

**BIOLOGICAL EVALUATION  
FOR  
SENSITIVE PLANTS  
AND OTHER BOTANICAL RESOURCES**

Public Wheeled Motorized Travel Management Plan  
Stanislaus National Forest  
Pacific Southwest Region

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Prepared by: \_\_\_\_\_

Terri Walsh  
Botanical Resource Analyst  
Recreation Solutions Enterprise Team  
Washington Office

Reviewed by:

Sue Warren Travel Management ID Team Leader

Approved by:

Crispin Holland  
Forest Wildlife, Aquatics, and Botany Program Coordinator

This biological evaluation has been prepared in accordance with direction in FSM 2672.4. It complies with 36 CFR 219.19 and 36 CFR 241.1.

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## Introduction

A botanical analysis consisting of a Biological Evaluation for the listed Stanislaus National Forest (STF) sensitive plants, unique habitats, other botanical resources, including noxious and invasive weeds, was conducted for the Stanislaus National Forest Motorized Travel Management Environmental Impact Statement EIS. The purpose of this biological evaluation is to analyze the potential effects of the EIS on sensitive species of plants and their habitats and determine whether implementation of the EIS would result in a trend toward Federal listing of any Sensitive Plant species within their geographical range on the Forest.

Potential habitat for sensitive plant species and invasive plants was analyzed within the project area using forest GIS files, soil and vegetative overlays, and elevation maps. Descriptions of the survey protocols used to conduct the potential habitat search are located in the data and method section of this document. This assessment includes information about each individual route in the proposed alternatives with site specificity to support the effects determination. Site-specific mitigations are identified and assessed for impacts to other resources. Refer to the Project Record for site-specific mitigations and assessment.

## Purpose and Need

Refer to Purpose and Need for Action in Chapter 1 of the STF Public Wheeled Motorized Travel Management EIS for a full discussion of the purpose and need for this project, as filed in the Federal Register (NOI 2007). The Travel Management project proposes to stop unmanaged recreation resulting in resource damage from the use of unauthorized routes and cross-country motorized vehicle travel and redirects use to sustainable NFS roads and trails.

**Analysis Framework-** Statutes, Regulations, Forest Plan, and other direction Management direction specific to the project can be found in the Travel Management Environmental Impact Statement (EIS). This section summarizes management direction for threatened, endangered, and sensitive (TES) plant species.

## **Stanislaus National Forest Land and Resource Management Plan (LRMP) Standards and Guidelines 2005.**

General direction for management of Sensitive Plants under the STF LRMP is to "provide for and manage plant habitats and activities for threatened and endangered species to achieve recovery objectives so that special protection measures provided under the Endangered Species Act (ESA) are no longer necessary" (FSM 2670.21; USDA FS, 1995). Endangered Species Act of 1973 (ESA)

**The Endangered Species Act of 1973 (16 USC 1531 et seq.)** requires that any action authorized by a federal agency will not jeopardize the continued existence of a threatened or endangered (T&E) species, or result in the destruction or adverse modification of habitat of such species that is determined to be critical. Section 7 of the ESA directs Federal departments and agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitats. The Standards and Guidelines outlined in the General Direction of the Sensitive Plants Interim and Recovery Management (12-A) includes: 1) Protect sensitive plants from activities that might cause them to become Federally listed as Threatened or Endangered;

- 2) Identify populations of sensitive plants that occur in areas planned for timber sales or “other” projects;
- 3) Modify planned projects to avoid or minimize adverse impacts to sensitive plants;
- 4) Where projects may jeopardize a sensitive plant species, perform a Biological Evaluation, botanical investigation and develop management guidelines, as necessary for the species involved; and
- 5) Conduct surveys and monitoring necessary to detect potentially damaging disturbances, changes in known populations and locations of new populations.

Section 7 of the ESA, as amended, requires the responsible federal agency to consult the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service concerning T&E species under their jurisdiction. It is Forest Service policy to analyze impacts to T&E species to ensure management activities are not likely to jeopardize the continued existence of a T&E species, or result in the destruction or adverse modification of habitat of such species that is determined to be critical.

**E.O. 13112 Invasive Species 64 FR 6183 (February 8, 1999)** Provides direction to prevent and control the introduction and spread of invasive species.

**Forest Service Manual and Handbooks (FSM/H 2670)** Forest Service Sensitive (FSS) 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. The Biological Evaluation (BE) is summarized or referenced in the EIS and includes:

- Management of Sensitive Plants on the Stanislaus National Forest is based on Forest Service policy set out in the Forest Service Manual (FSM 2670),
- Forest Service Handbook (FSH 2609.25), the Stanislaus National Forest Land and Resource Management Plan, as amended (LRMP), USDA FS, 1988;
- Stanislaus National Forest Sensitive Plant Management Guide (Beck and Hurley, DATE);
- USDA Forest Service R5 Sensitive Species Evaluations and Management Guide, 2006.
- FSM 2670.32 direction is to "avoid or minimize impacts to [Sensitive] species whose viability has been identified as a concern." Where it is determined that impacts cannot be avoided, "the line officer with project approval authority, [may make] the decision to allow or disallow impact, but the decision must not result in loss of species viability or create significant trends toward Federal listing."
- United States Department of Agriculture Regulation 9500-4 directs the Forest Service to avoid actions which may cause a sensitive species to become threatened or endangered (FSM 2670.12; USDA FS, 1995). Further, it is a Forest Service objective to "maintain viable populations of all native ... plant species in habitats distributed throughout their geographic range on National Forest System lands" (FSM 2670.22).

**Sierra Nevada Forest Plan Amendment (STFPA 2004)** The following direction applies to motorized travel management and botanical resources:

- Noxious Weeds Management (STFPA Management Standard & Guidelines 36-49).

- Wetland and Meadow Habitat (STFPA Management Standard & Guideline 70): See Water Resources section.
- Riparian Habitat (STFPA Management Standard & Guideline 92): See Water Resources section.
- Bog and Fen Habitat (STFPA 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, 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 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).

**Forest Service Direction for Noxious Weeds Policy** under FSM 2081.03 (USDA FS, 1995) directs that “when any ground disturbing action or activity is proposed, determine the risk of introducing or spreading noxious weeds associated with the proposed action”. For projects having moderate to high risk of introducing or spreading noxious weeds, the project decision document must identify noxious weed control measures that must be undertaken during project implementation. For a complete list of noxious weeds known or expected to occur in the STF Travel Management analysis area, please refer to the noxious weed section of this document.

**Sensitive Plant Protection** Sensitive Plant protection (FSM 2670.32; USDA FS, 1995) requires the Agency to reduce, minimize or alleviate possible adverse effects to Sensitive Plants. The following management requirements are recommended for the Travel Management Plan implementation:

- Assume areas of unsurveyed suitable habitat are occupied by sensitive plants.
- Avoid or minimize impacts to species of concern.
- Avoid impacts where possible. Analyze unavoidable impacts for 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.
- If monitoring indicates negative impacts are occurring to sensitive plants or plant habitat, determine site-specific mitigations to minimize or eliminate further damaging from motor vehicle use. Actions may include signing the area for special resource concerns, erecting barricades to block vehicle use, or most restrictive closing the route seasonally or year-around.

## Monitoring

Monitoring of sensitive plants would occur in areas of the Forest where concentrated numbers of sensitive plant sites are located along NFTS routes. These areas have the greatest potential for adverse effects from motor vehicles. Monitoring of these occurrences should take place yearly for five years to determine if the populations are still extant (have not been extirpated) and to determine whether effects will have lasting adverse effects.

**Meadows, Fens, Bogs, Riparian Habitat:** Field surveys of meadows have been conducted on the Forest for meadows greater than one acre in size and that have a road or trail within the meadow. Several sensitive plant taxa can occur within meadows and monitoring and mitigation would help to protect their habitat. If adverse impacts to the hydrologic function of meadows were detected, measures would be employed to restore proper functioning condition. Monitoring of meadow areas continues on each of the three districts, as individual projects demand, however, information for this analysis was derived from existing data sources and Stanislaus NF Fen and Meadow survey report (USDA FS 2007.).

## Routine Maintenance

Maintenance activities associated with this project are identified in Chapter 2 and in Appendix I of the EIS. Routine maintenance will be required for any of the proposed additions to the system. The following activities may be used to conduct maintenance activities:

## Mitigation and Other Requirements Common to All Action Alternatives

Based on their site-specific review of each proposed addition to the NFTS, resource specialists identified mitigation measures and other requirements to reduce some of the potential impacts caused by the various alternatives (Resource Analysis Database Summary Report, project record). Appendix I (Route Data) lists routes with mitigations and other requirements by alternative, while the specific mitigations and requirements are further defined in Appendix F (Maintenance and Mitigation Definitions). Specific mitigations (see Table 2.05-7) must be completed prior to designation of the route for public motorized use.

### Mitigation Measures

Mitigation activities may use one or more of the following hand tools or mechanized equipment depending on route location and accessibility:

- Mechanized equipment: ATV, auger, chainsaw, compactor, pole saw, rock rake, tractor, trailer, etc.
- Hand tools: hand saw, McLeod, pick, posthole digger, pruning shear, rake, shovel, etc.

The following mitigation measures apply to certain routes within the action alternatives (see Appendix I, Route Data EIS):

1. **Annual Maintenance**<sup>1</sup>: maintenance and repair of a route annually due to less favorable soil type, steeper tread gradient, and/or higher trail use.
2. **Boardwalk**: trail tread reinforcement structure resembling a low bridge and constructed over wet or otherwise unstable soil.

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<sup>1</sup> “Annual Maintenance” is considered a mitigation measure in contrast to “Routine Maintenance” where maintenance and repair activities occur once every 3 to 5 years.

3. **Cattleguard:** motorcycle/ATV cattleguard (width 60 inches or less) installed along existing fence line, causing minimal ground disturbance, as structure requires leveling of surface only.
4. **Combined Use Signing:** prepare plan and implement signing for identified portions of high standard (passenger car) roads for Combined Use by highway legal and non-highway legal vehicles.
5. **Drain Dips:** Constructed erosion control techniques that reverse the grade of a trail for a distance of 15-20 feet before returning to the prevailing grade. The change in grade forces water to run off the trail surface rather than gaining additional velocity and volume. Hardened drain dips include additional tread hardening (see Tread Harden).
6. **Fence Barrier:** wood fence constructed using 4 to 6 inch vertical posts with horizontal rails bolted through posts, 30 inches above ground surface. Requires digging up to 8 inch wide by 24-inch deep hole for installation of post.
7. **Full Bench:** trail resting entirely on an excavation into a steep side slope, no fill is used to support the trail.
8. **Log Barrier:** logs placed in a shallow trench along a travel way restricting vehicle traffic to desired locations.
9. **Low Impact Barrier:** low resource impact, vehicle barrier constructed by placing full-length railroad ties on top of 24 inch ties, held in place by driving rebar through ties into ground approximately 24 inches. Requires no digging of holes, but sometimes leveling of ground is required for placement.
10. **Mixed Use Signing:** prepare plan and implement signing for identified portions of certain (high clearance) roads available for use by both highway legal and non-highway legal motor vehicles.
11. **No Vehicles Sign:** small standard traffic signs posted alongside routes to control and direct traffic.
12. **Padding:** fabric placed on native surface and covered with a layer of soil to protect sensitive resources.
13. **Rock Barrier:** large rock boulders, usually 36 to 48 inch diameter, placed in shallow holes along a travel way to restrict vehicle traffic to desired locations.
14. **Tread Harden:** tread or stream crossing treatment using concrete blocks, geosynthetics, logs, mechanical compaction, rock ballast, soil cement or timbers to protect the trail surface.
15. **Waterbars:** constructed log, rock or soil berm that diverts water from the trail tread.

## Consultation to Date

A list of all Federally listed Threatened, Endangered or Proposed plant species (TEP) for the STF, was acquired from the U.S. Fish and Wildlife Service (USFWS, 2008). As indicated by the latest list, dated December 12, 2007, there is a reported occurrence of a Federally listed plant species, *Pseudobahia bahiafolia*, on the STF. *Pseudobahia bahiafolia* is a very low elevation (500 feet) species, which occurs in grasslands and open woodlands in the central Sierra foothills and central San Joaquin Valley (Johnson, 1993). The reported occurrence from the Buchanan Mine Road/Basin Creek area of the Mi-Wok Ranger District is based on a specimen on deposit at the UC Berkeley/Jepson Herbarium. This specimen was recently identified as *Pseudobahia bahiafolia* var. *pinnatidifida*. The taxonomy of this species was revised and the revision did not catch up to this specimen until recently. Bruce Baldwin, curator, Jepson Herbarium, and an

expert on the sunflower family, reviewed the specimen in December 2006. He determined it to be the much more common *Pseudobahia heermannii* (Willits, 2006), not the rare *Pseudobahia bahiafolia*. *Pseudobahia bahiafolia* is not considered further in this biological evaluation. There are no Federally listed TEP plants within the analysis area and no consultation with USFWS is required.

## Description of Project

### Proposed Actions

The proposed changes to STF National Forest Transportation System (NFTS) roads and trails provide a diversity of wheeled motorized recreation opportunities while protecting sensitive plants and their habitats and minimizing the spread of noxious weeds. The three discreet actions common to all the alternatives are:

- **Cross-country travel:** All of the action alternatives prohibit cross-country travel. Under Alternative 2 (the existing system), cross-country travel would be allowed to continue.
- **Changes to the existing NFTS:** The alternatives vary in changes to the existing NFTS in terms of vehicle type, season of use and wheeled over snow use.

**Change in class of vehicles:** Vehicle type changes would occur on NFTS roads within in each of the Alternatives. Changing the class of vehicle allowed using a particular road does not create impacts to sensitive species and watchlist plants/plant communities. These roads already have hardened surfaces that lack vegetation. It is likely that direct impacts to sensitive species and watchlist plants/plant communities occurred when the road was developed. Indirect impacts may still be occurring if the sensitive species and watchlist plants/plant communities have survived within 200 feet of the road. These indirect and cumulative impacts would continue regardless of the type of vehicle using the road. In addition, there are no studies that indicate one type of vehicle spreads weed seed and/or weed plant parts more than another type of vehicle. Therefore, changing the class of vehicle does not make the road more or less susceptible to weed introduction and spread and does not reduce the risk of sensitive species and watchlist plants/plant communities being lost or degraded.

**Seasonal Closures:** All action alternatives propose seasonal closures during the wettest part of the year, during the winter closure dates, or during the wet weather closures when 1 inch of rainfall occurs in a 24-hour period and allowing for 72 hours of drying. See Chapter 2 of EIS for reference for individual alternative seasonal closure dates. Under these restrictions, all native and non-native surface routes will be closed. Seasonal closures would reduce off-road impacts to sensitive plants and habitats located along these routes during the season when soils are most vulnerable to impacts from rutting, compaction and erosion (see Chapter 3, EIS, Soils). These soil effects may translate into direct and indirect effects to sensitive plants. The length of seasonal closure varies by alternative. These restrictions would likely provide a beneficial effect to sensitive plants and habitats during the wettest season when soils are most prone to rutting, compaction, and erosion.

**Wheeled Over Snow:** Wheeled over snow use would be prohibited in all of the Alternatives except on the routes listed in Table 1, or where allowed by permit or other authorization.

**Table 1: Wheeled Over Snow Routes**

Route	District	Miles
3N01	Mi-Wok	20.0
4N12	Summit	19.0
7N05	Calaveras	1.1
7N09	Calaveras	2.1
7N17	Calaveras	2.8
7N23	Calaveras	4.4
8N02	Calaveras	1.4
8N12	Calaveras	0.6
	<b>Total</b>	<b>51.4</b>

A potential indirect impact to sensitive plant habitat would either exist by sediment runoff from ruts or changes in hydrology functions. These roads are surfaced and rutting or changes to hydrologic function are not to occur. Any impacts to plants or habitat would have occurred when these roads were constructed. Wheeled Over Snow use is proposed on existing NFTS roads. Direct and Indirect effects are analyzed for sensitive plants within Alternative 2 for existing conditions.

**Additions to the System:** Alternative 1, 4, and 5 include routes proposed for addition to the NFTS. All proposed route additions have an assigned maintenance level based on specific road or trail management objectives and any applicable vehicle type or season of use. All proposed additions to the system will receive the appropriate level of routine maintenance such as brushing, signing, cleaning, clearing debris, etc. Resource specialists have documented their site-specific review of each proposed route in the Route Analysis Database included in the Project Record.

## Alternatives Analysis

For the complete discussion of the project description by alternatives, refer to Chapter 2 of the EIS.

### Alternative 1 (Proposed Action)

This is the Proposed Action, as described in the Notice of Intent, with corrections based on updated data and map information and refinements responding to issues raised during scoping. These corrections and refinements provide additional motorized recreation opportunities (including those accessing dispersed recreation activities thereby replacing the need for travel corridors), reduce conflicts and provide additional resource protection.

### Alternative 2 (No Action)

The No Action Alternative provides a baseline for comparing the other alternatives. Under the No Action alternative, current management plans would continue to guide management of the project area. This alternative would **not** change the use of any National Forest Trail System (NFTS) roads and would not add any miles of NFTS motorized trails. Under this alternative, the agency would take no affirmative action (no change from current management or direction) and cross-country travel with continued use of unauthorized routes would occur. It would include

only existing seasonal closures and would not include any restrictions on motorized dispersed recreation access. No changes would be made to the current NFTS and no cross-country travel prohibition would be implemented. The Travel Management Rule would not be implemented, and no Motorized Vehicle Use Map (MVUM) would be produced. Motor vehicle travel by the public would not be limited to NFTS routes. Unauthorized routes would continue to have no status or authorization as NFTS facilities.

### **Alternative 3 (Cross Country Prohibited)**

Alternative 3 responds to administration and resource issues by prohibiting cross-country travel without adding any new facilities to the NFTS. This alternative also provides a baseline for comparing the impacts of other alternatives that propose changes to the NFTS in the form of new facilities (roads and trails). None of the currently unauthorized routes would be added to the National Forest System under this alternative.

### **Alternative 4 (Recreation)**

Alternative 4 responds to the motorized recreation opportunities issue by providing additional routes and reducing restrictions. This alternative would maximize motorized recreation opportunities (including those accessing dispersed recreation activities thereby replacing the need for travel corridors).

### **Alternative 5 (Resources)**

Alternative 5 responds to the administration, private property, recreation and resource issues by limiting additions to the NFTS and increasing restrictions that would reduce conflicts and provide additional resource protection. This alternative would limit motorized recreation opportunities (including those accessing dispersed recreation activities) and provide greater protection for forest resources.

## **Analysis Area**

The STF Travel Management (TM) analysis area for TEPS plants includes all NFS lands within the administrative boundary of the STF, except for those included in the Interface Recreation Plan, roadless areas, and wilderness areas. Direct, Indirect, and Cumulative effects are analyzed for all NFS lands within the STF administrative boundary. Cumulative effects are analyzed for all past, present, and foreseeable future activities in the proposed areas within the STF administrative boundary. Research Natural Areas and Special Interest Areas are also included in the analysis.

Other botanical resources on the STF include Special Interest Areas (SIAs) and Research Natural Areas (RNAs). SIAs were established mostly for their botanical features and historical values. The SIAs fall within Management Area Direction of the Forest Plan Direction (USDA FS, 2005). Only a few roads are located within SIAs and RNAs for all alternatives. No routes from the action alternatives 1, 4, and 5 added to the system in these areas. The effects to existing routes in Alternative 2 and 3 analyzed.

### **Special Interest Areas**

The management emphases for SIAs is to protect and manage unique geological, scenic, historical, archaeological, botanical and memorial features, and to preserve the integrity of the special interest feature for which the areas were established. The general direction in the Forest

Plan is to complete population surveys for the sensitive plant occurrences before any type of new activity occurs, and to provide for education and interpretation of sensitive plants in a way which assures protection of the plants and their habitat. A wide range of resource activities are permitted, provided the unique features of each area are protected (General Direction, Standard & Guidelines, Sensitive Plants Interim and Recovery Management 12-A).

There are eleven SIAs within the analysis area. They vary in size from less than ½ acre to approximately 2,960 acres. Two SIAs contain sensitive species and Botanical resources, and are set aside to manage as botanical areas. Two additional cultural areas contain species of significant cultural importance. For the purposes of this BE, only these four SIAs are analyzed. 1) **Trumbull Peak Historic and Botanical Area** is located on the Groveland RD in T2S., R19E, Sections 3, 9, 10, 15, 16, and 22. The area includes the upper slopes of Trumbull Peak, the Trumbull Peak Lookout, a railroad spur, and two logging inclines. The entire area covers 150 acres and includes three occurrences of sensitive plants: Yosemite onion (*Allium yosemitense*), Congdon's woolly sunflower (*Eriophyllum congdonii*), and Congdon's lewisia (*Lewisia congdonii*). No actions are being proposed in this botanical area. Access to the area is gated to limit traffic to authorized users.

2) **Pacific Madrone Botanic Area** is located along the slopes of an unnamed drainage on the Groveland Ranger District in T1S, R18E, SE ¼, Section 33. This 15 acre area contains the two southernmost known groves of Pacific Madrone (*Arbutus menziesii*). The two groves together contain 20 mature and sapling trees, and some seedlings surrounded by riparian vegetation. There are no known occurrences of sensitive plants. No actions are proposed in this botanical area.

3) **Anderson Flat (Bull Creek Cultural Area)** is located on the Groveland District. No actions are proposed in this botanical area. There are plants of cultural importance within the area. There is no direction under the Forest Management Plan for management of the cultural or other plant resources. The Bureau of Land Management has issued direction for the development of an interagency policy for traditional gathering of culturally important plants. This new policy "ensures that traditional practitioners have access to plants and such plants are managed in a manner that promotes ecosystem health for the lands managed by BLM and FS" (U.S. Department of Agriculture 2006. BLM & FS policy for traditional gathering of cultural plants). Culturally sensitive native plants or ethnobotanicals are plants that California native people have utilized for countless generations. Ethnobotanical plants are currently being threatened by the accumulation of past management activities, OHV impacts, catastrophic fire, and their subsequent displacement by encroaching vegetation. "Once they are gone, there is little evidence that would suggest this type of plant diversity, except for the archaeological site whose presence is a statement of the landscape's life-sustaining diversity" (Balen, 2008 Culturally Sensitive Native Plant Species). There is a substantial site of deer grass, *Muelenbergia rigins*, traditionally gathered for basket weaving occurring in the Bull Creek/ Anderson Flat area.

Noxious weeds infestations, such as yellow starthistle and Klamath weed, are present along the right of way on Bull Creek Road and other county roads in the forest. Mariposa County is unable to control these weed infestations because they only have an easement through the area. "Not only are these invasive species adjacent to private property on which the property owners are

actively engaged in weed control, but they are also present in staging areas for OHV use - all of which means the increased OHV use will lead to increased soil disturbance and distribution of noxious weed seeds, not only along the right-of-ways, but also into other areas of the forest as well as being transported out on the area on vehicles parked in the yellow starthistle infested staging areas”(Boze, Cathi Mariposa County Agricultural Commissioner, 2008 Public comment letter).

4) **McCormick Creek Cultural Area** is an administratively confidential SIA located in the northwest part of the forest on the Calaveras District. There are plant species that have cultural significance, and continue to be monitored by the district Heritage program manager. No actions are proposed in this cultural area.

### **Research Natural Areas**

In addition to SIAs, botanical resources are protected in RNAs. RNAs were established for natural ecosystem research, including maintaining botanical resources. RNAs fall within Management Area Direction of the Forest Plan Direction (USDA FS, 2005).

The management emphasis for RNAs is to maintain select vegetative, aquatic, and/or geologic elements in natural conditions. Protection against any activities that directly or indirectly modify ecological processes is provided. (FSM 4063.3) Established for research and study purposes, the RNA is a discrete land area large enough to represent a specific natural ecosystem. There are four RNAs managed for research and study purposes on the STF, comprising approximately 2,243 acres. There are no routes proposed for addition in these RNAs.

1) **Bell Meadow Research Natural Area** is located in the east-central portion of the Forest, consisting of aspen stands along with wet mountain meadow and riparian habitats. The area is approximately 490 acres in size, including 110 acres of aspens. It includes examples of the aspen-meadow complex in deep soils. The purpose for this Research Natural Area is primarily aspen research. A portion of Bell Creek is identified as eligible for Wild and Scenic River status. The natural values of this area are protected as a Research Natural Area.

2) **Critchfield (Bourland Meadow) Research Natural Area** is located in the east-central part of the Forest. The site is comprised of 1,003 acres, located near the headwaters of Bourland Creek. The Emigrant Wilderness area borders the southeast boundary. Vegetation consists of seven major vegetation associations, including red fir, red fir-lodgepole pine, red fir-western white pine-lodgepole pine, red fir-white fir-Jeffrey pine, red fir-white fir, and red fir-aspen. Wet and dry meadows are also present and the area is noted for aquatic bog values. Stages of succession are present in several stands, including meadows. Plant diversity in the wet and dry meadows is considered high. A portion of Bourland Creek was identified as eligible for Wild and Scenic River status.

3) **Grizzly Mountain Research Natural Area** is located in the southern part of the Forest and consists of 500 acres on the northerly slopes of Little Grizzly and Big Grizzly Mountains. Black oak stands occupy most of the area, interspersed with brush and scattered ponderosa pine. The purpose of this Research Natural Area is black oak research. It was burned by wildfire in 1987.

4) **Clark Fork Candidate Research Natural Area** is comprised of approximately 460 acres,

located in the northeast part of the Forest, southeast of Clark Fork Campground. It includes various mixtures of white fir and other conifers at a range of elevations. Part of the area (250 acres) is within the Bald Peak proposed addition to the Carson-Iceberg Wilderness. The remainder is within the Clark Fork proposed Wild and Scenic River. The purpose of this Research Natural Area is white fir research.

## **Existing Environment**

### **General Description**

The STF is located on the west slope of the (central) Sierra Nevada and is bounded on the North West by the North Fork of the Mokelumne River and the Eldorado National Forest and on the east by the Humbolt-Toiyabe National Forest and Yosemite National Park. The Sierra National Forest lies south of the Groveland Ranger District, separated by the Merced Wild and Scenic River Area. Within the forest boundaries, the Mokelumne Wilderness, Carson-Iceberg Wilderness, and Emigrant Wilderness areas are excluded from this analysis due to a lack of roads and/or the prohibition on motor vehicle use within designated wilderness. Elevations within the roaded portions of the analysis area range from approximately 3,300 feet on the south edge of the Forest to about 9,000 feet at the eastern boundary near Ebbetts Pass. Topography is equally variable, with flat meadows, gentle hills, and steep mountains and drainages.

### **Dominant Vegetation types**

Within the analysis area, the dominant vegetation types, from west to east, begin with a narrow band of Foothill-Woodland vegetation (blue oak, interior live oak, black oak, gray pine, and grasslands) and a mosaic of Chaparral (whiteleaf manzanita, buckbrush, and chamise); the Sierran Yellow Pine forests (ponderosa pine, Douglas fir, black oak, and incense cedar); Sierran Montane forests, which includes the Sierra Nevada mixed conifer type (ponderosa pine, sugar pine, Jeffrey pine, Douglas fir, white fir and black oak); the Upper Montane (red fir, Jeffrey pine, lodgepole pine, and western white pine), and Subalpine forests (mountain hemlock, western juniper, and whitebark pine) (Barbour 1977, Potter 1998).

The upper montane and subalpine areas include broad expanses of chaparral consisting of huckleberry oak, greenleaf, and pinemat manzanita, interspersed with extensive areas of rock outcrop as well as numerous wet meadows and springs. Within these larger communities exists a diversity of specialized communities, including slate outcrops, lava caps, riparian drainages, subalpine lakes, montane meadows, and fens. These communities provide habitat for STF sensitive plant species and potential for effects from this project as described below.

### **Sensitive Plant Review**

#### **Data and Methods**

Field surveys and existing information were used to make determinations in this Biological Evaluation. Habitat parameters for TEPS taxa were determined from a variety of sources, including:

- STF Sensitive Plant Field Guide (USDA FS, 2004);
- STF Travel Management Sensitive Plant GIS layers of routes, soil, lava caps, meadows, sensitive plants, and noxious weeds, (USDA FS 2008);

- Region 5 USFS Sensitive Plant Species Evaluation and Documentation forms (USDA FS, 1998, 2006);
- Forest and District project files (occurrence records and route inventory data sets);
- Pre-field analysis with STF soil survey maps and forest-wide lava cap data(USDA soilord3\_data\_equals\_175);
- Forest-wide satellite imagery data of meadows;
- California Department of Fish and Game's Natural Diversity Data Base (CNDDDB), 2008) Special Vascular Plants, Bryophytes, and Lichens List <http://www.dfg.ca.gov>
- California Native Plant Society Inventory of Rare and Endangered Plants of California (CNPS, 2001; online version, CNPS, 2007);
- Jepson Manual: higher plants of California (Hickman, 1993); and
- Sierra Nevada Forest Plan Amendment FEIS, Volume 3, Chapter 3, Part 4.6 (USDA FS, 2001).

Although some field surveys were conducted on both existing and proposed motorized routes, surveys for sensitive plants in preparation for the Travel Management Specialist report and the Biological Evaluation for sensitive plants and noxious weeds were not completed throughout the analysis area for each travel route. Some of the routes to the dispersed campsites were analyzed with site-specific, on-the-ground surveys conducted in areas with botanical resource concerns.

Field surveys for sensitive plants in preparation for the Travel Management Botanical and Noxious Weed Specialist Report and Biological Evaluation were completed using standard survey protocols; the Region 5 USFS Sensitive Plant Species Evaluation and Documentation forms were employed (USDA FS, 1998, 2006). Site-specific surveys were conducted in areas with botanical resource concerns as well as along travel routes that intercept or were within 200 feet of a known sensitive plant occurrence, suitable sensitive plant habitat, or known noxious weed infestation.

Sensitive plant occurrence data was collected across the forest, primarily from project specific work. The entire Forest has not been surveyed. These surveys tend to focus on areas with potential habitat for sensitive and other special-status plant species. Because surveys were not conducted systematically across forest, the forest-wide range and distribution of individual taxa may be understated. Even when surveys occur at the appropriate time, plants may not be evident at that time. For example, some plants of *Allium tribracteatum* may remain dormant in drought years and not produce the single leaf characteristic of non-flowering individuals (USDA FS, 2008, Phase 2 108 BE, Margaret Willits, 2008).

STF sensitive plant GIS files, provided by district botanists, consist of data from at least two decades of field surveys, occurrence and suitable habitat data, monitoring, and personal field observations. These files were utilized for the analysis. Travel routes that intercepted a known sensitive plant occurrence, suitable sensitive plant habitat, or noxious weed infestation within 200 feet of proposed additions to the system were analyzed using existing documentation from field surveys, soil and vegetation map overlays and shape files.

The shape files consist of all known sensitive plant occurrence and suitable habitats currently provided for this analysis. This GIS generated data was used to compare and analyze the five alternatives. This information has been collected from 1988 to 2008. Occurrence and suitable habitat location data may be incomplete for some data sets, for example on the Groveland

District. All confirmed occurrences are represented by polygons, regardless of size of the area (see correspondence with J. Haas 8/16/2008). The Mi-Wok and Calaveras Ranger Districts shape files are in the form of data points, line points and polygons representing all occurrences and suitable habitat areas. The data was collected primarily for project specific purposes and surveys conducted for OHV route impacts. Although there was no metadata to verify accuracy, there were explanations sent describing some of the data short-fallings, e.g. explaining that some data was not accurate and there was overlap between datasets. Duplicate records were identified and examined to avoid over or under-reporting of occurrences or suitable habitat. The results in these summary tables could be affected by the quality and disparity of the data that was submitted.

This Biological Evaluation uses presence of sensitive species detected during on-the-ground surveys and an analysis of the existing data for unsurveyed potential habitat to make final determinations of effects to sensitive plants. Since surveys of the proposed trails additions are not complete, this analysis assumes that the species is present within the identified potential habitat. Sensitive species may or may not be in unsurveyed potential habitat. In addition, it is possible sensitive species go undetected in any given area because the species did not produce aboveground structures that were visible at the time of the survey. For example, *Lewisia kelloggii* var. *kelloggii* is only visible for a few weeks after the snow melts. In many instances, the access to those potential habitats is not open because the snow has not melted in the more shaded areas of the road or trail that provides access. If the timing of the survey is not right, the sensitive plant could go undetected.

Since the late 1980s sensitive plant surveys and monitoring has documented plant occurrences and the impacts to species and their habitats. Impacts include damage from motorized vehicles routes and driving off-road through sensitive plant occurrences (STF sensitive plant files, 2007). These off-road impacts are especially notable in areas of gentle to moderately sloped terrain with low-growing vegetation, such as lava caps, granitic and volcanic balds, and meadows, all of which are suitable habitats for many STF sensitive plant species. Sensitive plant sites located on damp or wet cliff crevices, such as the brook pocket moss, are much less vulnerable to off-road vehicle travel.

This analysis includes site-specific information from more than two decades of plant monitoring, years of personal field observations, and the Forest sensitive plant database. While this specific information was quite valuable to the analysis, there remained many potential occurrences without monitoring or observational records.

An important cumulative effect to sensitive plants and habitat is the continued increase in OHV activities on the STF. The results of this analysis will show an increase of mileage and number of routes available for OHV use occurs under the action alternatives 1 and 4, will increase the potential for direct and indirect effects to sensitive plants and suitable habitat. Action alternatives 3 and 5 will reduce the mileage and number of routes available for OHV use. The reduction in routes and mileage is likely to concentrate OHV use on the routes designated, thereby, increasing the potential for effects to roadside occurrences on those routes.

## Sensitive Plant Species

This biological evaluation (BE) analyzes the potential effects of the proposed Travel Management Project (TMP) to the plants listed on the Regional Forester’s Sensitive Plant List (USDA FS, 2006), and their habitats occurring in or adjacent to routes proposed for designation in this EIS (Table 1). Of the 39 sensitive taxa considered, including 33 plant species, 6 mosses and one lichen taxa, 21 taxa are known to occur within or adjacent to proposed additions to the system. Habitat and rationale for determination of effects is displayed in Table 2. Table 2 shows presence of plant species and whether it is associated with additions to the system. There are no federally listed threatened, endangered or proposed species (TEPS) on the Stanislaus National Forest.

The following species and habitat descriptions provide a condensed narrative of the Sensitive Plant species which have occurrences or have the potential to occur with suitable habitat within or adjacent to the travel corridor. Narratives for species found or expected within the STF, but not within, or adjacent to the travel corridors considered in this analysis can be found in the following section, Existing Environment, of this document. Complete listings and descriptions of each species can be found in the project record, and in reference section (USDA FS 2005. Forest Service Sensitive Vascular Plant, Bryophyte & Lichen Species Evaluation & Documentation, Jeannie Haas, STF Sensitive Plant Coordinator).

Information on species status, distribution, and ecology was derived from general literature reviews, USFS documents and maps, CDFG California Natural Diversity Database (CNDDDB) and CDFG NatureServe database (2007), various field books, floras, and personal communications listed within the References. The site surveys in conjunction with literature and input from resource agency botanists were used to determine the potential occurrence of each species and/or its habitat.

Table 2 lists all the Forest Service sensitive species known or expected to occur on the STF. The status rating is provided to give the reader an indication of the rarity of the species within its known range of occurrence. The table is followed by a more complete narrative description of the species, range, and distribution, beginning on page 21, under habitat descriptions.

**Table 2 Sensitive Plant Species and Habitat Description**

Botanical Name	Common Name & Listings	Presence	Route?	Habitat Description/ Landscape
<i>Allium jepsonii</i> *	Jepson’s onion <b>ALJE CNPS 1B.2</b>	P	No	Upland and Mid Slopes
<i>Allium tribracteatum</i>	Three bracted onion <b>ALTR CNPS 1B.2</b>	K	Yes	Lower Montane, Chaparral and Woodlands, Upland and Mid Slope
<i>Allium yosemitense</i>	Yosemite onion <b>ALYO CNPS 1B.3</b>	K	No	Lower Montane, Chaparral and Woodlands, Upland and Mid Slope
<i>Arctostaphylos nissenana</i> *	Nissenan’s manzanita <b>ARNICNPS 1B.2</b>	P	No	Lower Montane, Chaparral and Woodlands
<i>Balsamorhiza macrolepis</i> var. <i>macrolepis</i>	Big-scale balsamroot <b>BAMAM CNPS 1B.2</b>	K	Yes	Lower Montane, Chaparral and Woodlands
<i>Botrychium ascendens</i> *	Upswept moonwort <b>BOAS2 CNPS 2.3</b>	P	No	Lower Montane, Moist Habitats-Meadows and Riparian Areas
<i>Botrychium crenulatum</i> *	Scalloped moonwort <b>BOCR CNPS 2.2</b>	P	No	Lower Montane, Moist Habitats-Meadows and Riparian Areas
<i>Botrychium lunaria</i> *	Common moonwort <b>BOLU CNPS 2.3</b>	P	No	Moist Habitats-Meadows and Riparian Areas, Upland Slopes
<i>Botrychium minganense</i> *	Mingan’s moonwort <b>BOMI CNPS 2.2</b>	P	No	Moist Habitats-Meadows and Riparian Areas, Upland Slopes

<i>Botrychium montanum*</i>	Western goblin <b>BOMO CNPS 2.1</b>	P	No	Moist Habitats-Meadows and Riparian Areas, Upland Mid Slopes, Lower Montane
<i>Calochortus clavatus</i> var. <i>avius*</i>	Pleasant Valley Mariposa lily <b>CACLA CNPS 1B.2</b>	P	No	Lower Montane, Upper Slopes
<i>Clarkia australis</i>	Small's southern clarkia <b>CLAU2 CNPS 1B.2</b>	K	Yes	Lower Montane, Chaparral and Woodlands
<i>Clarkia biloba</i> ssp. <i>australis</i>	Mariposa clarkia <b>CLBIA 1B.2</b>	K	Yes	Lower Montane , Chaparral and Woodlands
<i>Clarkia lingulata*</i>	Merced clarkia <b>CLLI CNPS 1B.1</b>	P	No	Lower Montane , Chaparral and Woodlands
<i>Cypripedium montanum</i>	Mountain lady's slipper <b>CYMO2 CNPS 4.2</b>	K	Yes	Upland and Mid Slopes
<i>Draba asterophora</i> var. <i>asterophora*</i>	Tahoe draba <b>DRASA2 CNPS 1B.2</b>	P	No	Upland Slopes
<i>Epilobium howellii</i>	Subalpine fireweed <b>EPHO3 CNPS 1B.3</b>	K	No	Moist Habitats-Meadows and Riparian Areas
<i>Eriophyllum congdonii</i>	Congdon's woolly Sunflower <b>ERCO16 CNPS 1B.2</b>	K	No	Lower Montane, Chaparral and Woodlands, Upland and Mid Slopes
<i>Eriophyllum nubigenum</i>	Yosemite woolly sunflower <b>ERNU6 CNPS 1B.3</b>	K	No	Lower Montane, Chaparral and Woodlands, Upland and Mid Slopes
<i>Erythronium taylori</i>	Taylor's fawn lily <b>ERTA CNPS 1B.2</b>	K	No	Moist Habitats-Meadows and Riparian Areas, Upland and Mid Slopes
<i>Erythronium tuolumnense</i>	Tuolumne fawn lily <b>ERTU CNPS 1B.2</b>	K	Yes	Moist Habitats-Meadows and Riparian Areas, Lower Montane
<i>Horkelia parryi</i>	Parry's horkelia <b>HOPA CNPS 1B.2</b>	K	Yes	Lower Montane, Chaparral and Woodlands
<i>Hulsea brevifolia*</i>	Short-leaved hulsea <b>HUBR CNPS 1B.2</b>	P	No	Lower Montane, Upland and Mid Slopes
<i>Iris hartwegii</i> ssp. <i>Columbiana</i>	Tuolumne iris <b>IRHAC CNPS 1B.2</b>	K	No	Lower Montane, Chaparral and Woodlands, Upland and Mid Slopes
<i>Lewisia congdonii</i>	Congdon's bitterroot <b>LECO4 CNPS 1B.3</b>	K	No	Lower Montane, Chaparral and Woodlands, Upland and Mid Slopes
<i>Lewisia disepala*</i>	Yosemite lewisia <b>LEDI3 CNPS 1B.2</b>	P	No	Lower Montane, Chaparral and Woodlands, Upland and Mid Slopes
<i>Lewisia kelloggii</i> ssp. <i>kelloggii</i>	Kellogg's lewisia <b>LEKEK GLOBAL.2</b>	K	Yes	Upland and Mid Slopes
<i>Lomatium stebbinsii</i>	Stebbin's lomatium <b>LOST CNPS 1B.1</b>	K	Yes	Lower Montane, Chaparral and Woodlands, Upland and Mid Slopes
<b>Botanical Name</b>	<b>Common Name &amp; Listings</b>	<b>Presence</b>	<b>Route?</b>	<b>Habitat Description/ Landscape</b>
<i>Lupinus gracilentus</i>	Slender lupine <b>LUGR CNPS 1B.3</b>	K	No	Upland and Mid Slopes
<i>Mimulus filicaulis</i>	Hetch-Hetchy monkeyflower <b>MIFI CNPS 1B.2</b>	K	Yes	Moist Habitats-Meadows and Riparian Areas
<i>Mimulus gracilipes*</i>	Slender stalked monkeyflower <b>MIGR CNPS 1B.2</b>	P	No	Lower Montane, Chaparral and Woodlands
<i>Mimulus pulchellus</i>	Pansy monkeyflower <b>MIPU CNPS 1B</b>	K	Yes	Moist Habitats-Meadows and Riparian Areas
<b>Moss Species</b>				
<i>Bruchia bolanderi</i>	Bolander's bruchia' <b>BRBO CNPS 2.2</b>	K	Yes	Moist Habitats-Meadows and Riparian Areas
<i>Fissidens aphelotaxifolius*</i>	Brook pocket moss <b>FIAP CNPS 2.2</b>	P	No	Moist Habitats-Meadows and Riparian Areas, Upland and Mid Slopes
<i>Helodium blandowii*</i>	Blando's bog moss <b>HEBL CNPS 2.3</b>	P	No	Moist Habitats-Meadows and Riparian Areas
<i>Meesia triquetra</i>	Three ranked	P	No	Moist Habitats-Meadows and

	Hump-moss <b>METR CNPS 4.2</b>			Riparian Areas
<i>Meesia uliginosa</i> *	Broad nerved Hump-moss <b>MEUL CNPS 2.2</b>	P	No	Moist Habitats-Meadows and Riparian Areas
<i>Mielichhoferia elongata</i> *	Elongate Copper-moss <b>CNPS 2.2</b>	P	No	Moist Habitats-Meadows and Riparian Areas
<b>Lichen Species</b>				
<i>Hydrothyria venosa</i>	Veiny aquatic lichen <b>HYVE</b>	K	Yes	Moist Habitats-Meadows and Riparian Areas

\* These Regional Forest's Sensitive Plant Species are unknown to occur on the Stanislaus National Forest. However, they are expected to occur within the boundaries of the forest, the Forest is within the range of the species, or occurrences are near enough to the Forest boundaries to warrant including them on this list.

Source: USDA Forest Service, Pacific Southwest Region, Sensitive Plant Species

## Species Accounts and Habitats

This BE covers of a wide range of habitats. Habitats for the 39 Sensitive plant taxa in the analysis are unevenly distributed across the analysis area. Habitats are grouped into three broad landscape types: 1) **Upland and mid slope habitats** supporting sensitive species consist of dry rocky sites, and forest openings in mixed conifer forests where edaphic (soil or substrate) limitations affect plant growth and species composition (e.g. gravelly lahar, hard slate, granitics and volcanic balds, and serpentine soils); 2) **Moist habitats-meadow and riparian areas** including streamside zones, meadows, fens, seeps, and springs; taxa included in this habitat type tend to be affected by changes in hydrology trends; and, 3) **Lower montane, chaparral and woodland habitats** where the soils are derived from metasedimentary parent materials and support chaparral and oak woodland vegetation.

### Upland and Midslope habitats

There are twelve sensitive plant taxa known or expected to occur adjacent to proposed additions on upland and mid slope landscapes (Table 1). Upland and midslope habitats include volcanic ridges and openings. Volcanic openings are often referred to as lava caps (or lahars). These openings are suitable habitat for twelve sensitive plant species, including *Allium jepsonii*, *Allium tribracteatum*, *Allium yosemitense*, *Calochortus clavatus* var. *avius*, *Lomatium stebbinsii*, and *Mimulus pulchellus*. *Lewisia congdonii* and *Eriophyllum nubigenum* are found on metamorphic or granitic rock outcrops, while *Lewisia disepala* can be found in pans of granitic and sandy soils, adjacent to granite outcrops. *Lewisia kelloggii* ssp. *kelloggii* can occur on ridge tops with sandy soils or on volcanic lava caps. *Draba asterophora* var. *asterophora* (not on forest), and *Eriophyllum nubigenum* both can occur on granitic rock outcrops or metamorphic rock substrate.

In forested habitat, *Clarkia australis* inhabits openings in westside ponderosa pine forest and Sierran mixed-conifer forest. *Cypripedium montanum*, is associated with deeper soils and mature dense forest stands on north-facing slopes, sometimes in cutslopes of roads. *Hulsea brevifolia* occurs in sandy or gravelly soils of the red fir forest, and *Lupinus gracilentus* occurs in subalpine, lodgepole pine forest.

### Upland and Mid Slope Habitat Descriptions for Sensitive Species:

***Allium jepsonii*** (Jepson's onion) There are no known occurrences of this plant species on the STF. Jepson's onion grows on basalt, volcanic and serpentine outcrops, at elevations ranging from 900 to 6,000 feet elevation. Jepson's onion occurs in habitat similar to that of Stebbin's

lomatium, and has been surveyed along with other lava cap species. Although motorized routes may affect suitable habitat for this species, there are no known occurrences within 200 feet proposed additions.

**Allium tribracteatum** (Three Bracted Onion) is known in Tuolumne County and one occurrence has been confirmed in Calaveras County on private land. On the STF, there are 47 known plant sites, primarily located in suitable habitats along the ridges near Crandall Peak and along Highway 108. Most of the sites occur on Forest Service land. All but one occurrence are found on thin volcanic soils, typically on lava caps. *Allium tribracteatum* grows in openings of chaparral and lower and upper montane coniferous forests on lava caps. Elevations range from 4,500 to 6,000'. Many of the proposed additions pass through or are within 200 feet of plant sites and suitable habitat areas.

**Allium yosemitense** (Yosemite onion) occurs on lava caps and metamorphic rock ridges south of the Tuolumne River at elevations ranging from 1,500 to 7,000 feet. There are four known occurrences of this plant species on the STF within the analysis area. Yosemite onion grows in chaparral, lower and upper montane coniferous forests on gravelly lahar. Lava caps are extremely fragile and subject to erosion and compaction when disturbed. Although suitable habitat areas for this species may be affected by motorized use, there are no known occurrences within 200 feet of proposed additions to the system.

**Cypripedium montanum** (Mountain lady's slipper) is an uncommon orchid in California, however, it is commonly found in Wyoming, Montana, Idaho, Oregon, Washington, Alaska, British Columbia, and Alberta. Within California it occurs in 15 counties, reaching as far south as Santa Cruz County along the coast and down into Madera County in the Sierra Nevada, although it is not continuous within this range. *Cypripedium montanum* has adapted to multiple habitats, growing in both moist and dry conditions at elevations between 600 and 4,800 feet. It is found in mesic sites on deep loamy soils within montane coniferous forest and in relatively dry conditions on hillsides with northerly aspects in mixed conifer forests. There are about 48 occurrences between the Eldorado, Plumas, Stanislaus and Sierra NF and Yosemite NP. The STF has 35 documented occurrences of this orchid species, each having fewer than ten plants each (USDA 2008, Middle Fork Fuel Reduction BE). All occurrences are growing on slopes with north aspects, with less than five to over 45 degrees, in mixed conifer forest under 50-90 percent canopy. The occurrence areas are moist, at least in the early summer months, with deep, loamy soils derived from granite. Motorized use affects numerous suitable habitat areas for this species, and three known sites are within 200 feet of the existing unauthorized routes.

**Draba asterophora var. asterophora** (Tahoe draba) is an alpine perennial forming large mats through vegetation reproduction. These plants grow in rock crevices and granite talus slopes at high elevations between 8,000 and 10,200 feet elevation. Slopes are typically north facing and frequently hold patches of snow throughout the summer months. The most frequently cited locations for Tahoe (star) draba are characterized by extensive scree slopes of granitic material ranging in size from sand to small boulders (Reynolds, 2008). Seven distinct populations occur within a discontinuous distribution between Washoe County, Nevada and to Mt. Gibbs near Tioga Pass in Yosemite, CA; Mt. Rose Ski Area/ Slide Mountain; Mt. Rose; Rose Knob; Heavenly Valley (Lake Tahoe Basin Management Unit); Job's Peak (Lake Tahoe Basin Management Unit); Yosemite; and Echo Lake (El Dorado National Forest). There are no known occurrences of this plant species on the STF. Due to the lack of known occurrences, the high elevation and inaccessible suitable habitat for this species, it will not be considered for further

analysis in this document.

***Eriophyllum nubigenum*** (Yosemite woolly sunflower) has all known occurrences within the Merced River watershed, except three occurrences on the STF, located in the Tuolumne River watershed. The YNP occurrences are all south of the main fork of the Merced River and Yosemite Valley. A total of three occurrences of Yosemite woolly sunflower are known from the STF. ***Eriophyllum nubigenum*** tends to be limited to open, rocky, and shallow soils, on a metasedimentary substrate on the STF and on granitic substrates in YNP. It is found in plant communities comprised of montane manzanita chaparral and upper montane coniferous forest at elevations ranging from 5,000 to 7,800 feet. Although numerous suitable habitat areas for this species may be affected by proposed additions, there are no known occurrences within 200 feet.

***Hulsea brevifolia*** (short-leaved hulsea) is known to occur in Yosemite NP. It grows in partial shade in red fir and upper montane coniferous forests, on sandy or gravelly soils. It ranges in elevation from 4,900 to 8,500 feet. It is found in Yosemite NP along roadsides, on shoulders, road cuts, and fill slopes. Although motorized routes may affect numerous suitable habitat areas for this species, there are no known occurrences within 200 feet of the proposed additions.

***Lewisia congdonii*** (Congdon's lewisia) has eight occurrences found within its geographic range. Congdon's lewisia has a disjunct distribution between the Kings River Canyon and the Merced River Canyon 50 miles to the north. All but one population are in the Merced River drainage. Elevation ranges from 2,000 to 7,000 feet. Plants are found on rock faces, cracks and ledges in rocky areas, on talus and scree, and on spoil piles of the abandoned barium mine. The Kings River population grows on granitics, while the other populations are found on metamorphics. It is found in plant communities ranging from chaparral to coniferous forest. On the Stanislaus NF, the only known occurrence is within the Trumbull Peak SIA. Estimates of the population ranges from less than 100 plants to over 10,000. Area to the populations is gated and can only be accessed by foot. Currently, there is no potential for impacts caused by motor vehicle access to the known occurrence and suitable habitat.

***Lewisia disepala*** (Yosemite lewisia) is not known on the STF. The nearest known occurrences are in Yosemite NP. It is found in pans and shelves of granitic and sandy soils adjacent to granite outcrop in upper and lower montane mixed coniferous forest and pinyon and juniper woodlands. Although motorized routes may affect numerous suitable habitat areas for this species, there are no known occurrences within 200 feet of proposed additions.

***Lewisia kelloggii ssp. kelloggi*** (Kellogg's lewisia) is found on ridge tops or open flats with sandy granitic soils or on volcanic lava caps. Kellogg's lewisia has documented occurrences on the STF but has a larger range in California. This subspecies is known from at least 43 occurrences ranging from Madera County (Sierra NF) to Plumas County (Plumas NF), including 10 occurrences in Yosemite National Park (USDA FS. 2006, Regional Forester's List of Sensitive Plant Species Revision). There are 10 known occurrences of this plant species on the STF. Many of the proposed additions pass through or are within 200 feet of plant sites and suitable habitat areas.

***Lomatium stebbinsii*** (Stebbin's lomatium) grows on lava caps between the Mokelumne and Tuolumne Rivers at elevation ranges from 3,000 to 7,000 feet. There are approximately 328 known sites of ***Lomatium stebbinsii*** on the STF within the analysis area. Stebbin's lomatium grows in openings of chaparral and lower and upper montane coniferous forests on gravelly lahar (volcanic mudflow soils, often referred to as "lava caps"). Elevations range from 4,500 to 6,000'.

This plant species is endemic to Tuolumne and Calaveras counties. Known populations range from the Mokelumne River to the Clavey River. The most extensive occurrences are found in the watersheds of the South Fork of the Stanislaus and North Fork of the Tuolumne Rivers. Many of the proposed additions pass through or are within 200 feet of plant sites and suitable habitat areas.

*Lupinus gracilentus* (slender lupine) grows in openings of subalpine coniferous forests and on seasonally moist slopes of lodgepole pine forest at elevations ranging from 7,500 to 11,000 feet. It is known to occur primarily at high elevations in YNP, Mariposa, Tuolumne and Inyo Counties. Many of the proposed additions pass through or are within 200 feet of plant sites and suitable habitat areas.

### **Moist Habitats – Meadows, Boggs, and Riparian areas:**

Forest Service Botany/Range Survey Crews conducted fen and Meadow surveys seasonally within the last 10 years. For a complete list of Range allotment and fen survey data, see the Project Record. Fens provide unique habitats for rare plant species. As compared to other habitats, the disproportionately large number of rare species of vascular and nonvascular plants associated with peatlands in the Sierra Nevada further underscores the importance of these habitats with respect to the biological diversity of the region. Off-highway vehicle (OHV) use can negatively affect fens by exposing soil and bare peat, creating channels in fens, which acts as a water diversion, and compacting soil. Water diversions, ditches, and roads can have a substantial impact on the hydrology as well as the biotic integrity of fens, (Cooper, D.J. 1994.

Fens are areas where there is at least 40 cm of organic soils in the upper 80 cm of the soil profile (USDA, 2007, Condition Check List for Fens in Montane and Subalpine Zones of the Sierra Nevada). This organic soil is commonly referred to as peat. The vegetation of fens varies widely and appears to be controlled by the hydrologic regime (water depth, water flow rates). The integrity of peatland systems is tied to hydrologic conditions. For example, roads placed above fens may divert runoff away from the fen and the result is a de-watering of the fen. Once the water table is lowered, peat oxidization and subsequent decomposition occurs quickly thereby reducing the peat depth, altering hydrologic patterns, and resulting in a change in plant species composition (Cooper 1996.) In addition, roads can act as sources of sediment input into fens. As areas dry out, plant species often change to non peat-forming species such as forbs. Since this system is reliant on groundwater, any disturbances that affect water quality or quantity are a threat.

Invasion by exotic species (non-native plant species) is apparent in some peatlands in the Sierra Nevada. Such species include timothy (*Phleum pratense*) as well as exotic species common to other wetland types such as Canada thistle (*Cirsium arvense*) and dandelion (*Taraxacum officinale*). Native increasers (plants that increase after disturbance) often invade a fen that has been overgrazed or artificially drained. Although these species are native and commonly found in low abundance in undisturbed fens, they can be indicative of disturbance if they dominate areas previously occupied by sedges (Rocchio 2006. Rocky Mountain Alpine-Montane Wet Meadow Ecological System).

### **Sensitive Plant Species Known or Expected to occur in Moist Habitat**

Seventeen taxa are listed as sensitive on the STF in moist habitats such as meadows, fens, seeps, springs, and streamside zones (Table 1). Only seven of these seventeen species are known to

occur on the STF, including one moss, *Bruchia bolanderi*, one lichen, *Hydrothyria venosa*, and five plants, *Epilobium howellii*, *Erythronium tuolumnense*, *Erythronium taylori*, *Mimulus filicaulis*, and *Mimulus pulchellus*.

*Hydrothyria venosa* is a rare lichen, which is a combination of two different types of organisms (fungi and algae) growing together in a symbiotic relationship. It occurs within the analysis area. Lichens occur in all types of habitats, and frequently show specific substrate preferences. They are important in soil formation. As information regarding lichen distributions in the Sierra Nevada and on the STF is incomplete, there is a need for further study of lichen ecology and distribution. Motorized vehicle use affects lichens and the habitat through damage to organisms themselves, and damage to the habitat component of clear water from introduction of sediment and possible petroleum products.

Bryophytes are mosses, liverworts, and hornworts (non-vascular green plants) and they play a crucial role in the hydrologic cycle and in the ecology of meadows and riparian areas. *Bruchia bolanderi* is the only moss to occur on the STF. It is possible that the mosses in unsurveyed areas within the analysis area do occur in fens and meadows on the STF lands. Motorized vehicles affect moss species in several ways. When mosses are run over by vehicles, they do not have an underground root system that can help them recover, unlike vascular plants. In addition, water temperature is important to the photosynthetic ability of mosses. As described in the Sierra Nevada Ecosystem Project Analysis (SNEPA 2001), mosses can photosynthesize effectively at temperatures as low as 33°F, compared to a lower limit of about 50° F for vascular plants. Mosses stop photosynthesizing effectively at an upper limit of about 77°F, in contrast to vascular plants which some can photosynthesize at temperatures of up to 100° F. In summary, when vehicles disturb moss layers, it is possible that water temperatures can go up due to hydrologic disruption.

The ten other species to occur within suitable habitat areas include the five species of the moonwort complex that are widely distributed in North America and elsewhere. In California, they occur infrequently in a variety of moist habitats throughout the Sierra Nevada and other portions of the state. Moonwort species are difficult to distinguish from each other and all have similar habitat preferences such as wet or moist soils in meadows and fens or along the edges of lakes and streams. The moonworts include *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium lunaria*, *Botrychium minganense*, and *Botrychium montanum*. The remaining five taxa that have not been located on the STF include *Fissidens aphelotaxipholius*, *Helodium blandowii*, *Meesia triquetra*, *Meesia uliginosa*, and *Mielichhoferia elongata*.

#### **Moist Habitat Descriptions for Sensitive Species:**

***Botrychium ascendens*** (Upswept moonwort) is found in lower montane coniferous forest, meadows and seeps from approximately 4,900 to over 7,500 feet in elevation. Upswept moonwort has not been identified on the STF. Although suitable habitat areas for this species may be affected by motorized use, there are no known occurrences within 200 feet of proposed additions to the system.

***Botrychium crenulatum*** (Scalloped moonwort) is found in fens, lower montane coniferous forest, meadows, seeps, and freshwater marches from approximately 4,900 to over 10,500 feet in elevation. Scalloped moonwort has not been identified on the STF. Although suitable habitat areas for this species may be affected by motorized use, there are no known occurrences within

200 feet of proposed additions to the system.

**Botrychium lunaria** (Common moonwort) is found in meadows, seeps, and in subalpine and upper montane coniferous forest from approximately 7,450 to over 11,000 feet in elevation. Common moonwort has not been found on the STF. Although suitable habitat areas for this species may be affected by motorized use, there are no known occurrences within 200 feet of proposed additions to the system.

**Botrychium minganense** (mingan moonwort) is found in fens and in lower and upper montane coniferous forest from approximately 4,900 to over 6,750 feet in elevation. Mingan moonwort has not been identified within the STF. Although suitable habitat areas for this species may be affected by motorized use, there are no known occurrences within 200 feet of proposed additions to the system.

**Botrychium montanum** (Mountain moonwort) is found in lower and upper montane coniferous forest, meadows, and seeps from approximately 4,900 to 7,000 feet. There are no occurrences identified on the STF of mountain moonwort. Although suitable habitat areas for this species may be affected by motorized use, there are no known occurrences within 200 feet of proposed additions to the system.

**Bruchia bolanderi** (Bolander's bruchia) is a moss known from 21 occurrences documented in California since 1980 with the majority in the Sierra Nevada Mountains. **Bruchia bolanderi** previously thought to be endemic to California and Oregon was recently found in Nevada and Utah. California populations are known from Fresno, Tulare, Madera, Mariposa, Modoc, Nevada, Tuolumne, Tehama and Plumas counties. It is also known from the Rogue River National Forest 10 miles north of Lake of the Woods in Klamath County, Oregon. This moss has been documented within the Plumas, Stanislaus, Sierra, and Eldorado National Forests. Habitat for Bolander's bruchia includes meadows, fens, springs, seeps, and damp soil in montane and subalpine coniferous forests from about 5,500 to 9,250 feet. It grows in ephemeral habitats such as erosion ditches or small streamlets through wet meadows and at the edges of fens, and seems capable of reestablishing itself in recently disturbed soils. There is one known occurrence and numerous suitable habitat areas on STF. There are proposed and existing routes of the TMP passing through or within 200 feet suitable habitat and one plant occurrence of this plant species that may be affected by motorized vehicle travel.

**Epilobium howellii** (subalpine fireweed) occurs in wet meadows, streamsides and mossy seeps in upper montane and subalpine coniferous forest, consistent with silty sites under part or near-full shade, with little competition. The meadows and seeps where this species occurs can easily be entered with late seasonal ohv use. There are six known occurrences within 200 feet of the proposed and existing routes in the TMP.

**Erythronium taylori** (Pilot Ridge fawn lily) is known from only one occurrence discovered on unique cliff formations in the Groveland Ranger District of the STF. The occurrence is restricted to isolated cliff-like rock outcrops in a north-facing, cool, damp, shaded microclimate, within the mixed conifer forest at approximately 4,200 feet. The occurrence numbers about 10,000 plants. Although suitable habitat areas for this species may be affected by motorized use, there are no known occurrences within 200 feet of proposed additions to the system.

**Erythronium tuolumnense** (Tuolumne fawn lily) grows on a variety of substrates and under a variety of canopies. It is found primarily on north facing slopes with rocky soils. It also grows

in ephemeral drainages on very steep slopes and it is associated with intermittent or perennial streams on less steep slopes. It is found at elevations ranging from about 1,600 to 4,880 feet. Currently it occurs from Deer Creek, the North Fork of the Tuolumne River and the South Fork of the Stanislaus River on the STF. Three occurrences occur on private lands. There are 42 known occurrences on the STF ranging in size from several individuals to more than 10,000 individuals. Many of the proposed and existing routes of the TMP pass through or are within 200 feet of plant sites/occurrences and suitable habitat areas.

**Fissidens aphelotaxipholius** (brook pocket moss) is known to occur in wet soil, humus and rocks along narrow streams, near small waterfalls; damp or wet crevices or cliffs; and upper montane coniferous forest from about 6,000 to 7,200 feet. Although suitable habitat areas for this species may be affected by motorized use, there are no known occurrences within 200 feet of proposed additions to the system.

**Helodium blandowii** (Blandow's bog moss) occurs near the forest boundaries of Kennedy Meadows, fens and seeps in subalpine conifer forest, and alpine lakes at 6,000 to 9,000 feet. Although suitable habitat areas for this species may be affected by motorized use, there are no known occurrences within 200 feet of proposed additions to the system.

**Hydrothyria venosa** (Veined water lichen) occurs on the western slope of the Sierra Nevada, the north coast range, northwestern California, Oregon, Washington, and British Columbia and in several eastern states. In the Sierra Nevada, it occurs on the Stanislaus, Plumas, and Sequoia National Forests and Calaveras Big Trees State Park. Other California occurrences include Shasta-Trinity and Mendocino National Forests. Within the Sierra Nevada, Veined water lichen is found in cold, unpolluted streams in mixed conifer forests. The water is very clear and peak flows are not of the intensity that would lead to scouring. The streamlets have a rich aquatic bryophyte flora and rarely are more than 8 inches in depth. It occurs at elevations ranging from 3,000 to 9,000 feet. Although suitable habitat areas for this species may be affected by motorized use, there are no known occurrences within 200 feet of proposed additions to the system.

**Meesia triquetra** (three-ranked hump-moss) is usually associated with Sphagnum and cold springs or seeps, between 4,000 and 9,000 feet. There are no known occurrences of this moss on the STF. Although suitable habitat areas for this species may be affected by motorized use, there are no known occurrences within 200 feet of proposed additions to the system.

**Meesia ulignosa** (broad-nerved hump-moss) occurs in meadows and fens on dead/decomposing wood, usually in the subalpine zone at 4,000 to 9,500 ft. There are no known occurrences of this moss on the STF. Although suitable habitat areas for this species may be affected by motorized use, there are no known occurrences within 200 feet of proposed additions to the system.

**Mielichoferia elongata** (elongate copper-moss) occurs in all types of seasonally or perennially moist rock outcrops, often with high copper or heavy metal content, at lower elevations of foothill woodland, and occasionally coniferous forest. There are no known occurrences of this moss on the STF. Although suitable habitat areas for this species may be affected by motorized use, there are no known occurrences within 200 feet of proposed additions to the system.

**Mimulus filicaulis** (Hetch-Hetchy monkeyflower) occurs in meadows, seeps, and seasonally wet road cuts between the elevations of 2,000 and 5,500 feet. Although a moist germinating species,

it also occurs on sites that dry out substantially in the summer, often within mixed-conifer stands. It germinates in early spring and dies soon after blooming and setting seed in late spring. In very dry years, *Mimulus filicaulis* occurrences might not bloom at all. The currently known range for this species is the Main Fork of the Tuolumne River south to Mariposa District of the Sierra NF and east into Yosemite National Park. There are approximately 204 known sites within the STF. All of the documented occurrences are on the Groveland Ranger District. Many of the proposed and existing routes of the TMP pass through or are within 200 feet of plant sites/occurrences and suitable habitat areas.

***Mimulus pulchellus*** (pansy monkeyflower) grows in vernal wet to moist sites, which are usually flat, or with a slight slope, often on volcanic lava caps and granitic substrates. The elevational range is 2,000 to 6,500 feet. The times for germination and identification are in early spring from late April through June, depending on elevation and weather conditions. It occurs in Calaveras, Mariposa and Tuolumne Counties in the STF, YNP, and near the town of Mariposa. It occurs in the Chowchilla River watershed (near Mariposa) and the Merced, Stanislaus and Tuolumne river watersheds. There are 76 known sites of this species on the STF. It has been found in roads and routes driven in early spring. Many of the proposed and existing routes of the TMP pass through or are within 200 feet of plant occurrences and suitable habitat areas.

#### **Lower Montane, Chaparral, and Woodland Habitats:**

Six Sensitive Plant Species occur in the lower montane chaparral, and woodland habitats (Table 1): *Balsamorhiza macrolepis var. macrolepis*, *Clarkia biloba ssp. australis*, *Clarkia lingulata*, *Eriophyllum congdonii*, *Horkelia parryi*, *Iris hartwegii ssp. columbiana*. One additional species, *Arctostaphylos nissenana*, occurs in lower montane, chaparral and woodland habitats, but has no known occurrences within the analysis area.

***Arctostaphylos nissenana*** – Nissenan manzanita is found in the lower Sierra Nevada foothills of the knobcone pine and chaparral habitats. It is typically found in areas with slate or shale rock types and associated soils. It ranges in elevation from 1,450 to 3,650 feet. Although it is known to occur on the Eldorado NF, it has not been found on the STF in suitable habitat areas. Although suitable habitat areas for this species may be affected by motorized use, there are no known occurrences within 200 feet of proposed additions to the system.

***Balsamorhiza macrolepis var. macrolepis*** (big-scale balsamroot) is found in the Sierra Nevada Foothills from Tehama County south to Mariposa County and the interior Coast Range from Tehama County (Mendocino National Forest) south to Santa Clara County. It inhabits a variety of soil and plant community habitats, including ponderosa pine forest, chaparral, vernal moist meadows and grasslands, and grassland within oak woodland. Substrates are usually sandstone, serpentine, or basalt outcrop. The Bureau of Land Management (BLM) occurrence in Mariposa County occurs on rocky clays of metasedimentary origin. It is usually found in openings or under an open brush cover. The elevation range is below 4,600 feet. There is one known occurrence of *Balsamorhiza macrolepis var. macrolepis* on the STF located in the Middle Fork Fuel Reduction and Forest Health Project analysis area. There is one occurrence and numerous suitable habitat areas for this plant species that may be affected by proposed additions.

***Clarkia australis*** (Small's southern clarkia) is typically found on slopes with a south, southwest, or southeast aspect. It grows in openings in ponderosa pine and mixed-conifer stands often in association with bear clover. *Clarkia australis* tends to prefer "disturbed" sites – e.g. sites with

little or no competition from more aggressive weedy species. In the natural setting, fire is the typical disturbance agent. It grows in open areas (sun or lightly filtered sun) within manzanita stands. When not associated with bear clover, the species is usually observed growing in bare mineral soil or with a very light layer of leaf litter at elevations between 2,500 and 6,000 feet. All but three currently known occurrences of Clarkia australis occur on the Groveland Ranger District (USDA 2008, Middle Fork Fuel Reduction BE). One occurrence is known from private property within the boundaries of the Forest. Two other occurrences are known from Yosemite National Park (YNP), near the boundary with the STF. There are 484 known sites of this species on the forest. Many of the proposed and existing routes of the TMP pass through or are within 200 feet of plant occurrences and suitable habitat areas that may be affected by motorized use.

Clarkia biloba ssp. australis (Mariposa clarkia) is most often found on north, northeast or northwest-facing slopes, usually under light shade. It is occasionally found on southwest or southeast-facing slopes, sometimes in direct sunlight. Clarkia biloba ssp. australis tends to prefer "disturbed" sites, e.g. sites with little or no competition from more aggressive weedy species. In the natural settings, fire is the common disturbance agent. The elevational range is approximately 1,500 to 4,600 feet. There are approximately 152 known sites of Clarkia biloba ssp. australis on the Stanislaus National Forest. Many of the proposed and existing routes of the TMP pass through or are within 200 feet of plant occurrences and suitable habitat areas that may be affected by motorized use.

Clarkia lingulata (Merced clarkia) is known from only two populations, both found on the Merced River in Mariposa County at around 1500 feet elevation on the south side of the Merced River. The two occurrences are approximately two miles apart in the Merced River Canyon near the confluence with South Fork Merced River. It grows in the mixed chaparral/woodland habitat in the Merced River drainage. It does not appear to be limited by soils, geology, or other biotic or abiotic habitat components. Although motorized routes may affect numerous suitable habitat areas for this species, there are no known occurrences within 200 feet of the proposed additions.

Eriophyllum congdonii (Condon's woolly sunflower) is found in chaparral, woodland, and lower montane coniferous forest on metamorphic rock ridges and outcrops. It is also found in valley and foothill grasslands, south of the Tuolumne River and east of Pilot ridge at 1,600 to 6,235 feet in elevation. There are 24 known sites of this plant species on the STF. Many of the proposed and existing routes of the TMP pass through or are within 200 feet of suitable habitat areas that may be affected by motorized use.

Horkelia parryi (Parry's horkelia) is known from Amador, Calaveras, El Dorado, and Mariposa counties. It grows on stony, disturbed, slightly acidic soils under open canopies in chaparral and cismontane woodland below 3,400 feet. On the ENF, it co-habitates with Nissenan manzanita. It is often found on Ione formation soils. It has been known to colonize disturbed sites such as abandoned roads where the canopy is open. The Eldorado National Forest has four known occurrences. Two occurrences were found on the Sierra NF in Mariposa County. Many of the proposed and existing routes of the TMP pass through or are within 200 feet of plant occurrences and suitable habitat areas that may be affected by motorized use.

Iris hartwegii ssp. columbiana (Tuolumne iris) is known from three occurrences on STF, one occurrence on BLM lands, and two occurrences on private lands in Tuolumne and Calaveras Counties. Two of these occurrences are in the watershed of the South Fork of the Stanislaus River. It grows on dry, open or partially shaded slopes in foothill woodlands and yellow pine

forests. It occurs at elevations ranging from 1,350 to 5,000 feet. There are proposed and existing routes of the TMP passing through or are within 200 feet of and suitable habitat areas that may be affected by motorized use.

## Watchlist Plant Species

Watchlist plant species are those 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 be included on the Regional Forester's Sensitive Plant List. Such species make an important contribution to forest biodiversity. The Stanislaus NF has developed a watchlists of species. These watch lists are dynamic and updated as the need arises to reflect changing conditions and new information. The creation of these lists is key steps in meeting our commitment, as an agency, to maintaining biologically diverse and healthy ecosystems.

**Table 3-Watchlist Species**

<i>Botanical Name</i>	Common Name
<i>Acrostics humilis</i>	mountain bent grass
<i>Astragalus kentrophyta</i> var. <i>danaus</i>	Sweetwater Mtns. milk-vetch
<i>Bolandra californica</i>	Sierra bolandra
<i>Carex tompkinsii</i>	Tompkin's sedge
<i>Cryptantha crymophila</i>	subalpine cryptantha
<i>Delphinium hansenii</i> ssp. <i>ewanianum</i>	Ewan's larkspur
<i>Didymodon norrisii</i>	Norris' beard-moss
<i>Drosera rotundifolia</i>	round-leaved sundew
<i>Eriogonum ovalifolium</i> var. <i>eximium</i>	brown-margined buckwheat
<i>Eryngium pinnatisectum</i>	Tuolumne button celery
<i>Eryngium</i> sp. <i>nov.</i>	button celery, coyote thistle
<i>Helianthemum suffrutescens</i>	Bisbee Peak rush-rose
<i>Lilium humboldtii</i> ssp. <i>humboldtii</i>	Humboldt lily
<i>Madia yosemitana</i>	Yosemite madia
<i>Meesia longiseta</i>	long-stalked hump moss
<i>Mielichhoferia elongata</i>	elongate copper-moss
<i>Mimulus grayi</i>	Gray's monkeyflower
<i>Mimulus inconspicuus</i>	small-flowered monkeyflower
<i>Mimulus whipplei</i> ( <i>extinct?</i> )	Whipple's monkeyflower
<i>Orthotrichum spjutii</i>	Spjut's bristlemoss
<i>Perideridia bacigalupii</i>	Bacigalupi's yampah
<i>Rhyncospora capitellata</i>	beaked sedge
<i>Silene invisus</i>	short-petaled campion
<i>Trichostema rubisepalum</i>	Hernandez bluecurls

## Effects to Watch List Species

Of the 23 plant taxa on the Watch List Species (Table 3), one known occurrence of *Bolandra californica* (Sierra Bolandra) occurs in three sites, identified from surveys conducted in 1995,

exist Pine Needle Flat on road 5N02R. The area was re-surveyed in 2008, and the habitat for Sierra Bolandra showed no impacts from vehicles. The surveys were conducted before any sign of plant foliage, and it is uncertain of the existing number of plants. It is recommended that the district continue to monitor this occurrence. The Sierra Bolandra is unlikely to be directly impacted by the STF Travel Management Project.

A second watchlist plant, *Silene invisa* (short-petaled campion) has known locations within the analysis area from past surveys conducted in the mid 1990's. Once listed as sensitive, it has become a watchlist species. Impacts to the individuals from Wheeled Over Snow use would not likely cause an adverse affect.

Although known for variable rarity, and in general, a wider range of occurrences than those listed as Sensitive Species, factors such as CNPS ranking, the local population size, fragility of habitats, and upper/lower limits of range all add to concerns regarding effects to these watchlist species. These two species will not be further analyzed in this evaluation.

The STF Travel Management Project may affect individuals of these species; however, these effects are not likely to lead to designation as sensitive or to listing under the Endangered Species Act.

## **Noxious and Invasive Weed Species**

### **Introduction**

Invasive grasses, such as cheatgrass (*Bromus tectorum*), and forbs, such as knapweeds (*Centaurea* species), have invaded over 50 million hectares of the region (western U.S.), reducing biodiversity by displacing native plants and animals (Mack 1989; Billings 1990).

Noxious weeds are defined in Forest Service Manual (FSM) 2080.5 (USDA FS 1995) as "those plant species designated as noxious weeds by the Secretary of Agriculture or by the responsible State official. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, and are nonnative or new to or not common to the United States or parts thereof."

The Stanislaus National Forest maintains a list of noxious weeds and non-native, invasive pest plants of concern. Inventories for weeds are conducted using this list as a guide. The list was generated from several sources including the Forest Plan (Table 3.6a, 2001 STFPA Final Environmental Impact Statement (FEIS), V.2, Chapter 3, part 3.6, pages 310-311), the list of State-rated noxious weeds (2007), new weed discoveries in the Forest, occurrence records at CalFlora (a web-based botanical database), published technical references (Bossard, et.al., 2000, Hickman, 1993, Whitson, et.al., 1996), and personal observations.

### **Noxious Weed Management**

The Forest has inventoried, monitored, planned, or implemented a number of noxious weed treatment projects as reported in 2004 and 2005 accomplishment reports. Currently, there are 2622.96 total acres, and 29.52 miles of motorized routes infested with noxious weed and invasive plant species (Appendix H) within the analysis area.

### Habitat Vulnerability and Vector Methods

The state of the current data regarding weed and non-native infested routes within the STF is limited. The current collected data shows approximately 650 proposed and existing routes that have associated invasive weed infestations. This data includes data points and polygons mapped along roadsides, primarily recorded by ground-based methods. The information associated with each infested route, such as size of infestation or distance along a route, is often unknown. All data on known weed and non-native plant locations have been collected by botanists during the last 10 years, documenting approximately 86 miles of weed infested roadways (Appendix I). Although many of the existing roads within the analysis area have been surveyed for weeds, not all of the proposed additional routes for the STF Travel Management Plan have been surveyed. The GIS query of the existing data includes routes within 200 feet of infested areas, and weed infestation on existing and proposed routes within 200 feet of sensitive plant occurrences/suitable habitats.

Weeds have been introduced and spread through transport on vehicles, in straw and hay, on earthmoving and mowing/weed-eating equipment, and in animal manure. Weed seeds also spread quickly down stream and upwind along lakes and reservoirs.

Yellow starthistle and Scotch broom are by far the most common species found along STF motorized routes (STF weed database 2007). To a lesser extent, several other invasive weed species occur on the STF, primarily along roads. Yellow Starthistle, *Centaurea solstitialis*, was introduced in North America probably sometime after 1849 as a seed contaminant in Chilean-grown alfalfa seed, also known as Chilean clover. Historic records indicate that alfalfa was first introduced to Chile from Spain and from Spain to California before 1903. Yellow starthistle in California was mainly transported to other areas by the use of tractors and equipment. It began invading the foothill grasslands around the 1940's and has become a part of the grazing/weed system (DiTomaso 2001.) Human activities are the primary mechanism for long distance movement of yellow starthistle seed. It is transported in large amounts by road maintenance equipment and on the undercarriage of vehicles. It can reduce land value and reduce access to recreational areas (Roche and Roche 1988). In addition, starthistle infestations can reduce wildlife habitat and forage, displace native plants, and decrease native plant and animal diversity (Sheley and Larson 1995). Dense infestations not only displace native plants and animals, but also threaten natural ecosystems and nature reserves by fragmenting sensitive plant and animal habitat (Scott and Pratini 1995).

A list of the most invasive weed species known to occur on the routes within this EIS is in Table 4.

**Table 4 Noxious Weeds and Non-native Invasive Plants On the Stanislaus National Forest**

Common Name	Botanical Name		CA Weed Status
Russian knapweed	<i>Acroptilon repens</i>	perennial	BW
jointed goatgrass	<i>Aegilops cylindrica</i>	Annual grass	BW
barbed goatgrass	<i>Aegilops triuncialis</i>	Annual grass	BW
tree-of-heaven	<i>Ailanthus altissima</i>	deciduous tree	Non-native
giant reed	<i>Arundo donax</i>	perennial grass	Non-native

black mustard	<i>Brassica nigra</i>	perennial	Non-native
cheatgrass	<i>Bromus tectorum</i>	Annual grass	Non-native
hoary cress	<i>Cardaria draba</i>	perennial	BW
whitetop	<i>Cardaria pubescens</i>	perennial	BW
Italian thistle	<i>Carduus pycnocephalus</i>	annual	CW
slenderflower thistle	<i>Carduus tenuiflorus</i>	annual	CW
smooth distaff thistle	<i>Carthamnus baeticus</i>	annual	BW
woolly distaff thistle	<i>Carthamnus lanatus</i>	annual	BW
purple starthistle	<i>Centaurea calcitrapa</i>	Annual to perennial	BW
diffuse knapweed	<i>Centaurea diffusa</i>	Annual to perennial	AW
Iberian starthistle	<i>Centaurea iberica</i>	Annual to biennial	AW
spotted knapweed	<i>Centaurea maculosa</i>	Perennial	AW
Tocalote	<i>Centaurea melitensis</i>	annual	Non-native
Yellow starthistle	<i>Centaurea solstitialis</i>	annual	CW
squarrose knapweed	<i>Centaurea squarrosa</i>	perennial	AW
rush skeletonweed	<i>Chondrilla juncea</i>	perennial	AW
Canada thistle	<i>Cirsium arvense</i>	perennial	BW
bull thistle	<i>Cirsium vulgare</i>	biennial	Non-native
field bindweed	<i>Convolvulus arvensis</i>	perennial vine	CW
Bermuda grass	<i>Cynodon dactylon</i>	perennial	CW
Scotch broom	<i>Cytisus scoparius</i>	deciduous shrub	Non-native
Quackgrass	<i>Elytrigia repens</i>	perennial grass	BW
leafy spurge	<i>Euphorbia esulus</i>	perennial	AW
oblong spurge	<i>Euphorbia oblongata</i>	perennial	BW
fennel	<i>Foeniculum vulgare</i>	perennial	Non-native
French broom	<i>Genista monspessulana</i>	deciduous shrub	CW
Hydrilla	<i>Hydrilla verticillata</i>	aquatic herb	AW
Klamath weed	<i>Hypericum perforatum</i>	perennial	CW
dyers woad	<i>Isatis tinctoria</i>	perennial	BW
perennial pepperweed	<i>Lepidium latifolium</i>	perennial	BW
oxeye daisy	<i>Leucanthemum vulgare</i>	perennial	Non-native
Dalmation toadflax	<i>Linaria genistifolia</i> ssp. <i>dalmatica</i>	perennial	AW
purple loosestrife	<i>Lythrum salicaria</i>	Perennial	BW
Eurasian milfoil	<i>Myriophyllum spicatum</i>	aquatic herb	Non-native
parrot feather watermilfoil	<i>Myriophyllum aquaticum</i>	aquatic herb	Non-native
black locust	<i>Robinia pseudoacacia</i>	deciduous tree	Non-native
<b>Common Name</b>	<b>Botanical Name</b>		<b>CA Weed Status</b>
Himalaya blackberry	<i>Rubus discolor</i>	perennial vine	Non-native
Russian thistle, tumbleweed	<i>Salsola tragus</i>	annual	Non-native
white horse nettle	<i>Solanum elaeagnifolium</i>	perennial	BW
Johnson grass	<i>Sorghum halepense</i>	perennial grass	CW

Spanish broom	<i>Spartinum junceum</i>	deciduous shrub	Non-native
milk thistle	<i>Silybum marianum</i>	Annual or biennial	Non-native
medusahead grass	<i>Taeniatherum caput-medusae</i>	Annual grass	CW
Puncturevine	<i>Tribulus terrestris</i>	Annual herb	Non-native
Gorse	<i>Ulex europaeus</i>	thorny shrub	BW
woolly mullein	<i>Verbascum thapsus</i>	perennial	Non-native

Most weeds will persist in permanent natural openings such as in meadows, on lava caps, and along roads. With the possible exception of blackberries, most weeds tend to be shaded out in forested areas as trees grow. Weeds are of particular concern where they alter habitats; compete with sensitive plants and other rare species; or live near vectors that could carry them quickly to other areas (streamside, areas of high human use, fire staging and action areas, birds, etc.).

Refer to the weed risk assessment (Project Record) for more information about how weeds spread. Weed infestation introduced by motorized vehicle use negatively affects sensitive species. Table 5 shows miles of roads that are infested with weeds. Table 6 displays the proposed additions to the NFTS infested with invasive weeds (STF weed occurrence records and surveys results) and are associated with sensitive plant effects. These sensitive plant occurrences are at increased risk of loss of individuals and habitat due to weed introduction and spread over the short and long term. The sensitive/watchlist species occurrences that have known weed occurrences located within 200 feet are at even greater risk of negative impacts from weed infestation. This mileage does not represent a total inventory of weeds, roadside or otherwise; it does include the routes with the most extensive roadside infestations on routes.

**Table 5 Miles of Routes Infested with Invasive Weeds by Road Maintenance Level and Alternative**

Road Maintenance Level	ALT 1 Miles	ALT 2 Miles	ALT 3 Miles	ALT 4 Miles	ALT 5 Miles
ML2	16.37	24.36	24.36	21.34	16.06
ML2 + SLO	4.58	0.00	0.00	3.40	4.57
ML3 + SLO	4.91	5.16	5.16	4.94	5.16
Motorized Trail (addn)	0.80	0.00	0.00	4.00	0.00
TOTAL	26.66	29.52	29.52	33.68	25.79

ML1 indicates a level 1 road (closed to motor vehicle traffic)

ML2 indicates a level 2 road (open to all vehicles)

ML3 indicates a level 3 road (open to street legal vehicles only)

The data was derived from GIS layers maintained by the STF. The numbers were derived by intersecting the additional motorized routes with polygon data of noxious weeds. It is important to note that the STF database of noxious weeds does not track all invasive weed species. It does track those species considered the most invasive by a consensus of botanists in this Region.

**Table 6 Additions to the NFTS with Weeds and Direct Impacts to Sensitive Plants**

Route	Sensitive Plant	Invasive Plants
15EV43C	Tuolumne fawn lily	Yellow starthistle
15EV43C	Tuolumne fawn lily	Yellow starthistle
15EV43C	Tuolumne fawn lily	Yellow starthistle
15EV43C	Tuolumne fawn lily	Milk thistle
15EV43C	Tuolumne fawn lily	Milk thistle
15EV43G	Tuolumne fawn lily	Yellow starthistle
16EV108	Stebbin's lomatium	Cheatgrass
16EV109	Stebbin's lomatium	Cheatgrass
16EV236	Stebbin's lomatium	Cheatgrass
17EV183	Parry's horkelia	Yellow starthistle
17EV192	Hetch-Hetchy monkeyflower/ Parry's horkelia	Yellow starthistle
17EV192A	Hetch-Hetchy monkeyflower/ Parry's horkelia	Yellow starthistle
17EV231	Three bracted onion/ Stebbin's lomatium	Tree of heaven
17EV78	Stebbin's lomatium	Cheatgrass
17EV88	Three bracted onion/ Stebbin's lomatium	Cheatgrass
18EV110	Kellogg's lewisia/ Stebbin's lomatium	Cheatgrass
FR98581	Mariposa clarkia	Yellow starthistle

While noxious weeds and other invasive plant species may cause indirect effects to sensitive plants through competition, weeds have dramatic effects on potent habitats for sensitive plants by occupying the area, precluding establishment of any other plant species. Invasive weeds also reduce species diversity in natural habitats across the analysis area.

Effects from noxious weeds will continue to occur regardless of which alternative is selected. Alternatives with fewer routes open for public motorized use, especially those that exclude routes currently weed infested, provide a reduced risk for vectoring of seeds by motor vehicles, and may decrease the spread of weeds to uninfested portions of these routes and other parts of the forest.

## **ISSUES AND INDICATOR MEASURES USED TO MEASURE EFFECTS**

Motor vehicle use on and off established routes has affected or has the potential to affect Sensitive plant populations, either directly by damage or death to individual plants from motorized vehicles (stem breaking, crushing, etc.). Vehicle use also has the potential to affect, indirectly, Sensitive plant populations by altering the habitat through soil disturbance, changes in hydrologic functioning, or by the introduction of non-native, invasive plant species that can out-compete sensitive species for water, sunlight, and nutrients. Motor vehicle use is likely to affect other rare plant habitats, such as meadows and lava caps, which exist on gentle slopes or flat terrain with little or no vegetation or natural barriers to motor vehicles. Motorized vehicle use of native surfaced roads/trails/areas will increase sediment production and erosion. As use increases, sediment production and erosion will increase.

Invasive non-native plants (weeds) will continue to spread along and within surfaced and native surfaced motorized vehicle roads/trails/areas without specific prevention and/or control measures.

## **Indicators Measures**

Based on a review of the literature, and considering the variety of effects upon plants, the following general analysis measures were developed to compare the degree to which the five alternatives may result in impacts to sensitive plant occurrences/potential habitat by motorized vehicle use on proposed or existing routes.

Indicator Measure 1: Number of sensitive plant sites/ occurrences within 200 feet of wheeled motorized routes

This indicator measure includes proposed additional trails and the current routes open for public motorized use. This includes the parking of a vehicle within one vehicle length of the travel way or within 200 feet of sensitive plant sites. Vehicle and human use on and immediately adjacent to travel routes affect or have the potential to affect rare plant population either directly by damage or death to individual plants (crushing, stem breaking, etc.) or, indirectly by altering the habitat through soil disturbance, changes in hydrologic functioning, or by the introduction of non-native, invasive plants.

The rationale for a 200-foot buffer around the route is a professional judgment related to the potential extent of damage to individual plants or habitat from vehicles and human use. Most motorized users do not leave their vehicles and walk more than 200 feet from the travel route. Exceptions occur at vistas, points of interest (for example fishing sites), and designated campsites. At these locations, foot traffic may affect plants and their habitat more than 200 feet from the motorized travel route. Little information is available to quantify definitively the distance from route edge in which direct and indirect effects occur within different habitats. The establishment of a 200-foot buffer represents a method to allow comparison between alternatives.

Indicator Measure 2: Number of documented direct impacts within 30 feet of sensitive plant sites/occurrences on either side of route's edge.

Direct effects consist of documented disturbances from motor vehicles that resulted in damage to sensitive plants by either driving off-road or parking off roads. Under these conditions, 30 feet from routes edge was a likely distance for limits of potential direct effects, such as trampling and crushing to sensitive plants. Plant sites and occurrences within 30 feet on either side of the route's edge are assumed to be affected.

Indicator Measure 3: Miles of motorized routes passing through lava caps

Lava caps are unique habitats and a watchlist plant community for the STF. Open areas, such as lava caps or granitic and volcanic balds do not provide natural barriers to motorized vehicle use or limit vehicle movement. Lava caps are relatively level, open habitats comprised of low herbaceous vegetation and scattered low shrubs. In addition, these habitats tend to be highly roaded. Two sensitive plant taxa (i.e., three-bracted onion and Stebbin's lomatium) occur on the STF in open habitat on rocky ridges and outcrops adjacent to proposed routes or within 200 feet

of the routes. Damage to lava caps and to sensitive plant occurrences on lava caps has been documented on the STF. The number of native surface routes within lava caps is a useful means of comparing potential effects to sensitive plant habitat among the alternatives.

Indicator Measure 4: Miles of motorized routes passing through meadows

Meadows, fens, and riparian areas provide habitat for, seventeen sensitive species, including six mosses, one lichen, five moonworts, and subalpine fireweed, Pilot Ridge fawn lily, Tuolumne fawn lily, Hetch-Hetchy monkeyflower and pansy monkeyflower which may be directly/indirectly affected by routes open for public wheeled motor vehicle use through wet areas. Habitat is susceptible to changes in hydrology, sedimentation, compaction, rutting, and exposure of bare soil. Damage to meadow habitat and to sensitive plant sites within meadow habitats has been documented on the STF. The miles of native surface routes within these habitats provide a means of comparing potential effects to sensitive plant habitat among alternatives.

Indicator 5: Miles of motorized routes infested with invasive plant species within 200 feet of sensitive plant occurrences/ and habitat

Routes infested with invasive plant species (noxious weeds): measuring this indicator would show potential indirect effects to sensitive plant habitat. The rationale for a 200-foot distance for the limit of potential indirect effects included a professional judgment that indirect effects from compaction, changes to drainage patterns, and spread of invasive species that compete with sensitive plants were most likely to occur within 200 feet. Noxious weeds and other invasive plant species may cause indirect effects to sensitive plants through competition. Invasive plant species also may have dramatic direct effects on their habitats as well as to species bio-diversity across the analysis area.

**Measures used to determine effects to sensitive plant and sensitive plant habitats:**

- Routes within 30 feet on either side of routes edge of a site/occurrence with documented impacts = direct effects.
- Routes within 200 feet of a site/occurrence/suitable habitat = potential direct and potential indirect effects.
- Routes passing through meadows and lava caps = potential direct and indirect effects to habitat for the sensitive species.
- Routes infested with invasive plant species = potential direct and indirect effects to sensitive plant habitat.

Note: This analysis uses the terms sensitive plant “site” and sensitive plant “occurrence”. These terms are not synonymous. A plant ‘occurrence’ is often composed of two or more discrete plant ‘sites’. Sites meeting specific criteria such as proximity are grouped into a single occurrence.

## ASSUMPTIONS

For a list of general assumptions with for analysis, refer to Chapter 3 of the EIS. The following list of assumptions is specific to sensitive plants.

- Motor vehicle use on and off established routes has affected or has the potential to affect sensitive plant populations, either directly by damage or death to individual plants from wheel-traffic (stem breaking, crushing, etc.), or indirectly by altering the habitat through soil disturbance, changes in hydrologic functioning, or by the introduction of non-native, invasive plant species that can out-compete sensitive species for water, sunlight, and nutrients.
- Motor vehicle access is unlikely to affect sensitive plant occurrences and habitats on steep or extremely rocky terrain. Motor vehicle use is more likely to affect rare plant occurrences and suitable habitat areas, such as meadows and lava caps, with gentle slopes and/or flat terrain with little or no vegetation or natural barriers to motor vehicles.
- Wheeled motorized vehicle use of native surface routes increases sediment production and erosion, thereby potentially adversely affecting sensitive plant habitat (for more detail, see soils or hydrology sections).
- Effects from all types of motor vehicles are assumed equal.
- Without specific prevention and control measures, invasive non-native plants (weeds) will continue to spread along surfaced and native surfaced motorized vehicle roads and trails, and into adjacent areas.
- For the purpose of this analysis, unless indicated in the data, each “point” of infestation along a route was assumed to be within 200 feet of the route. This assumption is based on 1) the fact that more than half of the weed data are five years or older and 2) application of a conservative rate of average weed spread along a disturbed road-side, especially with occasional road maintenance.
- Route proliferation will occur only in Alternative 2, as all other alternatives assume recreationists will stay on designated routes, future trail proliferation is projected to stay constant, about 2+ miles per year.

## EFFECTS OF THE ALTERNATIVES

### Environmental Consequences

All of the alternatives include varying degrees of seasonal closures for native and non-native (aggregate and paved) routes. The length of the seasonal closures and the miles of native and non-native routes vary in each of the action alternatives (1, 4 and 5). In general, Alternative 5 provides the longest time for seasonal closures, with the least of amount of potential impacts to sensitive plants.

## Impacts to Sensitive Plants

Impacts to sensitive plants and their habitats vary across all alternatives and no alternative eliminates all adverse effects to sensitive plants. In general, alternatives with fewer miles of routes open for public motorized vehicle use show reduced effects to sensitive plants and their habitats (Alternative 3 and 5). In Alternative 2, existing routes may affect 40 % of known sensitive plant sites /suitable habitats, and 26 % may be affected in Alternative 3. The differences are less dramatic when comparing effects among the action alternatives. For example, additional routes in Alternative 1 may potentially affect 5 % of known plant sites, and 0.5 % may be potentially affected by additional routes in Alternative 5. Alternatives 1, 3, 4, and 5 prohibit cross country travel. Alternative 3 was used as the baseline for the number of existing miles of routes affecting sensitive plants. For the total effects to sensitive plant resources analyzed under the each action alternative (1, 4 and 5), the baseline number of routes from Alternative 3 was added to proposed additional miles of routes. Table 7 shows the Effects Summary of proposed motorized routes on Sensitive Plants, Habitats, and Noxious Weeds.

The results of this analysis has indicated an increase of mileage and number of routes available for OHV use occurs under the action alternatives 1 and 4, and will increase the potential for direct and indirect effects to sensitive plants and suitable habitat. Action alternatives 3 and 5 will reduce the mileage and number of routes available for OHV use. The reduction in routes and mileage is likely to concentrate OHV use on the routes designated, thereby, increasing the potential for effects to roadside occurrences on those routes.

**Table 7 Effects Summary of Motorized Routes Proposed for the STF Motorized Travel**

Indicator	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Number of additional motorized routes <sup>i</sup> with sensitive plant sites <sup>ii</sup> within 200 ft	68	0	0	102	8
Miles of additional motorized routes <sup>i</sup> within meadows	1.8	0	0	2.1	0.2
Number of additional motorized routes through lava caps with known plant sites	29.3	0	0	32.1	6.3
Total number of routes with sensitive plant sites	493	612	410	533	419
Number of sensitive plant sites with noxious weed infestations within 200 ft	22	41	41	17	5
Miles of weed infested additional motorized routes	.80	0	0	4.0	.02
Total miles of weed infested motorized routes	26.66	29.52	29.52	33.68	25.79
Total Miles weed infested routes See Appendix A.Drendel 10/2					

## Effects to Sensitive Plants Common to All Alternatives

The typical vegetation associated with habitat for a majority of the documented STF sensitive plant occurrences consists of low growing shrubs and/or herbaceous plants in areas of sparse or

widely spaced trees. Meadow and riparian areas also provide habitat for documented STF sensitive plant occurrences. The types of associated vegetation and their distribution are important characteristics for this analysis both because of the role that vegetation plays in stabilizing the soil and its ability, or inability, to deter expansion of vehicular use. Vehicles can easily gain access into areas with low plant cover (i.e. lava caps, low chaparral, granitic and volcanic “balds”, and meadows), and larger sized four-wheel vehicles have broken “trail” through natural shrub barriers as tall as 8 feet to gain access to selected local areas. Areas with larger or denser vegetation are accessed along little-used or abandoned roads, utility corridors, skid trails and temporary logging roads, which typically are not open for public motorized travel.

### **Direct Effects**

Direct effects to plants may be lethal. This occurs when individual plants are broken, crushed, or trampled by vehicles traveling or parking off road surfaces. Off-road vehicles traveling cross country crush vegetation and root systems, killing seedlings and changing the composition of the forest (Cole and Bayfield 1993). Bisecting occurrences by both system and unauthorized routes often cause direct effects to sensitive plants. Plants themselves are often killed and habitat is permanently altered. Motor vehicle routes (STF sensitive plant files, 2007) bisect several sensitive plant sites, such as the *Erythronium tuolumnense* in the Deer Creek area, and the *Horkelia parryi* in the Date Flat area.

Other direct effects may occur to sensitive plants when branches or flowering stems are crushed or broken by off-road vehicles. This damage reduces the reproductive and photosynthetic capacities of plants. Repeated damage of this type weakens the compensatory capabilities of sensitive species and other native plants, which can lead to the degradation of habitat and eventually to the replacement of native plant species with non-native species more adapted to frequent disturbances, such as invasive weeds.

### **Indirect Effects**

Impacts to soil from repeated off-road use lead to the degradation of habitat for sensitive plants and other native plant communities. Compaction by vehicles contributes to roadside invasions of exotic plant species by reducing native plant vigor and creating areas of competition-free space that are open to invasion (Frenkell 1970).

Extensive studies have been made on the effects of strength of soil, bulk density, and soil moisture on the growth of crop plants. Considerable emphasis is placed on the importance of soil strength reducing root extension and emergence of seedlings (Arndt 1965; Taylor 1971). However, increased bulk density accompanied by decreases in soil moisture and air also retard growth of roots (Veihmeyer 1950; Taylor and Ratliff 1969; Lowry et al. 1970; Voorhees et al. 1975).

Marked changes in the physical and chemical properties of soil have important implications for the biologic productivity of the land, its vulnerability to erosion, and the spread of damage to areas not directly affected (Wilshire 1983). These impacts to soil (from repeated off-road use) can cause soil compaction, erosion, loss of soil moisture, slower water infiltration rates, and even changes in soil temperatures. Soil compaction inhibits plant growth. In sensitive plant habitat, soils subjected to vehicular traffic that become compacted and eroded due to wheel ruts would likely become unsuitable for seedling development and the sustainability or expansion of that sensitive plant population.

In studies of off-road vehicle use in natural areas around the San Francisco Bay Area, increases in bulk density of soils (measure of compacted soil) caused by vehicular use average about 8 percent for sandy soil and 18 percent for silty and clayey soils. Increased bulk density generally occurs to a depth of 30 cm (~12 inches) and has been observed in places at depths of 90 cm (~35 inches) or more (Wilshire et al. 1978). With repeated vehicular passes, the compressive stresses are generally transmitted to deeper soil layers.

Researchers measured various effects to soils from off-road vehicles at seven sites in the San Francisco Bay Area (Wilshire et al., 1978). Results included the following:

- **Soil erosion:** The increased runoff caused by vegetation stripping and the physical changes in the soil contribute to increased sediment yield from accelerated erosion. In this study, measured soil and substrate losses from vehicular use zones range from 7 to 1180 kg/m<sup>2</sup>.
- **Soil moisture:** Soil moisture shows substantial reduction because of vehicular use. In silty and clay soils, the losses average 43% to depths of 30 cm. The reduction of soil moisture in the more common loamy soils reflects changes in structure and composition of the soil brought about by compaction and erosion (H.G. Wilshire et al. 1978).
- **Water infiltration:** Studies have shown a much slower rate of water infiltration on vehicle-impacted soil versus adjacent non-impacted soil. Infiltration rates on unused soil averaged 1 mm/1.6 second, and those on (vehicle) tracked soil averaged 1 mm/60 second (H.G. Wilshire et al., 1978).
- **Soil temperature:** The effects of vehicular use extends the diurnal temperature range so that the soil is warmer (by 6-10 °C.) in the day and cooler (to 2.5 °C.) at night. The differences diminish at depth, so that below about 10 cm there is no significant difference in night temperature in and out of the vehicle-impacted zones. Temperatures remain higher during the day (about 3-4 °C) in impacted soils at depths of 18 cm. The extended diurnal range in temperature in vehicle-impacted soils is the combined result of loss of the shading and or transpiration effects of plants and the change in insulating characteristics of the soil caused by compaction.

## **Meadows**

Meadows are particularly susceptible to compaction because most meadows remain wet into August, with many staying wet year-round. Routes that pass through or along edges of meadows cause long-term adverse impacts to sensitive plant habitat. These impacts include loss of vegetation, stream bank disturbances, accelerated erosion, and soil compaction. Soil compaction can influence drainage patterns as well as cause ruts in these well-defined soils. In either case, water infiltration into meadow soils is slowed or drainage patterns altered. These effects can change the type of vegetation occurring in disturbed portions of a meadow from the desired native grasses and sedges to an early seral type of vegetation, potentially non-native invasive plant species. Once established, many invasive plants tend to form monocultures, which exclude/replace native plant species, including sensitive species (Rocchio 2006. Rocky Mountain Alpine-Montane Wet Meadow Ecological System).

## **Weed Infested Routes**

Based on the miles of weed infested routes, the risk of weed vectoring by motor vehicles and equipment within 200 feet of known sensitive plant occurrences/suitable habitat areas is greatest in Alternative 2, followed in decreasing order by Alternatives 4, 1, 5 and 3 respectively. The risk of vectoring weeds varies with location in the analysis area. Risk is high along routes with existing infestations, especially when the adjacent habitat is open with little canopy cover.

## **Cumulative Effects**

The geographic scope of this cumulative effects analysis includes NFS lands within the boundaries of the Stanislaus National Forest. This geographic scope was selected because impacts to sensitive plants and noxious weeds accumulate at a given location on the ground, irrespective of actions in surrounding areas. Therefore, the cumulative effects analysis includes historic effects from grazing and mining activities that occurred as early as 1850, as well as effects from more recent past activities.

A critical step in cumulative effects analysis is to compare the current condition of the resource and the projected changes (due to management activities) within the natural variability of the resource and processes of concern. This is difficult to determine for sensitive plants since long-term data for these species is most often lacking. Many sensitive plant habitats have a long history of disturbance (impacts from grazing and mining activities begun in the mid 1800's) and an undisturbed reference is often lacking. Minimizing on-site changes to sensitive plants and their habitat may be the most effective way of reducing cumulative impacts. If one can minimize the adverse effects at the local scale, it follows that there would be a reduced potential for larger-scale effects (MacDonald et al 2004).

Flagging and avoiding sensitive plants during project work is the most frequently used management strategy for reducing cumulative impacts to known sites. While flag-and-avoid management is effective in reducing cumulative impacts in most projects, it is not a practical mitigation for this project. Educational signage may help minimize impacts especially if utilized prior to a site becoming a "destination" location. Installing barriers along access routes to plant sites that experience repeated impacts from off-road vehicles is expensive but can be effective for excluding larger motor vehicles (i.e. 4 wheel drive trucks) but is less effective in keeping motorcycles or ATVs out of plant sites. Therefore alternatives that reduce opportunities for adverse effects are preferable to alternatives that do not (i.e. fewer routes overall or fewer routes in sensitive areas).

The cumulative effects analysis for sensitive plants considers impacts of the alternatives when combined with the following past, present, and foreseeable future actions and events.

Cumulative effects caused by invasive plant species infestations will continue to increase in disturbed areas within 200 feet or adjacent to sensitive plant habitats. These infestations will increase with additional miles of routes and increases in motorized vehicle use throughout the analysis area.

### **Past Management Activities:**

Within the known range of the sensitive plant species known to or to occur within the analysis area, the number of occurrences and amount of suitable habitat that have been adversely affected by previous management activities and programs on private and federal lands has not been fully tabulated, but has been of consequence. For instance in the past decade alone, 52% of approximately 120,548 completed and pending project acres has undergone timber/fuels reduction and other vegetation projects (2008\_10\_24CEA), and while direct effects to sensitive plant species from disturbances caused by these activities has been mitigated by avoidance, indirect effects such as further invasion by noxious weeds has occurred. Given the magnitude of the disturbance involved in various activities during the past 150 years, it is likely that historic

fire suppression, road and trail construction (designed and unauthorized routes), campground construction, other types of recreation activities including OHV use, timber management, salvage activities, reforestation practices, historic grazing and mining activities, and hydroelectric development have degraded suitable habitat. It is also likely that individual sensitive plants have been destroyed by these activities and that entire occurrences have been eliminated.

In order to understand the contribution of past actions to the cumulative effects of the proposed action and 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 of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several 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 over the last century (and beyond), and trying to isolate the individual actions that 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 effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. 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 those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality (CEQ) issued an interpretive memorandum on 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.” (CEQ.2005. Guidance on the Consideration of Past Actions in Cumulative Effects Analysis). For these reasons, the analysis of past actions in this section is based on current environmental conditions (Federal Register.2008. 36 Part 220; National Environmental Policy Act Procedures; Final Rule).

### **Present and Foreseeable Management Activities:**

Cumulative effects for sensitive plant species include current and anticipated future effects from all system and unauthorized routes. These effects are combined with present and foreseeable future actions and events including soil disturbance from logging and other fuels treatments, wild fire suppression activities, fire salvage logging (USFS and private industry), emergency Burn Area Emergency Rehabilitation (BAER) treatments, reforestation activities including proposed vegetation release treatments (mechanical, manual, and chemical), montane meadow grazing, road construction and maintenance, existing road conditions, and existing and anticipated noxious weed infestations and control treatments within the described analysis area. See Appendix B in the EIS for a complete list of present and future projects.

Cumulative effects to sensitive plants and their habitats must also presume a continued increase of motorized recreation. A recently released State Fuel Tax Study (California Department of Parks and Recreation 2006) states that annual registration for non-street-licensed vehicles increased by 112 percent during the time from 2001 to 2006. For the purposes of this effects analysis, potential for impacts to sensitive plant habitats to increase is at rates similar to the increase in use of off-road vehicles. An increase in the number of OHVs using a smaller system of open routes that traverse sensitive plant habitats in accessible landscapes (i.e. lava caps and meadows) is likely to cause an increased level of damage to these habitats and associated plants. Educational signage and other informational opportunities (i.e. enhanced media coverage, Tread Lightly signage) coupled with monitoring and adequate enforcement efforts, can help mitigate potentially increased impacts to these habitats. If impacts continue, further actions to dissuade motorists from driving off-road or through affected occurrences should be implemented and may include installation of barriers along the boundary of the habitat being affected.

### ***Alternative 1 (Proposed Action)***

This is the Proposed Action, as described in the Notice of Intent, with corrections based on updated data and map information and refinements responding to issues raised during scoping. These corrections and refinements provide additional motorized recreation opportunities (including those accessing dispersed recreation activities thereby replacing the need for travel corridors), reduce conflicts and provide additional resource protection.

#### **Direct and Indirect Effects**

The impact to sensitive plant communities is similar among Alternatives 1 and 4, with impacts to sensitive plants/habitat slightly less in Alternative 1.

#### **Cross Country Travel Prohibited**

Cross Country travel is prohibited, except as allowed by permit or other authorization. Parking is allowed one vehicle length off NFTS routes. Direct impacts to sensitive species from cross country use could be significant at least at the local, site-specific level. The significance of direct and indirect impacts is dependent on many factors including the amount of disturbance, the sensitive species being impacted, and in some cases, the season when the disturbance takes place. The significance of impacts is also dependent on the number of sensitive species that occur in a specific location and how many of them are damaged. Prohibition of cross country travel should reduce the negative effects to sensitive plants.

#### **Additions to the System**

There are 151.64 miles of unauthorized routes added to the NFTS system under this alternative. 68 routes are within 200 feet of known sensitive plant sites/habitat areas. This alternative would have direct and potential indirect effects to approximately 83 known sites and suitable habitat areas within 200 feet of motorized routes. At this time it is unknown the extent of the direct and indirect affects to unknown sensitive plant sites. Alternative 1 has 1.8 additional motorized miles within meadows, 29.3 additional motorized miles though lava caps, and 0.80 miles of weed infested additional native surface routes.

#### **Vehicle Class Changes**

Effects from all types of motor vehicles are assumed equal.

#### **Seasonal Closures**

Alternative 1 provides for seasonal closures on designated native and non-native NFTS

motorized routes. Lower elevations are open all year, middle elevations are open April 1 through November 30, and upper elevations are open May 15 through November 30. Alternative 1 will have a lesser impact on sensitive plant resources than Alternative 4. In addition, Alternative 1 has more of an impact than Alternative 5 due to the length of seasonal closures.

### **Wheeled Over Snow Use**

Wheeled Over Snow routes would have potential direct/and indirect impacts to sensitive plants on eight routes that allow Wheeled Over Snow travel. The effects of these routes to these plants have been included in the analysis in Indicator Measure # 1 of this Alternative.

#### **Indicator Measure 1:** Number of sensitive plant sites/ occurrences within 200 feet of wheeled motorized routes

Under Alternative 1, there is potential for direct and indirect effects to 83 documented sensitive plant sites and suitable habitat areas. These 83 sensitive plant sites and suitable habitat areas are documented to be within 200 feet of 157.39 miles of proposed routes under Alternative 1. Based on the assumption that suitable habitat exist along routes in upland and mid slope habitats and lower montane, chaparral, and woodland habitats, fourteen sensitive plant species may be directly or indirectly affected by routes within 200 feet of suitable habitat. These include: Jepson's onion, Yosemite onion, Nissenan manzanita, big-scale balsamroot, Pleasant Valley mariposa lily, Small's southern clarkia, Merced clarkia, Tahoe draba, Congdon's woolly sunflower, Parry's horkelia, short-leaved hulsea, Tuolumne iris, Yosemite lewisia, and slender-stalked monkeyflower.

#### **Indicator Measure 2:** Number of documented direct impacts within 30 feet of sensitive plant sites/occurrences on either side of route's edge.

Adding routes affect 59 documented sensitive plant sites analyzed under Alternative 1. Appendix A represents the routes with direct impacts to plants for this alternative.

The following represents the number of potentially affected occurrences for each sensitive plant species along additional routes proposed for Alternative 1:

- Twenty-six sites of Stebbin's lomatium;
- Four sites of three bracted onion;
- Five sites of Parry's horkelia;
- Nine sites of Hetch-Hetchy monkeyflower;
- Seven sites of Small's southern clarkia;
- Three sites of Tuolumne fawn lily;
- Three sites of Kellogg's lewisia; and
- Two sites of Mariposa clarkia.

#### **Indicator Measure 3:** Miles of motorized routes passing through lava caps

There are 29.3 miles of proposed motorized routes within lava caps with sensitive plant sites and suitable habitat areas. Proposed routes for motor vehicle use in lava cap areas may directly or indirectly affect three known sensitive plant species. These sensitive plant sites are known to occur within 200 feet of proposed motorized routes within lava cap areas and include Stebbin's lomatium, three bracted onion, and Kellogg's lewisia.

**Indicator Measure 4:** Miles of motorized routes passing through meadows

There are 1.8 miles of additional motorized routes through meadows and riparian habitats with the potential to affect several sensitive plant species and mosses. Based on the assumption that suitable habitat exist along routes in meadows and riparian areas, seventeen sensitive species, including six mosses, one lichen, five moonworts, Tuolumne fawn lily, Hetch-Hetchy monkeyflower, subalpine fireweed, pansy monkeyflower, and Pilot Ridge fawn lily may be directly/indirectly affected by routes open for public wheeled motor vehicle use through wet areas. This alternative has the greatest number of proposed and existing motorized routes of the action alternatives affecting sensitive plants in moist habitats.

**Indicator Measure 5:** Miles of motorized routes infested with invasive plant species within 200 feet of sensitive plant occurrences/ and habitat

There are 0.80 additional miles, including 55 routes, under Alternative 1 infested with invasive plant species with the potential to indirectly affect sensitive plant sites and suitable habitat areas. Currently, there are 29 known noxious weed and invasive plant infestations within 200 feet of sensitive plant sites and suitable habitat areas documented for the additional routes proposed under Alternative 1. Under this alternative, there are 22 sensitive plant sites/suitable habitat areas within 200 feet of weed infested additional routes, and 33 sensitive plant sites/suitable habitat areas of existing routes, for 54 plant sites/habitats potentially affected by weed infestations. The two sensitive plant species with the highest number of sites with potential indirect and direct effects from noxious and invasive weed infestations include the Tuolumne fawn lily and Stebbin's lomatium. Stebbin's lomatium has 7 sites within 200 feet of noxious weed infestations, and Tuolumne fawn lily has 6 sites within 200 feet of noxious and invasive weed infestations on proposed motorized routes. Noxious and invasive weed infested routes under this alternative may indirectly or directly affect an additional nine sensitive plant sites. Table 7 under the Summary of Effects section lists the routes infested with noxious and invasive weeds within 200 feet of sensitive plant sites for all of the alternatives.

**Cumulative Effects**

Of all the other action alternatives, Alternative 1 will potentially have the second highest impact to sensitive plant sites and suitable habitat areas. The Tuolumne fawn lily, an endemic to the STF, has documented impacts from numerous recreational and other forest uses (Appendix B, EIS). Past and current impacts by OHV have been extensively documented in suitable habitat areas for this plant species. The three sensitive plant sites of Tuolumne fawn lily that may be impacted by additional routes under Alternative 1 represent approximately 7 % of the total known sensitive plant sites for this species in the analysis area. Stebbin's lomatium, another endemic to the Stanislaus National Forest, has documented impacts from OHV and other recreational uses. The twenty-six plant sites of Stebbin's lomatium that may be impacted by Alternative 1 represent approximately 7 % of the total known sites for this species within the analysis area. Under this alternative, additional roads and increases in OHV use will likely increase the cumulative effects to both of these plant species over time. It is assumed that present and future OHV use will contribute to the adverse cumulative effects, but would not result in a trend toward federal listing for either Tuolumne fawn lily or Stebbin's lomatium.

Stebbin's lomatium and Kellogg's lewisia grow in lava cap habitat areas where the highest densities of motorized routes occur in the analysis area. Both of these rare plant species are anticipated to decline in the number of individual plants and plant sites under all of the Alternatives.

A second vulnerable species, Hetch-Hetchy monkeyflower, has approximately 204 known sites documented on the STF. This species has a narrow range, distributed through the southern half of the Groveland RD on the STF. Nine of the 204 sites have documented impacts from motorized vehicles on the analysis area. The meadows and seeps where this species occurs are easily accessed by OHV's. Currently, numerous projects with impacts to this species have been documented including OHV use, logging, Ackerson and Rogge wildfires, large fire salvage, and reforestation projects (USDA 2003). The nine plant sites potentially impacted by Alternative 1 represent approximately 4 % of the total known sites for this species within the analysis area.

Parry's horkelia occurs in open habitat where users have created unauthorized OHV trails. Some of these trails pass through known sites. There are documented sites near a fuel break near the Date Flat area. Noxious and invasive weeds spread by OHV use currently threaten this species. The five sites that may be impacted under Alternative 1 represent approximately 4% of the total known plant sites.

The other meadow-dwelling sensitive species include moonworts, hump-mosses, Bolander's bruchia, and Blandow's bog moss. Although these are known to be wide ranging species, none are currently known to be numerous in California, and some of these species are thought to be in decline throughout their historic ranges. It is assumed that cumulative effects have affected the suitable habitat and potentially unknown occurrences of these meadow-dwelling sensitive species from present and foreseeable future management activities on the STF. However, it is not likely that the cumulative effects will result in reducing the viability of these species.

There are 26.7 additional and existing miles of motorized routes infested with noxious and invasive weed species under Alternative 1. Alternative 1 has the greatest number of known sensitive plant sites and suitable habitat areas that may be affected by additional and existing miles of weed infested motorized routes. Cumulatively, potential indirect effects to sensitive plant resources caused by invasive species will be greater under Alternative 1 than the other action alternatives.

Overall, adverse cumulative effects to sensitive plant species under Alternative 1 are not to be of the scale that would reduce species viability for any of the STF sensitive plant species. Implementation of Alternative 1 would not improve conditions for sensitive plants and their habitats over time, because of continued public wheeled motor vehicle use and new routes added to the system. Impacts to sensitive plant sites and suitable habitat areas by motorized uses have occurred in the past, are currently taking place, and are to increase in the near future due to the predicted increase in motor vehicle use on the STF. There are three routes that will be mitigated for direct/ and indirect effects to plants and habitat in Alternative 1 (See Mitigation summary at end of this document). Monitoring of sensitive plant sites and erecting physical barriers needs to be implemented where impacts from off-road vehicles use is documented as directly affecting sensitive plant occurrence areas.

Compliance and maintenance efforts may limit the extent of impacts to the more vulnerable sensitive plant habitat areas. Difficult access to suitable habitat areas and sensitive plant occurrence areas, as well as prohibiting cross country travel will alleviate impacts from motor vehicles in some areas of the forest.

## **Effects determination**

Under Alternative 1, direct and indirect effects may occur to a total of 493 sensitive plant sites and suitable habitat areas within 200 feet of motorized routes. This number includes sites affected by existing routes under Alternative 2 (baseline), in addition to the sensitive plant occurrences potentially affected by proposed routes under Alternative 1. The 493 known sensitive plant sites that occur within 200 feet of existing and proposed routes that may be affected by motorized travel under Alternative 1 represents about 31 per cent of the 1,580 total known sensitive plant sites within the analysis area. Under Alternative 1, cumulative impacts to sensitive plants on the STF remain below the threshold required to reduce the overall viability for these rare plant species, or to cause listing under the Endangered Species Act.

### **Alternative 2 (No Action)**

The No Action Alternative provides a baseline for comparing the other alternatives. Under the No Action alternative, current management plans would continue to guide management of the project area. This alternative would not change the use of any NFTS roads and would not add any miles of NFTS motorized trails. Under this alternative, the agency would take no affirmative action (no change from current management or direction) and cross country travel with continued use of unauthorized routes would continue. It would include only existing seasonal closures and would not include any restrictions on motorized dispersed recreation access.

Direct impacts to sensitive species from cross country use could be significant at least at the local, site-specific level. The significance of direct and indirect impacts is dependent on many factors including the amount of disturbance, the sensitive species being impacted, and in some cases, the season when the disturbance takes place. The significance of impacts is also dependent on the number of individuals of sensitive species that occur in a specific location and how many of them are damaged.

### **Direct and Indirect Effects**

Alternative 2 is considered the baseline data of current conditions within the analysis area. This alternative does not change the use of any existing NFTS roads, would not add any miles of NFTS motorized trails, the agency would take no action from current management direction, and cross country travel would continue with the use of unauthorized routes. It would not include any restrictions on motorized dispersed recreation access. Alternative 2 has potential direct and indirect effects to approximately 39 percent of all documented sensitive plant sites/ occurrences and suitable habitat areas within 200 feet of existing motorized routes for the analysis area. Alternative 2 has 11.16 miles of motorized routes within meadows, and 29.52 miles of weed infested native surface routes.

There are no existing seasonal closures with Administrative action to close road segments as needed.

With the assumption of route proliferation occurring in this Alternative, there are approximately 277 miles of existing unauthorized trails that could possibly incur route proliferation at additions of 2 miles per year (Route Proliferation Trends, 2008).

Wheeled Over Snow routes would have potential direct/ and indirect impacts to sensitive plant habitat on eight routes that allow this use. The potential impacts of these routes to the sensitive

plants/ and habitat and have been included in the analysis in Indicator Measure # 1 of this Alternative. Wheeled over snow travel is prohibited on routes with less than 12 inches of snow and impact to plant would most likely be secondary to rutting or change in hydrology.

This alternative would have the greatest impacts to sensitive plant communities in comparison to all of the other alternatives, with direct and indirect effects to approximately 612 known sites/suitable habitat areas within 200 feet of the 2,259.37 miles of routes open for public motorized vehicle use. At this time, it is unknown what the direct and indirect effects are to undocumented plant occurrences. The unknown effects to sensitive plants and their habitat is greatest for this alternative as motor vehicle travel by the public would not be limited to NFTS routes and continued use and creation of routes will occur.

**Indicator Measure 1:** Number of sensitive plant sites/ occurrences within 200 feet of wheeled motorized routes

Direct and indirect effects may occur to 612 sensitive plants sites/habitat areas located within 200 feet to routes open for public motorized vehicle use.

Based on the assumption that suitable habitat exists along routes in upland and mid slope habitats and lower montane, chaparral, and woodland habitats, fourteen sensitive plant species may be directly or indirectly affected by routes within 200 feet of occurrences/ sites/ or suitable habitat. These include: Jepson's onion, Yosemite onion, Nissenan manzanita, big-scale balsamroot, Pleasant Valley mariposa lily, Small's southern clarkia, Merced clarkia, Tahoe draba, Congdon's woolly sunflower, Parry's horkelia, short-leaved hulsea, Tuolumne iris, Yosemite lewisia, and slender-stalked monkeyflower.

**Indicator Measure 2:** Number of documented direct impacts within 30 feet of sensitive plant sites/occurrences on either side of route's edge.

There are approximately 248 documented sensitive plant sites along analyzed routes in Alternative 2 to have known direct impacts caused by motor vehicles use including driving off-road or parking off-roads. These sensitive plant species include:

- Three sites of Kellogg's lewisia;
- Twenty-five sites of Mariposa clarkia;
- Forty-five sites of Small's southern clarkia;
- Twenty-eight sites of Tuolumne fawn lily;
- Fifteen sites of pansy monkey flower;
- Five sites of Hetch-Hetchy (slender-stemmed) monkeyflower;
- Eighteen sites of three-bracted onion;
- Sixty-eight sites of Stebbins's lomatium;
- Four sites of mountain lady slipper;
- Two occurrence of Bolander's bruchia;
- One occurrence of Tuolumne iris;
- Two occurrence of veiny aquatic lichen
- Three occurrence of Yosemite woolly sunflower (Congdon's woolly sunflower); and
- Nineteen sites of Parry's horkelia

**Indicator Measure 3:** Miles of motorized routes passing through lava caps

Approximately 65.97 miles of existing motorized routes within lava caps have sensitive plant sites and potential habitat for three sensitive species, including Stebbin's lomatium, three bracted onion, and Kellogg's lewisia.

**Indicator Measure 4:** Miles of motorized routes passing through meadows

There are approximately 11.16 miles of existing routes through meadows under this alternative. Based on the assumption that suitable habitat exist along routes in meadows and riparian areas, seventeen sensitive species, including six mosses, one lichen, five moonworts, Tuolumne fawn lily, Hetch-Hetchy monkeyflower, subalpine fireweed, pansy monkeyflower, and Pilot Ridge fawn lily may be directly/indirectly affected by routes open for public wheeled motor vehicle use through wet areas.

**Indicator Measure 5:** Miles of motorized routes infested with invasive plant species within 200 feet of sensitive plant occurrences/ and habitat

There are 29.52 miles and 458 motorized routes infested with noxious and invasive weed species under Alternative 2, with the potential to directly and/or indirectly affect sensitive plant sites and/or suitable habitat areas. Currently, there are 32 known noxious and invasive weed infestations within 200 feet of sensitive plant occurrences and suitable habitat areas documented for the additional routes proposed under Alternative 2. Under this alternative, routes with noxious and invasive weed infestations within 200 feet directly or indirectly affect 41 sensitive plant sites and suitable habitat areas. Table 7 under the Summary of Effects section presents the routes infested with noxious and invasive weeds within 200 feet of sensitive plant sites for all of the alternatives.

**Cumulative Effects**

Although adverse cumulative effects to sensitive plant species under Alternative 2 are not of a scale that would reduce species viability, nearly 40 percent of the total number of sensitive plant sites/occurrences and suitable habitat and suitable habitats are currently impacted by motor vehicle use. Past and current impacts by motor vehicle travel have not been extensively documented in all suitable habitat areas for sensitive plant species. Alternative 2 has potential direct and indirect effects to approximately 39 percent of all STF documented plant sites within the analysis area and potential indirect effects to their habitats. Alternative 2 has the third greatest number of miles within meadows and lava caps, after Alternatives 1 and 4. Under Alternative 2, cumulative effects would continue to impact sensitive plants and their habitat, especially in meadows and on lava caps. Monitoring and compliance efforts would serve to mitigate damage to some of the most vulnerable sites. Monitoring of sensitive plant sites and erecting physical barriers may be implemented where impacts from off-road vehicle use have been documented as directly affecting sensitive plant occurrence areas.

Implementation of Alternative 2 would not improve conditions for sensitive plants and their habitats, over time, because of continued unrestricted public motorized vehicle use. Impacts to sensitive plant occurrences and habitat have occurred in the past, are currently taking place, and are expected to increase in the foreseeable future due to the predicted increase in motor vehicle use. . The unknown effects to sensitive plants and their habitat is greatest under this alternative as motor vehicle travel would not be limited to NFTS routes and continued use of user created routes will occur.

Although Alternative 2 does not reflect the greatest number of miles of invasive plant infestations within 200 feet of sensitive plant resources, the risk of weed vectoring by motorized vehicles is greater than all of the other alternatives due to the lack of closures on cross country travel routes, and the lack of seasonal use restrictions. Over time, this alternative may have the highest level of cumulative effects to sensitive plant resources caused by noxious and invasive plant infestations.

Stebbin's lomatium and Kellogg's lewisia grow in lava cap habitat areas where the highest densities of motorized routes occur in the analysis area. Both of these rare plant species are anticipated to decline in the number of individual plants and plant sites under all of the Alternatives.

### **Alternative 2 Effects determination**

The 612 known sites currently affected by roads under Alternative 2 represent about 39 per cent of the 1,580 total known sensitive plant sites in the analysis area. In Alternative 2, cumulative impacts to sensitive plants remain below the threshold required to reduce the overall viability or cause listing status for these rare plant species

### **Alternative 3 (Cross Country Prohibited)**

Alternative 3 responds to the administration and resource issues by prohibiting cross country travel without adding any new facilities to the NFTS. This alternative also provides a baseline for comparing the impacts of other alternatives that propose changes to the NFTS in the form of new facilities (roads and trails). No unauthorized routes would be added to the National Forest System under this alternative. Existing closures would remain in effect.

### **Direct and Indirect Effects**

The impacts to sensitive plants is similar among Alternative 2 and Alternative 3, as both provide a baseline for comparing the impacts of other alternatives that propose changes to the NFTS in the form of roads and trails. Under this alternative, cross country travel would be prohibited. This alternative potentially would have the least amount of effects on sensitive plant occurrences and suitable habitat areas than all the other Alternatives.

Wheeled Over Snow routes would have potential direct and indirect impacts to sensitive plants associated with eight routes. The impacts of these routes to these plants have been included in the analysis in Indicator Measure 1.

This alternative would have impacts to sensitive plant communities with direct and indirect effects to approximately 410 known sites /suitable habitats occurring within 200 feet of 2,259.37 miles of motor vehicle routes. At this time, it is unknown what the direct and indirect effects are to undocumented plant occurrences.

**Indicator Measure 1:** Number of sensitive plant sites/ occurrences within 200 feet of wheeled motorized routes

Direct and indirect effects may occur to approximately 410 sensitive plant sites and suitable habitat areas within 200 feet of motorized routes open for public use.

Based on the assumption that suitable habitat exist along routes in upland and midslope habits and lower montane, chaparral, and woodland habitats, fourteen sensitive plant species may be directly or indirectly affected by routes within 200 feet of suitable habitat. These include:

Jepson's onion, Yosemite onion, Nissenan manzanita, big-scale balsamroot, Pleasant Valley mariposa lily, Small's southern clarkia, Merced clarkia, Tahoe draba, Congdon's woolly sunflower, Parry's horkelia, short-leaved hulsea, Tuolumne iris, Yosemite lewisia, and slender-stalked monkeyflower.

**Indicator Measure 2:** Number of documented direct impacts within 30 feet of sensitive plant sites/occurrences on either side of route's edge.

There are 155 documented sensitive plant sites along analyzed routes under Alternative 3 to have known impacts from motor vehicle use, including driving off-road or parking off-roads. These sensitive plant species include:

- Twenty-four sites of Mariposa clarkia;
- Thirty-nine sites of Small's southern clarkia;
- Twelve sites of Tuolumne fawn lily;
- Ten sites of pansy monkey flower;
- Fourteen of Hetch-Hetchy (slender-stemmed) monkeyflower;
- Five sites of three-bracted onion;
- Thirty-one sites of Stebbins's lomatium;
- Four site of mountain lady slipper; and
- One occurrence of Bolander's bruchia.
- One occurrence of Tuolumne iris
- One occurrence of veiny aquatic lichen
- Three occurrence of Yosemite woolly sunflower (Congdon's woolly sunflower) and,
- Ten sites of Parry's horkelia

**Indicator Measure 3:** Miles of motorized routes passing through lava caps  
Approximately 65.97 miles of existing motorized routes on lava caps are within 200 feet of sensitive plant sites and/or potential habitat. Three sensitive plant species, including Stebbin's lomatium, three bracted onion, and Kellogg's lewisia grow in the lava cap habitat.

**Indicator Measure 4:** Miles of motorized routes passing through meadows

There are approximately 11.16 miles of routes through meadows under this alternative. Based on the assumption that suitable habitat exist along routes in meadows and riparian areas, seventeen sensitive species, including six mosses, one lichen, five moonworts, Tuolumne fawn lily, Hetch-Hetchy monkeyflower, subalpine fireweed, pansy monkeyflower, and Pilot Ridge fawn lily may be directly/indirectly affected by routes open for public wheeled motor vehicle use through wet areas.

**Indicator Measure 5:** Miles of motorized routes infested with invasive plant species within 200 feet of sensitive plant occurrences/ and habitat

There are 29.52 miles and 376 motorized routes infested with invasive plant species under Alternative 3, with the potential to directly and/or indirectly affect sensitive plant sites and/or suitable habitat areas. Currently, there are 32 known noxious and invasive weed infestations within 200 feet of sensitive plant occurrences and suitable habitat areas documented for the existing routes proposed under Alternative 3. Under this alternative, routes with noxious and invasive weed infestations within 200 feet may directly or indirectly affect 41 sensitive plant sites and suitable habitat areas. Table 7 under the Summary of Effects section presents the routes

infested with noxious and invasive weeds within 200 feet of sensitive plant sites for all of the alternatives.

### **Cumulative Effects**

Overall, adverse cumulative effects to sensitive plant species in Alternative 3 are not of the scale that would reduce species viability. Past and current impacts by motor vehicle travel have not been extensively documented in all suitable habitat areas for sensitive plant species. Under this alternative, there will be a decrease in the number of OHV routes by prohibiting travel on cross-country routes in comparison to the “no action” alternative. Continued use will likely increase the cumulative effects to all of the sensitive plant species within 200 feet of existing routes over time. At this time, it is assumed that the cumulative effects from present and foreseeable future management activities, including those from motor vehicle impacts, would not result in a trend toward federal listing for sensitive plants expected or known to occur within the analysis area.

Alternative 3 has potential direct and indirect effects to approximately 26 percent of all STF documented plant sites and potential indirect effects to their habitats within the analysis area. Under Alternative 3, cumulative effects would continue to impact sensitive plants and their habitats, especially in meadows and on lava caps, with fewer impacts than the other alternatives. Over time, the potential indirect and direct effects caused by the infestations of weedy plant species will increase.

Over time, implementation of Alternative 3 would improve conditions for sensitive plants and their habitats in comparison to the other alternatives by eliminating cross-country routes, and by not adding any new routes. Impacts to sensitive plant occurrences and habitats have occurred in the past, are currently taking place, and will increase in the near future due to the predicted increase in motor vehicle use on the STF. Monitoring of plant sites, signing and barriers to impede access may be implemented where monitoring reveals continued impacts from off-road vehicles use. In conjunction with monitoring, compliance efforts may limit the extent of impacts to the more vulnerable sensitive plant habitats. The STF Travel Management Project may affect individuals of these plant species; however, these effects are not likely to lead to listing under the Endangered Species Act.

### **Alternative 3 Effects determination**

The 410 known plant sites/suitable habitat areas currently affected by roads under Alternative 3 represent about 26 per cent of the 1,580 total known sensitive plant sites within the analysis area. Under Alternative 3, cumulative impacts to sensitive plants on the STF are to remain below the threshold to reduce the overall viability for these rare plant species.

### **Alternative 4 (Recreation – Action Alternative)**

This alternative responds to the motorized recreation opportunities issue by providing additional routes and reducing restrictions. This alternative would maximize motorized recreation opportunities (including those accessing dispersed recreation activities thereby replacing the need for travel corridors).

### **Direct and Indirect Effects**

#### **Cross Country travel**

Cross Country travel is prohibited, except as allowed by permit or other authorization. Parking

is allowed within one vehicle length off NFTS routes. Direct impacts to sensitive species from dispersed recreational access could be significant at least at the local, site-specific level. The significance of direct and indirect impacts is dependent on many factors including the amount of disturbance, the sensitive species being impacted, and in some cases, the season when the disturbance takes place. The significance of impacts is also dependent on the number of sensitive plant individuals that occur in a specific location and how many of them are damaged.

### **Additions to the System**

175.97 miles of unauthorized routes are added to the NFTS system under this alternative. 102 routes are within 200 feet of known sensitive plant sites and/or suitable habitat areas. This alternative will have the greatest impact to sensitive plant communities of all of the action alternatives, with potential direct and indirect effects to approximately 123 known sensitive plant sites and suitable habitat areas within 200 feet of proposed additional motorized routes within the analysis area.

Alternative 4 has the greatest number of miles proposed in lava caps of all the action alternatives. Alternative 4 also has the highest mileage of weed infested additional and existing routes, with 33.68 miles of infestations on native surface routes being analyzed.

### **Vehicle Class Changes**

#### **Seasonal Closures**

Alternative 4 provides for seasonal closures on designated NFTS motorized routes. Lower elevations are open all year, middle and upper elevations are open April 1 through December 31. The shorter length of time for seasonal closures increases the potential for direct and indirect effects to sensitive plant and other botanical resources under this alternative, in comparison to Alternative 1 and 5.

#### **Wheeled Over Snow**

Wheeled Over Snow routes would have potential direct and indirect impacts to sensitive plants on eight routes identified for this use (Table 7). The impacts of these routes to these plants have been included in the analysis in Indicator Measure 1.

#### **Indicator Measure 1:** Number of sensitive plant sites/ occurrences within 200 feet of wheeled motorized routes

Alternative 4 proposes approximately 175.97 miles of additional unauthorized routes, potentially directly or indirectly effecting documented sensitive plant sites and/or suitable habitat areas. At this time, it is unknown what the direct and indirect effects are to undocumented plant occurrences. This alternative has potential to have the greatest impact on sensitive plant species and suitable habitat areas. 123 sensitive plant sites and habitat areas are within 200 feet of the proposed and existing routes.

Based on the assumption that suitable habitat exist along routes in upland and mid slope habitats and lower montane, chaparral, and woodland habitats, fourteen sensitive plant species may be directly or indirectly affected by routes within 200 feet of suitable habitat. These include: Jepson's onion, Yosemite onion, Nissenan manzanita, big-scale balsamroot, Pleasant Valley mariposa lily, Small's southern clarkia, Merced clarkia, Tahoe draba, Congdon's woolly sunflower, Parry's horkelia, short-leaved hulsea, Tuolumne iris, Yosemite lewisia, and slender-stalked monkeyflower.

**Indicator Measure 2:** Number of documented direct impacts within 30 feet of sensitive plant sites/occurrences on either side of route's edge.

There are 72 documented plant sites along proposed routes in Alternative 4 that may be directly affected by motor vehicles driving off-road or parking off-roads. Appendix B represents the routes with direct impacts to plants for this alternative.

The following represents the number of occurrences for each sensitive plant species that may be directly affected by unauthorized routes added to the system under Alternative 4:

- Thirty sites of Stebbin's lomatium;
- Five sites of three bracted onion;
- Six sites of Parry's horkelia;
- Eleven sites of the Hetch-Hetchy monkeyflower;
- Nine sites of the Small's southern clarkia;
- Four sites of the Tuolumne fawn lily;
- Four sites of Kellogg's lewisia; and
- Two sites of Mariposa clarkia.

**Indicator Measure 3:** Miles of motorized routes passing through lava caps

An additional 32.1 miles of motorized routes within lava caps habitat areas have documented sensitive plant sites and suitable habitat. Alternative 4 has the greatest number of routes (a total of approximately 128 routes including existing and proposed) in lava cap habitat areas, and the largest potential for affects to the three sensitive plant species found growing on lava caps, including Stebbin's lomatium, Kellogg's lewisia, and three bracted onion.

**Indicator Measure 4:** Miles of motorized routes passing through meadows

There are 2.1 miles of additional motorized routes in meadows and riparian areas proposed under this alternative. Based on the assumption that suitable habitat exist along routes in meadows and riparian areas, seventeen sensitive species, including six mosses, one lichen, five moonworts, Tuolumne fawn lily, Hetch-Hetchy monkeyflower, subalpine fireweed, pansy monkeyflower, and Pilot Ridge fawn lily may be directly/indirectly affected by routes open for public wheeled motor vehicle use through wet areas.

**Indicator Measure 5 :** Miles of motorized routes infested with invasive plant species within 200 feet of sensitive plant occurrences/ and habitat

There are 4 miles and 83 additional motorized routes, under Alternative 4 infested with invasive plant species with the potential to indirectly or directly effect sensitive plant sites and suitable habitat areas. Currently, there are 42 known noxious weed infestations within 200 feet of sensitive plant sites and suitable habitat areas documented for the additional routes proposed under Alternative 4. Under this alternative, there are a total of 17 sensitive plant sites/suitable habitat areas within 200 feet of noxious weed infestations on additional routes, and 32 sites on existing routes. The two sensitive plant species with the highest number of occurrences with potential direct and indirect effects from noxious weed infestations include the Tuolumne fawn lily and Stebbin's lomatium. Stebbin's lomatium has six sites within 200 feet of noxious weed infestations, and Tuolumne fawn lily has five sites within 200 feet of noxious weed infestations. Table 7 under the Summary of Effects section presents the routes infested with noxious weeds within 200 feet of sensitive plant sites for all of the alternatives.

## Cumulative Effects

Overall, adverse cumulative effects to sensitive plant species from Alternative 4 may or may not be of the scale that could reduce species viability for two of the most potentially affected species: the Tuolumne fawn lily and Stebbin's lomatium. Stebbin's lomatium grows in lava cap habitat areas, which tend to have the highest density of routes affecting rare plant resources. At least 8 percent of the known sites in the analysis area of Stebbin's lomatium are likely to be adversely affected by motorized vehicle use from the additional routes under this alternative.

Approximately 10 percent of the known sites of Tuolumne fawn lily are likely to be adversely affected by motorized vehicle use from the additional routes under this alternative. At this time, it is unlikely that the cumulative effects from past, present, and foreseeable future management activities, including those from motor vehicle impacts, would result in a trend toward federal listing for Tuolumne fawn lily (CNPS list 1B.2) and Stebbin's lomatium (CNPS 1B.1).

Kellogg's lewisia has 10 sites documented in the analysis area but has a larger range within California. Three sites have documented direct impacts from motor vehicles on existing motorized routes. In addition, routes proposed under Alternative 4 may directly affect four sites of this plant species. 70% of the known plant sites of this plant species may be directly affected by motorized travel under this alternative, including the sites affected by existing conditions (Alternative 2) and sites potentially affected by proposed additional routes (Alternative 4). Extensive surveys have not been conducted due to the recent listing as sensitive. It is determined that the cumulative effects in the analysis area from present and foreseeable future management activities would not likely result in a trend toward federal listing for Kellogg's lewisia (CNPS list 3).

Stebbin's lomatium and Kellogg's lewisia grow in lava cap habitat areas where the highest densities of motorized routes occur in the analysis area. Both of these rare plant species are anticipated to decline in the number of individual plants and plant sites under Alternatives 4.

The other meadow-dwelling and riparian sensitive species include the moonworts, the hump-mosses, Bolander's bruchia, Blandow's bog moss and the water-veined lichen. While none of these species is known to be abundant in California, they are wide ranging species thought to be in decline throughout their historic ranges. Even though cumulative effects are likely to occur from present and foreseeable future management activities within the analysis area, there is not likely to be a trend toward federal listing.

There are 29.68 additional and existing miles of motorized routes infested with noxious and invasive weed species under Alternative 4. Alternative 4 has the potential to indirectly and directly effect 49 known sensitive plant sites and suitable habitat areas within 200 feet of weed infested motorized routes. Cumulatively, potential indirect effects to sensitive plant resources caused by invasive species will be slightly less than Alternative 1.

Implementation of Alternative 4 would not, over time, improve conditions for sensitive plants and their habitats because of continued public motorized use. Impacts to sensitive plant occurrences and habitat have occurred in the past, are currently taking place, and will increase in the near future due to the predicted increase in motor vehicle use and the increase in proposed motorized routes. There are four routes that will be mitigated for direct/ and indirect effects to plants and habitat in Alternative 4 (See Mitigation summary at end of this document).

Monitoring of plant sites, signing and barriers may be implemented where continued impacts from off-road vehicles use are apparent. Compliance efforts may assist in limiting the extent of impacts to the more vulnerable sensitive plant habitats.

### **Effects determination**

Under Alternative 4, direct and indirect effects are documented for 523 sensitive plant sites and suitable habitat areas located within 200 feet of 102 routes for motorized vehicle use. This total plant site number includes 410 sites affected by existing routes under Alternative 2 (baseline), in addition to the 123 plant sites that may be affected by proposed additional routes under Alternative 4. The 523 known sensitive plant sites that may be affected by motorized vehicle use under Alternative 4 represent about 33 per cent of the 1,580 total known sensitive plant sites within the analysis area. In Alternative 4, cumulative impacts to sensitive plants within the analysis area of the STF are to remain below the threshold required to conserve viability for these rare plant species.

### **Alternative 5 (Resources)**

This Alternative responds to the Resource protection issues.

#### **Direct and Indirect Effects**

##### **Cross Country Travel**

Cross Country travel is prohibited, except as allowed by permit or other authorization. Parking is allowed within one vehicle length off NFTS routes. Direct impacts to sensitive species from dispersed recreational access could be significant at least at the local, site-specific level. The significance of direct and indirect impacts is dependent on many factors including the amount of disturbance, the sensitive species being impacted, and in some cases, the season when the disturbance takes place. The significance of impacts is also dependent on the number of sensitive plant individuals that occur in a specific location and how many of them are damaged.

##### **Additions to the System**

28.37 additional miles of unauthorized routes are added to the NFTS system under this alternative. Eight routes are within 200 feet of known sensitive plant occurrences. This alternative will have less of an impact to sensitive plant communities than alternative 1, 2, and 4. Alternative 5 may potentially directly and/or indirectly affect nine known sensitive plant sites and suitable habitat areas within 200 feet of proposed motorized routes within the analysis area.

Alternative 5 has the least number of proposed additional routes into meadows and lava cap areas. Alternative 5 also has the least number of additional miles of weed-infested routes, including 25.79 miles of weed-infested routes being analyzed.

##### **Vehicle Class Changes**

##### **Seasonal Closures**

Alternative 5 provides for seasonal closures on designated native and non-native NFTS motorized routes. Lower elevations are open all year, middle elevations are open April 15 through November 15, and upper elevations are open May 15 through November 15. This alternative provides for the greatest protection for botanical resources, including sensitive plant resources, with the longest seasonal closure period in comparison to all of the other alternatives.

## **Wheeled Over Snow**

No wheeled over snow use is being proposed in this alternative.

### **Indicator Measure 1:** Number of sensitive plant sites/ occurrences within 200 feet of wheeled motorized routes

Direct and indirect effects may occur to 9 sensitive plant sites and/or suitable habitat areas located within 200 feet of additional routes open for public wheeled motor vehicle use.

Alternative 5 includes approximately 31 additional miles of unauthorized routes that may cause direct/indirect effects to sensitive plant sites and/or suitable habitat areas. The direct and indirect effects that may occur to undocumented plant occurrences and/or suitable habitats under this alternative are unknown.

Based on the assumption that suitable habitat exist along routes in upland and mid slope habitats and lower montane, chaparral, and woodland habitats, fourteen sensitive plant species may be directly or indirectly affected by routes within 200 feet of suitable habitat. These include: Jepson's onion, Yosemite onion, Nissenan manzanita, big-scale balsamroot, Pleasant Valley mariposa lily, Small's southern clarkia, Merced clarkia, Tahoe draba, Congdon's woolly sunflower, Parry's horkelia, short-leaved hulsea, Tuolumne iris, Yosemite lewisia, and slender-stalked monkeyflower.

Indicator Measure 2: Number of documented direct impacts within 30 feet of sensitive plant sites/occurrences on either side of route's edge.

There are 8 known sensitive plant sites along additional routes analyzed under Alternative 5 that may be impacted by motor vehicle routes by either driving off road or parking. Appendix C in represents the routes with direct impacts to plants for this alternative.

The following number of sites for each sensitive plant species represents the additional routes added to the system under Alternative 5:

- Four sites of Stebbin's lomatium;
- One sites of three bracted onion;
- Two sites of Parry's horkelia; and
- One site of the Small's southern clarkia.

The STF Travel Management Project may affect individuals of these species; however, these effects are not likely to lead to designation as sensitive or to listing under the Endangered Species Act.

### **Indicator Measure 3:** Miles of motorized routes passing through lava caps

There is an additional 6.3 miles of motorized native surface routes proposed within lava cap areas with sensitive plant sites and suitable habitats under this alternative. Alternative 5 has the least number of additional routes in lava cap areas of all of the alternatives.

### **Indicator Measure 4:** Miles of motorized routes passing through meadows

There are 0.2 miles of additional motorized routes through meadows (habitat for several sensitive plant species). Based on the assumption that suitable habitat exist along routes in meadows and riparian areas, seventeen sensitive species, including six mosses, one lichen, five moonworts, Tuolumne fawn lily, Hetch-Hetchy monkeyflower, subalpine fireweed, pansy monkeyflower, and Pilot Ridge fawn lily may be directly/indirectly affected by routes open for public wheeled motor vehicle use through wet areas. Alternative 5 provides the most protection of STF meadow and riparian botanical resources of all of the action alternatives.

**Indicator Measure 5:** Miles of motorized routes infested with invasive plant species within 200 feet of sensitive plant occurrences/ and habitat

0.02 additional miles, including seven additional motorized routes, infested with invasive plant species under Alternative 5 with the potential to indirectly and directly affect sensitive plant sites and suitable habitat areas. Currently, there are seven known noxious and invasive weed infestations within 200 feet of sensitive plant sites and suitable habitat areas documented for the additional routes proposed under Alternative 5. There are five sensitive plant sites within 200 feet of noxious weeds that may be indirectly or directly affected by infestations additional routes under this alternative. Table 7 under the Summary of Effects section (page 35) presents the routes infested with noxious weeds within 200 feet of sensitive plant sites for all of the alternatives.

### **Cumulative Effects**

Alternative 5 will provide more protection of botanical resources and conservation of sensitive plant sites and suitable habitat areas than Alternatives 1, 2 and 4. Cumulative effects would continue to impact sensitive plants and their habitat, but in a manner that slows the damage incurred from motor vehicle travel. This is mainly due to a reduction in miles of routes open for public motorized use within and adjacent to suitable habitat areas and plant occurrences, and the prohibition of cross-country travel. Meadow, riparian and other wetland habitats are provided with more protection under Alternative 5, as there are fewer roads that would affect wet habitats, including areas with suitable habitats and sensitive plant occurrences. Lava cap habitat areas will also be provided with more protection, as Alternative 5 has the least number of additional motorized routes in lava caps. There is one route to be mitigated under this Alternative for direct and indirect affects to plants and habitat (See Mitigation measures at the end of this document). Monitoring and compliance efforts would still be necessary to mitigate damage to the most vulnerable sites.

There are 25.79 additional and existing miles of motorized routes infested with noxious and invasive weed species under Alternative 5. Alternative 5 has the potential to directly and indirectly affect 37 known sensitive plant sites and suitable habitat areas within 200 feet of additional and existing miles of weed infested motorized routes. Cumulatively, potential direct and indirect effects to sensitive plant and other botanical resources caused by invasive species will be less for Alternative 5 than for the other action alternatives (1 and 3, 4).

### **Alternative 5 Effects determination**

There are approximately 418 documented sensitive plant sites within 200 feet of analyzed routes in Alternative 5 that may be impacted by motor vehicle routes either by driving off road, parking. This total plant site number includes 410 sites directly affected by routes under Alternative 3 (baseline), and 9 sites potentially affected by routes proposed under Alternative 5. The known sites potentially affected by roads under Alternative 5 represents about 26 per cent of the 1580 total known sensitive plant sites within the analysis area of the STF.

## MANAGEMENT RECOMMENDATIONS

### **Monitoring**

#### **Plants**

Monitoring is identified in Chapter 2 of the DEIS. Monitoring of sensitive plants would occur in areas of the Forest where concentrated numbers of sensitive plant sites are located along open routes. These areas have the greatest potential for adverse effects from motor vehicles.

Monitoring of impacted occurrences should take place yearly for five years to determine whether the occurrences are still extant (have not been extirpated) and to determine whether effects will have lasting adverse effects.

#### **Meadows**

Field monitoring of meadows would be implemented for meadows greater than one acre in size that have a road or trail within the meadow or that bisects the meadow. Several Sensitive plant taxa can occur within meadows and this monitoring would help to document occurrences and protect their habitat. If adverse impacts to the hydrologic function of meadows were detected, measures would be employed to restore proper functioning condition.

### **Maintenance of Transportation Facilities**

Routine maintenance is assumed with any of the proposed routes:

For repair and maintenance of roads, trails, and landline boundaries. Examples include but are not limited to:

- Authorizing a user to grade, resurface, and clean the culverts of an established NFS road;
- Grading a road and clearing the roadside of brush without the use of herbicides;
- Resurfacing a road to its original condition;
- Pruning vegetation and cleaning culverts along a trail and grooming the surface of the trail; and
- Surveying, painting, and posting landline boundaries.

For repair and maintenance of recreation sites and facilities:

Examples include but are not limited to:

- Applying registered herbicides to control poison oak on infested sites in a campground;
- Applying registered insecticides by compressed air sprayer to control insects at a recreation site complex;
- Repaving a parking lot; and
- Applying registered pesticides for rodent or vegetation control.

Routine maintenance for areas containing sensitive plant occurrences would include monitoring sites during and after special events, such as the Enduro races that take place in the spring. This is a “high” risk season for sensitive plants when the soil is moist and more susceptible to rutting and changes in water runoff. Maintenance does not include building waterbars to direct the flow of runoff, and construction of waterbars would require mitigative measures in a future analysis.

Some of the trails will continue to impact known sensitive plant occurrences and habitat. Lava caps are particularly sensitive to these events, and it is recommended that timing of maintenance activities be considered in the fall when impacts would be reduced. Projects requiring plant surveys shall be submitted annually by February 1 of the scheduled project year (STF 2001, Off Highway vehicle Trail Conservation and Erosion Control Standard and Guidelines.)

If maintenance requires brushing and piling, it is recommended that the activity does not occur on sensitive lava cap areas and near sensitive plant occurrences. Signs indicating Sensitive Resource are recommended in sensitive areas, such as lava caps, to deter visitors from parking, pulling off, or turning around on the volcanic soils. Further direction for SWECO equipment repair projects from the Guidelines are summarized as followed:

- Sensitive Plant and Noxious Weed sites near tractor repair locations shall be flagged and avoided
- SWECO Tractor and all other mechanized equipments shall be washed of all debris
- If noxious weeds are discovered in the area, equipment shall be washed prior to leaving the noxious weed site and District Botanist consulted
- The discovery of previously unknown or uninventoried potential Sensitive Plants and Noxious Weed sites shall be reported prior to the continuation of additional trail repairs at or near discovery site
- All site-specific requirements identified in Biological Evaluations shall be followed and adhered to.

Equipment that is used for administrative maintenance activities should be cleaned when working between areas so as not to chance weed infestation from seed carrying. See standard project prevention measures.

Recommendations: The following recommendations are made to reduce impacts to sensitive species and native plant communities that support them:

- Use only certified weed-free products for erosion control to avoid possible adverse impacts to sensitive plant and habitat.
- Ensure that all equipment used is weed free.
- Follow the STF seeding guidelines
- Survey all motorized trails before they are open for use
- Routinely (annually) survey motorized trails for weed occurrence and treat weeds rapidly
- Ensure routine maintenance of motorized trails to reduce erosion and possible degradation of native plant communities

### **Recommended Mitigations**

Four routes have been identified for mitigative measures to be implemented because of impacts to the sensitive plants and habitats. These routes are within the Deer Creek area with impacts to the Tuolumne fawn lily, and the Stebbin's lomatium occurrences in one area. These routes are:

15EV38 – rock barriers to be placed 50 feet at base of incline to deter vehicles from sensitive plants; Recommend accurately mapping and monitoring occurrence 16-9D of Tuolumne fawn lily (Alternatives 1, 4, and 5).

16EV108 – log barriers to be placed 50 feet at base of hill climb to prevent trail access and widening, and access to lava cap and lomatium occurrence. Tractor is not recommended and

barrier type would require no digging (Alternatives 1 and 4).

16EV209 – rock barriers 740 feet along creek and occurrence; Recommend survey, mapping, and monitoring Tuolumne fawn lily occurrences (Alternative 4).

16EV265 - rock barriers 182 feet along occurrence of Tuolumne fawn lily to prevent further impacts from vehicles and weed disbursement (Alternatives 1 and 5).

If plant populations continue to be impacted, future analysis for removal of the route from the system would be conducted when conditions do not meet standards.

Sensitive Plant protection (Forest Service Manual (FSM 2670.32; USDA FS, 1995): In order to reduce, minimize or alleviate possible adverse effects to Sensitive Plants, the following management requirements are recommended for implementation of the Travel Management Plan.

- Areas of suitable habitat that have not been surveyed will be treated as having sensitive plants unless surveys are done and no sensitive plants are found.
- Avoid or minimize impacts to species whose viability has been identified as a concern.
- If impacts cannot be avoided, 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.
- If monitoring indicates negative impacts to sensitive plants or plant habitat, determine site-specific mitigations to minimize or eliminate further damaging from motor vehicle use. Actions may include signing the area for special resource concerns, erecting barricades to block vehicle use, or most restrictive closing the route seasonally or year-around.

### **Monitoring**

- Sensitive Plants: Monitoring is identified in Chapter 2 of the DEIS. Monitoring of sensitive plants would occur in areas of the Forest where concentrated numbers of sensitive plant sites are located along open routes. These areas have the greatest potential for adverse effects from motor vehicles.
- Monitoring of impacted occurrences should take place yearly for five years to determine whether the occurrences are still extant (have not been extirpated) and to determine whether impacts will have lasting adverse effects.
- Meadows, Fens, Bogs, Riparian Habitat: Field surveys of meadows would be implemented for meadows greater than one acre in size that have a road or trail within the meadow or that bisect the meadow. Several Sensitive plant taxa can occur within meadows and monitoring and mitigation would help to protect their habitat. If adverse impacts to the hydrologic function of meadows were detected, measures would be employed to restore proper functioning condition. Monitoring of meadow areas continues on each of the three districts, as individual projects demand, however, information for this analysis was derived from existing data sources and Stanislaus NF Fen and Meadow survey report (USDA FS 2007).

In accordance with the Forest Plan, mitigation measures specified below will be implemented. These mitigation measures will provide benefits to sensitive and watchlist species and other native vegetation. Motorized trails un-authorized for motorized use with serious and adverse erosion problems will not be available for use until those erosion problems are mitigated by each resource. Regardless of the alternative selected, native vegetation will be at risk of being negatively impacted by motorized vehicle use until erosion from roads/trails/areas is reduced

and/or eliminated. Negative impacts to native vegetation are not considered significant unless those impacts are reducing the viability of a species or a plant community. This analysis therefore focuses on impacts to rare plant species and plant communities.

Mitigation activities may use one or more of the following hand tools or mechanized equipment depending on route location and accessibility:

Mechanized equipment: ATV, auger, chainsaw, compactor, pole saw, rock rake, tractor, trailer, etc. Hand tools: handsaw, McLeod, pick, posthole digger, pruning shear, rake, shovel, etc.

The following mitigation measures apply to the action alternatives:

1. **Annual Maintenance:** maintenance and repair of a route annually due to less favorable soil type, steeper tread gradient, and/or higher trail use.
2. **Boardwalk:** trail tread reinforcement structure resembling a low bridge and constructed over wet or otherwise unstable soil.
3. **Cattleguard:** motorcycle/ATV cattleguard (width 60 inches or less) installed along existing fence line, causing minimal ground disturbance, as structure requires leveling of surface only.
4. **Combined Use Sign Plan:** prepare and implement sign plan for identified portions of high standard (passenger car) roads for Combined Use by highway legal and non-highway legal vehicles.
5. **Drain Dips:** Constructed erosion control technique, which reverses the grade of a trail for a distance of 15-20 feet before returning to the prevailing grade. The change in grade forces water to run off the trail surface rather than gaining additional velocity and volume. Hardened drain dips include additional tread hardening.
6. **Fence Barrier:** wood fence constructed using 4 to 6 inch vertical posts with horizontal rails bolted through posts, 30 inches above ground surface. Requires digging up to 8 inch wide by 24 inch deep hole for installation of post.
7. **Full Bench:** trail resting entirely on an excavation into a steep side slope, no fill is used to support the trail.
8. **Log Barrier:** logs placed in a shallow trench along a travel way restricting vehicle traffic to desired locations.
9. **Mixed Use Sign Plan:** prepare and implement sign plan for identified portions of certain (high clearance) roads available for use by both highway legal and non-highway legal motor vehicles.
10. **No-Dig Barrier:** low resource impact, vehicle barrier constructed by placing full-length railroad ties on top of 24 inch ties, held in place by driving rebar through ties into ground approximately 24 inches. Requires no digging of holes, but sometimes leveling of ground is required for placement.
11. **No Vehicles Sign:** small standard traffic signs posted alongside routes to control and direct traffic.
12. **Rock Barrier:** large rock boulders, usually 36 to 48 inch diameter, placed in shallow holes along a travel way to restrict vehicle traffic to desired locations.
13. **Tread Harden:** tread or stream crossing treatment using concrete blocks, geosynthetics, logs, mechanical compaction, rock ballast, soil cement or timbers to protect the trail surface.
14. **Waterbars:** constructed log, rock or soil berm that diverts water from the trail tread.

## MITIGATION FOR NOXIOUS/INVASIVE WEEDS

Mitigation measures are limited. Standard project prevention measures (e.g., equipment and vehicle washing before entering uninfested areas) are not applicable under travel management. Mechanical treatments of noxious weeds are labor intensive and expensive, require many years of repeated treatment, and are impractical for infestation. Chemical treatments have been limited primarily to yellow starthistle on the three districts within the analysis area. Unless an environmental analysis is approved for chemical treatment of invasive species, the risk of spreading noxious weeds will remain high within and adjacent to infested areas. Best Management Practices have been proposed to the Regional Office on October 17, 2007, streamlining direction for Invasive Plant Prevention and Management (Willits, email 1.16.09). A complete copy of recommendations is on file with the project record.

## EFFECTS SUMMARY

The following summary presents the results from the botanical resources analysis for rare plants, unique habitats, other botanical resources, including noxious and invasive weeds for the STF. Although the effects to sensitive plants vary by alternative and the selection of any alternative may contribute to adverse effects on multiple occurrences of sensitive plants, all alternatives, except Alternative 2, represent a decreased risk to sensitive plants than under the existing conditions. The six sensitive plant taxa that have been most affected in the past, due to the habitats' proximity to routes, will continue to be most at risk in the future. These sensitive taxa include Stebbin's lomatium (*Lomatium stebbinsii*), Tuolumne fawn lily (*Erythronium tuolumnense*), three bracted onion (*Allium tribracteatum*), Kellogg's lewisia (*Lewisia kelloggii*), Small's southern clarkia (*Clarkia australis*), and Hetch-Hetchy monkeyflower (*Mimulus filicaulis*). These six taxa have sites and suitable habitat adjacent to routes included in all the alternatives with the exceptions of Alternative 3, which does not have routes with impacts to Kellogg's lewisia, and Alternative 5, which has routes adjacent to occurrences of four taxa.

**Table 8 Summary of Sensitive Taxa and Watchlist species Occurrences**

Common Name	Sensitive/Watchlist	Total
Three bracted onion	Sensitive	47
Yosemite onion	Sensitive	4
Big-scale balsamroot	Sensitive	6
Bolander's bruchia	Sensitive	1
Small's southern clarkia	Sensitive	484
Mariposa clarkia	Sensitive	152
Mountain lady's slipper	Sensitive	35
Norris' beard moss	Watchlist	1
Congdon's woolly sunflower	Sensitive	24
Yosemite woolly sunflower	Sensitive	3
Button celery	Watchlist	2
Taylor's fawn lily	Sensitive	1
Tuolumne fawn lily	Sensitive	42
Parry's horkelia	Sensitive	129
Veiny aquatic lichen	Sensitive	8
Tuolumne iris	Sensitive	2
Congdon's bitterroot	Sensitive	3
Kellogg's lewisia	Sensitive	10
Stebbin's lomatium	Sensitive	328
Hetch-Hetchy monkeyflower	Sensitive	204
Pansy monkeyflower	Sensitive	76
Beaked sedge	Watchlist	1
<b>Total</b>		<b>1,584</b>

Table 9 presents the direct and indirect effects to sensitive plants by alternative for each indicator measure developed. The effects were analyzed for the action alternatives (Alternative 1, 3, 4 and 5) with additional miles of routes proposed, and with total miles of existing and additional for all the alternatives.

**Table 9 Summary of Direct and Indirect Effects to Sensitive Plants by Alternative**

Sensitive Plant Occurrence Effects	Indicator Measure	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Number of Sites Directly/Indirectly Affected (w/in 200 ft) by <b>Additional</b> Routes	1	83	0	0	123	9
Number of Sites Directly/Indirectly (w/in 200 ft) Affected by <b>Total</b> Number of Routes	1	493	612	410	523	419
Number of Sites Directly Affected by <b>Additional</b> Routes	2	59	0	0	69	8
Number of Sites Directly Affected by <b>Total</b> Number of Routes	2	111	101	55	123	64
Number of Sites Directly/Indirectly Affected on Lava Caps by <b>Additional</b> Routes	3	31	0	0	36	6
Number of Sites Directly/Indirectly Affected on Lava Caps by <b>Total</b> Number of Routes	3	43	166	12	48	18
Number of Sites Directly/Indirectly Affected in Moist Habitats by <b>Additional</b> Routes	4	33	0	0	15	0
Number of Sites Directly/Indirectly Affected in Moist Habitats by <b>Total</b> Number of Routes	4	51	66	18	33	18
Number of Sites Directly/Indirectly Affected by Invasive Plant Infestations (w/in 200 ft) by <b>Additional</b> Routes	5	22	0	0	17	5
Number of Sites Directly/Indirectly Affected by Invasive Plant Infestations (w/in 200 ft) by <b>Total</b> Number of Routes	5	63	41	41	58	46

From the results presented in Table 9, Alternative 5 will have the least amount of impact to unique habitats such as lava caps and meadows, while Alternative 3 will have the least amount of overall indirect and direct impacts to sensitive plant sites. Alternative 2 (no action) poses the greatest indirect and direct effects to sensitive plants and suitable habitats along existing routes and to lava cap and moist habitat types. Alternative 4 has the potential for the highest direct impacts to known sensitive plant sites, while Alternative 3 poses the greatest risk to sensitive plants indirectly and directly affected by routes within 200 feet of areas infested with noxious and invasive plants.

Table 10 presents the direct effects to sensitive plants and one moss by species as measured by using the numbers in Indicator Measure 3 and adding the proposed alternative numbers from 1, 4, and 5. The effects were analyzed for all of the alternatives including additional miles of routes proposed, and existing miles of routes for alternative 2.

**Table 10 Summary of Direct Effects (Indicator Measure 2) to Sensitive Plants by Alternative**

Plant Species	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
<i>Lomatium stebbinsii</i>	26	68	31	30	4
<i>Allium tribracteatum</i>	4	18	5	5	1
<i>Clarkia australis</i>	7	45	39	9	1
<i>Clarkia biloba</i> ssp. <i>australis</i>	2	25	24	2	0
<i>Mimulus filicaulis</i>	9	15	14	11	0
<i>Horkelia parryi</i>	5	19	10	6	2
<i>Erythronium tuolumnense</i>	3	28	12	4	0
<i>Cypripedium montanum</i>	0	4	4	0	0
<i>Mimulus pulchellus</i>	0	15	10	0	0
<i>Lewisia kelloggii</i> ssp. <i>kelloggii</i>	3	3	0	4	0
<i>Eriophyllum congdonii</i>	0	3	3	0	0
<i>Eriophyllum nubigenum</i>	0	3	0	0	0
<i>Hydrothyria venosa</i>	0	2	1	0	0

<i>Iris hartwegii</i> ssp. <i>columbiana</i>	0	1	1	0	0
<i>Balsamoriza macrolepis</i> var. <i>macrolepis</i>	0	0	0	0	0
<b>Moss Species</b>					
<i>Bruchia bolanderi</i>	0	2	1	0	0
<b>Additional Miles of Routes with Direct Effects to Plant Sites</b>	<b>55</b>	<b>0</b>	<b>0</b>	<b>69</b>	<b>8</b>
<b>Total Miles of Routes with Direct Effects to Plant Sites</b>	<b>210</b>	<b>248</b>	<b>155</b>	<b>224</b>	<b>163</b>
	<b>114</b>	<b>251</b>		<b>140</b>	<b>16</b>
	<b>96</b>	<b>3</b>	<b>0</b>	<b>124</b>	<b>147</b>

As the data from Tables 9 and 10 indicate, the potential for direct impacts to sensitive plants and unique habitats increases with additional miles of motorized routes proposed for action Alternatives 1 and 4, respectively.

### Determination of Effects

It is my determination that the STF Public Wheeled Motorized Travel Management EIS:

1) Would have no effect on the sensitive plant species: Tahoe draba (*Draba asterophora* var. *asterophora*).

2) May affect individuals but likely would not result in a trend toward federal listing for the following sensitive plant species:

Jepson's onion (*Allium tribracteatum*), three bracted onion (*Allium tribracteatum*), Yosemite onion (*Allium yosemitense*), Nissenan's manzanita (*Arctostaphylos nissenana*), big-scale balsamroot (*Balsamorhiza macrolepis* var. *macrolepis*), upswept moonwort, (*Botrychium ascendens*), scalloped moonwort (*Botrychium crenulatum*), common moonwort (*Botrychium lunaria*), Mingan's moonwort (*Botrychium manganese*), Pleasant Valley Mariposa lily (*Calochortus clavatus* var. *avius*), Small's southern clarkia (*Clarkia australis*), Mariposa clarkia (*Clarkia biloba* ssp. *australis*), Merced clarkia (*Clarkia lingulata*), mountain lady's slipper (*Cypripedium montanum*), subalpine fireweed (*Epilobium howellii*), Congdon's woolly sunflower (*Eriophyllum congdonii*), Yosemite woolly sunflower (*Eriophyllum nubigenum*), Taylor's fawn lily (*Erythronium taylori*), Tuolumne fawn lily (*Erythronium tuolumnense*), Parry's horkelia (*Horkelia parryi*), short-leaved hulsea (*Hulsea brevifolia*), Tuolumne iris (*Iris hartwegii* ssp. *columbiana*), Congdon's bitterroot (*Lewisia congdonii*), Yosemite lewisia (*Lewisia disepala*), Kellogg's lewisia (*Lewisia kelloggii* ssp. *kelloggii*), Stebbin's lomatium (*Lomatium stebbinsi*), slender lupine (*Lupinus gracilentus*), Hetch-Hetchy monkeyflower (*Mimulus filicaulis*), slender-stalked monkeyflower (*Mimulus gracilipes*), pansy monkeyflower (*Mimulus pulchellus*), and sensitive lichen species: veiny aquatic lichen (*Hydrothyria venosa*); and sensitive moss species: Bolander's bruchia (*Bruchia bolanderi*), Bolander's bruchia (*Helodium blandowii*), three ranked hump moss (*Meesia triquetra*), broad nerved hump moss (*Meesia uliginosa*), and elongate copper moss (*Miclichoferia elongata*).

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 8/11/08 - GIS metadata shapefiles- information provided as metadata supplement  
 to OHV route designation project.  
 8/06/08 – dispersed campsite concerns  
 8/06/08 – prefield review  
 8/04/08 – GPS units and data  
 7/28/08 – Sensitive Plants and staging areas  
 7/23/08 – BE example, South 108phase2 revision  
 6/23/08 – Step 3 botany tracking doc, OHV/sensitive plant route concerns  
 6/23/08 – updated sensitive plant shape files  
 6/23/08 – Draft NOI For Route Designation  
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## Appendix A Alternative 1 Additions to the NFTS with Direct Impacts to Sensitive Plants

### Additions to the NFTS with Direct Impacts to Sensitive Plants

<b>Additions Route</b>	<b>Species Identifier</b>	<b>????</b>	<b>District</b>	<b>Quad</b>	<b>Additions Route</b>	<b>Species Identifier</b>	<b>????</b>	<b>District</b>	<b>Quad</b>
16EV108	ALTRLOST	19	Mi-Wok	Twain Harte	FR98503	CLAU2	17	Groveland	Ascension Mt
16EV108	LOST5	19	Mi-Wok	Twain Harte	FR98531	CLBIA	17	Groveland	Ascension Mt
16EV109	LOST5	19	Mi-Wok	Twain Harte	FR98535	CLAU2	17	Groveland	Ascension Mountain
16EV110	ALTRLOST	19	Mi-Wok	Twain Harte	FR98538	CLAU2	17	Groveland	Ascension Mountain
16EV111	ALTRLOST	19	Mi-Wok	Twain Harte	FR98551	CLAU2	16	Groveland	El Portal
16EV230	ERTU	19	Mi-Wok	Twain Harte	FR98581	CLBIA	16	Groveland	Cherry Lake S
16EV236	LOST5	19	Mi-Wok	Twain Harte	FR98602	LOST5	16	Mi-Wok	Hull Creek
16EV265	ERTU	19	Mi-Wok	Twain Harte	FR98680	ERTU	17	Mi-Wok	Columbia SE
17EV153	LOST5	16	Mi-Wok	Hull Creek	FR98697	ALTRLOST	16	Mi-Wok	Crandall Peak
17EV182	HOPA2	16	Groveland	Buckhorn Creek	1S1921	CLAU2	16	Groveland	Ascension Mt
17EV183	HOPA2	16	Groveland	Buckhorn Creek					
17EV184	HOPA2	16	Groveland	Buckhorn Creek					
17EV300	LOST5	16	Mi-Wok	Hull Creek					
17EV303	LOST5	16	Mi-Wok	Hull Creek					
17EV318	MIFI	18	Groveland	Jawbone Ridge					
17EV319	MIFI	18	Groveland	Jawbone Ridge					
17EV320	MIFI	18	Groveland	Jawbone Ridge					
17EV322	MIFI	18	Groveland	Jawbone Ridge					
17EV323	MIFI	18	Groveland	Jawbone Ridge					
17EV324	MIFI	18	Groveland	Jawbone Ridge					
17EV325	MIFI	18	Groveland	Jawbone Ridge					
17EV326	MIFI	18	Groveland	Jawbone Ridge					
17EV327	MIFI	18	Groveland	Jawbone Ridge					
17EV37	LOST5	18	Mi-Wok	Hull Creek					
17EV45	LOST5	18	Mi-Wok	Hull Creek					
17EV53	LOST5	16	Mi-Wok	Hull Creek					
17EV54	LOST5	18	Mi-Wok	Hull Creek					
17EV58	LOST5	16	Mi-Wok	Hull Creek					
17EV60	LOST5	16	Mi-Wok	Hull Creek					
17EV60	LOST5	18	Mi-Wok	Hull Creek					
17EV78	LOST5	16	Mi-Wok	Hull Creek					
17EV79	LOST5	18	Mi-Wok	Hull Creek					
17EV88	LOST5	16	Mi-Wok	Hull Creek					
17EV91	LEKEK	18	Mi-Wok	Hull Creek					
17EV91	LOST5	18	Mi-Wok	Hull Creek					
18EV110	LEKEK	19	Mi-Wok	Hull Creek					
18EV110	LOST5	19	Mi-Wok	Hull Creek					
18EV134	LOST5	16	Mi-Wok	Hull Creek					
18EV170	LEKEK	19	Mi-Wok	Hull Creek					
18EV170	LOST5	19	Mi-Wok	Hull Creek					

## Appendix B Alternative 1 Additions to the NFTS with weed occurrences

Additions to the NFTS with weed occurrences and associated Direct Impacts to sensitive plants

Route	Sensitive Species	Sensitive Species	
15EV43C	ERTU	CEME2	16
15EV43C	ERTU	CESO3	16
15EV43C	ERTU	CESO3,CE	16
15EV43C	ERTU	SIMA	16
15EV43C	ERTU	SIMA3	16
15EV43G	ERTU	CESO3 or	16
16EV108	LOST	BRTE	19
16EV109	LOST	BRTE	19
16EV236	LOST	BRTE	19
17EV183	HOPA	CESO3	16
17EV192	MIFI/HOPA	CESO3	16
17EV192A	MIFI/HOPA	CESO3	16
17EV231	ALTR/LOST	AIAL	16
17EV78	LOST	BRTE	16
17EV88	LOST/ALTR	BRTE	16
18EV110	LEKEL/LOST	BRTE	19
FR98581	CLBIA	CESO3	16

## Appendix C Alternative 4 Additions to the NFTS with associated Direct Impacts to Sensitive Plants

### Alternative 4 Additions to the NFTS with associated Direct Impacts to Sensitive Plants

Route	Species Identifier		District	Quad	Route	Species Identifier		District	Quad
16EV108	ALTRLOST	19	Mi-Wok	Twain Harte	17EV78	LOST5	16	Mi-Wok	Hull Creek
16EV108	LOST5	19	Mi-Wok	Twain Harte	17EV79	LOST5	18	Mi-Wok	Hull Creek
16EV109	LOST5	19	Mi-Wok	Twain Harte	17EV88	LOST5	16	Mi-Wok	Hull Creek
16EV110	ALTRLOST	19	Mi-Wok	Twain Harte	17EV91	LEKEK	18	Mi-Wok	Hull Creek
16EV111	ALTRLOST	19	Mi-Wok	Twain Harte	17EV91	LOST5	18	Mi-Wok	Hull Creek
16EV209	ERTU	18	Mi-Wok	Twain Harte	18EV110	LEKEK	19	Mi-Wok	Hull Creek
16EV230	ERTU	19	Mi-Wok	Twain Harte	18EV110	LOST5	19	Mi-Wok	Hull Creek
16EV236	LOST5	19	Mi-Wok	Twain Harte	18EV134	LOST5	16	Mi-Wok	Hull Creek
16EV265	ERTU	19	Mi-Wok	Twain Harte	18EV170	LEKEK	19	Mi-Wok	Hull Creek
17EV10	CYMO2	19	Mi-Wok	Hull Creek	18EV170	LOST5	19	Mi-Wok	Hull Creek
17EV101	ALTRLOST	19	Mi-Wok	Crandall Peak	18EV94	LEKEK	16	Mi-Wok	Hull Creek
17EV101	LOST5	19	Mi-Wok	Crandall Peak	18EV94	LOST5	16	Mi-Wok	Hull Creek
17EV153	LOST5	16	Mi-Wok	Hull Creek	1S1734A	AGEL8	17	Groveland	Jawbone Ridge
17EV182	HOPA2	16	Groveland	Buckhorn Creek	1S1824	CLAU2	16	Groveland	Ascension Mt
17EV183	HOPA2	16	Groveland	Buckhorn Creek	1S1824	MIFI	16	Groveland	Ascension Mt
17EV184	HOPA2	16	Groveland	Buckhorn Creek	1S1913	CLAU2	16	Groveland	Ascension Mt
17EV300	LOST5	16	Mi-Wok	Hull Creek	1S1913	MIFI	16	Groveland	Ascension Mt
17EV303	LOST5	16	Mi-Wok	Hull Creek	1S1920	CLAU2	16	Groveland	Ascension Mt
17EV318	MIFI	18	Groveland	Jawbone Ridge	1S1921	CLAU2	16	Groveland	Ascension Mt
17EV319	MIFI	18	Groveland	Jawbone Ridge	1S1930	CLAU2	16	Groveland	Ascension Mt
17EV320	MIFI	18	Groveland	Jawbone Ridge	31736A	LOST5	16	Mi-Wok	Hull Creek
17EV322	MIFI	18	Groveland	Jawbone Ridge	3S1815	HOPA2	18	Groveland	Kingsley
17EV323	MIFI	18	Groveland	Jawbone Ridge	FR10200	HOPA2	16	Groveland	Buckhorn Creek
17EV324	MIFI	18	Groveland	Jawbone Ridge	FR98485	HOPA2	17	Groveland	Buckhorn Creek
17EV325	MIFI	18	Groveland	Jawbone Ridge	FR98503	CLAU2	17	Groveland	Ascension Mt
17EV326	MIFI	18	Groveland	Jawbone Ridge	FR98531	CLBIA	17	Groveland	Ascension Mt
17EV327	MIFI	18	Groveland	Jawbone Ridge	FR98535	CLAU2	17	Groveland	Ascension Mt
17EV37	LOST5	18	Mi-Wok	Hull Creek	FR98538	CLAU2	17	Groveland	Ascension Mt
17EV45	LOST5	18	Mi-Wok	Hull Creek	FR98551	CLAU2	16	Groveland	EI Portal
17EV50	LOST5	18	Mi-Wok	Hull Creek	FR98581	CLBIA	16	Groveland	EI Portal
17EV53	LOST5	16	Mi-Wok	Hull Creek	FR98602	LOST5	16	Mi-Wok	Hull Creek
17EV54	LOST5	18	Mi-Wok	Hull Creek	FR98680	ERTU	17	Mi-Wok	Columbia SE
17EV58	LOST5	16	Mi-Wok	Hull Creek	FR98697	ALTRLOST	16	Mi-Wok	Crandall Peak
17EV60	LOST5	16	Mi-Wok	Hull Creek					
17EV60	LOST5	18	Mi-Wok	Hull Creek					

## Appendix D Alternative 4 Additions with weed occurrences and associated Direct Impacts to sensitive plants

**Alternative 4** Additions with weed occurrences and associated Direct Impacts to sensitive plants

<b>Route</b>	<b>Sensitive Species Identifier</b>	<b>Weed Species Identifier</b>	
15EV43C	ERTU	CEME2	16
15EV43C	ERTU	CESO3	16
15EV43C	ERTU	CESO3,CE	16
15EV43C	ERTU	SIMA	16
15EV43C	ERTU	SIMA3	16
15EV43G	ERTU	CESO3 or	16
16EV108	LOST	BRTE	19
16EV109	LOST	BRTE	19
16EV236	LOST	BRTE	19
17EV183	HOPA	CESO3	16
17EV192	MIFI/HOPA	CESO3	16
17EV192A	MIFI/HOPA	CESO3	16
17EV231	ALTR/LOST	AIAL	16
17EV78	LOST	BRTE	16
17EV88	LOST/ALTR	BRTE	16
18EV110	LEKEL/LOST	BRTE	19
FR98581	CLBIA	CESO3	16

## Appendix E Tables of Effects Alternative 5

### a. Additions to the NFTS with Direct Impacts to Sensitive Plants

Route	Species Identifier		District	Quad
16EV109	LOST5	19	Mi-Wok	Twain Harte
16EV111	ALTRLOST	19	Mi-Wok	Twain Harte
16EV236	LOST5	19	Mi-Wok	Twain Harte
17EV182	HOPA2	16	Groveland	Buckhorn Creek
17EV183	HOPA2	16	Groveland	Buckhorn Creek
17EV300	LOST5	16	Mi-Wok	Hull Creek
1S1930	CLAU2	16	Groveland	Ascension Mt

### b. Additions to the NFTS with weed occurrences and associated direct impacts to sensitive plants

Route	Sensitive Plant Identifier	Weed Species Identifier		District	Quad
16EV109	LOST5	BRTE	19	Mi-Wok	Twain Harte
16EV236	LOST5	BRTE	19	Mi-Wok	Twain Harte
17EV183	HOPA2	CESO3	16	Groveland	Buckhorn Creek
17EV192	HOPA2/MIFI	CESO3	16	Groveland	Jawbone

## Appendix F Sensitive Plant and Watchlist Occurrences

**Total Sensitive Plant and Watchlist Occurrences**

<b>Common Name</b>	<b>Sensitive/Watchlist</b>	<b>Total Occurrences</b>
Three bracted onion	Sensitive	47
Yosemite onion	Sensitive	4
Big-scale balsamroot	Sensitive	6
Bolander's bruchia	Sensitive	1
Small's southern clarkia	Sensitive	484
Mariposa clarkia	Sensitive	152
Mountain lady's slipper	Sensitive	35
Norris' beard moss	Watchlist	1
Congdon's woolly sunflower	Sensitive	24
Yosemite woolly sunflower	Sensitive	3
Button celery	Watchlist	2
Taylor's fawn lily	Sensitive	1
Tuolumne fawn lily	Sensitive	42
Parry's horkelia	Sensitive	129
Veiny aquatic lichen	Sensitive	8
Tuolumne iris	Sensitive	2
Congdon's bitterroot	Sensitive	3
Kellogg's lewisia	Sensitive	10
Stebbin's lomatium	Sensitive	328
Hetch-Hetchy monkeyflower	Sensitive	204
Pansy monkeyflower	Sensitive	76
Beaked sedge	Watchlist	1
<b>Total</b>		<b>1,584</b>

## Appendix G Acres of Weed Infestation

### Total Acres of Weed Infestation

PLANT_CODE	# of Plots	ACRES
AECY	1	0.05
AETR	2	0.04
AIAL	1	0.09
BROOM	1	0.18
BRTE	19	46.46
CAPY2	23	8.26
CEDI3	1	2.10
CEME2	139	150.10
CESO3	901	2,176.10
CESO3 or	1	0.24
CESO3,CE	2	1.14
CESO3?	1	0.03
CESO3CC	1	5.10
CESTM	4	0.51
CIAR	1	0.25
CIVU	107	33.32
COAR	1	0.01
CYSC	5	0.49
CYSC4	4	1.43
GEMO	1	0.27
HYPE	55	42.53
ISTI	4	0.74
LEVU	10	0.41
RUDI2	3	4.40
RULA	1	5.06
SAOF	2	1.08
SIMA	2	0.21
SIMA3	1	0.16
SPJU	1	0.02
TACA	3	1.36
TACA,CES	1	0.10
TACA8	61	138.34
TRTE	2	0.11
VETH	22	2.28
	<b>Total acres</b>	<b>2,622.96</b>

## Appendix H Comparison of Miles of Road Infested with Invasive Weed Species

<b>Miles of road infested with Invasive weed species</b>				
<b>Maintenance Level</b>	<b>NALT1</b>	<b>NALT2&amp;3</b>	<b>NALT4</b>	<b>NALT5</b>
ML1	7.36	7.51	4.09	7.50
ML2	16.37	24.36	21.34	16.06
ML2 SLO	4.58	0.00	3.40	4.57
ML3+ SLO	4.91	5.16	4.94	5.16
Total	33.22	37.03	33.77	33.29
Subtotal Motorized Roads (ML2, ML2 SLO & ML3)	<b>25.86</b>	<b>29.52</b>	<b>29.68</b>	<b>25.79</b>
Motorized Trails ( on AD Tables for BE sensitive plants noxious weeds.doc)	0.80	0.0	4.00	0.0
Total Miles weed infested motorized routes	<b>26.66</b>	<b>29.52</b>	<b>33.68</b>	<b>25.79</b>

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## Appendix I Summary of Routes with Direct Effects to Sensitive Plants Alternative 2 and 3

ii The summaries for number of routes includes a route only once even if the route has multiple sites

### Alternative 2 – Summary of Plants with direct effects

DIST	ROUTE	ALT2	PLANTS COD	Total	DIST	ROUTE	ALT2	PLANTS COD	Total
MW	01N01	2	CLBIA	1	MW	03N64A	3	LOST	1
MW	01N01		ERTU	2	MW	03N68	3	LOST	1
MW	01N01	3	CLAU2	1	MW	03N73	3	ALTR	1
MW	01N01J	3	ERTU	1	MW			DINO	1
MW	01N02Y	3	CLBIA	1	MW	03N30		LOST	4
MW	01N03	3	ERTU	1	MW	03N73B	3	LOST	6
MW	01N03	25	ERTU	2	MW	03N76Y	3	LOST	1
MW	01N03B	23	ERTU	1	MW	03N79	3	LOST	4
MW	01N04	2	CLBIA	4	MW	03N87	3	MIPU	3
MW	01N12	3	CLAU2	1	MW	03N96	3	LOST	1
MW	01N17	3	CLBIA	1	MW	04N02	3	ALTR	4
MW	01N20	3	CLBIA	1	MW	04N02		CLBIA	1
MW	01N25	3	CLAU2	1	MW	04N02		LOST	4
MW	01N25B	3	CLAU2	1	MW	04N15	3	ALTR	3
MW	01N41	3	MIPU	1	MW	04N15		LOST	8
MW	01N67	3	CLAU2	10	MW	04N61	3	LOST	1
MW	01N67		CLBIA	4	MW	04N80	3	LOST	1
MW	02N07	3	CLBIA	7	MW	04N80	25	LOST	1
MW	02N09	2	CLAU2	3	MW	04N86	3	LOST	1
MW	02N09E	23	CLAU2	1	MW	04N89A	3	LOST	1
MW	02N11	3	CLAU2	2	MW	11719A	9	ERTU	1
MW	02N11		CLBIA	1	MW	15EV38	11	ERTU	1
MW	02N11F	3	CLAU2	1	MW	16EV104	11	LOST	1
MW	02N14YA	3	LOST	1	MW	16EV106	11	ERTU	3
MW	02N34	3	CLAU2	1	MW	16EV108	11	LOST	1
MW	02N34		CLBIA	1	MW	16EV109	11	MIPU	1
MW	02N34A	3	CLAU2	5	MW	16EV110	11	ALTR	11
MW	02N75	3	CLAU2	2	MW	16EV110		ERTU	1
MW	02N75		CLBIA	4	MW	16EV110		LOST	10
MW	02N88A	3	CLBIA	1	MW	16EV111	11	ALTR	1
MW	02N98Y	3	LOST	1	MW	16EV111		LOST	4
MW	03N01	2	BRBO	1	MW	16EV115	11	ALTR	6
MW	03N01Y	3	ERTU	2	MW	16EV115		LOST	8
MW	03N02	28	IRHAC	1	MW	16EV117	11	ALTR	5
MW	03N03	3	ERTU	2	MW	16EV117		LOST	2
MW	03N05	3	MIPU	1	MW	16EV209	11	ERTU	2
MW	03N06Y	3	ERTU	3	MW	16EV210	11	ERTU	1
MW	03N10Y	3	ERTU	1	MW	16EV211	11	ERTU	1
MW	03N15	3	ERTU	1	MW	16EV219	11	ERTU	1
MW	03N20	3	LOST	18	MW	16EV220	11	ERTU	1
MW	03N20A	3	LOST	1	MW	16EV230	11	ERTU	3
MW	03N23Y	3	CYMO2	1	MW	16EV236	11	ALTR	1
MW	03N24	3	ERTU	2	MW	16EV236		LOST	2
MW	03N24		MIPU	2	MW	16EV240	11	ALTR	1
MW	03N30	3	ALTR	5	MW	16EV240		LOST	2
MW			LOST	6	MW	16EV243	11	ERTU	1
MW			MIPU	4	MW	16EV248	11	ALTR	2
MW	03N42A	3	LOST	1	MW	16EV248		LOST	2
MW	03N47Y	3	LOST	1	MW	16EV263	11	ERTU	1

MW	03N58	3	ERTU	4	MW	16EV265	11	ERTU	1
MW	03N60D	3	LOST	1	MW	16EV269	11	MIPU	1
MW	03N64	3	LOST	1	MW	16EV307	11	ERTU	1
<b>DIST</b>	<b>ROUTE</b>	<b>ALT2</b>	<b>PLANTS COD</b>	<b>Total</b>	<b>DIST</b>	<b>ROUTE</b>	<b>ALT2</b>	<b>PLANTS COD</b>	<b>Total</b>
MW	16EV54	11	MIPU	1	CAL	07N29		LOST	2
MW	17EV101	11	ALTR	11	CAL	07N30	25	LOST	1
MW	17EV101		LOST	17	SUM	04N39	3	LOST	1
MW	17EV117	11	ALTR	2	SUM	18EV256	6	LOST	1
MW			LOST	2	SUM	4N39X2	3	LOST	1
MW	17EV153	11	LOST	3	SUM	4N39X2	22	LOST	4
MW	17EV212	11	LOST	2	GR	01N07	2	CLBIA	11
MW	17EV228	11	MIPU	1	GR	01N45	23	CLBIA	1
MW	17EV255	11	LOST	1	GR	01N81	23	CLBIA	1
MW	17EV258	11	ALTR	1	GR	01N96	3	CLBIA	3
MW			LOST	1	GR	01N97	3	CLAU2	1
MW	17EV259	11	LOST	7	GR	01S02	2	CLAU2	1
MW	17EV296	11	LOST	3	GR	01S02		CLBIA	1
MW	17EV300	11	LOST	1	GR	01S03	2	CLAU2	7
MW	17EV303	11	LOST	8	GR	01S04	23	CLAU2	2
MW	17EV37	11	LOST	2	GR	01S05	3	CLAU2	1
MW	17EV45	11	LOST	2	GR	01S05		MIFI	1
MW	17EV50	11	LOST	13	GR	01S05		MIPU	1
MW	17EV53	11	ALTR	1	GR	01S05A	23	CLAU2	1
MW	17EV53		LOST	8	GR	01S12	3	CLAU2	9
MW	17EV60	11	LOST	1	GR	01S12		ERCO16	3
MW	17EV78	11	LOST	1	GR	01S12		MIFI	4
MW	17EV79	11	LOST	1	GR	01S12D	3	CLAU2	1
MW	17EV88	11	LOST	13	GR	01S13Y	3	CLAU2	1
MW	17EV91	11	LOST	13	GR	01S15Y	3	CLAU2	1
MW	18EV110	11	LEKEK	6	GR	01S16Y	3	MIFI	1
MW	18EV110		LOST	17	GR	01S19	3	CLAU2	1
MW	18EV134	11	LOST	14	GR	01S19A	3	CLAU2	2
MW	18EV170	11	LEKEK	4	GR	01S24	3	CLAU2	5
MW	18EV170		LOST	13	GR	01S25	3	MIFI	5
MW	18EV308	11	BRBO	1	GR	01S25		MIPU	1
MW	18EV94	11	LEKEK	2	GR	01S25A	3	CLAU2	2
MW	18EV94		LOST	2	GR	01S25F	3	CLAU2	1
MW	21703C	11	LOST	1	GR	01S26	3	CLAU2	6
MW	31734N	9	LOST	1	GR	01S26		MIFI	1
MW	EV14835	11	ALTR	1	GR	01S26Y	23	CYMO2	1
MW	EV14835		LOST	1	GR	01S28	2	CLBIA	2
MW	FR14056	9	LOST	4	GR	01S28B	23	CLBIA	1
MW	FR98680	9	ERTU	1	GR	01S39Y	3	CLAU2	2
MW	FR98682	9	ERTU	1	GR	01S39YB	23	MIFI	1
MW	FR98697	9	ALTR	5	GR	01S46	23	MIFI	1
MW	FR98697		LOST	4	GR	01S52YA	23	MIFI	1
CAL	04N04Y	3	MIPU	1	GR	01S57	3	MIFI	1
CAL	05N51	24	CACLA	1	GR	01S57Y	23	CYMO2	1
CAL	05N51Y	3	MIPU	1	GR	01S58	3	CLBIA	1
CAL	05N63	2	MIPU	1	GR	01S59	23	CLAU2	2
CAL	06N64	3	HYVE	1	GR	01S59		MIFI	1
CAL	07N06	25	LOST	1	GR	01S70	3	CLAU2	2
CAL	07N10	24	LOST	1	GR	01S81	3	CLAU2	1
CAL	07N29	25	ALTR	2	GR	01S85	3	CLBIA	1
<b>DIST</b>	<b>ROUTE</b>	<b>ALT2</b>	<b>PLANTS COD</b>	<b>Total</b>					
GR	01S89	3	MIFI	1					
GR	01S90	2	MIFI	1					

GR	01S97	23	CLAU2	1					
GR	02N40B	23	CYMO2	1					
GR	02S03	3	ERCO16	4					
GR	02S11	3	HOPA2	2					
GR	01N08	3	HYVE	1					
GR	02S13	3	MIFI	1					
GR	02S20	3	CLAU2	2					
GR	02S20C	23	CLAU2	1					
GR	02S30	2	CLAU2	3					
GR	02S37Y	3	CLAU2	1					
GR	02S47A	23	MIFI	1					
GR	02S59	3	HOPA2	1					
GR	02S59B	23	HOPA2	1					
GR	02S79	3	CLAU2	2					
GR	02S91	3	CLAU2	6					
GR	02S92	3	CLAU2	2					
GR	03S02	3	HOPA2	8					
GR	03S03	3	HOPA2	1					
GR	03S03A	23	HOPA2	1					
GR	03S04	3	ERCO16	1					
GR	03S06	23	HOPA2	1					
GR	03S10	3	HOPA2	3					
GR	03S10A	3	HOPA2	3					
GR	03S15	3	HOPA2	5					
GR	17EV181	11	HOPA2	2					
GR	17EV182	11	HOPA2	1					
GR	01N10	3	CLBIA	3					
GR	17EV183	11	HOPA2	2					
GR	18EV263	11	HOPA2	3					
GR	18EV264	11	HOPA2	1					
GR	18EV265	11	HOPA2	1					
GR	18EV314	23	CLBIA	1					
GR	1S1824	11	CLAU2	3					
GR	1S1907B	11	CLAU2	2					
GR	1S1920	11	CLAU2	1					
GR	1S1921	11	CLAU2	1					
GR	1S1922D	9	MIPU	1					
GR	3S1815	11	HOPA2	1					
GR	FR10200	11	HOPA2	1					
GR	FR14878	9	CLAU2	1					
GR	FR15219	22	CLBIA	1					
GR	FR8531	9	CLBIA	1					
GR	FR8601	9	CLAU2	1					
GR	FR9778	9	MIFI	1					
GR	FR98485	9	HOPA2	1					
			<b>Grand Total</b>	<b>652</b>					

### Appendix J Alternative 3 Summary Routes with Direct Effects to Plants


DIST	Route	Alternative 3	PLANTS_COD	Total	DIST	Route	ALT3	PLANTS_COD	Total
MW	01N01	2	CLBIA	1	MW	03N73		LOST	4
MW	01N01		ERTU	2	MW	03N73B	3	LOST	6
MW	01N01	3	CLAU2	1	MW	03N76Y	3	LOST	1
MW	01N01J	3	ERTU	1	MW	03N79	3	LOST	4
MW	01N02Y	3	CLBIA	1	MW	03N87	3	MIPU	3
MW	01N03	3	ERTU	1	MW	03N96	3	LOST	1
MW	01N03	25	ERTU	2	MW	04N02	3	ALTR	4
MW	01N03B	23	ERTU	1	MW	04N02		CLBIA	1
MW	01N04	2	CLBIA	4	MW	04N02		LOST	4
MW	01N12	3	CLAU2	1	MW	04N15	3	ALTR	3
MW	01N17	3	CLBIA	1	MW	04N15		LOST	8
MW	01N20	3	CLBIA	1	MW	04N61	3	LOST	1
MW	01N25	3	CLAU2	1	MW	04N80	3	LOST	1
MW	01N25B	3	CLAU2	1	MW	04N80	25	LOST	1
MW	01N41	3	MIPU	1	MW	04N86	3	LOST	1
MW	01N67	3	CLAU2	10	MW	04N89A	3	LOST	1
MW	01N67		CLBIA	4	CAL	04N04Y	3	MIPU	1
MW	02N07	3	CLBIA	7	CAL	05N51Y	3	MIPU	1
MW	02N09	2	CLAU2	3	CAL	05N63	2	MIPU	1
MW	02N09E	23	CLAU2	1	CAL	06N64	3	HYVE	1
MW	02N11	3	CLAU2	2	CAL	07N06	25	LOST	1
MW	02N11		CLBIA	1	CAL	07N10	24	LOST	1
MW	02N11F	3	CLAU2	1	CAL	07N29	25	ALTR	2
MW	02N14YA	3	LOST	1	CAL	07N29		LOST	2
MW	02N34	3	CLAU2	1	CAL	07N30	25	LOST	1
MW	02N34		CLBIA	1	SUM	04N39	3	LOST	1
MW	02N34A	3	CLAU2	5	SUM	18EV256	6	LOST	1
MW	02N75	3	CLAU2	2	SUM	4N39X2	3	LOST	1
MW	02N75		CLBIA	4	SUM	4N39X2	22	LOST	4
MW	02N88A	3	CLBIA	1	GR	01N07	2	CLBIA	11
MW	02N98Y	3	LOST	1	GR	01N08	3	HYVE	1
MW	03N01	2	BRBO	1	GR	01N10	3	CLBIA	3
MW	03N01Y	3	ERTU	2	GR	01N45	23	CLBIA	1
MW	03N02	28	IRHAC	1	GR	01N81	23	CLBIA	1
MW	03N03	3	ERTU	2	GR	01N96	3	CLBIA	3
MW	03N05	3	MIPU	1	GR	01N97	3	CLAU2	1
MW	03N06Y	3	ERTU	3	GR	01S02	2	CLAU2	1
MW	03N10Y	3	ERTU	1	GR	01S02		CLBIA	1
MW	03N15	3	ERTU	1	GR	01S03	2	CLAU2	7
MW	03N20	3	LOST	18	GR	01S04	23	CLAU2	2
MW	03N20A	3	LOST	1	GR	01S05	3	CLAU2	1
MW	03N23Y	3	CYMO2	1	GR	01S05		MIFI	1
MW	03N24	3	ERTU	2	GR	01S05		MIPU	1
MW	03N24		MIPU	2	GR	01S05A	23	CLAU2	1
MW	03N30	3	ALTR	5	GR	01S12	3	CLAU2	9
MW	03N30		LOST	6	GR	01S12		ERCO16	3
					GR			MIFI	4
					GR	01S12D	3	CLAU2	1
					GR	03N47Y	3	LOST	1
					GR	03N58	3	ERTU	4
MW					GR	03N64	3	LOST	1
MW						03N64A	3	LOST	1
MW						03N68	3	LOST	1
MW						03N73	3	ALTR	1
MW						03N73		DINO	1

DIST	Route	ALT3	PLANTS_COD	Total	DIST	Route	ALT3	PLANTS_COD	Total
GR	01S13Y	3	CLAU2	1	GR	03S03A	23	HOPA2	1
GR	01S15Y	3	CLAU2	1	GR	03S04	3	ERCO16	1
GR	01S16Y	3	MIFI	1	GR	03S06	23	HOPA2	1
GR	01S19	3	CLAU2	1	GR	03S10		HOPA2	3
GR	01S19A	3	CLAU2	2	GR	03S10A	3	HOPA2	3
GR	01S24	3	CLAU2	5	GR	03S15	3	HOPA2	5
GR	01S25	3	MIFI	5	GR	18EV314	23	CLBIA	1
GR	01S25		MIPU	1	GR	FR15219	22	CLBIA	1
					MW	03N60D	3	LOST	1
GR	01S25A	3	CLAU2	2					
GR	01S25F	3	CLAU2	1				<b>Total</b>	<b>353</b>
GR	01S26	3	CLAU2	6					
GR	01S26		MIFI	1					
GR	01S26Y	23	CYMO2	1					
GR	01S28	2	CLBIA	2					
GR	01S28B	23	CLBIA	1					
GR	01S39Y	3	CLAU2	2					
GR	01S39YB	23	MIFI	1					
GR	01S46	23	MIFI	1					
GR	01S52YA	23	MIFI	1					
GR	01S57	3	MIFI	1					
GR	01S57Y	23	CYMO2	1					
GR	01S58	3	CLBIA	1					
GR	01S59	23	CLAU2	2					
GR	01S59		MIFI	1					
GR	01S70	3	CLAU2	2					
GR	01S81	3	CLAU2	1					
GR	01S85	3	CLBIA	1					
GR	01S89	3	MIFI	1					
GR	01S90	2	MIFI	1					
GR	01S97	23	CLAU2	1					
GR	02N40B	23	CYMO2	1					
GR	02S01	3	CLVI	3					
GR	02S03	3	ERCO16	4					
GR	02S11	3	HOPA2	2					
GR	02S13	3	MIFI	1					
GR	02S20	3	CLAU2	2					
GR	02S20C	23	CLAU2	1					
GR	02S30	2	CLAU2	3					
GR	02S37Y	3	CLAU2	1					
GR	02S47A	23	MIFI	1					
GR	02S59	3	HOPA2	1					
GR	02S59B	23	HOPA2	1					
GR	02S79	3	CLAU2	2					
GR	02S91	3	CLAU2	6					
GR	02S92	3	CLAU2	2					
GR	03S02	3	HOPA2	8					
GR	03S03	3	HOPA2	1					