types of deformities
- retention of a component of forest floor organic matter to provide nutrients and fungal diversity, and maintain soil moisture for decomposition processes
    - soil productivity standards require maintenance of 50%+ fine organic matter cover and at least 5 logs per acre in a range of decay classes
- retention of large, woody debris on the forest floor to provide nutrients and fungal recruitment diversity
    - all snags 19 inches or larger in diameter and an average of 5 tons of logs per acre will be retained

Special Interest Plants

Often referred to as “watch list” species, Special Interest plants are species which do not meet all of the criteria to be included on the Regional Forester’s Sensitive Plant List, but are of sufficient concern that we need to consider them in the planning process. These include species that are locally rare, are of public concern, occur as disjunct populations, are newly described taxa, or lack sufficient information on population size, threats, trend or distribution. To better identify these species, forests have been encouraged to develop watch lists for these Special Interest species. These 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. Effects to these species are evaluated when they are known to occur in project areas. Seventy-eight Special Interest plants are known to occur on the Lassen National Forest. Species which are not known to occur in areas that may be open to OSV use are not included in this analysis. See Table 110.

Table 110. Special interest plant species considered

Scientific Name Common Name	Habitat	Life Form
Allium sanbornii var. *sanbornii* Sanborn's onion	Granite, volcanic, or serpentine outcrops. West of Mineral, Battle Creek. Flowers May-Sept.	Perennial herb
Anthoxanthum nitens ssp. *nitens* vanilla grass	Meadows or under lodgepole. Bunchgrass Valley and Brokeoff Meadows. 4,900-6,200 ft. Flowers April-July.	Perennial grass
Arnica fulgens hillside arnica	Eastside meadows. Open damp depressions in sagebrush scrub or grasslands. Clover/Grays Val. Flowers May-Aug.	Perennial herb
Artemisia tripartita ssp. *tripartita* threetip sagebrush	Upper montane coniferous forest, in rock, volcanic openings. 7,200-8,500 ft. Flowers in August.	Shrub
Asplenium septentrionale northern spleenwort	Dacite rock outcrops or cliffs. LVNP, Manzanita Chutes & Christie Hill. Flowers Jul-Aug.	Perennial herb
Astragalus inversus Susanville milk-vetch	Plains and sparsely wooded hills in sagebrush scrub and yellow pine forests. Frequent. Flowers May-Sept.	Perennial herb
Astragalus pauperculus depauperate milk-vetch	Blue oak woodland and chapparrel, or rocky grassland areas. Indian Creek RNA. Flowers March-May.	Perennial herb
Betula glandulosa bog birch	Boggy meadows. Bridge Creek, Big Springs, Humbug Valley. Flowers April-June.	Deciduous Tree/Shrub
Botrychium simplex Yosemite moonwort	Wet meadows. Uncommon. LT Creek, Milkhouse Flat, Magee Lake. Flowers July-Sept.	Perennial herb
Brasenia schreberi watershield	Wetlands, Lakes, Fens. Domingo, Wilson, Shotoverin and Cameron Lakes. Flowers June-Sept.	Aquatic, perennial
Calystegia atriplicifolia ssp. *buttensis* Butte Co. morning glory	Open dry slopes in pine or oak and pine forests. Graham Pinery RNA. 2,000-4,000 ft. Flowers May-July.	Perennial herb
Cardamine bellidifolia var. *pachyphylla* alpine bittercress	Rocky outcrops and scree slopes. 7,100-9,200 ft. Flowers June-Aug.	Perennial herb
Carex davyi Davy's sedge	Dry, often sparse meadows and slopes. 4,595-10,830 ft. Flowers May-Aug.	Perennial herb
Carex geyeri Geyer's sedge	Dry slopes and open woods. Cornelia Lott Sank Memorial Spring. Flowers May-June.	Perennial herb
Carex lasiocarpa woolly-fruited sedge	Pond edges and fens. Willow Lake, Domingo Lake, Cooper Swamp, Hay Meadows. Flowers June-July.	Perennial herb
Carex limosa mud sedge	Fens. Willow & Domingo Lakes, Cooper Swamp, Green Island Lake. Flowers June-Aug.	Perennial herb
Carex petasata Liddon's sedge	Meadows, lower montane conifer forests. Patterson Flat. Halls Flat and Burgess Springs. Flowers June-July.	Perennial herb
Caulanthus major var. *nevadensis* slender jewel-flower	Juniper woodland, open rocky areas. Dow Butte (location uncertain). Flowers June-July.	Perennial herb
Claytonia palustris marsh claytonia	Montane marshes and swamps; Jonesville, Colby, etc. Flowers June-Aug.	Perennial herb
Dimeresia howellii doublet	Dry volcanic areas. North of Sheepshead. Flowers May-July.	Annual herb
Drosera anglica English sundew	Cold bogs in yellow pine or fir forests. Willow Lake, Domingo Lake, Big Springs. Flowers July-Aug.	Perennial herb
Erigeron inornatus var. *calidipetris* hot rock daisy	Sandy, volcanic soils. Frequent. Flowers June-Sept.	Perennial herb
Erigeron nivalis northern daisy	Subalpine lava outcrops. Lassen Peak, Mt. Harkness, Mt. Shasta; Bogard Buttes. Flowers July-Aug.	Perennial herb
Erigeron petrophilus var. *sierrensis* northern Sierra daisy	Rocky foothills to forests, sometimes on serpentine. Near Middle Camp. Flowers June-Sept.	Perennial herb
Eriogonum ovalifolium var. *depressum* depressed wild buckwheat	Low mounds around playas. 5,700 ft. Windy Hollow. Flowers June-Aug.	Perennial herb/subshrub
Eriogonum pyrolifolium var. *pyrolifolium* pyrola-leaved buckwheat	High elevation volcanic talus. Red Cinder (Caribou) and LNVP. Known site on Forest but not mapped in GIS. 5,200-10,800 ft. Flowers July-Sept.	Perennial herb/subshrub
Eriophorum gracile cotton grass	Fens and wet meadows in upper conifer forests. Almanor Fens. Flowers May-Sept.	Perennial herb

Scientific Name Common Name	Habitat	Life Form
Gratiola heterosepala Boggs Lake hedge-hyssop	Vernal pools and wet edges of lakes and reservoirs. Conservation Strategy 1994. Flowers Apr-Aug.	Annual herb
Hackelia amethystina amethyst stickseed	Openings in forest and meadows, dry slopes. Diamond Mts. Flowers June-July.	Perennial herb
Hackelia cusickii Cusick's stickseed	Under large old-growth junipers. Ebey Lake area. Flowers Apr-July.	Perennial herb
Hesperocyparis bakeri Baker cypress	Dry volcanic or serpentine soil, in chaparral or yellow pine forests. Cub Ck, Burney Mtn, and Timbered Crater areas. Flowers all seasons.	Conifer tree
Hulsea nana little hulsea	High elevation Cascade peaks. LVNP, Burney Mt., and Magee Peak in 1000 Lakes Wilderness. Flowers July-Aug.	Perennial herb
Iliamna bakeri Baker's globe mallow	Volcanic loam or lava beds, especially post-fire. Juniper woodland, chaparral. 3,200-8,200 ft. Flowers July-Aug.	Perennial herb
Juncus hemiendytus var. *abjectus* Center Basin rush	Damp or vernally wet open areas. Flowers June-July.	Perennial herb
Lilium humboldtii ssp. *humboldtii* Humboldt lily	Chaparral and lower montane conifer forests on dry forest floor or dry brushy slopes. Near Deer Creek (Barkley Fire). Flowers May-July.	Perennial herb
Limnanthes floccosa ssp. *floccosa* woolly meadowfoam	Vernal pools, drainages, etc. in woodlands. Cayton; Finley Lake, etc. Flowers Mar-June.	Annual herb
Lupinus dalesiae Quincy lupine	Dry, often rocky slopes in mixed conifer forest on slate soil. 2,500-6,500 ft. Flowers May-July.	Perennial herb
Lycopus uniflorus northern bugleweed	Fens, marshes, swamps. Willow Lake and Willow Creek, Domingo Lake. Flowers July-Sept.	Perennial herb
Lysimachia thyrsiflora tufted loosestrife	Lake and stream margins, meadows. Willow Lake. 2,625-5,495ft. Flowers May-August.	Perennial herb
Meesia triquetra 3-ranked hump-moss	Fens and seeps, South of Lassen National Park, Big Springs, Little Grizzly Creek. Flowers any season.	Bryophyte, moss (perennial herb)
Mimulus glaucescens shield-bracted monkeyflower	Wet places in foothill woodland, grassland. Front Country. Frequent. Flowers Mar-May.	Annual herb
Mimulus pygmaeus Egg Lake monkeyflower	Moist soil in open meadows, drainages or edges of pools, in open woods, sage. Flowers May-June.	Annual herb
Muhlenbergia jonesii Jones' muhly	Moist soil in open meadows, drainages or edges of pools, in open woods, sage. Flowers June-Aug.	Perennial grass
Navarretia subuligera awl-leaved navarretia	Rocky plains and slopes, foothill woodland, yellow pine forest. Indian Creek RNA. Flowers Apr-Aug.	Annual herb
Nemophila breviflora basin nemophila	Streambanks, meadows, thickets. Ponds south of Soldier Mt. 4,000-7,910 ft. Flowers May-July.	Annual herb
Packera indecora rayless mountain butterweed	Meadows and seeps, Type locality near Pine Creek. Flowers July-Aug.	Perennial herb
Penstemon cinicola ash beardtongue	Dry or moist volcanic sands, yellow pine or lodgepole forests. Caribou, Butte Ck. Flowers June-Aug.	Perennial herb
Penstemon heterodoxus var. *shastensis* Shasta beardtongue	Meadowy, open grassy sites in yellow pine to red fir. Flowers June-Aug.	Perennial herb
Penstemon janishiae Janish's beardtongue	Rocky areas or openings in sagebrush or juniper. Diamond Mt. Flowers May-July.	Perennial herb
Phlox muscoides moss phlox	Rocky alpine slopes. Lassen, Loomis Pk. Flowers July-Aug.	Perennial herb
Piperia colemanii Coleman's rein orchid	Chaparral, duff in lower montane coniferous forest, often shaded. 3,600-7,000 ft. Flowers June-Aug.	Perennial herb
Pogogyne floribunda profuse-flowered pogogyne	Vernal pools and similar habitat on Modoc Plateau. 3,200-5,000 ft. Flowers June-Aug.	Annual herb
Polyctenium fremontii var. *fremontii* Fremont's combleaf	Vernally moist depressions. Government Lake and Pine Creek. 3,200-6,800 ft. Flowers May-June.	Perennial herb
Polygonum bidwelliae Bidwell's knotweed	Open areas in pine or pine and oak forests. Cayton Valley area, and Indian Creek RNA. Flowers Apr-June.	Annual herb

Scientific Name Common Name	Habitat	Life Form
Polystichum kruckebergii Kruckeberg's swordfern	Cliff crevices and talus slopes, mid to high elevation. Humboldt Pk, Mt. Harkness (LVNP). Green Island Lake RNA. Flowers July-Aug.	Perennial herb
Polystichum lonchitis northern hollyfern	Subalpine and upper montane conifer forests/ granitic or carbonate. Green Island Lake RNA. 5,400-7,800 ft. Flowers June-Sept.	Perennial herb
Potamogeton robbinsii Robbins's pondweed	Deep water. Saucer Lake (Green Island Lake RNA). 4,985-11,485 ft. Flowers July-Aug.	Aquatic perennial herb
Potamogeton praelongus white-stemmed pondweed	Deep water. Willow Lake. Flowers July-Aug.	Aquatic perennial herb
Potentilla newberryi Newberry's cinquefoil	Seasonally flooded flats. Butte Creek Pit and Huckleberry Meadows. Flowers May-Aug.	Perennial herb
Rhynchospora alba white beaked-rush	Fens, freshwater marshes in yellow pine, mixed conifer, or fir. Willow Lake. Flowers July-Aug.	Perennial herb
Schoenoplectus heterochaetus slender bulrush	Lake margins and marshes. Wilson Lake only known location in CA. Flowers in August.	Aquatic perennial herb
Schoenoplectus subterminalis water bulrush	Fen and montane lake margins. Near Wilson Lake, Hay Mdws, Cameron Meadows & Philbrook Reservoir. Flowers July-Aug.	Aquatic perennial herb
Scutellaria galericulata marsh skullcap	Marshes, swamps. Fall River; Lake Almanor near Last Chance. Flowers June-Sept.	Perennial herb
Senecio hydrophiloides sweet marsh ragwort	Wet meadows in eastside pine or lodgepole. Flowers May-July.	Perennial herb
Silene occidentalis ssp. *occidentalis* western campion	Montane coniferous forest, open dry sites, chaparral. Flowers June-Aug.	Perennial herb
Sparganium natans small bur-reed	Fens and lake margins, cooler places. Green Island Lake; Bear Flat, etc. Flowers in Aug.	Perennial herb
Stellaria longifolia long-leaved starwort	Fens, wet meadows and riparian zones. Jonesville, Goose Valley, Philbrook Res., Last Chance and Mill Creeks. Flowers May-Aug.	Perennial herb
Stellaria obtusa obtuse starwort	Moist soil in red fir or yellow pine forests. Frequent. Flowers June-Aug.	Perennial herb
Stenotus lanuginosus woolly stenotus	Meadow margins or low sage; shallow rocky soil. Flowers May-July.	Perennial herb
Streptanthus longisiliquus long-fruit jewelflower	Broadleaf upland and lower montane conifer forests. Rattlesnake Creek. Flowers Apr-Sept.	Perennial herb
Stuckenia filiformis ssp. *alpina* slender-leaved pondweed	Shallow freshwater marshes and swamps. Green Island Lake RNA. 985-7,055ft. Flowers May-July.	Aquatic perennial herb
Subularia aquatica ssp. *americana* water awlwort	Lake margins and streambanks in upper montane conifer forests. On LNF, but location unmapped. 5,700-9,300 ft. Flowers July-Sept.	Aquatic annual herb
Thermopsis californica var. *argentata* silvery false-lupine	Somewhat alkaline flats, yellow pine forests. Many locations on district. Flowers Apr-Aug.	Perennial herb
Trifolium andersonii ssp. *andersonii* Anderson's clover	Open eastside pine, sandy soil. Elysian Valley. 3,000-8,000 ft. Flowers June-July.	Perennial herb
Trillium ovatum ssp. *oettingeri* Salmon Mtns wakerobin	Damp, shaded mixed conifer forests at the edge of wet or moist drainages. Screwdriver area and Mill Ck. below LVNP. Flowers Feb-July.	Perennial herb
Utricularia intermedia flat-leaved bladderwort	Shallow water/fens. Boundary Fen, Willow Lake, Last Chance Marsh, lake near Hay Mdw, near Snag Lake. Flowers July-Aug.	Aquatic perennial herb
Utricularia minor lesser bladderwort	Shallow water/fens and marshes. Coon Hollow, Papoose Meadows, and Green Island, Willow, and Wilson Lakes. Flowers in July.	Aquatic perennial herb
Utricularia ochroleuca cream-flowered bladderwort	Shallow water, lake margins. Last Chance Marsh (per Rondeau), Boundary Fen, Willow and Little Willow Lks. Flowers June-July.	Aquatic perennial herb

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**, 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).
- **Perennial herbaceous species**, including grasses 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.
- **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.
- **Aquatic plant species** grow underwater and would not be directly affected by OSV use. If an occurrence is located within 100 feet of OSV trails, 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.

Other Botanical Resources

Special Interest Areas (SIAs)

All three SIAs designated as Botanical Areas are currently and proposed open to OSV use.

- Montgomery Creek Grove Botanical Area, 4.6 acres
- Murken Botanical Area, 480 acres
- Willow Lake Bog Botanical Area, 59 acres

Research Natural Areas (RNAs)

Off-road OSV use is prohibited in designated and proposed RNAs per the Lassen LRMP (1983), so OSV use in RNAs is not allowed away from existing roads and trails.

- Blacks Mountain
- Cub Creek
- Graham Pinery (proposed)
- Green Island Lake (proposed)
- Indian Creek (proposed)
- Mayfield (proposed)
- Soda Ridge (proposed)
- Timbered Crater (proposed)

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 will result in mostly small differences in degree of potential effects. Therefore, each alternative's effects will mainly summarize the extent of botanical resources 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.

TEPS plants

Effects discussions 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.

Survey and Manage Species

For all alternatives, no OSV trails are proposed in the NWFP portion of the Lassen National Forest, so none of the known Survey and Manage sites are within 100 feet of OSV trails. However, all of the Survey and Manage sites are in areas open to cross-country OSV travel.

Because the proposed action and alternatives would not produce ground-disturbing impacts, there would be no negative effects on Survey and Manage species or their persistence within the project area; therefore, field surveys and site management for these species are not required. Without the loss of overstory canopy cover, specific host trees, forest floor organic matter, or large woody debris, habitat characteristics would be retained for conserving Survey and Manage fungi. Occurrences of *Cypripedium montanum* would not be affected because the species is dormant and underground when OSV uses take place. Occurrences of *Ptilidium californicum* would not be affected because the species grows low on the bases of large trees and minimum snow depths would prevent impacts as well as the fact that OSV operators avoid making contact with large trees for safety reasons and to prevent damage to their vehicles.

Special Interest Plants

Effects discussions for Special Interest 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.

Separate sections follow for invasive plant species and other botanical resources (SIAs and RNAs).

Direct Effects Introduction

Direct effects are caused by the action and occur at the same time and place. A key difference between OSV use and other types of motor vehicle use is that, when properly operated and managed, OSVs do not make direct contact with soil, water, and ground vegetation, whereas most other types of motor vehicles operate directly on the ground (USDA FS 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 because minimum snow depths are expected to prevent direct effects to vegetation at ground level.

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 minimum snow depth requirements of all alternatives 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 Lassen National Forest, OSV travel on snow-free areas is prohibited in the current and proposed scenarios. By not allowing OSV use when and where there is less than 12 inches snow depth, the Lassen National Forest minimizes the possibility of direct damage to soils and ground vegetation.

Indirect Effects Introduction

Indirect effects are caused by the action and occur later in time or are farther removed in distance, but are still reasonably foreseeable. Three specific topics of indirect effects were identified: snow compaction, pollutants, and invasive plant species. Potential effects from snow compaction and pollutants are described below, and a discussion of potential invasive plant effects will follow in its own section because it is a required analysis topic itself.

Snow Compaction

Snow is compacted by any of the allowed OSVs, including snowmobiles, snow cats, 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 2012) 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 and others (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/cross-country ski compaction and snowmelt erosion on groomed trails, Eagleston and Rubin (2012) 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 snow melt.

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 (2013) 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 snow melt, 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 which determine their vulnerability are the timing of flowering, and growth form and size (Fahey and Wardle 1998). Prolonged snow lie 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 on the Lassen National Forest occurs over an existing road and trail network and does not alter landforms or result in significant soil disturbance that would change water flow patterns or quantities of surface water runoff. Trail grooming does not cause substantial impacts to water quality, perennial, intermittent or ephemeral streams, wetlands or other bodies of water (McNamara 2015).

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 and reasonably foreseeable to have a

degree of compaction that could influence vegetation. **Therefore, in this analysis, areas within 100 feet 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 a reasonably foreseeable source of indirect effects.

Pollutants

Emissions from over-snow vehicles, particularly two-stroke engines on snowmobiles, 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.

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 snow melt, 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 were found below EPA criteria and guidelines for the volatile organic compounds analyzed and were below levels that would adversely impact aquatic ecosystems (Arnold and Koel 2006).

Studying air quality and snow chemistry effects from 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 on the Lassen National Forest (considerably less than those observed in Yellowstone National Park) are not expected to impair water quality (McNamara 2015).

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 Lassen National Forest, no mortality of roadside TES plants due to vehicle pollutants has been observed, even considering year-round vehicle uses. Therefore, the level of effect to TES 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 concentrated in areas of heavy OSV use. **Therefore, in this analysis, areas within 100 feet 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 a reasonably foreseeable source of indirect effects.

Relative Potential Effects to Plant Life Forms

Considering the combination of direct and indirect effects described above, and the minimum snow depth requirements of all the current 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 reasonably foreseeable if the species occurs near designated OSV trails. Effects may occur in all areas open to OSV use.
- Deciduous trees and shrubs – somewhat less likely, due to winter dormancy; indirect effects are reasonably foreseeable if the species occurs near designated OSV trails. Effects may occur in all areas open to OSV use.
- Sub-shrubs (low-growing woody species) – less likely due to less exposure to direct effects (but still reasonably foreseeable); indirect effects may be reasonably foreseeable if the species occurs near designated OSV trails. Effects may occur in all areas open to OSV use.
- Perennial herbaceous species – direct effects are unlikely (not reasonably foreseeable) due to minimum snow depth requirements; indirect effects may be reasonably foreseeable if the species occurs near designated OSV trails. Effects may occur along designated OSV trails, but are not likely in areas open to cross-country OSV use.
- Annual species – direct effects are highly unlikely (not reasonably foreseeable) due to minimum snow depth requirements; indirect effects might be reasonably foreseeable 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 open to cross-country OSV use.
- Aquatic species – direct effects would not occur because OSV use is not allowed over open water; indirect effects from pollutants might be reasonably foreseeable if the species occurs near designated OSV trails. Effects may occur along designated OSV trails, but are not likely in areas open to cross-country OSV use.

Trees, shrubs, or sub-shrub species

Direct Effects

Snowmobile activities may damage vegetation on and along trails and in area open to cross-country OSV use. The most commonly observed effect from snowmobiles was 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 one 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. These direct effects are expected to be localized and not result in loss of entire occurrences.

On the Lassen National Forest, OSV use may directly damage individuals of the Lassen National Forest Special Interest plants *Artemisia tripartita* ssp. *tripartita*, *Betula glandulosa*, *Eriogonum ovalifolium* var. *depressum*, *Eriogonum pyrolifolium* var. *pyrolifolium*, and *Hesperocyparis bakeri*.

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 ovalifolium* var. *depressum* and *Eriogonum pyrolifolium* var. *pyrolifolium*), 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)

Direct Effects

With minimum snow depth requirements 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

Compacted snow may alter the timing of new foliage emergence in the spring, due to delayed snowmelt and colder soil temperatures. This is expected to have minimal effects to perennial herbaceous plants because they are assumed to be adapted to a wide variety of natural snowmelt times.

Airborne pollutants would not affect perennial herbaceous species because the snow layers would prevent the pollutants from reaching their foliage, that is, if foliage were to even be living during OSV season. As with any of the plant groups, 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.

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 generally not growing during the authorized period of OSV use.

Indirect Effects

Compacted snow may alter the timing of seed germination and plant growth in the spring, due to delayed snowmelt and colder soil temperatures. This is expected to have minimal effects to annual plants because they are assumed to be adapted to a wide variety of natural snowmelt times.

Airborne pollutants would not affect annual species because the new generation of plants (seeds) would still be dormant under the snow. 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 potential 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.

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 aquatic habitats.

Indirect Effects

Delayed snow melt 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. 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 plant responses, if any, would not be noticeable.

Threatened and Endangered Plants

Orcuttia tenuis

OSV uses are not likely to affect vernal pool habitats. Population monitoring on the Lassen National Forest has not revealed any adverse effects to these habitats from OSV use in previous years. The main populations of *Orcuttia tenuis* on the Lassen National Forest are fenced, mainly to exclude OHV and other impacts of recreational use. These fences also effectively prevent OSV use within the vernal pools unless snow depth is over four or five feet. Although recreational/OHV uses in vernal pools may affect these habitats and *Orcuttia tenuis* plants during the drier seasons, OSV use during the winter would not result in habitat disturbance because the minimum snow depth of 12 inches is sufficient to prevent contact between OSVs and the soil surface.

Compacted snow generally causes delayed snowmelt and increases the transfer of freezing temperatures to the ground due to reduced insulating air spaces (Keddy et al. 1979, Fahey and Wardle 1998, Davenport and Switalski 2006, Eagleston and Rubin 2012, Gage and Cooper 2013). For *Orcuttia tenuis*, seed germination occurs when the vernal pools are filled with water, usually well after the majority of snowmelt in the pools. The short delay of snowmelt and colder soil temperatures from OSV-compacted snow would not likely delay or reduce germination of *Orcuttia tenuis*. The effects of snow compaction and OSV emissions are concentrated in areas of heavy use, such as along designated OSV trails. Only very small portions (totaling 0.4 acres) of three *Orcuttia tenuis* occurrences are present within 100 feet of existing or proposed designated OSV trails. For the purpose of preventing or reducing OHV and other recreation impacts, fencing/barriers are present at two of the sites. One of these occurrences has also been monitored for three consecutive seasons and no evidence of OSV effects has been observed; therefore, it is anticipated that there would be no measurable or predictable indirect effects to *Orcuttia tenuis*.

Because living plants are not present during the period of OSV use, *Orcuttia tenuis* would not be directly affected. Indirect effects are also unlikely to affect the species or alter its habitat, as described above. With

no direct or indirect effects expected, there would be no cumulative effects to this species. Therefore, it is determined that the Lassen OSV Designation project will have **no effect** on *Orcuttia tenuis*.

***Orcuttia tenuis* Critical Habitat**

The Lassen OSV Designation project does 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 (McNamara 2015). Water quality is also not expected to be measurably affected in the vernal pools, and the composition of vegetation, including invasive plant species, is not expected to be altered by OSV use. Because the primary constituent elements of *Orcuttia tenuis* critical habitat would be unaffected by OSV use, it is determined that the Lassen OSV Designation project will have **no effect** on *Orcuttia tenuis* critical habitat.

Tuctoria greenei

OSV uses are not likely to affect vernal pool habitats. Population monitoring on the Lassen National Forest has not revealed any adverse effects to these habitats from OSV use in previous years. Because *Tuctoria greenei* is not known to occur on the Lassen National Forest, there would be no direct effects to individuals from OSV use on these lands. The indirect effects of snow compaction and OSV emissions are concentrated in areas of heavy use, such as along designated OSV trails. No *Tuctoria greenei* occurrences are present within 100 feet of existing or proposed designated OSV trails; therefore, it is anticipated that there would be no measurable or predictable indirect effects to the occurrences.

With no direct or indirect effects expected, there would be no cumulative effects to this species. Therefore, it is determined that the Lassen OSV Designation project will have **no effect** on *Tuctoria greenei*.

***Tuctoria greenei* Critical Habitat**

The Lassen OSV Designation project does 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 (McNamara 2015). Water quality is also not expected to be measurably affected in the vernal pools, and the composition of vegetation, including invasive plant species, is not expected to be altered by OSV use. Because the primary constituent elements of *Tuctoria greenei* critical habitat would be unaffected by OSV use, it is determined that the Lassen OSV Designation project will have **no effect** on *Tuctoria greenei* critical habitat.

Invasive Species

On the Lassen National Forest, 30 invasive plant species are documented. Appendix A of the botany specialist's report includes a list of each species and their acreage of presence near OSV trails and in areas open to OSV use.

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.

As with the other indirect effects described above, 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 five OSV trailheads would be the same for all alternatives. The following weed species have been found at the OSV trailheads:

- Ashpan – no weeds documented
- Fredonyer – *Lepidium latifolium* and *Leucanthemum vulgare*
- Jonesville – no weeds documented
- Morgan Summit – *Centaurea solstitialis*
- Swain Mountain – *Lepidium latifolium* and *Hypericum perforatum*

On the Lassen National Forest, there have been no observations of weed introductions or spread specifically tied to OSV use (Sanger pers. comm. 2015). Roadside weed infestations are routinely treated during their active growing season each year. Given the uncertainties described above and overall lack of evidence of OSV use contributing to weed infestations, the risk of weed increases due to OSV use is expected to be very low for all alternatives.

Other Botanical Resources

Special Interest Areas

The purpose of this SIA analysis is to determine compliance with the intended focus of each of the three areas that are established as a Botanical Special Interest Area. There is no variation between alternatives regarding OSV uses in these SIAs, so this section will apply for all alternatives.

Montgomery Creek Grove Botanical Area is less than 5 acres in size, and is heavily forested. Although the area is open to OSV use, recreational OSV users would not likely visit the area due to the difficulty in maneuvering snow machines through the dense forest. Therefore, OSV use is not expected to alter any of the vegetation and habitat characteristics for which the Special Interest Area was established.

At 480 acres, the Murken Botanical Area is the largest of the three botanical SIAs, and is easily accessible. With the minimum snow depth requirements for all alternatives, OSV use is not expected to alter any of the vegetation and habitat characteristics for which the Special Interest Area was established.

Willow Lake Bog Botanical Area encompasses 59 acres, most of which is open water. OSVs would not be authorized to operate over lakes, so the area would receive little OSV use. Due to the restrictions on OSV use on lakes, and minimum snow depth requirements, OSV use is not expected to alter any of the vegetation and habitat characteristics for which the Special Interest Area was established.

Research Natural Areas

The purpose of the RNA analysis is to determine compliance with the Lassen LRMP direction. Because off-road vehicle use is prohibited in RNAs, per the Lassen LRMP, no OSV uses are allowed off designated roads or trails in these areas, and the current OSV Designation proposal and subsequent decision would not overrule the current LRMP direction. No OSV trails are currently existing or proposed in RNAs. However, some RNAs are at least partially open to OSV use in each alternative, as currently defined by the project's spatial data. The extent of these open areas will be described under each alternative. If OSV use were to occur in portions of these RNAs, it would not likely have substantial effects to the natural characteristics for which these areas were established, other than the noise generated during OSV operation and the tracks remaining in the snow when OSVs have left the area. It is assumed that the intent of the Lassen OSV Designation project was to prohibit OSV use within all RNAs, and a correction of the associated spatial data will most likely be completed with the final analysis.

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.

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Snow plowing at the established OSV trailheads is an ancillary activity associated with the Lassen National Forest OSV Designation project, and is not analyzed as a part of the proposal. Snow plowing is not expected to affect botanical resources, other than providing an additional vector for the possible transport of noxious/invasive weed species. Other ongoing and foreseeable future actions include livestock grazing, recreation, timber harvest, fuels reduction, woodcutting activities, wildfire suppression, and other activities. These activities may affect 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.

Dutch Fire Salvage and Tamarack Fire Salvage are identified ongoing/future projects in the Hat Creek area. Beyond the effects of these wildfires, additional impacts may occur to the sensitive species *Astragalus inversus* because known sites are present in the Dutch Fire Salvage area.

Threatened and Endangered Plants

Since there would be no direct or indirect effects to *Orcuttia tenuis* or *Tuctoria greenei* or their associated critical habitat, there would be no cumulative effects to consider for these species.

Sensitive Plants

The effects of present and future projects on TEPS species would likely be minimal since all projects are analyzed and mitigation measures are designed for those species for which viability is a concern, on a project-by-project basis. When the minimal effects from other projects and activities are combined with the effects from the current proposal, there would be no loss of viability for any plant species and none would trend toward federal listing, for all alternatives.

Survey and Manage and Special Interest Plants

The effects of present and future projects on Survey and Manage and Special Interest plants would likely be minimal because all projects are analyzed and mitigation measures are designed for those species for which viability is a concern, on a project-by-project basis.

Invasive Plants

Invasive plants are also analyzed for each project, and design features are typically incorporated into project plans where ground disturbance may occur. In addition, weeds are routinely treated each year as part of the Lassen National Forest weeds program. The very low weed risk of the Lassen National Forest OSV Designation 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 Special Interest Areas, there would be no cumulative effects from OSV use.

Research Natural Areas

With no other vehicle uses permitted within RNAs, there would be no cumulative effects from the OSV uses as proposed in this draft analysis. With the expected correction to the associated spatial data for the final analysis, there would be no OSV use in RNAs, and thus no cumulative effects.

Alternative 1 – No Action

Alternative 1 Effects to Botanical Resources

Detailed indicators and measures for botanical resources are presented in appendix A of the botany specialist's report. The following table summarizes these same measures by the major analysis topics.

Table 111. Botanical resources indicators and measures for alternative 1

Analysis Topic	Total acres on Lassen National Forest	Acres within 100 feet of OSV trails	Acres in areas open to OSV use
Survey and Manage Plants and Fungi	8.4 (NWFP area only)	0	8.4
Threatened and Endangered plants	74	0.4	68
Threatened and Endangered plant Critical Habitats	23,809	13	22,001
Sensitive plants	2,347	24	1,540
Special Interest plants	5,677	49	5,550
Invasive plants	7,858	55	7,150
Special Interest Areas	544	0	544
Research Natural Areas	13,634	0	1,109

There are no additional effects to botanical resources beyond those described in Effects Common to All Alternatives that are specific to alternative 1. This alternative would generally have the greatest potential for direct effects to botanical resources due to larger areas of open OSV use.

Threatened and Endangered Plants

As described above in Effects Common to All Alternatives, there would be no direct, indirect, or cumulative effects to *Orcuttia tenuis*, *Tuctoria greenei*, or their critical habitats.

Sensitive Plants

For the five Sensitive woody plant species, *Eriogonum prociduum*, *Eriogonum spectabile*, *Frangula purshiana* ssp. *ultramafica*, *Monardella follettii*, and *Pinus albicaulis*, due to the potential for direct damage where they occur in areas open to OSV use and indirect effects to occurrences within 100 feet of designated OSV trails, alternative 1 of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For seven of the Sensitive perennial herbaceous plant species, *Astragalus pulsiferae* var. *suksdorfii*, *Botrychium crenulatum*, *Botrychium minganense*, *Botrychium montanum*, *Meesia uliginosa*, *Penstemon sudans*, and *Silene occidentalis* ssp. *longistipitata*, due to the potential for indirect effects to occurrences within 100 feet of designated OSV trails, alternative 1 of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For all seven Sensitive annual plant species, *Clarkia gracilis* ssp. *albicaulis*, *Clarkia mildrediae* ssp. *mildrediae*, *Cryptantha crinita*, *Eriastrum tracyi*, *Limnanthes floccosa* ssp. *bellingeriana*, *Mimulus evanescens*, and *Phacelia inundata*, because living plants are not present during the period of OSV use and they do not occur within 100 feet of designated OSV trails, alternative 1 of the Lassen OSV Designation project will have **no impact** to these species.

For the Sensitive aquatic plant species, *Peltigera gowardii*, due to the potential for indirect effects from pollutants in the snowpack to occurrences within 100 feet of designated OSV trails, alternative 1 of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For all other Sensitive plant not specifically mentioned above, because they are not present within 100 feet of designated OSV trails, alternative 1 of the Lassen OSV Designation project will have **no impact** to these species.

Survey and Manage Species

As described in Effects Common to All Alternatives, because no ground-disturbing actions are proposed, there would be no negative effects on Survey and Manage species or their habitats within the project area.

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 open to 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.

Because there is potential for direct damage where they occur in areas open to OSV use and indirect effects to occurrences within 100 feet of designated OSV trails, the five Special Interest woody plant species, *Artemisia tripartita* ssp. *tripartita*, *Betula glandulosa*, *Eriogonum ovalifolium* var. *depressum*, *Eriogonum pyrolifolium* var. *pyrolifolium*, and *Hesperocyparis bakeri*, **may be affected** by alternative 1

of the Lassen OSV 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 is potential for indirect effects to occurrences within 100 feet of designated OSV trails, eleven of the Special Interest perennial herbaceous plant species, *Asplenium septentrionale*, *Astragalus inversus*, *Carex davyi*, *Carex petasata*, *Claytonia palustris*, *Erigeron inornatus* var. *calidipetris*, *Juncus hemiendytus* var. *abjectus*, *Muhlenbergia jonesii*, *Penstemon cinicola*, *Penstemon heterodoxus* var. *shastensis*, and *Piperia colemanii*, and one of the annual plant species, *Mimulus pygmaeus*, **may be affected** by alternative 1 of the Lassen OSV 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 100 feet of designated OSV trails, alternative 1 of the Lassen OSV Designation project **will not affect** these species.

Invasive Plants

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

As described above in Effects Common to All Alternatives, all Botanical Special Interest areas would remain open to OSV use, but this use is not expected to alter any of the characteristics for which each Special Interest Area was established.

Research Natural Areas

There are no designated OSV trails in RNAs. Black Mountain RNA (521 acres) is currently open to OSV use according to the project spatial data, but the area is managed as a closed area per LRMP direction. The portion (472 acres) of Indian Creek RNA outside the Ishi Semi-Primitive Non-Motorized area is also mapped as open to OSV use. Furthermore, due to spatial mapping disagreements along the edges of Cub Creek and Timbered Crater RNAs, 116 additional acres are mapped as open to OSV use; however, these areas are clearly intended to exclude OSV use. Graham Pinery, Green Island Lake, Mayfield, and Soda Ridge RNAs would remain closed to OSV use. If 1,109 acres of RNA would become open to OSV use, alternative 1 would not comply with the Lassen Land and Resource Management Plan. However, it is not expected that the current OSV Designation proposal and subsequent decision would overrule the current LRMP direction, and OSV use within RNAs would be managed as closed areas, thus complying with the Lassen LRMP.

Alternative 2 – Proposed Action

Alternative 2 Effects to Botanical Resources

Detailed indicators and measures for botanical resources are presented in appendix A of the botany specialist reports. The following table summarizes these same measures by the major analysis topics.

Table 112. Botanical resources indicators and measures for alternative 2

Analysis Topic	Total acres on Lassen National Forest	Acres within 100 feet of OSV trails	Acres in areas open to OSV use
Threatened and Endangered plants	74	0.4	68
Threatened and Endangered plant Critical Habitats	23,809	13	22,001
Sensitive plants	2,347	24	1,412
Survey and Manage Plants and Fungi	8.4 (NWFP area only)	0	8.4
Special Interest plants	5,677	49	5,453
Invasive plants	7,858	55	5,904
Special Interest Areas	544	0	544
Research Natural Areas	13,634	0	116

There are no additional effects to botanical resources beyond those described in Effects Common to All Alternatives that are specific to alternative 2. The reduction of minimum snow depth from 18 to 12 inches for grooming would result in no different effects to botanical resources. This alternative would generally have less potential for direct effects to botanical resources due to larger areas of open OSV use. The area of potential indirect effects would be the same as for alternative 1.

Threatened and Endangered Plants

As described above in Effects Common to All Alternatives, there would be no direct, indirect, or cumulative effects to *Orcuttia tenuis*, *Tuctoria greenei*, or their critical habitats.

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 open to 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.

Sensitive Plant Determinations for Alternative 2:

For the five Sensitive woody plant species, *Eriogonum prociduum*, *Eriogonum spectabile*, *Frangula purshiana* ssp. *ultramafica*, *Monardella follettii*, and *Pinus albicaulis*, due to the potential for direct damage where they occur in areas open to OSV use and indirect effects to occurrences within 100 feet of designated OSV trails, alternative 2 of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For seven of the Sensitive perennial herbaceous plant species, *Astragalus pulsiferae* var. *suksdorfii*, *Botrychium crenulatum*, *Botrychium minganense*, *Botrychium montanum*, *Meesia uliginosa*, *Penstemon sudans*, and *Silene occidentalis* ssp. *longistipitata*, due to the potential for indirect effects to occurrences within 100 feet of designated OSV trails, alternative 2 of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For all seven Sensitive annual plant species, *Clarkia gracilis* ssp. *albicaulis*, *Clarkia mildrediae* ssp. *mildrediae*, *Cryptantha crinita*, *Eriastrum tracyi*, *Limnanthes floccosa* ssp. *bellingeriana*, *Mimulus evanescens*, and *Phacelia inundata*, because living plants are not present during the period of OSV use

and they do not occur within 100 feet of designated OSV trails, alternative 2 of the Lassen OSV Designation project will have **no impact** to these species.

For the Sensitive aquatic plant species, *Peltigera gowardii*, due to the potential for indirect effects from pollutants in the snowpack to occurrences within 100 feet of designated OSV trails, alternative 2 of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For all other Sensitive plants not specifically mentioned above, because they are not present within 100 feet of designated OSV trails, alternative 2 of the Lassen OSV Designation project will have **no impact** to these species.

Survey and Manage Species

As described in Effects Common to All Alternatives, because no ground-disturbing actions are proposed, there would be no negative effects on Survey and Manage species or their habitats within the project area.

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 open to 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.

Because there is potential for direct damage where they occur in areas open to OSV use and indirect effects to occurrences within 100 feet of designated OSV trails, the five Special Interest woody plant species, *Artemisia tripartita* ssp. *tripartita*, *Betula glandulosa*, *Eriogonum ovalifolium* var. *depressum*, *Eriogonum pyrolifolium* var. *pyrolifolium*, and *Hesperocyparis bakeri*, **may be affected** by alternative 2 of the Lassen OSV 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 is potential for indirect effects to occurrences within 100 feet of designated OSV trails, eleven of the Special Interest perennial herbaceous plant species, *Asplenium septentrionale*, *Astragalus inversus*, *Carex davyi*, *Carex petasata*, *Claytonia palustris*, *Erigeron inornatus* var. *calidipetris*, *Juncus hemiendytus* var. *abjectus*, *Muhlenbergia jonesii*, *Penstemon cinicola*, *Penstemon heterodoxus* var. *shastensis*, and *Piperia colemanii*, and one of the annual plant species, *Mimulus pygmaeus*, **may be affected** by alternative 2 of the Lassen OSV 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 100 feet of designated OSV trails, alternative 2 of the Lassen OSV Designation project **will not affect** these species.

Invasive Plants

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

As described above in Effects Common to All Alternatives, all Botanical Special Interest areas would remain open to OSV use, but this use is not expected to alter any of the characteristics for which each Special Interest Area was established.

Research Natural Areas

There are no designated OSV trails in RNAs. Black Mountain RNA would be closed to OSV use. Indian Creek RNA would also be closed to OSV use, in part due to it being in the area below 3,500 feet. Due to spatial mapping disagreements along the edges of Cub Creek and Timbered Crater RNAs, 116 acres would be open to OSV use; however, these areas are clearly intended to exclude OSV use. Graham Pinery, Green Island Lake, Mayfield, and Soda Ridge RNAs would remain closed to OSV use. If these 116 acres of RNA would become open to OSV use, alternative 2 would not comply with the Lassen Land and Resource Management Plan. However, it is not expected that the current OSV Designation proposal and subsequent decision would overrule the current LRMP direction, and OSV use within RNAs would be managed as closed areas, thus complying with the Lassen LRMP.

Alternative 3

Alternative 3 Effects to Botanical Resources

Detailed indicators and measures for botanical resources are presented in appendix A of the botany specialist's report. The following table summarizes these same measures by the major analysis topics.

Table 113. Botanical resources indicators and measures for alternative 3

Analysis Topic	Total acres on Lassen National Forest	Acres within 100 feet of OSV trails	Acres in areas open to OSV use
Threatened and Endangered plants	74	0.4	61
Threatened and Endangered plant Critical Habitats	23,809	13	21,016
Sensitive plants	2,347	24	1,328
Survey and Manage Plants and Fungi	8.4 (NWFP area only)	0	8.4
Special Interest plants	5,677	64	5,365
Invasive plants	7,858	76	4,647
Special Interest Areas	544	0	544
Research Natural Areas	13,634	0	116

There are no additional effects to botanical resources beyond those described in Effects Common to All Alternatives that are specific to alternative 3. This alternative would have the least potential for direct effects to botanical resources due to larger areas of open OSV use. The area of potential indirect effects is larger than alternatives 1 and 2 because additional miles of OSV trails would be designated.

Threatened and Endangered Plants

As described above in Effects Common to All Alternatives, there would be no direct, indirect, or cumulative effects to *Orcuttia tenuis*, *Tuctoria greenei*, or their critical habitats.

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 open to 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.

Sensitive Plant Determinations for Alternative 3:

For the five Sensitive woody plant species, *Eriogonum prociduum*, *Eriogonum spectabile*, *Frangula purshiana* ssp. *ultramafica*, *Monardella follettii*, and *Pinus albicaulis*, due to the potential for direct damage where they occur in areas open to OSV use and indirect effects to occurrences within 100 feet of designated OSV trails, alternative 3 of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For seven of the Sensitive perennial herbaceous plant species, *Astragalus pulsiferae* var. *suksdorfii*, *Botrychium crenulatum*, *Botrychium minganense*, *Botrychium montanum*, *Meesia uliginosa*, *Penstemon sudans*, and *Silene occidentalis* ssp. *longistipitata*, due to the potential for indirect effects to occurrences within 100 feet of designated OSV trails, alternative 3 of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For all seven Sensitive annual plant species, *Clarkia gracilis* ssp. *albicaulis*, *Clarkia mildrediae* ssp. *mildrediae*, *Cryptantha crinita*, *Eriastrum tracyi*, *Limnanthes floccosa* ssp. *bellingeriana*, *Mimulus evanescens*, and *Phacelia inundata*, because living plants are not present during the period of OSV use and they do not occur within 100 feet of designated OSV trails, alternative 3 of the Lassen OSV Designation project will have **no impact** to these species.

For the Sensitive aquatic plant species, *Peltigera gowardii*, due to the potential for indirect effects from pollutants in the snowpack to occurrences within 100 feet of designated OSV trails, alternative 2 of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For all other Sensitive plants not specifically mentioned above, because they are not present within 100 feet of designated OSV trails, alternative 2 of the Lassen OSV Designation project will have **no impact** to these species.

Survey and Manage Species

As described in Effects Common to All Alternatives, because no ground-disturbing actions are proposed, there would be no negative effects on Survey and Manage species or their habitats within the project area.

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 open to 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.

Because there is potential for direct damage where they occur in areas open to OSV use and indirect effects to occurrences within 100 feet of designated OSV trails, four of the five Special Interest woody plant species, *Artemisia tripartita* ssp. *tripartita*, *Betula glandulosa*, *Eriogonum ovalifolium* var. *depressum*, and *Hesperocyparis bakeri*, **may be affected** by alternative 3 of the Lassen OSV 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. Different from all other alternatives, *Eriogonum pyrolifolium* var. *pyrolifolium* would **not be affected** in alternative 3 because it is not present in areas open to OSV use or in areas within 100 feet of designated OSV trails.

Because there is potential for indirect effects to occurrences within 100 feet of designated OSV trails, eleven of the Special Interest perennial herbaceous plant species, *Asplenium septentrionale*, *Astragalus inversus*, *Carex davyi*, *Carex petasata*, *Claytonia palustris*, *Erigeron inornatus* var. *calidipetris*, *Juncus hemiendytus* var. *abjectus*, *Muhlenbergia jonesii*, *Penstemon cinicola*, *Penstemon heterodoxus* var. *shastensis*, and *Piperia colemanii*, and one of the annual plant species, *Mimulus pygmaeus*, **may be affected** by alternative 3 of the Lassen OSV 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 100 feet of designated OSV trails, alternative 3 of the Lassen OSV Designation project **will not affect** these species.

Invasive Plants

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

As described above in Effects Common to All Alternatives, all Botanical Special Interest areas would remain open to OSV use, but this use is not expected to alter any of the characteristics for which each Special Interest Area was established.

Research Natural Areas

There are no designated OSV trails in RNAs. As with alternative 2, Black Mountain RNA would be closed to OSV use and Indian Creek RNA would also be closed to OSV use, in part due to it being in the area below 3,500 feet. Due to spatial mapping disagreements along the edges of Cub Creek and Timbered Crater RNAs, 116 acres would be open to OSV use; however, these areas are clearly intended to exclude OSV use. Graham Pinery, Green Island Lake, Mayfield, and Soda Ridge RNAs would remain closed to OSV use. If these 116 acres of RNA would become open to OSV use, alternative 3 would not comply with the Lassen Land and Resource Management Plan. However, it is not expected that the current OSV Designation proposal and subsequent decision would overrule the current LRMP direction, and OSV use within RNAs would be managed as closed areas, thus complying with the Lassen LRMP.

Alternative 4

Alternative 4 Effects to Botanical Resources

Detailed indicators and measures for botanical resources are presented in appendix A in the botany specialist's report. The following table summarizes these same measures by the major analysis topics.

Table 114. Botanical resources indicators and measures for alternative 4

Analysis Topic	Total acres on Lassen National Forest	Acres within 100 feet of OSV trails	Acres in areas open to OSV use
Threatened and Endangered plants	74	0.4	68
Threatened and Endangered plant Critical Habitats	23,809	13	22,001
Sensitive plants	2,347	25	1,505
Survey and Manage Plants and Fungi	8.4 (NWFP area only)	0	8.4
Special Interest plants	5,677	64	5,521
Invasive plants	7,858	55	7,028
Special Interest Areas	544	0	544
Research Natural Areas	13,634	0	588

There are no additional effects to botanical resources beyond those described in Effect Common to All Alternatives that are specific to alternative 4. With this alternative, the reduction of minimum snow depth from 18 to 6 inches for grooming would result in no different effects to botanical resources. This alternative would have a greater potential than alternative 2 for direct effects to botanical resources due to areas below 3,500 feet being open OSV use. The area of potential indirect effects would be similar to alternative 3.

Threatened and Endangered Plants

As described above in Effects Common to All Alternatives, there would be no direct, indirect, or cumulative effects to *Orcuttia tenuis*, *Tuctoria greenei*, or their critical habitats.

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 open to 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.

Sensitive Plant Determinations for Alternative 4:

For the five Sensitive woody plant species, *Eriogonum prociduum*, *Eriogonum spectabile*, *Frangula purshiana* ssp. *ultramafica*, *Monardella follettii*, and *Pinus albicaulis*, due to the potential for direct damage where they occur in areas open to OSV use and indirect effects to occurrences within 100 feet of designated OSV trails, alternative 4 of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For seven of the Sensitive perennial herbaceous plant species, *Astragalus pulsiferae* var. *suksdorfii*, *Botrychium crenulatum*, *Botrychium minganense*, *Botrychium montanum*, *Meesia uliginosa*, *Penstemon sudans*, and *Silene occidentalis* ssp. *longistipitata*, due to the potential for indirect effects to occurrences within 100 feet of designated OSV trails, alternative 4 of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For all seven Sensitive annual plant species, *Clarkia gracilis* ssp. *albicaulis*, *Clarkia mildrediae* ssp. *mildrediae*, *Cryptantha crinita*, *Eriastrum tracyi*, *Limnanthes floccosa* ssp. *bellingeriana*, *Mimulus evanescens*, and *Phacelia inundata*, because living plants are not present during the period of OSV use and they do not occur within 100 feet of designated OSV trails, alternative 4 of the Lassen OSV Designation project will have **no impact** to these species.

For the Sensitive aquatic plant species, *Peltigera gowardii*, due to the potential for indirect effects from pollutants in the snowpack to occurrences within 100 feet of designated OSV trails, alternative 4 of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For all other Sensitive plants not specifically mentioned above, because they are not present within 100 feet of designated OSV trails, alternative 4 of the Lassen OSV Designation project will have **no impact** to these species.

Survey and Manage Species

As described in Effects Common to All Alternatives, because no ground-disturbing actions are proposed, there would be no negative effects on Survey and Manage species or their habitats within the project area.

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 open to 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.

Because there is potential for direct damage where they occur in areas open to OSV use and indirect effects to occurrences within 100 feet of designated OSV trails, the five Special Interest woody plant species, *Artemisia tripartita* ssp. *tripartita*, *Betula glandulosa*, *Eriogonum ovalifolium* var. *depressum*, *Eriogonum pyrolifolium* var. *pyrolifolium*, and *Hesperocyparis bakeri*, **may be affected** by alternative 4 of the Lassen OSV 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 is potential for indirect effects to occurrences within 100 feet of designated OSV trails, eleven of the Special Interest perennial herbaceous plant species, *Asplenium septentrionale*, *Astragalus inversus*, *Carex davyi*, *Carex petasata*, *Claytonia palustris*, *Erigeron inornatus* var. *calidipetris*, *Juncus hemiendytus* var. *abjectus*, *Muhlenbergia jonesii*, *Penstemon cinicola*, *Penstemon heterodoxus* var. *shastensis*, and *Piperia colemanii*, and one of the annual plant species, *Mimulus pygmaeus*, **may be affected** by alternative 4 of the Lassen OSV 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 100 feet of designated OSV trails, alternative 4 of the Lassen OSV Designation project **will not affect** these species.

Invasive Plants

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

As described above in Effects Common to All Alternatives, all Botanical Special Interest areas would remain open to OSV use, but this use is not expected to alter any of the characteristics for which each Special Interest Area was established.

Research Natural Areas

There are no designated OSV trails in RNAs. Black Mountain RNA would be closed to OSV use. Because the area below 3,500 feet would be open to OSV use, the portion of Indian Creek RNA outside the Ishi Semi-Primitive Non-Motorized area (472 acres) would be open to OSV use. Graham Pinery, Green Island Lake, Mayfield, and Soda Ridge RNAs would remain closed to OSV use. As with all other alternatives, due to spatial mapping disagreements along the edges of Cub Creek and Timbered Crater RNAs, 116 acres would be open to OSV use; however, these areas are clearly intended to exclude OSV use. If these 588 acres of RNA would become open to OSV use, alternative 3 would not comply with the Lassen Land and Resource Management Plan. However, it is not expected that the current OSV Designation proposal and subsequent decision would overrule the current LRMP direction, and OSV use within RNAs would be managed as closed areas, thus complying with the Lassen LRMP.

Degree to Which the Alternatives Address the Issues

Table 115. Relative comparison of alternatives by botanical resource issue topics

Analysis Topic	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Threatened and Endangered plants	All alternatives equal (issue sufficiently addressed – no effects)	All alternatives equal	All alternatives equal	All alternatives equal
Threatened and Endangered plant Critical Habitats	All alternatives equal (issue sufficiently addressed – no effects)	All alternatives equal	All alternatives equal	All alternatives equal
Sensitive plants	All alternatives equal (issue sufficiently addressed – minor potential effects)	All alternatives equal	All alternatives equal	All alternatives equal
Survey and Manage species	All alternatives equal (issue sufficiently addressed)	All alternatives equal	All alternatives equal	All alternatives equal
Special Interest plants	Alternatives 1 and 2 equal (issue sufficiently addressed – minor potential effects)	Alternatives 1 and 2 equal	Alternatives 3 and 4 equal, with slightly more potential for effects (issue sufficiently addressed – minor potential effects)	Alternatives 3 and 4 equal, with slightly more potential for effects
Invasive plants	All alternatives equal (issue sufficiently addressed – very low risk)	All alternatives equal	All alternatives equal	All alternatives equal
Special Interest Areas	All alternatives equal (issue sufficiently addressed)	All alternatives equal	All alternatives equal	All alternatives equal
Research Natural Areas	Compliant with LRMP per existing management direction and expected OSV use management	Compliant with LRMP per existing management direction and expected OSV use management	Compliant with LRMP per existing management direction and expected OSV use management	Compliant with LRMP per existing management direction and expected OSV use management

Summary of Botanical Resource Measures and Determinations

Table 116. Botanical resources summary of measures for all alternatives

Analysis Topic	Total acres on Lassen National Forest	Acres within 100 feet of OSV trails	Acres in areas open to OSV use
Threatened and Endangered plants	74	0.4 all alternatives	68 Alt. 1 68 Alt. 2 61 Alt. 3 68 Alt. 4
Threatened and Endangered plant Critical Habitats	23,809	13 all alternatives	22,001 Alt. 1 22,001 Alt. 2 21,016 Alt. 3 22,001 Alt. 4
Sensitive plants	2,347	24 all alternatives	1,540 Alt. 1 1,412 Alt. 2 1,328 Alt. 3 1,505 Alt. 4
Survey and Manage Plants and Fungi	8.4 (NWFP area only)	0 all alternatives	8.4 all alternatives
Special Interest plants	5,840	49 Alt. 1 49 Alt. 2 64 Alt. 3 64 Alt. 4	5,550 Alt. 1 5,453 Alt. 2 5,365 Alt. 3 5,521 Alt. 4
Invasive plants	7,858	55 Alt. 1 55 Alt. 2 76 Alt. 3 55 Alt. 4	7,150 Alt. 1 5,904 Alt. 2 4,647 Alt. 3 7,028 Alt. 4
Special Interest Areas	544	0 all alternatives	544 all alternatives
Research Natural Areas	13,634	0 all alternatives	1,109 Alt. 1 116 Alt. 2 116 Alt. 3 588 Alt. 4

Threatened and Endangered Plants

Although occurrences and critical habitat for *Orcuttia tenuis* and critical habitat for *Tuctoria greenei* are located within the Lassen National Forest OSV Designation project, proposed activities are not expected to affect the critical habitats or occurrences of any proposed or listed species because authorized activities would occur at a time of year when the plants are not growing, occurrences are located greater than 100 feet from OSV trails, and OSV use on the required minimum snow depths is not expected to result in any changes to vegetation or hydrology of their vernal pool habitats. Therefore, it is determined that the Lassen National Forest OSV Designation project will have **no effect** on *Orcuttia tenuis* or critical habitats for *Orcuttia tenuis* and *Tuctoria greenei* on the Lassen National Forest.

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 open to 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 close proximity to areas of concentrated

use (within 100 feet 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 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.

Sensitive Plant Determinations:

For the five Sensitive woody plant species, *Eriogonum prociduum*, *Eriogonum spectabile*, *Frangula purshiana* ssp. *ultramafica*, *Monardella follettii*, and *Pinus albicaulis*, due to the potential for direct damage where they occur in areas open to OSV use and indirect effects to occurrences within 100 feet of designated OSV trails, all alternatives of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For seven of the Sensitive perennial herbaceous plant species, *Astragalus pulsiferae* var. *suksdorfii*, *Botrychium crenulatum*, *Botrychium minganense*, *Botrychium montanum*, *Meesia uliginosa*, *Penstemon sudans*, and *Silene occidentalis* ssp. *longistipitata*, due to the potential for indirect effects to occurrences within 100 feet of designated OSV trails, all alternatives of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For all seven Sensitive annual plant species, *Clarkia gracilis* ssp. *albicaulis*, *Clarkia mildrediae* ssp. *mildrediae*, *Cryptantha crinita*, *Eriastrum tracyi*, *Limnanthes floccosa* ssp. *bellingeriana*, *Mimulus evanescens*, and *Phacelia inundata*, because living plants are not present during the period of OSV use and they do not occur within 100 feet of designated OSV trails, all alternatives of the Lassen OSV Designation project will have **no impact** to these species.

For the Sensitive aquatic plant species, *Peltigera gowardii*, due to the potential for indirect effects from pollutants in the snowpack to occurrences within 100 feet of designated OSV trails, all alternatives of the Lassen OSV Designation project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability in the planning area**.

For all other Sensitive plants not specifically mentioned above, because they are not present within 100 feet of designated OSV trails, all alternatives of the Lassen OSV Designation project will have **no impact** to these species.

Survey and Manage Species

For all alternatives, no OSV trails are proposed in the NWFP portion of the Lassen National Forest, so none of the known Survey and Manage sites are within 100 feet of OSV trails. However, all of the Survey and Manage sites are in areas open to cross-country OSV travel.

Because the proposed action and alternatives would not produce ground-disturbing impacts, there would be no negative effects on Survey and Manage species or their persistence within the project area; therefore, field surveys and site management for these species are not required. Without the loss of overstory canopy cover, specific host trees, forest floor organic matter, or large woody debris, habitat characteristics would be retained for conserving Survey and Manage fungi. Occurrences of *Cypripedium montanum* would not be affected because the species is dormant and underground when OSV uses take place. Occurrences of *Ptilidium californicum* would not be affected because the species grows on the

bases of large trees and minimum snow depths would prevent impacts as well as the fact that OSV operators avoid impacting large trees for safety reasons.

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 open to 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 concentrated use (within 100 feet 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 severely damaged and may eventually die from intensive OSV damage, 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 is potential for direct damage where they occur in areas open to OSV use and indirect effects to occurrences within 100 feet of designated OSV trails, four of the five Special Interest woody plant species, *Artemisia tripartita* ssp. *tripartita*, *Betula glandulosa*, *Eriogonum ovalifolium* var. *depressum*, *Eriogonum pyrolifolium* var. *pyrolifolium*, and *Hesperocyparis bakeri*, **may be affected** by all alternatives of the Lassen OSV 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 is potential for indirect effects to occurrences within 100 feet of designated OSV trails, 11 of the Special Interest perennial herbaceous plant species, *Asplenium septentrionale*, *Astragalus inversus*, *Carex davyi*, *Carex petasata*, *Claytonia palustris*, *Erigeron inornatus* var. *calidipetris*, *Juncus hemiendytus* var. *abjectus*, *Muhlenbergia jonesii*, *Penstemon cinicola*, *Penstemon heterodoxus* var. *shastensis*, and *Piperia colemanii*, and one of the annual plant species, *Mimulus pygmaeus*, **may be affected** by all alternatives of the Lassen OSV 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 100 feet of designated OSV trails, all alternatives of the Lassen OSV Designation project **will not affect** these species.

Invasive Plants

Thirty invasive plant species are documented in the project area, and most infestations along roadsides are treated each year. There is some potential for weeds to be introduced to OSV trailheads and into areas open to 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 these uncertainties 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 very low for all alternatives.

Special Interest Areas

For all alternatives, the vegetation and habitat characteristics for which each of the three Botanical Areas (Montgomery Creek Grove, Murken, and Willow Lake Bog) were established would be maintained. The required minimum snow depths for OSV use, and design features that prohibit OSV use from operating over open water would protect these resources from damage.

Research Natural Areas

The purpose of the RNA analysis is to determine compliance with the Lassen LRMP direction. Because off-road vehicle use is prohibited in RNAs, no OSV uses are allowed off designated roads or trails. No OSV trails are currently existing or proposed in any of the RNAs. Graham Pinery, Green Island Lake, Mayfield, and Soda Ridge RNAs are excluded from OSV uses in all alternatives.

However, some RNAs are at least partially open to OSV use in each alternative, as currently defined by the project's spatial data. Although the management of OSV uses on the ground excludes these uses within RNAs per the LRMP, according to the current project's spatial data, Black Mountain RNA (521 acres) is currently open to OSV use, but would be excluded in alternatives 2, 3, and 4. Due to spatial mapping disagreements along the edges of Cub Creek and Timbered Crater RNAs, 116 additional acres would be open to OSV use in all alternatives; however, these areas are clearly intended to exclude OSV use. The portion (472 acres) of Indian Creek RNA outside the Ishi Semi-Primitive Non-Motorized area is also currently open to OSV use, and would be open to OSV use in alternative 4.

If any RNA areas would actually become open to OSV use, there would not be compliance with the Lassen LRMP. However, it is not expected that the current OSV Designation proposal and subsequent decision would overrule the current LRMP direction, and OSV use within RNAs are expected to be managed as closed areas, thus complying with the Lassen LRMP.

Compliance with LRMP and Other 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 this Biological Evaluation/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 Lassen National Forest Land and Resource Management Plan (LRMP) and the Sierra Nevada Forest Plan Amendment because Sensitive plant populations would remain viable and their habitats would be maintained.

Because the proposed action and alternatives do not involve ground disturbance, and would not affect Survey and Manage plants or fungi, the actions are in compliance with the Northwest Forest Plan as amended by the 2001 ROD.

All alternatives would maintain viable populations of all native and desired nonnative plants, and the proposed activities were reviewed for potential 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 Lassen LRMP and Forest Service Manual direction, as well as Executive Order 13112.

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 Lassen LRMP.

In the Lassen LRMP, Research Natural Areas are specifically excluded from off-road vehicles uses. This management of RNAs is expected to continue, and it is not the intent of the Lassen OSV Designation project to overrule the LRMP with respect to allowing off-route OSV uses in these areas. Thus, the proposed action and alternatives are assumed to be in compliance with LRMP direction. Still, it must be acknowledged that the project spatial data for this Draft EIS is not in agreement with the intended uses in RNAs.

Other Relevant Mandatory Disclosures

Unavoidable Adverse Effects

As described in Effects Common to All Alternatives, Sensitive and Special Interest woody plants and other Sensitive and Special Interest plants in close proximity to OSV trails may be affected by OSV use. Whitebark pine (*Pinus albicaulis*) may be particularly prone to damage because it occurs at high elevations where OSV users often prefer to ride. Without placing restrictions in areas where these species occur, there could be adverse effects to some individuals. 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 Sensitive and 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 damage to individuals could cause mortality and thus may constitute an irretrievable commitment for Sensitive and Special Interest plant species.

Soils

The purpose of this section is to analyze the potential impacts (direct, indirect and cumulative effects) of over-snow vehicles (OSVs) on the soil resource by alternative within the Lassen National Forest. This report includes:

- Analysis Methods and Scale;
- Affected Environment; and
- Environmental Consequences, including direct, indirect, and cumulative effects in light of past, present, and reasonably foreseeable future events

Relevant Laws, Regulations, and Policy

Regulatory Framework

Land and Resource Management Plan

The Lassen National Forest Land and Resource Management Plan (LRMP) provides standards and guidelines for activities on the Forest including OSV management.

- LRMP Standards and Guidelines pertinent to OSV management (USDA Forest Service 1993: Chapter 4):
  - Prevent irreversible losses of soil productivity: Assess impacts of proposed projects on the soil resource and take appropriate mitigative action.
    - The areal extent of detrimental soil disturbance will not exceed 15 percent of the area dedicated to growing vegetation
    - Soil cover is sufficient to prevent the rate of accelerated soil erosion from exceeding the rate of soil formation
    - Soil porosity and bulk density are at least 90 percent of the measurements found under undisturbed or natural conditions
    - Organic matter is present in amounts sufficient to prevent significant short- or long-term nutrient cycle deficits
  - Field verify existing reconnaissance soil resource inventory data for each ground-disturbing project
  - Conduct detailed soil surveys for all project areas that have an erosion hazard rating of “high” or “very high, landslides or unstable areas, potential revegetation or regeneration problems, active erosion or a significant potential to contribute to cumulative degradation of water quality
  - Retain ground-covering litter, duff and vegetation on at least 90 percent of non-rocky riparian areas, except when removal is needed to improve vegetative diversity or wildlife habitat
  - Rehabilitate areas of significant soil degradation caused by off-highway vehicles. Close trails and areas to motorized use if necessary to protect soils.
  - Map the occurrence of unstable Eocene non-marine deposits and granitic soils prior to ground-disturbing activities.

- Monitor and take necessary actions to prevent damage to meadows and soils in the high Lakes area.

Desired Condition

The desired condition for soils is that soil productivity and water quality remain high on the Forest.

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 report 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(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.”

Topics and Issues Addressed in This Analysis

Purpose and Need

The soil resource is not driving the purpose and need for this project.

Issues

Designating roads, trails, and areas for OSV use has the potential to result in ground disturbance and snow compaction, and this can directly, indirectly, and/or cumulatively adversely impact soil and water resources through soil compaction, erosion, and displacement.

OSVs, when operated cross-country instead of on designated trails, have the potential for more widespread impacts from ground disturbance (similar in nature to summer motorized use if there is inadequate snow cover). These potential effects are highly dependent on location, particularly areas of thin snow cover, and the amount and timing of use.

OSVs, when operated on designated National Forest System roads and designated National Forest System trails without adequate snow cover have the potential to also result in soil compaction, erosion, and displacement and decreased water quality, as described above.

Resolution

This issue will be carried forward through effects analysis in this report. Measurement indicators will be used to compare and contrast alternatives in the environmental impact statement (EIS).

We addressed this issue by developing an alternative to the proposed action that includes establishing a uniform 12-inch minimum snow depth for all uses, with some exceptions and added clarification to all alternatives (via project design criteria and monitoring measures) regarding how snow depths would be measured, enforced, and used as guidelines to ensure resource impacts are minimized.

This minimum snow depth would minimize the likelihood of adverse impacts to soil and water resources from OSV use.

Other Resource Concerns

No other resource concerns were identified by the public.

Resource Indicators and Measures

Soil productivity and soil stability are the two soil resource indicators (table 117).

Table 117. Resource indicators and measures for assessing effects to soil resources

Resource Element	Resource Indicator	Measure (Quantify if possible)
Soil Productivity and Soil Stability	OSV use on sensitive soils including wet meadows, areas with potential low stability and areas with potential erosion hazards.	Acres of cross-country travel open to OSV use on sensitive soils
Soil Stability	Minimum snow depths on trails	Inches of snow
Soil Productivity	Minimum snow depths for cross-country travel	Inches of snow
Soil Productivity	Total area open to OSV use	Acres open to cross-country OSV travel

Methodology and Information Sources

We analyzed soil resources within the project area using geographic information system (GIS) data, soils survey data, corporate soils data layers including the geology and geomorphology layers for the Lassen National Forest, a variety of reports and assessments of OSV impacts, and professional experience and judgement using scientific literature on OSV impacts. We consulted the Lassen National Forest Soil Scientist to help determine where the sensitive soils might be located on the Forest.

Incomplete and Unavailable Information

We performed no field observations and collected no site-specific soils information to support this analysis. Very little monitoring information is available on OSV impacts to the soil resource. The Lassen National Forest does monitor OSV use, but no specific soils monitoring has been conducted. Assessments of soil resource impacts of OSV use were primarily based on the scientific literature.

To determine where potential sensitive soils might be located on the Forest, we used the soils survey data and other corporate GIS layers to determine where wet meadow soils, soils with low stability, and soils with erosion potential might be located. The Lassen National Forest does not have a specific meadows layer or slope stability layer.

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 Lassen 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 majority of precipitation occurs on the Lassen National Forest from about late October to early May. At elevations above 5,000 feet, the majority of precipitation occurs as snow, and very little rainfall occurs during the summer months. The amount of annual precipitation ranges from about 16 inches along the eastern boundary and the northern Little Valley area, to 80 or 90 inches in and around Lassen Volcanic National Park, Philbrook Reservoir, and Snow Mountain. The median annual precipitation is approximately 30 to 50 inches. East of the Lassen National Forest boundary is high desert country with only 6 to 10 inches of annual precipitation.

The Lassen National Forest has diverse vegetation because of its wide ranges in precipitation and elevation. In the upper elevations, white pine, red and white fir, and manzanita grow well. Lodgepole pine, willow, alder, and ceanothus, snowbrush, and grasses can also be found at this elevation. The lower elevations typically see various oaks (blue, live, and black), grasses, and ceanothus, along with ponderosa pine and Jeffrey pine.

Soils and Geology

Soil resources on the Lassen National Forest are varied with a diversity of parent materials present. About 85 percent of the Forest is volcanic in origin including basalt, rhyolite, andesite, cinders, and ash parent materials. These soils are generally coarser-textured soils, but with good water-holding capacity and abundant nutrients. The southern 15 percent of the Forest is derived from non-volcanic parent materials including granitics, metamorphic and sedimentary rocks of different ages. These soil types tend to be less productive and are more prone to erosion, especially on steeper slopes. Tertiary age gravelly sediments are also present on the southern portion of the Forest and these soil types are more prone to slope instability and landslides. Lassen National Forest soils are included and described in the Tehama County soil survey (USDA Soil Conservation Service and Forest Service 1967) and the Soil Survey of Lassen National Forest Area, California (Kliewer 1994).

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.

The soils are grouped into 224 soil map units within 41 taxonomic groups (see appendix A of the soils specialist's report).

Soil Productivity

Soil productivity is important to maintain. 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. Some recent advances in logging technology and mechanization have exacerbated the problem, as feller bunchers must travel to each tree and slash is often piled with excavator type, tracked grapple equipment. Main skid trails and landings are the longest-lasting detrimental disturbance, where many machines travel over the same route. Activities on moist soils are especially damaging. Work on dry or frozen soils maintains much more of a soil's natural ability to quickly restore pore spaces.

Soil productivity within the Lassen 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 approximately 1 percent of the Lassen National Forest (approximately 13,759 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

Non-marine sediments in the southern part of the Forest, as well as some granitic slopes, can be unstable when slopes are steep (over 35 percent). Generally, the instability and slumping only occurs when soils are excavated deeper than 2 feet. These soil types make up about 6 percent of the Forest. These areas generally have a moderate stability hazard, with less than 2 percent of the soils having a high or very high stability hazard. 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 approximately 2 percent of the Forest (28,818 acres). None of the actual proposed OSV trails (groomed or ungroomed) occur on any mapped landslide deposits.

Some smaller portions of the granitic soils on steep slopes and some small areas of poorly consolidated rhyolite are the areas on the Forest with potential erosion hazards when soils have no vegetation present. These soil types are found on approximately 4 percent of the project area (64,101 acres).

Existing roads also have the potential for 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.

Alternative 1 – No Action

Direct and Indirect Effects

Current OSV use would continue on 976,760 acres of the Lassen National Forest under the no-action alternative. Minimum snow depth would be 12 inches of uncompacted snow to travel on trails or cross-country. Minimum snow depth prior to grooming would be between 12 and 18 inches of unpacked snow.

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 18 inches of snow on trails, meaning that there is little to no chance that soil will be exposed on groomed OSV trails. The 12-inch snow depth off trails has been observed to be adequate for cross-country travel and to mitigate and eliminate contact with soil surface, compaction, or rutting or disturbance of organic matter on ungroomed trails (USDA FSH 2509.25 for Region 2).

Soils within the Lassen 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 12 inches of snow is adequate to protect these sensitive soil types that cover approximately 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.

Soil Stability

With adequate snow depths, cross-country OSV use is unlikely to affect soil stability. There are approximately 28,818 acres with landslide potential. Landslides within the Lassen 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 a small effect on ground disturbance that could lead to erosion, especially on soils derived from granitic or rhyolitic parent materials (approximately 64,101 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 the potential for erosion on these sites. Also, OSV operators generally 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 118. Soil 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 (Meadow soils, erosive soils, low stability soils)	Acres of cross-country travel open to OSV use on sensitive soils	87,292
Soil Stability	Minimum Snow Depths on trails	Inches of snow	12
Soil Productivity	Minimum snow depths for cross-country travel	Inches of snow	12
Soil Productivity	Total area open to OSV use	Acres open to cross-country OSV travel	976,760

Alternatives 2 (Proposed Action), 3, and 4

Table 119 provides a summary of the alternatives proposed.

Table 119. Alternative comparisons

OSV Management	Alternative 1 No Action: Current OSV Management	Alternative 2 Proposed Action	Alternative 3	Alternative 4
National Forest System (NFS) Lands within the Lassen National Forest (acres)	1,150,020	1,150,020	1,150,020	1,150,020
OSV Use Allowed:				
• Designated OSV Areas (acres)	976,760	947,120	878,690	879,690
• Designated OSV Trails (miles)	406	406	406	408
Minimum Snow Depth for OSV Use on Designated Trails (inches)	12	6 on a limited basis	6 on a limited basis	Dependent on snow conditions. No restriction with 6 or more inches on trails identified for grooming.
Minimum Snow Depth for Cross-country OSV Use (inches)	12	12	12	12

Project Design Features and Mitigation Measures

Soil and Water Resources

- Spill containment equipment shall be available at the facilities where grooming equipment is re-fueled.
- Designate specified equipment maintenance and refueling sites and ensure that they are located on gentle slopes, on uplands, and outside of Riparian Conservation Areas (RCAs) and sensitive terrestrial wildlife habitats.
- Grooming shall not occur when the ground surface is exposed and soil damage or rutting could occur. The operator shall consider recent, current, and forecasted weather and snow conditions to ensure these conditions are met.
- Design and maintain all stream crossings and other instream structures to provide for passage of flow and sediment, withstand expected flood flows, and allow free movement of resident aquatic life.
- Prohibit OSV use and grooming in wet meadows unless protected by at least 1 foot of packed snow or 2 inches of frozen soil, unless there is no other practicable alternative route. If OSV trails must enter wet meadows, use bridges or raised prisms with diffuse drainage to sustain flow patterns. Set crossing bottoms at natural levels of channel beds and wet meadow surfaces. Avoid actions that may dewater or reduce water budgets in wet meadows.
- Adhere to Best Management Practices related to Over Snow Vehicle Use from the 2012 USFS National Core BMP Technical Guide and the 2011 Region 5 Soil and Water Conservation Handbook Provide BMPs, project design features, and mitigation measures associated with compliance. Discuss reliability, cost, and effectiveness of these measures. Use research or monitoring to back up effectiveness and reliability.

Required Monitoring

The Forest Service has an obligation to monitor the effects of OSV use as required by Subpart C of the Travel Management Regulations. Furthermore, as an ongoing component of the State-funded OSV program, California State Parks requires and provides funds to the Forest Service to monitor OSV trail systems for evidence of OSV trespass into closed areas, OSV use near or damage of sensitive plant and wildlife sites, and low snow areas subject to erosion.

Monitoring that will occur during implementation of any alternative related to the soil resource includes the following:

1. Monitor to ensure resource damage is not occurring when there is less than the prescribed minimum snow depth (depending on alternative) with certain exceptions as described in the alternative description (chapter 2 EIS). Snow depth measurement locations and techniques would be developed using an interdisciplinary team approach and would consider terrain, season, proximity to sensitive areas, and resource damage criteria.
2. Monitor and take necessary actions to prevent damage to meadows and soils in the High Lakes area.
3. Monitor to ensure OSV use is not occurring in prohibited areas.
4. Monitor to ensure OSV use that is restricted to designated routes is not encroaching outside the trail corridor.
5. Periodically monitor the effects of the 6-inch minimum snow depth allowed to ensure that there are no impacts to the road or trail surface under alternatives 2, 3, and 4.

Direct and Indirect Effects

The potential direct and indirect effects for these alternatives are similar to the no-action alternative except that the no-action alternative has more acreage open to cross-country OSV use and has the potential to have the most impacts to the soil resource. Project design features proposed here would not be implemented under the no-action alternative either. Also, under alternatives 2, 3, and 4, OSV use can occur on existing roads and trails with a minimum snow depth of 6 inches instead of 12 inches, which could lead to localized soil disturbance where there is repeated use at lower snow depths. The effects of snow plowing and trail grooming would be similar to those effects described under the no-action alternative above.

Soil Productivity

Impacts of OSV use on soil productivity would be similar to the impacts described under the no-action alternative. 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 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 2, the acres open to cross-country OSV travel on sensitive soils would be the same as under the no-action alternative, but that acreage would decrease under alternatives 3 and 4 (table 120). Alternative 3 would have the least impact on sensitive soils and soil productivity overall because the least acreage would be open to potential cross-county OSV travel within the Lassen National Forest.

Soil Stability

Impacts of OSV use on soil stability would be similar to the impacts described under the no-action alternative. 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 potential to have exposed bare soil on trails and roads under alternatives 2, 3, 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 is important to determine the site-specific effects of a reduced minimum snow depth on the soil resource.

Table 120. Soil resource indicators and measures for alternatives 2, 3, and 4 direct and indirect effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2	Alternative 3	Alternative 4
Soil Productivity and Soil Stability	OSV use on sensitive soils (meadow soils, erosive soils, low stability soils)	Acres (%) of cross-country open to OSV use on sensitive soils	87,292 (6%)	73,622 (5%)	84,529 (6%)
Soil Stability	Minimum Snow Depths on trails	Inches of snow	6	6	6
Soil Productivity	Minimum snow depths for cross-country travel	Inches of snow	12	12	12
Soil Productivity	Total area open to OSV use	Acres open to cross-country OSV travel	947,120	878,690	879,690

Cumulative Effects

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Cumulative effects include a discussion of the combined, incremental effects of human activities. For activities to be considered cumulative, their effects need to overlap in both time and space with those of the proposed actions. For the soil resource, the area for consideration is the whole planning area.

Vegetation Management

Several past, current, and future vegetation management activities are occurring on the Lassen National Forest over approximately 722,391 acres. 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 will be minimal throughout the forest. Potential road-building 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 roads and 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 has a significant direct impact upon soils.

Grazing

Almost the entire Lassen National Forest is located within a grazing allotment. There are 46 grazing allotments present. Impacts of grazing are generally limited to areas where the animals bed, lounge, trail or access water. This generally only occurs during the spring, summer, and fall seasons when no snow

covers the ground. Cumulative impacts from grazing are unlikely as OSV use will not likely occur at the same time as grazing, and impacts from OSV use are minimal.

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 will continue to affect California and the Lassen National Forest in the future. Precipitation events will likely become more unpredictable and warmer temperatures will 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 potentially increase the amount of time the soil would be exposed to OSV impacts if seasons of OSV use are not shortened. Potentially, this could increase the impacts on sensitive soil sites including wet meadows and erosive sites because of increased soil exposure.

Summary of Environmental Effects

Table 121 summarizes the soil issue indicators and the potential effects to those indicators by alternative.

Table 121. Summary comparison of environmental effects to the soil resource

Resource Element	Indicator/ Measure	Alternative 1 (no-action alternative)	Alternative 2 (proposed action)	Alternative 3	Alternative 4
Soil Productivity and Soil Stability	OSV acres open to cross-country travel on sensitive soils (including wet meadows, areas with potential low stability, and areas with potential erosion hazards).	There would be no change in acreage of area currently open to cross-country OSV travel on sensitive soils. Approximately 87,292 acres with mapped sensitive soil types are open to cross-country travel.	Approximately 87,292 acres of sensitive soils would be open to cross-country OSV travel within the Forest. This is no different from the no-action alternative, and these two alternatives have the greatest acreage of sensitive soils open to OSV cross-country travel.	Approximately 73,622 acres of sensitive soils will be open to cross-country OSV travel. Under this alternative, the least amount of sensitive soils will be open to OSV cross-country travel.	Approximately 84,529 acres of sensitive soils will be open to cross-country OSV travel. Under this alternative, there would be less sensitive soils open to cross-country OSV travel than the proposed action, but slightly more than under alternative 3.
Soil Stability	Minimum snow depths on trails (inches)	Minimum snow depth is 12 inches of unpacked snow prior to any OSV travel over existing roads and trails. This minimum snow depth has been observed to be sufficient to prevent contact of OSVs with the bare soil surface.	Minimum snow depth is 6 inches of unpacked snow prior to any OSV travel over existing roads and trails. This minimum snow depth may potentially create conditions in which the road surface is exposed to OSVs and there is potential for some soil erosion or rutting of the road surface. Monitoring of this snow depth is recommended to further evaluate the potential effects to soils.	Minimum snow depth is 6 inches of unpacked snow prior to any OSV travel over existing roads and trails. This minimum snow depth may potentially create conditions in which the road surface is exposed to OSVs and there is potential for some soil erosion or rutting of the road surface. Monitoring of this snow depth is recommended to further evaluate the potential effects to soils.	Minimum snow depth is 6 inches of unpacked snow prior to any OSV travel over existing roads and trails. This minimum snow depth may potentially create conditions in which the road surface is exposed to OSVs and there is potential for some soil erosion or rutting of the road surface. Monitoring of this snow depth is recommended to further evaluate the potential effects to soils.

Resource Element	Indicator/ Measure	Alternative 1 (no-action alternative)	Alternative 2 (proposed action)	Alternative 3	Alternative 4
Soil Productivity	Minimum snow depths for cross-country travel (inches)	Minimum snow depth for cross-country OSV travel is currently 12 inches of unpacked snow. Potential effects to the soil are unlikely to occur with at least 12 inches of snow covering the soil surface.	Minimum snow depth of 12 inches of unpacked snow for cross-country OSV travel would not change. Potential effects to the soil are unlikely to occur with at least 12 inches of snow covering the soil surface.	Minimum snow depth of 12 inches of unpacked snow for cross-country OSV travel would not change. Potential effects to the soil are unlikely to occur with at least 12 inches of snow covering the soil surface.	Minimum snow depth of 12 inches of unpacked snow for cross-country OSV travel would not change. Potential effects to the soil are unlikely to occur with at least 12 inches of snow covering the soil surface.
Soil Productivity	Total acres open to OSV use	Approximately 976,760 acres of the Forest are open to OSV use. Under the no-action alternative, the most acreage is open to OSV use; therefore, the most potential for soil damage exists under this alternative.	Approximately 947,120 acres of the Forest would be open to OSV use. This is less area open to OSV use compared to the no-action alternative, but it is the greatest amount of acres open to OSV use when compared to the other action alternatives. The proposed action has the potential for the most impacts to the soil resource when compared with alternatives 3 and 4.	Approximately 876,690 acres of the Forest would be open to OSV use, which is the least amount of land open to OSV use out of all four alternatives.	Approximately 879,690 acres of the Forest would be open to OSV use, which is a greater area than under alternative 3, but less area than the no-action and proposed action alternatives.

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

This project complies with the Lassen 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.

Socioeconomics

This section analyzes the social and economic consequences of management alternatives to allow over-snow vehicle (OSV) use on the Lassen National Forest. The Lassen National Forest is analyzing management alternatives to designate OSV routes and areas on the forest. These designations will comply with Subpart C - Use by Over-Snow Vehicles, of the Forest Service Travel Management Regulations. In addition, the Lassen National Forest will combine the analysis needed for OSV use designations with analysis to formalize the identification of National Forest System Snow Trails that will be groomed for OSV use.

The human environment is central to the purpose and need for this project. OSV use designation on the Lassen National Forest seeks to protect public values related to access, safety, recreational enjoyment, and natural and cultural resources (ecosystem services). This specialist report analyzes the social and economic dimensions of OSV use designation.

Relevant Laws, Regulations, and Policy

Regulatory Framework

Land and Resource Management Plan

The 1992 Lassen National Forest Land and Resource Management Plan (LRMP) does not specify goals and objectives for the social and economic environment. However, the LRMP's goals and objectives for cultural resources, facilities, and recreation are relevant to the social and economic analysis. In particular, the following goals help to frame the social and economic analysis in this report:

- Ensure that Forest actions are not detrimental to traditional Native American religious rights and practices (pg. 4-3)
- Provide stable and cost-efficient road and trail systems (pg. 4-3)
- Provide a wide-range of outdoor recreation opportunities to meet public demand (pg. 4-4)
- Provide diverse opportunities for off-highway vehicle recreation (pg. 4-4)
- Provide diverse opportunities for winter sports (pg. 4-4)
- Work in partnership with local communities to expand recreational facilities, programs, and trails on both public and private land (pg. 4-5)

Travel Management Regulations Subpart C

The Forest Service's 2005 Travel Management Regulations 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 specialist report 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 NFMA 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 specialist report identifies minority and low-income populations in the analysis area and addresses the potential for disproportionate and adverse effects to these populations.

Topics and Issues Addressed in This Analysis

Resource Indicators and Measures

Table 122. Socioeconomic resource indicators and measures for assessing effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Used to address: P/N, or key issue?	Source (LRMP S/G; law or policy, BMPs, etc.)?
Economic activity	Employment	Number of jobs and amount of labor income	No	--
Quality of life	Recreation visitation	Number of recreation visits	No	--
Quality of life	Values, beliefs, and attitudes	Qualitative evaluation of public values, beliefs, and attitudes	No	--
Environmental justice	Effects to low-income and minority populations	Qualitative evaluation of disproportionate effects to low-income and minority populations	No	Executive Order 12898

Methodology

Economic Analysis

Economic impacts were modeled using IMPLAN Professional Version 3.0 with 2012 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 on the Lassen National Forest. Indirect employment and labor income contributions occur when a sector purchases supplies and services from other industries in order 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 440 sectors using Federal data from 2012.

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 (USFS 2015b), and public comments to discern the primary values that the Lassen 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 Lassen National Forest, last collected in FY2010
- Public scoping comments

Incomplete and Unavailable Information

Due to incomplete and unavailable information, the socioeconomic analysis uses the following assumptions:

1. Local economic composition (e.g., sectoral specialization, size of labor market) is constant throughout the analysis period.
2. OSV trail grooming increases OSV visitor use.
3. Forest visitors' recreation preferences do not change during the analysis period.
4. OSV and non-motorized winter recreation visitors have similar characteristics to forest visitors overall (e.g., place of residence).

Spatial and Temporal Context for Effects Analysis

The Lassen National Forest is located in northeastern California. 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 Lassen National Forest's economic area of influence encompasses Butte, Lassen, Plumas, Shasta, and Tehama counties. These five 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 (2025). 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 123. Resource indicators and measures for the 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 Lassen National Forest is located in northeastern California in Butte, Lassen, Plumas, Shasta, and Tehama counties. The area around the Lassen National Forest is mostly non-metropolitan; the nearest major population centers are Redding, California (in Shasta County) to the west and Chico, California (in Butte County) to the south.

The analysis area counties have high shares of older residents than the state. Plumas County has nearly double the share of residents over the age of 65 compared to 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 124. Demographic characteristics by county

Location	Population (ACS 2013 5-year Estimate)	Rural-Urban Continuum Code (ERS 2013)	Share of Population Over 65 (ACS 2013 5-year Estimate)
Butte County	220,542	3 (Metro, less than 250,000)	15.8%
Lassen County	34,018	7 (Nonmetro, not adjacent to metro)	10.3%
Plumas County	19,586	7 (Nonmetro, not adjacent to metro)	22.1%
Shasta County	177,966	3 (Metro, less than 250,000)	17.6%
Tehama County	63,241	4 (Nonmetro, adjacent to metro)	16.4%
California	37,659,181	--	11.8%

Source: U.S. Census Bureau 2015a and USDA ERS 2013

The five 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 every county compared to the state. These economic characteristics suggest that changes in local employment and income may be felt acutely. Lassen 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 potential changes in employment, income, and public finances in the context of local economic characteristics.

Table 125. Economic characteristics by county

Location	Median Household Income (ACS 2013 5-year Estimate)	Unemployment Rate (ACS 2013 5-year Estimate)	Share of Tourism-related Employment (County Business Patterns 2013, accessed via EPS)
Butte County	$43,752	14.1%	18.6%
Lassen County	$53,107	13.6%	20.4%
Plumas County	$45,794	17.2%	15.4%
Shasta County	$44,651	13.4%	17.8%
Tehama County	$41,924	15.8%	19.2%
California	$61,094	11.5%	16.3%

Source: U.S. Census Bureau 2015a and U.S. Census Bureau 2015b

Much of the Lassen 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).

Recreation Visitors

National Visitor Use Monitoring data was last collected on the Lassen National Forest in fiscal year 2010. Approximately 300,000 visits to the Lassen National Forest occur each year (USFS 2015b). Nearly 10

percent of survey respondents indicate that they participate in snowmobiling during their trip, with 8.4 percent reporting that snowmobiling is the primary purpose of their trip (USFS 2015b). That makes snowmobile use the third most common recreation activity on the forest, behind only viewing natural features and fishing, which account for 19.4 percent and 22.0 percent of main activities, respectively (USFS 2015b). The majority of forest visitors (60.2 percent) traveled fewer than 100 miles to reach the site. Nearly one-fifth of visits originated from a single zip code (96130), which covers the city of Susanville, California (USFS 2015b). The NVUM data do 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

Visitors to national forests spend money on lodging, restaurants, gasoline, entry fees, and souvenirs. These purchases support employment and income in communities that surround NFS 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). These data indicate that a snowmobiler spends an average of $642 ($2007) on a non-local overnight trip and $74 ($2007) on a local day trip, compared to $366 ($2007) and $34 ($2007) 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) on the Lassen National Forest supports approximately 79 jobs[36] and $2.6 million in labor income on an average annual basis (USFS 2015a). The largest contributions are to the retail trade and accommodation and food services sectors (USFS 2015a). Due to the high spending of snowmobilers, changes to over-snow vehicle opportunities on the Lassen National Forest have the potential to 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 Lassen 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 on the Lassen National Forest.

[36] 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.

Snow depth restrictions were controversial among some commenters with one noting that “Snow depth restrictions have always been difficult for the FS to enforce, and have often resulted in Law Enforcement closing down an entire area based solely on snow depths at trailheads” (Sierra Access Coalition). However, other snowmobile users found the snow depth restriction reasonable, stating their “support [for] the implementation of the 6-inch minimum for OSV usage on roads and trails…parking or trailhead facilities are located in areas where there may be minimal snowfall but exceptional recreational opportunities remain for the snowmobile community in areas that are higher and colder and may have numerous feet of snow” (ORBA).

Some commenters believe that elevation restrictions are at best, redundant and perhaps arbitrary given the snowpack restriction (ORBA, George Van Eperen). Furthermore, another commenter noted that “snowmobiling cross-country is self-limiting. A snowmobiler quickly pays the high price for riding his snowmobile with inadequate snow” (Sierra Access Coalition). Beliefs that OSV users self-regulate may contribute to negative attitudes about Forest Service restrictions on OSV access and use.

The contribution of OSV use to local economic activity, and the potential for restrictions to decrease these economic contributions, was noted by a commenter: “It is critical that an economic analysis be completed as part of the environmental analysis…If the restrictions that are currently proposed in the NOI were implemented this year, there would be a great impact to local businesses and loss of jobs” (Sierra Access Coalition).

Some commenters noted that motorized and non-motorized recreationists face asymmetrical user conflict: “Quiet non-motorized recreationists can have the quality of their experience dramatically altered by snowmobiles, while motorized users often don’t even notice skiers using the same landscape” (WWA 2014). In particular, some commenters identified the following effects that reduce the quality of the recreation experience for non-motorized users: “OSV impacts on other recreational users include noise, toxic exhaust, consumption of powder snow and rutting of trails and routes. Because non-motorized users wish to avoid such impacts, non-motorized use becomes concentrated at the areas where motorized use is prohibited. Where snowmobile use is heavy, non-motorized users are displaced to the extent that the area becomes effectively motorized use-only” (Snowlands Network).

A number of non-motorized winter recreationists expressed concerns that shared motorized and non-motorized spaces pose health (from snowmobile emissions) and safety (potential for collision or triggering an avalanche) risks to non-motorized users (WWA 2014).

Additionally, some commenters believe that motorized and non-motorized winter recreation users have inequitable opportunities on the Lassen National Forest. For example, one comment argued that “the motorized community has more than enough open space to use compared to areas that are exclusive to human powered backcountry use” (Snowlands Network). Additionally, other comments expressed concern that the proposed action would leave over 82 percent of the forest open to cross-county OSV use (Wild Earth Guardians, WWA). As a result of asymmetrical user conflict and few restrictions on OSV use, these commenters argue that “with fewer or smaller areas available, there will be a concentration of use which may lead to increased crowding, recreational conflict and resource damage. For example, it is becoming more commonplace for snowmobilers to travel on dry roadbeds or snow-free trails to access receding snowline” (WWA 2014).

These views led some commenters to suggest that the forest dedicate some terrain to non-motorized snow sports only, to reduce conflict: “Motorists with OSVs now travel, per visit, faster, farther, higher and longer than in the past. This turbocharged magnification of demand for terrain has increased impacts to forest resources, to air and water quality, to modest (bipedal) forest visitors, and likely to resident wildlife” (Jeff Erdoes). Snowlands Network identifies the following areas as particularly important for

non-motorized recreational users: Eagle Lake, Butte Lake, McGowen, Colby Mountain, Lake Almanor, and Fredonyer-Goumaz (Snowlands Network).

The relationship between OSV users and Pacific Crest Trail users was highlighted in several comments. For some, "the prohibition of snowmobiles on the PCT trail tread only is inadequate in protecting the trail and experience afforded PCT winter users" (PCTA). Other commenters, however, argued that OSVs should be allowed to cross the PCT at any location (Recreation Outdoors Coalition).

Environmental Justice

As noted above, residents of the analysis area counties experience a higher degree of economic insecurity than California residents overall. This is borne out in the poverty data, which reveals that four of the five analysis area counties have a higher poverty rate than California. In particular, residents of Butte and Tehama counties experience particularly high rates of poverty.

However, the analysis area counties have lower shares of minority residents than the state. In California, 60 percent of the population identifies other than non-Hispanic white. In the analysis area counties, the shares of minority residents are much lower, accounting for between 15 percent and 34 percent of the population.

Table 126. Environmental justice characteristics by county

Location	Poverty Rate[37] (ACS 2013 5-year Estimate)	Share Other than White Alone, Non-Hispanic (ACS 2013 5-year Estimate)
Butte County	20.4%	25%
Lassen County	16.9%	34%
Plumas County	15.2%	15%
Shasta County	17.5%	18%
Tehama County	19.7%	29%
California	15.9%	60%

Source: U.S. Census Bureau 2015a

Given high rates of poverty in the analysis area, the environmental consequences analysis will address the potential for management actions to disproportionately and adversely affect low-income individuals. Low-income individuals may be less able to adapt to changes in employment, income, and recreation opportunities on the Lassen National Forest.

Alternative 1

The "no action" alternative is required by the National Environmental Policy Act and serves as a baseline to compare effects of action alternatives. This alternative would continue current management and would not affect OSV use in the project area.

[37] "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 2015a).

Table 127. 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

Economic Activity

The “no action” alternative 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, 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 on the Lassen National Forest and quality of life for visitors and area residents. In particular, commenters discussed recreation opportunities and user conflict. The “no action” alternative would not implement management activities that affect recreation opportunities or user conflict. As noted in the recreation report, conflicts between motorized and non-motorized winter experiences on the Lassen National Forest are currently minor and infrequent. However, 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 potential for increased user conflict may particularly affect quality of life for non-motorized winter recreation users.

Environmental Justice

The “no action” alternative 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 increase the travel costs (e.g., 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.

Alternative 2

Alternative 2 is the proposed action, with modifications based on public concerns expressed in the scoping process. Alternative 2 would designate routes and areas for OSV use on the Lassen National Forest.

Direct and Indirect Effects - Alternative 2

Economic Activity

The proposed action would decrease the acres open to OSV use to 947,120 acres, a 3 percent reduction from existing conditions. However, the proposed action would continue to designate 406 miles of designated OSV trails and groom 324 miles of OSV trails, which is the same as current conditions. As stated in the assumptions, based on observational evidence, OSV visitor use is driven by the miles of groomed trails. Therefore, the proposed action is not expected to change recreational visitor use compared to the “no action” alternative. As a result, recreation-related employment, income, and tax revenue would not change relative to the “no action” alternative.

Quality of Life

The values, beliefs, and attitudes discussion above identified several key issues related to OSV use on the Lassen National Forest and quality of life for visitors and area residents. In particular, commenters discussed recreation opportunities and user conflict. The proposed action would close 202,900 acres to OSV use, which is a 15 percent increase from existing conditions. Therefore, the proposed action would improve quality of life for non-motorized winter recreation users on the Lassen National Forest who prefer to have areas separated from OSV users. The increase in acres closed to OSV use may alleviate some concerns expressed by non-motorized winter recreation users related to vehicle exhaust fumes, disparities in speed, noise, and competition for fresh powder. Although the miles of designated and groomed OSV trails would not change relative to current conditions, some OSV users may feel that the reduction in open acres adversely affects their quality of life.

The proposed action would continue to groom OSV trails in close proximity to the Caribou Wilderness boundary and to the boundary of Lassen Volcanic National Park. Additionally, non-motorized and motorized users would continue to share trailheads for access. Therefore, the potential for user conflict to adversely affect quality of life would continue under the proposed action.

Environmental Justice

The proposed action would prohibit OSV use in areas below 3,500 feet in elevation. This may require some OSV users to travel farther to recreate on the forest. However, snow depths are typically inadequate at lower elevations, so the effect of the prohibition on travel costs is expected to be minor. Like the “no action” alternative, climate change may affect travel costs due to reduced precipitation and warmer winters. Low-income individuals would be disproportionately affected by changes in the cost of participating in winter recreation on the forest. Overall, the proposed action is expected to have a minor effect on recreation travel costs.

Table 128. Socioeconomic resource indicators and measures for alternative 2 direct/indirect effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2 Direct/Indirect Effects
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	15% increase in acres closed to OSV use would benefit quality of life of non-motorized winter recreation users; potential for continued user conflict due to trails in proximity to wilderness, national park, and shared trailheads
Environmental Justice	Low-income and minority populations	Change in cost of participating in recreation activities	Minor change due to prohibition on OSV use below 3,500 feet in elevation; 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, and prescribed burns. These actions have the potential to temporarily restrict or displace recreation use. However, none of the actions are expected to measurably affect annual recreation use, visitor spending, and associated employment, 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.

Table 129. 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 effects to employment, income, and tax revenue are expected
Quality of life	Recreation visitation	Number of recreation visits	Infrequent and minor displacement not expected to change number of recreation visits
Quality of life	Values, beliefs, and attitudes	Qualitative evaluation of public values, beliefs, and attitudes	Infrequent and minor displacement not expected to change user 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

Alternative 3 is described in detail in chapter 2 of the EIS. Alternative 3 was developed to address the non-motorized recreational experience issue.

Direct and Indirect Effects - Alternative 3

Economic Activity

Alternative 3 would decrease the acres open to OSV use to 878,690 acres, a 10 percent reduction from existing conditions. However, alternative 3would continue to designate 406 miles of designated OSV trails and groom 324 miles of OSV trails, which is the same as current conditions. As stated in the assumptions, based on observational evidence, OSV visitor use is driven by the miles of groomed trails. Therefore, alternative 3 is not expected to change recreational visitor use compared to the “no action” and proposed action alternatives. As a result, recreation-related employment, income, and tax revenue would not change relative to the “no action” and proposed action alternatives.

Quality of Life

The values, beliefs, and attitudes discussion above identified several key issues related to OSV use on the Lassen National Forest and quality of life for visitors and area residents. In particular, commenters discussed recreation opportunities and user conflict. Alternative 3 would close 271,330 acres to OSV use, which is a 36 percent increase from existing conditions. Therefore, alternative 3 would improve quality of life for non-motorized winter recreation users relative to both the “no action” alternative and the proposed action. The increase in acres closed to OSV use may alleviate some concerns expressed by non-motorized winter recreation users related to vehicle exhaust fumes, disparities in speed, noise, and competition for fresh powder. Although the miles of designated and groomed OSV trails would not change relative to current conditions, some OSV users may feel that the reduction in open acres adversely affects their quality of life.

Alternative 3 would continue to groom OSV trails in close proximity to the Caribou Wilderness boundary and to the boundary of Lassen Volcanic National Park. Additionally, non-motorized and motorized users would continue to share trailheads for access. Therefore, the potential for user conflict to adversely affect quality of life would continue under alternative 3.

Environmental Justice

The environmental justice consequences are expected to be consistent with those described under alternative 2.

Table 130. Socioeconomic resource indicators and measures for alternative 3 direct/indirect effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 3 Direct/Indirect Effects
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	36% increase in acres closed to OSV use would benefit quality of life of non-motorized winter recreation users; potential for continued user conflict due to trails in proximity to wilderness, national park, and shared trailheads
Environmental Justice	Low-income and minority populations	Change in cost of participating in recreation activities	Minor change due to prohibition on OSV use below 3,500 feet in elevation; climate change may increase distances winter recreation users must travel for adequate snow depth

Cumulative Effects – Alternative 3

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

The cumulative effects under alternative 3 would be similar to the cumulative effects described under alternative 2.

Alternative 4

Alternative 4 is described in detail in chapter 2. Alternative 4 was developed to address the motorized recreational experience issue.

Direct and Indirect Effects - Alternative 4

Economic Activity

Alternative 4 would decrease the acres open to OSV use to 966,270 acres, a 1 percent reduction from existing conditions. Alternative 4 would continue to designate 406 miles of designated OSV trails and groom 324 miles of OSV trails, which is the same as current conditions. As stated in the assumptions, based on observational evidence, OSV visitor use is driven by the miles of groomed trails. Therefore, alternative 4 is not expected to change recreational visitor use compared to the other alternatives analyzed in this report. As a result, recreation-related employment, income, and tax revenue would not change relative to the “no action” alternative.

Quality of Life

The values, beliefs, and attitudes discussion above identified several key issues related to OSV use on the Lassen National Forest and quality of life for visitors and area residents. In particular, commenters discussed recreation opportunities and user conflict. Alternative 4 would close 183,750 acres to OSV use, which is a 5 percent increase from existing conditions. Alternative 4 would close fewer acres to OSV use than the other action alternatives (proposed action and alternative 3). In addition, alternative 4 would allow OSV use below 3,500 feet in elevation where snow depths are adequate. The net effect on motorized and non-motorized quality of life is expected to be consistent with current conditions and the "no action" alternative.

Alternative 4 would continue to groom OSV trails in close proximity to the Caribou Wilderness boundary and to the boundary of Lassen Volcanic National Park. Additionally, non-motorized and motorized users would continue to share trailheads for access. Therefore, the potential for user conflict to adversely affect quality of life would continue under the proposed action.

Environmental Justice

Unlike the proposed action and alternative 3, alternative 4 would allow OSV use below 3,500 feet in elevation where snow depths are adequate. Therefore, management actions are not expected to affect the travel costs of motorized winter recreation users relative to current conditions. The environmental justice consequences are the same as described under the "no action" alternative.

Table 131. Socioeconomic resource indicators and measures for alternative 4 direct/indirect effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 4 Direct/Indirect Effects
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	No net change in quality of life relative to current conditions; 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

Cumulative Effects – Alternative 4

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

The cumulative effects under alternative 4 would be similar to the cumulative effects described under alternative 2.

Summary

Table 132 displays a comparison of each alternative's socioeconomic consequences.

Table 132. Summary comparison of environmental effects to socioeconomic resources

Resource Element	Indicator/Measure	Alt 1	Alt 2	Alt 3	Alt 4
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	No change due to management; increased visitor use over time would increase number of jobs, labor income, and tax revenue	No change due to management; increased visitor use over time would increase number of jobs, labor income, and 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	No change due to management; visitor use expected to increase over time	No change due to management; visitor use expected to increase over time	No change due to management; visitor use expected to increase over time	No change due to management; visitor use expected to increase over time
Quality of life	Values, beliefs, and attitudes	No net change in quality of life relative to current conditions; user conflict may increase due to population growth and increased visitor use	15% increase in acres closed to OSV use would benefit quality of life of non-motorized winter recreation users; potential for continued user conflict due to trails in proximity to wilderness, national park, and shared trailheads	36% increase in acres closed to OSV use would benefit quality of life of non-motorized winter recreation users; potential for continued user conflict due to trails in proximity to wilderness, national park, and shared trailheads	No net change in quality of life relative to current conditions; user conflict may increase due to population growth and increased visitor use
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	Minor change due to prohibition on OSV use below 3,500 feet in elevation; climate change may increase distances winter recreation users must travel for adequate snow depth	Minor change due to prohibition on OSV use below 3,500 feet in elevation; climate change may increase distances winter recreation users must travel for adequate snow depth	No change due to management; climate change may increase distances winter recreation users must travel for adequate snow depth

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

The “no action” alternative would not be in compliance with Subpart C of the Travel Management regulations, which requires designation of roads, trails, and areas on NFS lands to provide for OSV use.

Alternatives 2, 3 and 4 would be in compliance with Subpart C of the Travel Management regulations. These alternatives would also be in compliance with the Forest Plan direction to provide diverse off-highway and winter recreation opportunities.

This report satisfies requirements for socioeconomic analysis, as identified in the Relevant Laws, Regulations, and Policy section.

Noise

This analysis considers and discloses the potential acoustic impacts of sound related to the following proposed actions:

- Designating roads, trails and areas for Over Snow Vehicle (OSV) use
- Identification of snow trails for grooming for snowmobile use

This analysis compares alternatives that would result in varying levels of snowmobile use on the Lassen National Forest.

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 (NFS) 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, Forest-wide Standard and Guideline number 69 (USDA Forest Service 2009b).

Land and Resource Management Plan

The Lassen National Forest Land and Resource Management Plan (LRMP or Forest Plan) provides standards and guidelines for areas that are relevant to this noise analysis as follows:

Forest Goals:

Wilderness and Further Planning Areas

a. Protect Wilderness character in designated and recommended Wilderness

Standards and Guidelines:

15. Recreation

(a)(3). Manage recreation according to the Recreation Opportunity Spectrum (ROS) classes described in the ROS User’s Guide, as specified in Appendix J, and the Management Prescriptions. Refer to the separate ROS Map for the distribution of ROS classes throughout the Forest.

(b)(6) Minimize user conflicts by specifying allowable winter use on certain roads and trails (for example cross-country ski trails, snowmobile-only trails or winter 4-wheel drive only).

Desired Condition

The desired outcome of this OSV use designation process is a manageable, designated OSV system of trails and areas within the Lassen National Forest, which is consistent with and achieves the purposes of the Forest Service Travel Management Regulations at 36 CFR part 212, Subpart C. The system of trails and areas will provide access, ensure that 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.

Management Area

The following management areas are relevant to providing both motorized recreation opportunities, and quiet non-motorized recreation opportunities.

M – Semi-Primitive Motorized Recreation

This prescription is derived from the ROS class of semi-Primitive Motorized (SPM) (see Appendix J of the LRMP for the definition of this class). It is intended to facilitate dispersed, motorized recreation, such as snowmobiling, four-wheel driving, and motorcycling, in areas essentially undisturbed except for the presence of four-wheel drive roads and trails. Non-motorized activities such as hiking, fishing, hunting, picnicking, and cross-country skiing are also possible. Motorized travel may be seasonally prohibited or restricted to designated routes to protect other resources. (LRMP 4-60)

N – Semi-Primitive Non-Motorized Recreation:

This prescription is derived from the R0S class of Semi-Primitive Non-Motorized (SPNM) (See Appendix J of the LRMP for the definition of this class). It is intended to facilitate dispersed recreation such as hiking, mountain bicycling, horseback riding, hunting, and cross-country skiing in unroaded, essentially undisturbed areas outside of existing and proposed wilderness areas. Motorized recreation is prohibited (LRMP 4-63).

Prohibit motorized recreation, including four wheel driving, motorcycling, and snowmobiling (LRMP 4-64)

S – Special Areas

Recreation: 2. Prohibit motorized vehicles within Research Natural Areas (LRMP 4-68)

Wild and Scenic Rivers: 1. Allow public recreation and other resource use activity based on the recommended category of each river segment. (LRMP 4-69)

W – Wilderness Prescription

The prescription specifies management direction in accordance with the Wilderness Act of 1964, assuming no permanent or long-lasting evidence of human use. Motorized and mechanized equipment is prohibited (LRMP 4-76).

Special Area Designations

Special Area Designations within the Lassen National Forest that are relevant to the noise analysis include Wilderness, Proposed Wilderness, Inventoried Roadless Areas, and National Trails.

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
- 2001 Roadless Area Final Rule (36 CFR Part 294)
- 2005 Travel Management Regulations – Subpart C (36 CFR Parts 212 and 261) as amended in 2015 - Use by Over Snow Vehicles (Travel Management Regulations)

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 lands are subject to the state standards described above. The Lassen LRMP does not identify Standards and Guidelines regulating noise emissions of forest activities (California Department of Parks and Recreation 2010).

Topics and Issues Addressed in This Analysis

Issues

Designating trails and areas for OSV use and grooming trails for OSV use leads to generation of anthropogenic noise and the potential to 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.

Resource Indicators and Measures

The potential for increased noise will be measured by:

- Acres of designated OSV use areas and anticipated change (increase/decrease) in overall use patterns; model outputs for noise generation;

- Miles of designated OSV trails (groomed and ungroomed) and anticipated change (increase/decrease) in overall use patterns; model outputs for noise generation;

The GIS noise model will consider:

- Proximity of predicted noise increases above ambient levels in sensitive areas to include:
  - Points along the Pacific Crest Trail
  - OSV trails near Wilderness areas;
  - OSV trails near communities;
  - OSV trails brought forward by the public as concern areas during scoping (Butte Lake area);
  - Plowed OSV trailheads

Table 133. Resource indicators and measures for assessing effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Used to address: P/N, or key issue?	Source (LRMP S&G[38]; law or policy, BMPs[39], etc.)?
Noise	Opportunities for motorized winter uses	Acres open to OSV use, percent change	Yes	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.
	OSV designations	Miles of designated OSV trails/Miles of groomed OSV trails	Yes	

Environmental Consequences

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 includes commonly available datasets including:

- Digital elevation model (DEM)
- Land cover

[38] Standard and Guideline
[39] Best Management Practices

- Local weather conditions (average air temp, relative humidity, wild speed & 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.)

Spatial Context:

- Forest Boundary

Effects Timeframe:

- Short-term effects occur within 1 year.
- Long-term effects occur up to 20 years.

Affected Environment

Existing Condition

The Lassen National Forest has a well-developed winter recreation program which emphasizes snowmobile use and includes 406 miles of snowmobile trails that connect to six well-placed developed staging areas.

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 NFS trails (snow trails) by grooming snow for OSV use. Plowing of local access roads and trailhead parking lots, grooming trails for OSV 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.

The groomed OSV trail systems on the Hat Creek, Eagle Lake, and Almanor Ranger Districts are described in detail in the Recreation section of this analysis.

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 potential impacts to other recreational uses, and wildlife resources. These effects are specifically addressed in the Recreation and Wildlife sections of this analysis.

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 analysis, conflict between motorized and non-motorized winter users 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 and air quality impacts that lead to the displacement of non-motorized users.

Areas of specific concern to non-motorized users who are typically seeking a quiet recreation setting that is not influenced by the sight, sound, or exhaust smell of motorized vehicles include cross-country ski trails, the Pacific Crest Trail, the Butte Lake area, Wilderness, Proposed 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.

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 sounds 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.

Table 134. Resource indicators and measures for the existing conditions and alternative 1

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Existing Condition
Noise	Opportunities for motorized winter uses	Acres open to OSV use	976,760 acres open to OSV use
	OSV designations	Miles of designated OSV trails/Miles of groomed OSV trails	406 miles of designated OSV trails/324 of those miles are groomed OSV trails

Alternative 1 – No Action

By definition, direct and indirect effects (40 CFR 1508.8), and cumulative effects (40 CFR 1508.7) result from the proposed action, and thus are not germane to the no-action alternative.

Noise

Under the no-action alternative, 976,760 acres would remain open to 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. Of the 976,760 acres open to OSV use, only approximately 304,820 acres are anticipated to have high to moderate OSV use levels (see maps in the recreation section of this analysis) and the associated potential noise impacts.

Conflicts between motorized and non-motorized winter experiences on the Lassen are currently minor and infrequent, existing conflicts would continue and may increase as population and visitor use increase.

Occasional incursions into adjacent wilderness areas and non-motorized areas on other Federal lands would continue to occur, and possibly increase as population and visitor use increase.

Alternative 2 – Proposed Action

Project Design Features and Mitigation Measures

1. Coordinate timing of trail grooming to minimize impact on recreation experiences.
2. Configure OSV system to minimize impact on other resource values.
3. As staffing and funding allows, consider areas where additional signage along the Pacific Crest Trail may be needed to enhance wayfinding for winter users. Agency signage procedures would be followed. As a guideline, ensure trail markers are at eye level (approximately 40” above average maximum snow depth).
4. The Pacific Crest Trail would be identified on the Over Snow Vehicle Use Map.
5. Consider areas where antler shed gathering is popular and/or concentrated and if there is a need to implement seasonal OSV use restrictions or changes in management to provide for this recreational opportunity.

Required Monitoring

1. Monitor wilderness boundaries and other closed areas near groomed snow trails and areas open to OSV use for OSV incursions, coordinate and implement increased education or enforcement actions as needed.
2. Monitor trailheads and groomed trail areas for user conflicts and public safety concerns, coordinate and implement 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).

Direct and Indirect Effects - Alternative 2

Under alternative 2, 947,120 acres would remain open to 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 open Areas. Of the 947,120 acres open to OSV use, only 304,820 acres are anticipated to have high to moderate OSV use levels (see maps in the recreation section of this analysis) and the associated potential noise impacts.

Using average environmental factors for the winter season on the Lassen National Forest and the SPreAD-GIS model, figure 11 shows 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 Map 1 include the plowed OSV trailheads, points where OSV trails are near cross-country ski trails, designated wilderness areas, and Lassen Volcanic National Park, and points where OSV trails cross the Pacific Crest Trail. The noise propagation contour lines on the map show how the OSV sound is expected to spread out from the source location given unique environmental, vegetation and terrain conditions. The map also shows excess noise levels where the introduced OSV noise would be in excess of ambient sound conditions.

As shown in figure 12, OSV noise along the groomed OSV trails near the wilderness boundary may be heard from within the wilderness area. This represents a short-term disturbance to opportunities for solitude. This impact would be temporary and short-term as the OSV passes by on the trail.

Figure 13 shows the extent of potential noise impacts from OSV trails crossing the PCT, and near several non-motorized cross-country ski trails. The experience of non-motorized users along the PCT in the vicinity of OSV crossings would be temporarily impacted by noise from OSVs. Since PCT crossings would be designated in this alternative, the potential for noise impacts is confined to the area near the designated crossings. This would reduce the influence of noise that may be experienced under existing conditions, since there are currently no designated PCT crossings. Potential noise impacts to cross-country ski trails are generally concentrated near the plowed trailheads and less as both motorized and non-motorized users move away from the trailhead.

Figure 14 shows the extent of potential noise impacts at several points, near popular non-motorized recreation areas.

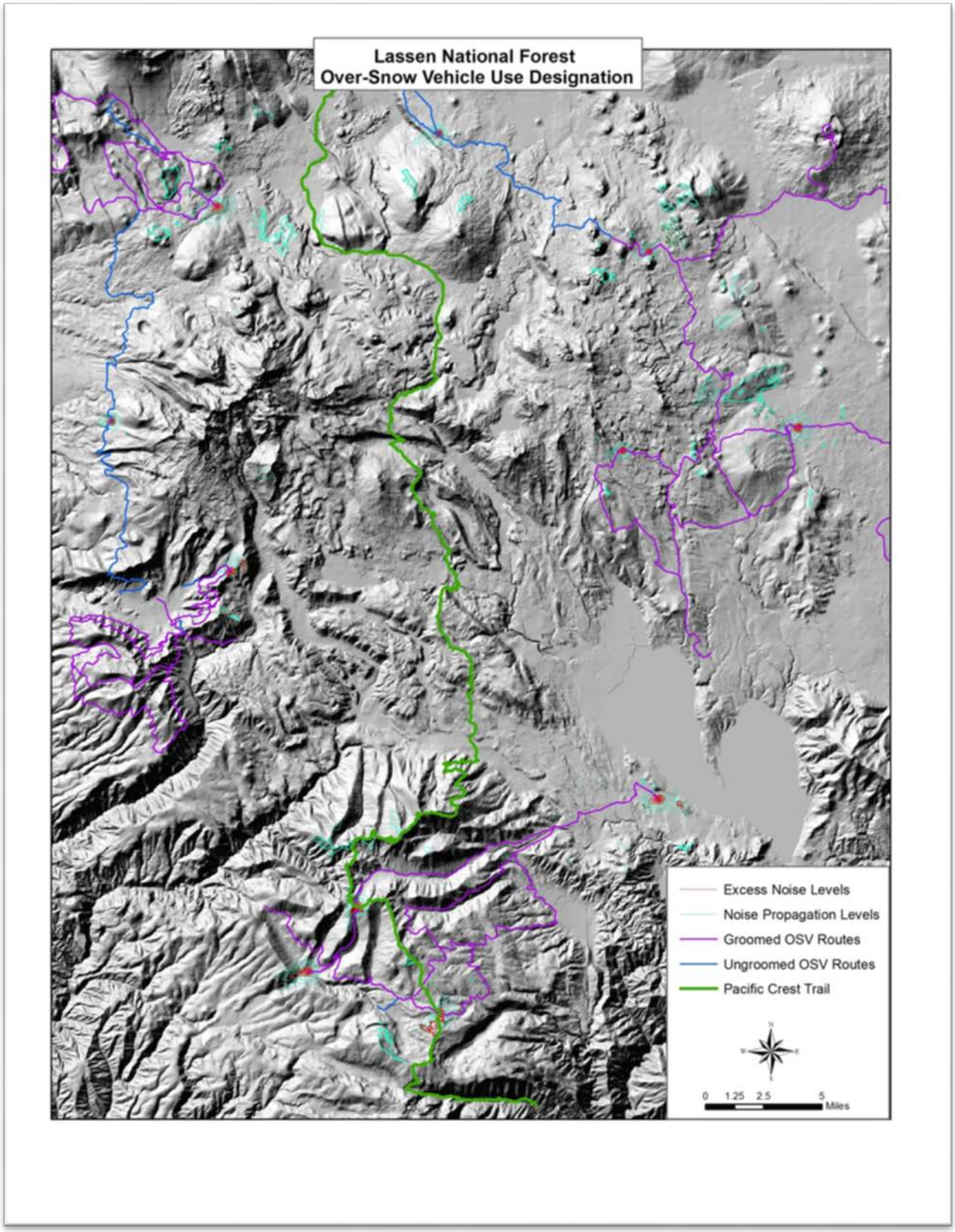

Figure 11. Lassen National Forest OSV sound propagation

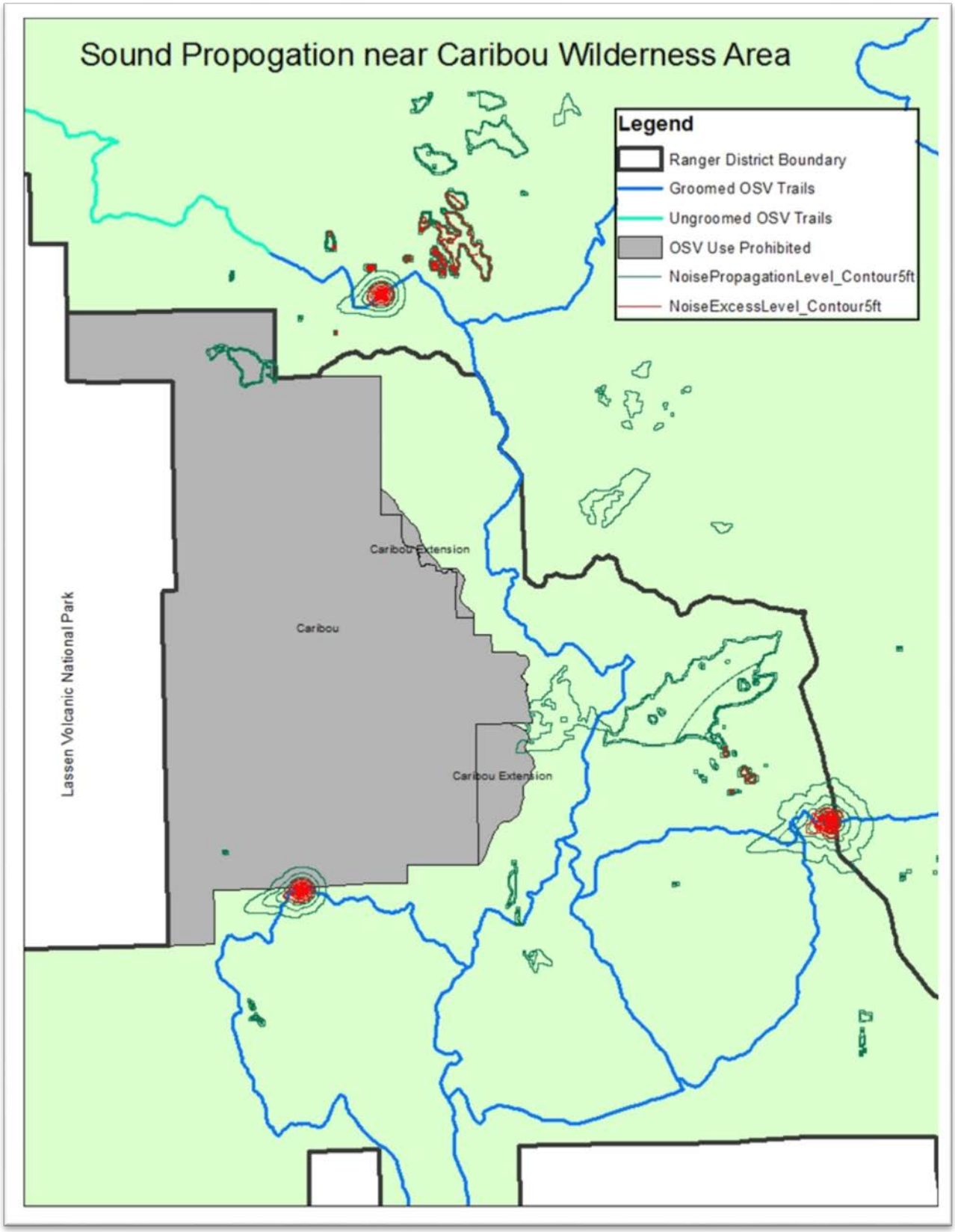

Figure 12. Sound propagation near Caribou Wilderness Area

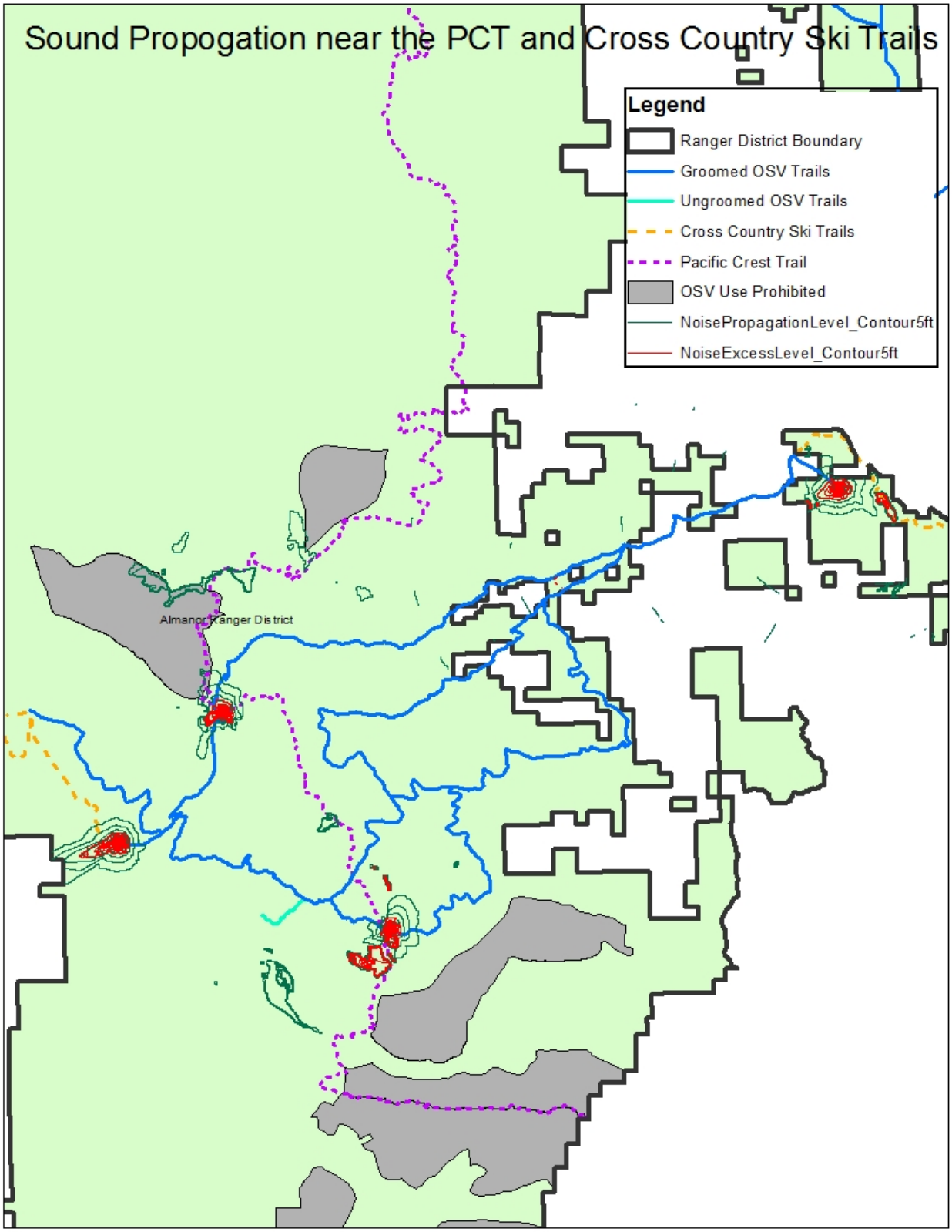

Figure 13. Sound propagation near the Pacific Crest Trail and cross-country ski trails

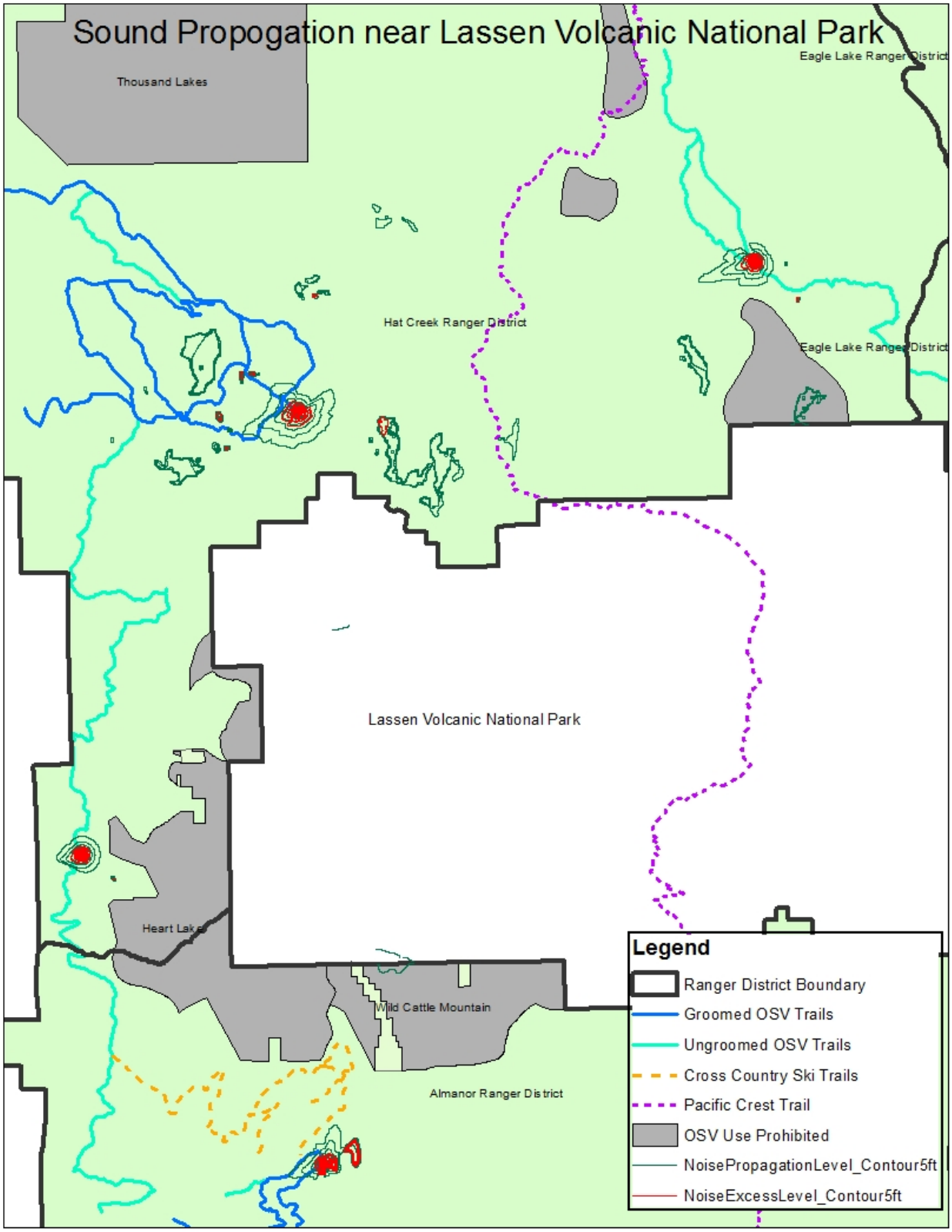

Figure 14. Sound propagation near Lassen Volcanic National Park

Ongoing monitoring for user 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 135. Resource indicators and measures for alternative 2 direct/indirect effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2 Direct/Indirect Effects
Noise	Opportunities for motorized winter uses	Acres open to OSV use	947,120 acres open to OSV use, a 3 percent decrease from existing conditions.
	OSV designations	Miles of designated OSV trails/Miles of groomed OSV trails	406 miles of designated OSV trails/ 324 of those miles are groomed OSV trails

Cumulative Effects – Alternative 2

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Past, present, and reasonably foreseeable projects in the project area include vegetation management, livestock grazing, prescribed burns, and recreation. There are many on-going and scheduled projects identified in the Lassen National forest which may increase the management presence across the forest.

Noise

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 is not 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 since the ambient sound conditions are typically quieter during the night.

Non-motorized winter visitors to the Lassen 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

Project Design Features and Mitigation Measures

The project design features and mitigation measures listed for alternative 2 would apply, in addition to the following:

- Education on responsible practices, trail restrictions, or separations to reduce conflicts.

Direct and Indirect Effects - Alternative 3

Noise impacts associated with the groomed and ungroomed OSV trail system in alternative 3 would be the same as alternative 2.

Alternative 3 would prohibit OSV use on more acres than alternative 2, and would designate areas where motorized OSVs are restricted to designated trails. With additional areas closed or restricted to OSVs, the

opportunities for non-motorized use (in areas not influenced by the sights, sounds and exhaust smells of OSV use) are enhanced.

The new OSV prohibitions in the McGowan, Colby Mountain, Lake Almanor, and Eagle Lake Addition areas, and the OSV restrictions to designated trails within the Butte Lake Area and Fredonyer-Goumaz/Willard Hill Areas would reduce the impact of OSV noise in these areas.

Table 136. Resource indicators and measures for alternative 3 direct/indirect effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 3 Direct/Indirect Effects
Noise	Opportunities for motorized winter uses	Acres open to OSV use	878,690 acres open to OSV use, a 10 percent reduction from existing conditions.
	OSV designations	Miles of designated OSV trails/Miles of groomed OSV trails	406 miles of designated OSV trails/324 miles of groomed OSV trails, no change from existing conditions.

Alternative 4

Direct and Indirect Effects - Alternative 4

Alternative 4 would allow OSV use on more acres than alternative 3, and slightly fewer acres than alternative 2. Allowing use of OSVs below 3,500 feet would enhance OSV opportunities when snow depths are adequate for use in that area, and with this use, additional acres would be subject to potential noise impacts from OSV use.

The McGowen area would be closed to OSV use, similar to alternative 3, with the exception of one designated OSV trail, where OSVs are restricted to the trail only. This would minimize noise impacts and associated conflicts between motorized and non-motorized use in this area, which is popular for non-motorized recreation.

Otherwise, noise impacts associated with the groomed and ungroomed OSV trail system in alternative 4 would be the same as alternative 2.

Table 137. Resource indicators and measures for alternative 4 direct/indirect effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 4 Direct/Indirect Effects
Noise	Opportunities for motorized winter uses	Acres open to OSV use	966,270 acres open to OSV use, a 1 percent reduction from existing conditions.
	OSV designations	Miles of designated OSV trails/Miles of groomed OSV trails	406 miles of designated OSV trails/324 miles of groomed OSV trails, no change from existing conditions.

Summary

Degree to Which the Purpose and Need for Action is Met

All of the action alternatives (alternative 2, 3, and 4) equally meet the purpose and need to effectively manage OSV use by identifying a manageable system of OSV trails and areas per Subpart C of the Travel

Management Regulations and to identify OSV trails for grooming to provide a high quality OSV trail system.

Degree to Which the Alternatives Address the Issues

Table 138 provides a comparison of the alternatives and the degree to which the alternatives address the noise related issues.

Table 138. Summary comparison of how the alternatives address the key issues

Issue	Indicator/Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Noise	Opportunities for motorized winter uses/Acres	976,760 acres open to OSV use and potentially affected by noise/173,260 acres closed to OSV use and available for quiet recreation	947,120 acres open to OSV use and potentially affected by noise/202,900 acres closed to OSV use and available for quiet recreation	878,690 acres open to OSV use and potentially affected by noise/271,330 acres closed to OSV use and available for quiet recreation	966,270 acres open to OSV use and potentially affected by noise/183,750 acres closed to OSV use and available for quiet recreation
	OSV designations / Miles	406 miles designated /324 miles groomed	406 miles designated /324 miles groomed No change from existing conditions.	406 miles designated /324 miles groomed No change from existing conditions.	406 miles designated /324 miles groomed No change from existing conditions.

Summary of Environmental Effects

All action alternatives provide the same level of groomed motorized OSV trail opportunities, and therefore the same degree of potential noise impacts associated with trail use. Cross-country travel by OSV is limited by minimum snow depth requirements for all action alternatives; however, alternative 4 provides the most flexibility in application of the minimum snow depth requirements on OSV trails with underlying NFS system roads and trails to access higher elevations and adequate snow depths. Alternative 4 provides the most access for motorized OSV use, compared to alternatives 2 and 3, and therefore the greatest potential for noise impacts across the Forest.

Alternative 3 enhances opportunities for quiet, non-motorized recreation with the designation of areas where OSVs would be prohibited, or restricted to designated OSV trails, while maintaining the existing level of groomed OSV trail opportunities. Alternative 3 minimizes the potential impacts from noise associated with OSV use to a greater extent than alternatives 2 and 4.

Alternative 2 maintains OSV opportunities, and associated potential for impacts from noise, most similar to the existing conditions on the Lassen National Forest.

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 regulations that requires designation of roads, trails, and areas on NFS lands to provide for over-snow vehicle use. Alternative 1 would not implement the management area direction from the Lassen Forest Plan to prohibit motorized use in the Blacks Mountain Research Natural Area.

Alternatives 2, 3, and 4 would comply with Subpart C of the Travel Management regulations and the Lassen 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 NFS 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.

Air Quality

Air quality is a key resource and a valued element of the forest experience. Air quality is protected under several provisions of the Clean Air Act (CAA), including the Prevention of Significant Deterioration (PSD) program, the National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS). Potential impacts to air quality from winter use on the Lassen National Forest include issues related to OSV[40] emissions. This analysis describes the existing condition of air quality on the Lassen National Forest and evaluates the potential changes and effects of the alternatives on air quality.

Relevant Laws, Regulations, and Policy

Regulatory Framework

Land and Resource Management Plan

The Lassen National Forest Land and Resource Management Plan (LRMP 1992) provides standards and guidelines for Air Quality. The LRMP states Forest Standards and Guidelines call for compliance with State and local air quality requirements, and minimizing of smoke encroachment from prescribed burning (pg. 2-1).

The Forest Standards and Guidelines, with regard to OSV use, apply to the entire Forest.

a. Maintain air quality to meet or exceed legal requirements of appropriate levels of Government.

    (1) Comply with the Federal Clean Act, as amended, and State and local air quality regulations.

Federal Clean Air Act

In 1963, Congress passed the Federal Clean Air Act and amended the act 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, 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 National Ambient Air Quality Standards (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 National Ambient Air Quality Standards and non-degradation standards for Class 1 areas. Managers are further directed to improve existing substandard conditions and reverse negative trends

[40] An OSV is defined in the Forest Service’s Travel Management Rule 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) (DEIS 2015).

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.[41]

National Ambient Air Quality Standards (NAAQS)

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 (EPA 2010j). These standards are detailed in Figure 15 along with footnote information located in the appendix found in the air quality specialist report.

California Air Resources Board

California law authorizes the California Air Resources Board to set ambient (outdoor) air pollution standards (California Health & Safety Code section 39606) in consideration of public health, safety, and 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 Figure 15. Footnote information can be found in the appendix in the air quality specialist report. (Further information can be found at: http://www.arb.ca.gov/desig/statedesig.htm).

The California Air Resources Board (ARB) 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 (SIPs), 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 national ambient air quality standards (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 U.S. Environmental Protection Agency (U.S. EPA) for approval and publication in the Federal Register. The Code of Federal Regulations

[41] http://www.arb.ca.gov/research/aaqs/aaqs2.pdf

Title 40, Chapter I, Part 52, Subpart F, Section 52.220 lists all of the items which are included in the California SIP (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.

Prevention of Significant Deterioration (PSD)

The Clean Air Act established the PSD program to protect air quality in relatively clean areas. One purpose of the PSD program is to protect public health and welfare, including natural resources, from adverse effects that might occur even though NAAQS are not violated. Another purpose is to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value (42 U.S.C. 7401 et seq.). The PSD program applies to new major sources and major modifications to existing sources. A key component of the PSD program is the PSD increment which is the amount of pollution an area is allowed to increase. PSD increments prevent the air quality in clean areas from deteriorating to the level set by the NAAQS. The NAAQS is a maximum allowable concentration "ceiling." A PSD increment, on the other hand, is the maximum allowable increase in concentration that is allowed to occur above a baseline concentration for a pollutant (EPA 2015c)

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 U.S. Environmental Protection Agency (U.S. EPA) 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 towards national visibility goals. In 2009, the Air Resources Board (ARB) prepared a Regional Haze Plan (RH Plan) for California demonstrating reasonable progress in reducing haze by 2018, the first benchmark year on the path to improved visibility. U.S. EPA 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 oversee analyses of monitoring data and preparation of technical reports regarding regional haze in the western United States (see Figure 18. Class 1 Areas in California).

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 (PM10)[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 (PM2.5)[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 (NDIR)	35 ppm (40 mg/m^3)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
Nitrogen Dioxide (NO_2)[10]	1 Hour	0.18 ppm (339 μg/m^3)	Gas Phase Chemiluminescence	100 ppb (188 μg/m^3)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 μg/m^3)		0.053 ppm (100 μg/m^3)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[11]	1 Hour	0.25 ppm (655 μg/m^3)	Ultraviolet Fluorescence	75 ppb (196 μg/m^3)	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	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]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[10]	—	
Lead[12,13]	30 Day Average	1.5 μg/m^3	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 μg/m^3 (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 μg/m^3		
Visibility Reducing Particles[14]	8 Hour	See footnote 13	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			

See footnotes on next page ...

For more information please call ARB-PIO at (916) 322-2990 California Air Resources Board (10/1/15)

Figure 15. State and national ambient air quality standards

Criteria Pollutants Regulated by EPA

Ozone (O_3) is the most widespread air quality problem in the state. It is a colorless gas with a pungent, irritating odor. Ozone, an important ingredient of smog, 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 ARB regulates as an air pollutant is produced close to the ground level, where people live, exercise, and breathe. The California Air Resources Board (ARB) is concerned about ozone pollution because of its effects on the health of Californians and the environment (ARB 2015).

Review of Ozone Standard – 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 $_{10}$ (PM $_{10}$) 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 PM_{10} include: effects on breathing and respiratory systems, damage to lung tissue, cancer, and premature death. Acidic PM_{10} 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 in on-road motor vehicles (such as cars and trucks) and industrial sources. As a result of 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 (No_2) is a reddish-brown gas with an irritating odor. It is emitted from motor vehicles, industrial facilities, and power plants. Indoors, home heaters and gas stoves also produce substantial amounts of NO_2. Nitrogen dioxide and nitric oxide are products of all types of combustion. Nitric oxide reacts with hydrocarbons in the presence of sunlight to form nitrogen dioxide. In the summer months NO_2 is a major component of photochemical smog and an essential ingredient in the formation of ground-level ozone pollution. Exposure to NO_2 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 NO_2 standard of 0.030 ppm and lowered the one-hour NO_2 standard to 0.18 ppm, after an extensive review of the scientific literature (source: ARB 2015).

Carbon Monoxide (CO) A colorless, odorless gas, 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— headaches, fatigue, slow reflexes, and dizziness—also occur in healthy people (source: ARB 2015).

Sulfur Dioxide (SO_2) A colorless gas with a strong, suffocating odor, sulfur dioxide is primarily a combustion product of coal, fuel oil, and diesel fuel. Only small quantities of SO_2 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

The Lassen LRMP states for the desired future condition that present air quality is maintained. Baseline conditions for all air quality-related values are defined and limits of acceptable change are established for Class 1 wilderness areas. (LRMP pg 4-2)

Topics and Issues Addressed in This Analysis

Issues

Designating roads, trails, and areas for OSV use and grooming trails for OSV use have the potential to generate exhaust and emit pollutants into the air. This has the potential to degrade air quality, which can impact recreational users and sensitive areas.

Resource Indicators and Measures

The air quality analysis is a qualitative discussion comparing miles of trails open to OSV use and acres open to OSV use. The resource indicators are shown in Table 139 and will be used throughout the analysis to compare the alternatives and their potential effects to air quality.

Table 139. Air quality resource indicators and measures for assessing effects

Resource Element	Resource Indicator	Measure	Used to address: P/N, or key issue?	Source (LRMP S/G; law or policy, BMPs, etc.)?
Air Quality	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.	No	Forest Standards and Guidelines (pg. 4-15) Air Quality a. Maintain air quality to meet or exceed legal requirements of appropriate levels of government. 1. Comply with the Federal Clean Air Act, as amended, and state and local air quality regulations.
	Estimate of change (increase/decrease) in emissions and the potential to create adverse impacts to air quality.	Acres open to OSV visitor use.	No	Forest Standards and Guidelines (pg. 4-15) Air Quality a. Maintain air quality to meet or exceed legal requirements of appropriate levels of government. 1. Comply with the Federal Clean Air Act, as amended, and state and local air quality regulations.
	Potential effects of OSV emissions to create adverse impacts to air quality.	Shifts in OSV use in relation to sensitive areas (Class 1 and II areas).	No	Forest Standards and Guidelines (pg. 4-15) Air Quality a. Maintain air quality to meet or exceed legal requirements of appropriate levels of government. 1. Comply with the Federal Clean Air Act, as amended, and state and local air quality regulations. LRMP (pg. 3-3) Caribou, Thousand Lakes, and Lassen Volcanic Wilderness Areas are designated as Class I areas, allowing no degradation in air quality.

Environmental Consequences

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 Geographic Information System (GIS) data layers from the Lassen 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
- Lassen National Forest Plan (USDA Forest Service 1992).
- Scientific literature cited in the "References" section.
- The National Visitor Use Monitoring (NVUM) information from the years 2001, 2006, and 2010 was reviewed.
- OSV use was from the 2009 OSV Winter Trailhead Survey conducted in support of the 2010 State OSV Program Environmental Impact Report (EIR) for Program Years 2010-2020.
- Information and correspondence obtained from the Air Resource Specialist at CARB.

Incomplete and Unavailable Information

No information was found on past monitoring of air quality or OSV emissions in the Lassen National Forest.

Assumptions used in the 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/day and was averaged based on the responses received through a survey forum (snowest.com).

Forest-wide, 10,020 OSV visitors were estimated for the winter season (Valentine 2015).

Spatial and Temporal Context for Effects Analysis

The spatial context for effects analysis will be the forest boundary. The temporal context for effects analysis will be one year.

Affected Environment

Existing Condition

Air Quality Management

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 Lassen National Forest lies mostly within the Sacramento Valley and Northwest Plateau with a small portion in the Mountain Counties Air Basin (Figure 16. Designated air basins in California).

Figure 16. Designated air basins in California

Air Pollution Control District

Air Quality for the forest is managed and regulated by seven air management districts. Air management districts typically follow county boundaries. Most of the forest lies within the Shasta and Lassen air districts with the southern third of the forest in the Tehama, Northern Sierra (Nevada, Plumas and Sierra counties) and Butte Districts and the northern portion within the Siskiyou and Modoc Air Districts. See (Figure 17) for a map of air districts in relation to the Lassen National Forest. Air quality rules and regulations for each air pollution control district can be found at their website.

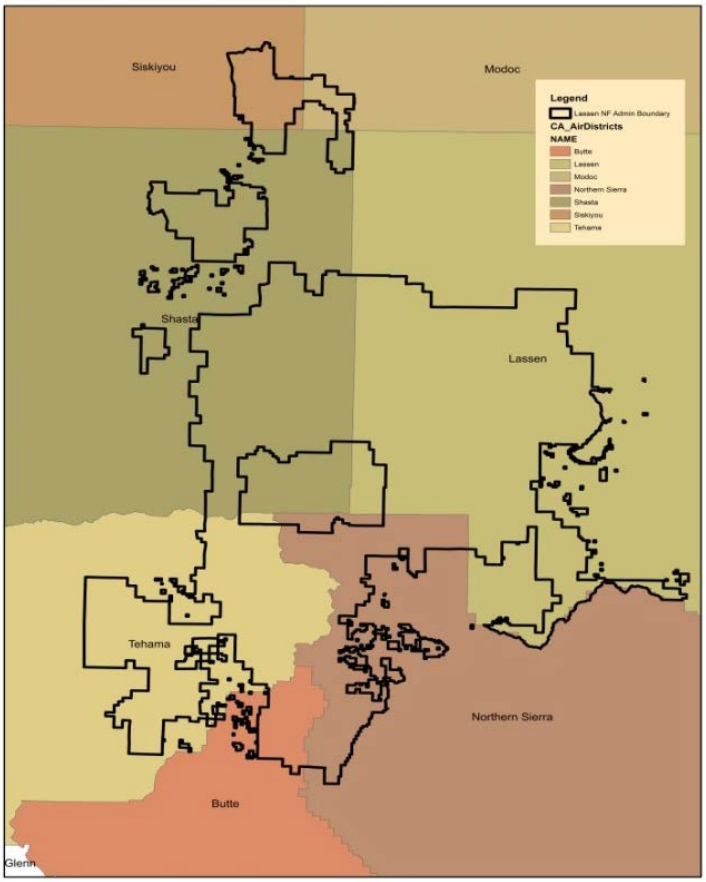

Figure 17. Air pollution control districts within the Lassen National Forest

Class 1 and II Areas

The Thousand Lakes and Caribou Wilderness are designated as Federal Class 1 Areas on the Lassen National Forest (Figure 18. Class 1 Areas in California). The Lassen Volcanic National Park, managed by the National Park Service, is also a designated Class 1 area that is surrounded by the Lassen National Forest. The Caribou Wilderness lies along the eastern boundary of Lassen Volcanic National Park and the Thousand Lakes Wilderness is located northwest of Lassen National Park. The Ishi Wilderness lies in the southwest portion of the forest and is classified as a Class II area by EPA, which allows some reduction in air quality.

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). This change is caused by air pollutants: particles and gases in the atmosphere which either scatter or absorb light. The net effect is the creation of a hazy condition. Sources for visibility impairment in these Class 1 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 1 Areas in California. The LAV01 IMPROVE Monitoring site is located at Lassen Volcanic National Park. Smoke directly impacted the Class 1 Areas and had an overwhelming impact on visibility progress at many monitoring sites throughout California and the west (ARB 2014).

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 1 Area IMPROVE monitors, California determines the current Regional Haze plan strategies are sufficient for California and its neighboring states to meet their 2018 Reasonable Progress Goals (ARB 2014).

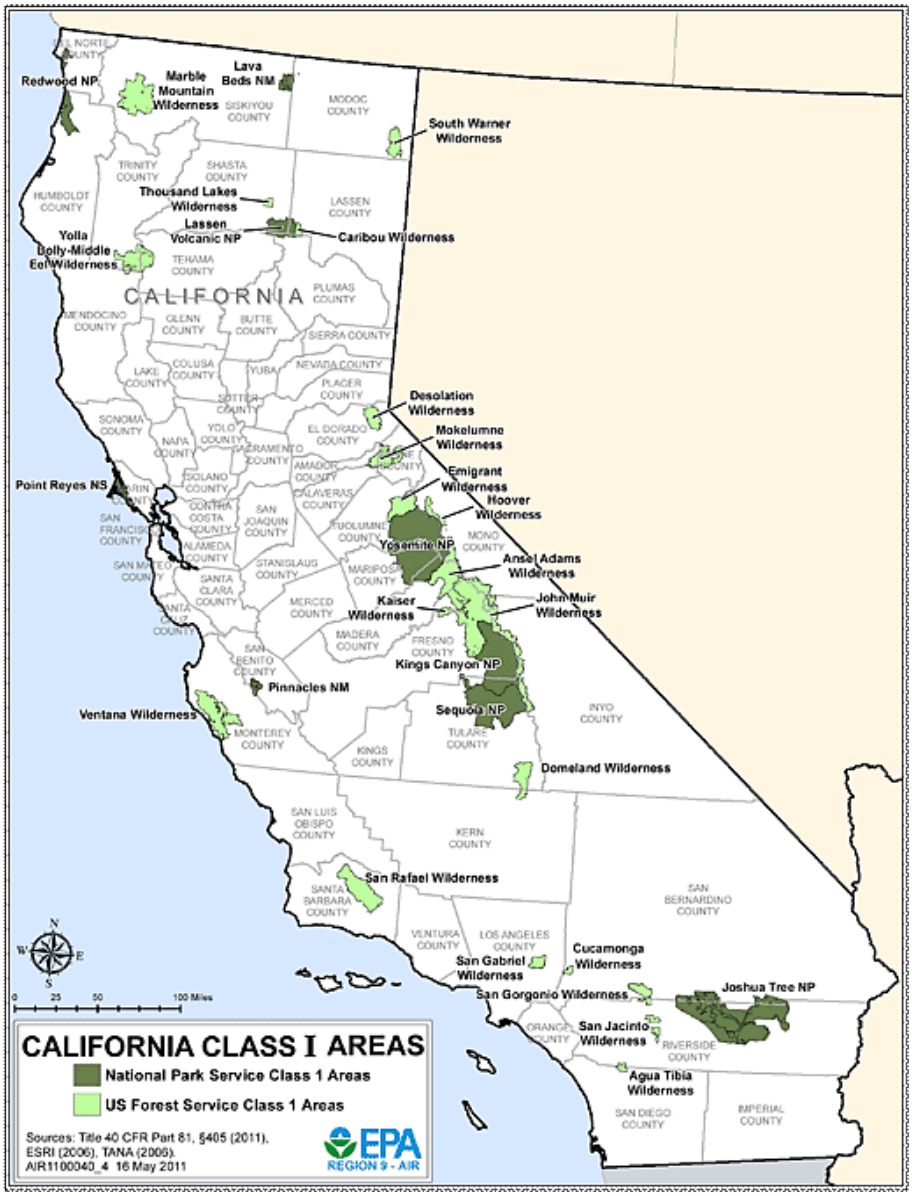

Figure 18. Class 1 Areas in California

Air Quality Standards

The Lassen 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 (NO_2), PM_{10}, $PM_{2.5}$, ozone (O_3), and sulfur dioxide (SO_2). 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 Lassen National Forest is potentially 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 (gas stations, restaurants, railroads, and wood burning stoves) are also found outside Forest Service administered lands.

Currently, the Lassen National Forest complies with Federal and State standards and there are no known violations of the Clean Air Act. According to the Environmental Protection Agency, Butte County is in non-attainment for three criteria pollutants, 8-hour ozone, carbon monoxide and $PM^{2.5}$. The non-attainment boundary for 8-hour Ozone crosses the Lassen National Forest at the south central section on the Almanor Ranger District. The concern for Ozone is in the summer only according to the Air Pollution Specialist at the Air Resources Board (Lopina 2015). The city of Chico, California, within the Butte Air Pollution Control District is in non-attainment for carbon monoxide and $PM_{2.5}$. A portion of Tehama County is also in non-attainment for 8-hour ozone and Plumas County is classified as moderate non-attainment for $PM_{2.5}$ (Table 140).

Table 140. Non-attainment areas for criteria pollutants

County/ 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)
Butte	*Marginal*	*Moderate (Chico, CA)*	Unclassified /Attainment	(Chico, CA)	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment
Lassen	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment
Modoc	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment
Plumas (Within Northern Sierra Air District)	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	*Moderate*	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment
Nevada (Within Northern Sierra Air District)	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment
Sierra (Within Northern Sierra Air District)	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment
Shasta	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment
Siskiyou	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment	Unclassified /Attainment
Tehama	Tuscan Buttes. Marginal non-attainment (partial County)	Unclassified /Attainment N/A	Unclassified /Attainment N/A	Unclassified /Attainment N/A	Unclassified /Attainment N/A	Unclassified /Attainment N/A	Unclassified /Attainment N/A

Source: http://www3.epa.gov/airquality/greenbook/. Accessed: 10/01/2015:

The table below shows the California Ambient Air Quality Standards (CAAQS) state designations for all criteria pollutants in California. The Air Resources Board makes State area designations for 10 criteria pollutants: ozone, suspended particulate matter (PM_{10}), 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 eight counties in non-attainment for PM_{10}, four in non-attainment for Ozone and Butte County also in non-attainment for $PM_{2.5}$.

Table 141. State-designated non-attainment areas for criteria pollutants

County and/ or Air District	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)	Sulfates	Hydrogen Sulfide	Visibility Reducing Particles
Butte	*Non-Attainment*	Attainment	Attainment	*Non-Attainment*	*Non-Attainment*	Attainment	Attainment	Attainment	Unclassified	Unclassified
Lassen	Attainment	Unclassified	Attainment	Attainment	*Non-Attainment*	Attainment	Attainment	Attainment	Unclassified	Unclassified
Modoc	Attainment	Unclassified	Attainment	Attainment	*Non-Attainment*	Attainment	Attainment	Attainment	Unclassified	Unclassified
Nevada (within No Sierra Air Dist)	*Non-attainment*	Unclassified	Attainment	Unclassified	*Non-Attainment*	Attainment	Attainment	Attainment	Unclassified	Unclassified
Plumas	Unclassified	Attainment	Attainment	Unclassified *(Portola Valley in non-attainment)	*Non-Attainment*	Attainment	Attainment	Attainment	Unclassified	Unclassified
Sierra	Unclassified	Unclassified	Attainment	Unclassified	*Non-Attainment*	Attainment	Attainment	Attainment	Unclassified	Unclassified
Shasta	*Non-Attainment*	Unclassified	Attainment	Attainment	Non-Attainment	Attainment	Attainment	Attainment	Unclassified	Unclassified
Siskiyou	Attainment	Unclassified	Attainment	Attainment	Attainment	Attainment	Attainment	Attainment	Unclassified	Unclassified
Tehama	*Non-Attainment*	Unclassified	Attainment	Unclassified	*Non-Attainment*	Attainment	Attainment	Attainment	Unclassified	Unclassified

Source: www.arb.ca.gov.desig/adm/adm.htm (ARB last review, August 22, 2014)

For ozone, $PM_{2.5}$, and PM_{10}, 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 in each CBSA. The table below includes the CBSAs, population of the CBSAs, the site in each CBSA that is currently measuring the highest concentration, and monitor information used to evaluate whether the minimum monitoring requirement is satisfied. In all cases, sufficient monitoring exists and no additional monitoring is required (ARB 2015).

Table 142. Minimum monitoring requirements for ozone

CBSA	County/ Counties	Population (2010 Census)	3-Year Average the 4th Highest Concentration (ppm)	Site with the Highest 3-Year Average of the 4th Highest Concentration	Number of Monitors Required	Number of Active Monitors	Number of Additional Monitors Needed
Bakersfield*	Kern	839,361	0.091	Bakersfield-Municipal Airport	2	8	0
Chico	Butte	220,000	0.075	Paradise-Airport Road	1	2	0
El Centro	Imperial	174,528	0.080	El Centro	1	3	0
Los Angeles-Long Beach-Anaheim*	Los Angeles and Orange	12,828,837	0.098	Santa Clarita	4	16	0
Oxnard-Thousand Oaks-Ventura	Ventura	823,318	0.079	Simi Valley	2	5	0
Redding	Shasta	177,223	0.068	Anderson & Lassen Volcanic	1	4	0
Riverside- San Bernardino-Ontario*	Riverside and San Bernardino	4,224,851	0.103	Redlands-Dearborn	3	21	0
Sacramento-Arden Arcade-Roseville*	El Dorado, Placer, Sacramento, Nevada and Yolo	2,149,127	0.085	Folsom-Natoma Street	2	17	0
Santa Rosa*^	Sonoma	483,878	0.057	Healdsburg	1	2	0
Vallejo-Fairfield*	Solano	413,344	0.066	Vacaville-Ulatis Drive	2	3	0
Yuba City	Sutter and Yuba	166,892	0.074	Sutter Buttes^^	1	2	0

Source: ARB 2015

Table 145 displays the annual average emissions (tons per year) generated for the air districts within the Lassen National Forest (EPA 2013).

Table 143. Annual average emissions (tons per year) by air district

		Emissions Estimates (Tons/Year)						
Air District	**TOG**	**ROG**	**CO**	**Nox**	**Sox**	**PM**	**PM10**	**PM2.5**
Butte	9380.5	6212.3	30389.9	6643	109.5	10793.05	6270.7	2171.75
Lassen	6288.95	2197.3	12884.5	1766.6	94.9	5880.15	3777.75	1153.4
Modoc	5715.9	1135.15	3157.25	1003.75	14.6	6303.55	3606.2	543.85
Northern Sierra	10577.7	5131.9	33572.7	4796.1	270.1	12380.8	7577.4	1941.8
Shasta	10829.55	5650.2	34525.35	8570.2	175.2	7548.2	4847.2	2014.8
Siskiyou	9084.85	3854.4	15173.05	3467.5	58.4	9698.05	6015.2	1573.15
Tehama	7971.6	2449.15	8913.3	4117.2	36.5	5208.55	3014.9	810.3
TOTAL Emissions for Air Districts (tons/year)	**59849.05**	**26630.4**	**138616.1**	**30364.35**	**759.2**	**57812.35**	**35109.35**	**10209.05**

Snowmobile Emission Standards

The effect of emissions from snowmobile activity on air quality and deposition in high-elevation ecosystems has been studied primarily at Yellowstone National Park (YNP) in northwestern Wyoming. Snowmobiles emit hydrocarbons (HC), nitrogen oxides (NO_x), particulate matter (PM), carbon monoxide (CO), and non-combusted fuel vapors (USDI 2000). Combustion engine emissions contain carcinogens including benzene, butadiene, and polycyclic aromatic hydrocarbons (USDI 2000). Combustion engines also emit large amounts of carbon dioxide.

In 2002, EPA issued a regulation that imposed stringent pollution regulations on snowmobiles, requiring that they fall under regulations of the Clear 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).

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 2015[3]).

Table 144. Exhaust emission standards for snowmobiles

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

Source: Code of Federal Regulations, Accessed November 2015

Best Available Control Technology (BAT)

Snowmobiles must be certified by the National Park Service to enter some National Parks (Yellowstone, Grand Teton). BAT 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 BAT snowmobiles (which result in lower carbon monoxide and hydrocarbon emissions) (USDI 2013), is not currently required on the Lassen National Forest.

Motorized Winter Recreation

The Lassen National Forest has a well-developed winter recreation program which emphasizes snowmobile use and includes 406 miles of snowmobile trails that connect to six well-placed developed staging areas. Details on the groomed OSV trail system on the Hat Creek, Eagle Lake, and Almanor Ranger Districts of the Lassen National Forest can be found in the R5 OSV Lassen Recreation Report (Valentine 2015).

Table 145 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 for the 2015/2016 winter season is 10,020 OSV users Forest-wide (Valentine 2015).

Table 145. Lassen National Forest OSV visitor use (based on 2009 Data from CA State DEIR)

Location	Day Description	Number of Vehicles*	Number of OSVs
Forest-wide	Weekend/Holiday (approx. 33 per season)	106	212
Forest-wide	Weekday (approx. 65 per season)	21	42
Individual Trailheads	Weekend/Holiday	15 (average)	30
Individual Trailheads	Weekday	3.5	7

*assumes an average of 2 OSVs per vehicle parked at a trailhead (Valentine 2015)

Grooming activities

Currently, there are 324 miles of National Forest System trails that are groomed for OSV use on the Lassen National Forest. Snow trail grooming for OSV use typically occurs mid-December and continues through March (12/26-3/31). Grooming historically occurred several times per week with a maximum of 12 hours per day and a total of 1,743 hours for the season (Lassen DEIS 2015).

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 (Lassen DEIS 2015).

Table 146. Resource indicators and measures for the existing condition and alternative 1

Resource Element	Resource Indicator	Measure	Existing Condition/Alt 1
Air Quality	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	406 miles
	Estimate of change (increase/decrease) in emissions and the potential to create adverse impacts to air quality.	Acres open to OSV visitor use	976,760 acres
	Potential effects of OSV emissions to create adverse impacts to air quality.	Shifts in OSV use in relation to sensitive areas (Class 1 and II areas).	No known impacts to air quality or NAAQS/CAAQS violations exist.

Alternative 1 – No Action

By definition, direct and indirect effects (40 CFR 1508.8), and cumulative effects (40 CFR 1508.7) result from the proposed action, and thus are not germane to the no-action alternative. With regard to air quality on the forest, there are no known violations of the Clean Air Act under the existing condition.

Air quality on the Lassen National Forest is potentially affected by land management and development activities on and off the forest. Air pollution sources include emissions from mobile and stationary sources including industrial activity, highway vehicles, off-road vehicles (all- terrain vehicles, aircraft, locomotives, construction machinery). Dust and burning can also have significant impacts to air quality as they are occurring 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 1 areas.

There are three factors, largely beyond State control, that can interfere with air quality in Class 1 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).

The table below displays the potential contribution of snowmobile emissions from the estimated 10,020 OSV visitors that recreate on the Lassen National Forest each year. All calculations were done using emission estimates from a 2-stroke snowmobile (EPA 2010). As shown in Table 147, it is estimated emissions from OSV use on the Lassen contributes approximately 0.12 percent of carbon dioxide (CO) to the air districts under the no-action alternative and less than 0.01 percent of nitrogen oxide (NOx) and particulate matter (PM).

Table 147. Emission estimate (tons per year) for OSV use on the Lassen National Forest

Source	Number of OSVs	Miles*	CO	NOx	PM
Snowmobile (2-stroke)	10,020	50	163.47	0.47	1.49
% Pollutant Contribution to Air Districts	-------	----	0.12	Less than 0.01	Less than 0.01

*Assumes 10,020 OSVs recreate on the Lassen per year and travel an average of 50 miles.

Alternative 2 – Proposed Action

Project Design Features and Mitigation Measures

- As funding allows, consider development of separate parking areas for motorized and non-motorized users.
- As funding allows, collect emissions data in at trailheads ensure impacts to air quality are minimized.
- Impose idling time limits for OSVs at trailheads and in parking lots to reduce emissions, potential impacts to air quality and nuisance smell.

Direct and Indirect Effects - Alternative 2

Under alternative 2 there would be a 3 percent reduction in acres open to OSV use. The proposed areas where use would be prohibited would be located in the southwestern corner of the Lassen National Forest (at elevations of 3,500 feet or less) and in the Black Mountain Research Natural Area. Proposed closures would minimize impacts to air quality in these areas. The reduction of acres open to OSV use may cause a shift in OSV use to other areas. However, it is not likely this shift will result in significant affects to air quality in other areas of the Lassen National Forest. With a proposed 3 percent reduction in acres open to OSV use, it is likely emissions generated as a result of OSVs would be similar or less than what is currently estimated and displayed in Table 147. Current emissions are estimated to contribute less than 1 percent (0.12 percent of carbon dioxide (CO), less than 0.01 percent of nitrogen oxide (NOx) and less than 0.01 percent of particulate matter (PM)) of pollutants to the seven air districts within the Lassen National Forest. These emissions are minor compared to other off-forest sources of air pollution that can impact 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 Sno-Cats. Diesel engines also emit sulfur oxides and particulates. Air quality impacts from vehicle emissions are influenced by the effectiveness of the smog control devices on cars, amount of traffic, and the duration of engine idling. 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.

Although there can be localized air quality impacts where there are a large number of snowmobiles occupying a parking lot as studied at Yellowstone National Park, those conditions do not apply in this case. The number of anticipated users for this assessment would be considered low as compared to Yellowstone National Park, which records 75,000 snowmobile visitors each winter (Millner 2015). The estimated 10,020 OSV visitors forest-wide for the winter season (96 days, based on 12/26-3/31 grooming season) would equate to approximately 104 OSV visitors on the forest per day utilizing 406 miles of trail and 947,120 acres open to OSV use. That is equivalent to approximately one OSV visitor per 9,106 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 c oncerns 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 specialist 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 potential impacts to air quality in those areas. It is anticipated any impacts to air quality from winter motorized recreation under alternative 2 will not result in any violations to National and State Ambient Air Quality Standards, as current levels of use do not (see Table 147).

A study by Musselman et al. (2007) was conducted 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 (NO_x, NO), carbon monoxide (CO), ozone (O_3) and particulate matter (PM_{10} mass). They found Nitrogen oxides and carbon monoxide were significantly higher 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 was 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 2007).

Class 1 Areas

In Yellowstone National Park, the implementation of best available technology (BAT) requirements and the reduction in the number of OSVs entering the park during the managed use era dramatically reduced CO, PM, and hydrocarbon emissions. The substantial CO and PM emissions reductions from implementing BAT requirements have come with one important tradeoff—an increase in NO_x emissions. OSVs that meet BAT requirements have higher NO_x emissions than those that do not meet BAT requirements. They found overall, from 2003 to 2011, air quality stabilized at the monitoring stations in the park, with the exception of 2010. These positive trends in air quality are primarily the result of BAT requirements for OSVs, fewer OSVs entering the park in recent years, and carbureted snow coaches being replaced with modern fuel-injected engines. Requiring the use of only BAT OSVs has improved emissions despite the increasing number of snow coaches now entering the park. Although these changes present an overall positive trend toward lower emissions by OSVs, other local sources, such as uncontrolled wood stoves in warming huts and some facilities in the park, still contribute to winter CO and $PM_{2.5}$ concentrations (USDI 2013).

Implementation of alternative 2 is expected to maintain the same air quality conditions as compared to the existing condition due to good dispersion characteristics across the forest, low inversion potential, low emissions generated from OSVs as compared to other potential sources, and the equivalent number of OSV route miles open. In addition, it is expected the proposed reduction in acres and areas open to OSV use may reduce air quality impacts in those areas and nearby Class 1 areas. 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, and no violations of the Clean Air Act are expected to occur under alternative 2.

Table 148. Air quality resource indicators and measures for alternative 2

Resource Element	Resource Indicator	Measure	Alternative 2
Air Quality	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.	406 miles (no change from existing condition)
	Estimate of change (increase/decrease) in emissions and the potential to create adverse impacts to air quality.	Acres open to OSV visitor use.	947,120 acres (3% decrease from existing condition)
	Potential effects of OSV emissions to create adverse impacts to air quality.	Shifts in OSV use in relation to sensitive areas (Class 1 and II areas)	OSV trails within ¼ mile of sensitive areas (Caribou Wilderness, Caribou extension proposed Wilderness, Mill Creek Proposed Wilderness and Thousand Lakes Wilderness boundaries, and to the boundary of Lassen Volcanic National Park). No known impacts to air quality or NAAQS/CAAQS violations exist.

Cumulative Effects – Alternative 2

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Past, present, and reasonably foreseeable future actions have the potential to impact air quality and are summarized below. Air quality on the forest is potentially affected by land management and development activities on and off the forest. Air pollution sources include emissions from industrial activity, highway vehicles, off-road vehicles (all- terrain vehicles, aircraft, locomotives, construction machinery). Dust and burning can also have significant impacts to air quality as they are occurring 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 as a result of Sno-cats utilized for plowing and grooming of parking lots and trailheads could also contribute to localized air pollution on forest. However, it is estimated the contribution of administrative Sno-cats 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 Lassen National Forest. Substantial impacts to air quality are not expected to occur during winter months on the Lassen National 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, the action 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 or impact air quality on forest. There are no known unavoidable adverse, irreversible or irretrievable effects to air quality as a result of implementing alternative 2.

Alternative 3

Alternative 3 was developed to address the quality non-motorized recreational experience significant issue and is discussed in detail in the EIS. It includes components of the modified proposed action with several additions. OSV use would be prohibited in additional areas that are important for non-motorized

recreation, including McGowen, Colby Mountain, Lake Almanor, and Eagle Lake Addition. OSV use would be restricted to designated trails within two areas including Butte Lake Area and Fredonyer-Goumaz/Willard Hill Area.

This alternative also includes a 12-inch minimum snow depth for cross-country OSV use, an 18-inch minimum snow depth for grooming and a 6-inch minimum snow depth for OSV use on underlying roads or trails. OSV use on roads with at least 6 inches of snow would be allowed on a limited basis on specific, identified routes in order for OSVs to access higher terrain and legal snow levels when snow depths are less than 12 inches, as long as this use does not cause visible damage to the underlying surface and can be readily enforced. This alternative would groom the same snow trails for OSV use as the modified proposed action.

Direct and Indirect Effects - Alternative 3

Alternative 3 would prohibit OSV use on more acres than alternative 2, and would designate areas where motorized OSVs are restricted to designated trails. Designation of the Butte Lake Backcountry Solitude Area minimizes motorized impact on the Caribou Wilderness and Caribou extension proposed wilderness and Lassen Volcanic National Park thereby minimizing potential impacts to air quality in those areas.

With additional areas closed or restricted to OSVs, the potential effects to air quality in sensitive areas would be less under alternative and with a proposed 10 percent reduction in acres open to OSV use forest-wide, it is likely emissions generated as a result of OSVs would be similar or less than what is currently estimated and displayed in Table 147. Current emissions generated as a result of OSV use on the Lassen are estimated to contribute less than 1 percent (0.12 percent of carbon dioxide (CO), less than 0.01 percent of nitrogen oxide (NOx) and less than 0.01 percent of particulate matter (PM)) of pollutants to the seven air districts within the Lassen National Forest. These emissions are minor compared to other sources of air pollution impacting the forest and will be further reduced under this alternative.

Project Design Features and Mitigation Measures

The project design features and mitigation measures listed for alternative 2 would apply for alternative 3.

Cumulative Effects- Alternative 3

The cumulative effects listed for alternative 2 would also apply for alternative 3.

Table 149. Air quality resource indicators and measures for alternative 3

Resource Element	Resource Indicator	Measure	Alternative 3
Air Quality	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.	406 miles of designated OSV trails (no change from existing conditions)
	Estimate of change (increase/decrease) in emissions and the potential to create adverse impacts to air quality.	Acres open to OSV visitor use.	878,690 acres open to OSV use (a 10 percent decrease from the existing conditions)
	Potential effects of OSV emissions to create adverse impacts to air quality.	Shifts in OSV use in relation to sensitive areas (Class 1 and II areas).	OSV trails in close proximity of sensitive areas (Caribou Wilderness, Caribou extension proposed Wilderness, Mill Creek Proposed Wilderness and Thousand Lakes Wilderness boundaries, and to the boundary of Lassen Volcanic National Park.) No known impacts to air quality or NAAQS/CAAQS violations exist.

Alternative 4

Direct and Indirect Effects - Alternative 4

Alternative 4 would allow OSV use on more acres than alternative 3, and slightly fewer acres than alternative 2.

The McGowen area would be closed to OSV use like alternative 3. However, one designated OSV trail would remain open and OSVs would be restricted to the trail only. This would potentially minimize impacts from OSV encroachment into Lassen Volcanic National Park and subsequent effects to air quality in the park. Otherwise, alternative 4 effects would be similar to those described for alternative 2, and with a proposed 1 percent reduction in acres open to OSV use forest-wide as compared to the existing condition, it is likely emissions generated as a result of OSVs would be similar to or less than what is currently estimated and displayed in Table 147. Current emissions generated as a result of OSV use on the Lassen are estimated to contribute less than 1 percent (0.12 percent of carbon dioxide (CO), less than 0.01 percent of nitrogen oxide (NOx) and less than 0.01 percent of particulate matter (PM)) of pollutants to the seven air districts within the Lassen National Forest. These emissions are minor compared to other sources of air pollution impacting the forest.

Project Design Features and Mitigation Measures

The project design features and mitigation measures listed for alternative 2 would apply for alternative 4.

Cumulative Effects for Alternative 4

The cumulative effects listed for alternative 2 would also apply for alternative 4.

Table 150. Air quality resource indicators and measures for alternative 4

Resource Element	Resource Indicator	Measure	Alternative 4
Air Quality	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.	406 miles of designated OSV trails (no change from existing conditions)
	Estimate of change (increase/decrease) in emissions and the potential to create adverse impacts to air quality.	Acres open to OSV visitor use.	966,270 acres open to OSV use (a 1 percent decrease from the existing conditions)
	Potential effects of OSV emissions to create adverse impacts to air quality.	Shifts in OSV use in relation to sensitive areas (Class 1 and II areas).	OSV trails in close proximity (approx. ¼ mile) of sensitive areas (Caribou Wilderness, Caribou extension proposed Wilderness, Mill Creek Proposed Wilderness and Thousand Lakes Wilderness boundaries, and to the boundary of Lassen Volcanic National Park.) No known impacts to air quality or NAAQS/CAAQS violations exist.

Summary

It is expected the levels of pollutants for the alternatives would fall within the ranges currently experienced and no violation of state or Federal ambient air quality standards would occur on the Lassen National Forest during the OSV season.

Degree to Which the Purpose and Need for Action is Met

Table 151 provides a comparison of the alternatives and the degree to which the alternatives address potential air quality issues.

Table 151. Summary comparison of alternatives

Resource Element	Resource Indicator/Measure	Alternative 1 – No Action	Alternative 2 – Modified Proposed Action	Alternative 3	Alternative 4
Air Quality	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	976,760 acres open to OSV use. No known violations of the CAA as a result of OSV use under the existing condition (see Table 147).	947,120 acres open to OSV use, a 3 percent reduction from existing conditions. . No violations of the CAA are anticipated.	878,690 acres open to OSV use, a 10 percent reduction from existing conditions. No violations of the CAA are anticipated.	966,270 acres open to OSV use, a 1 percent reduction from existing conditions. No violations of the CAA are anticipated.
	Estimate of change (increase/decrease) in emissions and the potential to create adverse impacts to air quality. Acres open to OSV visitor use	406 miles designated for OSV use. No known violations of the CAA as a result of OSV use under the existing condition.	406 miles designated for OSV use. No change from existing conditions. No violations of the CAA are anticipated.	406 miles designated for OSV use. No change from existing conditions. No violations of the CAA are anticipated.	406 miles designated for OSV use. No change from existing conditions. No violations of the CAA are anticipated.
	Potential effects of OSV emissions to create adverse impacts to air quality/ Shifts in OSV use in relation to sensitive areas (Class 1 and II areas).	Groomed OSV trails are in close proximity to the Caribou Wilderness, Thousand Lakes Wilderness, and the boundary of Lassen Volcanic National Park. No known violations of the CAA or impact to Class 1 areas as a result of OSV use under the existing condition.	Groomed OSV trails are in close proximity to the Caribou Wilderness, Thousand Lakes Wilderness, and the boundary of Lassen Volcanic National Park. No violations of the CAA or impact to Class 1 areas are anticipated under this alternative.	Groomed OSV trails are in close proximity to the Caribou Wilderness, Thousand Lakes Wilderness, and the boundary of Lassen Volcanic National Park. Designation of Butte Lake Backcountry Solitude area minimizes OSV impacts and reduces emissions near Caribou wilderness and Lassen Volcanic National Park. No violations of the CAA or impact to Class 1 areas are anticipated under this alternative.	Groomed OSV trails are in close proximity to the Caribou Wilderness, Thousand Lakes Wilderness and the boundary of Lassen Volcanic National Park. No violations of the CAA are anticipated or impacts to Class 1 areas.

Summary of Environmental Effects

Potential impacts of OSV use on Class 1 and II areas would be fairly similar for all action alternatives. Alternatives 2 and 3 would provide slightly more protection due to additional OSV restrictions and closures in the vicinity of sensitive areas. In all action alternatives, Class 1 and II areas are closed to OSV use.

Compliance with LRMP and Other 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 alternatives 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 NFS 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.

Other Agencies and Individuals Consulted

Cassandra Lopina, Air Pollution Specialist, California Air Resources Board.

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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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The following individuals, groups, agencies, and email addresses were either contacted directly in the scoping process, or made themselves known to the Forest Service by submitting comments during scoping for the Lassen OSV Designation analysis.

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Gould	Carl	
Hanson	Lorraine	Snowmobile Club
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Distribution of the Environmental Impact Statement

This environmental impact statement has been distributed to individuals who specifically requested a copy of the document. In addition, copies have been sent to the following Federal agencies, federally recognized tribes, State and local governments, and organizations representing a wide range of views.

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Acronyms

CVC	California Vehicle Code
DEM	Digital Elevation Model
GIS	Geographic Information System
LRMP	Land and Resource Management Plan
MVUM	Motor vehicle use map
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NVUM	National Visitor Use Monitoring
OHV	Off-highway vehicle
OSV	Over-snow vehicle
PCT	Pacific Crest Trail
RFA	Recreation Facility Analysis
ROS	Recreation opportunity spectrum

Glossary

Administrative Use	Motorized vehicle use vehicle use associated with management activities or projects on National Forest 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.
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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Appendices

The following appendices support the information documented in this DEIS.

Appendix A – Public Scoping Comment Categories and Classification Code Definitions.

Appendix B – Forest Plan Direction and 36 CFR §212.55.

Appendix C – Actions Considered in Cumulative Impacts Analysis and How Cumulative Impacts were Considered.

Appendix D – Water Quality Best Management Practices.

Appendix A. Scoping Comment Categories

Subject	Approximate Percentage of Comments
Wildlife	20%
Watersheds (soil and water)	8%
Transportation	1%
Socioeconomics	6%
Recreation	36%
Noise	7%
National Forest Management Act	<1%
National Environmental Policy Act	4%
Fisheries	1%
Climate Change	<1%
Botany	7%
Air Quality	8%
Total	**100%**

Public Scoping Classification Code Definitions

Identification of Issues	Description	Classification Code
Significant (or Key) Issues (Write an issue statement)	A point of disagreement, debate, or dispute over a proposed action based on environmental effects that can often be resolved by developing an alternative to the proposed action, modifying the proposed action in some way, and/or developing site-specific non-routine mitigation measures or design features. OR The issue cannot be adequately addressed with standard mitigation and is not resolved by existing management guidance or direction. An issue should describe a specific action and the environmental effect(s) expected to result from that action – "Cause-effect." Key issues are those most relevant to the analysis (significant issues should only be used when referring to significant environmental effects (SEE), which are addressed in an EIS. For an EA, if you have SEE, you will need to do an EIS.)	1.1 Or 2.1
Alternatives (Don't need to write an issue statement but should address these comments)	A new alternative suggested by the public or another agency or group or a new alternative component suggested. OR Suggestions for changes to the alternatives or the proposed action.	3.1
Nonsignificant (Non-Key) Issues: A point of disagreement, debate or dispute over a proposed action based on environmental effects that falls into one of these categories. (Don't write an IS; however, need to identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (1506.3), narrowing the discussion of these issues in the statement to a brief presentation of why they will not have a significant effect on the human environment or providing a reference to their coverage elsewhere (40 CFR 1501.7(a)(3)), and FSH 1509.15 (12.41)).	Already decided by law, regulation or policy	4.1
	Irrelevant to the decision to be made	4.2
	Conjectural in nature or not supported by scientific evidence	4.3
	Impacts are limited in extent, duration, and intensity due to project design or limited nature of impact	4.4
	Can be addressed through implementation of routine or standard project design features or mitigation measures	4.5
	Outside the scope of the proposed action	4.6
Suggestion/comment or procedural concern (Don't need to write an issue statement but should briefly address these comments)	General concerns, questions, or suggestions not specifically related to the proposed action's effects.	5.1
Document specific comments and/or document corrections (Don't need to write an issue statement but should briefly address these comments)	If we need to identify the document specific comments, we would need to set up "categories" that are specific to the resource or by some categories identified in the coding structure. Document specific comments especially if the proposed action is specific. Also includes document corrections or factual information corrections.	6.1

Appendix B. Forest Plan Direction and 36 CFR §212.55

OHV Management Practices Emphasized and Permitted in each Forest Plan Management Prescription (1992 Forest Plan)

Forest-wide Standards and Guidelines

Recreation

Provide diverse opportunities of winter sports.

1. Continue to implement the preferred alternative of the 1989 Winter OHV Management Plan, for the construction of trailheads and trail networks for winter recreation.

2. Cooperate with the State of California to identify locations where snow removal is needed to accommodate safe, off-highway parking for dispersed winter use.

3. Designate and mark trails needed for additional dispersed winter recreation.

5. Accommodate snowmobile use over most of the Forest where not in conflict with other uses or resources. Due to the dispersed nature of the activities, do not provide regular patrols. Provide first aid services only as Forest personnel happen to be available.

6. Minimize user conflicts by specifying allowable winter use on certain roads and trails (for example cross-country ski trails, snowmobile-only trails or winter 4-wheel drive only.

7. Prohibit snow removal on designated snowmobile and cross-country ski trails between specified dates (Forest Plan, pages 4-25-26).

Restricted Off-Highway Vehicle Use: This practice involves control of off-highway vehicle use. Use can be seasonally prohibited or restricted to designated routes (Forest Plan, Appendix E, page E-4).

Management Prescription	Description	OHV Management Practices		Other Relevant Direction
		Emphasized	Permitted	
A (page 4-40)	Non-Timber Wildlife	None	Restricted Off-Highway Vehicle Use	Seasonally close roads where necessary to protect wildlife during critical periods Manage recreation according to the specified Recreation Opportunity Spectrum classes (See Forest Standards and Guidelines)
B (page 4-42)	Range/ Wildlife	None	Restricted Off-Highway Vehicle Use	Manage recreation according to the specified Recreation Opportunity Spectrum class, which is primarily Roaded Natural
C (page 4-44)	Firewood	None	Restricted Off-Highway Vehicle Use	Manage recreation according to Recreation Opportunity Spectrum class of Roaded Natural (see Forest Standards and Guidelines)
D (page 4-45)	Developed Recreation	Restricted Off-Highway Vehicle Use		

Over-snow Vehicle Use Designation

Management Prescription	Description	OHV Management Practices		Other Relevant Direction
		Emphasized	Permitted	
E (page 4-48)	Early Suc-cessional	Restricted Off-Highway Vehicle Use		Close roads to motorized vehicles as appropriate to meet the needs of deer, black bear, and other emphasized species listed in the Management Area direction. Manage recreation according to the Recreation Opportunity Spectrum class of Roaded Natural (see Forest Standards and Guidelines)
F (page 4-50)	Riparian/ Fish	None	Restricted Off-Highway Vehicle Use	Confine off-highway vehicles, <u>except oversnow vehicles</u>, to designated roads, trails, and stream crossings in riparian areas.
G (page 4-54)	Old Growth/ Goshawk	Restricted Off-Highway Vehicle Use		Manage recreation according to the Recreation Opportunity Spectrum classes of Semi-Primitive Non-Motorized, Semi-Primitive Motorized, or Roaded Natural (see Forest Standards and Guidelines).
K (page 4-56)	Rocky/ Sparse Timber	None	Restricted Off-Highway Vehicle Use	Manage recreation according to the Recreation Opportunity Spectrum classes of Semi-Primitive Nan-Motorized and Roaded Natural (see Forest Standards and Guidelines)
L (page 4-58)	Late Suc-cessional	None	Restricted Off-Highway Vehicle Use	Manage recreation according to the Recreation Opportunity Spectrum classes of semi- Primitive Non-Motorized, Semi-Primitive Motorized, or Roaded Natural (see Forest Standards and Guidelines)
M (page 4-60)	Semi-Primitive Motorized	Restricted Off-Highway Vehicle Use		Design motorized routes to take advantage of recreation and scenic opportunities, insure successful rehabilitation of soil and vegetation, and provide motorized recreation challenges. Close specific areas or travel routes seasonally or year-round as needed to facilitate management of adjacent areas, prevent damage to other resources, prevent use conflicts, and avoid unnecessary costs Monitor and limit visitor use through a quota permit system when other resources are damaged or recreation experiences are reduced
N (page 4-63)	Semi-Primitive Non-Motorized	Restricted Off-Highway Vehicle Use		Design trails to take advantage of recreation attributes such as vistas, streams, lakes, and areas of geologic interest Monitor and limit visitor use when other resources are damaged or recreation experiences are reduced Prohibit motorized recreation, including four-wheel driving, motorcycling, and snowmobiling.
R (page 4-66)	Range	None	Restricted Off-Highway Vehicle Use	Manage recreation according to the specified Recreation Opportunity Spectrum class which is primarily Roaded Natural (see Forest Standards and Guidelines)

Management Prescription	Description	OHV Management Practices		Other Relevant Direction
		Emphasized	Permitted	
S (page 4-68)	Special Areas- Research Natural Areas	None		Prohibit motorized vehicles within Research Natural Areas Manage recreation according to the designated Recreation Opportunity Spectrum classes (see Forest Standards and Guidelines)
	Special Areas - Other Special Areas	None	Restricted Off-Highway Vehicle Use	
T (page 4-71)	Timber	None	Restricted Off-Highway Vehicle Use	None
V (page 4-73)	View/ Timber	None	Restricted Off-Highway Vehicle Use	Manage recreation according to the Recreation Opportunity Spectrum (ROS) class of Roaded Natural or Rural (see Forest Standards and Guidelines).
W (page 4-76)	Wilderness	None		Prohibit motorized vehicles except where authorized for emergencies or for other purposes, based on environmental analysis.
Z (page 4-79)	Minimal Manage-ment	None		None

Sierra Nevada Forest Plan Amendment

Forest-wide Standards and Guidelines

Standards and guidelines described in this section apply to all land allocations (other than wilderness areas and wild and scenic river areas) unless stated otherwise (2004 Record of Decision, page 49).

Wheeled Vehicles

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 (2004 Record of Decision, page 59).

36 CFR §212.55: Criteria for designation of roads, trails, and areas.

(a) General criteria for designation of National Forest System roads, National Forest System trails, and areas on National Forest System lands. In designating National Forest System roads, National Forest System trails, and areas 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.

(b) Specific criteria for designation of trails and areas. In addition to the criteria in paragraph (a) of this section, in designating National Forest System trails and areas 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.

(c) Specific criteria for designation of roads. In addition to the criteria in paragraph (a) of this section, in designating National Forest System roads, the responsible official shall consider: (1) Speed, volume, composition, and distribution of traffic on roads; and (2) Compatibility of vehicle class with road geometry and road surfacing.

(d) Rights of access. In making designations pursuant to this subpart, the responsible official shall recognize: (1) Valid existing rights; and (2) The rights of use of National Forest System roads and National Forest System trails under § 212.6(b). (e) Wilderness areas and primitive areas. National Forest System roads, National Forest System trails, and areas on National Forest System lands in wilderness areas or primitive areas shall not be designated for motor vehicle use pursuant to this section, unless, in the case of wilderness areas, motor vehicle use is authorized by the applicable enabling legislation for those areas.

Appendix C: How Cumulative Impacts were Considered

We considered whether the potential impacts of the alternatives would accumulate with the impacts of past, other present and reasonably foreseeable future actions in both time and geographic space (FSH 1909.15, Sec. 15.2). If the proposed action or alternatives being analyzed in this DEIS would result in no direct or indirect impacts, there could be no cumulative impacts. It logically follows that if the direct and indirect impacts of the action would occur within a different context than the impacts of past, present, and reasonably foreseeable future actions, there would also be no potential for impacts to accumulate in time and geographic space.

Consideration of Past Actions

The analysis of cumulative impacts begins with consideration of the direct and indirect impacts on the environment that are expected or likely to result from the proposed action and alternatives. Once the direct and indirect impacts are determined, we then look for existing (residual indirect) impacts of past actions.

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

To understand the contribution of past actions to the cumulative impacts of the alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. 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 impacts.

The cumulative impacts analysis does not attempt to quantify the impacts of past human actions by adding up all individual residual impacts of prior actions on an action-by-action basis. There are practical reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions in the past, and isolating the impacts of each individual past action that might continue to have residual impacts would be nearly impossible.

Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative impacts of the proposed action and alternatives. In fact, focusing on individual impacts of past actions would be less accurate than looking at existing conditions. This is because there is limited information on the environmental impacts of individual past actions and one cannot reasonably identify each and every past action that has incrementally contributed to current conditions. By looking at current conditions, we are sure to capture all the residual impacts of past human actions, regardless of which particular action or event contributed those impacts.

This practice adheres to direction in the Council on Environmental Quality's interpretive memorandum of June 24, 2005, regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions." For these reasons, our analysis of past actions is based on current environmental conditions.

Consideration of Reasonably Foreseeable Future Actions

Cumulative impacts can only occur when the likely impacts resulting from the proposed action or alternatives overlap spatially and temporally with the likely impacts of reasonably foreseeable future actions (FSH 1909.15, Sec. 15.2).

The Code of Federal Regulations at 36 CFR Part 220 provides direction for identifying reasonably foreseeable future actions that should be considered in the analysis of cumulative impacts. Reasonably foreseeable future actions are those federal or non-federal activities not yet undertaken, for which there are existing decisions, funding, or identified proposals" (36 CFR §220.3).

"Identified proposals for Forest Service actions are those for which the Forest Service has a goal and is actively preparing to make a decision on one or more alternative means of accomplishing that goal and the effects can be meaningfully evaluated (40 CFR §1508.23)" (36 CFR §220.4(a)(1)).

The relevance and usefulness of other ongoing or reasonably foreseeable future activities or events that might result in impacts that would accumulate with the specific direct and indirect impacts to specific resources depends on the context in which those direct and indirect impacts are considered. Those actions and events are discussed in the relevant resource sections.

Therefore, the other present and reasonably foreseeable future actions were considered in two phases. The first phase determined whether another present or reasonably foreseeable action was relevant and useful to the analysis. The other present or reasonably foreseeable future action would only be relevant and useful if its impacts would accumulate with the impacts of the alternative being analyzed. The second phase determined the cumulative impacts of those actions determined to be relevant and useful.

Other Present and Reasonably Foreseeable Future Actions Considered in Cumulative Impacts Analyses

Routine maintenance occurs throughout the project area on roads and in campgrounds. Routine Forest Service use of mineral material sources occurs in these designated areas throughout the project area. Routine noxious weed management (hand pulling/digging) occurs along forest roads throughout the project area. A wide range of recreational use occurs in all seasons across the forest, and forest-wide campgrounds and roads receive routine use during the months that climate conditions allow. Ongoing maintenance and use of communication sites and personal use woodcutting occur throughout the project area. Ongoing actions and reasonably foreseeable future actions included include snowplowing of winter recreation parking areas.

Grazing on range allotments is also ongoing. These allotments are shown in the following table.

Table 152. Lassen National Forest active range allotments and grazing permits

Allotment	Livestock	Season of Use	AUMs
Almanor Ranger District @ 3,483 AUMs			
Antelope	Cattle	3/1 – 5/31	799
Benner Creek (one day crossing)	Cattle	6/1 – 6/1	5
Campbell Mountain	Cattle	7/1 – 8/15	44
Collins	Cattle	6/15 – 10/31	162
Cone & Ward South	Cattle	11/15 – 4/15	693
Deer Creek	Cattle	6/1 – 10/15	297
Feather River	Cattle	6/1 – 10/15	416
Lyonsville	Cattle	5/15 – 9/15	189
Martin	Cattle	6/1 – 9/30	137
Morgan Springs	Cattle	6/15 – 10/31	434
Murphy Hill	Cattle	7/1 – 9/30	199
Soda Creek – North Butte	Cattle	6/16 – 9/15	108

Allotment	Livestock	Season of Use	AUMs
Eagle Lake Ranger District @ 21,751 AUMs			
Bridge Creek	Cattle	6/1 – 9/15	1,931
Champs Flat	Cattle	6/1 – 9/30	2,515
Clover Valley	Cattle	6/1 – 8/31	399
Coyote	Cattle	6/1 -9/30	424
Diamond Mountain	Cattle	7/1 – 8/31	135
Duck Lake	Cattle	6/1 – 9/15	260
Grays Valley	Cattle	6/1 – 10/15	1,189
Gooch Valley	Cattle	6/1 – 9/30	1,191
Harvey Valley	Cattle	6/1 – 10/31	3,320
Homer Lake	Cattle	6/1 – 9/30	190
Lower Pine Creek	Cattle	6/1 – 9/9	1,995
Mountain Meadows	Cattle	6/1 – 9/15	162
North Eagle Lake	Cattle	6/1 – 9/30	1,059
Poison Lake	Cattle	6/1 – 10/15	3,555
Robbers Creek	Cattle	6/1 – 9/15	380
Silver Lake (one day crossing)	Cattle	6/1 – 6/1	9
South Eagle Lake	Cattle	5/16 – 9/30	599
Susan River	Cattle	6/1 – 9/15	785
Upper Pine Creek	Cattle	6/1 – 9/15	1,653
Hat Creek Ranger District@ 10,764 AUMs			
Bainbridge	Cattle	6/1 – 7/31	742
Bald Mountain	Cattle	4/16 – 5/31	269
Bear Valley	Cattle	6/1 – 10/15	1,271
Butte Creek	Cattle	6/1 – 9/30	858
Coyote Springs	Cattle	6/1 – 9/30	826
Dixie Valley	Cattle	6/1 – 10/15	1,261
Horse Valley	Cattle	4/16 – 5/31	338
Murken Lake	Cattle	4/16 – 5/31	409
North Battle Creek	Cattle	7/1 – 9/30	319
North Hot Springs	Cattle	4/16 – 5/31	266
North Hot Springs	Cattle	6/1 – 9/15	232
Procter Creek	Cattle	8/1 – 9/30	724
Six Mile Hill	Cattle	4/16 – 5/31	149
Soldier Mountain	Cattle	4/16 – 6/15	424
Willow Springs	Cattle	6/1 – 10/15	2,676
Total Permitted AUMs			35,998

Source: Final Environmental Impact Statement, Motorized Travel Management, Lassen National Forest, Appendix C.

The list of future foreseeable actions includes those projects on the Lassen National Forest Schedule of Proposed Actions (SOPA). The SOPA is updated quarterly and posted on the Lassen National Forest website. Land disturbing projects listed on the SOPA as “developing proposal” or “in progress” are included here as potentially contributing to cumulative effects.

1. Lassen NF ML3 Roads Evaluation
   Status : **Developing Proposal**
   Appeal Outcome : N/A
   Decision : N/A
   Imp. Constraints : N/A
   Name : Lassen NF ML3 Roads Evaluation
   Forest : Lassen National Forest (110506)
   Mgt. Unit : Lassen National Forest All Units (11050600)
   Analysis Type : EA
   Purpose : Recreation management
   Activities : Travel management
   Description: Forest-wide evaluation of maintance level changes and mixed use on ML3 roads.
   Location: UNIT - Lassen National Forest All Units. STATE - California. COUNTY - Butte, Lassen, Plumas, Shasta, Tehama. LEGAL - Not Applicable. Various ML3 roads throughout Lassen NF.

2. Upland Windthrow Salvage
   Status : **Developing Proposal**
   Appeal Outcome : N/A
   Decision : N/A
   Imp. Constraints : N/A
   Name : Upland Windthrow Salvage
   Forest : Lassen National Forest (110506)
   Mgt. Unit : Eagle Lake Ranger District (11050658)
   Analysis Type : EA
   Purpose : Forest products
   Activities : Road improvements/construction
   Description: Salvage of wind thrown timber across the northern portions of the Eagle Lake and Hat Creek Ranger District.
   Location: UNIT - Eagle Lake Ranger District. STATE - California. COUNTY - Lassen, Shasta. LEGAL - Not Applicable. Northern portion of the Eagle Lake and Hat Creek Ranger Districts.

3. Mudstove Project
   Status : **Developing Proposal**
   Appeal Outcome : N/A
   Decision : N/A
   Imp. Constraints : N/A
   Name : Mudstove Project
   Forest : Lassen National Forest (110506)
   Mgt. Unit : Almanor Ranger District (11050651)
   Analysis Type : DM
   Purpose : Forest products, Fuels management
   Activities : Timber sales (salvage), Fuel treatments (non-activity fuels)
   Description: The Mudstove project proposes to salvage harvest windthrown trees and trees structurally damaged by the 2/6/2015 extreme wind event. Proposed project is approximately 250 acres.
   Location: UNIT - Almanor Ranger District. STATE - California. COUNTY - Plumas. LEGAL - sec 8, 9, 15, 16, 22 T28N, R6E; sec 29, 31, 32 T30N, R7E; sec 5, 6, 8, 9 T29N, R7E, MDM. pockets of windthrow in portions of Stover Mountain and Mud Creek Rim.

4. Storrie Aquatic Organism Passage (AOP) Project
   Status : **In Progress**
   Appeal Outcome : N/A
   Decision : N/A
   Imp. Constraints : N/A
   Name : Storrie Aquatic Organism Passage (AOP) Project
   Forest : Lassen National Forest (110506)
   Mgt. Unit : Almanor Ranger District (11050651)
   Analysis Type : DM
   Purpose : Wildlife, Fish, Rare plants
   Activities : Species habitat improvements, Watershed improvements
   Description: Remove three road-stream crossing structures that are barriers to aquatic organism passage. Replace with new structures that allow aquatic organisms to pass above and below the road crossings and that are capable of passing a 100-year storm flow.
   Location: UNIT - Almanor Ranger District. STATE - California. COUNTY - Plumas. LEGAL - Not Applicable. 3 separate project sites: NFS road 26N08 crossing Water Creek, NFS road 26N08 crossing Miller Ravine, and NFS road 26N08 crossing Rock Creek. All sites are within the Yellow Creek 5th field watershed.

5. Blacks Windthrow Salvage Project
   Status : **In Progress**
   Appeal Outcome : N/A
   Decision : N/A
   Imp. Constraints : N/A
   Name : Blacks Windthrow Salvage Project
   Forest : Lassen National Forest (110506)
   Mgt. Unit : Eagle Lake Ranger District (11050658)
   Analysis Type : DM
   Purpose : Forest products, Fuels management
   Activities : Timber sales (salvage)
   Description: Mechanically salvage the windthrown trees within the Blacks Experimental Forest for the purpose of capturing economic value, restoring access, and improving safety.
   Location: UNIT - Eagle Lake Ranger District. STATE - California. COUNTY - Lassen. LEGAL - The project is located in all or portions of: Sections 14 and 15, T33N, R7E, MDM. Blacks Experimental Forest.

6. Dry Loch Windthrow Salvage
   Status : **In Progress**
   Appeal Outcome : N/A
   Decision : N/A
   Imp. Constraints : N/A
   Name : Dry Loch Windthrow Salvage
   Forest : Lassen National Forest (110506)
   Mgt. Unit : Eagle Lake Ranger District (11050658)
   Analysis Type : DM
   Purpose : Forest products, Fuels management
   Activities : Timber sales (salvage)
   Description: Mechanically salvage windthrown trees within the project area that are in excess of what is needed to meet standards and guidelines for wildlife and soils.
   Location: UNIT - Eagle Lake Ranger District. STATE - California. COUNTY - Lassen. LEGAL - The project is located in all or portions of: T33N, R7E, Sections 28-29 and 31-33; T32N, R7E, Section 6; and T33N, R6E, Section 36, MDM. Swains/Poison Area.

7. Grizzly Restoration Project
   Status : **In Progress**
   Appeal Outcome : N/A
   Decision : N/A
   Imp. Constraints : N/A
   Name : Grizzly Restoration Project
   Forest : Lassen National Forest (110506)
   Mgt. Unit : Almanor Ranger District (11050651)
   Analysis Type : EA
   Purpose : Recreation management, Wildlife, Fish, Rare plants, Forest products, Fuels management, Watershed management, Road management, Research and Development
   Activities : Dispersed recreation mgmt., Travel management, Species habitat improvements, Timber sales (green), Fuel treatments (non-activity fuels), Watershed improvements, Road improvements/construction, Road maintenance, Road decommissioning, Research and Development.
   Description: Grizzly proposes to move Forest road 26N11 away from Scotts John Crk; increase forest resilience, decrease fuels, maintain/improve wildlife habitat through thinning and prescribed fire; and implement actions to support three research proposals.
   Location: UNIT - Almanor Ranger District. STATE - California. COUNTY - Butte, Plumas. LEGAL - Not Applicable. The project area consists of four separate areas near Scotts John Creek, Grizzly Creek, Water Creek, and Yellow Creek, and ranges in elevation from 4,150 feet to 7,200 feet.

8. Rust Resistant Sugar Pine Mainenance
   Status : **In Progress**
   Appeal Outcome : N/A
   Decision : N/A
   Imp. Constraints : N/A
   Name : Rust Resistant Sugar Pine Mainenance
   Forest : Lassen National Forest (110506)
   Mgt. Unit : Eagle Lake Ranger District (11050658)
   Analysis Type : DM
   Purpose : Vegetation management (other than forest products)
   Activities : Forest vegetation improvements
   Description: Thin areas around proven rust resistant sugar pine (RRSP) trees to increase sustainability by reducing direct vegetative competition, wildfire risk, over-wintering habitat for cone boring insects, and squirrel access to crowns.
   Location: UNIT - Eagle Lake Ranger District. STATE - California. COUNTY - Lassen. LEGAL - T29N, R10E, sections 4, 27, 33, and 34; T30N, R9E, sections 24, 33, and 34; T31N, R9E, sections 8, 10, 16, and 17; T32N, R9E, section 2; T32N, R10E, sections 9, 10, 15, 21, 28, 32, and 33, MDB&M. Areas of treatment proposed with the Rust Resistant Sugar Pine Project are located throughout the Eagle Lake Ranger District.

9. Pacific Gas and Electric (PG&E) Utility Pole Replacement Project - Shasta County, CA
   Status : **In Progress**
   Appeal Outcome : N/A
   Decision : N/A
   Imp. Constraints : N/A
   Name : Pacific Gas and Electric (PG&E) Utility Pole Replacement Project - Shasta County, CA
   Forest : Lassen National Forest (110506)
   Mgt. Unit : Lassen National Forest All Units (11050600)
   Analysis Type : DM
   Purpose : Special use management

Activities : Special use authorizations
Description: The proposed action is authorization for PG&E to replace one deteriorated electric distribution pole lying within the Pit 3-2101 Circuit utility corridor easement on National Forest System Lands.
Location: UNIT - Hat Creek Ranger District. STATE - California. COUNTY - Shasta. LEGAL - T36N, R2E, Section2, NE1/4 SW1/4. The existing utility pole is located in the Pit River Canyon ~10 miles E of Big Bend, CA & north of the Pit River. It lies N of FS Rd 37N60Y near Camp Nine Flat on the Shasta NF (administered by LNF).

10. Bald Fire Salvage and Restoration
    Description: Proposed activities include: salvage, treatment of non-merchantable trees, removing hazard trees along roads and trails, treatment of activity slash, site preparation, and planting,. Treatments (salvage logging, roadside hazard, fuels treatment) on approximately 14,000 acres; reforestation on approximately 12,000 acres.
    Dates: sold; work to begin within 2016.
    Additional information, including maps:
    Web Link: http://www.fs.fed.us/nepa/nepa_project_exp.php?project=45965

11. Lassen Day Fire Salvage
    Description: Salvage of dead and/or dying trees within approximately 200 acres of the Day Fire area on the Lassen National Forest.
    Dates: Unknown
    Additional information, including maps:
    Web Link: http://www.fs.fed.us/nepa/nepa_project_exp.php?project=46000

12. Eiler Fire Salvage
    Description: Treat approximately 3,048 acres of area salvage (20% of NFS lands), 1,174 acres of roadside hazard trees (8% of NFS lands), 4,480 acres of fuels treatments (30% of NFS lands), and reforest 5,645 acres (38% of NFS lands) within the fire perimeter. Bring 2.4 miles of existing non-system roads (needed to implement the project for multiple entries) into the Forest road system as Maintenance Level (ML) 2 roads. These roads currently meet Forest transportation standards. Construct one-half mile of new construction that will be needed for access during project implementation and for long-term management. This road will be classified as a ML 1 and thus closed to wheeled motor vehicle traffic once all project activities are complete. Bring one water source proposed for use in implementing the project up to best management.
    Dates: sold; work to begin within 2016
    Additional information, including maps:
    Web Link: http://www.fs.usda.gov/project/?project=45962

13. Creeks Timber Sales
    Description: Four timber sales currently sold within the Creeks analysis area. Sales will include sawtimber and biomass reduction. Total acres treated will be approximately 2400.
    Dates: sold; work has already begun on one and may start by 2016 on the other three
    Additional information, including maps:
    Web Link: http://www.fs.usda.gov/project/?project=4943

14. Upland Windthrow Salvage Project
    Description: Salvage of wind thrown timber across the northern portions of the Eagle Lake and Hat Creek Ranger District.
    Dates: planning stages; projected implementation: 8/2016
    Maps not yet available

Appendix D: Water Quality Best Management Practices

BMP 2-25 (USFS 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 IDT [interdisciplinary team] during environmental analysis and incorporated 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 (USFS 2000): Water Quality Monitoring of off-highway vehicle (and OSV) Use According to a Developed Plan

a. Objective: To provide a systematic process to determine when and to what extent off-highway vehicle use will cause or is causing adverse effects on water quality.

b. Explanation: Each Forest’s off-highway vehicle plan [Travel Management Plan and LRMP] will:

    1. Identify areas or routes where off-highway vehicle use could cause degradation of water quality

    1. Establish baseline water quality data for normal conditions as a basis from which to measure change.

    2. Identify water quality standards and the amount of change acceptable.

    3. Establish monitoring measures and frequency.

    4. Identify controls and mitigation appropriate in management of off-highway vehicles.

    5. Restrict off-highway vehicles to designated routes.

c. Implementation: Monitoring results are evaluated against the off-highway vehicle 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 off-highway vehicle 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, snowcats, and snow grooming machines. Snowmobiles and snowcats 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 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, polycyclic aromatic hydrocarbons, 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 of over-snow vehicle emissions on air quality and water quality.
- Use applicable practices of BMP Rec-4 (Motorized and Nonmotorized 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) 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.