3.06. Plant Communities

Introduction

Management of plant/fungi species, native plant communities, and maintenance of plant diversity, is an important part of the mission of the Forest Service (FS) (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 FS 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 Land and Resource Management Plan (LRMP). Key parts 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 National Forest System (NFS) lands, and developing and implementing management objectives for populations and/or habitats of rare species.

Management decisions related to motorized travel can affect plant and fungi species, their habitats, and natural communities. 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 FS 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)). Therefore, management decisions related to motorized travel on NFS lands must consider effects to plant and fungi species, and their habitats.

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

Direction relevant to the Proposed Action as it affects native plants/plant communities includes:

Endangered Species Act (ESA): The ESA 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 USFWS and the National Marine Fisheries Service concerning TE species under their jurisdiction. It is FS policy to analyze impacts to TE species to ensure management activities are not likely to jeopardize the continued existence of a TE species, or result in the destruction or adverse modification of habitat of such species that is determined to be critical. This assessment is documented in a Biological Assessment (BA) and is summarized or referenced in this chapter.

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:

- Noxious weeds management (Management Standard & Guidelines 36-49).
- Wetland and Meadow Habitat (Management Standard & Guideline 70): See Appendix I (Riparian Conservation Objectives).
- Riparian Habitat (Management Standard & Guideline 92): See Water Resources section.
- Bog and Fen Habitat (SNFPA ROD page 65, S&G #118): Prohibit or mitigate ground-disturbing activities that adversely affect hydrologic processes that maintain water flow, water quality, or water temperature critical to sustaining bog and fen ecosystems and plant species that depend on these ecosystems. During project analysis, survey, map, and develop measures to protect bogs and fens from such activities as trampling by livestock, pack stock, humans, and wheeled vehicles.
- Sensitive Plant Surveys (Corrected Errata, April 19, 2005): Conduct field surveys for threatened, endangered, proposed, and sensitive (TEPS) plant species early enough in project planning process that the project can be designed to conserve or enhance TEPS plants and their habitat. Conduct surveys according to procedures outlined in the Forest Service Handbook (FSH 2609.25.11). If additional field surveys are to be conducted as part of project implementation, survey results must be documented in the project file. (Management Standard & Guideline 125). The standards and guidelines provide direction for conducting field surveys, minimizing or eliminating direct and indirect impacts from management activities, and adherence to the Regional Native Plant Policy (USDA Forest Service 2004).

In addition, the Tahoe National Forest (TNF) has completed interim management guides (IMGs) for several sensitive species including: *Eriogonum umbellatum* var. *torreyanum* (1993); *Ivesia aperta* var. *aperta*, *Ivesia aperta* var. *canina*, *and Ivesia sericoleuca* (1992); and *Lewisia cantelovii* and *Lewisia serrata* (1997). The most commonly recommended management prescription in these IMGs is avoidance of direct, indirect and cumulative impacts.

Affected Environment

Background

TNF plant communities are made up of a series of vegetation types arranged in dynamic patterns. TNF plant communities are constantly changing due to the occurrence of such things as: wildfires, ecological succession, climate change, wind, drought, insects, management activities, etc.

As described in the SNFPA (2001), the physical structures that form the TNF and the diversity and number of plant species, have not changed much in the last 2 million years. However, the distribution and associations of plant species have changed significantly over time. Table 3.06-1 provides the acres and types of vegetation types found on the TNF (SNFPA 2001).

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 (SNFPA 2001). Plant species may be rare due to evolutionary history, basic population ecology, historic or current human activities, or a combination of these factors. Human activities may or may not be responsible for the current distribution and abundance of rare species. However, an important assumption in this analysis is that motorized vehicle use within and adjacent to rare species occurrences have the ability to negatively impact the trends of specific plant and fungi species. In particular, motorized vehicle use can reduce the quality of and/or the amount of habitats that support rare plant and fungi species. Table 3.06-2 displays the number of sensitive species occurrences known to occur on TNF system lands.

In addition to rare plant species, six of the native plant communities found in the TNF are impacted by motorized vehicle use: aquatic/riparian, serpentine, older forests, oak woodland, forest edges/openings, and high elevation openings/rocky areas. Two ecologically important disturbance related processes that are contributed to by motorized vehicle use are also discussed in detail: noxious weed infestation and native plant community fragmentation.

Aquatic/riparian, serpentine, older forest, oak woodland, forest edges/openings, and high elevation openings/rocky area plant communities are made up of several different vegetation types. These plant communities are of concern because of the amount of the plant community available, the condition of the remaining plant communities, and/or because the plant community provides habitat for a number of threatened, endangered, proposed, sensitive, (TEPS) and/or watchlist plants. The presence of and expansion of weeds into Sierra Nevada native plant communities is a serious threat to all plant communities. In addition, the lack of connectivity/fragmentation of plant communities is a concern.

Table 3.06-1. Acres of Vegetation Type on the TNF

Vegetation type	Acres
Unvegetated (includes rock outcrops, water, urban and agricultural)	50,159
Grassland (does not include grassy patches in the conifer zones)	34
Shrublands (does not include brush patches embedded in the conifer zone)	165,409
Black oak	50,306
Live oak	9,518
Riparian hardwoods (primarily aspen, willow and cottonwood species)	3,559
Mixed conifer	164,693
Ponderosa pine	11,645
Red fir	127,388
Westside white fir	174,455

The diversity of topography, geology, and elevation on the TNF has combined to create conditions that support a diverse flora. For example, the TNF is known to contain about 30 percent of the 5,000 native vascular plant species known to occur in the state of California. In Nevada County alone, there are over 1,490 native vascular plant species (Beedy and Brossard 2002). The TNF sensitive species list currently contains 30 rare vascular plants that are known to occur on or near TNF system lands. They include: *Arabis rigidissima* var. *demota*, *Astragalus webberi*, *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium lunaria*, *Botrychium minganense*, *Botrychium montanum*, *Calochortus clavatus* var. *avius*, *Clarkia biloba* ssp. *Brandegeae*, *Cypripedium fasciculatum*, *Cypripedium montanum*, *Epilobium howellii*, *Erigeron miser*, *Eriogonum umbellatum* var. *torreyanum*, *Fritillaria eastwoodiae*, *Ivesia aperta* var. *aperta*, *Ivesia aperta* var. *canina*, *Ivesia sericoleuca*, *Ivesia webberi*, *Lewisia cantelovii*, *Lewisia kelloggii* ssp. *hutchisonii*, *Lewisia kelloggii* ssp. *kelloggii*, *Lewisia longipetala*, *Lewisia serrata*, *Lupinus dalesiae*, *Monardella follettii*, *Penstemon personatus*, *Phacelia stebbinsii*, *Pyrrocoma lucida*, and *Tauschia howellii*. These 30 plants, 6 mosses, 1 lichen, and 3 fungi are listed in Table 3.06-2. The TNF also has 21 vascular plants on its watchlist.

There are 6 rare mosses known to occur on TNF system lands and/or adjacent to them. They include: *Bruchia bolanderi*, *Fissidens aphelotaxifolius*, *Helodium blandowii*, *Meesia triquetra*, *Meesia uliginosa*, and *Mielichhoferia elongata*. These mosses are habitat specific either occurring in aquatic/riparian areas or in rock with copper/heavy metals (*Mielichhoferia elongata*). They may have crucial roles in the hydrologic cycle and in the ecology of meadows and riparian areas. The TNF does not have a comprehensive moss flora. In addition, *Meesia longiseta* and *Sphagnum* moss species are included on the TNF watchlist. It is possible that *Meesia longiseta* occurs in fens on the TNF but at this time there are no known occurrences of *Meesia longiseta* on the TNF. Several fen habitats on the TNF are known to contain mosses in the genus *Sphagnum*. *Sphagnum* moss is ecologically important in that it prefers to grow in acidic conditions and actually contributes to the acidity by giving off hydrogen ions. In addition, *Sphagnum* moss can absorb more than 90 percent of its dry weight in water, which can be crucial in maintaining hydrological conditions in meadows and fens.

Motorized vehicles impact moss species in several ways. When mosses are run over by vehicles, they do not have an underground root system that can help them recover (compared to vascular plants). In addition, water temperature is important to the photosynthetic ability of mosses. As described in the SNFPA (2001) mosses can photosynthesize effectively at temperatures as low as 33 degrees F (compared to a lower limit of about 50 degrees F for vascular plants). Mosses stop photosynthesizing effectively at an upper limit of about 77 degrees F (in contrast to vascular plants, some of which can photosynthesize at temperatures of up to 100 degrees F). When moss layers are disturbed by vehicles, it is possible that water temperatures can go up due to hydrologic disruption.

The rare lichen, *Hydrothyria venosa*, is known to occur on or near TNF system lands. There are no lichens on the TNF watchlist. Lichens occur in all types of habitats, and frequently show specific substrate preferences. They are important in soil formation. Information regarding lichen distributions in the Sierra Nevada and on the TNF is incomplete. There is a great need for further study of lichen ecology and distribution in the Sierra Nevada. Motorized vehicle use affects lichens primarily through damage to the organisms themselves and by damaging the habitat where they are growing. Threats to *Hydrothyria venosa* include damage to the habitat component of clear water from introduction of sediment and possibly petroleum products.

There are 3 rare fungi known to occur on or adjacent to TNF system lands. They include: *Cudonia monticola*, *Dendrocollybia racemosa*, and *Phaeocollybia olivacea*. There are no fungi on the TNF watchlist. Information regarding fungal distributions and ecology on the TNF is incomplete. However, it is known that fungi break down organic material to make inorganic nutrients available for use by other organisms. In addition, many fungi are considered essential food sources for animals. Others play important roles as mycorrhizal symbionts for vascular plants where nutrients are exchanged between a fungus and the roots of a plant. Motorized vehicle use affects fungi primarily through damage to the underground portion of the fungus through compaction and/or displacement of soil, and/or damage to and/or displacement of host plants. Mycorrhizal relationships between fungi and vascular plants are essential for plant growth and survival. Motorized vehicles are recognized as carriers of non-native invasive plants (weeds) that can displace native vegetation.

Motorized vehicle use is also known to damage biotic (living) soil crusts. These soil crusts are formed from a relationship between the top few millimeters of the soil, and an assortment of lichens, mosses, liverworts, cyanobacteria, algae, fungi, and bacteria. Motorized vehicles break through these crusts exposing the soil to wind and/or water erosion.

Table 3.06-2. Number of Sensitive Species Occurrences Known to Occur on TNF System Lands

Scientific Name	Known Occurrences on TNF system lands	Estimated number of plants
Arabis rigidissima var. *demota*	None	0
Astragalus webberi	None	0
Botrychium ascendens	4	Less than 80
Botrychium crenulatum	8	Less than 500
Botrychium lunaria	None	0

Scientific Name	Known Occurrences on TNF system lands	Estimated number of plants
Botrychium minganense	None	0
Botrychium montanum	None	0
Bruchia bolanderi	4	Number of moss plants not estimated
Calochortus clavatus var. *avius*	None	0
Clarkia biloba ssp. *Brandegeae*	4	Varies by year – this is an annual plant – less than 4,000
Cudonia monticola	1	Not estimated – most of the fungus is underground.
Cypripedium fasciculatum	5	Less than 500
Cypripedium montanum	None	0
Dendrocollybia racemosa	1	Not estimated
Epilobium howellii	4	Less than 500
Erigeron miser	14	8,100
Eriogonum umbellatum var. *torreyanum*	11	7,000
Fissidens aphelotaxifolius	None	0
Fritillaria eastwoodiae	7	Less than 1,000
Helodium blandowii	None	0
Hydrothyria venosa	None	0
Ivesia aperta var. *aperta*	5	Less than 5,000
Ivesia aperta var. *canina*	None	0
Ivesia sericoleuca	28	50,000
Ivesia webberi	None	None
Lewisia cantelovii	16	Less than 5,000
Lewisia kelloggii ssp. *hutchisonii*	8	10,000+
Lewisia kelloggii ssp. *kelloggii*	None	0
Lewisia longipetala	4	Less than 1,000
Lewisia serrata	5	Less than 500
Lupinus dalesiae	2	Less than 500
Meesia triquetra	12	Number of moss plants not estimated.
Meesia uliginosa	17	Number of moss plants not estimated.
Mielichhoferia elongata	None	0
Monardella follettii	None	0
Penstemon personatus	2	Less than 1,000
Phacelia stebbinsii	19	Varies by year – this is an annual plant
Phaeocollybia olivacea	2	Not estimated – most of the fungus is underground.
Pyrrocoma lucida	12	Less than 25,000
Tauschia howellii	2	Less than 5,000

Plant Community Groups

Background: The following discussion groups TNF rare plants and fungi by the general types of habitats where they grow and/or places them into a non-specific plant community group. The plant community/

habitat grouping approach is not all inclusive. Important habitat elements necessary to the viability of a particular species may be missed. However, this grouping provides a rough approximation of the type of habitat each species needs and allows an evaluation of how the potential habitat is impacted by motorized vehicle use. An evaluation of how potential habitat is impacted is important since surveys are not considered up to date, especially along temporary and Management Level 1 (ML 1) roads. Unauthorized and system motorized vehicle roads/trails/areas may or may not have sensitive and/or watchlist species growing within or adjacent to them. However, it is reasonable to expect them to be in the potential habitat since there are known occurrences of sensitive/watchlist species and/or watchlist plant communities within and/or near NFTS roads/trails/areas.

Mitigation measures specified in Appendix A (Site Specific Road, Trail and Open Area Information) would be implemented in all of the action alternatives (they become management requirements). These mitigation measures would provide benefits to sensitive/watchlist species and other native vegetation. All of the mitigation measures must be implemented before the motorized road/trail/area is available to be used. Regardless of which action alternative is selected, there would be benefits to native vegetation from implementation of these mitigation measures. However, impacts to native vegetation would still occur. These impacts are not considered significant unless those impacts are reducing the viability of a species or causing the loss of an entire plant community. Therefore, this analysis focuses on impacts to those plant/fungus species and/or plant communities that are considered limited, i.e. the sensitive/watchlist species and watchlist plant communities. The analysis is divided into the effects of impacts to known occurrences where surveys have been done, and effects to potential habitats where current surveys are not available.

Revegetation of unauthorized roads/trails/areas (routes): The amount of time necessary for an unauthorized road/trail/area (route) to revegetate is a concern primarily due to possible sediment loss through erosion and changes to the hydrology. The appearance of native vegetation in a disturbed area is considered one of the first visual signs of ecosystem recovery (Switalski et al. 2004). Vegetative recovery of sites is considered acceptable once an herbaceous understory of native vegetation is achieved (Gibson et al. 2000). Studies of the length of time it takes a disturbed area to achieve vegetative recovery indicate that the amount of time varies, and that extrapolation of the time frames from one site to another requires an accounting of site-specific historical and environmental factors (ibid). In addition, the limiting factors of the disturbed area (e.g. seed availability, plant recruitment and survival, and soil compaction) need to be defined (Roovers et al. 2005).

Rare plants/fungi and plant communities may continue to be negatively impacted by unauthorized routes for a period of time even after the motorized use is removed if erosion from the unauthorized motorized vehicle is not reduced and/or eliminated and hydrologic flow is not restored. It is recognized that continued use of routes in need of erosion control by other users (foot, mountain bike and horse traffic) may also prohibit vegetative recovery. Native vegetative cover protects against erosion and maintains infiltration capacity of the soil (Switalski et al. 2004). Soil and watershed surveys of unauthorized motorized vehicle routes indicate 50% of the routes had some level of erosion. Refer to the botanical and soil/water survey documentation located in the project record. Therefore, it is important to

estimate how long it might take an unauthorized motorized vehicle route to recover vegetatively once the motorized vehicle use is removed.

It is anticipated that some of the unauthorized motorized vehicle routes will not recover without restoration actions. These routes would be restored by the TNF as budgets and personnel are available. Some unauthorized routes may be proposed for addition to the NFTS at a later date after conducting NEPA and implementing mitigations to reduce and/or eliminate existing resource damage. Other routes may be used for non-motorized recreation. Still others would be left alone and they will revegetate without restoration actions. All of these scenarios add to and/or reduce impacts to native vegetation. As stated above, it is recognized that non-motorized recreational use may also negatively impact native vegetation. However, motorized vehicle use is recognized as more damaging to vegetation than pedestrians (USDA et al. 1998). In addition, the rate of vegetative 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 motorized vehicle use (USDA et al. 1998). The ecological effects of motorized vehicle routes can extend substantial distances from the road in terrestrial ecosystems (Trombulak and Frissell 2000). Motorized vehicle routes can injure organisms adjacent to them and alter physical conditions beneath them. They change soil density, temperature, soil water content, light levels, dust, surface waters, patterns or runoff and sedimentation. They can also add heavy metals (especially lead), salts, organic molecules, ozone, and nutrients to adjacent environments (ibid).

Aquatic/Riparian Plant Communities

Riparian vegetation is found near water sources at all elevations, and aquatic vegetation is found within the water. The SNFPA (2004) identified special aquatic features and defined them as unique wetlands of high biological diversity occupied by rare aquatic and terrestrial animal plant species. Aquatic and riparian ecosystems have significantly greater biodiversity than adjacent uplands (Kondolf et al. 1996), providing habitat for both aquatic and terrestrial plant and animal species. They are a critical component of biodiversity within the arid lands of the western United States and their importance is amplified by the small amount of land they occupy (Caicco 1998, Goebel et al. 2003). These ecosystems are also important for rare or endemic plant and animal species including rare or endemic invertebrate species (Erman 1996, Erman and Erman 1990).

Riparian plant communities are important even though they may cover only small areas. Some small riparian plant communities (those associated with streams and wetlands such as springs and seeps) are considered headwater systems. Headwater systems benefit humans by mitigating flooding, maintaining water quality and quantity, recycling nutrients, and providing habitat for plants and animals (Meyer et al 2003). The benefits that humans receive from the natural functioning of headwater systems are called ecosystem services. Intact physical and biological characteristics of small streams and wetlands provide natural flood control, recharge groundwater, trap sediments and pollution from fertilizers, recycle nutrients, create/maintain biological diversity, and sustain the biological productivity of downstream rivers, lakes and estuaries. Seasonal and perennial riparian and aquatic ecosystems provide these ecosystem services. Human disturbances such as extensive motorized vehicle use within headwater

systems can result in water pollution, stream filling, and/or the introduction of weeds and other exotic species, can diminish the biological diversity of the systems, and affect the downstream rivers and streams (ibid). Changes to vegetation or hydrology, water pollution, or the introduction of weeds can have profound effects on biota living in headwaters (ibid).

Most estimates indicate that more than 50 percent of the world's aquatic/riparian plant communities (wetlands) may have been altered, degraded or lost in the last 150 years through a wide range of human activities (O'Connell 2003). Aquatic/riparian plant communities in the Sierra Nevada have been directly removed or have had their functions impaired by gold mining, gravel mining, hydroelectric development, land clearance and diversions of water for irrigation, land drainage, timber harvest, construction of roads and railroads, urbanization, livestock grazing, and ground water abstraction (Kondolf et al. 1996). Many of the NFTS and unauthorized motorized vehicle routes cross perennial/intermittent streams and/or are located within 100 feet of aquatic/riparian plant communities.

This analysis used 100 feet from riparian vegetation to define the distance where direct/indirect impacts from motorized vehicles could occur. This distance has been successfully used in other projects to buffer native plants/plant communities from direct/indirect impacts. TNF soil/water staff has also used a 100-foot buffer for perennial water to reduce/eliminate impacts from a variety of projects (to protect water quality from negative impacts from other types of management activities). A recent review of scientific literature revealed that a 100-foot riparian buffer is adequate to mitigate against significantly impacting riparian and aquatic resources (Spackman and Hughes 1995 and Steinblums, I. J., H. A. Froehlich, and J. K. Lyons, 1984).

About 541 miles of motorized vehicle use are currently located within 100 feet of riparian vegetation on the TNF (about 395 miles of NFTS, state, county, and private, and 146 miles of unauthorized routes and closed NFTS roads still receiving some motorized use). A distance of one vehicle length from aquatic/riparian dependent rare plants was chosen as the distance from a route where motorized vehicle use could directly impact rare plants. The Tahoe has about 3,389 perennial and intermittent water crossings (NFTS, state, county, and private and unauthorized). According to information presented in Section 3.02, the condition of system routes varies - with areas of high motorized route density and high erosion risk having a higher risk of accelerated erosion and sediment production and/or deposition. Section 3.02 states that - in general, higher route densities translate into higher potential for adverse effects to aquatic/riparian habitats.

In this analysis, aquatic/riparian plant communities have been grouped to include: wet meadows, seeps, fens/peatlands, vernally wet areas, riparian (streamside and lakeside), wet/moist rock cliffs, and spring plant communities. Sensitive species that occur in/are dependent on aquatic/riparian plant communities include: *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium lunaria*, *Botrychium minganense*, *Botrychium montanum*, *Bruchia bolanderi*, *Epilobium howellii*, *Fissidens aphelotaxifolius*, *Helodium blandowii*, *Hydrothyria venosa*, *Ivesia aperta* var. *aperta*, *Ivesia aperta* var. *canina*, *Ivesia sericoleuca*, *Ivesia webberi*, *Lewisia cantelovii*, *Lewisia serrata*, *Meesia triquetra*, *Meesia uliginosa*, and *Pyrrocoma lucida*. Watchlist plants and plant communities that are dependent on aquatic/riparian plant communities include: *Darlingtonia californica*, *Drosera anglica*, *Drosera rotundifolia*, *Juncus*

marginatus var. *marginatus*, *Mimulus lacinatus*, *Potamogeton filiformis*, *Rhynchospora alba*, *Rhynchospora capitellata*, *Scutellaria galericulata*, *Sphagnum* moss species, *Utricularia minor*, *Veronica cusickii*, special aquatic features, and aspen groves. *Bruchia bolanderi* was found within 30 feet of TKN-J5. *Ivesia sericoleuca* was found within 1 foot of TKN-M2. *Epilobium howellii* was found at the end of YRN-001. A vernal pool was found adjacent to TKN-J2. Aspen plant communities were found along TKN-J11, TKN-J13, TKN-M2, TKS-11, SV-005, and SV-P14. Seep/spring plant communities were found along SV-005, TKN-5, TKN-J13, TKN-M2, YRS-066, YRS-SF4 and YRS-SF5.

Hydrologic alteration is considered one of the biggest threats to sensitive/watchlist species dependent on aquatic/riparian plant communities. Many NFTS and unauthorized motorized vehicle routes cross perennial and/or intermittent streams and/or are located within 100 feet of riparian vegetation. These crossings can alter the hydrologic conditions of the aquatic/riparian plant community at the crossing and downstream from the crossing. The significance of the hydrologic alterations (and therefore impacts to aquatic/riparian vegetation) is dependent on the condition of the soil and vegetation at the crossing. Surveys of crossings (refer to the project record) showed a wide range of existing conditions. Some crossings are well armored with rock and do not show significant signs of erosion (or impacts to aquatic/riparian vegetation). In other cases, the access to the crossing is too steep, erosion of the stream banks is occurring and/or riparian vegetation is lacking. Refer to Appendix A (Site Specific Road, Trail and Open Area Information) for more information about crossings.

In summary, sensitive/watchlist species dependent on aquatic/riparian plant communities benefit most when the health of the aquatic/riparian ecosystem is maintained or improved. Motorized vehicle use can negatively impact these plant communities by changing the pattern of water flow, reducing vegetative cover, compacting soil, causing erosion, depositing petroleum products/sediment thereby reducing water quality, and introducing invasive non-native plants (weeds). The significance of these negative impacts varies dependent on many factors.

Riparian vegetative recovery: Native riparian vegetation is adept at recovering from disturbance such as motorized vehicle use as long as the soil is healthy (healthy soil is not compacted or lost through erosion) and the hydrology of the disturbed area is not severely modified. However, each riparian site is different - for example, each stream has a unique combination of channel morphology, streamside vegetation, hydrology, geology, and soils. Therefore the recovery rates of riparian vegetation will vary. Routes located adjacent to streams and groundwater discharge areas (seeps and springs) will be susceptible to excessive wetness and periodic flooding (Leung and Marion 1996) and may continue to erode even after the motorized use is removed. The presence of weeds indicates a degrading ecosystem (Thompson et al 1998). Routes with extensive weed infestation may not recover vegetatively.

Light use: If the motorized vehicle disturbance was light (bare soil was not created/is limited, the route is already revegetating, and/or streambanks and floodplains were not significantly altered), vegetative recovery will occur rapidly (1 to 2 years based on personal observations) since the roots of the riparian vegetation will still be intact. Native riparian tree and shrub species have deep rooted, soil binding root systems. If native tree and shrub root systems are intact, species such as white or mountain alder (*Alnus rhombifolia* and *A. tenuifolia*) will sprout from the root crown and grow throughout the first

growing season after the disturbance. Native rhizomatous riparian species such as sedges (*Carex* species) will also continue to grow and provide soil cover if their root systems have not been significantly disturbed.

Heavy use: Heavily used riparian areas will have reduced infiltration due to soil compaction, and subsequent surface runoff; reduced and/or eliminated vegetative cover; and the streams and floodplains may have been physically modified. If restoration actions are not taken, erosion may continue and worsen dependent on many factors such as storm and high peak runoff events. In the case of riparian vegetation associated with streams, where a channel is beginning a cycle of erosion, native riparian vegetation seed sources may be absent, the channel gradients may be steep and recovery may require decades or longer (Elmore and Beschta 1987). These areas may not recover without restoration efforts and would be high priority restoration project areas.

Riparian vegetation associated with meadows can heal when remedial treatments reverse the downward trend in the following indicators (Zeedyk 1996):

- Incised channel with active headward erosion
- Eroding soil surface marked by sheet, rill or gully erosion, lowered water table and receding capillary zone
- Surface drying with loss of hydric soils
- Declining population of wetland plant species
- Increasing numbers of upland species
- Disappearance of wetland obligate fauna

Restoration of wet meadow areas begins when available soil moisture increases and the duration of moisture availability is extended enough to meet the minimum seasonal growth requirements of locally adapted wetland plants, especially sedges and rushes (Zeedyk 1996). Allowing unauthorized routes located within wet meadows to heal themselves is seldom a responsible decision with regard to restoring wetland integrity (Zeedyk 1996). The route surface must be reshaped to allow overland runoff to cross over rather than be captured by the unauthorized route. Simple revegetation is seldom sufficient to assure meadow restoration - structural work is usually required (ibid). This is especially true where the unauthorized route has incised below the meadow surface.

Riparian vegetation recovery in disturbed areas located in fen/peatland/spring/seep areas would be similar to what is described above under light and/or heavy use. However, if fen plant communities are heavily disturbed and the hydrology altered, the fen plant community may be converted to a wet meadow plant community. Fens/peatlands contain plant species adapted to specific conditions. Therefore there would be a change in plant species composition and a change in plant biodiversity for the area.

Intermediate use: In areas that have received intermediate use, the existing condition of riparian vegetation impacted by unauthorized motorized vehicle routes falls somewhere between being able to recover on its own, and needing extensive restoration work. Riparian vegetation located within one vehicle length of an unauthorized motorized vehicle route will need site specific evaluation to determine what is needed for revegetation, and monitoring to determine whether vegetative recovery is occurring.

The greater soil moisture in riparian plant communities magnifies the amount of plant and soil damage (Yorks et al 1997).

Serpentine and/or Copper/Heavy Metal Plant Communities

Serpentines (ultramafic soils) are looked upon as significant segments of the worldwide fabric of diversity (Kruckeberg 1984). The vegetation growing on serpentine areas can be highly distinctive. Many serpentine areas are sparsely vegetated and dry, while others are relatively productive and support mixed conifer and yellow pine communities. Plants that exist on serpentine soil have adapted to the unusual chemical composition of the soil. Many species have evolved that are specific to serpentine soil (such species are known as endemics). Several endemic serpentine sensitive and watchlist plant species only occur on serpentine soil. Currently there are about 1,660 acres of serpentine soils on TNF system lands that are impacted by motorized vehicle use of system and unauthorized roads/trails/areas (within 100 feet of the road/trail/area). There are 80 miles of NFTS, state, county, and private and 40 miles of unauthorized routes and closed NFTS roads still receiving some motorized use located within serpentine plant communities.

Serpentines are also identified as irreplaceable watershed systems (Kruckeberg 1984). Serpentine outcrops contain highly fractured and faulted metamorphic and igneous ultramafic rock which serves to store water in the water table. Year-around water such as springs, seeps, and other continuous water flow areas are common in these areas (ibid). Even undisturbed serpentine areas may have sheet erosion and mass wasting. However, disturbance severely enhances the erosion potential on serpentines (ibid).

In this analysis, serpentine plant communities include rocks and soils derived from serpentine that contain heavy metals. Serpentine rocks have iron magnesium silicate and impurities of chromium, nickel, and other toxic elements. As these rocks weather, soils develop that are high in magnesium and iron, low in calcium, and toxic to plants that are not specifically adapted to them. Therefore, they contain unique plant communities. Sensitive species that occur on serpentine soils or copper/heavy metal soils include: *Mielichhoferia elongata* and *Monardella follettii*. Watchlist species that are dependent on these types of habitats include: *Allium sanbornii* var. *congdonii*, *Allium sanbornii* var. *sanbornii*, *Chlorogalum grandiflorum*, and *Perideridia bacigalupi*. Many serpentine floras in California contain a high degree of endemism (Brooks 1987). TNF serpentines occur primarily along the lower western slopes of the forest (Kruckeberg 1984).

Motorized vehicle use impacts these plant communities by reducing vegetative cover, creating disturbed soils that are subject to erosion, and introducing weeds. Many serpentine habitats are open terrain lacking vegetation (Kruckeberg 1984). These habitats are limited (less than 1 percent of the earth) (Brooks 1987).

Serpentine vegetative recovery: Serpentine areas are characterized by critically low levels of most principal plant nutrients, exceptionally high levels of magnesium and iron, and a number of toxic trace elements (Safford et al. 2005). Safford and Harrison (2005) report that very low soil fertility in serpentine soils lead to:

- low rates of plant growth and low levels of community productivity

- thin vegetative cover and large extents of bare ground
- higher ratios of native to exotic species
- a higher component of perennial herbs than the adjacent nonserpentine areas

Human disturbance in serpentine areas such as off-highway vehicle use are generally easy to see because vegetation and soil recovery are very slow (Harrison et al 2006). Revegetation of serpentine areas disturbed by motorized vehicle use may also be dependent on whether topsoil remains in the disturbed area. In one study (Koide and Mooney 1987), revegetation of topsoil plots was much more effective than revegetation efforts on subsoil plots especially in serpentine areas with shallow soils. In another study, older trees harvested on serpentine soils were not replaced by old second growth trees for more than 150 years (Kruckeberg 1984). In addition, the types of plants that are capable of growing on serpentine soils appear to be limited (ibid). Many of the plants that are growing on non-serpentine soils located adjacent to serpentine soils do not appear to have the genetic preadaptation to become established on serpentine soils (ibid).

Since even undisturbed serpentine areas are considered erosive, it is expected that revegetation of unauthorized motorized vehicle routes would be slow especially if the use level was intermediate to heavy and there was a loss of top soil. Even lightly disturbed areas would have increased erosion potential. Therefore, in general terms, vegetative recovery of unauthorized motorized vehicle routes is not expected in the short term (1 to 5 years) and may not occur in the long term (5 years plus) without restoration efforts.

Older Forest Plant Communities

In this analysis, older forest is described as occurring in the red fir/upper montane forest and mixed-conifer forest. Other vegetation types exist that also have older trees, but mixed conifer and red fir are the primary types of older forest analyzed in this document. For more information about old forests, refer to the SNFPA (2001). There are about 285,728 acres of older forest on TNF system lands, of which 29,900 acres are currently, impacted by system and unauthorized, motorized vehicle roads/trails/areas (routes). This acreage number was obtained using about 100 feet on either side of system and unauthorized motorized vehicle routes that pass through vegetation mapped as CWHR 4 and above on NFS lands. There are about 2,057 miles of NFTS, state, county, and private and 817 miles of unauthorized routes and closed NFTS roads still receiving some motorized use located in older forest plant communities.

Plant and fungi species that are dependent on older forest plant communities rely on shade, protected microclimates, and infrequently disturbed substrates. Because of mycorrhizal associations, these species are intolerant of edge effects that change the temperature, moisture, and other microclimate conditions. Sensitive species dependent on these habitats include: *Cudonia monticola*, *Cypripedium fasciculatum*, *Cypripedium montanum*, *Dendrocollybia racemosa*, and *Phaeocollybia olivacea*. The TNF does not currently have any watchlist species or plant communities dependent on older forests.

Motorized vehicle use can impact older forest plant communities in several ways. The most significant impacts may be to underground mycelia and mycorrhizal networks. Motorized vehicle use

disturbs the litter/duff/soil organics, reduces soil shade/moisture, and creates openings. Openings created by motorized vehicle routes may be breaks in the mycelial network. Reductions in leaf litter and organic material in soils affects the amount of nutrients and water available to plants dependent on mycorrhizal associations and fungi. Creation of bare soil also increases the risk of weed introduction and spread.

Older Forest vegetative recovery: Guariguata and Dupuy (1997) found evidence of soil compaction in tracks of 3 out of the 4 logging roads studied 12 to 17 years after those roads were abandoned. They estimated recovery of tree basal area in road tracks to take at least 80 years to reach the status found in adjacent logged forest and that species richness could take even longer to recover. However, in this document, vegetative recovery is described as the amount of time to re-establish the native forb layer. The understory species associated with old growth, including those dependent on the litter depth and mycorrhizal fungi of old growth forest floors are known to grow into small openings (Lindh and Muir 2004) such as the width of a route. In the short term (five years or less), native vegetation may establish on routes that have little soil compaction. It is likely that routes with moderate to heavy soil compaction (within the wheel tracks) would take more than 5 years to recover vegetatively (develop native forb or shrub cover). In many cases, native shrubs growing along the sides of the route will lean into the route. However, the bare soil established by the motorized vehicle would remain unvegetated and subject to erosion.

Oak Woodland Plant Communities

California's oak woodlands are largely privately owned and are estimated to cover about 10 million acres (Ewing et al. in Bartolome and Standiford 1992). They provide shelter and food for wildlife, wood and fuel for humans, and feed for livestock (Jimerson and Carothers 2002). Oak woodlands contain some of the highest species diversity found in California native plant communities (Jimerson and others in Jimerson and Carothers 2002). The TNF manages about 13,886 acres oak woodland. There are about 75 miles of NFTS, state, county, and private and 23 miles of unauthorized routes and closed NFTS roads still receiving some motorized use located in oak woodland plant communities.

Oak woodlands have experienced extensive historic disturbance through harvest of the oaks for fuelwood cutting, mining timbers, domestic and commercial construction, and widespread and heavy livestock grazing (ibid). No other ecosystem in the Sierra Nevada has experienced more human influence over a longer time period than the oak woodlands (Anderson in SNFPA 2001). Threats to oak woodlands across the State include: urbanization, conversion to agriculture, fragmentation, low rates of regeneration, competition from weeds, and sudden oak death. Motorized vehicles impact these ecosystems on TNF lands by introducing and spreading weeds, damaging native vegetation, increasing soil erosion and fragmenting habitats. The TNF does not have any rare plants or fungi that are entirely dependent on oak woodlands.

Oak woodland vegetative recovery: It is believed that oak woodlands are not regenerating in a sustainable fashion (McCreary 2004). The natural regeneration of some oak species is apparently inadequate to replace trees that are harvested or die naturally (Bartolome et al in McCreary 2004). Therefore, unauthorized motorized vehicle routes located in oak woodlands that are no longer used by

motorized vehicles may not experience a significant amount of oak regeneration. However, it is recognized that the best growing site for acorns is shaded, bare mineral soil (McDonald and Tappeiner in SNEP 1996). Acorns that fall onto the bare soil (wheel track areas) created by these routes from adjacent trees may have a better chance of becoming established. However, unauthorized motorized vehicle routes will have changed soil porosity in the wheel track areas. The moisture content of soils under the wheel track areas declines even if the use is removed (Helvey and Kochenderfer 1990 in Trombulak and Frissell 2000) probably due to the changed soil porosity. In addition, the increase of sunlight to the ground in the motorized vehicle disturbed area may cause a change in ground cover from sparse grass to heavy grass and shrubs. However, the nature and rate of vegetative recovery will vary from site to site dependent on such factors as soil, slope, exposure to the sun and local microclimate (Johnson and Tietje – date unknown).

Forest Edges and Openings

Forests of all ages contain edges and openings. Plants dependent on edges and openings within forested plant communities are not considered habitat specific. Forest edges and openings occur in all plant communities. Therefore the number of acres of forested edge and openings on TNF system lands overlaps with the acreages in the other plant communities discussed. There are 3,489 miles of NFTS, state, county, and private and 1,148 miles of unauthorized routes and closed NFTS roads still receiving some motorized use within forest edges and opening plant communities. Forest edge and openings are constantly being created as trees and other vegetation dies. Forest edge and opening plant communities are lost as vegetation grows into them. In this analysis, sensitive species with potential habitat within forest edge and openings include: *Astragalus webberi, Calochortus clavatus* var. *avius, Clarkia biloba* ssp. *brandegeae, Fritillaria eastwoodiae, Lewisia kelloggii* ssp. *hutchisonii, Lewisia kelloggii* ssp. *kelloggii, Lupinus dalesiae, Penstemon personatus,* and *Phacelia stebbinsii*. Watchlist species with potential habitat within edge and opening plant communities include: *Androsace occidentalis* var. *simplex, Erigeron petrophilus* var. *sierrensis,* and *Lilium humboldtii* ssp. *humboldtii*.

Motorized vehicle use can impact these plant communities by increasing the risk of weed introduction and spread, reducing plant cover, increasing erosion, reducing photosynthetic ability by covering vegetation with dust, changing water flow patterns, and compacting soil.

Vegetative recovery in forest edge/opening areas: Native vegetation that responds to the creation of an opening in the canopy (increased light to the soil and increased nutrient availability) are generally considered earlier succession species. The length of time it takes a disturbed area to revegetate in forest edge/opening areas is dependent of a number of factors. In most cases, the soil contains seeds of native plants that will germinate and grow within the first year assuming top soil and water are available. This vegetative recovery is expected irregardless of the plant community where the forest edge/opening occurs. For example the understory species associated with old growth, including those dependent on the litter depth and mycorrhizal fungi of old-growth forest floors, will grow into small openings (Lindh and Muir 2004) as well as native shrub species located in young forest areas such as plantations (personal observation). Revegetation of motorized vehicle routes by native plants will begin within the first year as

long as the routes do not experience continued disturbance. Again, top soil and moisture will be needed for the native plants to survive. If the soil and hydrology of the route has been extremely altered, revegetation may not occur until further action is taken. The greatest species and plant losses take place in the first few passes by wheels. Plant and soil damage increase with the amount of weight and power applied (Yorks et al 1997). Greater soil moisture and/or deeper overstory shading magnify these impacts (ibid).

High Elevation Openings and Rocky Areas

Some plants only grow in openings at high elevations (generally 6,000 feet and above). Trees may be present in the area, but they do not form closed-canopy situations. The TNF manages 43,240 acres of high elevation openings and rocky areas. There are 54 miles of NFTS, state, county, and private and 18 miles of unauthorized routes and closed NFTS roads still receiving some motorized use in these plant communities. Sensitive species with potential habitat within these types of plant communities include: *Arabis rigidissima* var. *demota, Erigeron miser, Eriogonum umbellatum* var. *torreyanum, Lewisia longipetala,* and *Tauschia howellii*. Watchlist species that have potential habitat within these types of plant communities include: *Asplenium trichomanes-ramosum, Claytonia megarhiza* and *Tonestus eximius*.

Motor vehicle use is unlikely to impact certain rare plant habitats due to the steep or rocky nature of the surrounding terrain. However, since these habitats are generally steep and have highly erosive soils/rock outcrops/rocky openings when motorized vehicle use does occur near or within the habitat itself, damage to the habitat can be severe. The plants dependent on these plant communities do not appear to compete well with other vegetation. Therefore, weed introduction and/or spread is a significant risk. These plant communities are already subject to natural erosion and have a short growing period. Any disturbance increases erosion risk and can cause significant impacts to the soil and water components of the habitat.

Vegetative recovery in high elevation openings and rocky areas: Studies documenting the time it takes for a disturbed area to revegetate in high elevation, rocky areas are very limited. It is known that these areas have limited growing seasons and harsh conditions in regard to temperature extremes. Any disturbance within these habitats would disturb and/or remove vegetation and leaf litter. Due to the steepness of many of these habitats, disturbance would accelerate erosion. Given these factors, it is likely that disturbed areas would not recover on their own. This is dependent on the amount of disturbance and other factors. Climate factors such as heavy snow years and unchecked soil erosion can limit plant establishment and stop the vegetative recovery process or push it back by several decades (Willard et al. 2007).

Noxious Weeds

Sierra Nevada region biodiversity is at increased risk due to alterations in human uses, fire regimes, and climatic change and changes brought about by weed invasion (D' Antonio et al. 2004). Climate changes may result in massive geographical shifts in locations of sites that provide environments for native plants. Opportunities for replacement of native species with weeds will be enhanced (Franklin 2003). In general

terms, the majority of TNF system lands are considered weed free, with most weed occurrences located along roads and/or in highly disturbed areas such as landings. The lower elevations on the westside of the forest currently contain the worst weed infestations (other than the musk thistle occurrence on the Truckee Ranger District) and provide the entry points for many weeds into the TNF, i.e. the "source" for weeds that are moving upslope into coniferous forests.

When an area is heavily infested with weeds, the weeds directly compete with native plants and can cause their local displacement. In addition, weeds can have a number of indirect effects including changes to: aesthetic values, biological diversity and ecosystem services (D'Antonio et al. 2004). Potential impacts include: alteration of disturbance regimes (including wildfire), changes in the food base for wildlife species, soil erosion and loss of soil carbon storage, decreases in range or forest productivity and altered recreational or aesthetic values (Mack et al. 2000, Di Antonio et al. 2004). They can hybridize with native species (ibid) altering native plant genetics.

Maintaining or improving the NFS lands requires the maintenance and improvement of the basic ecosystem elements of soil, water and vegetation. The stability and ecological function of natural wildlands depend on a diverse community of native plants (Mullin et al 2000). Native vegetation provides resilience against drought, flooding, minimizes erosion, promotes water infiltration and storage, along with providing wildlife and recreation values. Areas infested with weeds do not provide these ecosystem services at the same level as native vegetation. Research has shown that sites dominated by weeds have increased rates of soil erosion and runoff causing degradation of habitat for wildlife and native vegetation.

Once weeds become established, it is hard to get rid of them. Weeds arrived in the United States (many come from Eurasia) without the insects and diseases that preyed on them, and the plants that evolved in competition with them in their native land. Without insects, diseases, etc. to control these weeds, they can increase at a rapid rate.

Disturbed areas generally have more weeds than non-disturbed areas. Weeds are more likely to have higher leaf area and lower tissue construction costs (advantageous under high light and nutrient conditions) and greater phenotypic plasticity than native plants. Increased resource availability and altered disturbance regimes associated with human activities often differentially increase the performance of weeds over that of natives (Daehler 2003). Refer to Table 3.06-3 for information about the weeds known to occur on TNF lands.

Motorized vehicle use is known to enhance weed introduction in a number of ways (Trombulak and Frissell 2000) including increasing weed introduction by moving weed seed and plant parts from place-to-place in the mud/soil on their tires, and/or on the vehicle body. In addition, motorized vehicle use disturbs native plant communities and makes them 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 motorcycle trails (NFTS and unauthorized-for public use) provide habitat for any weed seed deposited there.

Weeds are known to be spread by motorized vehicle use regardless of the season of use. Native vegetation is also known to be physically damaged by motorized 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 motorized vehicle use introduces weeds into new areas and the weeds become established, the fuel pattern is frequently changed. 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. In addition, motorized vehicle use of the various routes is known to increase the chance of ignition through engine sparks, sparks from friction (e.g. rock bouncing on rock), and human negligence. 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. Eliminating motorized vehicles from natural areas is the most effective strategy for stopping the introduction of weeds into new areas (Rooney 2003).

The rate that weeds are introduced to a new area from motorized vehicle use is unknown. In one study, Rooney (unpublished-2003) collected mud from the undercarriage of 14 motorized vehicles. He found that seeds germinated from the soil 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 motorized vehicle user days, he estimated that about 6 million seeds were transported per vehicle per year in Wisconsin. Rooney predicted that over the long term, with motorized vehicles as seed dispersers, the fraction of roads/trails colonized by weeds would increase until all routes had reached a weed saturation level. This prediction was based on the lack of constant, extensive, effective surveillance of motorized vehicle routes. He noted that motorized vehicles are known seed carriers, that there is invariably a time lag between the time weeds colonize an area and when they are detected, and another time lag between detection and eradication efforts. He also reported that weeds are generally better adapted to vehicular dispersal than native species due to their small seed size, high seed production, and persistent seed banks. In this analysis, 100 feet was chosen to define the distance that weed seed would travel on tires. In reality the distance is could be greater or less than 100 feet dependent on many factors.

When native plants are replaced by weeds, the entire ecosystem can be impacted including microbial flora and fauna and insect pollinators, all of which contribute to normal ecosystem function. In addition, these disturbed areas create edges within the various plant communities where they are located. 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.

Disturbance by motorized vehicles can have long-term effects to soils and favor weed establishment. Motorized vehicles compact soils reducing water infiltration and accelerating erosion. They also displace soils and sheer off vegetative roots. If these effects are severe there can be a loss of soil productivity. 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/trails/areas 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 motorized vehicle use that helps to spread weeds is tied to the use of recreational areas and facilities, such as trailheads, campgrounds, and dispersed camping areas. These areas are frequently the first site on NFS lands that the motorized vehicle comes in contact with after leaving major highways. Therefore, they frequently receive weed seed and plant parts. These areas have constant soil disturbance which provides a good seedbed for any weed seed that is deposited. In addition, the users themselves (recreationists) can also disperse weed seeds on their clothing, footwear, and camping equipment. Since many campgrounds are located near riparian plant communities and riparian areas in campgrounds frequently have high levels of public activity, they have a higher risk of weed infestation. Some weeds are adapted to aquatic/riparian plant communities and rapidly become established on sites where soils have been disturbed, such as streambanks and crossings areas. Water can carry weed seeds and plant parts great distances, increasing weed spread. Aquatic weeds, such as purple loosestrife, can take over whole wetland ecosystems, impeding water flow and reducing the quality of wetland habitats.

Table 3.06-3. Some of the Weeds known to occur on TNF System Lands

Weed Species	CDFA*	California Invasive Plant Council**
Ailanthus altissima (tree-of-heaven)	C	Moderate
Bromus tectorum (cheatgrass)	N/A	High
Carduus nutans (musk thistle)	A	Moderate
Carduus pycnocephalus (Italian thistle)	B	Moderate
Centaurea diffusa (diffuse knapweed)	A	Moderate
Centaurea maculosa (spotted knapweed)	A	High
Centaurea solstitialis (Yellow star thistle)	C	High
Centaurea melitensis (tocalote or Malta star thistle)	C	Moderate
Chondrilla juncea (skeleton weed)	A	Moderate
Cirsium arvense (Canada thistle)	B	Moderate
Cirsium vulgare (bull thistle)	C	Moderate
Cytisus scoparius (Scotch broom)	C	High
Genista monspessulana (French broom)	C	High
Hypericum perforatum (Klamath weed)	C	Moderate

Weed Species	CDFA*	California Invasive Plant Council**
Lepidium latifolium (tall whitetop)	B	High
Linaria genistifolia ssp. dalmatica (dalmatian toadflax)	A	Moderate
Robinia pseudoacacia (black locust)	N/A	Limited
Rubus armeniacus (=R. discolor) (Himalayan blackberry)	N/A	High
Spartium junceum (Spanish broom)	N/A	High
Verbascum thapsus (wooly mullein)	N/A	Limited

*California Department of Food and Agriculture Ratings (CDFA) 2007
A-Eradication, containment, rejection, or other holding action
B-Eradication, containment, control or other holding action at the direction of the County Agricultural Commissioner
C-State endorsed holding action and eradication only when found in a nursery

**California Invasive Plant Council Ratings (CalIPC)
High – Severe ecological impacts, reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Species usually widely distributed ecologically among and within ecosystems.
Moderate – Substantial and apparent, but not severe, ecological impacts; attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent on ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.
Limited – Invasive, but either their ecological impacts are minor on a statewide level or information on them is insufficient to justify a higher rating, although they may cause significant problems in specific regions or habitats. Reproductive biology and other attributes result in low to moderate rates of invasion. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Sensitive plants and fungi and/or watchlist species occurrences located in and/or near motorized vehicle routes have a high risk of negative impacts from weed introduction and spread. Surveys of over 95 miles of unauthorized motorized roads/trails/areas have been completed. Refer to Table 3.06-13 for a list of the proposed additions to the NFTS that have weed occurrences located within 100 feet or less of them.

Weeds are known to directly/indirectly impact sensitive plant occurrences. For example, an occurrence of the sensitive species *Clarkia biloba* ssp. *Brandegeae* is currently being impacted by the invasion of yellow star thistle along the Mosquito Ridge road located outside of Foresthill. Table 3.06-4 displays the unauthorized routes and closed NFTS roads still receiving some motorized use where sensitive/watchlist plants and/or plant communities have been discovered. These occurrences are at increased risk of loss of individuals and habitat due to weed introduction and spread over the short and long term. The sensitive/watchlist species occurrences that have known weed occurrences located within 100 feet are at even greater risk of negative impacts from weed infestation.

Table 3.06-4. Unauthorized Routes and Closed NFTS roads still receiving some motorized use with Sensitive and Watchlist Plants/Plant Communities*

Route ID	Name of Sensitive/ Watchlist Plant, watchlist plant community	Known weed occurrence within 100 feet
TKN-J2	Vernal pool	None
TKN-J5	*Erigeron miser*, *Bruchia bolanderi*, seep/spring	None
TKN-J13	Aspen, seep/spring	Cheatgrass
TKN-M2	*Ivesia sericoleuca*, aspen, seep/spring	Cheatgrass
TKS-11	Aspen	None
YRN-001	*Epilobium howellii*	None
YRN-7	*Erigeron petrophilus* var. *sierrensis*	None

Route ID	Name of Sensitive/ Watchlist Plant, watchlist plant community	Known weed occurrence within 100 feet
YRS-F1 near Fordyce Creek crossing	*Erigeron miser*	None
YRS-SF4	Seep/spring	None
YRS-SF5	Seep/spring	None
SV-005	Aspen, seep/spring	None
SV-P14	Aspen	Cheatgrass, musk thistle

*Sensitive plant occurrence is within 100 feet of the road/trail/area.

Vegetative recovery in weed infested areas: When the motorized vehicle use on a route is removed, 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 et al 2008). The amount of time needed for the route to revegetate with native species is dependent on many factors including the type of weed at the site. Refer to the weed risk assessment for this project located in the project file for more information about ecological characteristics of weeds known to occur on the TNF. Continued motorized vehicle use within aspen plant communities could spread weeds so that aspen regeneration is reduced increasing the risk of loss of these plant communities.

Native Plant Habitat Fragmentation

Many acres of TNF system lands are considered fragmented with other ownership lands embedded within and adjacent to them. The presence of these inholdings affects the current condition and future outlook of TNF system lands. For example, most of the lower elevation, westside oak woodland plant communities are in private ownership and are experiencing rapid development as home sites. The existence of developed land adjacent to NFS land often increases the amount of human activity on the NFS land and increases the risk of unauthorized routes, and weed introduction/spread onto NFS lands. Plant communities located on inholding lands can be managed much differently than NFS lands and can reduce the desired connectivity of plant communities.

Connectivity of native plant communities is often described in terms of large geographic areas of particular vegetation types (such as mixed conifer) that are not fragmented by roads, development or other disturbances. The largest geographic areas other than wilderness on TNF system lands that have limited road/development/disturbance are the Inventoried Roadless Areas (IRAs). However, it is recognized that wilderness areas, Special Interest Areas (SIAs), and Research Natural Areas (RNAs) also provide some native plant community connectivity but generally on a smaller scale. Refer to Section 3.09 for a more information about wilderness, SIAs, and RNAs.

Wilderness: The Granite Chief wilderness is about 24,864 acres in size and contains high elevation forests and meadows. Motorized vehicle use within Granite Chief is prohibited. None of the alternatives change management of this wilderness area. Therefore, native plant connectivity within Granite Chief Wilderness area will not be impacted by motorized vehicle activity regardless of the alternative selected.

SIAs: The SIAs located on the TNF include: Placer County Big Tree Grove Botanical area, Devil's Postpile Geologic area, Glacier Meadow Geologic area, Grouse Falls Scenic area, Meadow Lake Cultural area, Sagehen Headwaters, and Mason Fen area. No changes in management of these SIAs will occur under implementation of any of the alternatives. Motorized vehicle use within these SIAs is either excluded or discouraged. Therefore, native plant connectivity within these SIAs will not be impacted by motorized vehicle activity. Placer County Big Tree Grove, Sagehen Headwaters, and Mason Fen SIAs were established for their native plant characteristics. However, these botanical SIAs are relatively small in area.

RNAs: Lyon Peak/Needle Lake, Sugar Pine Point and Babbitt Peak are the RNAs located on the TNF. Motor vehicles are excluded from all of these RNAs including the No Action Alternative. Therefore, native plant connectivity within these RNAs will not be impacted by motorized vehicle activity. None of the alternatives propose changes to the existing management of these RNAs. These RNAs provide some native plant community connectivity but at a much smaller scale than IRAs and Granite Chief Wilderness.

IRAs: The TNF has eleven IRAs. The character and amount of roads, private land, and motorized trails varies greatly by IRA. Refer to Section 3.09 for the names and acres of IRAs on the TNF. Some of the IRAs contain motorized vehicle roads/trails/areas (routes). The existing condition of routes within RNAs varies. Some started as mining trails and were not made for motorized vehicle use. Over time, these foot/animal trails became wagon trails and then vehicle trails and eventually some of them have become system motorized vehicle routes. Current use of the unauthorized motorized vehicle routes and closed NFTS roads in TNF IRAs is considered light to moderate primarily due to such factors as level of difficulty and remote location.

Large geographic areas such as IRAs that are relatively undisturbed by humans are important for native plants both individually and cumulatively to help maintain species viability and biodiversity (USDA FS 2000, Loomis et al. 2000). Nationally, they play an important role in providing habitat for threatened, endangered, proposed and sensitive (TEPS) plant species (ibid). TNF IRAs are not known to contain TEP plants, but do have occurrences of sensitive and watchlist plants. Nationally, IRAs provide important habitat for more than 1,400 sensitive and almost 100 threatened, endangered and/or proposed (TEP) plant species (ibid) and are considered important biological strongholds for native plant species and communities (ibid). TNF IRAs have not been surveyed. Therefore, the number of TEPS and watchlist plants/plant communities that occur within them is unknown.

Native vegetation within large geographic areas such as IRAs is less likely to be exposed to disruption by human activities such as collection, trampling, and other surface disturbance. This lower level of human disruption may make IRAs important references for understanding the natural composition and dynamics of native plant communities (USDA FS 2000). Roadless areas are less likely to experience problems with weed species and are more likely to be able to maintain intact native plant communities (ibid).

Conservation and management of the biodiversity of the Sierra Nevada is a priority and human land uses are considered the most pervasive threats to native plants in the Sierra Nevada (Murphy et al. 2004). Large geographic blocks of land contain naturally functioning ecosystems that provide many valuable

services including watershed protection, carbon storage, nutrient cycling, pest control, pollination, and fish and wildlife habitat. Preserving naturally functioning ecosystems (natural environments) provides many benefits to society (Krutilla and Fisher 1975 in Loomis et al. 2000).

The effects of motorized vehicle use on native plant connectivity have not been fully studied. However, motorized vehicle use is known to change the plant composition within the areas where the use occurs. In one study done in Idaho, native shrubs/bunch grasses/microbiotic crusts were less prevalent and disturbance loving plants were more prevalent closer to motorized trails. Motorized vehicles directly damaged the native plants and microbiotic crusts and disturbed the surrounding habitat enough to facilitate invasion by weeds. Many weeds (such as the cheatgrass in this study) are known to help spread fire. When wildfire occurs in areas infested with cheatgrass, the native vegetation is frequently lost and the cheatgrass spreads - eventually becoming a monoculture. Motorized vehicle use is also known to increase the amount of bare ground and decrease the cover of microbiotic crust, negatively affecting nutrient cycling and increasing erosion. Dust created by the motorized vehicle use has been shown to decrease native plant cover by reducing rates of photosynthesis, leaf conductance, transpiration, and water use efficiency. Dust can also increase temperatures of leaves and stems and decrease leaf surface areas (Munger et al 2003). Changes in plant composition and plant community functions (such as the rate and spread of wildfire) reduce native plant connectivity and fragment native plant communities. In general, the degree of fragmentation/amount of connectivity loss depends on the intensity and extent of motorized vehicle use. However, even a single motorized vehicle pass can kill and/or injure many types of native plants and introduce weed seed. Native plants with shallow root systems are especially vulnerable (Wilshire 1983, Lacey et al. 1997). Native vegetation species vary in their ability to resist being damaged and in their ability to recover from the damage (Cole 1995). However, all native vegetation appears to have a threshold beyond which the species can no longer recover from motorized vehicle damage and/or other disturbances.

Loss of native vegetation increases the risk of soil loss due to wind and water erosion. Soil erosion accelerates decomposition of organic matter, weakens soil aggregate stability and results in the formation of inorganic surface crusts. Inorganic surface crusts increase water runoff, inhibit seed germination and emergence of seedlings, and reduce water penetration. Natural soil stabilizers such as lichen, fungal and algal crusts are highly vulnerable to damage from motorized vehicle use (Cole 1995).

Motorized vehicle use is known to influence the native vegetation and therefore the biodiversity of the area where the use is occurring. As mentioned above, plant biodiversity is at an increased risk of adverse cumulative effects from increased population growth and associated land uses, land conversions, and nonnative species invasions both nationally and regionally. National Forests with many inholdings such as the TNF have increased risks to biodiversity from nonnative species invasions. Limiting motorized vehicle disturbance within these large geographic areas would provide increased assurances that biological diversity in those areas would be conserved. This biological diversity conservation would be achieved by maintaining the native plant communities where weed species are currently rare, uncommon, or absent because motorized vehicles are known to introduce weeds into new areas. Once weeds are established, they provide a source of weed seed to spread to new areas. The value of large

geographic areas such as IRAs in conserving biodiversity is likely to increase as native plant communities are lost and/or degraded (USFS 2000). Native plant community loss and degradation, and impacts to native plant communities from the invasion and/or encroachment of weeds are increasing nationally and regionally. Increased weed infestation is recognized as a primary threat to biodiversity.

Environmental Consequences

All of the action alternatives reduce the effects of motorized vehicle travel on native plants/plant communities by prohibiting cross country travel. In addition, all action alternatives prohibit motorized vehicle use on some unauthorized roads/trails/areas (routes) and closed NFTS roads still receiving some motorized use. A number of things could happen to routes when motorized vehicle use is prohibited (refer to the affected environment discussion). Some of the routes may be actively closed by the TNF after conducting NEPA. This would benefit sensitive/ watchlist species because they would be avoided during route closure and would have reduced risk after the route was closed. Some of the routes may be proposed for addition to the NFTS at a later date, again after conducting NEPA. In this scenario, sensitive/watchlist species would be avoided during reconstruction/maintenance, but would be at increased risk from dust and weed invasion. Some of the routes may be left to revegetate and will not be visible on the ground after about 5 years. Under this scenario some sensitive/watchlist species would benefit. Others that need openings would not benefit. Other routes may continue to be used for non-motorized recreation. Non-motorized recreational activities can also negatively impact sensitive/watchlist species through direct impacts to the plants and competition from invading weeds, but foot and horse travel are considered less impacting than motorized travel.

Assumptions

The analysis of effects to botanical resources/native vegetation is based on the assumptions listed below:

- Motorized vehicle use within and adjacent to rare species occurrences have the ability to negatively impact the long-term viability of specific plant and fungi species.
- Impacts to sensitive/watchlist species and/or native plant communities are assumed to be limited to the route footprint and the area immediately adjacent (within 100 feet) to it.
- Sensitive/watchlist species and/or native plant communities located within 100 feet of a proposed motorized addition to the NFTS may be indirectly impacted by motorized vehicle use - regardless of the alternative selected.
- Sensitive/watchlist species and/or native plant communities located within one vehicle length of a proposed motorized addition to the NFTS may be directly impacted by motorized vehicle use regardless of the alternative selected.
- Sensitive/watchlist species and/or native plant communities occur within the identified potential habitat that has not been surveyed. Occurrence is assumed until surveys are completed so that analysis of possible impacts can be done.
- Without specific prevention and/or control measures, non-native plants (weeds) will continue to spread along and within surfaced and unsurfaced motorized vehicle roads/trails/areas.

- It is the agency position that just putting a route on a map will not increase the use of that route. However, it is assumed that motor vehicle use of unsurfaced roads/trails/areas will increase sediment production and erosion and that increased use will cause increased sediment production and erosion.
- The projects identified in Appendix H (Reasonably Foreseeable Projects and Cumulative Effects) will be analyzed and implemented on TNF system lands within the next 5 to 10 years.
- All vehicles are assumed "equal." All vehicles were assumed equal in this analysis as many of the motorized routes being analyzed would be open to all types of motorized vehicles, making it impossible to determine which type of vehicle would be using which route at any given time. Hence the impacts to sensitive/watchlist species/native plant communities from a motorcycle are assumed equal to those impacts from a 4-wheeled vehicle.
- Volunteers can effectively maintain adopted trails over the long term.

Data Sources

Data from the following sources was used in this analysis:

- Road/trail/area specific surveys for this project.
- TNF GIS layers for weeds, special aquatic features, streams, sensitive plants, watchlist plants and plant communities, RNAs, SIAs, soils, and vegetation.
- Botanical surveys conducted for a variety of projects including: livestock grazing allotments, fuel reduction, mining, etc.
- Scientific literature on: specific rare plants/fungi and/or their habitats, native plant communities, non-native plants (weeds), climate change and its effects on weed spread/native plant communities, and native plant habitat fragmentation.
- Other data sources including: CNDDB, CNPS On-line Inventory, PLANTS database, Nature Serve, and Jepson Interchange.

Indicator Measures

The following general indicator measures were used to compare alternatives in regard to known occurrences of sensitive/watchlist species and/or plant communities and to potential habitat without current surveys. These indicator measures were selected based on literature review and professional judgment.

- **Number of perennial and intermittent water crossings**.
- **Proposed addition to the NFTS within 100 feet of unsurveyed potential habitat**.
- **Sensitive/watchlist species and/or watchlist plant communities within one vehicle length of proposed additions (direct effects).** Since vehicles are allowed to pull off routes to a distance of one vehicle length, there is a possibility of direct impacts to sensitive/watchlist species and/or other vegetation within that distance from the proposed addition.
- **Sensitive/watchlist species and/or watchlist plant communities within 100 feet of proposed addition (indirect effects).** One hundred feet was chosen to define the distance for indirect impacts to sensitive/watchlist species based on successful reduction of direct and indirect impacts

to sensitive/watchlist species located more than 100 feet away from other types of ground-disturbing management activities that have been implemented in the past. Soil and water TNF staff has used a 100-foot buffer for perennial water to reduce/eliminate impacts from a variety of projects (to protect water quality from negative impacts from other types of management activities). Soil and water staff report that "A recent review of scientific literature revealed that a 100-foot riparian buffer is adequate to mitigate against significantly impacting riparian and aquatic resources" (Spackman and Hughes 1995 and Steinblums, I. J., H. A. Froehlich, and J. K. Lyons, 1984).

- **Weed infestations within 100 feet of the proposed addition**. One hundred feet was chosen to define the distance that weed seed could travel from an established weed occurrence via vehicle tires. In reality, the distance would probably be further than 100 feet and/or less than 100 feet dependent on many factors.
- **Miles of proposed additions within inventoried roadless areas**. This indicator was chosen to assess potential effects on plant community fragmentation in large blocks of land.

Elements of the proposal

In addition to the indicator measures, the alternatives are compared by plant community with a focus on the major parts of the proposal:

- Prohibition of cross country travel [including unauthorized routes and closed NFTS roads still receiving some motorized use].
- Additions to the NFTS (including roads and motorized trails)
- Establishment of motorized "Open Areas"
- Changes to the NFTS (including change in the class of vehicles resulting from approval of mixed use, change in the class of vehicles resulting from changes in maintenance levels, changes in seasonal restrictions, over the snow travel, and re-opening Maintenance Level 1 (ML 1) roads making them ML-2 roads).
- Amendments to the Forest Plan
- Cumulative effects including all of the above and the reasonably foreseeable. The spatial boundary of the cumulative effects analysis area is the TNF.

There are some elements of the project proposal that do not differ significantly in their impacts to sensitive/watchlist species and/or plant communities regardless of the alternative selected, or the type of plant community. These elements of the proposal include: Establishment of motorized "Open Areas," changes to the NFTS, and amendments to the Forest Plan. The consequences of implementing these elements of the proposal are presented below:

Establishment of motorized "Open Areas"

Indicator(s) used to measure effects:

- Acres of "Open Area"

No Action: Alternative 1 does not propose acres of "Open Areas" for reservoir access or the Greenhorn area, but it does not prohibit use of these areas either. Alternative 1 has the greatest risk of negative effects to native vegetation, when compared to the action alternatives. However, since the reservoir shoreline access areas and the Greenhorn area have been surveyed and no sensitive/watchlist species were found, direct impacts to sensitive/watchlist species are not expected. Implementation of Alternative 1 could spread weeds and could therefore indirectly impact sensitive/watchlist species and/or native plant communities in other areas. Bare soil such as what appears around reservoirs when the water level recedes, provides ideal areas for weeds to become established. Weeds can grow in these areas for several growing seasons - until water levels rise again and are high enough (and stay high enough) to drown or rot any seeds in the soil. The amount of bare soil around reservoirs and timing/duration of water levels is difficult to predict. However, any vehicle that drives over a weed infested area has the ability to spread weed seed and/or plant parts from the open area to other areas. The spreading of weeds from one place to another is an indirect impact to the native plants located where the weeds are spread. The area around Boca Reservoir is known to be heavily infested with the "A" rated weed – musk thistle and has areas adjacent to the Reservoir that have been infested with spotted knapweed. The bare soil in the low water line around Boca Reservoir provides suitable establishment sites for musk thistle and spotted knapweed. Use of this bare soil area by motor vehicles could spread these highly invasive weeds to new areas.

Action alternatives: In general terms, the action alternatives prohibit cross country travel, however, Alternatives 2 and 6 allow cross country travel in "Open Areas." Alternative 2 proposes the addition of about 2,649 acres of "Open Areas" as open shoreline access on dry soils around Boca, Prosser and Stampede Reservoirs (2,589 acres) and the Greenhorn open area (60 acres). Alternative 6 proposes specific designated access routes through the open shoreline areas of Boca, Prosser and Stampede (244 acres), but does not propose the addition of the Greenhorn open area. Alternatives 3, 4, 5, and 7 do not propose shoreline access or the Greenhorn open area.

None of the action alternatives would directly impact sensitive/watchlist species through addition of "Open Areas" since the "Open Areas" have been surveyed and no sensitive/watchlist species were found. However, Alternatives 2 and 6 could indirectly impact sensitive/watchlist species and native plant communities. Alternative 2 has the greatest risk of the action alternatives of indirectly impacting sensitive/watchlist species and/or native plant communities through the spread of weeds since it proposes the addition of the most acres of open area. Alternative 6 has less risk of weed spread than Alternative 2 because it proposes the addition of specific "lanes" for low water access. Providing access along specific routes reduces the area that would be used by motorized vehicles reducing the area in need of future weed survey. Weeds are much easier to treat if they are detected when they are first becoming established.

Changes to the NFTS

No Action: Alternative 1 does not change the class of vehicles that can use a particular route and does not implement seasonal restrictions. Implementation of Alternative 1 would not impact sensitive/watchlist species and/or native plant communities any differently than they are currently being impacted. Impacts

would vary dependent on many variables including the types of plant communities the route passes through (different plant communities provide habitat for different sensitive/watchlist species); amount of motorized use of the route; etc.

Action alternatives: It is difficult to determine how implementation of a particular action alternative could impact sensitive/watchlist species and/or native plant communities when there is a change in the class of vehicles that use a system route or a change in the time when a road can be used (implementation of seasonal restrictions). Refer to the following discussion:

1. Change in type of vehicle: Changing the type of vehicle that can use a specific route could negatively impact sensitive/watchlist species and/or native plant communities that occur along that route. It is recognized that the width of the route could vary if the proposed change made the route narrower. However, many of the motorized routes being analyzed would be open to all types of motorized vehicles and do not reduce the width of routes. It is impossible to predict what type of motorized vehicle will be using which route at any given time since motorcycles and 4-wheel-drive vehicles can all use many of the routes. Hence for analysis purposes, the impacts to sensitive/watchlist species and/or native plant communities from use of a motorcycle are assumed equal to those impacts from a 4-wheeled vehicle and do not differ significantly by action alternative.

It is likely that direct impacts to sensitive/watchlist species and/or plant communities occurred when the road was developed. Indirect impacts may still be occurring if the sensitive/watchlist species and/or plant communities have survived within 100 feet of the road. These indirect/cumulative impacts would continue regardless of the type of vehicle using the road. In addition, there are no studies that indicate one type of vehicle spreads weed seed and/or weed plant parts more than another. Therefore, changing the class of vehicle does not make the road more or less susceptible to weed introduction and spread and does not reduce the risk of sensitive/watchlist species and/or plant communities being lost or degraded.

2. Seasonal restrictions: The impact to native plant communities and the sensitive/watchlist species dependent on them from implementation of seasonal restrictions varies by plant community and species. However, the significance of beneficial or negative impacts from the seasonal restriction is difficult to quantify for a number of reasons. Removing motorized vehicle use from routes during the wet season does reduce the potential amount of erosion from that route that could occur especially if the route becomes rutted. However, this amount of potential erosion can not be quantified. Determining where the rutting and erosion would take place and if that erosion would impact sensitive/watchlist species and/or plant communities is difficult. It is reasonable to assume that those sensitive/watchlist species and/or native plant communities located within one vehicle length of a proposed addition to the NFTS would not benefit from soil erosion regardless of the season of use.

Some sensitive/watchlist species would have limited impacts from season of use restrictions. Those sensitive/watchlist species that are aquatic/riparian plant community dependent are always subject to erosion and/or soil rutting because those native plants grow in soils that are wet/moist year-around. Serpentine (ultramafic soils) plant communities are considered highly erosive year-around. The known occurrences of rare plants located within one vehicle length of a system motorized vehicle route that are dependent on older forest plant communities (such as *Cypripedium fasciculatum* occurrences) are all

located within road cut-banks. Due to their location in reference to the system roads, they would not be at risk from increased erosion unless the entire road washed out. Erosion at levels that would wash out entire roads is not expected regardless of the season of use. It is recognized that implementing seasonal restrictions to reduce the amount of motorized use on wet soils could benefit sensitive/watchlist species and/or native plant communities. However, even one vehicle pass can kill a plant or group of plants regardless of the time of year the tire passes over the vegetation. Therefore, it is very difficult to quantify differences between action alternatives based on seasonal restrictions. In addition, the seasonal restrictions do not necessarily prohibit motorized vehicle use during the growing season. For example, the season of use for TKN-M2 that has a known occurrence of *Ivesia sericoleuca* is May 1 to December 1. *Ivesia sericoleuca* grows on the eastside of the Forest at elevations where snowmelt from meadows would occur near May 1. Therefore the seasonal restriction does not benefit the *Ivesia sericoleuca* occurrence other than possibly reducing the amount of soil compaction/rutting/water channeling that could occur if the route were open earlier than May 1.

The action alternatives that do not have seasonal restrictions could negatively impact sensitive/watchlist species and/or plant communities if motorized use occurs on a route when the soils are wet. However, many of the proposed additions occur at elevations that would prohibit use of the route before May 1st anyway due to snow accumulation. For example, *Epilobium howellii* occurs at the end of YRN-001. YRN-001 is proposed for addition to the NFTS in Alternatives 2, 5 and 6. Alternative 2 would have YRN-001 open all year; Alternative 5 would have the season of use from May 1 to December 31; and Alternative 6 would have the season of use from April 1 to December 31. From personal experience, it is rare to be able to access the area where YRN-001 is located before mid June and most years the area is snowed in by December. In addition, if there is a known sensitive/watchlist species and/or plant community within 100 feet of a route, mitigations have been developed to reduce or eliminate impacts and seasonal restrictions would not change the mitigations. Therefore, there really isn't a difference in impacts to sensitive/watchlist species and/or plant communities for any alternative in regard to seasonal restrictions. When compared to Alternative 1, there is no difference in impacts.

Amendments to the Forest Plan

No Action: Alternative 1 does not propose Forest Plan amendments. Therefore implementation of this portion of Alternative 1 would not impact sensitive/watchlist species and/or native plant communities.

Action alternatives: Alternatives 2, 5 and 6 propose amendments to the Forest Plan (change the seasonal restriction for deer winter range in Management Area 84).The other action alternatives do not propose this Forest Plan amendment. Amending the Forest plan in regard to seasonal restriction for deer winter range in Management Area 84 would not impact sensitive/watchlist species and/or native plant communities.

Elements of the Proposal that Vary by Alternative

Implementation of some elements of the proposal shows variation of effects by alternative and by plant community. These elements of the proposal include: 1) prohibition of cross country travel, 2) additions to

the NFTS and reopening of ML 1 roads, and 3) cumulative impacts including reasonably foreseeable. These three elements of the proposal are analyzed by plant community.

Aquatic/Riparian Plant Communities

1. Prohibition of cross country travel

Indicator(s) used to measure effects:

- Acres where cross country travel is prohibited (thereby reducing the mileage of routes available for motorized use). Mileage reduction includes unauthorized routes and closed NFTS roads still receiving some motorized use located within 100 feet of riparian vegetation.
- Number of perennial and intermittent water crossings on routes where public motorized vehicle use is prohibited

No Action: Alternative 1 does not prohibit cross country travel. Therefore, about 134,222 acres of riparian vegetation could be impacted by cross country travel. Under implementation of Alternative 1 impacts to known occurrences of sensitive/watchlist species dependent on aquatic/riparian plant communities would likely increase over time as motorized vehicle use increases. As yet undiscovered sensitive/watchlist species would be at risk as new routes were created. It is likely that cross country use would kill and/or injure at least some sensitive/watchlist species and it is reasonable to expect that some occurrences would be lost. Those sensitive species considered in downward trend would be most at risk for loss of viability. TNF sensitive plants in a downward trend that are dependent on aquatic/riparian plant communities include: *Ivesia aperta* var. *canina* and *Ivesia webberi*. Since *Ivesia aperta* var. *canina* and *Ivesia webberi* are experiencing a downward trend across their range of occurrence, impacts to them could be significant if they occur on TNF system lands.

Direct/indirect impacts could be significant at least at the local, site specific level. Possible direct impacts include killing and/or injuring sensitive/watchlist species and/or native vegetation by running over them. Severe and persistent disturbance to sensitive/watchlist species occurrences and/or aquatic/riparian plant communities could convert them to a different type of plant community. The significance of these impacts is dependent on many factors including the amount of disturbance, the sensitive/watchlist species being impacted, and in some cases, the season when the disturbance takes place (for example, running over a sensitive/watchlist species while it is in bloom could negatively impact reproduction - at a minimum. Running over the same plant while it is dormant and underground would not have the same impacts - especially if the soil health is not reduced). The significance of impacts is also dependent on the number of sensitive/watchlist species that occur in a specific location and how many of them are injured and/or killed. In addition, the significance of impacts is dependent on the amount and condition of the type of habitat needed by a particular sensitive/watchlist species across its range of distribution.

When a sensitive/watchlist species is dependent on plant communities that are limited (for example *Meesia uliginosa* is usually found in fens and fens are plant communities of limited distribution), impacts could be significant. The type of motorized vehicle is not a factor since all vehicles are known to have adverse impacts to natural resources (Foltz and Meadows 2007). It is impossible to know when or where

cross country motorized vehicle use would occur, but since it would not be restricted in Alternative 1, the risk of significant direct/indirect impacts is higher than in the action alternatives.

If cross country motorized vehicle use reduced the soil health within a sensitive/watchlist occurrence through compaction, increased erosion, changed water flows, and/or introduced weeds, the sensitive/watchlist occurrence would have reduced health, and/or could be converted to a different plant community. Conversion to another plant community would be considered significant especially at the site specific level.

In most cases, recommendations for sensitive/watchlist species – especially aquatic/riparian plant communities - are for protection from impacts. Most TNF sensitive/watchlist species are considered aquatic/riparian dependent and are limited in distribution. When an occurrence has reductions in the health of the soil and/or changes to the amount or health of water/air/vegetation components of the habitat, those sensitive/watchlist species habitats may not be able to maintain and/or perform their natural prescribed functions (Foltz and Meadows 2007). Refer to Section 3.02 for more information regarding soil and water. Allowing unrestricted motorized vehicle use across the Forest greatly increases the risk of negative direct/indirect impacts to sensitive/watchlist species.

Unauthorized routes and continued motorized use of closed NFTS roads are considered an expression of cross country travel. TNF unauthorized routes and closed NFTS roads still receiving some motorized use have about 908 perennial and intermittent water crossings and 146 miles located within 100 feet of riparian vegetation. Alternative 1 has the greatest number of perennial and intermittent water crossings and greatest number of miles of motorized vehicle use located within 100 feet of riparian vegetation of all alternatives. Therefore, Alternative 1 has the greatest risk of negative impacts to aquatic/riparian plant communities and those species dependent on them.

Action alternatives: In general terms, the action alternatives prohibit cross country travel. Therefore, no direct, indirect, or cumulative impacts to sensitive/watchlist species and/or aquatic/riparian watchlist plant communities (from cross country travel) are expected.

2. Additions to the NFTS and Reopening ML 1 Roads

Indicator(s) used to measure effects:

- Miles of proposed additions to the NFTS that are located within 100 feet of riparian vegetation.
- Number of proposed additions with perennial and intermittent water crossings
- Sensitive/watchlist species and/or watchlist plant communities located within 100 feet of proposed additions to the NFTS
- Weed sites located within 100 feet of proposed additions to the NFTS

No Action: Alternative 1 does not propose the addition of routes to the NFTS. However, implementation of Alternative 1 could impact sensitive/watchlist species and/or aquatic/riparian plant communities directly/indirectly by continuing use of about 908 perennial and intermittent water crossings and 146 miles of route located within 100 feet of riparian vegetation. Refer to the discussion under effects of cross country use under the No Action Alternative above. Direct/indirect impacts could be significant at least at the site specific level.

Surveys located several aquatic/riparian dependent sensitive/watchlist species and/or plant communities along or within 100 feet of several routes: *Bruchia bolanderi* along TKN-J5; *Epilobium howellii* at the end of YRN-001; *Ivesia sericoleuca* along TKN-M2 (cheatgrass infestations were found within 100 feet of the TKN-M2 *Ivesia sericoleuca* occurrence); aspen along TKN-M2, TKS-11, SV-005, and SV-P14; a vernal pool at the end of TKN-J2; and springs/seeps along SV-005, TKN-J5, TKN-M2, YRS-SF4 and YRS-SF5.

Implementation of Alternative 1 would continue to impact these sensitive/watchlist species and/or watchlist aquatic/riparian plant communities directly, indirectly, and cumulatively. The significance of these impacts is dependent on many factors including the amount of disturbance. Under implementation of Alternative 1 the risk of significant (occurrence scale) soil compaction, increased erosion, changed water flows, and/or weed introduction is high.

Action alternatives: Tables 3.06-5, 3.06-6, and 3.06-7 display the number of perennial and intermittent water crossings, the number of miles of proposed additions located within 100 feet of riparian vegetation, and identify the proposed additions to the NFTS where surveys identified sensitive/watchlist species and/or watchlist plant communities. The following discussion is divided into impacts to known occurrences and impacts to potential habitat that lacks current surveys.

A. Impacts to known occurrences:

Vernal pool watchlist plant community: Implementation of Alternatives 2, 4, 5, 6, and 7 would impact the vernal pool at the end of TKN-J2. TKN-J2 is proposed for addition to the NFTS under all action alternatives except Alternative 3. Mitigation measures specified in Appendix A (Site Specific Road, Trail and Open Area Information) require barriers to placed around the vernal pool/seasonal wetland so that damage from motorized use is reduced/eliminated. Continued motorized vehicle use within this vernal pool would eventually cause a loss of the native plants within it - if mitigations were not implemented, and the vernal pool plant community would be lost. Barriers would be placed at the end of TKN-J2 to eliminate direct impacts to the vernal pool from motorized vehicle travel. The vernal pool would still be at risk from indirect impacts under Alternatives 2, 4, 5, 6, and 7 – especially increased risk of weed introduction and spread. Implementation of Alternative 3 provides benefits to the vernal pool by reducing the risk of weed introduction/spread and the amount of dust produced by motor vehicle use of TKN-J2.

Seep/spring watchlist plant communities: As mentioned above, seep/spring plant communities were found along routes SV-005, TKN-J5, TKN-J13, TKN-M2, YRS-066, YRS-SF4, and YRS-SF5. SV-005 and YRS-066 are proposed in Alternatives 2, 5 and 6. No mitigations are proposed for SV-005 since motorized vehicle use is not currently impacting the seep/spring plant community along the route. No mitigations are proposed for YRS-066 since motorized vehicle use is not currently impacting the developed spring located about 50 feet away from it. TKN-J5 is proposed in Alternatives 2, 5, 6, and 7. The water from the seep would be directed to the meadow instead of down the route. TKN-M2 is proposed in Alternatives 2, 5 and 6. Barriers would be placed along the route where it passes through the seep/spring plant community. YRS-SF4 is proposed in Alternatives 2, 5, and 6. Water from the seep/spring plant communities would be directed so it does not flow down the road. TKN-J13 and YRS-

SF5 is proposed in Alternatives 2, 4, 5, 6, and 7. The damaged seep/spring plant community located off of route YRS-SF5 would be restored prior to this route being available for motorized use. The wet areas along TKN-J13 would have soil and water mitigations implemented in Alternatives 2, 4, 5 and 7. In Alternative 6, TKN-J13 was shortened from 1.6 miles to .1 miles in length to avoid the seep/spring plant communities altogether. When compared to Alternative 1, implementation of these mitigations would reduce, but not eliminate, impacts to these seep/spring plant communities. Remaining impacts to the seep/spring plant communities contribute to cumulative impacts to aquatic/riparian plant communities. Alternatives 3 and 4 do not propose the addition of SV-005, TKN-J5, TKN-M2, YRS-066 or YRS-SF4 to the NFTS and Alternative 3 does not propose the addition of TKN-J13 or YRS-SF5 to the NFTS. Therefore, seep/spring plant communities along those proposed additions benefit from the prohibition of public motorized vehicle use of those routes in Alternatives 3 and 4.

Aspen watchlist plant communities: Aspen watchlist aquatic/riparian plant communities were found along SV-005, SV-P14, TKN-J11, TKN-M2, and TKS-11. Barriers would be placed on either side of the proposed additions where they pass through the aspen plant communities along routes SV-P14, TKS-11 and TKN-M2. Impacts to aspen communities, caused from implementing the action alternatives, would be less than Alternative 1. No mitigations were proposed for aspen plant communities located along routes SV-005 and TKN-J11 since negative impacts to the aspen from motorized vehicle use were not detected during field surveys.

Sensitive plants: Table 3.06-7 shows that *Bruchia bolanderi* along TKN-J5 and *Ivesia sericoleuca* along TKN-M2 are at higher risk in Alternatives 2, 5, 6, and 7 because both of those routes are proposed additions in those alternatives. The stream crossing at Castle Creek (TKN-J5) would be routinely checked to determine whether users are widening the crossing. Widening the crossing would put motor vehicles that much closer to *Bruchia bolanderi*. Barriers and signs would be placed adjacent to Castle Creek to keep users from reducing vegetative cover adjacent to the stream, increasing sediment. Barriers would also be placed so that turn-arounds, camping and parking do not occur with 100 feet of Castle Creek. These mitigations would reduce but not eliminate impacts to the *Bruchia bolanderi* occurrence located along Castle Creek, when compared to Alternative 1.

Barriers would also be placed on either side of TKN-M2 where it goes through the *Ivesia sericoleuca* and to block access to the route spur that passes through the occurrence. Any cheatgrass that spreads to the *Ivesia sericoleuca* occurrence would be manually treated. Barriers would also be placed on either side of TKN-M2 where it passes through the aspen plant community. Impacts to the *Ivesia sericoleuca* along TKN-M2 from motorized vehicle use would be reduced, but not eliminated. Indirect impacts of risk of weed infestation and dust would still occur. Over the long term, the risk of cheatgrass spreading and out-competing native vegetation including *Ivesia sericoleuca* along TKN-M2 is high. Refer to the weed risk assessment located in the project files for more information.

Epilobium howellii at the end of YRN-001 is at higher risk in Alternatives 2, 5, and 6. Barriers would be placed at the end of YRN-001 to reduce impacts to *Epilobium howellii* and to the riparian vegetation growing adjacent to the pond. Implementation of the mitigations along these routes reduces the risk of significant impacts to the sensitive/watchlist species and/or watchlist plant communities. Alternative 7

does not propose the addition of routes TKN-M2 and YRN-001. Alternatives 3 and 4 do not propose the addition of routes TKN-J5, TKN-M2, or YRN-001. Sensitive species and aquatic/riparian plant communities along those routes benefit from the prohibition of motorized vehicle use on those routes.

B. Impacts to potential habitat:

Compared to Alternative 1, all action alternatives would reduce the number of perennial/intermittent water crossings and the miles of proposed additions to the NFTS located within 100 feet of riparian vegetation and thus reduce the risk of negative impacts to aquatic/riparian plant communities and those sensitive/watchlist species dependent on them. Of the action alternatives, Alternative 2 has the greatest risk of negatively impacting aquatic/riparian plant communities and the sensitive/watchlist species dependent on them. Alternative 2 proposes the addition of 28 water crossings, about 5 miles of route within 100 feet or riparian vegetation, and 2,649 acres of open area next to Boca, Stampede, and Prosser Reservoirs and in the Greenhorn area. Refer to Tables 3.06-5 and 3.06-6. However, even though much of the 2,649 acres is located within 100 feet of water, those acres support little riparian vegetation and have been surveyed and sensitive/watchlist species are not present. These “Open Areas” have a high risk of spreading weeds to other areas however.

Implementation of Alternatives 5 and/or 6 have a slightly smaller risk of negatively impacting aquatic/riparian plant communities and the sensitive/watchlist species dependent on them than Alternative 2. Alternative 5 proposes the addition of 33 water crossings and about 7 miles of additions to the NFTS. Alternative 6 proposes the addition of 36 water crossings and about 7 miles of additions to the NFTS. Alternatives 5 and 6 do not propose the establishment of Prosser, Boca, Stampede or Greenhorn “Open Areas.” However, Alternative 6 does propose the establishment of access areas to Prosser, Boca, and Stampede Reservoirs (about 244 acres).

Alternatives 4 and 7 have less risk of negatively impacting aquatic/riparian plant communities and the sensitive/watchlist species dependent on them than Alternatives 2, 5 and 6. Alternative 7 proposes the addition of 14 water crossings and about 3 miles of additions to the NFTS. Alternative 4 proposes the addition of about 13 water crossings and about 3 miles of additions to the NFTS. Of the action alternatives, Alternative 3 has the least risk of negative impacts to sensitive/watchlist species dependent on aquatic/riparian plant communities because it does not propose the addition of any water crossings or miles to the NFTS and does not propose “Open Areas” or reservoir access areas. Alternative 3 provides the greatest benefits to sensitive/watchlist species dependent on aquatic/riparian plant communities that may occur within potential habitat.

Table 3.06-5. Number of perennial and intermittent water crossings by alternative*

Action type		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
1. Cross country travel		908	0	0	0	0	0	0
2. Additions to the NFTS	**# of perennial and intermittent stream crossings**	N/A	28	0	13	33	36	14
3. Establishment of Motorized "Open Areas" (acres)		N/A	2,649	0	0	0	244	0
4. Changes to the NFTS	**a. Change in Class of Vehicles resulting from approval of mixed use**	No Effect						
	b. Change in Class of Vehicles resulting from changes in maintenance levels	No Effect						
	c. Change in Season of Use	No Effect						
	d. Reopening Maintenance Level 1 Roads	0	0	0	0	46	3	0
5. Amendments to the Forest Plan		No Effect						
Total Crossings		**3,389**	**2,509**	**2,481**	**2,497**	**2,604**	**2,529**	**2,495**

*Crossings include lands under all ownerships.

The total includes crossings on State, County, and private roads. Alternative 1 total also includes unauthorized routes and closed NFTS roads still receiving some motorized use.

Table 3.06-6. Miles* of proposed additions to the NFS located within 100 feet of riparian vegetation by alternative

Action type		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
1. Cross country travel (miles) (acres)		146 134,222	0	0	0	0	0	0
2. Additions to the NFTS	**Miles added within 100 feet of riparian**	N/A	5	0	3	7	7	3
3. Establishment of Motorized "Open Areas" (acres for entire area)		N/A	2,649	0	0	0	244	0
4. Changes to the NFTS	**a. Change in Class of Vehicles resulting from approval of mixed use**	No Effect						
	b. Change in Class of Vehicles resulting from changes in maintenance levels	No Effect						
	c. Change in Season of Use	No Effect						
	d. Reopening Maintenance Level 1 Roads	0	0	0	0	6	1	0
5. Amendments to the Forest Plan		No Effect						
	Total Miles	**541**	**400**	**395**	**398**	**408**	**403**	**398**
	Total Acres	**134,222**	**2,649**	**0**	**0**	**0**	**244**	**0**

***** Miles are approximate. Note that there are 141,396 acres located within 100 feet of riparian vegetation on the Forest but 7,174 of those acres are located in areas closed by the LRMP. The total mileage includes State, County, and private roads. Alternative 1 total also includes unauthorized routes and closed NFTS roads still receiving some motorized use.

Table 3.06-7. Proposed additions to the NFTS that pass through sensitive/watchlist occurrences and/or watchlist aquatic/riparian plant communities by alternative

Route ID	Aquatic/riparian vegetation	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
SV-005	Aspen, seep/spring	Yes	No	No	Yes	Yes	No
SV-P14	Aspen	Yes	No	Yes	Yes	Yes	Yes
TKN-J2	Vernal pool	Yes	No	Yes	Yes	Yes	Yes
TKN-J5	*Bruchia bolanderi*, seep/spring	Yes	No	No	Yes	Yes	Yes
TKN-J13	Aspen, seep/spring	Yes	No	Yes	Yes	Yes but shortened	Yes
TKN-M2	*Ivesia sericoleuca*, aspen, seep/spring	Yes	No	No	Yes	Yes	No
TKS-11	Aspen	Yes	No	No	Yes	Yes	Yes
YRN-001	*Epilobium howellii*	Yes	No	No	Yes	Yes	No
YRS-066	Seep/spring within 50 feet	Yes	No	No	Yes	Yes	No
YRS-SF4	Seeps/springs	Yes	No	No	Yes	Yes	No
YRS-SF5	Seep/spring	Yes	No	Yes	Yes	Yes	Yes

***** Existing unauthorized routes and closed NFTS roads still receiving some motorized use listed here are also in Alternative 1.

3. Cumulative effects including reasonably foreseeable

Past/present/reasonably foreseeable future actions that could potentially affect or do affect aquatic/riparian plant communities and the sensitive/watchlist species dependent on them as well as the benefits from prohibiting public motorized use of routes are discussed. It is assumed that implementation of all of the action alternatives avoid significant long term cumulative impacts by implementing frequent and consistent evaluation of perennial and intermittent water crossings, implementing mitigations to reduce impacts to sensitive/watchlist species, and detection/treatment of weeds. This evaluation combined with rapid mitigation of resource damage/weed treatment avoids significant impacts to aquatic/riparian plant communities and the sensitive/watchlist species dependent on them in the long term.

Past: Management activities have occurred on Tahoe National Forest System (NFS) lands and privately owned lands for over a century, creating the existing condition as we see it. Historic management activities on NFS lands that impacted aquatic/riparian plant communities include: gold mining, gravel mining, hydroelectric development, land clearance, diversions of water for irrigation, land drainage, timber harvest, construction of roads and railroads, urbanization, livestock grazing, ground water abstraction, and others (Kondolf et al. 1996). This long history of disturbance to aquatic/riparian plant communities has contributed to the lack of an undisturbed reference for most aquatic/riparian dependent sensitive/watchlist species. Therefore, it is not possible to specifically quantify how these past management activities have impacted them. It is known that historic management activities altered springs, creeks, and rivers by diversion of water; that meadows, peatlands/fens were converted to other types of plant community when water was diverted and they dried out; that aquatic/riparian plant communities were repeatedly and heavily grazed by domestic livestock; and that numerous roads were built within RCAs changing the hydrology of the aquatic/riparian plant communities associated with

rivers and streams. These past management activities and others have cumulatively reduced the amount of aquatic/riparian plant communities within TNF watersheds that would be suitable habitat for the sensitive/watchlist species dependent on them. The amount of reduction is unknown.

In addition, aquatic/riparian plant communities were impacted when past management created conditions on the landscape that contributed to cross country travel. For example, skid trails and temporary roads that were created during past timber harvest projects are generally blocked off where they connect to system roads and trails once the project has been implemented. However, in a number of areas motorized vehicle users have removed or gone around the barriers that blocked access. Continued use of the old skid trail and/or temporary road created a motorized route that was not designed for continuous motorized use and may be located in an area that is not best suited to that use. For example, temporary crossings of streams are designed differently than permanent stream crossings. Trail planning and design – especially location – are important considerations for limiting disturbances to natural resources (Foltz and Meadows 2007) such as sensitive/watchlist species.

Current: It is recognized that current impacts to aquatic/riparian plant communities come from a variety of management activities - including motorized vehicle use. It is also recognized that motorized vehicle use within aquatic/riparian plant communities and their zones of influence (RCAs) negatively impacts the soil/vegetation/water in those site specific areas. For example, use of roads/trails/areas while the soils are wet can cause the formation of ruts/wheel tracks that can channel water away from the vegetation located near the rut. The channeled water frequently runs down the road or trail altering area hydrology and causing erosion of soil. Aquatic/riparian vegetation located in areas of changed hydrology and soil erosion often has reduced vigor and may die if the changes are severe.

Aquatic/riparian vegetation located within 30 feet of the road/trail can also be negatively impacted when it is run over as users park along the road/trail, or pull over to let others pass. Aquatic/riparian vegetation located within 100 feet of the route can be covered in dust causing a loss of plant growth. Water quality can also be negatively impacted when motorized vehicles add sediment and other pollutants to aquatic plant communities. (Refer to Section 3.02 for more information about impacts to soil and water.) Motorized vehicle use within aquatic/riparian plant communities and their zones of influence does not benefit soil, water and native vegetation within those areas. However, the significance of the negative impacts to soil/vegetation/water within specific aquatic/riparian plant communities varies. Refer to Appendix A (Site Specific Road, Trail and Open Area Information) for additional information about aquatic/riparian plant communities that are impacted by motorized vehicles.

Other on-going projects on the Forest that impact aquatic/riparian plant communities include: special uses projects such as utility corridor construction and maintenance (utility lines pass through and impact many different types of plant communities including aquatic/riparian); minerals operations that remove native vegetation and recontour the landscape; and livestock grazing projects (impacts to aquatic/riparian plant communities as livestock eat the vegetation and punch hoof holes into the soil). These on-going impacts to aquatic/riparian vegetation contribute to cumulative effects to these plant communities.

Surveys of over 95 miles and many acres of proposed additions to the NFTS showed that there are occurrences of sensitive/watchlist species and/or aquatic/riparian watchlist plant communities that are

negatively impacted by motorized vehicle use of NFTS routes, unauthorized routes, and by cross country use. Examples of these impacts are discussed below:

Example 1: *Meesia triquetra* is a sensitive moss that is dependent on aquatic/riparian plant communities called peatlands or fens. An occurrence of *Meesia triquetra* is currently being impacted by cross country motorized vehicle travel in Summit fen. Cross country travel onto the fen created bare soil by killing the vegetation where the wheel tracks occurred. In addition, Summit fen is also being indirectly impacted by the system route located within 100 feet above it. The system route is channeling water and sediment into the fen covering vegetation with sediment and creating bare soil areas. In addition, the addition of sediment may be changing the acidity of the water (pH) in the fen (formal monitoring of the water pH and possible peat loss has not occurred). It is known that damage to fens/peatlands from motorized vehicle use alters surface and subsurface flow patterns and can result in areas of bare peat and soil. Areas of exposed (bare) peat are at increased risk of drying out and decomposing. Wheel tracks can also weaken or destroy the rhizomatous root network of the clonal peat forming plants. Functioning fens/peatlands store carbon. Loss of moisture to the fen/peatland (from water being channeled down the road/trail) could cause the plants that make up this fen to die releasing carbon. Peat forming wetlands (such as Summit fen) also provide important benefits within TNF watersheds by improving water quality and providing habitat for unique plant communities. Because of the large historical loss of this type of plant community, remaining fens are considered rare.

Example 2: *Ivesia sericoleuca* and *Ivesia aperta* var. *aperta* occurrences are located on the eastside of the Forest in meadows and vernally wet areas (meadows and vernally wet areas also considered aquatic/riparian plant communities). Cross country motorized vehicle use has negatively impacted occurrences of these sensitive plants in several locations. Motorized vehicles have created ruts within occurrences that act as channels taking water and soil away from the sensitive plant occurrences. Several plants show pedestaling – where the body of the plant appears to be "perched" above the soil level. In addition, motorized vehicles have killed and/or injured individual plants by driving over them. Plants located within wheel tracks show reduced vigor – are much smaller than those located outside of wheel track areas.

Reasonably foreseeable: When past and current impacts are added to the impacts of the reasonably foreseeable future actions identified in Appendix H (Reasonably Foreseeable Projects and Cumulative Effects), risks to aquatic/riparian plant communities and the sensitive/watchlist species dependent on them increase.

Some current and reasonably foreseeable management actions do not impact aquatic/riparian plant communities and others are expected to have minimal direct impacts. For example, fuel reduction/timber harvest projects routinely establish a 50-100 foot buffer around aquatic/riparian plant communities (such as riparian vegetation along streams, peatlands, fens, springs, and seeps) where no management activities are implemented. This buffer is designed to reduce and/or eliminate direct/indirect impacts to aquatic/riparian plant communities and/or the sensitive/watchlist species that occur within them. Other projects such as conifer removal from aspen plant communities are designed to improve the health of aspen by improving its reproduction. Aspen conifer removal projects do not buffer riparian vegetation

from disturbance but attempt to limit the amount of disturbance within those aquatic/riparian plant communities. Therefore impacts to riparian vegetation and other riparian resources are expected to be minimal.

No Action: Implementation of Alternative 1 carries a high risk of cumulative impacts to sensitive/watchlist species dependent on aquatic/riparian plant communities. Since (in general terms) no restrictions would be in place to limit where motorized vehicle use could occur, all aquatic/riparian plant communities and sensitive/watchlist species dependent on them that grow in areas that are accessible by motorized vehicles would be at risk. Since complete surveys for the Forest are not available, and an undisturbed reference for aquatic/riparian plant community dependent sensitive/watchlist species is also lacking, this analysis focuses on cumulative impacts to aquatic/riparian plant communities without current botanical surveys and discussion of cumulative impacts to individual species where cross country travel/motorized vehicle use is known to impact them.

When the impacts of all past, current and reasonably foreseeable management actions are added to the possible impacts of implementing Alternative 1, (especially cross country travel) the potential to significantly impact (long term – over 5 years) aquatic/riparian plant communities and the sensitive/watchlist plant species dependent on them is high. Cumulative impacts include possible conversion of peatlands/fens and other wetlands to other types of plant communities from altered hydrology, soil erosion, and weed infestation. Aquatic/riparian plant communities frequently lack the vegetative barriers to keep motorized vehicle use from accessing them (for example wet meadow areas). Therefore, under Alternative 1, it is reasonable to expect cross country motorized vehicle use within them. Several examples of how uses of system and unauthorized routes, and cross country travel impact sensitive/watchlist species in aquatic/riparian plant communities are provided below. These examples are provided to give the reader information about the types of impacts that could occur with cross country motorized vehicle travel.

Example – *Bruchia bolanderi*: *Bruchia bolanderi* is currently indirectly/cumulatively impacted by motorized vehicle use in several locations. This sensitive moss occurs along Castle Creek and is located about 50 feet upstream and 30 feet downstream from the Castle Creek stream crossing along TKN-J5. There are limited numbers of this moss known to occur on the TNF. Known occurrences include Castle Valley, Summit fen, Round Valley meadow, and Upper Lola Montez areas. Both the Upper Lola Montez and Castle Creek occurrences are being impacted by motorized vehicles. In addition, TKN-J5 channels water and has altered the hydrology of site specific areas along it. Impacts are not currently considered significant. However, if motorized vehicle use causes significant hydrologic alternation or soil compaction, the moss occurrences could be lost. All occurrences of this moss on the TNF are small in area and could be significantly reduced by one vehicle pass. Implementation of Alternative 1 carries a high risk (short and long term) that motorized vehicles could significantly impact *Bruchia bolanderi* moss occurrences since they are all located in areas that are fairly accessible to motorized vehicles. In addition, over the long term, weeds could be introduced into the wet meadow plant community containing *Bruchia bolanderi*. If weeds were to become established in the *Bruchia bolanderi* locations, the sensitive moss plants would be lost. When, where, and if weeds would become established is unknown.

Example – *Ivesia sericoleuca*: *Ivesia sericoleuca* was discovered along TKN-M2. Cross country motorized vehicle use has killed and injured individual plants within this occurrence. These impacts are not considered significant at this time. However, over the long term, impacts to *Ivesia sericoleuca* occurrences from cross country travel by motorized vehicles may be significant.

Most of the known occurrences of *Ivesia sericoleuca* are known to be impacted by a combination of motorized and non-motorized vehicles, livestock grazing and/or cheatgrass invasion. Even though there are tens of thousands of *Ivesia sericoleuca* plants known to occur on Tahoe NFS lands, the majority are being negatively impacted. *Ivesia sericoleuca* plants grow in meadow plant communities where terrain and vegetation do not provide obstacles to cross country travel. TNF occurrence records for the 28 known occurrences indicate that 18 of the known occurrences are negatively impacted by off-highway vehicles (OHVs). Only two occurrence records indicate no disturbances. Twenty of the 28 occurrence records indicate that livestock grazing is a negative disturbance. Over the long term, cross country travel by motorized vehicles in these plant communities, combined with past/current impacts could significantly reduce the number of *Ivesia sericoleuca* plants on the TNF. In addition, over the long term, other occurrences of sensitive species, such as *Ivesia aperta* var. *aperta* and *Pyrrocoma lucida*, which are accessible by motorized vehicles traveling cross country could also be significantly reduced. Occurrences of all three of these sensitive plants are currently known to be negatively impacted by motorized vehicle use. Refer to the occurrence records for these plants located in the Supervisor's Office.

Example – *Populus tremuloides*/aspen: Aspen clones (watchlist plant communities) were found along several routes including TKN-M2, TKS-11, SV-005, and SV-P14. Over the long term, cross country travel could damage aspen so much that the aspen are killed and/or weakened. Weakened aspen are more susceptible to disease and/or insect infestation. Cross country travel through aspen stands could alter soil properties. Shepperd et al. (2006) reported that recreation activities can alter soil properties if continued vehicle passes cause the stripping of small moisture-absorbing roots from large lateral roots. Severe motorized vehicle use could increase runoff from storm events in these aspen clones increasing erosion (Shepperd et al. 2006). Over the long term (more than 5 years), continued motorized vehicle use within aspen could introduce disease, spread weeds so that regeneration is reduced, and increase the risk of loss of these plant communities.

Example – wet meadows: Some system and unauthorized motorized vehicle roads/trails end at the edge of wet meadows. For example, YRN-11 is an unauthorized road that ends at a wet meadow. There is evidence (wheel tracks) that some motorized users are driving past the end of the route onto the meadow. When motorized vehicle use occurs in wet meadows, soils are compacted, the hydrology is altered, and vegetation is killed. Implementation of Alternative 1 would not place barriers at the end of unauthorized trails such as YRN-11 and it is reasonable to assume that cross country travel across wet meadows would occur. Restoration of aquatic/riparian plant communities such as wet meadows is often time consuming and expensive and successful methods of reintroduction of sensitive/watchlist species are not always available.

Alternative 1 has the greatest number of perennial and intermittent water crossings, the most miles of motorized vehicle roads/trails/areas within 100 feet of riparian vegetation, and allows cross country

travel. Refer to Tables 3.06-5 and 3.06-6. In addition, implementation of Alternative 1 has the greatest risk of introducing and spreading weeds into aquatic/riparian habitats (Refer to the Noxious Weed Risk Assessment located in the project files).

Given all of the above information, implementation of Alternative 1 may impact *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium lunaria*, *Botrychium minganense*, *Botrychium montanum*, *Bruchia bolanderi*, *Epilobium howellii*, *Fissidens aphelotaxifolius*, *Helodium blandowii*, *Hydrothyria venosa*, *Ivesia aperta* var. *aperta*, *Ivesia aperta* var. *canina*, *Ivesia sericoleuca*, *Ivesia webberi*, *Meesia triquetra*, *Meesia uliginosa*, and *Pyrrocoma lucida* and may contribute to a trend for listing them as threatened or endangered over the long term. Implementation of Alternative 1 may also impact *Androsace occidentalis* var. *simplex*, *Darlingtonia californica*, *Drosera anglica*, *Drosera rotundifolia*, *Juncus marginatus* var. *marginatus*, *Mimulus lacinatus*, *Potamogeton filiformis*, *Rhynchospora alba*, *Rhynchospora capitellata*, *Scutellaria galericulata*, *Sphagnum* species, *Utricularia minor*, *Veronica cusickii*, special aquatic features and aspen groves. At this time, impacts to watchlist plants and/or plant communities are not considered significant unless entire plant communities are lost. Based on current information, watchlist plants/plant communities that are aquatic/riparian dependent are not at risk of being lost in the short term (less than 5 years). The number of aquatic/riparian plant communities that could be converted to other types of plant communities due to cross country motorized vehicle use is unknown. It is also unknown how such variables as climatic variation and future water demands from NFS lands combined with cross country motorized travel would impact aquatic/riparian plant communities. It is known that implementation of Alternative 1 could continue to negatively impact these limited plant communities. Refer to the watchlist report located in the project record. It is believed that implementation of Alternative 1 puts these plant communities at risk of being lost in the long term.

Action alternatives: Implementation of the action alternatives would cumulatively impact aquatic/ riparian plant communities and the sensitive/watchlist species dependent on them. When the impacts of all past, current and reasonably foreseeable management actions are added to the possible impacts of adding intermittent/perennial water crossings and miles of road/trail/area located within 100 feet of riparian vegetation, there is the potential to significantly impact (long term – over 5 years) them. However, as discussed previously, mitigations have been developed for those proposed additions to the NFTS that have current surveys (over 95 miles).

Motorized vehicle use of proposed additions that lack current surveys may be impacting sensitive/ watchlist species and/or aquatic/riparian plant communities. Direct/indirect impacts could be significant in the long term if sensitive/watchlist species and/or aquatic/riparian plant communities are lost. Impacts could also be significant over the long term if sensitive/watchlist species and/or aquatic/riparian plant communities are replaced by weeds. Currently there are no cost effective mitigations available to prevent the introduction of weeds from motorized vehicle use along roads/trails and within areas. Since the existing condition of the proposed additions without current surveys is unknown, the following alternative comparison is done for impacts to known occurrences and potential habitats.

Alternative 2: Of the action alternatives, Alternative 2 has the greatest risk of cumulatively impacting aquatic/riparian plant communities and the sensitive/watchlist species dependent on them. Alternative 2

proposes the addition of 28 water crossings, about 5 miles of route within 100 feet of riparian vegetation, and 2,649 acres of ”Open areas” next to Boca, Stampede, and Prosser Reservoirs and in the Greenhorn area. These “Open Areas” have a high risk of spreading weeds to other areas.

Implementation of Alternative 2 would also impact known occurrences of sensitive/watchlist species and/or aquatic/riparian plant communities along proposed additions. Mitigations have been developed to reduce and/or eliminate impacts to known occurrences; however, known occurrences are still at risk from indirect impacts such as dust and weed infestation. There are no mitigations available that effectively reduce the indirect impacts of increased risk of weed introduction/spread and reduced vigor due to dust. Motorized vehicle use along proposed additions that have weed infestations and sensitive/watchlist species and/or aquatic/riparian plant communities have the greatest risk that these species and/or plant communities would be infested with weeds over time. In addition, sensitive/watchlist species located within 100 feet of proposed additions are at increased risk of reduced vigor from dust. Dust covered plants do not reproduce or grow as well as those plants that are not covered in dust. Dust covered plants could be weakened to the point that they can no longer compete effectively with weeds or other vegetation. The amount of dust is dependent on many variables such as the amount of use, the type of soil, wind patterns, etc. Over the long term, competition for soil and water due to weed invasion and weakening of plants due to being covered with dust could kill plants. However, frequent field visits with rapid implementation of mitigations to reduce/eliminate impacts (including weed treatment) are expected to reduce the significance of these impacts. Therefore, impacts to known occurrences and/or potential habitats without current botanical surveys from implementation of Alternative 2 are not considered significant.

Alternatives 5 and 6: Implementation of Alternatives 5 and/or 6 have a slightly smaller risk of cumulatively impacting aquatic/riparian plant communities and the sensitive/watchlist species dependent on them than Alternative 2. Alternative 5 proposes the addition of 33 water crossings, about 7 miles of additions to the NFTS and reopens the most miles of ML 1 roads (about 46 miles) in aquatic and riparian communities. Alternative 6 proposes the addition of 36 water crossings, about 7 miles of additions to the NFTS and reopens about 3 miles of ML 1 roads in this community type. Alternatives 5 and 6 do not propose the same additions of Prosser, Boca, Stampede or Greenhorn “Open Areas” - Alternative 6 proposes 244 acres and Alternative 5 proposes no “Open Areas.” Therefore, Alternative 2 has a higher risk of weed spread than Alternatives 5 and 6.

Implementation of Alternatives 5 and 6 would also impact known occurrences of sensitive/watchlist species and/or aquatic/riparian plant communities along proposed additions. Known occurrences are still at risk from indirect impacts such as dust and weed infestation. Frequent field visits with rapid implementation of mitigations to reduce/eliminate impacts (including weed treatment) are expected to reduce the significance of these impacts. Therefore, impacts to known occurrences and/or potential habitats without current botanical surveys from implementation of Alternatives 5 and 6 are not considered significant.

Alternatives 4 and 7: Implementation of Alternatives 4 and 7 cumulatively impacts aquatic/riparian plant communities and the sensitive/watchlist species dependent on them. However, these cumulative

impacts are less than those under Alternatives 2, 5 and 6. Alternative 7 proposes the addition of 14 water crossings, about 3 miles of additions to the NFTS and does not have any water crossings associated with the reopening of any ML 1 roads. Alternative 4 proposes the addition of about 13 water crossings, about 3 miles of additions to the NFTS and does not have any water crossings associated with the reopening of any ML 1 roads. In addition, the amount of indirect impacts that known occurrences would experience is reduced in Alternatives 4 and 7 because they do not propose additions of specific routes with known occurrences. Implementation of Alternative 4 would not indirectly impact *Bruchia bolanderi* and the seep along TKN-J5; *Ivesia sericoleuca*, a spring, and aspen along TKN-M2; or aspen along TKS-11 and SV-005 because these routes are not proposed for addition to the NFTS under Alternative 4. Aspen along SV-P14 would continue to be indirectly impacted under Alternative 4. In addition, implementation of Alternative 4 would not spread cheatgrass along TKN-M2 through motorized vehicle use since motorized vehicle use of that route would be prohibited. Alternative 7 would continue to indirectly impact *Bruchia bolanderi* and the seep along TKN-J5 and aspen along TKS-11 and SV-P14. Alternative 7 would not impact *Ivesia sericoleuca*, a spring and aspen along TKN-M2, or continue to spread cheatgrass along TKN-M2.

Alternative 3: Implementation of Alternative 3 would cumulatively impact aquatic/riparian plant communities and those sensitive/watchlist species dependent on them through use of system routes. Of the action alternatives, Alternative 3 has the least risk of negative impacts to sensitive/watchlist species dependent on aquatic/riparian plant communities because it does not propose the addition of any water crossings or miles to the NFTS and does not propose "Open Areas." Implementation of Alternative 3 has the lowest weed risk of the action alternatives and provides the greatest benefit to aquatic/riparian plant communities and those sensitive/watchlist species dependent on them.

Given the above information, implementation of the action alternatives could impact: *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium lunaria, Botrychium minganense*, *Botrychium montanum*, *Bruchia bolanderi*, *Epilobium howellii*, *Fissidens aphelotaxifolius*, *Helodium blandowii, Hydrothyria venosa*, *Ivesia aperta* var. *aperta*, *Ivesia aperta* var. *canina*, *Ivesia sericoleuca*, *Ivesia webberi*, *Meesia triquetra*, *Meesia uliginosa*, or *Pyrrocoma lucida* but would not contribute to a trend for listing them as threatened or endangered. Implementation of the action alternatives could also impact *Androsace occidentalis* var. *simplex, Darlingtonia californica*, *Drosera anglica*, *Drosera rotundifolia, Juncus marginatus* var. *marginatus, Meesia longiseta*, *Mimulus lacinatus*, *Potamogeton filiformis*, *Rhynchospora alba, Rhynchospora capitellata*, *Scutellaria galericulata*, *Sphagnum* species, *Utricularia minor, Veronica cusickii*, special aquatic features and aspen groves but those impacts are not expected to be significant in the short or long term. Since it is assumed that motorized vehicle users would stay on designated routes regardless of the action alternative selected, and motorized vehicle use does not benefit aquatic/riparian plant communities, the alternative with the least number of miles within and adjacent to aquatic/riparian plant communities is the most beneficial to those plant communities and the resources dependent on them, i.e. Alternative 3.

Serpentine and/or Copper/Heavy Metal Plant Communities

1. Prohibition of cross country travel

Indicator(s) used to measure effects:

- Acres where cross country travel is prohibited (thereby reducing the mileage of routes available for motorized use) Mileage reduction includes unauthorized routes and closed NFTS roads still receiving some motorized use located within 100 feet of serpentine and/or copper/heavy metal plant communities.

No Action: Alternative 1 does not prohibit cross country travel on the 14,412 acres of serpentine soil within the TNF. Under implementation of Alternative 1 as yet undiscovered serpentine/copper/heavy metal dependent sensitive/watchlist species and/or plant communities could be negatively impacted by motorized vehicle use if they are located in areas accessible by vehicles. It is reasonable to expect that over time, cross country use would kill or injure sensitive/watchlist species and significantly impact serpentine plant communities. Cross country use in these plant communities could increase soil erosion. The significance of direct/indirect impacts is dependent on many factors including the amount of disturbance, the sensitive/watchlist 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/ watchlist species that occur in a specific location and how many of them are damaged. For example, some serpentine dependent sensitive species, such as *Mielichhoferia elongata* and *Monardella follettii*, have not been found on the TNF. If they were found in/along proposed additions to the NFTS, the occurrence would be considered an important range extension of the species and disturbances could be considered significant.

The TNF has about 80 miles of NFTS roads/trails open to motor vehicle use and 40 miles of unauthorized routes and closed NFTS roads still receiving some motorized use located within serpentine plant communities. About 1 mile of unauthorized route is located within an area closed to motorized vehicle travel by existing forest order. Since serpentine plant communities are sparsely vegetated, under Alternative 1, motor vehicles could access almost all of these communities via cross country travel. Dependent on many factors such as amount of motor vehicle use, amount of erosion, and amount of vegetation loss, impacts could be significant over the long term.

No sensitive species were found in the surveys of about 95 miles of unauthorized routes and closed NFTS roads still receiving some motorized use. An occurrence of the watchlist plant *Erigeron petrophilus* var. *sierrensis* was found within and along YRN-7. This is the only occurrence of this plant known on the TNF. Motorized vehicle use of YRN-7 is directly/indirectly impacting about 50% of the plants within the occurrence since about 50% of the plants are located within 100 feet of wheel tracks of YRN-7. Implementation of Alternative 1 could significantly reduce the size of this occurrence and/or kill all of these plants through cross country travel since the occurrence area is sparsely vegetated and there is evidence of cross country travel currently. Loss of the only occurrence of *Erigeron petrophilus* var. *sierrensis* on the TNF would be significant.

Action alternatives: All of the action alternatives prohibit cross country travel. Therefore, direct/ indirect impacts to sensitive/watchlist species dependent on these plant communities from cross country travel would not occur. Since unauthorized routes and continued motorized use of closed NFTS roads are considered an expression of cross country travel, the number of miles where motorized vehicle use is prohibited provides benefits to these plant communities. Alternatives 2 and 5 prohibit motorized use on the fewest miles of unauthorized routes and closed NFTS roads still receiving some motorized use of the action alternatives – about 36 miles or 90 percent. Alternatives 4 and 7 prohibit public motorized use on about 37 miles of unauthorized routes and closed NFTS roads still receiving some motorized use or 93 percent. Alternatives 3 and 6 prohibit public motorized use on 100 percent of the unauthorized routes and closed NFTS roads still receiving some motorized use located within serpentine/copper/heavy metal plant communities and would have the least risk of indirect and cumulative impacts to sensitive/watchlist species dependent on these plant communities.

2. Additions to the NFTS and Reopening ML 1 Roads

Indicator(s) used to measure effects:

- Miles of proposed additions to the NFTS that pass through serpentine (ultramafic) soils. Areas of copper/heavy metal soils are usually small and not identified as distinct soil mapping units. Therefore, the miles of unsurveyed proposed motorized vehicle road/trail/area in copper and heavy metal areas are not known. Areas of copper/heavy metal are identified during on the ground surveys.
- Sensitive/watchlist species located within 100 feet of proposed additions to the NFTS and/or miles of potential habitat lacking current surveys.

No Action: Alternative 1 does not propose additions to the NFTS; however, implementation of Alternative 1 could impact sensitive/watchlist species and/or serpentine/copper/heavy metal plant communities directly, indirectly, and cumulatively by continuing use of about 40 miles of unauthorized routes and closed NFTS roads, continuing use of the 80 miles of open NFTS roads/trails, state, county, and private routes, and allowing cross country travel within these plant communities. These impacts could be significant dependent on the species of plant, amount of disturbance, etc. Refer to the discussion above under the No Action Alternative for information about the effects of cross country travel.

Action alternatives: Compared to Alternative 1, all action alternatives would reduce the number of miles open for motorized vehicle use within serpentine/copper/heavy metal plant communities. Refer to Table 3.06-8.

A. Impacts to known occurrences: No sensitive species were found in surveys of proposed additions located within serpentine/copper/heavy metal plant communities. However, an occurrence of the watchlist plant *Erigeron petrophilus* var. *sierrensis* was found within and along YRN-7. Motorized vehicle use of YRN-7 is directly/indirectly impacting about ½ of the plants within this occurrence since about 50 percent of them are located within 100 feet of the route. Loss of 50 percent of the only known occurrence of this plant on the TNF would be significant. Therefore, mitigations were developed to reduce direct impacts. Barriers would be placed along both sides of YRN-7 where it passes through the occurrence. Indirect

impacts from dust and increased weed risk would continue. Therefore, those alternatives that propose the addition of YRN-7 have the greatest risk of indirect impacts to this plant. Alternatives 2, 5 and 7 propose the addition of YRN-7 to the NFTS. Alternatives 3, 4 and 6 do not propose YRN-7.

B. Impacts to potential habitat: Alternatives 2 and 5 propose the addition of about 4 miles, the most miles within this plant community. Alternatives 4 and 7 both propose the addition of about 3 miles of route within these plant communities. Alternatives 3 and 6 do not propose the addition of any routes within serpentine plant communities and therefore have the least risk of negative impacts to native plants including sensitive and watchlist species located within these plant communities.

Table 3.06-8. Miles* of road/trail/area within serpentine plant communities by alternative

Action type		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
1. Cross country travel (miles located within serpentine plant communities) (acres located within serpentine plant communities)		40 14,412	0	0	0	0	0	0
2. Additions to the NFTS	**Miles added within 100 feet of serpentine (ultramafic) soil**	N/A	4	0	3	4	0	3
3. Establishment of Motorized "Open Areas" (acres)		N/A	0	0	0	0	0	0
4. Changes to the NFTS	**a. Change in Class of Vehicles resulting from approval of mixed use**	No Effect						
	b. Change in Class of Vehicles resulting from changes in maintenance levels	No Effect						
	c. Change in Season of Use	No Effect						
	d. Reopening Maintenance Level 1 Roads	0.0	0.0	0.0	0.0	0.2	0.2	0.0
5. Amendments to the Forest Plan		No Effect						
	Total Miles	**120**	**85**	**81**	**84**	**85**	**84**	**84**
	Total Acres	**14,412**	**0**	**0**	**0**	**0**	**0**	**0**

*Miles are approximate. The total mileage includes NFTS, State, County, and private roads. Alternative 1 total also includes unauthorized routes and closed NFTS roads still receiving some motorized use.

3. Cumulative effects including reasonably foreseeable

Indicator(s) used to measure effects: Past/present/reasonably foreseeable future actions that could potentially impact serpentine/copper/heavy metal plant communities as well as the sensitive/watchlist species dependent on them, including the benefits from prohibiting use of unauthorized routes and closed NFTS roads still receiving some motorized use are discussed. It is assumed that all of the action alternatives avoid significant long term cumulative impacts by implementing frequent evaluation of routes, implementing mitigations to reduce impacts to sensitive/watchlist species, and conducting weed detection surveys with rapid treatment of weeds. This route evaluation combined with rapid mitigation of resource damage avoids significant impacts to serpentine/copper/heavy metal plant communities and the sensitive/watchlist species dependent on them in the short and long term.

Past: Serpentine habitats in the Sierra Nevada have been reduced in area and/or have had their functions impaired. Gold mining, timber harvest, road construction, recreational uses, and gravel mining are a few of the management activities that have impacted the serpentine habitats on the TNF.

Serpentine habitats are frequently open terrain (Kruckeberg 1984). Therefore they lack vegetation to prevent cross country travel by motorized vehicles. *Allium sanbornii* var. *congdonii, Allium sanbornii* var. *sanbornii, Chlorogalum grandiflorum, Mielichhoferia elongata, Monardella follettii* and *Perideridia bacigalupi* are the sensitive/watchlist species that are considered dependent on serpentine/copper/heavy metal habitats. Historic activities have cumulatively reduced the quality of serpentine habitat that would be suitable for these plants within TNF watersheds. The amount of reduction is unknown.

Current: Current management (2004 on) has added to cumulative impacts to serpentine/copper/heavy metal plant communities primarily through continued mining operations, utility corridor maintenance, and motorized vehicle use. Current management for sensitive/watchlist species being negatively impacted by motorized vehicle use has involved blocking the access with wooden and/or rock barriers. This method has not always been effective since the lack of vegetation in these plant communities allow access around the barriers. However, this analysis assumes that users would stay on routes and would not use routes where motorized vehicle use is prohibited.

Special uses projects such as utility corridor construction and maintenance pass through and impact many different types of plant communities including serpentine/copper/heavy metal. Mining/minerals projects are also known to impact serpentine/copper/heavy metal plant communities - and eliminate significant amounts of vegetation in some areas. Most of the serpentine plant communities on the TNF are considered disturbed, primarily by historic mining.

Reasonably foreseeable: Serpentine plant communities are cumulatively impacted when past impacts, the impacts of implementing the alternatives, and on-going impacts are added to the impacts of those actions identified in Appendix H (Reasonably Foreseeable Projects and Cumulative Effects). However, the reasonably foreseeable actions identified in Appendix H are not located in or near serpentine/copper/heavy metal plant communities. Therefore, the reasonably foreseeable projects listed in Appendix H are not expected to add to the cumulative impacts that serpentine/copper/heavy metal plant communities on the TNF experience.

No Action: Implementation of Alternative 1 carries a high risk of cumulative impacts to sensitive/watchlist species dependent on serpentine/copper/heavy metal plant communities. Since (in general terms) no restrictions would be in place to limit where motorized vehicle use could occur, all serpentine/copper/heavy metal plant community dependent sensitive/watchlist species would be at risk. These plant communities are frequently open terrain (Kruckeberg 1984) and lack vegetation to prevent cross country travel by motorized vehicles. In addition, Alternative 1 does not prohibit motorized vehicle use on unauthorized routes and closed NFTS roads still receiving some motorized use. When the impacts of all past, current and reasonably foreseeable management actions are added to the possible impacts of cross country travel, implementation of Alternative 1 has the potential to significantly impact serpentine/copper/heavy metal plant communities and the sensitive/watchlist species dependent on them. Implementation of Alternative 1 may impact *Mielichhoferia elongata* and *Monardella follettii* if they

occur on the unsurveyed potential habitat and may contribute to a trend for listing them as federally listed as threatened or endangered over the short or long term. Neither species has been found on TNF system lands. Therefore discovering either species on the TNF would make them important occurrences and impacts to them could be significant. Implementation of Alternative 1 may also impact *Allium sanbornii* var. *congdonii*, *Allium sanbornii* var. *sanbornii*, *Chlorogalum grandiflorum*, and *Perideridia bacigalupi*, but those impacts are not considered significant at this time even though cross country travel could negatively impact entire occurrences if they exist in the potential habitat that lacks current botanical surveys. Refer to the Biological Evaluation for Sensitive Plants and Fungi and the Watchlist Plant and Plant Community Report located in the project record more discussion of the past, current and reasonably foreseeable actions that contribute to cumulative impacts to serpentine/copper/ heavy metal plant communities. Over the long term, with cross country travel and other continued disturbances, some of the serpentine plant communities may lose significant amounts of vegetation and experience increased erosion. This could be locally significant and may be regionally significant over the long term since serpentine plant communities/areas of copper/heavy metals are limited in distribution and are known to have a high number of endemic plants.

Action alternatives: Compared to Alternative 1, all action alternatives would reduce the number of miles of road/trail open for public motorized use in serpentine/copper/heavy metal plant communities. However, implementation of the action alternatives could add to cumulative impacts experienced by sensitive/watchlist species dependent on serpentine/copper/heavy metal plant communities. Surveys to date have not detected any sensitive species along proposed additions to the NFTS. However, the watchlist plant *Erigeron petrophilus* var. *sierrensis* was discovered within and adjacent to YRN-7.

The action alternatives propose 8 routes that pass through serpentine soils. Two of the 8 are ML 1 or temporary route proposed additions in Alternative 5 only. The other routes are identified as: ARM-2, ARM-3r, YRN-509, YRN-7, and YRN-M2.

Alternatives 2 and 5: Cumulative impacts from implementations of Alternatives 2 and 5 are not considered significant. Of the action alternatives, implementation of Alternatives 2 and 5 propose the most miles of route in these plant communities and restrict public use of the fewest miles of unauthorized routes and closed NFTS roads still receiving some motorized use in these plant communities. Therefore, implementation of Alternatives 2 and 5 have the greatest risk of cumulatively impacting sensitive and/or watchlist species dependent on serpentine/copper/heavy metal plant communities of the action alternatives. The risk of cumulative impacts to serpentine plant communities is higher in Alternative 5 than in Alternative 2 because the ML 1 and temporary routes proposed under Alternative 5 do not have current surveys. Therefore, the risk of cumulatively impacting occurrences of sensitive/watchlist plants dependent on these plant communities (should they occur in the unsurveyed habitat) is less in Alternative 2 than in Alternative 5. All serpentine/cooper/heavy metal dependent sensitive/watchlist plants would have mitigations implemented to reduce and/or eliminate impacts from motorized vehicles when they are discovered. The management requirements (mitigations) for the known occurrence of *Erigeron petrophilus* var. *sierrensis* located immediately adjacent to YRN-7 are identified in Appendix A (Site Specific Road, Trail and Open Area Information). It is believed that these management requirements

would reduce (but not eliminate impacts to *Erigeron petrophilus* var. *sierrensis* plants from motorized use of YRN-7. In addition, serpentine/copper/heavy metal dependent rare plants could go undetected under implementation of Alternative 5 along routes without current botanical surveys.

Alternatives 4 and 7: Cumulative impacts from implementation of Alternatives 4 and 7 are not considered significant. Alternatives 4 and 7 both propose about 3 miles of additions to the NFTS within these plant communities and do not propose ML 1/temporary roads without current botanical surveys. Alternatives 4 and 7 prohibit motorized vehicle use of 37 miles of unauthorized routes and closed NFTS roads still receiving some motorized use within these plant communities. Sensitive/watchlist species would be indirectly impacted, but would have mitigations implemented to reduce/eliminate direct impacts to them under implementation of Alternatives 4 and 7 (should they occur in the unsurveyed habitat). Therefore, implementation of Alternatives 4 and 7 could indirectly and cumulatively impact *Mielichhoferia elongata* and *Monardella follettii* if they occur on the unsurveyed potential habitat, but would not contribute to a trend for federally listing them as threatened or endangered. Implementation of Alternatives 4 and 7 may also indirectly and cumulatively impact *Allium sanbornii* var. *congdonii, Allium sanbornii* var. *sanbornii, Chlorogalum grandiflorum,* and *Perideridia bacigalupi,* but those impacts are not considered significant at this time unless entire occurrences are negatively impacted.

Alternatives 3 and 6: Cumulative impacts from implementation of Alternatives 3 and 6 are not considered significant. Alternatives 3 and 6 do not propose any additions to the NFTS within this plant community and would prohibit motorized vehicle use of all 40 miles of route located within these serpentine/copper/heavy metal plant communities. Therefore, implementation of Alternatives 3 and 6 may cumulatively impact *Mielichhoferia elongata* and *Monardella follettii,* but would not contribute to a trend for federally listing them as threatened or endangered. Implementation of Alternatives 3 and 6 may also impact *Allium sanbornii* var. *congdonii, Allium sanbornii* var. *sanbornii, Chlorogalum grandiflorum* and *Perideridia bacigalupi* if they occur along system routes, but those impacts are not considered significant in the short or long term unless entire occurrences are eliminated.

Given the above information, implementation of the action alternatives may indirectly and cumulatively impact *Mielichhoferia elongata* and *Monardella follettii* if they occur on the unsurveyed potential habitat, but would not contribute to a trend for listing them as federally listed as threatened or endangered over the short or long term. Implementation of the action alternatives may also indirectly and cumulatively impact *Allium sanbornii* var. *congdonii, Allium sanbornii* var. *sanbornii, Chlorogalum grandiflorum*, and *Perideridia bacigalupi,* but those impacts are not considered significant at this time unless entire occurrences are negatively impacted.

Older Forest Plant Communities

1. Prohibition of cross country travel

Indicator(s) used to measure effects:

- Acres where cross country travel is prohibited thereby reducing the mileage of route available for motorized use within older forests.

No Action: Implementation of Alternative 1 would directly, indirectly, and cumulatively impact older forest plant communities and the sensitive species dependent on them**.** (There are currently no watchlist plants or plant communities dependent on older forests.) Alternative 1 does not prohibit cross country travel on 285,728 acres of TNF older forests. Under implementation of Alternative 1 as yet undiscovered sensitive species occurrences dependent on older forest plant communities would be at risk as new routes were created. It is expected that cross country use would damage at least some sensitive species occurrences (if they are present on TNF system lands) and it is reasonable to expect that some occurrences would be lost even though older forest plant communities are not considered open terrain.

There are about 285,728 acres of older forest on TNF system lands, of which 29,900 acres or about 11 percent are currently, impacted by system and unauthorized, motorized vehicle roads/trails/areas (routes). This acreage number was obtained using about 100 feet on either side of system and unauthorized motorized vehicle routes that pass through vegetation mapped as CWHR 4 and above on NFS lands. The significance of eleven percent disturbance is unknown. There are about 2,057 miles of NFTS, state, county, and private routes within these plant communities.

Direct/indirect impacts to sensitive species dependent on older forest plant communities from implementation of Alternative 1 could be significant at least at the local, site specific level. Cross country use could kill/injure these older forest dependent sensitive species directly, and/or indirectly kill/injure them through soil changes and the introduction/spread of weeds. Cross country use would also damage other native vegetation in these plant communities increasing the risk of erosion and possibly damaging mycorrhizal networks. The significance of direct/indirect impacts is dependent on many factors including the amount of disturbance, the sensitive species being impacted, the number of sensitive species that occur in a specific location, and how many of them are damaged. The following example is provided to show how current use is impacting older forest dependent species.

Example - Several occurrences of *Cypripedium fasciculatum* are currently impacted by maintenance of NFTS roads. In addition, NFTS routes have provided access to *Cypripedium fasciculatum* occurrences which has contributed to poaching of these plants (plants have been dug up and removed). Over the long term, cross country motorized vehicles could kill significant numbers of these plants and occurrences could be lost. In addition, introduction of weeds could eventually eliminate the occurrences. Nonnative blackberries have been introduced near the roadside occurrences of this orchid in the Rock Creek area. This aggressive weed could eventually displace the orchids in this area.

Severe cross country impacts to older forest plant communities containing sensitive species would be considered significant. It is impossible to know when or where cross country motorized vehicle use would occur, so these disturbances are difficult to quantify. Since Alternative 1 allows cross county travel, the risk of significant impacts to sensitive species that may occur within unsurveyed potential habitats and within known occurrences is higher than the action alternatives. Reducing and/or eliminating impacts to sensitive species are considered effective methods of reducing cumulative impacts to them. However, flag and avoid is not a practical mitigation when cross country travel is allowed. Allowing unrestricted motorized vehicle use across the Forest greatly increases the risk of negative indirect impacts to sensitive species.

Action alternatives: None of the action alternatives allow cross country travel within older forest plant communities. Therefore, direct/indirect impacts to sensitive species dependent on older forest plant communities from cross country travel would not occur. Refer to Table 3.06-9. Alternative 5 prohibits public motorized use of about 727 of the 768 miles of unauthorized routes and closed NFTS roads still receiving some motorized use located within older forest plant communities or about 95 percent. (About 49 miles of the 817 miles of unauthorized routes and closed NFTS roads within older forest plant communities is already prohibited by existing Forest Orders.) Alternative 2 prohibits public motorized use of about 735 miles in older forest plant communities or about 96 percent. Alternative 6 prohibits public motorized use on about 736 miles or about 96 percent also. Alternative 4 prohibits use on about 752 miles or 98 percent and Alternative 7 prohibits motorized use on 747 miles or about 97 percent. Alternative 3 prohibits public motorized use on all 817 miles of unauthorized routes and closed NFTS roads still receiving some motorized use.

2. Additions to the NFTS and Reopening ML 1 Roads

Indicator(s) used to measure effects:

- Miles of proposed additions to the NFTS within older forest plant communities. The miles of proposed additions that pass through older forests (CWHR 4 and above) is the indicator used to analyze impacts to unsurveyed older forest habitats. Table 3.06-9 displays the number of miles of motorized vehicle road/trail/areas in older forest plant communities by alternative.
- Sensitive species (associated with older forests) located within 100 feet of proposed additional NFTS motorized recreation opportunities. Surveys to date have shown that *Cypripedium fasciculatum* is located within 30 feet of several NFTS roads.

Table 3.06-9. Miles* of road/trail/area within older forest plant communities by alternative

Action type		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
1. Cross country travel (miles located within older forest plant communities) (acres located within older forest plant communities)		817 285,728	0	0	0	0	0	0
2. Additions to the NFTS	**Miles added within 100 feet of older forest**	N/A	33	0	16	41	32	21
3. Establishment of Motorized "Open Areas" (acres)		N/A	0	0	0	0	0	0
4. Changes to the NFTS	**a. Change in Class of Vehicles resulting from approval of mixed use**	No Effect						
	b. Change in Class of Vehicles resulting from changes in maintenance levels	No Effect						
	c. Change in Season of Use	No Effect						
	d. Reopening Maintenance Level 1 Roads	0	0	0	0.1	51	5	1
5. Amendments to the Forest Plan		No Effect						
	Total Miles **Total Acres**	**2,874** **285,728**	**2,090** **0**	**2,057** **0**	**2,073** **0**	**2,149** **0**	**2,094** **0**	**2,079** **0**

*Miles are approximate. The total mileage includes NFTS, State, County, and private roads. Alternative 1 total mileage also includes unauthorized routes and closed NFTS roads still receiving some motorized use.

No Action: Alternative 1 does not propose additions to the NFTS but it does not prohibit public motorized use of unauthorized routes and closed NFTS roads still receiving some motorized use and it allows cross country travel. Implementation of Alternative 1 could impact sensitive species directly/indirectly by continuing use of about 817 miles of unauthorized routes and closed NFTS roads still receiving some motorized use located within older forest plant communities. Refer to Table 3.06-9 which shows the miles of route within these plant communities by alternative. Implementation of Alternative 1 could also directly/ indirectly impact sensitive species through use of about 2,057 miles of NFTS, state, county, and private routes located within these plant communities. Direct/indirect impacts could be significant.

Sensitive species dependent on older forests were not found in the more recent botanical surveys (about 95 miles of recent survey). No new weed occurrences were found in older forest plant communities in these surveys.

Action alternatives: Compared to Alternative 1, all action alternatives would reduce the number of miles of unauthorized routes and closed NFTS still receiving some motorized use designated as open for motorized vehicles in older forest plant communities. Of the action alternatives, implementation of Alternative 5 proposes the most miles of addition to the NFTS – about 41 miles. Therefore, implementation of Alternative 5 has the greatest risk of negative impacts to sensitive species dependent on older plant communities of the action alternatives. Alternatives 2 and 6 propose the addition of 33 and 32 miles respectively to the NFTS. Alternative 7 proposes to add about 21 miles to the NFTS. Alternative

4 proposes to add about 16 miles to the NFTS. Alternative 3 does not propose any additions to the NFTS or propose reopening any ML 1 roads.

About 32 miles of proposed additions to the NFTS located within older forest plant communities have been surveyed and no sensitive species were found. However, these surveys did not target sensitive fungi. Therefore, sensitive fungi may be present even in the areas that received recent botanical surveys. Of the action alternatives, Alternative 5 carries the greatest risk to sensitive species dependent on older forests since at least 9 miles of proposed additions have not received current botanical surveys. Alternative 3 carries the least risk.

3. Cumulative effects including reasonably foreseeable

Indicator(s) used to measure effects: Past/present/reasonably foreseeable future actions that could potentially impact older forest plant communities and the sensitive species dependent on them as well as the benefits from prohibiting public motorized use on unauthorized routes and closed NFTS roads are discussed. It is assumed that all of the action alternatives avoid long term cumulative impacts by implementing frequent evaluation of routes, implementing mitigations to reduce impacts to sensitive species, and conducting annual weed detection surveys with rapid treatment of weeds. This route evaluation combined with rapid mitigation of resource damage avoids significant impacts to older forest plant communities and the sensitive species dependent on them in the short and long term.

Past: Many acres of older forest plant communities in the Sierra Nevada have been directly removed or have had their functions impaired. In the Sierra Nevada, late-successional older forests of middle elevations (westside mixed conifer, red fir, white fir, eastside mixed conifer, and eastside pine types) at present constitute 7 to 30 percent of the Forest cover, depending on forest type (Sierra Nevada Ecosystem Project 1996). It is reasonable to expect that the native plant species dependent on older forest plant communities have also experienced a decline in range and population viability since pre-settlement times. For example, sensitive fungi are dependent on specific vegetation (hosts) and certain amounts of leaf litter/duff. These habitat components for fungi have been historically reduced and/or eliminated through the removal of vegetation and alteration of older forest plant communities. The amount of reduction is unknown. In addition, the underground mycelial network has been broken through the creation of openings such as clearcuts and roads. Therefore, it is reasonable to expect that past management activities have cumulatively reduced the amount of older forest within TNF watersheds that would be suitable habitat for: *Cudonia monticola, Cypripedium fasciculatum, Cypripedium montanum, Dendrocollybia racemosa,* and *Phaeocollybia olivacea*. As stated above, the amount of reduction is unknown.

Current: In this analysis, older forest is described as occurring in the red fir/upper montane forest and mixed-conifer forest. Other vegetation types exist that also have older trees, but mixed conifer and red fir are the primary types of older forest analyzed in this document. For more information about old forests, refer to the SNFPA (2001).

As mentioned previously, there are about 285,728 acres of older forest on TNF system lands, of which 29,900 acres or about 11 percent are currently, impacted by system and unauthorized, motorized vehicle roads/trails/areas (routes). This acreage number was obtained using about 100 feet on either side

of system and unauthorized motorized vehicle routes and closed NFTS roads still receiving some motorized use that pass through vegetation mapped as CWHR 4 and above on NFS lands. The significance of this percentage is unknown. Refer to the wildlife biological evaluation located in the project record for a discussion of cumulative effects to older forest dependent animal species. Current impacts (that contribute to cumulative effects primarily from use of system routes) to known occurrences of the older forest dependent sensitive plant species – *Cypripedium fasciculatum* are discussed below.

There are 5 occurrences of *Cypripedium fasciculatum* on TNF system lands. One of the 5 known occurrences contains only 3 plants (Lafayette Ridge occurrence) and is not impacted directly /indirectly by motorized vehicle use. The remaining four occurrences are indirectly impacted by motorized vehicle use of the NFTS. There are *Cypripedium fasciculatum* occurrences located within 100 feet of the 25-28 road (50 plants directly above the road), the Rock Creek road (less than 30 plants some located directly adjacent to the road), the Madrone Springs road (about 20 plants located on the road cut bank), and the largest occurrence (about 350 plants) located at the end of a road near Old Condon Mill. (Note that the 25-28 road is analyzed for decommissioning in the Canyon Project – FY 2008.) Indirect impacts include dust and increased risk of weed introduction and spread. These indirect impacts are not considered significant at this time. However, illegal road maintenance and poaching have killed some plants. It is unknown whether these illegal activities would continue. However, the existence of the system roads in these locations adds to the cumulative effects to these plants.

Special uses projects such as utility corridor construction and maintenance, mining operations, and livestock grazing are all ongoing projects that are not known to impact occurrences of *Cypripedium fasciculatum*.

Reasonably foreseeable: Over the long term, with continued disturbance, older forest plant communities would continue to be fragmented through implementation of reasonably foreseeable management actions. In general terms, motorized vehicle use of system routes creates linear disturbances. As mentioned previously, there are 1,258 miles of NFTS, state, county, and private routes in older forests on Forest lands. The impacts of linear disturbances within older forest plant communities are not fully studied. The fuel reduction/timber harvest activities identified in Appendix H (Reasonably Foreseeable Projects and Cumulative Effects) impact older forests but must retain some older forest characteristics due to SNFPA direction for maintenance of specific canopies and retention of larger trees. The effects of fuel reduction/timber harvest on mycorrhizal interactions are not fully understood. The other types of reasonably foreseeable projects (other than fuel reduction/timber harvest) listed in Appendix H are expected to have little impact on older forest plant communities.

No action: Implementation of Alternative 1 cumulatively impacts older forest plant communities. Older forests are not considered sparsely vegetated and the ability to drive across the terrain is somewhat limited. However, surveys to date have shown that motorcycles are not limited in their ability to drive cross country through older forest plant communities. Refer to the project files and the survey records of specific routes. In addition, some older forests lack a middle story which makes them more accessible to motorized vehicles.

When the impacts of all past, current and reasonably foreseeable management actions are added to the possible impacts of cross country travel, use of unauthorized and system routes, there is the potential to significantly impact older forests and the sensitive species dependent on them over the long term (5 years plus). One of the biggest impacts of disturbance of any kind is the introduction and spread of weeds. Refer to the weed risk assessment located in the project record for more discussion of how weeds are introduced and spread within older forest plant communities.

Given the above information, the determination is that implementation of Alternative 1 could impact *Cudonia monticola, Cypripedium fasciculatum, Cypripedium montanum, Dendrocollybia racemosa,* and *Phaeocollybia olivacea*. Impacts to the sensitive fungi: *Cudonia monticola, Dendrocollybia racemosa,* and *Phaeocollybia olivacea* would not contribute to a trend for federal listing because the ESA does not apply to fungi. Impacts to *Cypripedium fasciculatum* and *Cypripedium montanum* could contribute to a trend toward federal listing over the long term primarily due to cross country travel.

Action alternatives: Compared to Alternative 1, all action alternatives would reduce the number of miles of unauthorized routes and closed NFTS roads designated as open for motorized vehicles in older forest plant communities. However, implementation of the action alternatives could cumulatively impact sensitive species dependent on older forest plant communities.

Past management activities have cumulatively reduced the amount of older forest plant communities within TNF watersheds. Current impacts including the use of system routes, add to those cumulative impacts. Some proposed additions to the NFTS and some ML 1 roads proposed for reopening do not have current surveys and may have sensitive species present within or along them. Impacts from motorized use of these routes may be adding to the cumulative impacts to older forests. Some of the reasonably foreseeable actions listed in Appendix H (Reasonably Foreseeable Projects and Cumulative Effects) are located within older forest plant communities and/or would reduce the amount of large down wood/canopy closure/litter and duff - changing older forest characteristics for some older forest dependent sensitive species.

As mentioned previously, older forest plant communities in the Sierra Nevada have been directly removed or have had their functions impaired. Given the past history of the Sierra Nevada, it is reasonable to expect that the plant and fungi species dependent on older forest conditions have experienced a significant decline in range and population viability since pre-settlement times (although this assumption is unproven).

Alternative 5: Implementation of Alternative 5 cumulatively impacts older forest plant communities and the sensitive species dependent on them. Alternative 5 proposes the most miles of additions to the NFTS and the reopening of the most miles of ML 1 roads of all of the action alternatives. Alternative 5 also prohibits public motorized use of the fewest miles of route located within older forests. Therefore implementation of Alternative 5 has the greatest risk of negatively impacting older forest plant communities and the sensitive species dependent on them. The significance of possible impacts is dependent on many factors including the sensitive species and the amount of impact. However, as stated previously, it is assumed that all of the action alternatives avoid significant long term cumulative impacts by implementing frequent evaluation of routes, implementing mitigations to reduce impacts to

sensitive/watchlist species, and conducting weed detection surveys with rapid treatment of weeds. This route evaluation combined with rapid mitigation of resource damage avoids significant impacts to older forest plant communities and the sensitive/watchlist species dependent on them in the short and long term.

Alternatives 2 and 6: Implementation of Alternatives 2 and 6 could add to the cumulative impacts to older forest plant communities and the sensitive species dependent on them primarily through dust and increased risk of weed introduction and spread. These additional cumulative impacts are not considered significant even when added to past, current, and reasonably foreseeable future management actions. The risk of negative impacts due to implementation of Alternatives 2 and 6 is less than under implementation of Alternatives 1 and 5.

Alternatives 4 and 7: Implementation of Alternatives 4 and 7 could add to the cumulative impacts to older forest plant communities and the sensitive species dependent on them primarily through dust and increased risk of weed introduction and spread. Those impacts are not considered significant even when added to past, current, and reasonably foreseeable future management actions. The risk of negative impacts due to implementation of Alternatives 4 and 7 is less than under implementation of Alternatives 1 due to the prohibition of cross country travel and Alternatives 5, 2, and 6 because they propose fewer miles of addition to the NFTS and reopen fewer ML 1 roads.

Alternative 3: Implementation of Alternative 3 could cumulatively add to the cumulative impacts to older forest plant communities and the sensitive species dependent on them primarily through use of system routes. However, implementation of Alternative 3 has the least number of miles of motorized vehicle road/trail/area available for public use within older forest plant communities and has the least risk of cumulative impacts to sensitive species that require older forest plant communities of all of the action alternatives. Alternative 3 does not propose additions to the NFTS and does not reopen ML 1 roads.

Given the above information, it is my determination that implementation of the action alternatives could impact *Cudonia monticola, Cypripedium fasciculatum, Cypripedium montanum, Dendrocollybia racemosa,* and *Phaeocollybia olivacea*. Impacts to the sensitive fungi (*Cudonia monticola, Dendrocollybia racemosa,* and *Phaeocollybia olivacea*) would not contribute to a trend for federal listing because the ESA does not apply to fungi. Impacts to *Cypripedium fasciculatum* and *Cypripedium montanum* would not contribute to a trend toward federal listing due to the assumptions that frequent route evaluation would occur along with implementation of mitigations to reduce impacts to sensitive/watchlist species, and weed detection surveys with rapid treatment of weeds.

Oak Woodland Plant Communities

1. Prohibition of cross country travel

Indicator(s) used to measure effects:

- Acres where cross country travel is prohibited thereby reducing the mileage of route available for motorized use within oak woodlands.

No Action: Implementation of Alternative 1 could directly, indirectly, and cumulatively impact oak woodland plant communities and the sensitive/watchlist species that may occur within them. Alternative 1

does not prohibit cross country travel and as yet undiscovered sensitive/watchlist species would be at risk as new routes were created. It is expected that cross country use would damage at least some sensitive/watchlist species (if they are present on Tahoe NFS lands) and it is reasonable to expect that some occurrences would be lost. Oak woodland plant communities are considered fairly open terrain.

There are about 13,886 acres of oak woodland on TNF system lands, with about 75 miles of NFTS and 23 miles of unauthorized routes and closed NFTS roads still receiving some motorized use located within them. Alternative 1 closes one mile of unauthorized route within oak woodlands by existing Forest Order.

Direct impacts to sensitive/watchlist species from implementation of Alternative 1 could be significant at least at the local, site specific level. Cross country use could kill and/or injure sensitive/watchlist species and other vegetation by running over them or by indirect soil/water changes and the introduction and spread of weeds. The significance of direct and indirect impacts is dependent on many factors including the amount of disturbance, the sensitive/watchlist species being impacted, and in some cases, the season when the disturbance takes place. Currently there are no sensitive/watchlist species on the TNF list that are oak woodland plant community dependent. However, several of the sensitive/watchlist species on the TNF list could grow in oak woodlands.

Severe cross country impacts within oak woodland plant communities containing sensitive/watchlist species would be considered significant. It is impossible to know when or where cross country motorized vehicle use would occur, so these disturbances are difficult to quantify. Since Alternative 1 allows cross county travel, the risk of significant impacts to sensitive/watchlist species that may occur within potential habitats lacking current surveys is higher than in the action alternatives. Reducing and/or eliminating impacts to sensitive/watchlist species are considered effective methods of reducing cumulative impacts to them. However, flag and avoid is not a practical mitigation when cross country travel/unrestricted motorized vehicle use is allowed.

Action alternatives: None of the action alternatives allow cross country travel. Therefore, direct impacts to sensitive/watchlist species within oak woodland plant communities from cross country travel would not occur. In addition, all of the action alternatives prohibit public motorized vehicle use of the about 23 miles of unauthorized routes and closed NFTS roads still receiving some motorized use located within oak woodland plant communities.

2. Additions to the NFTS and Reopening ML 1 Roads

Indicator(s) used to measure effects:

- Miles of proposed additions to the NFTS system located within oak woodland plant communities.

No Action: Alternative 1 does not propose additions to the NFTS. However, implementation of Alternative 1 could impact sensitive/watchlist species directly, indirectly, and cumulatively by continuing motorized vehicle use of 23 miles of route located within oak woodland plant communities. Refer to Table 3.06-10. Motorized vehicle use of about 75 miles of NFTS, state, county, and private routes located within these plant communities also adds to cumulative impacts. Direct/indirect impacts could be

significant dependent on many factors such as the species type, amount of disturbance, etc. Surveys to date have not detected any sensitive/watchlist species or new weed occurrences within oak woodlands.

Table 3.06-10. Miles* of road/trail/area within oak woodland plant communities by alternative

Action type		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
1. Cross country travel (miles located within oak woodland plant communities)		23	0	0	0	0	0	0
(acres located within oak woodland plant communities)		13,886						
2. Additions to the NFTS	**Miles added within oak woodlands**	N/A	0	0	0	0	0	0
3. Establishment of Motorized "Open Areas" (acres)		N/A	0	0	0	0	0	0
4. Changes to the NFTS	**a. Change in Class of Vehicles resulting from approval of mixed use**	No Effect						
	b. Change in Class of Vehicles resulting from changes in maintenance levels	No Effect						
	c. Change in Season of Use	No Effect						
	d. Reopening Maintenance Level 1 Roads	0	0	0	0	1	0	0
5. Amendments to the Forest Plan		No Effect						
	Total Miles	**98**	**75**	**75**	**75**	**76**	**75**	**75**
	Total Acres	**13,886**	**0**	**0**	**0**	**0**	**0**	**0**

*****Miles are approximate. The total mileage includes NFTS, State, County, and private roads. Alternative 1 total mileage also includes unauthorized routes and closed NFTS roads still receiving some motorized use.

Action alternatives: Compared to Alternative 1, all action alternatives would reduce the number of miles open for motorized vehicles in oak woodland plant communities. Of the action alternatives, implementation of Alternative 5 proposes the reopening of about 1 mile of ML 1 road. Therefore, of the action alternatives, implementation of Alternative 5 has the greatest risk of negative impacts to sensitive/watchlist species that may occur within oak woodland plant communities. ML 1 roads lack current botanical surveys. Sensitive/watchlist species and/or plant communities could occur within/adjacent to them and could be experiencing negative impacts from motorized vehicle use. Alternatives 2, 3, 4, 6, and 7 do not propose adding any miles to the NFTS and do not propose reopening any ML 1 roads.

3. Cumulative effects including reasonably foreseeable

Indicator(s) used to measure effects: Past/present/reasonably foreseeable future actions that could potentially impact oak woodland plant communities and the sensitive/watchlist species and/or watchlist plant communities that may occur within them, as well as the benefits from prohibiting public motorized vehicle use of unauthorized routes and closed NFTS roads are discussed.

Past: As identified previously, California's oak woodlands have experienced extensive historic disturbance. No other ecosystem in the Sierra Nevada has experienced more human influence over a longer time period than the oak woodlands (Anderson in SNFPA 2001). The amount of oak woodland plant communities and their health has been reduced across the State.

Current: Motorized vehicles impact TNF oak woodlands by: introducing and spreading weeds, damaging native vegetation, increasing soil erosion, and fragmenting habitats. Refer to Table 3.06-10 for the number of miles of motorized vehicle road/trail/area proposed within oak woodlands by alternative. Other ongoing projects on the Forest that impact oak woodlands include: special uses projects such as utility corridor construction and maintenance that pass through and impact oak woodlands; minerals operations that remove native vegetation and recontour the landscape; and livestock grazing projects. The TNF does not have any sensitive/watchlist species that are entirely dependent on oak woodlands. However, several sensitive plant species are known to occur in oak woodlands including *Clarkia biloba* ssp. *Brandegeae*.

Reasonably foreseeable: When the past and current impacts are added to the impacts of the reasonably foreseeable future actions identified in Appendix H (Reasonably Foreseeable Projects and Cumulative Effects), risks to oak woodlands increase. Some of the reasonably foreseeable projects identified in Appendix H would benefit oaks even though they are not located in oak woodlands because some oak tree species occur within mixed conifer plant communities. Some of the fuel reduction/timber harvest activities identified in Appendix H retain oaks and remove conifers from around the larger oak trees so they receive more light and nutrients – for example the Canyon Forest Health project. The biggest negative impact of disturbance of any kind within oak woodlands is the increased risk of introduction and spread of weeds.

No action: Implementation of Alternative 1 allows cross country use within TNF oak woodland plant communities and carries the greatest risk of negative impacts to those plant communities. Oak woodlands have a high risk that weeds would be introduced and become established due to the lower elevations of these plant communities. Cross country travel could introduce and spread weeds. Refer to the weed risk assessment (located in the project record) for the effects of weed infestation. In summary, weeds can displace sensitive/watchlist species and other native vegetation if the weeds become established and spread. Weed introduction and spread within sensitive/watchlist species occurrences is considered a significant long term impact. Therefore, when the impacts of all past, current and reasonably foreseeable management actions are added together, the possible impacts of cross country travel and motorized use of unauthorized routes and closed NFTS roads within oak woodlands has the potential to significantly impact sensitive/watchlist species over the long term (5 years plus).

Action alternatives: Compared to Alternative 1, all action alternatives would reduce the number of miles open for motorized vehicle use in oak woodlands. Implementation of the action alternatives reduces cumulative impacts to sensitive/watchlist species and/or native vegetation located within oak woodlands. The significance of these impacts is unknown. It is assumed that all of the action alternatives avoid long term cumulative impacts by implementing: frequent evaluation of routes, mitigations designed to reduce impacts to sensitive/watchlist species, and conducting frequent weed detection/treatment activities.

Implementation of these activities along with rapid mitigation of resource damage avoids significant impacts to oak woodlands plant communities and sensitive/watchlist species in the short and long term.

Alternative 5: Compared to Alternative 1, implementation of Alternative 5 has less risk of negative impacts to sensitive/watchlist species within oak woodlands. Conversely, implementation of Alternative 5 carries the highest risk of negative impacts to oak woodland plant communities of the action alternatives since it proposes to reopen one mile of ML 1 road. Compared to Alternative 1, Alternative 5 reduces cumulative impacts to oak woodland plant communities by prohibiting cross country travel.

Alternatives 2, 3, 4, 6, and 7: These action alternatives do not propose additions to the NFTS and do not reopen ML 1 roads in oak woodland plant communities. Therefore, implementation of these alternatives carries less risk of weed introduction and spread than Alternatives 1 and 5, and reduces cumulative impacts to oak woodland plant communities when compared to Alternatives 1 and 5.

Forest edges and openings

1. Prohibition of cross country travel

Indicator(s) used to measure effects:

- Acres where cross country travel is prohibited thereby reducing the mileage of route available for motorized use within forest edges/openings. (Note: there is overlap between these plant communities and aquatic/riparian, serpentine, older forest, oak woodland and high elevation rocky opening plant communities. Therefore the number of miles of unauthorized routes and closed NFTS roads still receiving some motorized use present in forest edge and openings plant communities contains some of the miles of same routes shown in other plant communities and the totals from all plant communities do not add up to the total of about 1,698 miles.)

No Action: Implementation of Alternative 1 could directly, indirectly, and cumulatively impact the sensitive/watchlist species dependent on forest edges and openings. Over the long term (5 years plus) those impacts could be significant. Alternative 1 does not prohibit cross country travel and plant communities located within forest edges and openings are accessible to motorized vehicles. Under implementation of Alternative 1 known and as yet undiscovered sensitive/watchlist species would be at risk of negative impacts. It is expected that long term cross country use would injure/kill some sensitive/watchlist species and it is reasonable to expect that some occurrences would be lost.

There are about 630,667 acres of forest edge/openings on Tahoe NFS lands, with about 3,489 miles of NFTS, state, county, and private routes and 1,148 miles of unauthorized routes and closed NFTS roads still receiving some motorized use located within them.

Direct impacts to sensitive/watchlist species from cross country use could be significant at least at the local, site specific level. The significance of direct/indirect impacts is dependent on many factors including the amount of disturbance, the sensitive/watchlist 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/watchlist species that occur in a specific location and how many of them are damaged. Occurrences of *Clarkia biloba* ssp. *Brandegeae, Fritillaria eastwoodiae, Lewisia kelloggii* ssp.

hutchisonii, *Lilium humboldtii* ssp. *humboldtii*, *Lupinus dalesiae*, and *Phacelia stebbinsii* are known to be impacted by use of system routes. Refer to the occurrence records located in the TNF files.

Severe cross country impacts within forest edge/openings containing sensitive/watchlist species would be considered significant. It is impossible to know when or where cross country motorized vehicle use would occur, so these disturbances are difficult to quantify. Since Alternative 1 allows cross county travel, the risk of significant impacts to sensitive/watchlist species is higher than in the action alternatives. Reducing and/or eliminating impacts to sensitive/watchlist species through flag and avoid methods is not a practical mitigation when cross country travel is allowed. Allowing unrestricted motorized vehicle use across the forest greatly increases the risk of negative impacts to sensitive/watchlist species.

Action alternatives: Compared to Alternative 1, all action alternatives would reduce the number of miles open for motorized vehicles. None of the action alternatives allow cross country travel. Therefore, direct/indirect impacts to sensitive/watchlist species within forest edges/openings from cross country travel would not occur. Refer to Table 3.06-11. Alternative 5 prohibits motorized public use on about 1,098 miles of the 1,148 miles of unauthorized routes and closed NFTS roads still receiving some motorized use or about 96 percent of them. Alternatives 2 and 6 prohibit motorized public use on about 1,116 and 1,112 miles respectively or about 97 percent of them. Alternatives 4 and 7 prohibit motorized public use on 1,134 and 1,130 miles or about 99 and 98 percent of them. Alternative 3 prohibits motorized public use on all 1,148 miles of unauthorized routes and closed NFTS roads still receiving some motorized use located within forest edges/openings.

Table 3.06-11. Miles of road/trail/area within forest edge/opening plant communities* by alternative

Action type		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
1. Cross country travel (miles) (acres)		1,148 630,667	0	0	0	0	0	0
2. Additions to the NFTS	**Miles added within forest edge/opening plant communities**	N/A	32	0	14	50	36	18
3. Establishment of Motorized "Open Areas" (acres)		N/A	0	0	0	0	0	0
4. Changes to the NFTS	**a. Change in Class of Vehicles resulting from approval of mixed use**	No Effect						
	b. Change in Class of Vehicles resulting from changes in maintenance levels	No Effect						
	c. Change in Season of Use	No Effect						
	d. Reopening Maintenance Level 1 Roads	0	0	0	0	72	9	1
5. Amendments to the Forest Plan		No Effect						
	Total Miles **Total Acres**	**4,637** **630,667**	**3,521** **0**	**3,489** **0**	**3,503** **0**	**3,611** **0**	**3,534** **0**	**3,508** **0**

*Forest edge/opening plant communities are those that are not considered older forest, oak woodland, aquatic/riparian, high elevation opening/rocky area, and serpentine. Miles represent routes that pass within 100 feet of forested plant communities. Miles are approximate. The total mileage includes NFTS, State, County, and private roads. Alternative 1 total mileage also includes unauthorized routes and closed NFTS roads still receiving some motorized use.

2. Additions to the NFTS and Reopening ML 1 Roads

Indicator(s) used to measure effects:

- Miles proposed for addition to the NFTS located within forest edges/openings.

No Action: Alternative 1 does not add routes to the NFTS but it does not prohibit public motorized vehicle use of 1,148 miles of unauthorized routes and closed NFTS roads still receiving some motorized use. Implementation of Alternative 1 could impact sensitive/watchlist species directly/indirectly by continuing use of those unauthorized routes and closed NFTS roads. Implementation of Alternative 1 could also directly/indirectly impact sensitive/watchlist species through use of about 3,489 miles of NFTS located within these plant communities. Refer to the discussion under effects of cross country use under the No Action Alternative above. Direct/indirect impacts could be significant at least at the site specific, local level.

Action alternatives: Compared to Alternative 1, all action alternatives would reduce the number of miles open for motorized vehicles in forest edges/openings. No sensitive/watchlist species and/or new weed occurrences were found in forest edges/openings during surveys for this project. However, ML 1 and temporary roads do not have current botanical surveys. Therefore, it is possible that sensitive/ watchlist species exist within/along them and they are being impacted.

Refer to Table 3.06-11 which shows the miles of proposed additions to the NFTS and miles of ML 1 roads proposed to be reopened within these plant communities by alternative. Alternative 5 proposes the addition of 50 miles to the NFTS. Alternatives 2 and 6 add 32 and 36 miles respectively. The risk of negative impacts to sensitive/watchlist species from implementing Alternatives 2 and 6 is less than Alternative 5. Alternatives 4 and 7 add 14 and 18 miles respectively. Therefore, the risk of negative impacts to sensitive/watchlist species from implementing Alternatives 4 and 7 is less than Alternatives 5, 2 and 6. Alternative 3 does not propose additions to the NFTS within forest edges/openings. Therefore, implementation of Alternative 3 has the least risk of negatively impacting sensitive/watchlist species through motorized vehicle use.

3. Cumulative effects including reasonably foreseeable

Indicator(s) used to measure effects: Past/present/reasonably foreseeable future actions that could potentially impact forest edges/openings and the sensitive/watchlist species that may occur within them, as well as the benefits from prohibiting public motorized vehicle use of unauthorized routes and closed NFTS roads are discussed.

Past: Plants that are dependent on openings and edges within forested plant communities are not considered habitat specific and the plant communities/habitats are not considered limited. Management activities have occurred on TNF system and privately owned lands for over a century. This long history of disturbance has contributed to the lack of an undisturbed reference for most plant species. Therefore, it is not possible to quantify how these past management activities have impacted sensitive plants/fungi and watchlist plants/plant communities. In addition, as previously mentioned past management has created conditions on the landscape that frequently contribute to cross country travel through the creation of skid trails and temporary roads. In a number of areas motorized vehicle users have removed the barriers

blocking the temporary road and/or have gone around the barriers. Past management activities have cumulatively added to the amount of forest edge/opening habitats but it is unknown if the edge and opening habitats created were suitable for: *Androsace occidentalis* var. *simplex*, *Clarkia biloba* ssp. *Brandegeae*, *Erigeron petrophyllus* var. *sierrensis*, *Fritillaria eastwoodiae*, *Lewisia kelloggii* ssp. *hutchisonii*, *Lilium humboldtii* ssp. *humboldtii*, *Lupinus dalesiae*, and *Phacelia stebbinsii*.

Current: Openings and forest edges are constantly being created naturally as trees and other vegetation dies, and lost when shrubs and other vegetation grow into them. In addition, forest edge/ opening plant communities located along roads/trails/areas and other highly disturbed areas such as landings have frequently become invaded by weeds. Most of the known weed occurrences on the TNF are located along or within roads/trails and landings.

The TNF is considered well roaded. Motorized vehicle use of roads is known to increase the risk of weed introduction and spread into new areas, reduce native plant cover, increase erosion, reduce photosynthetic ability of native plants by covering vegetation with dust, change water flow patterns across the landscape, and compact soil. Refer to the Sensitive Plant and Fungus Biological Evaluation and the Noxious Weed Risk Assessment located in the project record. Examples of current impacts to known occurrences of sensitive/watchlist species are provided below to show how current cross country travel by motorized vehicles adds to cumulative impacts.

Example 1: The TNF has limited numbers of the sensitive plant *Lewisia kelloggii* var. *hutchisonii* and limited amounts of suitable habitat. Several occurrences are currently being directly/indirectly impacted by cross country motorized vehicle use and use of NFTS routes. Other occurrences are currently being impacted by fuel reduction/timber harvest projects – for example in the American River Wildfire Complex. The habitat where this plant grows frequently appears barren since this plant completes its life cycle in a period of weeks. Over the long term (over 5 years), continued and increased cross country motorized vehicle use within these occurrences would eventually kill plants through soil compaction, changes in hydrology, and/or direct impacts such as running over them. An example of where these negative impacts are occurring is within the occurrence located along and within road 302-15.

Example 2: Most of the known occurrences of *Clarkia biloba* ssp. *Brandegeae* on the TNF are growing next to roads where occurrences are currently being run-over by cross country motorized vehicles. In addition, in some areas, invasive exotic weeds have been introduced into these plant communities by motorized vehicles causing a degradation of the habitat for these sensitive plants. For example, the *Clarkia biloba* ssp. *Brandegeae* occurrence located near Mosquito Ridge road is infested with yellow star thistle due in part to people pulling off the road and introducing these weed seeds into new areas. Competition from the yellow star thistle for water and nutrients may eventually kill the *Clarkia biloba* ssp. *Brandegeae* occurrence. Current impacts include reduction of vigor and lack of reproduction of this annual plant, compaction and/or degradation of the soil within the occurrence, and/or changes to water movement where they are growing.

Example 3: Several species are known to be negatively impacted by road maintenance and/or weed infestation. *Lilium humboldtii* ssp. *humboldtii* is currently being impacted by use of NFTS and other roads. Impacts to known occurrences include introduction and spread of weeds and loss of the plants

through road maintenance. Since this is a spring flowering bulb species, impacts from dust are not considered significant. Examples of where weeds are competing with this plant can be found along Highway 49 near Coyote Street where Scotch broom has moved into the area where this lily is growing and crowding out the lilies. Examples of where road maintenance has eliminated these lilies occurred along Highway 174 near Bear River (personal observation). *Lupinus dalesiae* occurrences are being directly/indirectly impacted by maintenance of system roads in several locations for example along the Gold Lakes Road.

Example 4: *Phacelia stebbinsii* plants are being directly/indirectly impacted by motorized vehicle use on system and user created trails in the Pierce OHV area. Cross country travel has created wheel tracks that have been blocked off to protect these sensitive plants and wetlands, but users continue to go around the barricades. Plants have been crushed and killed prior to setting seed which has reduced reproduction for this annual plant.

Reasonably foreseeable: Forest edge/opening habitats are cumulatively impacted when past and current impacts are added to the reasonably foreseeable future actions identified in Appendix H (Reasonably Foreseeable Projects and Cumulative Effects). The lower elevation forest edge/opening habitats located along system roads/trails/areas have frequently received weed seed from motorized vehicle use. All of the projects identified in Appendix H would disturb existing forest edge/openings and/or create new ones. Most of the ground disturbing projects identified in Appendix H have had botanical surveys to identify presence or absence of sensitive/watchlist species. Where sensitive/watchlist species were found, mitigations were implemented to reduce and/or eliminate impacts to them.

No action: Implementation of Alternative 1 allows cross country use within NFS forest edge/opening habitats and carries the greatest risk of negative impacts to those habitats. Cross country use could directly/indirectly impact *Astragalus webberi, Calochortus clavatus* var. *avius, Clarkia biloba* ssp. *brandegeae, Fritillaria eastwoodiae, Lewisia kelloggii* ssp. *hutchisonii, Lewisia kelloggii* ssp. *kelloggii, Lupinus dalesiae, Penstemon personatus*, and *Phacelia stebbinsii* (if they occur within the area of cross county use). Predicting where cross country motorized vehicle use would occur is not possible. It is likely that this cross country travel would damage and/or kill sensitive/watchlist species. In addition, impacts to known occurrences would occur. Impacts could be significant dependent on such factors as the sensitive/watchlist species being impacted, the number of individuals being impacted, and the severity of the disturbance. For example, direct impacts to an annual plant (such as *Phacelia stebbinsii*) that has already gone to seed would not be as adverse (as long as significant habitat alteration has not occurred) as direct impacts to an annual plant that has not set seed. If motorized vehicle use impacted a sensitive/ watchlist species to the point that it might not remain viable in an area and the loss of that species in that particular area would substantially influence the extinction risk of the entire species, the motorized vehicle use would have significant impacts to that species (Waples et al. 2007). As noted above, it is impossible to know when or where cross country motorized vehicle use would occur but since it would not be restricted in the No Action Alternative, the risk of negative impacts is higher. Since (in general terms) no restrictions would be in place to limit where motorized vehicle use could occur, all sensitive/watchlist species that can be accessed by motorized vehicles would be at increased risk.

Cumulative impacts could be significant. Over the long term, cross country motorized vehicle use could kill significant numbers of sensitive/watchlist species and the occurrences could be lost. In addition, introduction of weeds could eventually eliminate the occurrences.

Given the above information, implementation of Alternative 1 could impact *Astragalus webberi, Calochortus clavatus* var. *avius, Clarkia biloba* ssp. *brandegeae, Fritillaria eastwoodiae, Lewisia kelloggii* ssp. *hutchisonii, Lewisia kelloggii* ssp. *kelloggii, Lupinus dalesiae, Penstemon personatus,* and *Phacelia stebbinsii* and those impacts could contribute to a trend for federal listing as threatened or endangered. Implementation of Alternative 1 could also impact the watchlist plants, *Erigeron petrophyllus* var. *sierrensis,* and *Lilium humboldtii* ssp. *humboldtii.* Impacts to watchlist plants are not considered significant unless entire occurrences are lost. Over the long term, cross country travel within the only known occurrence of *Erigeron petrophyllus* var. *sierrensis* on the TNF could cause the loss of the entire occurrence.

Action alternatives: As identified previously, it is assumed that all of the action alternatives avoid long term cumulative impacts by implementing frequent evaluation of routes, implementing mitigations to reduce impacts to sensitive/watchlist species, and rapid detection/treatment of weeds. This route evaluation combined with rapid mitigation of resource damage avoids significant impacts to forest edges/openings and sensitive/watchlist species in the short and long term.

Surveys of proposed additions to the NFTS identified an occurrence of *Erigeron petrophyllus* var. *sierrensis* growing in a serpentine plant community along and within YRN-7. Refer to that section for a discussion of impacts to this watchlist plant. No other sensitive/watchlist species were found in surveyed forest edge/rocky opening plant communities. However, temporary and ML 1 roads do not have current surveys. In addition, many of the dispersed camping access routes also lack current surveys. Since forest edge/opening plant communities have a high likelihood of having been disturbed in the more recent past, there is a high risk of weeds being present in those areas lacking current surveys. The list of proposed additions that pass through forest edges/openings is located within the project record since it is a long list (9 pages long). However, Table 3.06-11 displays the number of miles of proposed additions and the miles of ML 1 roads proposed for reopening within forest edge/opening plant communities by alternative.

Alternative 5: Of the action alternatives, implementation of Alternative 5 has the highest risk of indirect/cumulative impacts to sensitive/watchlist plants that may be growing in forest edge/opening plant communities. However, implementation of Alternative 5 has less risk of indirect/cumulative impacts to sensitive/watchlist species growing in forest edges/openings than Alternative 1 because it does not allow cross country travel. Alternative 5 proposes the addition of 50 miles to the NFTS, and reopening about 72 miles of ML 1 roads. If sensitive/watchlist species occur within 100 feet of ML 1 or temporary roads proposed in Alternative 5 they would continue to be impacted until they are detected during routine maintenance checks. The significance of these impacts to sensitive/watchlist species would vary dependent on such factors as the type of species, amount of disturbance, and location of the sensitive/ watchlist species. Impacts are not considered significant over the short term (5 years or less). Over the long term, the risk of weeds being introduced and/or spreading from undetected weed occurrences is high. However, it is assumed that routine evaluation of routes would occur by personnel who can identify weed

species while the infestation is small in size and easily treated. Current impacts from cross country travel would not occur – it is assumed that users would stay on designated routes. When impacts from reasonably foreseeable projects are added to implementation of Alternative 5, the risk to sensitive/ watchlist species is high primarily from weed introduction and spread.

Alternatives 2 and 6: Implementation of Alternatives 2 and 6 could cumulatively impact sensitive/ watchlist species dependent on forest edge/opening habitats but those impacts are not considered significant for the reasons given under Alternative 5. Alternatives 2 and 6 propose the addition of 32 and 36 miles of route (respectively) which is less than the 50 miles proposed under Alternative 5. Alternative 2 does not propose to reopen ML 1 roads and Alternative 6 would reopen about 9 miles of ML 1 road which is less miles of road than the 72 miles proposed under Alternative 5. The risk of negative impacts to sensitive/watchlist species from implementing Alternative 6 is higher than in Alternative 2 but less than Alternative 5. As in Alternative 5, it is assumed that current impacts from cross country travel would not occur because users would stay on designated routes. However, when impacts from reasonably foreseeable projects are added to implementation of Alternatives 2 and 6, the risk to sensitive/watchlist species is high primarily from weed introduction and spread.

Alternatives 4 and 7: Implementation of Alternatives 4 and 7 adds to the cumulative impacts to sensitive/watchlist species in forest edges/openings. Alternatives 4 and 7 add 14 and 18 miles respectively. Alternative 4 does not propose to reopen any ML 1 roads and Alternative 7 proposes to open less than about 1 mile of ML 1 road. Current impacts from cross country travel are not expected. When the impacts from reasonably foreseeable projects are added to implementation of Alternatives 4 and 7, the risk to sensitive/watchlist species is lower than in Alternatives 5, 2 and 6.

Alternative 3: Implementation of Alternative 3 adds to the cumulative impacts of forest edge/opening plant communities and the sensitive/watchlist species growing in them, from the use of the NFTS. Alternative 3 does not propose any additions to the NFTS, does not propose reopening any ML 1 roads, and does not allow cross country use. Implementation of Alternative 3 would prohibit public motorized vehicle use on all 1,148 miles of unauthorized routes and closed NFTS roads still receiving some motorized use. Alternative 3 has the lowest risk of weed introduction and spread which is a benefit for all sensitive/watchlist species.

Given all of the above information, implementation of the action alternatives could impact *Astragalus webberi, Calochortus clavatus* var. *avius, Clarkia biloba* ssp. *brandegeae, Fritillaria eastwoodiae, Lewisia kelloggii* ssp. *hutchisonii, Lewisia kelloggii* ssp. *kelloggii, Lupinus dalesiae, Penstemon personatus*, and *Phacelia stebbinsii,* but would not contribute to a trend for federally listing them as threatened or endangered. Implementation of the action alternatives could also impact the watchlist plants, *Lilium humboldtii* ssp. *humboldtii* and *Erigeron petrophyllus* var. *sierrensis* but those impacts are not expected to cause the loss of entire occurrences.

High elevation openings and rocky areas

1. Prohibition of cross country travel

Indicator(s) used to measure effects:

- Acres where cross country travel is prohibited (thereby reducing the mileage of routes available for motorized use) within high elevation openings/rocky areas.

No Action: Implementation of Alternative 1 would directly, indirectly, and cumulatively impact the sensitive/watchlist species dependent on high elevation openings and rocky areas. Over the long term (5 years plus) those impacts could be significant. Alternative 1 does not prohibit cross country travel on about 43,240 acres of high elevation openings and rocky areas (high elevation openings and rocky areas are generally considered accessible to motorized vehicles). Under implementation of Alternative 1 known and as yet undiscovered sensitive/watchlist species occurrences would be at risk. Over the long term, cross country use could damage at least some sensitive/watchlist species occurrences and it is reasonable to expect that some occurrences would be lost.

Direct/indirect impacts to sensitive/watchlist species from cross country use could be significant at least at the local, site specific level. The significance of direct/indirect impacts is dependent on many factors including the amount of disturbance, the sensitive/watchlist 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. Occurrences of *Erigeron miser* are known to be impacted by use of NFTS and proposed additions to the NFTS. Severe cross country impacts within these plant communities containing sensitive/watchlist species would be considered significant. Soils in these plant communities are considered highly erosive and growing conditions are considered harsh.

Action alternatives: Compared to Alternative 1, all action alternatives would reduce the number of miles open for motorized vehicles in these plant communities. Direct impacts to sensitive/watchlist species within high elevation openings/rocky areas from cross country travel would not occur under the action alternatives. Refer to Table 3.06-12. Alternatives 2, 5, 6, and 7 prohibit public motorized use on about 16 miles of the 18 miles of unauthorized routes and closed NFTS roads still receiving some motorized use in these plant communities or about 89 percent of them. Alternatives 3 and 4 prohibit public motorized use of all 18 miles of unauthorized routes and closed NFTS roads within high elevation opening and rocky areas and therefore provide the least risk to those plant communities.

Table 3.06-12. Miles of proposed additions to the NFTS within high elevation opening/rocky areas by alternative

Action type		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
1. Cross country travel (miles located within high elevation openings & rocky areas)		18	0	0	0	0	0	0
(acres located within high elevation openings & rocky areas)		43,240						
2. Additions to the NFTS	**Miles added within 100 feet of high elevation/ rocky opening areas**	N/A	2	0	0	2	2	2
3. Establishment of Motorized "Open Areas" (acres)		N/A	0	0	0	0	0	0
4. Changes to the NFTS	**a. Change in Class of Vehicles resulting from approval of mixed use**	No Effect						
	b. Change in Class of Vehicles resulting from changes in maintenance levels	No Effect						
	c. Change in Season of Use	No Effect						
	d. Reopening Maintenance Level 1 Roads	0	0	0	0	0	0	0
5. Amendments to the Forest Plan		No Effect						
	Total Miles	**72**	**56**	**54**	**54**	**56**	**56**	**56**
	Total Acres	**43,240**	**0**	**0**	**0**	**0**	**0**	**0**

2. Additions to the NFTS and Reopening ML 1 Roads

Indicator(s) used to measure effects:

- Miles of proposed additions to the NFTS within high elevation openings/rocky areas.
- Sensitive/watchlist species occurrences (associated with high elevation openings/rocky areas) located within 100 feet of proposed additions. *Erigeron miser* was found within 100 feet of TKN-J4, TKN-J5 and YRS-F1 near Fordyce Creek. No weeds were found at any of these *Erigeron miser* sites.

No Action: Alternative 1 does not and an addition to the NFTS, but it also does not prohibit public motorized use on about 18 miles of unauthorized routes and closed NFTS roads. Implementation of Alternative 1 could impact sensitive/watchlist species directly/indirectly by continuing use of those unauthorized routes and closed NFTS roads especially TKN-J4, TKN-J5 and YRS-F1. Under implementation of Alternative 1, TKN-J4 and TKN-J5 would not be shortened and the *Erigeron miser* located at the end of these routes would continue to be impacted. Implementation of Alternative 1 could also directly impact sensitive/watchlist species through use of about 72 miles of NFTS routes located within these plant communities. Direct and indirect impacts could be significant at least at the local level.

Action alternatives: Compared to Alternative 1, all action alternatives would reduce the number of miles open for motorized vehicles in high elevation openings and rocky areas. Refer to Table 3.06-12 which shows the miles of proposed additions within these plant communities by alternative. Alternatives

2, 5, 6 and 7 propose the addition of about 2 miles to the NFTS located within high elevation rocky opening plant communities or about 11 percent. Alternatives 3 and 4 do not add miles in high elevation openings and rocky areas and would not directly/indirectly impact sensitive/watchlist species.

Impacts to known occurrences: *Erigeron miser* occurrences located at the "cement slab" at the end of TKN-J5, within 100 feet of TKN-J4, and along Fordyce Creek (YRS-F1) are currently being directly/indirectly impacted by unauthorized motorized vehicle use. Observations (by the author of this evaluation) have shown increased cross country motorized vehicle use within this plant community type on the TNF (compared to ten years ago). Mitigations were developed to reduce impacts to occurrences of *Erigeron miser* along TKN-J4 and TKN-J5. Both routes have been shortened to reduce resource impacts including impacts to this sensitive plant. No mitigations were developed for the *Erigeron miser* located along Fordyce Creek (YRS-F1) because current impacts are from dispersed camping versus motorized vehicle use. Refer to Appendix A (Site Specific Road, Trail and Open Area Information).

Impacts to potential habitat: Sensitive/watchlist species occurrences would have direct motorized vehicle impacts reduced and/or eliminated through implementation of mitigations for them. Indirect impacts such as covering them in dust and increased risk of weed introduction and spread would still occur. However, if sensitive/watchlist species occur within 30 or 100 feet of the routes without current botanical surveys they would remain undetected and could continue to be directly/indirectly impacted. The significance of impacts to sensitive/watchlist species varies by such factors as type of species, amount of disturbance, and location.

3. Cumulative effects including reasonably foreseeable

Indicator(s) used to measure effects: Past/present/reasonably foreseeable future actions that could potentially impact high elevation openings and rocky areas and the sensitive/watchlist species that may occur within them, as well as the benefits from prohibiting motorized vehicle use of unauthorized routes and closed NFTS roads are discussed. It is assumed that all of the action alternatives avoid long term cumulative impacts by frequently evaluating routes, implementing mitigations to reduce impacts to sensitive/watchlist species, and conducting early detection and treatment of weeds. Frequent route evaluation combined with rapid mitigation of resource damage avoids significant impacts to high elevation opening and rocky area plant communities and sensitive/watchlist species in the short and long term.

Past: These plant communities were historically grazed by livestock, timber was removed, roads/trails were built through them, and some of them were impacted by mining activities. Since the plant communities that occur at these sites have adapted to generally highly erosive and shallow soils, with harsh conditions and short growing seasons; those areas that were heavily disturbed may remain unvegetated. In addition, heavy snow years and unchecked erosion can limit plant establishment and stop the vegetative recovery process or push it back by several decades (Willard et al. 2007). Some of these high elevation openings/rocky areas have become infested with weeds such as Klamath weed. Historic management activities have reduced the amount of this type of plant community and/or the health of these types of plant communities on the TNF. These historic reductions could have negatively impacted: *Arabis*

rigidissima var. *demota, Claytonia megarhiza, Erigeron miser, Eriogonum umbellatum* var. *torreyanum, Lewisia longipetala, Tauschia howellii,* and *Tonestus eximius*. It is believed that the *Asplenium trichomanes-ramosum* occurrence located on the TNF is a disjunct occurrence and probably does not occur anywhere else on the TNF except in the limestone caves where it is currently known to occur. Historic management activities probably did not impact limestone caves on the TNF.

Current: Current management activities in these plant communities are primarily recreation related. *Erigeron miser* occurrences occur along and are negatively impacted by NFTS and proposed additions to the NFTS. *Erigeron miser* grows only on the TNF, in the crevices between granite rocks - a habitat type that is limited in distribution on the TNF. Known occurrences are being impacted by motorized vehicle use when users drive over granite slabs. Non-motorized recreation, primarily mountain bikes, is also impacting these plant communities.

Other ongoing projects on the Forest that impact these plant communities include: special uses projects such as utility corridor construction/maintenance that pass through and impact many different types of plant communities including high elevation openings and rocky areas; minerals operations that remove native vegetation and recontour the landscape; and livestock grazing. None of these ongoing projects impacts these plant communities significantly in the short term (5 years or less). However, they do increase the risk of weed introduction and spread especially over the long term.

Reasonably foreseeable: High elevation openings and rocky areas are cumulatively impacted when past and current impacts are added to the reasonably foreseeable future impacts. However, none of the actions identified in Appendix H (Reasonably Foreseeable Projects and Cumulative Effects) are proposed in high elevation openings/rocky areas.

No action: Implementation of Alternative 1 adds to the cumulative impacts to sensitive/watchlist species dependent on high elevation openings/rocky areas through cross country travel and use of about 18 miles of unauthorized routes and closed NFTS roads still receiving some motorized use in these plant communities. Over the long term, continued and/or increased cross country motorized vehicle use within sensitive/watchlist occurrences could kill significant numbers of plants. Therefore, implementation of Alternative 1 may significantly impact *Arabis rigidissima* var. *demota, Claytonia megarhiza, Erigeron miser, Eriogonum umbellatum* var. *torreyanum, Lewisia longipetala, Tauschia howellii,* and *Tonestus eximius* significantly over the long term (5 years plus). It is believed that the *Asplenium trichomanes-ramosum* occurrence located on the TNF is a disjunct occurrence and probably does not occur anywhere else on the TNF except in the limestone caves where it is currently known to occur. These limestone cave areas are inaccessible by motorized vehicles.

Given the above information, the determination is that implementation of Alternative 1 could impact *Arabis rigidissima* var. *demota, Claytonia megarhiza, Erigeron miser, Eriogonum umbellatum* var. *torreyanum, Lewisia longipetala, Tauschia howellii,* and *Tonestus eximius* and could contribute to a trend for federally listing them as threatened or endangered over the long term. Implementation of Alternative 1 would not impact *Asplenium trichomanes-ramosum*.

Action alternatives: Implementation of the action alternatives could cumulatively impact sensitive/watchlist species dependent on high elevation openings/rocky areas. Those impacts are not

considered significant. In the past, motorized vehicle use was not expected to occur in these habitats because they are generally steep and highly erosive, rock outcrops, and/or very high elevation rocky openings. However, current technology has increased the ability of motorized vehicles to travel in these kinds of habitats. When motorized vehicle use occurs near or within these plant communities, resource damage (loss of vegetation and erosion) can be severe. In addition, the plants dependent on these plant communities do not appear to compete well with other vegetation. Therefore, weed introduction and/or spread could kill them over the long term. These plant communities are already subject to natural erosion and have a short growing period. Any disturbance increases erosion and causes significant impacts to the soil and water components of the habitat.

There are 16 unauthorized routes and closed NFTS roads still receiving some motorized use located in these plant communities. Ten (includes YRS-F1 and YRS-F1b) of the 16 routes are considered spurs that access dispersed camping sites. TKN-J4, TKN-J5, YRN-11, YRS-003b, YRS-G3, and YRS-G3w are also located in these plant communities. Surveys identified that TKN-J4, TKN-J5 and YRS-F1 have occurrences of *Erigeron miser* within 100 feet of them. Mitigations have been developed for TKN-J4 and TKN-J5 that reduces and/or eliminates impacts to *Erigeron miser* from motorized recreation. Refer to Appendix A (Site Specific Road, Trail and Open Area Information).

Alternatives 2, 5, 6 and 7: Cumulative impacts from implementation of Alternatives 2, 5, 6, and 7 are not considered significant. None of these alternatives allow cross country travel. All of these alternatives propose the addition of about 2 miles and prohibit public motorized use of about 89 percent of the unauthorized routes and closed NFTS roads still receiving some motorized use. Implementation of these alternatives carries less risk of negatively impacting sensitive/watchlist species dependent on these plant communities than Alternative 1. However, of the action alternatives, implementation of Alternatives 2, 5, 6, and 7 have the highest risk of negative indirect impacts to sensitive/watchlist species dependent on these plant communities since they have the most miles of motorized routes. Of the action alternatives, implementation of Alternatives 2, 5, 6 and 7 also have the highest risk of introducing and spreading weeds. Alternatives 2, 5, 6 and 7 continue the indirect impacts to *Erigeron miser* occurrences located along routes TKN-J4, TKN-J5, and YRS-F1.

Alternatives 3 and 4: Implementation of Alternatives 3 or 4 adds to the cumulative impacts of high elevation openings and rocky areas the least. Alternatives 3 and 4 do not allow cross country use or propose additions to the NFTS. Alternatives 3 and 4 do not indirectly impact *Erigeron miser* occurrences located along routes TKN-J4, TKN-J5, and the YRS-F1 near Fordyce Creek. Implementation of Alternatives 3 and 4 still add to cumulative impacts through the use of the NFTS and the associated risk of weed introduction and spread. However, of all of the alternatives, Alternatives 3 and 4 provide the greatest benefits to high elevation/rocky opening sensitive/watchlist species and watchlist plant communities.

Given the above information, implementation of the action alternatives could impact *Arabis rigidissima* var. *demota, Claytonia megarhiza, Erigeron miser, Eriogonum umbellatum* var. *torreyanum, Lewisia longipetala, Tauschia howellii*, and *Tonestus eximius*, but would not contribute to a trend for

federally listing them as threatened or endangered in the short or long term. Implementation of the action alternatives would not impact *Asplenium trichomanes-ramosum* in the short or long term.

Noxious Weeds

1. Prohibition of cross country travel

Indicator(s) used to measure effects:

- Acres where cross country travel is prohibited and the miles of unauthorized routes and closed NFTS roads that pass through noxious weeds.

No Action: Implementation of Alternative 1 carries the highest risk of introduction and spread of aggressive, non-native plants (weeds) since it allows motorized vehicle use on the most miles of unauthorized roads/trails/areas/closed NFTS roads, and allows cross country travel on most of the Forest (except for areas closed by the LRMP). Motorized vehicles could potentially spread weeds to all accessible areas. Under implementation of Alternative 1, the number of unauthorized motorized vehicle roads/trails/areas would increase through cross country use.

Motorized vehicle use of those routes that have weed infestations has a high risk of spreading weeds to new areas. Surveys to date have identified several routes that are infested with weeds. Refer to Table 3.06-13. The routes displayed in Table 3.06-13 have the highest short and long term risk of weed spread to new areas. Different weeds have different ecological impacts. Table 3.06-13 also provides an indication of the ecological impact of the type of weed that infests the route. Under implementation of Alternative 1, all of the routes identified in Table 3.06-13 would continue to be used and that use would spread weeds.

Action alternatives: None of the action alternatives allow cross country travel which reduces the risk of introduction and spread of weeds by reducing the amount of NFS lands available for motorized travel. Therefore, the risk of direct/indirect impacts to sensitive/watchlist species and native plant communities from weed introduction and/or spread is less under the action alternatives in the short and long term compared to the No Action Alternative. Weeds would continue to spread on the Forest, but it is believed the rate of spread would be slower than under the No Action Alternative primarily due to the prohibition of public motorized vehicle use of some unauthorized routes, closed NFTS roads and prohibiting cross country travel.

Table 3.06-13. Weed occurrences along proposed additions to the NFTS

Route ID	Weed occurrences known to occur within 100 feet of road/trail/area	Ecological impact rating (Cal IPC)	Route miles
ARM-5	Large patches of cheatgrass adjacent to the trail	High	.8
SV-P14	Musk thistle is within about 100 feet.	Moderate	.4
TKN-J9	Wooly mullein and cheatgrass	Cheatgrass - High Wooly mullein - Limited	1.4
TKN-J13	Musk thistle is adjacent to the trail.	Moderate	1.6
TKN-M1	Cheatgrass is located in and adjacent	High	3.6
TKN-M2	Patches of cheatgrass adjacent to the north end of the trail	High	3.4
TKS-M9	Small amounts of bull thistle and orchard grass adjacent.	Moderate	3.0
YRM-M3	Scotch broom adjacent	High	.4

Route ID	Weed occurrences known to occur within 100 feet of road/trail/area	Ecological impact rating (Cal IPC)	Route miles
YRM-M4	Scotch broom and cheatgrass	High	.4
YRN-008	Scotch broom	High	.3
YRN-509	Scotch/Spanish broom and cheatgrass	High	.5
YRN-M3b	Klamath weed	Moderate	2.4
YRS-SF6	Bull thistle and cheatgrass	Moderate	1.4
35-4-P (Cal Ida)	Cheatgrass and tumble mustard adjacent	High	.5

2. Additions to the NFTS and Reopening ML 1 Roads

Indicator(s) used to measure effects:

- Miles of proposed additions to the NFTS system with weed occurrences with 100 feet.
- Sensitive/watchlist species and/or watchlist plant communities located within 100 feet of proposed additions that also have weed occurrences within 100 feet of the route.
- Miles of ML 1 roads proposed to be reopened

No Action: Alternative 1 does not propose additions to the NFTS, but it does not prohibit public motorized vehicle use of unauthorized routes or ML 1 roads. Therefore, implementation of Alternative 1 has a high risk of negatively impacting native plant communities and sensitive/watchlist species through the introduction and/or spread of weeds. Refer to the discussion under effects of cross country use under the No Action Alternative above. Direct/indirect impacts could be significant if weed infestations displace native plant communities.

Action alternatives: Compared to Alternative 1, all action alternatives would reduce the number of miles open for public motorized vehicle use. This would reduce the risk of weed introduction/spread. None of the action alternatives allow cross country travel which also reduces the risk of introduction of weeds into new areas and the spread of weeds from one place to another. Therefore, the risk of direct/ indirect impacts to native plant communities and/or sensitive/watchlist species from weed introduction/spread is less under the action alternatives in the long term. Refer to the Weed Risk Assessment located in the project record.

Surveys to date have located weed occurrences within 100 feet of routes: ARM-5, SV-P14, TKN-J9, TKN-J13, TKN-M1, TKN-M2, TKS-M9, YRM-M3, YRM-M4, YRN-008, YRN-509, YRN-M3b, YRS-SF6, and 35-4_P of the Cal Ida network (about 20 miles of route). Those action alternatives that propose the addition of these routes to the NFTS have a high risk of introducing/spreading weeds in the short and long term. The weed risk is reduced primarily through preventative measures that focus on training of maintenance crews in weed identification and rapid treatment of newly established weed occurrences. The weed risk is also reduced through ongoing treatment of known weed occurrences. There are no cost effective methods known that could be used to check all vehicles for weeds and/or wash all vehicles before they enter NFS lands.

Motorized vehicle use of routes with weeds and rare species/plant communities have a high risk of negatively impacting sensitive/watchlist species and/or watchlist plant communities. TKN-M2 has an

occurrence of *Ivesia sericoleuca* that has cheatgrass within 100 feet of it. Motorized vehicle use of TKN-M2 increases the risk of weed introduction/spread into this sensitive species occurrence. Cheatgrass would compete for water and nutrients, taking those resources away from the sensitive plants. Over time, sensitive plants would be weakened and/or killed. Aspen plant communities were found along TKN-M2, and SV-P14. Motorized vehicle use of TKN-M2 and SV-P14 increases the risk of weeds being introduced and spreading within these aspen plant communities. The significance of impacts to the aspen from weed infestation is dependent on a number of factors including the type of weed.

Alternative 5: Of the action alternatives, Alternative 5 proposes the addition of the most miles of route known to have weed occurrences (all 20 miles, see Table 3.06-13) and proposes to reopen the most miles of ML 1 roads (about 93 miles) that do not have current weed surveys. Alternative 5 proposes the addition of TKN-M2 and SV-P14 also (routes known to have rare plants/plant communities and weeds). Therefore, of the action alternatives, Alternative 5 has the highest risk of weed introduction and/or spread and the greatest risk of negatively impacting native plant communities and/or sensitive/watchlist species.

Alternative 2: Alternative 2 proposes the addition of about 19 miles of route known to have weed occurrences, including the addition of TKN-M2 and SV-P14, but does not propose to reopen any ML 1 roads. Therefore, Alternative 2 has a high risk of introducing weeds to new areas from motorized vehicle use of routes known to have weeds. Alternative 2 could also spread weeds from weed sites that may occur along unauthorized routes that do not have current surveys. However, the risk of weed spread from undetected weed occurrences is much lower in Alternative 2 than in Alternative 5 since most proposed addition miles have been surveyed.

Alternatives 6 and 7: Alternative 6 proposes the addition of about 17 miles and Alternative 7 proposes the addition of about 15 miles of route known to have weed occurrences. Alternatives 6 and 7 both propose the addition of SV-P14. However, unlike Alternative 6, Alternative 7 does not propose the addition of TKN-M2. Alternative 6 reopens about 11 miles of ML 1 roads and Alternative 7 reopens about 1 mile. Therefore, Alternatives 6 and 7 have less risk of introducing weeds to new areas from motorized vehicle use of routes known to have weeds than Alternatives 2 and 5. However, Alternatives 6 and 7 have a higher risk of spreading weeds from weed sites that may occur along ML 1 roads than Alternative 2 but not as much risk as under Alternative 5.

Alternative 4: Alternative 4 proposes the addition of about 12 miles of route known to have weed occurrences and proposes the addition of SV-P14. Alternative 4 proposes to reopen only .1 mile of ML 1 roads. Therefore, Alternative 4 has less risk of spreading weeds along routes known to have weeds than Alternatives 5, 2, 6, and 7.

Alternative 3: Alternative 3 does not propose the addition of any route known to have weed occurrences, does not propose the addition of TKN-M2 or SV-P14, and does not propose to reopen any ML 1 roads.

3. Cumulative effects including reasonably foreseeable

Indicator(s) used to measure effects: Past/present/reasonably foreseeable future actions that could potentially impact TNF system lands and the sensitive/watchlist species that may occur within them, as

well as the benefits from prohibiting motor vehicle use on unauthorized routes and closed NFTS roads are discussed. It is assumed that all of the action alternatives avoid long term cumulative impacts from weed introduction/spread by frequently evaluating routes and conducting early detection and treatment of weeds. Frequent route evaluation to detect weeds combined with rapid treatment of those weeds avoids significant impacts to native plant communities and sensitive/watchlist species in the short and long term.

Past: Most of the TNF is considered relatively weed free. This relatively weed free state may indicate that a source of weed seed was not available when TNF native plant communities were disturbed in the last century. This is unknown but appears to be a reasonable assumption based on literature that documents the progression of various weed species across California and the nation. It is also possible that weeds have persisted at low levels in some areas for decades before spreading rapidly when favorable conditions developed (Shepperd et al 2006). Many of the weeds found in California forests today were introduced intentionally or unintentionally by European settlers beginning in the 18th century (Bossard et al 2000).

The lack of weed infestation in previously disturbed areas may also indicate less access onto the TNF by motorized vehicles. It is widely recognized that motorized vehicle use has increased over the last decade. It is also widely recognized that motorized use helps to spread weeds from place to place both by creating habitat along routes and by carrying seed/weed plant parts on vehicles. However weeds were introduced, it is known that they are spreading across California. Jepson (1925) listed 292 non-native (weed) plant species in California. By the end of the 20th century the estimate for non-native plant species in California has risen to 1,045 (Randall and others 1998 in Shepperd et al 2006).

Current: In general terms, most weed occurrences on the TNF are located along State/County/ Federal/NFS roads. An exception to this is the large infestation of musk thistle located in the Boca Hill area on the Truckee RD which is located along the Truckee River, in older plantations, and along roads and trails. Ongoing management actions such as utility corridor maintenance, mining operation, use of NFTS roads/trails, and livestock grazing continue to spread weeds from place to place across the Forest. As noted in other sections of this document, there are weed infestations competing with sensitive species for soil, water and nutrients in several locations. Sensitive species occurrences with known weed infestations (and/or weed occurrences within 100 feet) include occurrences of *Clarkia biloba* ssp. *Brandegeae* (yellow star thistle), *Cypripedium fasciculatum* (Himalayan blackberry), *Erigeron miser* (Klamath weed) and *Ivesia sericoleuca* (cheatgrass). Use of road/trails has been identified as a contributing source of weeds in all of these known rare plant occurrences except the Klamath weed in the *Erigeron miser* occurrence. Weeds do not occur within all occurrences of sensitive/watchlist plants, but where they do the rare plant occurrence is at risk of being lost over the long term. Efforts have been made to reduce/eliminate the yellow star thistle in known *Clarkia biloba* ssp. *Brandegeae* occurrences along Mosquito Ridge road.

Ongoing actions that create bare soil conditions and/or reduce native vegetation and/or soil cover all increase the risk that weeds will become established if weed seed is introduced. Utility corridor maintenance, mining operations, use of NFTS roads/trails, and livestock grazing are all ongoing actions that create bare soil conditions and reduce native vegetation and/or soil cover.

Reasonably foreseeable: Implementation of those projects identified in Appendix H (Reasonably Foreseeable Projects and Cumulative Effects) may introduce weed seed and/or weed plant parts into new areas. Equipment that operates off roads while doing contracted work for the TNF must wash that equipment if it is coming from a weed infested area. This requirement and requiring the use of certified weed free plant materials for erosion control (when needed) both reduce the risk of weed introduction from reasonably foreseeable management actions. However, all of the projects listed in Appendix H involve travel on NFTS roads and could introduce weed seed into new areas from their vehicles. Ground disturbance favors weed spread if the weeds are already in or near the area being disturbed. Therefore, it is reasonable to expect that implementation of the reasonably foreseeable actions would introduce weeds into new areas and/or spread weeds from existing weed infestations over the long term.

No action: Implementation of Alternative 1 adds to the cumulative risk of weeds being introduced into new areas and spreading from existing weed sites. As identified in the Weed Risk Assessment for this project (refer to the project record) implementation of Alternative 1 has a high risk of introducing weeds into new areas and spreading weeds from areas that are already infested with weeds. The risk to native plant communities and/or sensitive/watchlist species from implementation of Alternative 1 is significant when added to past/current/reasonably foreseeable actions. Alternative 1 allows cross country use, does not prohibit motorized vehicle use of unauthorized routes, and does not prohibit use of closed NFTS roads. Therefore, it has the greatest risk of negative impacts to native plant communities and the sensitive/watchlist species, of any of the alternatives.

Action alternatives: Motorized vehicle use provides a continuous source of weed seed introduction and also provides disturbed areas within and adjacent to the motorized vehicle roads/trails/areas. Refer to the Weed Risk Assessment (in the project record) and the discussion under the No Action Alternative for more information. None of the action alternatives allow cross country use. Therefore, all of the action alternatives have less risk of introducing weeds into new areas than Alternative 1. In addition, some reduction of weed risk is expected from ongoing treatment of known weed occurrences. The risk of weed introduction and spread includes discussion of risk from using routes known to be infested and risk from use of routes that may be infested (routes without current surveys).

Alternative 5: Of the action alternatives, implementation of Alternative 5 has the greatest risk of weed introduction and spread and therefore the greatest risk of negative impacts to native plant communities and/or sensitive/watchlist species. Alternative 5 has the greatest weed risk of the action alternatives because it proposes the addition of the most miles of route known to have weed occurrences (all 20 miles) and proposes to reopen the most miles of ML 1 roads (about 93 miles) that do not have current weed surveys. Alternative 5 also proposes the addition of TKN-M2 and SV-P14 (routes known to have rare plants/plant communities and weeds). When current and reasonably foreseeable actions are added to the high risk that implementing Alternative 5 would introduce and spread weeds, the cumulative impacts could be significant. However, the assumption of frequent review of routes and rapid treatment of weeds reduces the significance of Alternative 5's contribution to cumulative impacts.

Since Alternative 5 does not allow cross country travel, it has less risk of spreading weeds into native plant communities and/or sensitive/watchlist species occurrences over the long term than implementation of Alternative 1.

Alternative 2: Alternative 2 proposes the addition of about 19 miles of route known to have weed occurrences, proposes the addition of TKN-M2 and SV-P14, but does not propose to reopen any ML 1 roads. Therefore, Alternative 2 has a high risk of introducing weeds to new areas from motorized vehicle use of routes known to have weeds. In addition, Alternative 2 adds shoreline access on dry soils in the Prosser/Boca/Stampede Reservoir areas and the Greenhorn area. Reservoir shoreline areas are known to have weed occurrences when the water level is low. For example, Canada thistle is known to occur along the low water line of French Meadows Reservoir and musk thistle and other weeds are known to occur along the Boca Reservoir low water line. Unvegetated areas provide sites where weeds can readily become established without competition from native vegetation. Prosser/Boca/Stampede Reservoir areas and the Greenhorn area have been surveyed and weeds are not currently present. In addition, weeds would have a harder time becoming established along the reservoirs when the water levels are high. When weed occurrences are covered with water, many of the weed seeds are killed. However, some of the weed seed floats to new areas. When water levels remain low for a period of time, weeds can become established and any motorized vehicle use in the areas where the weeds are located would spread the weeds to new areas.

The risk of weed spread from undetected weed occurrences is much lower in Alternative 2 than in Alternatives 1 and 5. When current and reasonably foreseeable actions are added to the risk that implementing Alternative 2 would introduce and spread weeds, there would be additions to cumulative impacts. However, since most of the risk is tied to use of routes with current surveys/known infestations, the risk is reduced by implementation of ongoing weed treatments. In addition, as mentioned above, the assumption of frequent review of routes and rapid treatment of newly established weeds reduces the significance of any action alternative's contribution to cumulative impacts.

Alternatives 6 and 7: Alternative 6 proposes the addition of about 17 miles and Alternative 7 proposes the addition of about 15 miles of route known to have weed occurrences. Alternatives 6 and 7 both propose the addition of SV-P14. However, Alternative 7 does not propose the addition of TKN-M2. Therefore the risk of spreading weeds from known infestations is high. Alternatives 6 and 7 do not propose "Open Areas." Therefore, Alternatives 6 and 7 have less risk of introducing weeds to new areas from motorized vehicle use of routes known to have weeds than Alternatives 2 and 5.

Alternative 6 reopens about 11 miles of ML 1 roads and Alternative 7 reopens about 1 mile. Alternative 6 has a higher risk of spreading weeds from weed infestations that may occur along these ML 1 roads than Alternative 7. Alternatives 6 and 7 have a higher risk of spreading weeds from weed sites that may occur along ML 1 roads than Alternatives 2 but not as much risk as under Alternative 5.

The above contributions to cumulative impacts are not considered significant due to the assumption of frequent review of routes with rapid treatment of newly established weeds.

Alternative 4: Alternative 4 proposes the addition of about 12 miles of route known to have weed occurrences and proposes the addition of SV-P14. Alternative 4 proposes to reopen only .1 mile of ML 1

roads and does not propose "Open Areas." Therefore, Alternative 4 has less risk of spreading weeds along routes known to have weeds than Alternatives 5, 2, 6, and 7. Alternative 4 contributions to cumulative impacts are not considered significant due to the assumption of frequent review of routes with rapid treatment of newly established weeds.

Alternative 3: Alternative 3 does not propose the addition of any route known to have weed occurrences, does not propose the addition of TKN-M2 or SV-P14, and does not propose to reopen any ML 1 roads. Therefore, Alternative 3 has the lowest weed risk of any of the alternatives and is the most beneficial to native plant communities and sensitive/watchlist species.

Native Plant Habitat Fragmentation

1. Prohibition of cross country travel

Indicator used to measure effects:

- Acres where cross country travel is prohibited (thereby reducing the mileage of routes available for motorized use within inventoried roadless areas (IRAs).

No action: Alternative 1 does not prohibit cross country motorized vehicle use of 98,304 acres of Inventoried Roadless Areas (IRAs). Under implementation of Alternative 1, 58 miles of unauthorized routes and closed NFTS roads still receiving some motorized use located within IRAs would be available for motorized vehicle use and accessible areas within those IRAs would be available for cross country travel. As discussed above, this increases the risk of weed introduction and spread within these areas – increasing the risk of negative impacts to native plants and sensitive/watchlist species. These negative impacts include reductions in native plant biodiversity and fragmentation of the native plant communities. Impacts could be significant over the long term.

Action alternatives: None of the action alternatives allow cross country travel within IRAs. Therefore there is less long term risk to native plant diversity from fragmentation of large blocks of native plant communities by weeds under implementation of the action alternatives (compared to the No Action Alternative). Of the action alternatives, Alternatives 2 and 5 prohibit public motorized use on the fewest miles of unauthorized routes and closed NFTS roads within IRAs and have the highest long term risk to native plant communities from fragmentation of large blocks of native plant communities via weeds. Alternatives 2 and 5 would prohibit public motorized use on about 4 miles of unauthorized routes and closed NFTS roads within these areas or about 33 percent. Alternative 7 would prohibit public motorized use on about 6 miles or about 46 percent. Alternative 6 would prohibit public motorized use on about 9 miles or about 69 percent. Alternatives 3 and 4 would prohibit public motorized use on all 13 miles of unauthorized routes and closed NFTS roads located within IRAs.

2. Additions to the NFTS and Reopening ML 1 Roads

Indicator used to measure effects:

- Miles proposed for addition to the NFTS that are located within IRAs.

No action: Alternative 1 does not prohibit public motorized use of the 58 miles of unauthorized routes and closed NFTS roads located in IRAs. It also allows cross country travel. Alternative 1 has the highest

long term risk to native plant communities from fragmentation of large blocks of native plant communities, of all the alternatives.

Action alternatives: Compared to Alternative 1, all of the action alternatives reduce the number of miles open for motorized vehicles in IRAs. Of the action alternatives, Alternatives 2 and 5 propose the addition of the most miles of unauthorized routes located in IRAs – about 8 and 10 miles respectively. Therefore, Alternatives 2 and 5 have the greatest long term risk of negatively impacting native plant and plant community diversity (from fragmentation of large blocks of native plant communities via weed infestation). Refer to Table 3.06-14. Alternative 7 adds about 6 miles and Alternative 6 adds about 4 miles. Alternatives 3 and 4 do not add miles within IRAs.

Table 3.06-14. Total miles of roads/trails/areas in inventoried roadless areas by alternative

Action type		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
1. Cross country travel (miles located within IRAs) (acres located within IRAs)		58 98,304	0	0	0	0	0	0
2. Additions to the NFTS	**Miles added within inventoried roadless areas**	N/A	8	0	0	10	4	6
3. Establishment of Motorized "Open Areas" (acres)		N/A	0	0	0	0	0	0
4. Changes to the NFTS	**a. Change in Class of Vehicles resulting from approval of mixed use**	No Effect						
	b. Change in Class of Vehicles resulting from changes in maintenance levels	No Effect						
	c. Change in Season of Use	No Effect						
	d. Reopening Maintenance Level 1 Roads	N/A	0	0	0	2	0	0
5. Amendments to the Forest Plan		No Effect						
	Total Miles	**207**	**157**	**0**	**0**	**161**	**153**	**155**
	Total Acres	**98,304**	**0**	**0**	**0**	**0**	**0**	**0**

3. Cumulative effects including reasonably foreseeable

Indicator(s) used to measure effects: Past/present/reasonably foreseeable future actions that could potentially impact IRAs, as well as the benefits from prohibiting public motorized use of unauthorized routes and closed NFTS roads are discussed. As stated previously, it is assumed that all of the action alternatives avoid long term cumulative impacts by frequently evaluating routes, implementing mitigations to reduce impacts to sensitive/watchlist species and/or watchlist plant communities, and conducting early detection and treatment of weeds. Frequent route evaluation to detect weeds combined with rapid treatment of those weeds avoids significant impacts to native plants and plant communities from weed infestation.

Since IRAs have not been surveyed, possible impacts to native plant biodiversity from fragmentation of large blocks of native plant communities are analyzed. It is recognized that sensitive/watchlist species

and/or watchlist plant communities add to native plant diversity and are considered important components of the native plant communities where they are located.

Past: Past actions that have impacted native plant communities in TNF IRAs include all of the past actions identified under the different plant communities in this report. IRAs were identified in the late 1970's during the Roadless Area Review and Evaluation (RARE I and RARE II). The character and amount of roads, private land, and motorized trails varies greatly by roadless area. Refer to Section 3.09. However, during the SNEP analysis, the East and West Yuba IRAs were identified as having some of the best remaining/largest concentrations of old growth forest in the Sierra Nevada.

Current: Current management activities that occur within TNF IRAs include use of NFTS roads/trails, activities on private land that are adjacent to NFS lands, livestock grazing and minerals operations. The amount of use of NFTS roads/trails, the types of private land activities, the amount and location of livestock grazing, and the minerals operations also vary by IRA. For example, the following unauthorized routes occur in the West Yuba IRA: YRN-M3b, YRN-M3a, YRN-7, and YRN-M2. All of these routes except YRN-7 were pioneered by miners to access mining claims. The East Yuba IRA also has active mining operations. YRN-001, YRN-M1, YRN-11, YRN 5a and 5c, YRN-9, YRN-007, and YRN-4 are all unauthorized routes that exist within the East Yuba IRA. Of these routes, YRN-M1, YRN-007, and YRN-4 were pioneered by miners. YRN-11, YRN 5a and 5c, YRN-9 and probably YRN-001 were pioneered by users. Routes used by miners to access their mining claims will remain available for their use regardless of the alternative selected. Refer to Section 3.09 for more information about current management activities within each IRA.

Reasonably foreseeable: Implementation of those projects identified in Appendix H (Reasonably Foreseeable Projects and Cumulative Effects) would not impact IRAs. None of those projects are located within IRAs.

No action: Implementing Alternative 1 has a greater risk of negative impacts to native plant diversity and a greater risk of negative impacts to native plant communities (and therefore the sensitive/watchlist species dependent on them) located within IRAs than the action alternatives. Alternative 1 has a higher risk of these negative impacts to plant diversity and connectivity primarily due to allowing cross country travel and allowing motorized use on unauthorized routes and closed NFTS roads within IRAs.

Motorized vehicle disturbance within IRAs can reduce native plant biodiversity. Loss of native plant biodiversity is dependent on the intensity of motorized vehicle use, but even a single vehicle pass can destroy or disrupt many types of plant communities. Plants with shallow root systems may be especially vulnerable (Wilshire 1983, Lacey et al. 1997). This loss of native vegetation increases the risk of soil loss due to wind and water erosion. Soil loss increases the decomposition of organic matter, weakens soil aggregate stability and can result in the formation of inorganic surface crusts. Inorganic surface crusts increase water runoff, inhibit germination and emergence of seedlings, and reduce water penetration into the soil. Natural soil stabilizers such as organic (lichen, fungal and algal) soil crusts are highly vulnerable to cross country motorized vehicle use. All of these impacts contribute to native plant community degradation and fragmentation.

Motorized vehicle use can fragment native plant communities and habitat for some sensitive/watchlist species. Those sensitive/watchlist plants with specific pollination and other habitat requirements are the most vulnerable to fragmentation impacts. For example, *Cypripedium fasciculatum* requires mycorrhizal connections underground and specific pollinators and is associated with older forests. Many of the TNF IRAs are considered older forest. During the SNEP analysis the East/West Yuba IRAs were identified as important older forest areas that provide connectivity across the crest of the Sierra Nevada. The East/West Yuba IRAs were also found to be important because they are located in a part of the Sierra Nevada that has less human presence. Cross country travel within these IRAs (and the others) would fragment the landscape and reduce ecological function within the older forest plant communities.

Motorized vehicle use, especially cross country use, is frequently identified as the cause of habitat fragmentation. Cross country motorized vehicle use has been shown to reduce perennial and annual plant cover, reduce plant density, and overall above-ground vegetative biomass (Hall 1989). In general terms, the degree of plant loss depends on the intensity of motorized vehicle use.

The density of NFTS motorized vehicle routes within the various IRAs is described in Section 3.09 (IRAs and Special Areas). Under Alternative 1, cross country use in IRAs could create high road/trail density over the long term with negative cumulative impacts to native plant communities. Several areas on the TNF have a high density of motorized vehicle roads/trails/areas – however none of the watersheds within IRAs are considered high risk watersheds. Refer to Section 3.02 (Soil and Watershed Resources). The IRAs on the TNF are considered relatively free of motorized vehicle routes and are assumed to provide quality habitat for native plants/fungi and plant communities. Over the long term severe cross country travel would reduce and/or eliminate habitat for some native plants/fungi.

Large blocks of unfragmented land play an important role in providing habitat for threatened, endangered, proposed (TEP), and sensitive plant species (USDA FS 2000). It is expected that TNF IRAs provide important biological strongholds for native plant species and communities just as they do across the nation. Native plant communities and sensitive/watchlist occurrences within TNF IRAs are less likely to be exposed to disruption by human activities such as collection, trampling, and other disturbance. Cross country travel increases the risk of collection, trampling and other disturbances to native plants/plant communities. This is especially true in the East/West Yuba IRAs. Within the Sierra Nevada, the East/West Yuba IRAs have been identified as having less human presence than any other old growth forests in the range. This lower level of human disruption increases the probability that the East/West IRAs are important references for understanding the natural composition and dynamics of native plant communities. Cross country travel within these IRAs increases the probability that native plant community composition and ecological function would be negatively impacted.

TNF IRAs are currently less likely to experience problems with nonnative invasive species (weeds) and are more likely to be able to maintain intact native plant communities. Native plants/plant communities are at increased risk of adverse cumulative effects from increased population growth and associated land uses, land conversions, and nonnative species invasions throughout the Sierra Nevada. Therefore, the value of relatively unfragmented blocks of land such as IRAs is likely to increase as native plant communities are degraded. Implementation of the No Action Alternative increases the risk of native

plant community loss and degradation. Native plant community loss and degradation from the invasion and/or encroachment of non-native plant species are increasing within the Sierra Nevada and implementation of the No Action Alternative could increase the rate of loss.

Action alternatives: All of the action alternatives reduce impacts to native plants/plant communities by reducing the number of unauthorized routes closed NFTS roads designated motorized vehicle use within IRAs and prohibiting cross country travel. The action alternatives that propose the addition of the most miles to the NFTS within IRAs have the greatest risk of negatively impacting native plant communities. The risk to native plants/plant communities is closely tied to the high risk of introducing and spreading weeds and generally increasing human presence in areas of large intact native plant communities (IRAs).

Alternative 5: Compared to the No Action Alternative, Alternative 5 reduces overall impacts to native plants/plant communities by reducing the number of unauthorized routes and closed NFTS roads still receiving some motorized use available to motorized vehicles within IRAs and prohibiting cross country travel. Of the action alternatives, implementation of Alternative 5 has the greatest risk of negative impacts to native plants/plant communities because it proposes the addition of the most miles of unauthorized routes located in IRAs (about 10 miles). These proposed additions are located primarily in the East/West Yuba IRAs; about 3 miles of unauthorized route within the East Yuba IRA, about 4 miles within the West Yuba IRA, about 1 mile in Castle Peak and about 1 mile in Grouse Lakes. In addition, Alternative 5 proposes to reopen about 2 miles of ML 1 within the West Yuba IRA. Therefore, of the action alternatives, implementation of Alternative 5 has the greatest risk of negatively impacting native plants/plant communities within the East/West Yuba IRAs. Refer to the discussion under the No Action Alternative. Over the long term these additions to cumulative impacts could be significant if native plant community composition and ecological function are severely impacted. Much is unknown regarding the amount of intact older forest plant community that is needed to maintain species composition and ecological function within the various types in the Sierra Nevada. However, as mentioned above, the East/West Yuba IRA areas have been identified as unique and important old forest areas (SNEP).

Alternatives 2 and 7: Compared to the No Action Alternative, Alternatives 2 and 7 reduces overall impacts to native plants/plant communities by reducing the number of unauthorized routes and closed NFTS roads available to motorized vehicles within IRAs and prohibiting cross country travel. Implementation of Alternatives 2 and 7 could also negatively impact native plants/plant communities within IRAs because they propose the addition of about 8 and 6 (respectively) miles of unauthorized routes in IRAs. These proposed additions are also located primarily in the East/West Yuba IRAs. Alternative 2 proposes about 2 miles of unauthorized routes within the East Yuba IRA, about 4 miles within the West Yuba IRA, 1 mile within Castle Peak and about 1 mile within Grouse Lakes. Alternative 7 proposes about 1 mile of unauthorized route within the East Yuba IRA, about 3 miles within the West Yuba IRA, about 1 mile in Castle Peak, and about 1 mile in Grouse Lakes. Alternatives 2 and 7 do not propose to reopen any ML 1 roads with in the IRAs. Therefore, the risk of negatively impacting native plants/plant communities within the East/West Yuba IRAs is not as high as under Alternative 5. However the risk is higher in Alternative 2 than in Alternative 7. Over the long term Alternatives 2 and 7 additions

to cumulative impacts could change native plant community composition and ecological function within IRAs. As discussed above, the significance of these possible impacts are unknown at this time.

Alternative 6: Compared to the No Action Alternative, Alternative 6 reduces overall impacts to native plants/plant communities by reducing the number of unauthorized routes and closed NFTS roads available to motorized vehicles within IRAs and prohibiting cross country travel. Implementation of Alternative 6 could also negatively impact native plants/plant communities within IRAs because it proposes the addition of about 4 miles of unauthorized routes in IRAs. These proposed additions are located in the East Yuba (2 miles), Castle Peak (1 mile) and the Grouse Lakes IRAs (1 mile). Alternative 6 does not reopen any ML 1 roads with in the IRAs. Implementation of Alternative 6 has less risk of negatively impacting native plants/plant communities within the East Yuba IRA than Alternatives 2, 5, and 7 and would not add to the cumulative impacts to the West Yuba IRA. The risk of negative impacts to native plants/plant communities within the Castle Peak and Grouse Lakes IRAs is about the same in Alternative 6 as it is in Alternatives 2, 5, and 7. The significance of these possible impacts is unknown.

Alternatives 3 and 4: Compared to the No Action Alternative, Alternatives 3 and 4 reduces overall impacts to native plants/plant communities by reducing the number of unauthorized routes and closed NFTS roads available to motorized vehicles within IRAs and prohibiting cross country travel. Implementation of Alternatives 3 and 4 have the least risk of negative impacts to native plants/plant communities within IRAs. Alternatives 3 and 4 do not propose additions to the NFTS or propose reopening ML 1 roads within IRAs. Implementation of Alternatives 3 and 4 would benefit sensitive/watchlist species (if they occur there)/native plants/plant communities by reducing the risk of weed introduction and spread by motorized vehicles. The value of large blocks of land such as IRAs in conserving sensitive/watchlist species and/or watchlist plant communities is likely to increase as native plant communities are lost and/or degraded throughout the Sierra Nevada region through development, climatic change, and weed infestation.

Summary of Effects Analysis across All Alternatives

Table 3.06-15 summarizes the effects analysis for botanical resources by ranking each alternative regarding how well it provides for each of the indicators. This summary is not meant to convey that the indicators are equal in importance. The following rankings were used: A score of 7 indicates the alternative has the least impact for native plants/plant communities to the indicator. A score of 1 indicates the alternative has the most impact for native plants/plant communities related to the indicator.

Table 3.06-15. Comparison of Effects to Plants/Plant Communities

Indicator	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Acres where cross country travel is prohibited thereby reducing the mileage of route available for motorized use within 100 feet of riparian vegetation	1	3	7	6	2	4	5
Number of perennial and intermittent water crossings	1	3	7	6	2	4	5
Aquatic/riparian dependent sensitive/watchlist species and/or watchlist plant communities within 0-100 feet of roads	1	3	7	6	2	4	5
Acres where cross country travel is prohibited thereby reducing the mileage of route available for motorized use that pass through serpentine (ultramafic) soils	1	3	7	5	2	6	4
Serpentine dependent sensitive/watchlist species within 0-100 feet of route	1	3	7	5	2	6	4
Acres where cross country travel is prohibited thereby reducing the mileage of route available for motorized use within older forest plant communities	1	3	7	6	2	4	5
Acres where cross country travel is prohibited thereby reducing the mileage of route available for motorized use within oak woodland plant communities	1	3	7	6	2	4	5
Acres where cross country travel is prohibited thereby reducing the mileage of route available for motorized use within forest edges/openings	1	3	7	6	2	4	5
Acres where cross country travel is prohibited thereby reducing the mileage of route available for motorized use within high elevation openings and rocky areas	1	3	7	6	2	4	5
High elevation opening dependent sensitive/ watchlist species located 0-100 feet of route	1	3	7	6	2	4	5
Sensitive/watchlist species and/or watchlist plant communities located within 0-100 feet of routes with weed occurrences within 0-100 feet of the route	1	3	7	6	2	4	5
Weed infestations within 0-100 feet of route	1	3	7	6	2	4	5
Acres where cross country travel is prohibited thereby reducing the mileage of route available for motorized use within IRAs	1	3	7	6	2	5	4
Average	1	3	7	5.8	2	4.4	4.8