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3.02 BOTANICAL RESOURCES

Of the Forest Service Regions, the Pacific Southwest Region contains the largest assemblage of sensitive plant species in comparison to its land base. Of the more than 8,000 vascular plant species occurring in California, well over half are known to occur on NFS lands. This is due to topography, geography, geology and soils, climate and vegetation. These same factors account for the exceptionally high endemic flora of the State. Over 100 plant species are found only on FS lands and found no where else in the world (Powell 2001).

Management of plant species and habitat and maintenance of a diversity of plant communities is an important part of the mission of the Forest Service (Resource Planning Act of 1974, National Forest Management Act of 1976). Management activities on National Forest System (NFS) lands must be planned and implemented so that they do not jeopardize the continued existence of threatened or endangered species or lead to a trend toward listing or loss of viability of Forest Service Sensitive species. In addition, management activities should be designed to maintain or improve habitat for rare plants and natural communities to the degree consistent with multiple-use objectives established in each Forest Plan. Key parts of these activities include: developing and implementing management practices to ensure that species do not become threatened or endangered because of FS actions; maintaining viable populations of all native and desired non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on NFS lands; and developing and implementing management objectives for populations and/or habitats of rare species. The Pacific Southwest Region has over 425 rare plant species on National Forest lands.

Management decisions related to motorized travel can affect plant species, their habitats, and natural communities. Effects include, but are not limited to, death or injury to plants, habitat modification, habitat fragmentation, and degraded habitat quality caused by increased risk of weed introduction and spread, change in hydrology, increased erosion, compaction, and sedimentation, risk to pollinators, loss of vegetation, over collection, or other factors reducing or eliminating plant growth and reproduction (Trombulek and Frissell 2000). The FS provides a process and standard through which rare plants receive full consideration throughout the planning process, reducing negative impacts on species, and enhancing opportunities for mitigation by developing and implementing management objectives for populations and/or habitats of sensitive species. It is Forest Service policy to minimize damage to soils and vegetation, avoid harassment to wildlife, and avoid significant disruption of wildlife habitat while providing for motorized public use on NFS lands (FSM 2353.03(2)). Management decisions related to motorized travel on NFS lands must consider effects to plant species and their habitats.

Vehicle travel is a major factor/vector in the introduction and spread of noxious weeds, so this project affects the population and distribution of these species. Additionally, the Chief of the Forest Service has determined that invasive species are one of four significant threats to forests and rangelands. The presence of these invaders affects many other resources, such as soil, wildlife habitat, and sensitive plants, so it is important to analyze and understand the effects of the project on noxious weed populations

Analysis Framework: Statute, Regulation, Forest Plan and Other Direction

Direction relevant to the proposed action as it pertains to botanical resources includes:

Forest Plan - General direction for management of Sensitive Plants under the Forest Plan 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). 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 (USDA 2005c) includes: 1) Protect sensitive plants from activities which might cause them to become Federally listed as Threatened or Endangered; 2) Identify populations of sensitive plants which 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.

Endangered Species Act (ESA) - The Endangered Species Act of 1973 (16 USC 1531 et seq.) requires that any action authorized by a federal agency not be likely to jeopardize the continued existence of a threatened or endangered (TE) species, or result in the destruction or adverse modification of habitat of such species that is determined to be critical. Section 7 of the ESA, as amended, requires the responsible federal agency to consult the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service concerning TE species under their jurisdiction. It is forest service policy to analyze impacts to TE species to ensure management activities are not be likely to jeopardize the continued existence of a TE 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) - 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. This assessment is documented in a Biological Evaluation (BE) and is summarized or referenced in this Chapter.

Sierra Nevada Forest Plan Amendment (SNFPA) - The Record of Decision (ROD) for the 2004 Sierra Nevada Forest Plan Amendment identified the following direction applicable to motorized travel management and botanical resources (USDA 2004c):

- Noxious weeds management (Management Standard & Guidelines 36-49).
- Wetland and Meadow Habitat (Management Standard & Guideline 70): See Water Resources section.
- Riparian Habitat (Management Standard & Guideline 92): See Water Resources section.
- Bog and Fen Habitat (ROD page 65, S&G #118): Prohibit or mitigate ground-disturbing activities that adversely affect hydrologic processes that maintain water flow, water quality, or water temperature critical to sustaining bog and fen ecosystems and plant species that depend on these ecosystems. During project analysis, survey, map, and develop measures to protect bogs and fens from such activities as trampling by livestock, pack stock, humans, and wheeled vehicles.

Sensitive Plant Surveys (Corrected Errata, April 19, 2005): Conduct field surveys for TEPS plant species early enough in project planning process that the project can be designed to conserve or enhance TEPS plants and their habitat. Conduct surveys according to procedures outline in the Forest Service Handbook (FSH 2609.25.11). If additional field surveys are to be conducted as part of project implementation, survey results must be documented in the project file. (Management S&G 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.

Direction relevant to the proposed action that is relevant to the management and prevention of noxious weeds includes:

FSM 2081.03 requires that a weed risk assessment be conducted when any ground disturbing activity is proposed. Determine the risk of introducing or spreading noxious weeds associated with the proposed action. Projects having moderate to high risk of introducing or spreading noxious weeds must identify noxious weed control measures that must be undertaken during project implementation.

Executive Order 13112 of Feb. 3, 1999, directs federal agencies to prevent the introduction of invasive species, detect and respond rapidly to and control such species, not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species unless the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.

Effects Analysis Methodology

GIS data was used to analyze existing routes open for public wheeled motor vehicle use, including the parking of a vehicle within one vehicle length of the travel way or within 200 feet of sensitive plant sites, and the additional routes added to the system within the action alternatives. 200 feet was chosen as an indicator because 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 judgment related to the potential extent of damage to individual plants or habitat from vehicles and human use. Even though 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 dispersed 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 definitively quantify 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.

The 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 trails not authorized for motorized use are not complete, this analysis assumes that the species is present within the identified potential habitat until surveys are complete. Sensitive species may or may not be in unsurveyed potential habitat. In addition, it is possible for certain sensitive species to 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. kellogii* 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.

Direct effects consist of documented disturbances from motor vehicles that resulted in damage to sensitive plants by either driving off-road, or parking. Under these conditions, 30 feet from routes edge was judged 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.

Lava caps are unique habitats and a watchlist plant community for the STF. Open areas, such as lava caps or granitics and volcanic balds do not provide natural barriers to motor 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) are known to occur on the STF in open habitat on rocky ridges and outcrops adjacent to additions to the NFTS or within 200 feet of the routes. These local endemics grow on very thin soils in open habitat that is quite vulnerable to OHV activity (M. Willits, personal communication, January 16, 2009). Damage to lava caps and to sensitive plant occurrences on lava caps were 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 between the alternatives.

Data for meadows, fens, and riparian areas was collected from individual district records for project specific activities, and surveys in these areas are incomplete. 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; all of which may be directly/or 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. For instance, on the Calaveras Ranger District, 2 areas within fen features were found to be heavily impacted by OHV users, creating tracks and rutted scars with in the middle of the wettest habitats (C. Meyers, personal communication August 13, 2008). The miles of native surface routes within these habitats provide a means of comparing potential effects to sensitive plant habitat between alternatives.

Data for noxious weeds was collected from GIS records. Routes infested with invasive plant species (noxious weeds) have the potential for direct and indirect effects to sensitive plant habitat. The rationale for a 200-foot distance for the limit of potential indirect effects included a judgment that 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 sensitive plant habitats as well as to species bio-diversity across the analysis area.

Assumptions Specific to Botanical Resources

1. 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.
2. Motor vehicle use is unlikely to impact sensitive plant occurrences and habitats on steep or extremely rocky terrain. Motor vehicle use is more likely to impact 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.
3. Without specific prevention and control measures, invasive non-native plants (weeds) will continue to spread along surfaced and native surfaced motor vehicle roads and trails, and into adjacent areas.
4. Motor vehicle use of native surface routes increases sediment production and erosion, thereby potentially adversely affecting sensitive plant habitat (for more detail, see soils or water resources sections).

5. Impacts to native vegetation including sensitive/watchlist species do not vary significantly by alternative when vehicle class is changed. Effects from all types of motor vehicles are assumed equal.
6. Based on the assumption that route proliferation will occur only in Alternative 2, future route proliferation is projected to be about 2 miles per year.
7. The effects to plant communities of implementing seasonal or wet weather closures were not compared because they cannot be quantified.
8. Unless indicated in the data, each "point" of weed 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, including occasional road maintenance.
9. Assume that the project is a ground-disturbing activity requiring a weed risk assessment. Assume infestations will continue. Assume high risk of spread where no information on weed populations exists.
10. Existing weed infestations will likely spread. Rate of spread will be increased by vehicular activity. Infestations located along routes where vehicles drive will spread further along the route. Motorized vehicles will bring weed seeds and propogative parts from home areas and other areas where they traveled.
11. Consider risk of spread to be medium if known populations of noxious weeds do not occur directly along travel routes, or occur on routes where travel is prohibited. Also, if the species that occur are in the B or C category or considered to be less invasive and already fairly well-distributed consider the risk to be medium. Risk of introduction or spread would be low if existing inventories show that noxious weed populations are not present on the routes in question.

Data Sources

1. Route-specific botanical data with a focus on additions to the NFTS (e.g., TE - species, meadows, lava cap features, habitats, etc. (Stanislaus Fen and Meadow survey report), including results of route-specific surveys of rare species.
2. Route specific inventories collected in Step 1 of Travel Management and associated tabular data sets.
3. GIS layers of the following data: routes, habitats, plant communities, soils, geology, meadows, etc.
4. Information on species status, distribution, and ecology was derived from general literature reviews, Forest Service documents and maps, California Department of Fish and Game, California Natural Diversity Database (CNDDB) (CDFG 2008), Nature Serve (CDFG 2007a), various field books, floras, and personal communications. The site surveys in conjunction with literature and input from the Forest botanists were used to determine the potential occurrence of each species and/or its habitat.

Botanical Resources Indicators

5. Number of sensitive plant sites/occurrences within 200 feet of wheeled motor vehicle
6. Number of documented direct impacts to sensitive plant sites/occurrences on either side of route's edge within 30 feet of motor vehicle routes
7. Miles of motorized routes passing through lava
8. Miles of motorized routes passing through meadows and riparian habitat
9. Miles of motorized routes infested with invasive plant species within 200 feet of sensitive plant occurrences/ and habitat

Botanical Resources Methodology by Action

1. Direct and indirect effects of the prohibition of cross-country motor vehicle travel.

Short-term timeframe: 1 year.

Long-term timeframe: 20 years.

Spatial boundary: Forest

Indicators: Number of sensitive plant sites/occurrences within 200 feet of wheeled motor vehicle. Number of documented direct impacts to sensitive plant sites/occurrences on either side of route's edge within 30 feet of motor vehicle routes. Miles of motorized routes passing through lava. Miles of motorized routes passing through meadows and riparian habitat. Miles of motorized routes infested with invasive plant species within 200 feet of sensitive plant occurrences and habitat.

Methodology: GIS analysis of existing unauthorized routes in relation to sensitive plant sites and their habitat. Site-specific analysis is documented for surveyed and unsurveyed routes and is identified within each alternative, and described in detail of how they will be implemented.

2. Direct and indirect effects of adding facilities to the NFTS including identifying seasons of use and vehicle class.

Short-term timeframe: 1 year.

Long-term timeframe: 20 years.

Spatial boundary: Forest.

Indicators: Number of sensitive plant sites/occurrences within 200 feet of wheeled motor vehicle. Number of documented direct impacts to sensitive plant sites/occurrences on either side of route's edge within 30 feet of motor vehicle routes. Miles of motorized routes passing through lava. Miles of motorized routes passing through meadows and riparian habitat. Miles of motorized routes infested with invasive plant species within 200 feet of sensitive plant occurrences and habitat.

Methodology: GIS analysis of existing unauthorized routes in relation to sensitive plant sites and habitat. Site-specific analysis is documented for surveyed and unsurveyed routes, and is identified within each alternative, and described in detail of how they will be implemented.

3. Direct and indirect effects of changes to the existing NFTS including identifying seasons of use and vehicle class.

Short-term timeframe: 1 year.

Long-term timeframe: 20 years.

Spatial boundary: Forest.

Indicators: Number of sensitive plant sites/occurrences within 200 feet of wheeled motor vehicle. Number of documented direct impacts to sensitive plant sites/occurrences on either side of route's edge within 30 feet of motor vehicle routes. Miles of motorized routes passing through lava. Miles of motorized routes passing through meadows and riparian habitat. Miles of motorized routes infested with invasive plant species within 200 feet of sensitive plant occurrences and habitat.

Methodology: GIS analysis of existing unauthorized routes in relation to sensitive plant sites and habitat.

4. Cumulative Effects

Short-term timeframe: not applicable; cumulative effects analysis will be done only for the long-term time frame.

Long-term timeframe: 20 years.

Spatial boundary: Forest.

Indicators: Number of sensitive plant sites/occurrences within 200 feet of wheeled motor vehicle. Number of documented direct impacts to sensitive plant sites/occurrences on either side of route's edge within 30 feet of motor vehicle routes. Miles of motorized routes passing through lava. Miles of motorized routes passing through meadows and riparian habitat. Miles of motorized routes infested with invasive plant species within 200 feet of sensitive plant occurrences and habitat.

Methodology: GIS analysis of all routes and sensitive plant sites and habitat.

Affected Environment

Within the analysis area, the dominant vegetation types, starting from lower elevations of Forest and moving upward, the Forest plant communities begin with a narrow band of Foothill-Woodland vegetation (blue oak, interior live oak, black oak, gray pine, and grasslands) with 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 ecosystems, including slate outcrops, lava caps, riparian drainages, subalpine lakes, montane meadows, and fens. These ecosystems provide habitat for STF sensitive plant species.

The difference between the current distribution and abundance of rare plant (threatened, endangered, proposed, sensitive, and/or watchlist) populations and historic levels is largely unknown (USDA 2004c). Plant species may be rare due to evolutionary history, basic population ecology, or were affected by human activities. Most likely, this situation is a combination of these factors. Human activities may or may not be responsible for the current distribution and abundance of the rare species.

Since the late 1980s sensitive plant monitoring on the STF has documented approximately 1,580 plant occurrences and the impacts to these species and their habitats. Within these occurrences are sites that may contain a number of plants (Project record). Impacts include damage from 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, 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.

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 because of the role that vegetation plays in: stabilizing the soil; and its capability to deter expansion of off road 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). Larger sized four-wheel vehicles have broken "trail" through natural shrub barriers as tall as 8 feet to gain access to selected local areas (OHV Wildlife Habitat Protection Plan 2004, Stanislaus OHV Grant Application). Areas with larger or denser vegetation are also accessed along little-used or abandoned roads, utility corridors, skid trails and temporary logging roads, which typically are not open for public motor vehicle travel.

Within the known range of the sensitive plant species known to or suspected to occur within the STF, the number of occurrences and amount of suitable habitat that were 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 acres of completed and pending project has undergone timber/fuels reduction and other vegetation projects (Appendix B). Tables 3.02-1 and 3.02-2 summarize the Sensitive Plant and Moss Species and Habitat descriptions for Sensitive Plant Taxa known or with Potential to occur on the Stanislaus National Forest. No Fish and Wildlife Service listed plant species occur on the Stanislaus National Forest; therefore no consultation with the agency is required.

Table 3.02-1 Sensitive Plant Species and Habitat Description

Botanical Name	Common Name/Listings	Presence[2]	Occurrence[3]	Habitat Description/Landscape Group
Allium jepsonii[1]	Jepson's onion ALJE CNPS 1B.2	P	No	Upland and Mid Slopes
Allium tribracteatum	Three bracted onion ALTR CNPS 1B.2	K	Yes	Lower Montane, Chaparral and Woodlands, Upland and Mid Slope
Allium yosemitense	Yosemite onion ALYO CNPS 1B.3	K	No	Lower Montane, Chaparral and Woodlands, Upland and Mid Slope
Arctostaphylos nissenana[1]	Nissenan's longate ARNICNPS 1B.2	P	No	Lower Montane, Chaparral and Woodlands
Balsamorhiza macrolepis var. macrolepis	Big-scale balsamroot BAMAM CNPS 1B.2	K	Yes	Lower Montane, Chaparral and Woodlands
Botrychium ascendens[1]	Upswept moonwort BOAS2 CNPS 2.3	P	No	Lower Montane, Moist Habitats-Meadows and Riparian Areas
Botrychium crenulatum[1]	Scalloped moonwort BOCR CNPS 2.2	P	No	Lower Montane, Moist Habitats-Meadows and Riparian Areas
Botrychium lunaria[1]	Common moonwort BOLU CNPS 2.3	P	No	Moist Habitats-Meadows and Riparian Areas, Upland Slopes
Botrychium minganense[1]	Mingan's moonwort BOMI CNPS 2.2	P	No	Moist Habitats-Meadows and Riparian Areas, Upland Slopes
Botrychium montanum[1]	Western goblin BOMO CNPS 2.1	P	No	Moist Habitats-Meadows and Riparian Areas, Upland Mid Slopes, Lower Montane
Calochortus clavatus var. avius[1]	Pleasant Valley Mariposa lily CACLA CNPS 1B.2	P	No	Lower Montane, Upper Slopes
Clarkia australis	Small's southern clarkia CLAU2 CNPS 1B.2	K	Yes	Lower Montane, Chaparral and Woodlands
Clarkia biloba ssp. Australis	Mariposa clarkia CLBIA 1B.2	K	Yes	Lower Montane , Chaparral and Woodlands
Clarkia lingulata[1]	Merced clarkia CLLI CNPS 1B.1	P	No	Lower Montane , Chaparral and Woodlands
Cypripedium montanum	Mountain lady's slipper CYMO2 CNPS 4.2	K	Yes	Upland and Mid Slopes
Draba asterophora var. asterophora[1]	Tahoe draba DRASA2 CNPS 1B.2	P	No	Upland Slopes
Epilobium howellii	Subalpine fireweed EPHO3 CNPS 1B.3	K	No	Moist Habitats-Meadows and Riparian Areas
Eriophyllum congdonii	Congdon's woolly Sunflower ERCO16 CNPS 1B.2	K	No	Lower Montane, Chaparral and Woodlands, Upland and Mid Slopes
Eriophyllum nubigenum	Yosemite woolly sunflower	K	No	Lower Montane, Chaparral and Woodlands,

Botanical Name	Common Name/Listings	Presence[2]	Occurrence[3]	Habitat Description/Landscape Group
	ERNU6 CNPS 1B.3			Upland and Mid Slopes
Erythronium taylori	Taylor's fawn lily ERTA CNPS 1B.2	K	No	Moist Habitats-Meadows and Riparian Areas, Upland and Mid Slopes
Erythronium tuolumnense	Tuolumne fawn lily ERTU CNPS 1B.2	K	Yes	Moist Habitats-Meadows and Riparian Areas, Lower Montane
Horkelia parryi	Parry's horkelia HOPA CNPS 1B.2	K	Yes	Lower Montane, Chaparral and Woodlands
Hulsea brevifolia[1]	Short-leaved hulsea HUBR CNPS 1B.2	P	No	Lower Montane,
Upland and Mid Slopes				
Iris hartwegii ssp. Columbiana	Tuolumne iris IRHAC CNPS 1B.2	K	No	Lower Montane, Chaparral and Woodlands, Upland and Mid Slopes
Lewisia congdonii	Congdon's bitterroot LECO4 CNPS 1B.3	K	No	Lower Montane, Chaparral and Woodlands, Upland and Mid Slopes
Lewisia disepala[1]	Yosemite lewisia LEDI3 CNPS 1B.2	P	No	Lower Montane, Chaparral and Woodlands, Upland and Mid Slopes
Lewisia kelloggii ssp. Kelloggii	Kellogg's lewisia LEKEK GLOBAL.2	K	Yes	Upland and Mid Slopes
Lomatium stebbinsii	Stebbin's lomatium LOST CNPS 1B.1	K	Yes	Lower Montane, Chaparral and Woodlands, Upland and Mid Slopes
Lupinus gracilentus	Slender lupine LUGR CNPS 1B.3	K	No	Upland and Mid Slopes
Mimulus filicaulis	Hetch-Hetchy monkeyflower MIFI CNPS 1B.2	K	Yes	Moist Habitats-Meadows and Riparian Areas
Mimulus gracilipes[1]	Slender stalked monkeyflower MIGR CNPS 1B.2	P	No	Lower Montane, Chaparral and Woodlands
Mimulus pulchellus	Pansy monkeyflower MIPU CNPS 1B	K	Yes	Moist Habitats-Meadows and Riparian Areas

[1] These Regional Forest's Sensitive Plant Species are not yet known to occur on the Stanislaus National Forest. However, either they are suspected to occur within the boundaries of the forest, or the Forest is within the range of the species, or occurrences are near enough to the boundaries to warrant including them on this list.
[2] Presence on the Stanislaus National Forest; known occurrences (K); potential to occur (P). (USDA 2006, Sensitive Plant Species)
[3] Occurrence within or adjacent to an addition to the NFTS

Table 3.02-2 Sensitive Moss and Lichen Species and Habitat Description

Botanical Name	Common Name/Listings	Presence[2]	Occurrence[3]	Habitat Description/Landscape Group
Bruchia bolanderi	Bolander's bruchia' BRBO CNPS 2.2	K	Yes	Moist Habitats-Meadows and Riparian Areas
Fissidens aphelotaxifolius[1]	Brook pocket moss FIAP CNPS 2.2	P	No	Moist Habitats-Meadows and Riparian Areas, Upland and Mid Slopes
Helodium blandowii[1]	Blandow's bog moss HEBL CNPS 2.3	P	No	Moist Habitats-Meadows and Riparian Areas
Meesia triquetra	Three ranked Hump-moss METR CNPS 4.2	P	No	Moist Habitats-Meadows and Riparian Areas
Meesia uliginosa[1]	Broad nerved Hump-moss MEUL CNPS 2.2	P	No	Moist Habitats-Meadows and Riparian Areas
Mielichhoferia longate[1]	Elongate Copper-moss CNPS 2.2	P	No	Moist Habitats-Meadows and Riparian Areas
Hydrothyria venosa	Veiny aquatic lichen HYVE	K	Yes	Moist Habitats-Meadows and Riparian Areas

[1] These Regional Forest's Sensitive Plant Species are not yet known to occur on the Stanislaus National Forest. However, either they are suspected to occur within the boundaries of the forest, or the Forest is within the range of the species, or occurrences are near enough to the boundaries to warrant including them on this list.
[2] Presence on the Stanislaus National Forest; known occurrences (K); potential to occur (P). (USDA 2006, Sensitive Plant Species)
[3] Occurrence within or adjacent to an addition to the NFTS

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 STF developed a watchlist of species (Table 3.02-3 and Table 3.02-4). These watchlists are dynamic and updated as the need arises to reflect changing conditions and new information. The creation of the lists of watchlist plant species is a key step in meeting our commitment, as an agency, to maintaining biologically diverse and healthy ecosystems.

Table 3.02-3 Stanislaus National Forest Watchlist Species

Botanical Name	**Common Name**
Acrostics humilis	mountain bent grass
Astragalus kentrophyta var. danaus	Sweetwater Mtns. milk-vetch
Bolandra californica	Sierra bolandra
Carex tompkinsii	Tompkin's sedge
Cryptantha crymophila	subalpine cryptantha
Delphinium hansenii ssp. ewanianum	Ewan's larkspur
Didymodon norrisii	Norris' beard-moss
Drosera rotundifolia	round-leaved sundew
Eriogonum ovalifolium var. eximium	brown-margined buckwheat
Eryngium pinnatisectum	Tuolumne button celery
Eryngium sp. nov.	button celery, coyote thistle
Helianthemum suffrutescens	Bisbee Peak rush-rose

Botanical Name	**Common Name**
Lilium humboltii ssp. humboltii	Humboldt lily
Madia yosemitana	Yosemite madia
Meesia longiseta	long-stalked hump moss
Mielichhoferia elongata	elongate copper-moss
Mimulus grayi	Gray's monkeyflower
Mimulus inconspicuos	small-flowered monkeyflower
Mimulus whipplei (extinct?)	Whipple's monkeyflower
Orthotrichum spjutii	Spjut's bristlemoss
Perideridia bacigalupii	Bacigalupi's yampah
Rhyncospora capitellata	beaked sedge
Silene invisa	short-petaled campion
Trichostema rubisepalum	Hernandez bluecurls

Table 3.02-4 Sensitive Taxa and Watchlist Species Occurrences

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

Plant Community Groups

The following discussion groups STF Sensitive Plants by the general types of habitats where they occur and/or places them into a non-specific plant community group. The plant community/ habitat grouping approach are not all inclusive. Important habitat elements necessary to the viability of a particular species may be missed. However, this grouping provides an approximation of the type of habitat each species needs and allows an evaluation of how the potential habitat is impacted by motor vehicle use. Unauthorized motorized trails and NFTS roads and trails may or may not have sensitive and/or watchlist species growing within or adjacent to them. Several sensitive and watchlist plant and plant community occurrences are known to occur within and/or near NFTS roads and trails.

Habitat for the 39 Sensitive taxa in the analysis is unevenly distributed across the analysis area. Habitat is grouped into three broad landscape types: 1) Upland and midslope habitats supporting sensitive species consist of dry rocky sites, forest openings in mixed conifer forests where edaphic (soil or substrate) limitations affect plant growth and species composition (e.g. gravelly lahar, hard slate, granitic and volcanic balds, and serpentine soils); 2) Moist habitats and 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 Mid Slope Habitat Descriptions for Sensitive Species

Twelve sensitive plant taxa are known or suspected to occur adjacent to additions to the NFTS on upland and mid slope landscapes (Tables 3.02-1 and 3.02-2). 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 forests and Sierran mixed-conifer forests. *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 forests.

Allium jepsonii (Jepson's onion) has 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 for, along with other lava cap species. Although suitable habitat for this species may be affected by motorized routes, no known occurrences exist within 200 feet of the additions to the NFTS.

Allium tribracteatum (three bracted onion) is found in Tuolumne County and one occurrence has been confirmed in Calaveras County on private land. On the STF, 47 known plant sites occur primarily located in suitable habitats along the ridges near Crandall Peak and along Highway 108. Most of the sites occur on the Forest. 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 additions to the NFTS 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. Four known occurrences of this plant species on the STF exist 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, no known occurrences exist within 200 feet of the additions to the system.

Cypripedium montanum (mountain lady's slipper) is an uncommon orchid in California. 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 also in relatively dry conditions on hillsides with northerly aspects in mixed conifer forests. About 48 occurrences exist 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 (Haas 2008). All occurrences are growing on slopes with north aspects, with less than 5 to over 45 degrees, in mixed conifer forest under 50-90 percent canopy. The occurrence areas are described as moist, at least in the early summer months, with deep, loamy soils derived from granite. Motorized routes affect 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. 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. 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). No known occurrences of this plant species exist on the STF. Due to the lack of known occurrences, and the high elevation and inaccessible suitable habitat for this species, it will not be considered for further analysis.

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 Merced River and Yosemite Valley. A total of three occurrences of Yosemite wooly 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 motorized routes, no known occurrences exist within 200 feet of the additions to the NFTS.

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. Numerous suitable habitat areas for this species were identified through GIS analysis and may be affected by use on motorized routes. No known occurrences exist within 200 feet of the additions to the NFTS.

Lewisia congdonii (Congdon's lewisia) has 8 known occurrences 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 screen, 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. Population estimates range from less than 100 plants to over 10,000. The area can only be accessed by foot. No potential for impacts caused by motor vehicle access exists to the known occurrence and suitable habitat for this plant species.

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. Numerous suitable habitat areas for this species were identified through GIS analysis and may be affected by use on motorized routes. No known occurrences exist within 200 feet of the additions to the NFTS.

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 has at least 43 known occurrences, ranging from Madera County (Sierra NF) to Plumas County (Plumas NF), including 10 occurrences in Yosemite National Park (Regional Forester's List of Sensitive Plant Species Revision). Ten known occurrences of this plant species on the STF exist within the analysis area. Many of the additions to the NFTS 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. Approximately 328 known sites of *Lomatium stebbinsii* are on the STF. Stebbin's lomatium grows in openings of chaparral and lower and upper montane coniferous forests on gravelly lahar (volcanic mud flow soils, often referred to as "lava caps"). Elevations range from 4,500 to 6,000 feet. This plant species is endemic to Tuolumne and Calaveras counties. Known populations of this lomatium range from the Mokelumne River to the Clavey River. The most extensive occurrences are found in the watersheds of the South Fork Stanislaus and North Fork Tuolumne Rivers. Many of the additions to the NFTS pass through or are within 200 feet of plant sites/occurrences 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 Yosemite National Park, Mariposa, Tuolumne and Inyo Counties. Numerous suitable habitat areas for this species were identified through GIS analysis and may be affected by use on motorized routes. No known occurrences exist within 200 feet of the additions to the NFTS.

Moist Habitats – Meadows, Bogs and Riparian Areas

Fen and Meadow surveys were conducted seasonally within the last 10 years by Forest Service Botany/Range Survey Crews (Project record). Fens provide unique habitats for rare plant species. As compared to other habitats, a disproportionately large number of rare species are of vascular and nonvascular plants associated with peatlands in the Sierra Nevada. This fact underscores the importance of these habitats contributing to the biological diversity of the region. Unauthorized Off-highway vehicle (OHV) use can negatively impact 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 hydrological function and biotic integrity of fens, (Cooper 1996).

Fens are areas where at least 40 cm of organic soils exist in the upper 80 cm of the soil profile (Stanislaus Fen and Meadow survey report). 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 inherently 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 impact 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 officionale*). Native increasers (plants that increase after disturbance) such as *Phalacroseris bolanderi*, *Mimulus primuloides*, and *Hypericum anagalloides* 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 suspected to occur in Moist Habitat

Seventeen taxa are listed as sensitive within the STF in moist habitats such as meadows, fens, seeps, springs, and streamside zones (Tables 3.02-1 and 3.02-2). Only seven of these seventeen species are known to occur on the STF, including one moss: *Bruchia bolanderi*, one lichen: *Hydrothyria venosa*, and 5 plants: *Epilobium howellii*, *Erythronium tuolumnense*, *Erythronium taylori*, *Mimulus filicaulis*, and *Mimulus pulchellus*.

Hydrothryria 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 is known to occur on the STF system lands. 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, a great need exists for further study of lichen ecology and distribution. Motor vehicle use affects lichens and the habitat through damage to organisms themselves. Other impacts include introduction of sediment and possible petroleum products into the lichen habitat component of clear water.

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 occur in fens and meadows on some unsurveyed areas on the STF. Motor vehicle uses impact moss species in two ways. When mosses are crushed by vehicles, they do not have an underground root system to help them recover as do vascular plants. In addition, water temperature is important to the photosynthetic ability of mosses. As described in SNFPA, mosses can photosynthesize effectively at temperatures as low as 33 degrees (F), compared to a lower limit of about 50 degrees for vascular plants (USDA 2004c). Mosses stop photosynthesizing effectively at an upper limit of about 77 degrees, in contrast to vascular plants which some can photosynthesize at temperatures of up to 100 degrees. When moss layers are disturbed by vehicle use, it is possible that water temperatures can go up due to hydrologic disruption (USDA 2004c).

Ten species are thought to occur within suitable habitat areas, but have not been located. They include the five species of the moonwort complex that are widely distributed in North America. 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 (wet or moist soils such as 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 ulignosa*, 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.

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. Numerous suitable habitat areas for this species were identified through GIS analysis and may be affected by use on motorized routes. No known occurrences exist within 200 feet of the additions to the NFTS.

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. Numerous suitable habitat areas for this species were identified through GIS analysis and may be affected by use on motorized routes. No known occurrences exist within 200 feet of the additions to the NFTS.

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. Numerous suitable habitat areas for this species were identified through GIS analysis and may be affected by use on motorized routes. No known occurrences exist within 200 feet of the additions to the NFTS.

Botrychium montanum (mountain moonwort) is found in lower and upper montane coniferous forest, meadows, and seeps from approximately 4,900 to 7,000 feet. No occurrences exist on the STF. Numerous suitable habitat areas for this species were identified through GIS analysis and may be affected by use on motorized routes. No known occurrences exist within 200 feet of the additions to the NFTS.

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. 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. One known occurrence and numerous suitable habitat areas exist on STF. Existing routes pass through or are within 200 feet of suitable habitat and one plant occurrence of this plant species may be affected by motor vehicle use.

Epilobium howellii (subalpine fireweed) occurs in wet meadows, streamside 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. Known occurrences exist on the STF, however, none are within 200 feet of additions to the NFTS and existing NFTS.

Erythronium taylori (Pilot Ridge fawn lily) is known from only one occurrence discovered on unique cliff formations in the Groveland Ranger District. 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. Numerous suitable habitat areas for this species were identified through GIS analysis and may be affected by use on motorized routes. No known occurrences exist within 200 feet of the additions to the NFTS.

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 is known from Deer Creek, the North Fork Tuolumne River and the South Fork Stanislaus River on the STF. Three occurrences are known on private lands. Approximately 42 known occurrences exist on the STF ranging in size from several individuals to more than 10,000 individuals. Many of the additions to the NFTS 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 in the vicinity of small waterfalls; damp or wet crevices or cliffs; upper montane coniferous forest from about 6,000 to 7,200 feet. Although numerous suitable habitat areas for this species may be affected by the location of motorized routes, no known occurrences exist within 200 feet of additions to the NFTS.

Helodium blandowii (Blandow's bog moss) is known to occur near the forest boundaries of Kennedy Meadows, fens and seeps in subalpine conifer forest and alpine lakes at 6,000 to 9,000 feet. Numerous suitable habitat areas for this species were identified through GIS analysis and may be affected by use on motorized routes. No known occurrences exist within 200 feet of the additions to the NFTS.

Hydrothyria venosa (veined water lichen) is known to occur 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 is known from 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. Known occurrences exist on the STF. Although numerous suitable habitat areas for this species may be affected by the location of motorized routes, 3 known occurrences are within 200 feet of the additions to the NFTS.

Meesia triquetra (three-ranked hump-moss) is usually associated with Sphagnum and cold springs or seeps, between 4,000 and 9,000 feet. No known occurrences exist on the STF. Numerous suitable habitat areas for this species were identified through GIS analysis and may be affected by use on motorized routes. No known occurrences exist within 200 feet of the additions to the NFTS.

Meesia uliqnosa (broad-nerved hump-moss) occurs in meadows and fens on dead/decomposing wood, usually in the subalpine zone, between 4,000 and 9,500. No known occurrences of this moss exist on the STF. Numerous suitable habitat areas for this species were identified through GIS analysis and may be affected by use on motorized routes. No known occurrences exist within 200 feet of the additions to the NFTS.

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. No known occurrences of this moss exist on the STF. Numerous suitable habitat areas for this species were identified through GIS analysis and may be affected by use on motorized routes. No known occurrences exist within 200 feet of the additions to the NFTS.

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, setting seed in late spring. In very dry years, *Mimulus filicaulis* occurrences might not bloom at all. The known range for this species is the Main Fork Tuolumne River south to Mariposa District of the Sierra NF and east into Yosemite National Park. Approximately 204 known sites exist within the STF. All of the documented occurrences are on the Groveland Ranger District. Many of the additions to the NFTS pass through or are within 200 feet of plant sites/occurrences and suitable habitat areas.

Mimulus pulchellus (pansy monkeyflower) grows in vernally 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 Stanislaus National forest, Yosemite National Park and near the town of Mariposa. It occurs in the Chowchilla River watershed (near Mariposa) and the Merced, Stanislaus and Tuolumne River watersheds. Approximately 76 known sites of this species exist on the STF. It has been observed in roads and routes driven in early spring. Many of the additions to the NFTS pass through or are within 200 feet of plant occurrences and suitable habitat areas.

Lower Montane, Chaparral and Woodland Habitats

Six Sensitive Plant Species are known to occur in the lower montane chaparral, and woodland habitats (Table 3.02-1): *Balsamorhiza macrolepis var. macrolepis*, *Clarkia biloba ssp. australis*, *Clarkia lingulata*, *Eriophyllum congdonii*, *Horkelia parryi*, and 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.

Lower Montane, Chaparral, and Woodland Habitat Descriptions for Sensitive Species

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 from the Eldorado NF, it has not been found on the STF in suitable habitat areas. Numerous suitable habitat areas for this species were identified through GIS analysis and may be affected by use on motorized routes. No known occurrences exist within 200 feet of the additions to the NFTS.

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 forests, chaparral, vernally moist meadows and grasslands, and grasslands 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 listed as below 4,600 feet. One known occurrence of *Balsamorhiza macrolepis var. macrolepis* on the STF is located in the Middle Fork Fuel Reduction and Forest Health Project analysis area. No occurrences of this plant species are within 200 feet of the additions to the NFTS.

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 known

occurrences of *Clarkia australis* occur on the Groveland Ranger District (Haas 2008). One occurrence is known from private property within the boundaries of the Forest. Two other occurrences are known in Yosemite National Park (YNP), near the boundary with the STF. Approximately 484 known sites of this species exist on the forest. Many of the additions to the NFTS pass through or are within 200 feet of plant occurrences and suitable habitat areas.

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. Approximately 152 known sites of Clarkia biloba ssp. australis exist on the STF. Many of the additions to the NFTS pass through or are within 200 feet of plant occurrences and suitable habitat areas.

Clarkia lingulata (Merced clarkia) is known from only two populations, both found on the Merced River in Mariposa County at around 1,500 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. Numerous suitable habitat areas for this species were identified through GIS analysis and may be affected by use on motorized routes. No known occurrences exist within 200 feet of the additions to the NFTS.

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. 24 known sites of this plant species exist on the STF. Many of the additions to the NFTS pass through or are within 200 feet of suitable habitat areas.

Horkelia parryi (Parry's horkelia) is known to inhabit 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. It has been documented on the ENF to co-habitate 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 ENF has four known occurrences. Many of the additions to the NFTS pass through or are within 200 feet of plant occurrences and suitable habitat areas.

Iris hartwegii ssp. columbiana (Tuolumne iris) has 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, 350 to 5,000 feet. Additions to the NFTS pass through or are within 200 feet of suitable habitat areas. Two occurrences of the Tuolumne iris are within 200 feet of additions to the NFTS.

Roads in Wet Areas

Meadows on the forest are the principal wetlands that were affected by roads. Forest roads can bisect meadows, separating the meadow into an upper and lower section via a large fill and culvert. This culvert can trap sediment above the crossing, aggrading the channel in the upper meadow and minimizing sediment deposition in the lower meadow where degradation of the channel has occurred. The road has altered the flow and sediment regime in the meadow. Several sensitive species on the STF are found in these habitats that may be affected by sediment deposition.

The road system directly affects riparian communities where it impinges on riparian areas. Roads can indirectly affect riparian communities by intercepting surface and subsurface flows and routing these flows so that riparian areas dry up and the riparian vegetation is replaced with upland vegetation. Seventeen taxa are listed as sensitive within the STF in moist habitats such as meadows, fens, seeps, springs, and streamside zones. One known occurrence of a rare lichen *Hydrothryria venosa*, is known to occur within 30 feet of the road edge of the STF road system. 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, a great need exists for further study of lichen ecology and distribution. Motor vehicle use affects lichens and the habitat through damage to organisms themselves, and these threats include damage to the habitat component of clear water from introduction of sediment and possible petroleum products.

One moss, *Bruchia bolanderi*, is known to occur within 30 feet of the road edge of the STF road system. Mosses, liverworts, and hornworts (non-vascular green plants) play a crucial role in the hydrologic cycle and in the ecology of meadows and riparian areas. It is possible that unlocated mosses do occur in fens and meadows on the STF. Motor vehicles impact moss species in several ways. Sensitive plants can occur on cut and fill slopes and sometimes grow on the road surface on maintenance level 1 and 2 roads. Roads can affect the hydrology of an area, drying out some areas, concentrating runoff, and causing erosion in others. In addition, sedimentation from roads and soil compaction from road-related activities affects Sensitive plant habitat in some areas.

Existing road densities may contribute significantly to fragmentation and erosion damage of special habitats such as aspen, meadows, oak woodlands, lavacaps, and Sensitive plant occurrences. Based on preliminary analyses, unauthorized roads account for a disproportionate amount of adverse effects to Sensitive plants.

A portion of the roadside management zone has known Sensitive plant occurrences that may be intolerant to ground-disturbing activities. A review of sensitive plant occurrences suggests that for some species, up to 81% of all known occurrences intersect roads (USDA 2003c). The additions to the NFTS have direct impacts on approximately 9% of the sensitive plant species occurring in the analysis area. These plant species are analyzed in the effects section of each alternative.

Plant communities may continue to be negatively impacted by motorized routes not added to the NFTS for a period of time after the motorized use is stopped if erosion from the motorized trail is not reduced and/or eliminated. Continued use of unauthorized routes by nonmotorized uses such as hiking, mountain biking, and horseback riding traffic may prevent vegetative recovery. Native vegetative cover protects against erosion and maintains infiltration capacity of the soil (Switalski 2004). Surveys of unauthorized routes (and those NFTS roads and trails used to access them) showed some level of erosion. Therefore, it is important to estimate how long it might take unauthorized routes not added to the NFTS might need to recover once use has stopped. The rate of passive recovery of any unauthorized route will vary from site to site based on the soil type, amount and type of vegetative cover at the site, topography of the area disturbed, and intensity of the motor vehicle use.

Noxious and Invasive Weed Species

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 as “those plant species designated as noxious weeds by the Secretary of Agriculture or by the responsible State official (FSM 2080.5). 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 being 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 (Table 3.02-5). Inventories for weeds are conducted using this list as a guide. The list was generated from several sources including the SNFPA (USDA 2001, p. 310-311), the list of State-rated noxious weeds (2007), new weed discoveries in the Forest, occurrence records (CalFlora 2008), published technical references (Bossard, et.al., 2000, Hickman, 1993, Whitson, et.al., 1996), and personal observations. The detailed Noxious Weed Risk Assessment can be found in the Project record.

Table 3.02-5 Noxious Weeds and Non-native Invasive Plants

Common Name	Botanical Name	Annual/Perennial	CA Weed Status[1]	CA Invasive Plant Council[2]
Russian knapweed	*Acroptilon repens*	Perennial	BW	Moderate
Jointed goatgrass	*Aegilops cylindrica*	Annual grass	BW	--
Barbed goatgrass	*Aegilops triuncialis*	Annual grass	BW	High
Tree-of-heaven	*Ailanthus altissima*	Deciduous tree	Non-native	Moderate
Giant reed	*Arundo donax*	Perennial grass	Non-native	High
Black mustard	*Brassica nigra*	Perennial	Non-native	Moderate
Cheatgrass	*Bromus tectorum*	Annual grass	Non-native	High
Hoary cress	*Cardaria draba*	Perennial	BW	Moderate
Whitetop	*Cardaria pubescens*	Perennial	BW	Limited
Italian thistle	*Carduus pycnocephalus*	Annual	CW	Moderate
Slenderflower thistle	*Carduus tenuiflorus*	Annual	CW	Limited
Smooth distaff thistle	*Carthamnus baeticus*	Annual	BW	--
Woolly distaff thistle	*Carthamnus lanatus*	Annual	BW	Moderate
Purple starthistle	*Centaurea calcitrapa*	Annual to Perennial	BW	Moderate
Diffuse knapweed	*Centaurea diffusa*	Annual to Perennial	AW	Moderate
Iberian starthistle	*Centaurea iberica*	Annual to Biennial	AW	--
Spotted knapweed	*Centaurea maculosa*	Perennial	AW	High
Tocalote/ Malta starthistle	*Centauria melitensis*	Annual	Non-native	Moderate
Yellow starthistle	*Centaurea solstitialis*	Annual	CW	High
Squarrose knapweed	*Centaurea virgata ssp. squarrosa*	Perennial	AW	Moderate
Rush skeletonweed	*Chondrilla juncea*	Perennial	AW	Moderate
Canada thistle	*Cirsium arvense*	Perennial	BW	Moderate
Bull thistle	*Cirsium vulgare*	Biennial	Non-native	Moderate
Field bindweed	*Convolvulus arvensis*	Perennial Vine	CW	--
Bermuda grass	*Cynodon dactylon*	Perennial	CW	Moderate
Scotch broom	*Cytisus scoparius*	Deciduous Shrub	Non-native	Moderate
Quackgrass	*Elytrigia repens*	Perennial Grass	BW	--
Leafy spurge	*Euphorbia esulus*	Perennial	AW	High
Oblong spurge	*Euphorbia oblongata*	Perennial	BW	High
Fennel	*Foeniculum vulgare*	Perennial	Non-native	High
French broom	*Genista monspessulana*	Deciduous Shrub	CW	High
Hydrilla	*Hydrilla verticillata*	Aquatic herb	AW	High
Klamath weed	*Hypericum perforatum*	Perennial	CW	Moderate
Dyers woad	*Isatis tinctoria*	Perennial	BW	Moderate
Tall whitetop/ perennial pepperweed	*Lepidium latifolium*	Perennial	BW	High
Oxeye daisy	*Leucanthemum vulgare*	Perennial	Non-native	Moderate
Dalmation toadflax	*Linaria genistifolia ssp. dalmatica*	Perennial	AW	Moderate
Purple loosestrife	*Lythrum salicaria*	Perennial	BW	High
Parrot feather watermilfoil	*Myriophyllum aquaticum*	Aquatic Herb	Non-native	High
Eurasian milfoil	*Myriophyllum spicatum*	Aquatic Herb	CW	High

Common Name	Botanical Name	Annual/Perennial	CA Weed Status[1]	CA Invasive Plant Council[2]
Black locust	*Robinia pseudoacacia*	Deciduous Tree	Non-native	
Himalaya blackberry	*Rubus discolor*	Perennial Vine	Non-native	High
Cut-leaved blackberry	*Rubus laciniatus*	Perennial Vine	Non-native	High
Bouncing bet	*Saponaria officionalis*	Perennial	Non-native	--
Russian thistle	*Salsola tragus*	Annual	Non-native	Limited
White horsenettle	*Solanum elaeagnifolium*	Perennial	BW	--
Johnson grass	*Sorghum halepense*	Perennial Grass	CW	--
Spanish broom	*Spartinum junceum*	Deciduous Shrub	Non-native	High
Milk thistle	*Silybum marianum*	Annual or Biennial	Non-native	--
Medusahead grass	*Taeniatherum caputmedusae*	Annual Grass	CW	High
Puncturevine	*Tribulus terrestris*	Annual Herb	Non-native	--
Gorse	*Ulex europaeus*	Thorny Shrub	BW	High
Woolly mullein	*Verbascum thapsus*	Perennial	Non-native	Limited

[1] Code Weed Status
AW A list (noxious weeds)
BW B list (noxious weeds)
CW C list (noxious weeds)
NAW Noxious aquatic weed
PN Public nuisance
Q Quarantine
QW Q list (temporary "A" list noxious weed, pending final determination).
[2] Calweeds Database, California Invasive Plant Council website- Accessed September 2008. California weed list status for noxious weeds, and a rating for the ecological impact of each species cal-1ps/ip/inventory/weedlist.

Noxious Weed Management

The Forest has inventoried and monitored noxious weed locations and planned or implemented a number of noxious weed treatment projects as reported in 2004 and 2005 accomplishment reports. Noxious weed infestations and invasive plant species occupy 2,622.96 acres and 29.52 miles of motorized routes. Until surveys are performed throughout the analysis area, these numbers are considered estimates.

Habitat Vulnerability and Vector Methods

Data regarding weed and non-native plant infested routes within the STF is limited. The data consists of approximately 650 routes with 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 were collected by botanists during the last 10 years, documenting approximately 86 miles of weed infested NFTS roads. Although many of the existing roads within the analysis area were surveyed for weeds, not all of the additions to the NFTS were surveyed. The GIS query of the existing data includes routes within 200 feet of infested areas, and weed infestation on existing and additions to the NFTS within 200 feet of sensitive plant occurrences/suitable habitats. Table 3.02-6 shows acres of weed species infestations on the forest.

Weeds were introduced and spread primarily 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, Tocalote or Malta starthistle and Medusahead grass are by far the most common species found along existing NFTS routes and additions to the NFTS (STF weed database 2008). 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 (UC Davis, Di Tomaso 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 (Di Tomaso 2008, 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).

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 occur near vectors (streamside, areas of high human use, fire staging and action areas, birds, etc.) that could carry them quickly to other areas.

Motor vehicle use is known to contribute to weed introduction in a number of ways (Trombulak and Frissell 2000) including moving weed seed and plant parts from place-to-place in the mud/soil on tires, and/or on the vehicle body. Motor vehicle use disturbs native plant communities and makes the habitat more suitable for weed growth by reducing native plant cover. The disturbed areas within and adjacent to major highways, general forest roads, two-tracked non-maintained roads, and OHV trails provide habitat for any weed seed deposited. Weeds are known to be spread by motor vehicle use regardless of the season of use. Native vegetation is also known to be physically damaged by motor vehicle use regardless of the season of use. Season of use may or may not affect the rate of spread of weeds, and/or the creation of bare soil. When weeds become established in these edge areas, they provide the weed seed source for new occurrences of weed in the areas adjacent.

When native plants are replaced by weeds, the entire ecosystem can be altered. For example, when motor vehicle use introduces weeds into new areas and the weeds become established, the vegetative pattern is changed, providing more flammable fuels into the system. As the weeds spread and increase in volume, an increase in fuels occurs. Weeds such as Scotch and Spanish brooms, cheatgrass, and others, change the arrangement of vegetation, the amount of soil moisture at specific times of the year, the amount of fuel available to burn, and how fire behaves. Vehicle fires were known to start wildfires. If a wildfire occurs in a weed infested area, many weeds such as cheatgrass and French/Spanish broom have the competitive edge over native plants when the burned area begins to revegetate.

Edges are recognized as potential starting points for invasions of weeds into the less disturbed areas of the rest of the plant community such as forested areas (Pauchard and Alaback 2005). Less disturbed areas such as the interior of a forest are usually considered less susceptible to weed invasion because of a combination of factors such as competition from native species, fewer sites for seed germination, less solar radiation and less seed dispersal. However, weed establishment is not based on disturbance alone. When a weed seed source is sufficiently close to a plant community, that plant community/habitat is at increased risk of weed introduction and spread.

The rate that weeds are introduced to the creation of unauthorized routes is unknown. In one study, Rooney (2003) collected mud from the undercarriage of 14 motor vehicles. He found that seeds germinated from the mud collected from 4 of those vehicles. In the same study, he reported that each vehicle carried an average of 3.6 seeds. When he multiplied this number by the number of motor vehicles traveling each day, he estimated that about 6 million seeds were transported per vehicle per year in Wisconsin. Rooney predicted that over the long term, with motor vehicles as seed dispersers, the fraction of roads/trails colonized by weeds would increase until all motorized roads and trails reached a weed saturation level. This prediction was based on the lack of constant, extensive,

effective monitoring of motor vehicle routes. He also reported that weeds are generally better adapted to vehicular dispersal than native plant species due to their small seed size, high seed production, and persistent seed banks. In this analysis, 200 feet was chosen to define the distance that weed seed would be dispersed and established from travel on tires.

Disturbance by motor vehicles can have long-term effects to soils and favor weed establishment. Motor vehicles compact soils reducing water infiltration and accelerating erosion. They also displace soils and sheer off vegetative roots. If these effects are severe, a loss of soil productivity may occur. Numerous passes by vehicles over vegetation causes the plants to die, exposing the soil organic layer. The loss of vegetative cover makes the soil organic layer more susceptible to erosion. Loss of vegetative cover and the soil organic layer reduces the ability of the soil to hold moisture. Many weed species are more capable of utilizing less productive soils with less soil moisture. Some weeds can also produce secondary chemical compounds that inhibit native plant germination and growth. These compounds also affect nutrient cycling rates by inhibiting soil microbial fauna activity.

Maintenance of roads and trails can also spread weeds. Grading disturbs soil and competing vegetation, and also transports soil, and weed seeds/parts to new locations. Cleaning ditches/developing waterbars moves soils and creates ideal seedbeds. Seeds from equipment can be deposited in stream crossings and washed downstream. Mower heads can also move weed seeds/parts to new locations. This movement of weed seed/parts can happen at any time of the year since the seeds and parts are present in the soil at infested sites at all times of the year. Stockpiles of crushed aggregate can also be infested with weeds. When that aggregate is moved to a new location, the weeds go with it.

Another aspect of motor vehicle use that helps to spread weeds is tied to the use of recreational areas and facilities, such as trailheads, campgrounds, staging areas, and dispersed camping areas. These areas are frequently the first site on NFS lands that the motor vehicle comes in contact with after leaving major highways. Therefore, they frequently receive weed seed and plant parts. These areas have constant soil disturbance that provide a good seedbed for any weed seed that is deposited. In addition, the visitors themselves can also disperse weed seeds on their clothing, footwear, and camping equipment. Since many campgrounds are located near riparian areas and riparian areas in campgrounds frequently have high levels of public activity, they have a higher risk of weed infestation. Many weeds are adapted to riparian areas and rapidly become established on sites where soils were disturbed, such as eroding stream banks, road and trail crossings, and undeveloped trails. In addition, streams can carry weed seeds and plant parts great distances, hastening weed spread. Aquatic weeds, such as purple loosestrife, can take over whole wetland ecosystems, impeding water flow and reducing the quality of wetland habitats. Surveys for this listed noxious weed are incomplete, and it has not been located with in the analysis area.

Sensitive plants and watchlist species occurrences located in and/or near motor vehicle roads and trails have a high risk of negative impacts from weed introduction and spread. Several of the known occurrences of weeds on the STF are known to directly and indirectly impact sensitive plant occurrences. Noxious weed infestations, such as yellow starthistle and Klamath weed, are present along the Bull Creek Road on the Groveland District, and several of the known occurrences and habitat of the sensitive species Clarkia australis are directly and indirectly impacted. These occurrences are in open habitat and cutbanks where off-trail use can easily occur, and noxious weed spread is a primary concern for high risk to habitat and plants. Table 3.02-7 displays the miles of routes infested with invasive weeds. Table 3.02-8 displays routes where sensitive/watchlist plants and/or plant communities were impacted with noxious weed infestations. These plants and communities 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; it does include the routes with the most extensive roadside infestations on routes.

While noxious weeds and other invasive plant species may cause direct or indirect effects to sensitive plants through competition, weeds have major effects on potentially sensitive habitats. Invasive weeds also reduce species diversity in natural habitats across the analysis area.

Table 3.02-6 Weed Species Infestations

Common Name	Botanical Name	Acronym	Acres
Jointed goatgrass	*Aegilops cylindrica*	AECY	0.05
Barbed goatgrass	*Aegilops triuncialis*	AETR	0.04
Tree-of-heaven	*Ailanthus altissima*	AIAL	0.09
Cheatgrass	*Bromus tectorum*	BRTE	46.46
Italian thistle	*Carduus pycnocephalus*	CAPY	8.26
Diffuse knapweed	*Centaurea diffusa*	CEDI	2.10
Tocalote/Malta starthistle	*Centauria melitensis*	CEME	150.10
Yellow starthistle	*Centaurea solstitialis*	CESO	2,177.51
Squarrose knapweed	*Centaurea virgata ssp. squarrosa*	CEVIS	0.51
Canada thistle	*Cirsium arvense*	CIAR	0.25
Bull thistle	*Cirsium vulgare*	CIVU	33.32
Field bindweed	*Convolvulus arvensis*	COAR	0.01
Scotch broom	*Cytisus scoparius*	CYSC	2.01
French broom	*Genista monspessulana*	GEMO	0.27
Klamath weed	*Hypericum perforatum*	HYPE	42.53
Dyers woad	*Isatis tinctoria*	ISTI	0.74
Oxeye daisy	*Leucanthemum vulgare*	LEVU	0.41
Himalaya blackberry	*Rubus discolor*	RUDI	4.40
Cut-leaved blackberry	*Rubus laciniatus*	RULA	5.06
Bouncing bet	*Saponaria officionalis*	SAOF	1.08
Milk thistle	*Silybum marianum*	SIMA	0.37
Spanish broom	*Spartinum junceum*	SPJU	0.02
Medusahead grass	*Taeniatherum caputmedusae*	TACA	138.80
Puncturevine	*Tribulus terrestris*	TRTE	0.11
Woolly mullein	*Verbascum thapsus*	VETH	2.28
		total	**2,622.96**

The Noxious Weed Risk Assessment has a complete description of invasive plant species (Project record)

Table 3.02-7 Motorized Routes Infested with Invasive Weeds by Road Maintenance Level

Road Maintenance Level	**Alternative** (miles)				
	1	**2**	**3**	**4**	**5**
ML2	16.37	24.36	24.36	21.34	16.06
ML2 + HLO	4.58	0.00	0.00	3.40	4.57
ML3 + HLO	4.91	5.16	5.16	4.94	5.16
Additions to the NFTS	0.80	0.00	0.00	4.00	0.00
total	26.66	29.52	29.52	33.68	25.79

ML2 indicates a level 2 road (normally open to all vehicles)
ML3 indicates a level 3 road (normally open to highway legal vehicles only)

Table 3.02-8 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

Special Interest Areas

The management emphasis for Special Interest Areas (SIA) 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 area was established. A wide range of resource activities is permitted, provided the unique features of each area are protected (see 3.05 Roadless and Special Areas). The two SIAs containing sensitive species and Botanical resources are addressed here:

Trumbull Peak Historic and Botanical Area: The entire area covers 150 acres and includes three occurrences of sensitive plants, including Yosemite onion (*Allium yosemitense*), Congdon's woolly sunflower (*Eriophyllum congdonii*), and Congdon's lewisia (*Lewisia congdonii*). The existing road access to the area is gated with permitted access only.

Pacific Madrone Botanic Area: This 15 acre area contains the two southernmost known groves of Pacific Madrone (*Arbutus menziesii*) growing 1/10 mile apart. The two groves contain 20 mature and sapling trees, and some seedlings surrounded by riparian vegetation. No known occurrences of sensitive plants and no additions to the NFTS in this area.

Research Natural Areas

Certain botanical resources are protected within four Research Natural Areas (see 3.05 Roadless and Special Areas).

Bell Meadow Research Natural Area (490 acres): designated for aspen research, the RNA is located in the east-central portion of the Forest. It contains 110 acres of aspen stands in Bell Meadow along with wet mountain meadow, riparian habitat and examples of the aspen-meadow complex on deep soils.

Critchfield (Bourland Meadow) Research Natural Area (1,003 acres): designated for bogs and meadow research the RNA is located in the east-central portion of the Forest adjacent to the Emigrant Wilderness. Vegetation consists of seven major associations: 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 present and the area is noted for aquatic bog values. Successional stages are present in several stands, including meadows.

Grizzly Mountain Research Natural Area (500 acres): designated for black oak research, the RNA is located in the southern portion of the Forests on the northern slopes of Little Grizzly and Big Grizzly Mountains. Black oak stands occupy most of the area, interspersed with brush and scattered ponderosa pine.

Clark Fork Candidate Research Natural Area (460 acres): designated for white fir research, the RNA is located in the northeast portion of the Forest near 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 and the remainder is within the Clark Fork proposed Wild and Scenic River.

Environmental Consequences

People, vehicles and the roads they travel on tend to diminish and fragment suitable habitat for certain Sensitive species.

The Stanislaus National Forest has about 2,947 miles of system roads. Most areas have adequate road access. Small areas are still identified where minor amounts of new road construction are needed.

In addition to the system roads, a number of unauthorized routes exist. Unauthorized roads originate in different ways. Some are built as temporary roads, often for timber access. Some are user-created routes made by OHV use. The entire forest has not been completely surveyed for unauthorized routes. The Stanislaus is in a gradual process of inventorying the unauthorized roads, and approximately half of the forest has now been inventoried. (See Transportation, Chapter 3)

In some areas of the Forest, new routes continue to be developed by people driving their vehicles off existing roads. After one vehicle leaves a set of wheel tracks, other vehicles follow, creating an unauthorized route.

Alternative 1 (Proposed Action)

DIRECT AND INDIRECT EFFECTS

1. Cross Country Travel

Cross-Country travel is prohibited in Alternative 1. Elimination of cross country travel reduces impacts to plant communities by reducing direct impacts of crushing, ground disturbance, sedimentation, and rutting. Fewer acres are disturbed, resulting in fewer weed infestations. Passive recovery would occur on routes not added to the system. Sensitive plant populations could be affected by other non-motorized uses on these routes.

2. Additions to the NFTS

Alternative 1 includes 157.39 miles of additions to the NFTS. These additions would likely increase the direct and indirect effects to sensitive plants and their habitats. Proliferation of unauthorized routes is assumed zero or minor. Use will be discontinued on 92 miles of unauthorized 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. Three routes will be mitigated for direct and indirect effects to plants and habitat in Alternative 1 (Appendix F).

The routes will be allowed to passively recover. Passive recovery and re-vegetation is expected within a 10 year period. Disturbed areas on shallow soils, particularly above 8,000 feet elevation (cold temperature), will recover more slowly. These changes will have a positive effect on soil conditions as compared to Alternative 2 (see 3.08 Soil). With less disturbance from motor vehicles direct

impacts would lessened. Competing vegetation as a result of passive recovery may have an indirect effect to sensitive plants and habitat.

3. Changes to the Existing NFTS

Vehicle Class

Vehicle class changes would occur on 623.28 miles of NFTS roads. It is assumed that changing vehicle class does not change impacts to sensitive species and watchlist plants/plant communities, and that effects from all types of motor vehicles are assumed equal. These roads already have hardened surfaces that lack vegetation. It is likely that direct impacts to sensitive species and watchlist 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 impacts would continue regardless of the type of vehicle using the road.

Season of Use

Alternative 1 provides for season of use on designated native NFTS motorized routes (see Chapter 2). 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 would have a longer closure time and more benefit with lesser impact on sensitive plant resources than Alternative 4 and more of an impact than Alternative 5.

Wheeled over snow use would be allowed on 111.01 miles of roads by ATVs when 12 inches or more of snow is present (see Table 2.02-2) with no anticipated impact to plant communities by allowing this use.

Indicator Measure 1 – Number of sensitive plant sites/ occurrences within 200 feet of wheeled motor vehicle routes

Under Alternative 1, potential exists 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 additions to the NFTS 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 to sensitive plant sites/occurrences on either side of route's edge within 30 feet of motor vehicle routes

This alternative includes 59 documented sensitive plant sites along additions to the NFTS that may be directly impacted by motor vehicle use, including driving off-road, parking and/or camping off roads. The Biological Evaluation (BE) for Sensitive Plants and Other Botanical Resources shows routes with direct impacts to plants for this alternative (see project record).

Table 3.02-9 represents the number of potentially affected occurrences for each sensitive plant species along additions to the NFTS for Alternative 1.

Table 3.02-9 Species and Occurrences within 30 feet of Additions to the NFTS: Alternative 1

Species Name	Occurrences
Kellogss's lewisia	3
Mariposa clarkia;	2
Small's southern clarkia	7
Tuolumne fawn lily	3
Hetch-Hetchy (slender-stemmed) monkeyflower	9
three-bracted onion	4
Stebbins's lomatium	26
Parry's horkelia	5

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

This alternative includes 29.3 miles of additions to the NFTS within lava caps with sensitive plant sites and suitable habitat areas. Three known sensitive plant species may be directly or indirectly affected by additions to the NFTS in lava cap habitat areas. These sensitive plant sites are known to occur within 200 feet of additions to the NFTS within lava cap areas: Stebbin's lomatium, three bracted onion, and Kellogg's lewisia. The three bracted onion (*Allium tribracteatum*) is an endemic occurring on very thin soils in open habitat and is quite vulnerable to OHV activity. This species would be most vulnerable by opening the trails within this habitat in early April (M. Willits, personal communication, January 16, 2009).

Indicator Measure 4 - Miles of motorized routes passing through meadows

Approximately 1.8 miles of additions to the NFTS pass through meadows 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. Of the action alternatives, Alternatives 1 and 4 have the greatest number of additions 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

This alternative includes 0.80 miles of additions to the NFTS infested with invasive plant species and the potential to indirectly affect sensitive plant sites and suitable habitat areas. Twenty nine known noxious weed and invasive plant infestations are within 200 feet of sensitive plant sites and suitable habitat areas. Under this alternative, 22 sensitive plant sites/suitable habitat areas are within 200 feet of weed infested additions to the NFTS, .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 associated with additions to the NFTS. An additional 9 sensitive plant sites may be indirectly or directly affected by noxious and invasive weed infested routes under this alternative.

CUMULATIVE EFFECTS

Alternative 1 will potentially have the third highest impact to sensitive plant sites and suitable habitat areas after alternative 1 and 4. The Tuolumne fawn lily, an endemic to the Stanislaus National Forest, has documented impacts from numerous recreational and other forest uses. Existing impacts by OHV in suitable habitat areas for this plant species were extensively documented. The three sensitive plant sites of Tuolumne fawn lily that may be impacted by additions to the NFTS 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-three 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, additions to the NFTS and increases in OHV use will likely increase the cumulative effects to both of these plant species over time. It is assumed that future OHV use will contribute to the adverse cumulative effects, but would not result in a second vulnerable species, Hetch-Hetchy monkeyflower, has approximately 204 known sites documented on the STF. This species has a fairly narrow range, distributed through the southern half of the Groveland Ranger District on the STF. Nine of the 204 sites have documented impacts from motor vehicles on the analysis area. The meadows and seeps where this species occurs are easily accessed by OHVs. Numerous types of projects impact this species and were documented including, OHV use, logging, Ackerson and Rogge wildfires, large fire salvage, and reforestation projects. 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 cross country OHV trails and some of these trails pass through known sites. Documented sites exist near a fuel break in the Date Flat area. Noxious and invasive weeds spread by OHV use threaten this species. The five sites that may be impacted under Alternative 1 represent approximately 4% of the total known plant sites.

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 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 forest projects have and will impacte the suitable habitat. Surveys for these meadow-dwelling sensitive species are incomplete within the analysis area. However, it is not likely that the cumulative effects of these projects (Appendix B) will result in reducing the viability of these species.

This alternative includes noxious and invasive weed infestations associated with 26.66 miles of additions.

Overall, adverse cumulative effects to sensitive plant species under Alternative 1 are not expected to be of the scale that would reduce species viability for any of the STF sensitive plant species. Implementation of Alternative 1 would not, over time, improve conditions for sensitive plants and their habitats as a result 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 are taking place and are expected to increase in the foreseeable future due to the predicted increase in motor vehicle use on the STF. 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.

While direct effects to sensitive plant species from disturbances caused by these activities has minimally 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 were destroyed by these activities and that entire occurrences may were eliminated.

For the purpose of this analysis, cumulative effects of past activities are represented within the existing conditions. Appendix B provides a list and description of past, present, and reasonably foreseeable projects on the STF and private lands within the Forest boundary. Some, but not all, of

these activities will contribute to effects on sensitive plant and habitat. Within the project area, hazardous fuels reduction and associated timber harvest have occurred on approximately 25,410 acres of NFS land since 2000 (Appendix B). These treatments are anticipated to be the primary activity that will alter forest vegetation and impact sensitive plants and habitat. These projects will likely occur on an estimated 3,500 acres per year, based upon the acreage treated in 2006. Since 2000, approximately 85,000 acres of NFS lands burned in wildfires. Within the project area, prescribed burning has occurred on about 22,500 acres between 2000 and 2008. CDF lists a total of 2,365 acres of private land within the STF administrative boundary for which timber harvest plans were submitted. On private timberlands, harvest methods include selective thinning and regeneration (clearcut) and then are reforested using herbicides to suppress competing vegetation

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 on unauthorized routes will alleviate impacts from motor vehicles in some areas of the forest. Under Alternative 1, cumulative impacts to sensitive plants on the STF are expected to remain below the threshold that reduces the overall viability for these rare plant species, or to cause listing under the Endangered Species Act.

Alternative 2 (No Action)

DIRECT AND INDIRECT EFFECTS

1. Cross Country Travel

Cross-country travel would not be prohibited under this alternative and travel on all existing routes would be allowed to continue except where prohibited by existing Forest Orders. Therefore it is assumed that route proliferation would continue over the short and long-term and the effects would be similar to those discussed below for adding routes to the NFTS. The use of these routes and the continued proliferation of new routes would result in increasing amounts of disturbance to sensitive plants and their habitat. These effects would be similar to those discussed within Alternative 4 for the short-term, but would be exacerbated over the long-term by the continued

2. Additions to the NFTS

No effects because use would only occur on the existing NFTS.

3. Changes to the Existing NFTS

Vehicle Class

No changes are made to vehicle class.

Season of Use

No changes are made to existing restrictions (see Table 2.02-7). Wheeled over Snow activities would be allowed to continue.

Alternative 2 has potential direct and indirect effects to approximately 39 percent of all documented sensitive plant 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 existing motorized routes within meadows, and 29.52 miles of weed infested native surface routes.

Wheeled over snow use would have potential direct and indirect impacts to sensitive plant habitat. The potential impacts of these routes to the sensitive plants and habitat are included in the analysis in Indicator Measure 1 of this alternative for the upland and midslope species and habitat. Indirect effects of wheeled over snow travel to plant species and habitat would most likely be a result secondary to rutting or change in hydrology.

Indicator Measure 1 - Number of sensitive plant sites/ occurrences within 200 feet of wheeled motor vehicle routes

Direct and indirect effects may occur to 612 sensitive plants sites/habitat areas located within 200 feet of 2,259.37 miles of motor vehicle 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 to sensitive plant sites/occurrences on either side of route's edge within 30 feet of motor vehicle routes

Approximately 248 documented sensitive plant sites occur along routes with known direct impacts caused by motor vehicles use including driving off-road, parking or camping off-roads. These sensitive plant species are listed in Table 3.02-10.

Table 3.02-10 Species and Occurrences within 30 feet of Additions to the NFTS: Alternative 2

Species Name	Occurrences
Kellogg's lewisia	3
Mariposa clarkia;	25
Small's southern clarkia	45
Tuolumne fawn lily	28
pansy monkey flower	15
Hetch-Hetchy (slender-stemmed) monkeyflower	5
three-bracted onion	18
Stebbins's lomatium	68
mountain lady slipper	4
Bolander's bruchia	4
Tuolumne iris	2
veiny aquatic lichen	2
Yosemite wooly sunflower	3
Parry's horkelia	19

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. The three bracted onion (*Allium tribracteatum*) is an endemic occurring on very thin soils in open habitat and is quite vulnerable to OHV activity.

Indicator Measure 4 - Miles of motorized routes passing through meadows

Approximately 11.16 miles of routes pass 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

At present, 29.52 miles and 521 motorized routes are infested with noxious and invasive weed species and the potential to directly and/or indirectly affect sensitive plant sites and/or suitable habitat areas. Thirty two known noxious and invasive weed infestations are within 200 feet of sensitive plant occurrences and suitable habitat areas. Under this alternative, 41 sensitive plant sites and suitable

habitat areas are directly or indirectly affected by routes with noxious and invasive weed infestations within 200 feet.

CUMULATIVE EFFECTS

Although adverse cumulative effects to sensitive plant species under Alternative 2 are not expected to be of the scale that would reduce species viability, nearly 40 percent of the total number of sensitive plant sites/ occurrences and suitable habitats throughout the STF are impacted by motor vehicle use. Current impacts by motor vehicle travel have not been extensively documented in all suitable habitat areas for sensitive plant species on the STF. Alternative 2 has potential effects to approximately 39 percent of all STF documented plant sites within the analysis area and potential effects to their habitats. Alternative 2 has the greatest number of miles within meadows and lava caps. Under Alternative 2, cumulative effects from implementing a variety of projects listed in Appendix B could impact sensitive plants and their habitat, especially in meadows and on lava caps.

Alternative 2 would not, over time, improve conditions for sensitive plants and their habitats as a result of continued public wheeled motor vehicle use on unauthorized routes. Impacts to sensitive plant occurrences and habitat are expected to increase in the foreseeable future due to the predicted increase in population and associated increases motor vehicle use on the STF. In Alternative 2, cumulative impacts to sensitive plants on the Stanislaus NF are expected to remain below the threshold required to reduce the overall viability or cause listing status for these rare plant species. The unknown effects to sensitive plants and their habitat is greater under this alternative as motor vehicle travel by the public would not be limited to NFTS routes and continued use of user created routes is more likely to occur. It is assumed present and future unmanaged OHV use will contribute to the adverse cumulative effects. The continued use of the existing routes and additions to the NFTS will negatively affect the viability of sensitive plant species and habitat. 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.

Alternative 2 reflects the greatest number of miles of invasive plant infestations within 200 feet of sensitive plant resources and the risk of weed vectoring by motor vehicles is greater than all of the other alternatives.

This alternative would has 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 2259.37 miles of routes open for public wheeled motor 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 greater for this alternative as motor vehicle travel by the public would not be limited to NFTS routes and continued use of user created routes will occur. Because of the inability to predict where route proliferation would occur on the Forest, it is difficult to determine what effects route proliferation would have on suitable habitat. While direct effects to sensitive plant species from disturbances caused by these activities has minimally 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 were destroyed by these activities and entire occurrences eliminated.

For the purpose of this analysis, cumulative effects of past activities are represented within the existing conditions. Appendix B provides a list and description of past, present, and reasonably foreseeable projects on the STF and private lands within the Forest boundary. Some, but not all, of these activities will contribute to effects on sensitive plant and habitat. Within the project area, hazardous fuels reduction and associated timber harvest have occurred on approximately 25,410 acres of NFS land since 2000 (Appendix B). These treatments are anticipated to be the primary activity that will alter forest vegetation and impact sensitive plants and habitat. These projects will likely occur on an estimated 3,500 acres per year, based upon the acreage treated in 2006. Since 2000, approximately 85,000 acres of NFS lands burned in wildfires. Within the project area, prescribed burning has occurred on about 22,500 acres between 2000 and 2008. CDF lists a total of 2,365 acres of private land within the STF administrative boundary for which timber harvest plans were submitted. On private timberlands, harvest methods include selective thinning and regeneration (clearcut) and then are reforested using herbicides to suppress competing vegetation.

Over time, this alternative may have the highest level of cumulative effects to sensitive plant resources caused by noxious and invasive plant infestations.

Alternative 3 (Cross Country Prohibited)

DIRECT AND INDIRECT EFFECTS

1. Cross Country Travel

Motor vehicle travel off NFTS routes by the public would be prohibited except as allowed by permit or other authorization. The routes will be allowed to passively recover. Passive recovery and re-vegetation is expected within a 10 year period. The time frame of 10 years allows for most of the routes to grow vegetation and stabilize to background erosion rates. Disturbed areas on shallow soils, particularly above 8,000 feet elevation (cold temperature), will recover more slowly. These changes will have a positive effect on soil conditions as compared to Alternative 2 (see 3.08 Soil). With less disturbance from motor vehicles direct impacts would lessened. Competing vegetation as a result of passive recovery may have an indirect effect to sensitive plants and habitat.

2. Additions to the NFTS

This alternative would not result in the addition of any motorized routes to the NFTS, nor would it change the type of use on NFTS routes.

3. Changes to the Existing NFTS

No changes are made to existing restrictions (see Table 2.02-7). No changes are made to the existing NFTS.

Indicator Measure 1 - Number of sensitive plant sites/ occurrences within 200 feet of wheeled motor vehicle routes

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 the NFTS. At this time it is unknown what the direct and indirect effects are to undocumented plant occurrences.

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 to sensitive plant sites/occurrences on either side of route's edge within 30 feet of motor vehicle routes

Alternative 3 contains 155 documented sensitive plant sites along the existing NFTS routes with known impacts from motor vehicle use, including driving off-road, parking or camping off-roads. Table 3.02-11 shows the number of occurrences of sensitive plant species for Alternative 3.

Table 3.02-11 Species and Occurrences within 30 feet of Additions to the NFTS: Alternative 3

Species Name	Occurrences
Mariposa clarkia;	24
Small's southern clarkia	39
Tuolumne fawn lily	12
pansy monkey flower	10
Hetch-Hetchy (slender-stemmed) monkeyflower	14
three-bracted onion	5
Stebbins's lomatium	31
mountain lady slipper	4
Bolander's bruchia	1
Tuolumne iris	1
veiny aquatic lichen	1
Yosemite wooly sunflower	3
Parry's horkelia	10

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

Approximately 65.97 miles of existing NFTS 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. The three bracted onion (*Allium tribracteatum*) is an endemic occurring on very thin soils in open habitat and is quite vulnerable to OHV activity.

Indicator Measure 4 - Miles of motorized routes passing through meadows

Approximately 11.16 miles of existing NFTS routes pass 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

Alternative 3 contains 29.52 miles and 440 motorized routes infested with invasive plant species and the potential to directly and/or indirectly affect sensitive plant sites and/or suitable habitat areas. Thirty two known noxious and invasive weed infestations are within 200 feet of sensitive plant occurrences and suitable habitat areas documented for the existing routes in Alternative 3. Under this alternative, 41 sensitive plant sites and suitable habitat areas may be directly or indirectly affected by routes with noxious and invasive weed infestations within 200 feet.

CUMULATIVE EFFECTS

Under Alternative 3, cumulative impacts to sensitive plants on the STF are expected to remain below the threshold in reducing the overall viability for these rare plant species.

Overall, adverse cumulative effects to sensitive plant species in Alternative 3 are not expected to be of the scale that would reduce species viability. Impacts by motor vehicle travel have not been extensively documented in all suitable habitat areas for sensitive plant species on the STF. Continued use on the NFTS will likely continue the level of effects to all of the sensitive plant species within

200 feet of these routes over time. At this time, it is assumed that the cumulative effects, present and foreseeable future management activities, including those from motor vehicle impacts, would not result in a trend toward federal listing for sensitive plants suspected 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. While direct effects to sensitive plant species from disturbances caused by these activities has minimally 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 were destroyed by these activities and entire occurrences eliminated. While direct effects to sensitive plant species from disturbances caused by these activities has minimally been mitigated by avoidance, indirect effects such as further invasion by noxious weeds has occurred.

For the purpose of this analysis, cumulative effects of past activities are represented within the existing conditions. Appendix B provides a list and description of past, present, and reasonably foreseeable projects on the STF and private lands within the Forest boundary. Some, but not all, of these activities will contribute to effects on sensitive plant and habitat. Within the project area, hazardous fuels reduction and associated timber harvest have occurred on approximately 25,410 acres of NFS land since 2000 (Appendix B). These treatments are anticipated to be the primary activity that will alter forest vegetation and impact sensitive plants and habitat. These projects will likely occur on an estimated 3,500 acres per year, based upon the acreage treated in 2006. Since 2000, approximately 85,000 acres of NFS lands burned in wildfires. Within the project area, prescribed burning has occurred on about 22,500 acres between 2000 and 2008. CDF lists a total of 2,365 acres of private land within the STF administrative boundary for which timber harvest plans were submitted. On private timberlands, harvest methods include selective thinning and regeneration (clearcut) and then are reforested using herbicides to suppress competing vegetation.

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 or facilities. Impacts to sensitive plant occurrences and habitats are taking place and are expected to increase in the foreseeable future due to the predicted increase in motor vehicle use on the STF. This alternative potentially would have the least amount of impacts and effects on sensitive plant occurrences and suitable habitat areas than all of the other alternatives.

Alternative 4 (Recreation)

DIRECT AND INDIRECT EFFECTS

1. Cross Country Travel

Cross-Country travel is prohibited in Alternative 4. The routes will be allowed to passively recover. Passive recovery and re-vegetation is expected within a 10 year period. Disturbed areas on shallow soils, particularly above 8,000 feet elevation (cold temperature), will recover more slowly. These changes will have a positive effect on soil conditions as compared to the Alternative 2 (see 3.08 Soil).

With less disturbance from motor vehicles direct impacts would lessened. Competing vegetation as a result of passive recovery may have an indirect effect to sensitive plants and habitat.

Direct impacts to sensitive species from dispersed recreational 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 plant individuals that occur in a specific location and how many of them are damaged.

2. Additions to the NFTS

This alternative adds 181.72 miles of unauthorized routes to the NFTS system, including 102 routes 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 additions to the NFTS within the analysis area. Proliferation of unauthorized routes is assumed zero or minor. Use will be discontinued on 65 miles of unauthorized routes

3. Changes to the Existing NFTS

Vehicle Class

Vehicle class changes would occur on 371.32 miles of NFTS roads. It is assumed that changing the class of vehicle does not change impacts to sensitive species and watchlist plants/plant communities and that effects from all types of motor vehicles are assumed equal. These roads already have hardened surfaces that lack vegetation. It is likely that direct impacts to sensitive species and watchlist 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 impacts would continue regardless of the type of vehicle using the road.

Season of Use

Alternative 4 provides for season of use on designated NFTS motorized routes. Season of use varies by surface type and route location within 3 different zones. Lower elevations are open all year, middle elevations are open April 1 through December 31, and upper elevations are open April 1 through December 31. The length of time for season of use increases the potential for direct and indirect effects to sensitive plant and other botanical resources under this alternative, in comparison to Alternatives 1 and 5.

Wheeled over Snow use is the same as Alternative 1.

Indicator Measure 1 - Number of sensitive plant sites/ occurrences within 200 feet of wheeled motor vehicle routes

Alternative 4 proposes approximately 181.72 miles of additions to the NFTS, potentially directly or indirectly affecting 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 within 200 feet of routes may be affected under Alternative 4.

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 to sensitive plant sites/occurrences on either side of route's edge within 30 feet of motor vehicle routes

This alternative includes 72 documented plant sites along additions to the NFTS that may be directly affected by motor vehicles either driving off-road, parking or camping off-roads. The Biological Evaluation (BE) for Sensitive Plants and Other Botanical Resources shows routes with direct impacts to plants for this alternative (see project record).

The following table 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.

Table 3.02-12 Species and Occurrences within 30 feet of Additions to the NFTS: Alternative 4

Species Name	Occurrences
Kellogss's lewisia	4
Mariposa clarkia;	2
Small's southern clarkia	9
Tuolumne fawn lily	4
Hetch-Hetchy (slender-stemmed) monkeyflower	11
three-bracted onion	5
Stebbins's lomatium	30
Parry's horkelia	6

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 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. The three bracted onion (*Allium tribracteatum*) is an endemic occurring on very thin soils in open habitat and is quite vulnerable to OHV activity. This species would be most vulnerable by opening the trails within this habitat in early April (M. Willits, personal communication, January 16, 2009).

Indicator Measure 4 - Miles of motorized routes passing through meadows

This alternative includes 2.1 miles of additions to the NFTS in meadows and riparian areas. 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

Under this alternative, 4 miles and 68 additions to the NFTS are infested with invasive plant species with the potential to affect sensitive plant sites and suitable habitat areas. Forty two known noxious weed infestations are within 200 feet of sensitive plant sites and suitable habitat areas documented for the additions to the NFTS under Alternative 4. Under this alternative, a total of 17 sensitive plant sites/suitable habitat areas are within 200 feet of noxious weed infestations on additions to the NFTS, 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 6 sites within 200 feet of noxious weed infestations, and Tuolumne fawn lily has 5 sites within 200 feet of noxious weed infestations.

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, including the Tuolumne fawn lily and Stebbin's lomatium. Stebbin's lomatium grows in lava cap habitat areas, which tend to have the highest number 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 motor vehicle use from the additions to the NFTS under this alternative. Approximately 10 percent of the known sites in the analysis area of Tuolumne fawn lily are likely to be adversely affected by motor vehicle use from the additions to the NFTS under this alternative. At this time, it is unlikely that the cumulative effects of 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. Three sites have documented direct impacts from motor vehicle uses on existing motorized routes. In addition, four sites of this plant species may be directly impacted by route additions to the NFTS under Alternative 4. A total of 70% of the known plant sites of this plant species may be directly affected by motorized travel under this alternative. Due to the extended range of this taxon within the Sierra Nevada and the fact that this taxon was only recently listed as sensitive surveys for it have not been extensive, 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).

Alternative 4 has the greatest number of additions to the NFTS in lava caps of all the action alternatives. 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 Alternative 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 are 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 to these meadow-dwelling sensitive species from present and foreseeable future management activities listed in Appendix B, it is not likely to be a trend toward federal listing for these wide-ranging species.

Alternative 4 also has the highest mileage of weed infested routes, with 33.68 miles of infestations on native surface routes and 29.68 miles of motorized routes are infested with noxious and invasive weed species. Alternative 4 has the potential to affect 49 known sensitive plant sites and suitable habitat areas within 200 feet of weed infested motorized routes. Cumulatively, effects to sensitive plant resources caused by invasive species will be more than Alternative 1. 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 were destroyed by these activities and entire occurrences eliminated. While direct effects to sensitive plant species from disturbances caused by these activities has minimally been mitigated by avoidance, indirect effects such as further invasion by noxious weeds has occurred.

For the purpose of this analysis, cumulative effects of past activities are represented within the existing conditions. Appendix B provides a list and description of past, present, and reasonably foreseeable projects on the STF and private lands within the Forest boundary. Some, but not all, of these activities will contribute to effects on sensitive plant and habitat. Within the project area, hazardous fuels reduction and associated timber harvest have occurred on approximately 25,410 acres of NFS land since 2000 (Appendix B). These treatments are anticipated to be the primary activity that

will alter forest vegetation and impact sensitive plants and habitat. These projects will likely occur on an estimated 3,500 acres per year, based upon the acreage treated in 2006. Since 2000, approximately 85,000 acres of NFS lands burned in wildfires. Within the project area, prescribed burning has occurred on about 22,500 acres between 2000 and 2008. CDF lists a total of 2,365 acres of private land within the STF administrative boundary for which timber harvest plans were submitted. On private timberlands, harvest methods include selective thinning and regeneration (clearcut) and then are reforested using herbicides to suppress competing vegetation.

Implementation of Alternative 4 would improve conditions for those sensitive plant populations and their habitats associated with routes not added to the system. Impacts to sensitive plant occurrences and habitat are expected to increase in the foreseeable future due to the predicted increase in motor vehicle use. Four routes will be mitigated for effects to plants and their habitats in Alternative 4. 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.

Alternative 5 (Resources)

DIRECT AND INDIRECT EFFECTS

1. Cross Country Travel

Cross-Country travel is prohibited in Alternative 5. Proliferation of unauthorized routes is assumed zero or minor. Current use will be discontinued on 220 miles of unauthorized routes. The routes will not be added to the NFTS and allowed to passively recover. Passive recovery and re-vegetation is expected within a 10 year period. Disturbed areas on shallow soils, particularly above 8,000 feet elevation (cold temperature), will recover more slowly. These changes will have a positive effect on soil conditions as compared to the Alternative 2 (see 3.08 Soil). With less disturbance from motor vehicles direct impacts would lessened. Competing vegetation as a result of passive recovery may have an indirect effect to sensitive plants and habitat.

Direct impacts to sensitive species from dispersed recreational 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 plant individuals that occur in a specific location and how many of them are damaged.

2. Additions to the NFTS

This alternative includes 31.51 miles of additions to the NFTS, including 8 routes 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 9 known sensitive plant sites and suitable habitat areas within 200 feet of additions to the NFTS within the analysis area.

Alternative 5 has the least number of additions to the NFTS 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

3. Changes to the Existing NFTS

Vehicle Class

Vehicle class changes would occur on 531.39 miles of NFTS roads. It is assumed that changing the class of vehicle allowed to use a particular road does not change impacts to sensitive species and watchlist plants/plant communities and that effects from all types of motor vehicles are assumed equal. These roads already have hardened surfaces that lack vegetation. It is likely that direct impacts

to sensitive species and watchlist 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.

Season of Use

Alternative 5 provides for season of use 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 season of use period in comparison to all of the other alternatives.

Indicator Measure 1 - Number of sensitive plant sites/ occurrences within 200 feet of wheeled motor vehicle routes

Direct and indirect effects may occur to 9 sensitive plant sites and/or suitable habitat areas located within 200 feet of additions to the NFTS 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 to sensitive plant sites/occurrences on either side of route's edge within 30 feet of motor vehicle routes

Eight known sensitive plant sites are along additions to the NFTS under Alternative 5 that may be impacted by motor vehicle routes either by driving off road, parking, or dispersed camping. The Biological Evaluation (BE) for Sensitive Plants and Other Botanical Resources shows routes with direct impacts to plants for this alternative (see Project record).

Table 3.02-13 shows the number of sites for each sensitive plant species represents the additions to the NFTS added to the system under Alternative 5.

Table 3.02-13 Species and Occurrences within 30 feet of Additions to the NFTS: Alternative 5

Species Name	Occurrences
Small's southern clarkia	1
three-bracted onion	1
Stebbins's lomatium	4
Parry's horkelia	2

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

This alternative includes 6.3 miles of native surface additions to the NFTS within lava cap areas with sensitive plant sites and suitable habitats. Alternative 5 has the least number of additions to the NFTS in lava cap areas of all of the alternatives. The three bracted onion (*Allium tribracteatum*) is an endemic occurring on very thin soils in open habitat and is quite vulnerable to OHV activity. This species would be most vulnerable by opening the trails within this habitat in early April (M. Willits, personal communication, January 16, 2009).

Indicator Measure 4 - Miles of motorized routes passing through meadows

This alternative includes 0.2 miles of additions to the NFTS 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

This alternative include 0.02 miles of additions to the NFTS, infested with invasive plant species and the potential to indirectly and directly affect sensitive plant sites and suitable habitat areas. Seven known noxious and invasive weed infestations are within 200 feet of sensitive plant sites and suitable habitat areas documented for the additions to the NFTS under Alternative 5. Five sensitive plant sites are within 200 feet of noxious weeds that may be indirectly or directly affected by infestations additions to the NFTS under this alternative.

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 wheeled motor vehicle 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, since fewer roads would impact 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 additions to the NFTS in lava caps. One route includes mitigation measures for direct and indirect affects to plants. Monitoring and compliance efforts would still be necessary to mitigate damage to the most vulnerable sites.

This alternative includes 25.79 miles of motorized routes infested with noxious and invasive weed species. Alternative 5 has the potential to indirectly and directly 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 indirect and direct effects to sensitive plant and other botanical resources caused by invasive species will be less for Alternative 5 than for the Alternatives 1 and 4.

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 were destroyed by these activities and entire occurrences eliminated. While direct effects to sensitive plant species from disturbances caused by these activities has minimally been mitigated by avoidance, indirect effects such as further invasion by noxious weeds has occurred.

For the purpose of this analysis, cumulative effects of past activities are represented within the existing conditions. Appendix B provides a list and description of past, present, and reasonably foreseeable projects on the STF and private lands within the Forest boundary. Some, but not all, of these activities will contribute to effects on sensitive plant and habitat. Within the project area, hazardous fuels reduction and associated timber harvest have occurred on approximately 25,410 acres of NFS land since 2000 (Appendix B). These treatments are anticipated to be the primary activity that

will alter forest vegetation and impact sensitive plants and habitat. These projects will likely occur on an estimated 3,500 acres per year, based upon the acreage treated in 2006. Since 2000, approximately 85,000 acres of NFS lands burned in wildfires. Within the project area, prescribed burning has occurred on about 22,500 acres between 2000 and 2008. CDF lists a total of 2,365 acres of private land within the STF administrative boundary for which timber harvest plans were submitted. On private timberlands, harvest methods include selective thinning and regeneration (clearcut) and then are reforested using herbicides to suppress competing vegetation.

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 diminished risk to sensitive plants than under existing conditions. The six sensitive plant taxa that were most impacted due to the habitat's 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.

Summary of Effects Analysis across All Alternatives

An increase of mileage and number of routes available for public motor vehicle use occurs under alternatives 1 and 4, and will increase the potential for direct and indirect effects to sensitive plants and suitable habitat. Alternatives 3 and 5 will reduce the mileage and number of routes available for 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 sensitive plant occurrences on those routes. Effects from noxious weeds will continue to occur regardless of which alternative is selected. Alternatives with fewer routes open for public wheeled motor vehicle use, especially those that exclude routes that are weed infested, provide a reduced risk for vectoring of seeds by motor vehicles, and may decrease the spread of weeds to non infested portions of these routes and other parts of the forest. When the motor vehicle use on unauthorized routes ceases, the recovery of native vegetation can be affected by the presence of weeds within and adjacent to that route. Vegetative recovery in areas infested with weeds may not occur if the weeds are not eliminated and desired native vegetation is encouraged (Bard 2004). The amount of time needed for the motorized road or trail to revegetate with native species is dependent on many factors including the type of weed at the site.

Sensitive plant species were adversely affected by roadside brushing, piling and burning, erosion seeding, grading, hazard tree removal, noxious weed introduction and road and culvert failure. Effects of roads on Sensitive plants may occur within the roadside hazard tree removal zone. This zone, which occupies about 14% of the Stanislaus roaded acres, is the area within which roadside hazard tree removal is likely to affect botanical resources.

Continued activities of annual road and trail maintenance such as grading and brushing could have direct effects to sensitive plant populations adjacent to these facilities with narrow road or trail prisms. These plant populations occupy about 2% of the Stanislaus roaded acres.

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

Table 3.02-14 gives the summary of effects of motorized routes to Sensitive Plants, Habitats and Noxious Weeds on the within the analysis area.

Table 3.02-14 Botanical Resources Indicator Measures

Indicator Measures	Alternative				
	1	2	3	4	5
Additions to the NFTS with sensitive plant sites within 200 ft	68	0	0	102	8
Additions to the NFTS within meadows (miles)	1.8	0	0	2.1	0.2
Additions to the NFTS through lava caps with known plant sites (miles)	29.3	0	0	32.1	6.3
Routes with sensitive plant sites within 30ft	493	612	410	533	419
Sensitive plant sites with noxious weed infestations within 200 ft	22	41	41	17	5
Weed infested additions to the NFTS (miles)	0.80	0	0	4.0	0.02
Weed infested motorized routes (miles)	26.66	29.52	29.52	33.68	25.79

Table 3.02-15 presents the direct and indirect effects to sensitive plants by alternative for each indicator measure developed. The effects were analyzed for Alternatives 1, 4 and 5 with miles of additions to the NFTS and with total miles of existing and additions to the NFTS for all alternatives.

Table 3.02-15 Direct and Indirect Effects to Sensitive Plants

Sensitive Plant Occurrence Effects	Indicator Measure	Alternative				
		1	2	3	4	5
Sites directly/indirectly affected (w/in 200 ft) by additions to the NFTS	1	83	0	0	123	9
Sites directly/indirectly (w/in 200 ft) affected by total number of routes	1	493	612	410	523	419
Sites directly affected by additions to the NFTS	2	59	0	0	69	8
Sites directly affected by total number of routes	2	111	101	55	123	64
Sites directly/indirectly affected on lava caps by additions to the NFTS	3	31	0	0	36	6
Sites directly/indirectly affected on lava caps by total number of routes	3	43	166	12	48	18
Sites directly/indirectly affected in moist habitats by additions to the NFTS	4	33	0	0	15	0
Sites directly/indirectly affected in moist habitats by total number of routes	4	51	66	18	33	18
Sites directly/indirectly affected by invasive plant infestations (w/in 200 ft) by additions to the NFTS	5	22	0	0	17	5
Sites directly/indirectly affected by invasive plant infestations (w/in 200 ft) by total number of routes	5	63	41	41	58	46

From the results presented in Table 3.02-15, 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 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 of the action alternatives to known sensitive plant sites, while Alternative 1 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 3.02-16 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 additions to the NFTS and existing routes for Alternative 2.

Table 3.02-16 Direct Effects to Sensitive Plants

Plant Species	Alternative				
	1	2	3	4	5
Lomatium stebbinsii	26	68	31	30	4
Allium tribracteatum	4	18	5	5	1
Clarkia australis	7	45	39	9	1
Clarkia biloba ssp. australis	2	25	24	2	0
Mimulus filicaulis	9	15	14	11	0
Horkelia parryi	5	19	10	6	2
Erythronium tuolumnense	3	28	12	4	0
Cypripedium montanum	0	4	4	0	0
Mimulus pulchellus	0	15	10	0	0
Lewisia kelloggii ssp. kelloggii	3	3	0	4	0
Eriophyllum nubigenum	0	3	0	0	0
Hydrothyria venosa	0	2	1	0	0
Iris hartwegii ssp.columbiana	0	1	1	0	0
Balsamoriza macrolepis var. macrolepis	0	0	0	0	0
Moss Species					
Bruchia bolanderi	0	2	1	0	0
Additions to the NFTS with Direct Effects to Plant Sites	55	0	0	69	8
total	**210**	**248**	**155**	**224**	**163**

Table 3.02-17 shows the potential for direct impacts to sensitive plants and unique habitat increases with additions to the NFTS under Alternatives 1 and 4, respectively.

Table 3.02-17 Summary of Effects for Botanical Resources

Indicators – Botanical Resources	Rankings of Alternatives for Each Indicator[1]				
	1	2	3	4	5
Unauthorized routes within or adjacent to sensitive plant sites or within or adjacent to suitable sensitive plant habitat.	3	1	5	2	4
Routes/areas open for public motor vehicle use within or adjacent to sensitive plant sites.	3	1	5	2	4
Routes/areas open for public motor vehicle use with documented disturbances from motor vehicles that resulted in damage to individual sensitive plants or to habitat.	3	1	5	2	4
Density of routes open for motor vehicle use within areas of suitable TES plant habitat where occurrences exist (e.g., lava caps)	1	3	5	2	4
Routes/areas open for motor vehicle use within moist habitats (miles)	1	3	5	2	4
Average for Botanical Resources	**2.2**	**1.8**	**5.0**	**2.0**	**4.0**

[1] A score of 5 indicates the alternative has the least impact on this resource; a score of 1 indicates the alternative has the most.

Compliance with the Forest Plan and Other Direction

All alternatives comply with the Forest Plan S&Gs for botanical resources.

Sensitive Plant Mitigations

Four routes require mitigation measures 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 also the Stebbin's lomatium occurrences in one area.

- 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).