3……: Weed Risk Assessment- Stanislaus NF

Executive Summary

The draft Environmental Impact Statement (DEIS) for this project analyzed 5 alternatives. The preferred alternative (Alternative 1) proposes to: prohibit cross country travel and would add 157.39 miles of motorized trail un-authorized for motorized use to the NFTS; impose wet weather seasonal closures on all native surface trails; and change 99.6 miles of existing National Forest Transportation System (NFTS) trails from "open to highway legal vehicles only" to "open to all vehicles."

Weed surveys are complete for about 2622.96 acres of the analysis area. The current collected data consists of approximately 650 proposed and existing routes, with 29.52 miles of motorized routes infested with noxious weed and invasive plant species (project record) within the analysis area. Most of the numbers presented in this document contain figures derived from limited metadata with the shapefiles submitted by three districts on the Stanislaus National Forest (STF). Although the majority of data presented in this document is a generalization of the known weed occurrences presented by the botanists on the forest, precision and accuracy of this data is lacking. As a result, all points, polygons and shapefiles with invasive plants were analyzed using 200 feet as the measure to existing and proposed routes. Additionally, 200 feet was chosen to define the distance that weed seed could travel on tires. In reality, the distance is probably further than 200 feet and/or less than 200 feet dependent on many factors.

Currently there are an estimated 2,623 acres of documented weed infested lands within the analysis area of the Stanislaus National Forest (STF), including approximately 30 miles of weed infested motorized routes. The following summary (Table 1) provides information for the weed risks from implementation of all of the alternatives, including Alternative 1, the proposed action alternative. All of the alternatives have a high risk of introducing weeds into new areas and spreading weeds from areas that are already infested with weeds.

Table 1

Factors	Variations	Risk
1. Inventory	Surveys of all the motorized trails proposed for addition to the NFTS in Alternative 1 are not complete. Surveys of portions of proposed motorized trails showed that cheat grass, yellow star thistle, bull thistle, Klamath weed, and medusahead grass occur within 200 feet of some of the proposed motorized trails.	High risk
2. Known noxious weeds	There are many weed occurrences known to occur along Federal, State, County, and NFTS roads and trails. Weed occurrences include yellow star thistle, milk thistle, cheat grass, medusahead grass, and others.	High risk
3. Habitat vulnerability	Motorized vehicle use disturbs habitats they pass through creating conditions favorable for weed introduction and spread. They are recognized as vectors for introducing and spreading weeds into new areas.	High risk
4. Non-project dependent vectors	People use NFTS roads and trails and motorized trails un-authorized for motorized use for a variety of activities including, mining, grazing access, mountain bike trails, horse-back riding, and hiking. These activities add to the likelihood of weed introduction.	Moderate to high risk
5. Habitat alteration	Implementation of this project will reduce the amount of	High risk

Factors	Variations	Risk
expected as a result of project.	ground cover and shade in and along the motorized vehicle roads/trails/areas and will keep those areas in a disturbed state.	
6. Increased vectors as a result of project implementation	Use of the NFTS motorized roads and trails and motorized trails un-authorized for motorized use are expected to increase.	High risk
7. Mitigation measures	Preventative measures incorporated into the project proposal are primarily designed for motorized trail maintenance and restoration and include using weed-free mulch and other plant materials if needed for erosion control, and washing equipment before it comes into a project area if it is coming from weed infested areas.	High risk. Preventative measures can not mitigate the high risk associated with use of the motorized vehicle roads/trails/areas.
8. Anticipated weed response to proposed action	Little reduction in overall risk through preventative measures.	High risk

Introduction

Extensive infestations of weeds can permanently degrade National Forest System (NFS) lands. The term "permanently degraded" relates to today's economics and technology. Invasive non-native plants (weeds) have already taken over or severely impaired millions of acres of western Federal lands. The biodiversity of the Sierra Nevada region is undergoing change due to alterations in human uses and fire regimes, climate change, and invasions by non-native species (Di Antonio et al. 2004). In general terms, Stanislaus NFS lands are primarily weed free, with most weed occurrences located along roads. Table 1. displays the list of weeds known to occur on the STF.

Invasive plant species are one of the greatest threats to wildlands in the United States (Mullin et al. 2000). Weed infestation and spread is one of the greatest negative impacts to maintaining or improving the health of the NFS lands. Climate changes will result in massive geographical shifts in locations of sites that provide environments for native plants. Opportunities for replacement of native species with undesirable exotic organisms will be enhanced (Franklin 2003).

A warming climate in the western part of the United States will often lead to an upward elevational migration of plant species. Rapid changes in climate may cause a loss of native plant species from the lower elevations if they can not migrate upward and establish fast enough. Stressed communities with fewer plant species distributed over large areas could have an increase in the quantity of unused resources. These stressed communities are then more available for the invasion and establishment of weeds (Tausch 2008).

When an area is heavily infested with weeds, they directly compete with native plants and can cause 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 and flooding, minimizes erosion, promotes water infiltration and storage, along with providing wildlife and recreation values. Areas infested with weeds do not provide resilience to drought, flooding, minimize erosion, promote water quality and quantity, or provide wildlife and recreational values 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.

Table 2 presents a list of the known noxious weeds and invasive plants within the analysis area of the STF. The table also provides the California weed list status for noxious weeds, and a rating for the ecological impact of each species (Calweeds Database, California Invasive Plant Council website).

TABLE 2
Noxious Weeds and Non-native Invasive Plants
on the Stanislaus National Forest

Common Name	**Botanical Name**	**Annual/ Perennial**	**CA Weed Status ***	**California Invasive Plant Council * ***
Russian knapweed	*Acroptilon repens*	Perennial	BW	Moderate
Jointed goatgrass	*Aegilops cylindrica*	Annual grass	BW	--
Barbed goatgrass	*Aegilops triuncialis*	Annual grass	BW	High
Tree-of-heaven	*Ailanthus altissima*	Deciduous tree	Non-native	Moderate
Giant reed	*Arundo donax*	Perennial grass	Non-native	High
Black mustard	*Brassica nigra*	Perennial	Non-native	Moderate
Cheatgrass	*Bromus tectorum*	Annual grass	Non-native	High
Hoary cress	*Cardaria draba*	Perennial	BW	Moderate
Whitetop	*Cardaria pubescens*	Perennial	BW	Limited
Italian thistle	*Carduus pycnocephalus*	Annual	CW	Moderate
Slenderflower thistle	*Carduus tenuiflorus*	Annual	CW	Limited
Smooth distaff thistle	*Carthamnus baeticus*	Annual	BW	--
Woolly distaff thistle	*Carthamnus lanatus*	Annual	BW	Moderate
Purple starthistle	*Centaurea calcitrapa*	Annual to Perennial	BW	Moderate
Diffuse knapweed	*Centaurea diffusa*	Annual to Perennial	AW	Moderate
Iberian starthistle	*Centaurea iberica*	Annual to Biennial	AW	--
Spotted knapweed	*Centaurea maculosa*	Perennial	AW	High
Tocalote/ Malta starthistle	*Centauria melitensis*	Annual	Non-native	Moderate
Yellow starthistle	*Centaurea solstitialis*	Annual	CW	High
Squarrose knapweed	*Centaurea virgata* ssp. *squarrosa*	Perennial	AW	Moderate
Rush skeletonweed	*Chondrilla juncea*	Perennial	AW	Moderate
Canada thistle	*Cirsium arvense*	Perennial	BW	Moderate
Bull thistle	*Cirsium vulgare*	Biennial	Non-native	Moderate
Field bindweed	*Convolvulus arvensis*	Perennial Vine	CW	--
Bermuda grass	*Cynodon dactylon*	Perennial	CW	Moderate

Scotch broom	*Cytisus scoparius*	Deciduous Shrub	Non-native	Moderate
Quackgrass	*Elytrigia repens*	Perennial Grass	BW	--
Leafy spurge	*Euphorbia esulus*	Perennial	AW	High
Oblong spurge	*Euphorbia oblongata*	Perennial	BW	High
Fennel	*Foeniculum vulgare*	Perennial	Non-native	High
French broom	*Genista monspessulana*	Deciduous Shrub	CW	High
Hydrilla	*Hydrilla verticillata*	Aquatic herb	AW	High
Klamath weed	*Hypericum perforatum*	Perennial	CW	Moderate
Dyers woad	*Isatis tinctoria*	Perennial	BW	Moderate
Tall whitetop/ perennial pepperweed	*Lepidium latifolium*	Perennial	BW	High
Oxeye daisy	*Leucanthemum vulgare*	Perennial	Non-native	Moderate
Dalmation toadflax	*Linaria genistifolia* ssp. *dalmatica*	Perennial	AW	Moderate
Purple loosestrife	*Lythrum salicaria*	Perennial	BW	High
Parrot feather watermilfoil	*Myriophyllum aquaticum*	Aquatic Herb	Non-native	High
Eurasian milfoil	*Myriophyllum spicatum*	Aquatic Herb	CW	High
Black locust	*Robinia pseudoacacia*	Deciduous Tree	Non-native	
Himalaya blackberry	*Rubus discolor*	Perennial Vine	Non-native	High
Cut-leaved blackberry	*Rubus laciniatus*	Perennial Vine	Non-native	High
Bouncing bet	*Saponaria officionalis*	Perennial	Non-native	--
Russian thistle	*Salsola tragus*	Annual	Non-native	Limited
White horsenettle	*Solanum elaeagnifolium*	Perennial	BW	--
Johnson grass	*Sorghum halepense*	Perennial Grass	CW	--
Spanish broom	*Spartinum junceum*	Deciduous Shrub	Non-native	High
Milk thistle	*Silybum marianum*	Annual or Biennial	Non-native	--
Medusahead grass	*Taeniatherum caputmedusae*	Annual Grass	CW	High
Puncturevine	*Tribulus terrestris*	Annual Herb	Non-native	--
Gorse	*Ulex europaeus*	Thorny Shrub	BW	High
Woolly mullein	*Verbascum thapsus*	Perennial	Non-native	Limited

*†Code	Weed Status
AW	A list (noxious weeds)
BW	B list (noxious weeds)
CW	C list (noxious weeds)
NAW	Noxious aquatic weed
PN	Public nuisance
Q	Quarantine
QW	Q list (temporary "A" list noxious weed, pending final determination)

**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.

The exotic plant species that have the potential to reduce local diversity or transform ecosystems have been called “transformer species” (D’Antonio et al. 2004). Transformer species have the potential to form monotypic stands, and greatly alter resource availability, trophic structure, ecosystem productivity, and/or disturbance regimes (ibid). Some of the transformer species invading the Sierra Nevada include: cheatgrass *(Bromus tectorum*), medusahead (*Taniatherum caputmedusae*), yellow star thistle (*Centaurea solstitialis*), spotted, diffuse and Russian knapweed (*Centaurea maculosa, C. diffusa, and Acroptilon repens* respectively), perennial pepperweed/tall whitetop (*Lepidium latifolium*), purple loosestrife (*Lythrum salicaria*), dalmatian toadflax (*Linaria genistifolia var. dalmatica*), leafy spurge (*Euphorbia esula*), gorse (*Ulex europaea*), French broom (*Genista monspessulana*), Scotch broom (*Cytisus scoparius*), Spanish broom (*Spartium junceum*) and Himalayan blackberry (*Rubus discolor*) (ibid). A few of these weeds are widespread, but many are still relatively restricted within the Sierra Nevada (SNFPA 2001 in D’Antonio et al. 2004). There are numerous factors used to assess weed risk. Weed risk is higher if a seed source is close to or within the proposed addition to the NFTS. Areas that have been recently disturbed are more vulnerable.

Developing/implementing mitigation measures can reduce the risk of weed seed/plant parts being introduced into new areas in some cases. Some weeds are more aggressive than others and would have a different response to motorized vehicle activity. Areas that have not been surveyed also have a high risk of weed presence and increased rate of spread because there is a higher likelihood that weeds that are introduced will go undetected and continue to spread. Surveys of the roads/trails/areas within the analysis area are not complete.

Current Management Direction

State and Federal laws, Forest Service direction, and other regulatory direction that is relevant to the management and prevention of noxious weeds and applicable to this project include:

1. **Forest Service Manual (FSM) 2080 -** Noxious Weed Management includes a policy statement calling for a risk assessment for noxious weeds to be completed for every project. Specifically, the manual states: *2081.03 – Policy*: When any ground disturbing action or activity is proposed, determine the risk of introducing or spreading noxious weeds associated with the proposed action. For projects having moderate to high risk of introducing or spreading noxious weeds, the project decision document must identify noxious weed control measures that must be undertaken during project implementation. Use contract and permit clauses to prevent the introduction or spread of noxious weeds by contractors and permittees. For example, where determined to be appropriate, use clauses requiring contractors or permittees to clean their equipment prior to entering NFS lands. *2081.2 - Prevention and Control Measures*: Determine the factors that favor the establishment and spread of noxious weeds and design management practices or prescriptions to reduce the risk of infestation or spread of noxious weeds. Where funds and other resources do not permit undertaking all desired measures, address and schedule noxious weed prevention and control in the following order:
    - **First Priority**: Prevent the introduction of new invaders,
    - **Second Priority**: Conduct early treatment of new infestations, and
    - **Third Priority**: Contain and control established infestations.

2. **Executive Order 13112** of February 3, 1999 directs federal agencies to prevent the introduction of invasive species, detect and respond rapidly to and control such species, not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species unless the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.
3. **Sierra Nevada Forest Plan Amendment (SNFPA) standard and guidelines (S&Gs)**: The SNFPA (2004) lists 14 S&Gs for management of noxious weeds. In summary, the S&Gs applicable to this project direct the Forest to conduct a noxious weed risk assessment that includes weed risk, prevention, and treatment in this DEIS (NEPA document).

Description of the Alternatives

Five alternatives are analyzed in detail 9Refer to Chapter 2 of the DEIS for a complete description of the alternatives). Chapter 2 of the DEIS is included in this report by reference.

Existing Environment (Plant Communities and Habitats)

Surveys of proposed additions to the NFTS within the analysis area are not complete. It is possible that the unsurveyed motorized trails have weeds growing within and adjacent to them. Table 1. lists the weeds that are known to occur on the within the analysis area of STF and the ecological impact rating of those weeds. There are known occurrences of weeds along several motorized NFTS motorized roads/trails. A weed risk analysis is provided in this document under each alternative for motorized vehicle use of NFTS roads/trails. The motorized vehicle use of NFTS motorized roads and trails contribute to the cumulative impacts.(Project Record) presents the tables for each alternative, providing the motorized routes, the acronym for each weed species within 200 feet of each route, the Ranger District and the quad name.

The following discussion summarizes what is known about the most commonly encountered weeds on STF system lands/along proposed additions to the NFTS.

Cheatgrass (*Bromus tectorum*): Cheatgrass is a non-native annual grass that is found in most of the United States, Canada and northern Mexico (Sheley and Petroff 1999). It is found in sagebrush semi-desert in the southern Great Basin to coniferous forest of the Rocky Mountains. Cheatgrass can significantly alter native rangeland vegetation composition through competitive exclusion of native species reproduction and the facilitation of wildfires (ibid). Once introduced, it rapidly spreads into adjacent rangeland vegetation. The sites most susceptible to cheatgrass invasion are those that have deep, loamy soils, south-facing slopes, and 12 to 22 inches (30 to 56 cm) of annual precipitation that peaks in late winter or early spring (Sheley and Petroff 1999). However, high plasticity allows the species to grow under a variety of site conditions. Humans can transport seeds in vehicles and clothing. Cheatgrass can dramatically influence plant community composition by its effects on the fire regime (ibid). For example, prior to European settlement, the fire free intervals probably varied from 20 to 25 years in higher elevation mountain big sagebrush (Artemisia tridentata vaseyana), to 50-100 years in drier Wyoming big sagebrush (Artemisia tridentata wyomingensis) habitat types that dominated the Snake River Plain. The Snake River Plain now burns at intervals of 5 years or less because cheatgrass has

increased the continuity of fine-textured fuels, which promotes frequent and larger fires (ibid). Although fire greatly reduces the density of cheatgrass plants the next growing season, the plants that establish produce so much more seed per plant, that the post-burn seed production for a site may increase by a factor of 100 (J.A. Young 1998 personal communication). Cheatgrass occurs adjacent to or within 200 feet of several proposed motorized trails – refer to Table 2. Cheatgrass has a high ecological rating. Cheatgrass is spread a short distance by wind and caching rodents (DiTomaso and Healy 2007). It is spread greater distances with water and soil movement and by clinging to animals and clothing (ibid). It is known to be transported long distances through recreational and other activities (ibid).

Cheatgrass exists and will continue to spread within the forest. It will remain patchy in occurrences on the westside of the forest and will not cover large areas unless all vegetation is removed from those areas, such as in a large wildfire. On the eastside of the forest, it will continue to spread especially in disturbed areas. Cheatgrass will eventually take over plant communities such as sagebrush/bitterbrush if those plant communities experience continued disturbance. This is especially true after wildfire events. Native plant and animal diversity would be reduced in those areas of cheatgrass infestation. Currently there are an estimated 46.50 acres of cheatgrass within the analysis area.

Italian thistle (*Carduus pycnocephalus*): This thistle is native to the Mediterranean region of southern Europe. It is an annual, sometimes biennial, that flowers in May and June and is generally senescent by mid July. Italian thistle infests roadsides and waste areas, and can be a major problem on hill side pasture land. Italian thistle will continue to spread on the forest. It will move into drier habitats that lack soil cover such as along roads and trails. It is spread primarily by vehicles and wind dispersal. Currently there are an estimated 8 acres of Italian thistle within the analysis area.

Tocalote or Malta starthistle (*Centaurea melitensis*): Tocalote or Malta starthistle is native to southern Europe (DiTomaso and Healy 2007). It grows in a variety of soils and habitats but is generally found in fields, along roads and in openings. It spreads by seeds primarily through human activities such as road maintenance and on vehicles. Dense infestations displace native plants. Currently there are an estimated 150 acres of Tocalote within the analysis area.

Yellow starthistle (*Centaurea solstitialis*): Yellow starthistle is native to the Mediterranean region of Europe. It was initially introduced around 1850 to Oakland California (Mullin et al 2000) as a seed contaminant in alfalfa imported from Chile. It is a deep-rooted annual that flowers during the dry summer months, after most other Mediterranean-climate species have set seed. Yellow star thistle displaces native plant communities and reduces plant diversity (Sheley and Petroff 1999, Mullin et al 2000). Once established, it reduces wildlife habitat and forage, displaces native plants, and decreases native plant and animal diversity. It has the ability to germinate rapidly under favorable and unfavorable field conditions. This allows yellow star thistle the opportunity to capture and use resources before neighboring species. It spreads by seed through many mechanisms of dispersal, including wind, erosion, animals and vehicles.

Yellow star thistle will continue to spread on the forest, but is most abundant at lower elevations. It will move into drier habitats that lack soil cover such as along roads and trails. It will also move into areas on the landscape that lack soil cover. In many areas, it is spread primarily by road maintenance and on vehicles. This species has a high ecological impact to native plant communities and spreads aggressively. Currently there are an estimated 2,183 acres of yellow starthistle within the analysis area.

Bull thistle (*Cirsium vulgare*): Bull thistle is found in disturbed or degraded land such as roadsides (Sheley and Petroff 1999). Disturbance favors bull thistle because seed production and seedling establishment are enhanced under disturbed conditions. Water, animals and human activities disperse the seed. Wind may also disperse seed, but at a lesser extent. Bull thistle will continue to spread throughout the forest. The areas most likely to experience bull thistle infestation include those where bare ground is formed, native vegetation is reduced, and a seed source is near. Vehicle use creates bare soils and eliminates native vegetation. Plant communities that are in healthy condition will eventually crowd out this disturbance-loving thistle. However, continued disturbance will spread it. This plant species has a moderate ecological impact. Currently there are an estimated 33 acres of bull thistle within the analysis area.

Klamath weed (*Hypericum perforatum*): Klamath weed is a native of Europe. It has been introduced throughout the world. Introduction of a successful biological control agent has reduced infestations by 99 percent in many areas of the western United States. However, other populations are still increasing in size even though the biological controls are present (Sheley and Petroff 1999). St. Johnswort seedlings are not strong competitors with other vegetation for light, nutrients, space, and moisture (ibid). They may exhibit high mortality under stress conditions (ibid). Wind (short distances), animals and/or humans (long distances) disperse seeds (ibid). Prevention through biological agents is easier, more environmentally desirable, and more cost-effective than the management of large-scale infestations.

Klamath weed will continue to spread on throughout the forest. Occurrences will remain patchy and will be located primarily along the sides of roads and trails. Klamath weed seedlings are not strong competitors, therefore, reducing competing vegetation benefits seedling success. It is anticipated that it will remain in disturbed areas. However, it is also expected that existing biological control agents will control this weed so it does not become widespread. Currently there are an estimated 43 acres of Klamath weed within the analysis area.

Himalayan blackberry (*Rubus discolor*): There are 2 non-native Rubus species in California (Himalayan – *Rubus discolor,* and cutleaf – *Rubus laciniatus*). Himalayan blackberry is the most common and trouble-some. Himalayan blackberry is native to Western Europe and was probably introduced to North America in 1885 as a cultivated crop (Bailey 1945 in Brossard et al. 2000). By 1945, it had become naturalized along the West Coast. It produces many seeds that are readily dispersed by mammals and birds. Seeds are also spread via rivers and streams, and it spreads vegetatively. It is known to grow well on a variety of soils including barren, infertile soil types. Himalayan blackberry colonizes areas initially disturbed and then neglected by humans and can dominate areas if not controlled (Brossard et al. 2000). It is a strong competitor that rapidly displaces native plants. This blackberry will continue to spread on the forest. Vehicle use will create bare soil within wet habitats and transport seed. Creation of more bare soil allows the blackberries to spread more rapidly. Currently there are an estimated 9.5 acres of Himalayan (4.4 acres) and cutleaf (5.1 acres) blackberries within the analysis area.

Medusahead grass (*Taeniatherum caputmedusae)*: This grass species, introduced from Eurasia, is an aggressive winter annual. It has infested millions of acres of semi-arid rangeland in the Pacific Northwest. It is extremely competitive, crowding out other undesirable species. Infested ranches have suffered 40 to 75 percent reductions in grazing capacity. Control of small isolated infestations is critical (Whitson, Burrill, Dewey, Cudney, Nelson, Lee, and Parker, 1992). This grass is considered an extremely high risk to ecological health because it is such a strong competitor with other vegetation. It is typically displaces native vegetation, infesting disturbed soils. Vehicles will perpetuate the spread of this species by spreading seed. Currently there are an estimated 140 acres of medusahead grass within the analysis area.

Woolly mullein (*Verbascum thapsus*): This biennial plant is native to Asia and is common throughout the temperate parts of North America (Whitson et al 1996). It is difficult to control due to the large number of seeds produced per plant. This plant is not considered a high risk to ecological health because it is not a strong competitor with other vegetation. It is usually replaced by native vegetation in the long term. Woolly mullein will continue to spread throughout the forest via seeds. Vehicles will spread seeds by moving them from place-to-place in soil or mud. Continued disturbance will create new areas for it to move into. Currently there are an estimated 2.3 acres of woolly mullein within the analysis area.

Table 2 presents the number of acres of weed infestations by species tallied for the analysis area.

TABLE 3
Weed Species Acreages

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

General Effects of Motorized Vehicle Use

Background: The STF is located in a part of the Sierra Nevada where biodiversity is at increased risk due to alterations in human uses, fire regimes, climatic change and changes brought about by weed invasion (D' Antonio et al. 2004). In general terms, the majority of the STF 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 and provide the entry points for many weeds into the STF. These infestations are a major "source" for weeds that are moving upslope into coniferous forests. On the eastside of the forest, many weed infestations appear to travel and spread from the state of Nevada.

When an area is heavily infested with weeds, the weeds directly compete with native plants, causing 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, D' 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, including rare plant habitats.

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).

Motorized vehicle use and weed introduction and spread: 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. Motorized vehicle use disturbs native plant communities, creating conditions more suitable for weed growth by reducing native plant cover. 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.

The disturbed areas within and adjacent to major highways, general forest roads, two-tracked non-maintained roads, and motorcycle trails (system trails and motorized trails un-authorized for motorized use) provide habitat for any weed seed deposited there. Loss of native vegetation due to season of use of the motorized vehicle has not been fully studied. However, 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.

Fuel pattern changes: Establishing new areas for motorized vehicle use increases the risk of weeds being introduced into new areas and changing the fuel patterns in that area. Motorized vehicle roads/trails/areas can act as breaks in the landscape fuels. However, areas that are disturbed can have much higher weed abundance than adjacent undisturbed areas. For example, one study found that weeds were over 200 percent higher on fuel breaks than in adjacent wildland areas (Merriam et al. 2005). Fuel breaks/disturbed areas/the shoulders of motorized roads/trails/areas can provide establishment sites for weeds and those weeds may move into surrounding areas, especially if those surrounding areas have been disturbed. Yellow starthistle, cheatgrass, and other weeds all change the arrangement of vegetation, the amount of soil moisture at specific times of the year, the amount of fuel available to burn, and fire behavior. In addition, motorized vehicle use of the various motorized trails 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, yellow starthistle and medusahead have the competitive edge over native plants when the burned area begins to revegetate.

Effects to soils: 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. 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.

Rate of spread: The rate that weeds are introduced to a new motorized trail is unknown. In one study, Rooney (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 carries 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 motorized trails had reached a weed saturation level. This prediction was based on the lack of constant, extensive, effective surveillance of motorized trails. 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, one half mile was thought to define the distance that weed seed would travel on tires. In reality, the distance is probably further than 200 feet and less than 200 feet dependent on many factors.

Impacts to rare plants/plant communities: Sensitive plants, lichen and mosses and/or watchlist plants/plant communities located in and/or near motorized vehicle roads/trails/areas have a high

risk of negative impacts from weed introduction and spread. Several of the known occurrences of weeds in the analysis area of the STF are known to directly and indirectly impact sensitive plant occurrences. For example, two sites of the sensitive species *Erythronium tuolumnense* are currently being impacted by the invasion of yellow starthistle and milk thistle along an unauthorized route proposed for inclusion under Alternative 1. Rare plant occurrences located along roads/trails/areas are at increased risk of loss of individuals and habitat due to weed introduction and spread over the short and long term. The sensitive plant occurrences that have known weed occurrences located within 200 feet are at even greater risk of negative impacts from weed infestation.

Sensitive species were discovered within 200 feet of several proposed additional routes for Alternative 1; *Erythronim tuolumnense* along proposed 15EV43C infested with yellow starthistle, *Mimulus filicaulis* and *Horkelia parryi* along proposed routes 17EV192 and 17EV192A infested with yellow starthistle, *Lomatium stebbinsii* and *Allium tribracteatum* along proposed routes 17EV231 and 17EV88 infested with cheatgrass, and *Clarkia biloba* ssp. *australis* along proposed route FR98581 infested with yellow starthistle.

Yellow starthistle and cheatgrass have high ecological impact rating. Both of these species are aggressive competitors with many vectors spreading seed. Cheatgrass has a high ecological rating. Cheatgrass is spread a short distance by wind and caching rodents (DiTomaso and Healy 2007). Both cheatgrass and yellow starthistle spread greater distances with water and soil movement and by clinging to animals and clothing (ibid). Both weeds are known to be transported long distances through recreation uses, livestock and other activities. (USDA Walsh, Biological Evaluation).

Vegetative recovery in weed infested areas: Motorized vehicle use on motorized trails unauthorized for motorized use affects the recovery of native vegetation by the presence of weeds within and adjacent to that motorized trail. 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 motorized trail to revegetate with native species is dependent on many factors, including the species of weed at the site.

Motorized trail maintenance: As mentioned above, motorized vehicle roads/trails/areas on NFS lands are high-risk sites for the introduction and spread of weeds (Ferguson et al. 2003). Transporting seeds and weed parts on vehicles, removing competing vegetation, and mixing soil during maintenance and construction provide ideal conditions for the introduction, germination and establishment of weed seeds (ibid). Grading disturbs soil and competing vegetation, and transports soil, weed seeds and weed parts to new locations. Cleaning ditches 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 and parts to new locations. This movement of weed seed and 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 be infested with weeds. When that aggregate is moved to a new location, the weeds go with it. Those alternatives that propose the greatest number of miles of roads/trails/areas will have the greatest need for maintenance and the highest risk of weed introduction into new areas.

Effects of dispersed camping, campgrounds, and trailheads: 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. The “areas” referred to in this analysis are the roads/trails (spurs) that lead to dispersed camping sites. Motorized vehicle use on these spurs adds to the cumulative impacts of motorized vehicle use on NFS lands. Since the spurs lead to

dispersed camping sites and/or away from campgrounds/trailheads, use of dispersed camping sites, campgrounds and trailheads also adds to the cumulative effects of motorized vehicle use on NFS lands. Campgrounds and trailheads are frequently the first sites on NFS lands that a motorized vehicle comes in contact with after leaving major highways. In some cases, the motorized vehicle is transported via trailer to the campground and trailhead. Therefore, campgrounds and trailheads frequently receive weed seed and plant parts. Campgrounds and trailheads have constant soil disturbance that provides a good seedbed for any weed seed that is deposited. In addition, users can also disperse weed seeds on their clothing, footwear, and camping equipment. Campgrounds and trailheads have a high risk of weed introduction. Those campgrounds and trailheads located in or near RCAs have a high risk of transporting weed seed and plant parts great distances. Many weeds are adapted to riparian areas and rapidly become established on sites where soils have been disturbed, (such as eroding stream banks, road and trail crossings, and motorized trails un-authorized for motorized use) and streams 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.

Native plant community fragmentation: The Sierra Nevada region is at increased risk of weed invasion. As mentioned above, this increased risk occurs at a time when the biodiversity of the Sierra Nevada region is undergoing change due to alterations in human uses, fire regimes, and climatic change - in addition to changes brought about by weed invasion (D' Antonio et al. 2004). The lower elevations on the westside of the forest currently contain the majority of weed infestations and provide the entry points for many weeds into the STF. Weed seed from these areas is being transported upslope into coniferous forests. The number of acres of STF system lands infested with weeds is currently estimated at 2,623 acres. Most weed infestations occur along roads and/or trails and in highly disturbed areas such as landings, burned areas, and dispersed camping areas. The higher the road density in an area the higher the risk for weed infestations to spread.

Adding motorized trails (to the NFTS) within large blocks of land unfragmented by motorized vehicle use increases the cumulative impacts to native vegetation on STF system lands by reducing the connectivity of native plant communities. Motorized vehicle use within large blocks of land that is unfragmented increases the risk that weeds will be introduced into these areas and spread – reducing the amount of native vegetation. Large blocks of land that lack motorized vehicle access are less likely to experience problems with weeds and are more likely to be able to maintain intact native plant communities. The largest blocks of land that exist on the STF that lack motorized vehicle access are wilderness, research natural areas and roadless areas. Eliminating motorized vehicles from natural areas is the most effective strategy for stopping the introduction of weeds into new areas (Rooney 2003).

Loss of water: Another impact of extensive weed infestation is loss of water. On the average, California receives about 200 million acre/feet of rainfall per year. About 60 percent or 125 million acre/feet of the total precipitation evaporates or is transpired by vegetation, which includes weeds. Ounce for ounce, weeds such as yellow starthistle absorb water at a faster rate than most native plants. Aggressive root development throughout the season enables weeds such as yellow starthistle to drain moisture away from soil layers where it would be available to localized annual and perennial grasses (Gerlach et al. 1998).

Season of Use, Temporary Order, Change in Class of Vehicles and Present and Reasonably Foreseeable Actions

Season of Use: In general terms, the season of use can benefit native vegetation but it is difficult to quantify those benefits. Motorized vehicle use, no matter what the season, provides a continuous source of weed seed introduction and also provides disturbed areas within and adjacent to the motorized road/trail/area. Loss of native vegetation due to season of use of the motorized vehicle has not been fully studied. However, weeds are known to be spread by motorized vehicle use regardless of the season of use. Native vegetation is 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, how much native vegetation is killed or injured, and/or the creation of bare soil. Weed seed and plant parts can be introduced into new areas regardless of the time of year the motorized trail is used. Many weed seeds remain viable for long periods of time and could be introduced along a motorized trail during the dry period of the year, and germinate during the wet period of the year.

However, it may be true that wet soil and weed seed clings to tires/vehicles more readily than dry soil and weed seed. If this is a reasonable assumption, prohibiting use of motorized trails when the soils are the wettest may reduce that rate of weed introduction and spread. This is an unproven assumption and the difference in rate of weed introduction can not be quantified. The number of variables that would affect the rate of introduction and spread along a specific motorized trail varies by such factors as type of weed, whether the motorized trail has wet/moist soil areas year-around, where the vehicle is coming from, and the weather that particular day (for example, did it rain). Therefore, in this analysis, season of use is not considered a significant variable when comparing impacts to native vegetation by alternatives.

The impact to native vegetation from the season that the motorized vehicle use occurs varies by plant community. However, the significance of beneficial or negative impacts from the season of use action is difficult to quantify for a number of reasons. Removing motorized vehicle use from NFTS motorized roads and trails, and motorized trails un-authorized for motorized use during the wet season does reduce the potential amount of erosion from that motorized road or trail that could occur especially if the motorized road or trail 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 rare plant and fungi species and/or rare plant communities is difficult. It is reasonable to assume that native vegetation located within 200 feet of a motorized trail would not benefit if it experienced soil erosion due to motorized vehicle use regardless of the season of use. Native vegetation in aquatic/riparian plant communities is always subject to erosion and/or soil rutting because those native plants grow in soils that are wet/moist year-around.

Change in class of vehicles: Changing the class of vehicle allowed to use a particular road does not change impacts to native vegetation. These roads already have hardened surfaces that lack vegetation. It is likely that direct impacts to native vegetation occurred when the road was developed. Indirect impacts of dust and increased risk of weed introduction still occur along native surface roads. These indirect and cumulative impacts would continue regardless of the type of vehicle using the road. In addition, there are no studies that indicate one type of vehicle spreads weed seed and/or weed plant parts more than another. 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 risks to native vegetation.

Implementation of present and reasonably foreseeable projects: Implementation of present

and reasonably foreseeable management activities also contributes to the introduction and spread of weeds (Project Record, cumulative effects). For example, fuel reduction/timber harvest/aspen improvement projects routinely require washing of equipment if it is coming to a project area from a weed infested area. However, implementation of fuel reduction/timber harvest/aspen improvement projects do not require treatment of weeds located along access roads or within existing landings or adjacent areas before new areas are disturbed. Soil disturbance is known to create conditions that are favorable to weed establishment if a seed source is near by. Ongoing projects such as utility corridor construction and maintenance require use of native plant materials for erosion control, but do not require vehicle inspection before vehicles drive down established corridors to inspect the utility corridors. On going livestock grazing projects are also known to spread weed seed on their coats or within droppings.

Alternative Implementation

Mitigation measures specified for impacts to sensitive plants by invasive weed species will be implemented in all of the action alternatives (Appendix XX). These mitigation measures will provide benefits to native vegetation. In addition, there are recommendations for road and vehicle maintenance included in the summary of this assessment. All alternatives carry a high risk of weed introduction into new areas over the long term because motorized vehicles are considered one of the main vectors for transporting weed seed and plant parts from place to place. The level of motorized vehicle use on a particular motorized trail does not necessarily relate to the amount of weed seed transported or the number of weed occurrences that become established on that motorized trail. Motorized vehicle use of a motorized trail un-authorized for motorized use just once could introduce weed seeds into a new area – it depends on where the vehicle has been, and when and where the weed seed falls off that vehicle. However, it is believed that the No Action - Alternative 2, which does not prohibit cross-country travel, has the greatest risks of weed introduction and spread. The second greatest risk for weed introductions and spread is Alternative 4 which has the greatest number of proposed additional unauthorized routes, followed by Alternative 1. Refer to Table 3 for the existing and additional miles of roads and trails available for motorized use.

Table 3 **Miles of road infested with Invasive weed species**
Within The STF Travel Management Analysis Area

Maintenance Level	NALT1	NALT2&3	NALT4	NALT5
ML3+ SLO	4.91	5.16	4.94	5.16
ML2	16.37	24.36	21.34	16.06
ML1	7.36	7.51	4.09	7.50
ML2 SLO	4.58	0.00	3.40	4.57
Grand Total	33.22	37.03	33.77	33.29
Total Motorized Roads (ML2, ML2 SLO & ML3)	**25.86**	**29.52**	**29.68**	**25.79**
Plus Motorized Trails (on AD Tables for BE sensitive plants noxious weeds.doc)	**0.80**		**4.00**	
Total Miles weed infested motorized routes (includes motorized roads and trails)	**26.66**	**29.52**	**33.68**	**25.79**

PROJECT DESCRIPTION

For the complete discussion of the project description by alternatives, refer to Chapter 22?? of the DEIS.

Alternative 1 (Proposed Action)

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

Alternative 2 (No Action)

The No Action Alternative provides a baseline for comparing the other alternatives. Under the No Action alternative, current management plans would continue to guide management of the project area. This alternative would **not** change the use of any NFTS roads and would not add any miles of NFTS motorized trails. Under this alternative, the agency would take no affirmative action (no change from current management or direction) and cross country travel with continued use of unauthorized routes would occur. It would include only existing seasonal closures and would not include any restrictions on motorized dispersed recreation access. No changes would be made to the current NFTS and no cross country travel prohibition would be put into place. The Travel Management Rule would not be implemented, and no MVUM would be produced. Motor vehicle travel by the public would not be limited to NFTS routes. Unauthorized routes would continue to have no status or authorization as NFTS facilities.

Alternative 3 (Cross Country Prohibited)

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

Alternative 4 (Recreation)

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

Alternative 5 (Resources)

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

List of Assumptions:

This evaluation of risk is also based on several assumptions to help analyze direct, indirect, and cumulative effects. These assumptions are listed below:

1.) Impacts caused by weed infestations to soils and vegetation are assumed to be within 200 feet for indirect and direct effects of the motorized trail.
2.) Native vegetation located within 200 feet of a proposed addition to the NFTS may be directly

and indirectly impacted by motorized vehicle use - regardless of the alternative selected.

3.) Reductions in native vegetation allow weeds to become established more readily.

4.) Unsurveyed motorized trails un-authorized for motorized use are assumed to have weeds until surveys have been completed.

5.) Non-native plants (weeds) will continue to spread along and within surfaced and native surfaced motorized roads and trails.

6.) NFTS motorized roads and trails and newly proposed additions to the NFTS could have increased use which may increase impacts to native vegetation through production of dust, increase in spread of weeds, etc.

7.) The projects identified in Appendix Forest wide Projects – Cumulative Effects Table will be analyzed and implemented on STF system lands within the next 5 to 10 years.

8.) All vehicles will need to be assumed "equal." Hence, the ability to spread weeds does not vary by motorized vehicle type. [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)].

9.) Weed seed can travel up to 200 feet on motorized vehicle tires. (It is recognized that the distance is probably further than 200 feet and less than 200 feet dependent on many factors.)

10.) It is assumed that all of the alternatives avoid long term cumulative impacts by frequently evaluating motorized trails, implementing mitigations to reduce impacts to native vegetation, and conducting early detection and treatment of weeds.

Indicator Measures: The following general indicator measures were used to compare alternatives. These indicator measures were selected based on literature review and profession judgment.

1. Weed infestations within 200 feet of the proposed motorized trail are considered to have moderate to high risk of spread. In this analysis, 200 feet was chosen to define the distance that weed seed could travel on tires. In reality the distance is probably further than 200 feet and/or less than 200 feet dependent on many factors.
2. Miles of unauthorized motorized trail proposed to add to the NFTS system.
3. Prohibition of cross country travel.
4. Cumulative effects including all of the above and the reasonably foreseeable.

Table 2 presents a summary of the risks and effects of weed infestations within 200 feet of motorized routes/trails by alternative.

TABLE 2
Risks and Effects Summary

Measure of Risk & Effect	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Number of weed infested additional routes	55	0	0	83	7
Number of weed infested existing and additional routes	431	458	376	459	383
Number of miles of weed infested routes	26.66	29.52	29.52	33.68	25.79
Number of weed occurrences w/in 200 feet of additional routes	70	0	0	97	7
Number of weed occurrences w/in 200 feet of additional and existing routes	741	736	671	768	678
Number of different weed species along additional routes	10	0	0	9	3
Number of different weed species along additional and existing routes	34	34	34	34	34

Alternative 1 – Proposed Action

Indicator Measure 1:
Implementation of this alternative has a high risk for weed spread and weed introduction and for indirect and direct effects on native vegetation and soils. Alternative 1 proposes to include 164.57 miles of additional routes, with 55 additional routes within 200 feet of weed occurrences. These occurrences of weeds include ten different species, comprising 70 weed occurrences within 200 feet of proposed additional routes for Alternative 1.

Indicator Measure 2:
Alternative 1 includes approximately 26.66 miles of roads infested with invasive plants, including 25.86 existing miles of infested routes and an additional 0.8 miles of proposed infested routes. Due to the high number of additional weed infested routes (55 routes), Alternative 1 has a high risk for the spread of existing infestations and for the introduction of new weed infestations.

Indicator Measure 3:
The short and long term risk of negative impacts to native plant communities from weed introduction and spread is lower for Alternative 1 than the no action alternative due to prohibiting cross country travel. Prohibiting cross country travel reduces the risk of introduction and spread of weeds by reducing the amount of NFS lands available for motorized travel.

Indicator Measure 4:
Implementation of Alternative 1 would cumulatively impact native vegetation in the short and long term by increasing the risk of weed introduction and spread on STF system lands. 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. The 55 additional motorized trails that are known to have weed infestations have a high risk of spreading weeds from these motorized routes into new areas.

It is assumed that all of the alternatives avoid long term cumulative impacts by frequently evaluating motorized trails, implementing mitigations to reduce impacts to native vegetation, and conducting early detection and treatment of weeds. Frequent motorized route/trail evaluation to detect weeds combined with rapid treatment of those weeds avoids significant impacts to STF system lands and native plant communities in the short and long term.

Most of the STF is considered relatively weed free. This relatively weed free state may indicate that a source of weed seed was not available when STF 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 STF 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 motorized trails 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).

In general terms, most weed occurrences on the STF are located along State/County/Federal/NFS roads. Weed infestations degrade NFS lands (including native plant communities) by directly competing with native plants and causing their displacement. Weeds are known to occur along both NFTS roads and trails and motorized trails un-authorized for motorized use. Ongoing management actions such as utility corridors maintenance, mining operation, providing recreational sites, 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 native plants for soil, water and nutrients in several locations.

Motorized vehicle use of NFTS motorized roads and trails are also an ongoing activity that is known to negatively impact native vegetation through the introduction of weeds. Motorized vehicle use of NFTS trails removes native vegetation, creating bare soil conditions. Dust from use of native surface road sand trails decreases native vegetation cover by reducing rates of photosynthesis, leaf conductance, transpiration, and water-use efficiency. Dust from motorized vehicle use has also been shown to increase temperatures of leaves and stems and decrease leaf surface areas (Munger et al 2003) negatively impacting plant vigor. Reduced native plant vigor increases the chance that weeds can become established.

Implementation of those projects identified in (Project Record – Cumulative) Effects may introduce weed seed and/or weed plant parts into new areas, even with washing the equipment that operates off roads, depending on whether or not the equipment is coming from a weed infested area. Generally it is required in most fuel reduction projects to wash equipment prior to operating on-forest, and to use of certified weed free plant materials for erosion control. However, all of the projects listed in (Project Record – Cumulative) involve travel on NFTS roads, potentially introducing weed seed into new areas from their vehicles. Ground disturbance causes weeds to spread, particularly if the weeds are already on or near the area being disturbed. It is reasonably foreseeable that weeds will continue to spread on the STF and will be introduced into native plant communities over the short and long term.

The two most abundant weed species on the additional 55 routes proposed by Alternative 1 include yellow starthistle and cheatgrass (see Tables for each alternative with weeds and routes). Both of these weeds have high ecological impacts and spread aggressively in disturbed soils and disturbance related openings in native plant communities. As a result, Alternative 1 has a high risk for weed infestations and spread, cumulatively affecting many acres of the STF (see Table 2 Risk and Effects Summary).

Alternative 2 – No Action

Indicator Measure 1:
Implementation of this alternative has the highest risk for weed spread and weed introduction and for indirect and direct effects on native vegetation and soils in comparison to all of the alternatives. There is a total of 458 existing routes within 200 feet of weed occurrences. These weed occurrences include 34 different species of invasive plants, comprising a total of 736 documented weed occurrences along routes for Alternative 2. The risk for spread of weeds and for additional weed introductions is extremely high.

Indicator Measure 2:
In comparison to Alternative 2, all action alternatives would reduce the number of miles of motorized trail which would reduce the risk of weed introduction and spread into new areas. All of the action alternatives, and Alternative 3, prohibit cross country travel which also reduces the risk of introduction and spread of weeds. Therefore, the risk of direct/indirect impacts to native

plant communities from weed introduction and spread is less under all of the other alternatives than the no action alternative in the long term.

Although no additional unauthorized routes will be added to the system, Alternative 2 includes approximately 29.52 miles of existing roads within 200 feet of weed infestations. Due to the high number of existing miles and cross country routes infested with weeds, Alternative 2 has the highest risk for the spread of existing infestations and for the introduction of new weed infestations.

Indicator Measure 3:
Implementation of Alternative 2 has the highest risk of introduction and spread of aggressive, non-native plants as it does not prohibit cross country travel, and it does not prohibit use of unauthorized motorized routes. Motorized vehicles could access more NFS lands and potentially spread weeds to all accessible areas. Under implementation of Alternative 2, the number of motorized trails un-authorized for motorized use would increase through cross country use.

Indicator Measure 4:
Implementation of Alternative 2 would cumulatively impact native vegetation in the short and long term by increasing the risk of weed introduction and spread on STF system lands. 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. Those motorized trails un-authorized for motorized use that are known to have weed infestations have a high risk of spreading weeds to other areas on the forest.

The no action alternative has potential long term cumulative impacts if weeds spread into areas not routinely evaluated for implementing mitigations to reduce impacts to native vegetation, and for conducting early detection and treatment of weeds. Frequent motorized trail evaluation to detect weeds combined with rapid treatment of those weeds avoids significant impacts to STF system lands and native plant communities in the short and long term. Cross country trail use, where road maintenance and weed control are not typically practiced, will increase the risk of spread of weeds under this alternative.

Under implementation of Alternative 2, thirty-four species of the weeds identified in Table 1 would continue to spread along the motorized trails as well as across the landscape, particularly in areas of cross country travel. Many of these species, including yellow starthistle, cheatgrass, gorse, spotted knapweed, oblong spurge, Spanish and French brooms, tall whitetop, purple loosestrife and Himalaya blackberry, all rated as having high ecological impacts, are recorded within 200 feet of existing routes for this alternative. There are large infestations of cheatgrass on the Calaveras and Miwok Ranger Districts, and very large infestation of yellow starthistle on the Groveland Ranger Districts within 200 feet of existing motorized routes (see Tables for each alternative with weeds and routes).

Implementation of those projects identified in Cumulative Effects, Project Record, has high potential to introduce weed seed and/or weed plant parts into new areas. With 736 known weed occurrences within 200 feet of 458 existing routes, the potential for the introduction and spread of weeds for any project using these routes is high. All of the projects listed in Cumulative Effects, Project Record, involve travel on NFTS roads, potentially introducing weed seed into new areas from their vehicles. Any ground disturbances favor weed spread, especially if the weeds are within or adjacent to the area being disturbed. It is reasonably foreseeable that weeds will continue to spread on the STF and will be introduced into native plant communities over the short and long term. The continuation of motorized travel on cross country trails under this alternative

increases the risk for the spread and introduction of weeds. Short and long term impacts due to weed infestations are at the highest level for the no action alternative (see Table 2. Risks and Effects Summary).

Alternative 3 – Cross Country Travel Prohibited

Indicator Measure 1:
Although implementation of this alternative has somewhat of a lower risk for weed spread and weed introduction and for indirect and direct effects on native vegetation and soils in comparison to the other 4 alternatives, Alternative 4 also has a high risk for weed spread and introduction. Alternative 3 proposes to include 2,259.37 miles of existing routes, with 376 routes within 200 feet of weed occurrences. These occurrences of weeds include 34 different species, comprising 671 weed occurrences within 200 feet of existing routes for Alternative 3.

Indicator Measure 2:
Alternative 3 includes approximately 29.52 miles of roads infested with invasive plants. Due to the high number of weed infested routes (376 routes), Alternative 3 is also considered to have a high risk for the spread of existing infestations and for the introduction of new weed infestations.

Indicator Measure 3:
The short and long term risk of negative impacts to native plant communities from weed introduction and spread is lower for Alternative 3 than the no action and action alternatives due to prohibiting cross country travel, and not adding any additional unauthorized routes to the NFTS system.

Indicator Measure 4:
Implementation of Alternative 3 would cumulatively impact native vegetation in the short and long term by increasing the risk of weed introduction and spread on STF system lands. 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. The existing 376 motorized routes that are known to have weed infestations have a high risk of spreading weeds to additional motorized routes into new areas.

It is assumed that all of the alternatives avoid long term cumulative impacts by frequently evaluating motorized trails, implementing mitigations to reduce impacts to native vegetation, and conducting early detection and treatment of weeds. Frequent motorized trail evaluation to detect weeds combined with rapid treatment of those weeds avoids significant impacts to STF system lands and native plant communities in the short and long term.

As discussed earlier, different weeds have different ecological impacts (see Table 1.) Under implementation of Alternative 3, thirty-four species of the weeds identified in Table 1. would continue to spread along the motorized trails as well as across the landscape. Many of these species, including yellow starthistle, cheatgrass, gorse, spotted knapweed, oblong spurge, Spanish and French brooms, tall whitetop, purple loosestrife and Himalaya blackberry, all rated as having high ecological impacts, are recorded within 200 feet of existing routes for this alternative (see Tables for each alternative with weeds and routes).

Implementation of those projects identified in Cumulative Effects, Project Record, has high potential to introduce weed seed and/or weed plant parts into new areas. With 671 known weed occurrences within 200 feet of 376 existing routes, the potential for the introduction and spread of weeds for any project using these routes is high. All of the projects listed in Cumulative Effects,

Project Record involve travel on NFTS roads, potentially introducing weed seed into new areas from their vehicles. Any ground disturbances favor weed spread, especially if the weeds are within or adjacent to the area being disturbed. It is reasonably foreseeable that weeds will continue to spread on the STF under Alternative 3, and will be introduced into native plant communities over the short and long term.

Prohibiting cross country travel 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 native vegetation from weed introduction and spread is less under Alternative 3 than Alternatives 1,2,4 and 5 in the long term. Although eliminating cross country travel and not adding any additional unauthorized routes reduces the risk of introduction and spread of weeds, the short and long term impacts due to weed infestations are considered high for Alternative 3 (see Table 2 Risks and Effects Summary).

Alternative 4 – Recreation

Indicator Measure 1:
Implementation of this alternative has a higher risk for weed spread and weed introduction and for indirect and direct effects on native vegetation and soils than Alternatives 1, 3, and 5. Alternative 4 proposes to include 182.37 miles of additional routes, with 83 additional routes within 200 feet of weed occurrences. These occurrences of weeds include nine different species, comprising 97 weed occurrences within 200 feet of proposed additional routes for Alternative 4.

Indicator Measure 2:
Alternative 4 includes approximately 33.68 miles of roads infested with invasive plants, including 29.68 existing miles of infested routes and an additional 4 miles of proposed infested routes. Due to the high number of additional weed infested routes (83 routes), Alternative 4 has a high risk for the spread of existing infestations and for the introduction of new weed infestations.

Indicator Measure 3:
Although 83 weed infested unauthorized routes will be added to the NFTS system for Alternative 4, the short and long term risk of negative impacts to native plant communities from weed introduction and spread is considered to be lower for Alternative 4 than the no action alternative due to prohibiting cross country travel. Prohibiting cross country travel reduces the risk of introduction and spread of weeds by reducing the amount of NFS lands available for motorized travel.

Indicator Measure 4:
Implementation of Alternative 4 would cumulatively impact native vegetation in the short and long term by increasing the risk of weed introduction and spread on STF system lands with adding 83 weed infested routes. 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. The additional 83 motorized trails that are known to have weed infestations have a high risk of spreading weeds from these motorized routes into new areas.

It is assumed that all of the alternatives avoid long term cumulative impacts by frequently evaluating motorized trails, implementing mitigations to reduce impacts to native vegetation, and conducting early detection and treatment of weeds. Frequent motorized trail evaluation to detect weeds combined with rapid treatment of those weeds avoids significant impacts to STF system lands and native plant communities in the short and long term.

Generally, most weed occurrences on the STF are located along and in adjacent areas to State/County/Federal/NFS roads. As weed infestations degrade NFS lands by directly competing with native plants and causing their displacement, ongoing management actions such as utility corridors maintenance, mining operation, providing recreational sites, 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 native plants for soil, water and nutrients on approximately 2,622 acres of the analysis area.

Motorized vehicle use of NFTS motorized roads and trails are an ongoing activity that is known to negatively impact native vegetation through the introduction of weeds and is anticipated to increase in number of users.

All of the projects listed in Cumulative Effects, Project Record involve travel on NFTS roads, potentially introducing weed seed into new areas from their vehicles. Ground disturbance causes weeds to spread, particularly if the weeds are already on or near the area being disturbed. It is reasonably foreseeable that weeds will continue to spread on the STF and will be introduced into native plant communities over the short and long term.

The two most abundant weed species on the additional 83 routes proposed by Aternative 4 include yellow starthistle and cheatgrass (see Cumulative Effects, Project Record). From the data presented in the tables in Appendix ???, two Ranger Districts, including Groveland and Miwok, are affected the most by the weed infested additional routes. As stated earlier, both cheatgrass and yellow starthistle have high ecological impacts and spread aggressively in disturbed soils and disturbance related openings in native plant communities. As a result, Alternative 4 has a high risk for weed infestations and spread, which may cumulatively affect many additional acres of the STF (see Table 2 Risks and Effects Summary).

Alternative 5 – Resources

Indicator Measure 1:
Implementation of this alternative also has a high risk for weed spread and weed introduction and for indirect and direct effects on native vegetation and soils, although the risk is lower than Alternatives 1, 2, and 4. Alternative 5 proposes to include 0.2 miles of additional routes, with 7 additional routes within 200 feet of weed occurrences. These occurrences of weeds include three different species, comprising 7 weed occurrences within 200 feet of proposed additional routes for Alternative 5.

Indicator Measure 2:
Alternative includes approximately 25.79 miles of roads infested with invasive plants, the least amount of miles of infested routes in comparison to the other alternatives. There are 7 proposed routes infested with weeds. Although this alternative, in comparison to the other alternatives, represents a reduced risk of weed introduction and spread due to the reduced number of proposed additional routes in weed infested areas, it is still considered a high risk for the spread of existing infestations and for the introduction of new weed infestations.

Indicator Measure 3:
The short and long term risk of negative impacts to native plant communities from weed introduction and spread is lower for Alternative 5 than the no action alternative due to prohibiting cross country travel. Prohibiting cross country travel reduces the risk of introduction and spread of weeds by reducing the amount of NFS lands available for motorized travel.

Indicator Measure 4:
Implementation of Alternative 5 would cumulatively impact native vegetation in the short and long term by increasing the risk of weed introduction and spread on STF system lands. 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. Based on the high ecological rating of 2 of the 3 weed species known to occur along the 7 additional motorized trails proposed for this alternative, there is a high risk of spreading and introducing weeds from these motorized routes into new areas (see Cumulative Effects, Project Record).

It is assumed that all of the alternatives avoid long term cumulative impacts by frequently evaluating motorized trails, implementing mitigations to reduce impacts to native vegetation, and conducting early detection and treatment of weeds. Frequent motorized trail evaluation to detect weeds combined with rapid treatment of those weeds avoids significant impacts to STF system lands and native plant communities in the short and long term.

Generally, most weed occurrences on the STF are located along and adjacent to State/County/Federal/NFS roads, where ongoing management actions such as utility corridors maintenance, mining operation, providing recreational sites, and livestock grazing continue to spread weeds from place to place across the forest. Alternative 5 will have the most impact to the Miwok and Groveland Ranger Districts where the weed infested additional unauthorized routes are proposed. The Miwok District has 3 proposed routes within 200 feet of cheatgrass infestations and 2 proposed routes within 200 feet of bull thistle infestations. The Groveland Ranger District has 2 proposed routes within 200 feet of yellow starthistle infestations. As stated earlier and presented in Table 1, both cheatgrass and starthistle have high ecological impacts, aggressively spreading to any disturbed soils and openings in native vegetation.

Motorized vehicle use of NFTS motorized roads and trails for Alternative 5 and all of the alternatives are ongoing activities that are known to negatively impact native vegetation through the introduction of weeds. All of the projects listed in Cumulative Effects, Project Record involve travel on NFTS roads, potentially introducing weed seed into new areas from their vehicles. Ground disturbance causes weeds to spread, particularly if the weeds are already on or near the area being disturbed. It is reasonably foreseeable that weeds will continue to spread on the STF and will be introduced into native plant communities over the short and long term.

The two most abundant weed species on the additional 7 routes proposed by Alternative 5 includes yellow starthistle and cheatgrass (see Tables for each alternative with weeds and route). Both of these weeds have high ecological impacts and spread aggressively in disturbed soils and disturbance related openings in native plant communities. As a result of this high impact rating, Alternative 5 has a high risk for weed infestations and spread, with the potential to cumulatively affect many acres of the STF (see Table 2 Risks and Effects Summary).

Recommendations

The following recommendations were developed to help prevent weed introduction and/or spread during construction/reconstruction and maintenance and are now considered part of the project proposal:

- Implement revegetation and restoration in disturbed areas, including burned areas, using the appropriate native plant species to minimize new infestations.
- Use only certified-weed free plant materials for erosion control.
- Wash all equipment/vehicles before it comes into the project area if it is coming

from a weed infested area.

- Wash all equipment/vehicles before leaving a weed infested project area.
- Continue cooperative efforts – including weed identification education.
- Work with motorized vehicle users to identify weeds and assist in weed eradication.
- Monitor motorized routes/trails/dispersed camping areas annually to detect and treat weed occurrences before large infestations develop.
- Develop annual treatment program for noxious weed occurrences and other high ecological impact weeds as necessary to minimize spread and introductions to other areas.

Project Files

The following information was used to develop this weed risk assessment. This information can be located in the project files:

1. References
2. Maps of soil and vegetative conditions
3. STF weed occurrence records
4. STF survey records
5. STF GIS weed layer

References

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USDA FS Manual (FSM) 2080 - Noxious Weed Management, 2081.03 – Policy: policy statement calling for a risk assessment for noxious weeds to be completed for every project clauses requiring contractors or permittees to clean their equipment prior to entering NFS lands.

- 2081.2 - Prevention and Control Measures Executive Order 13112 of February 3, 1999 directs federal agencies to prevent the introduction of invasive species

USDA FS SNFPA 2001 Sierra Nevada Forest Plan Amendment

SNFPA (2004) standard and guidelines (S&Gs)

- Noxious weeds management (Management Standard & Guidelines 36-49).
- Wetland and Meadow Habitat (Management Standard & Guideline 70): See Water Resources section.
- Riparian Habitat (Management Standard & Guideline 92): See Water Resources section.

Bog and Fen Habitat
(SNFPA ROD page 65, S&G #118): Prohibit or mitigate ground-disturbing activities that adversely affect hydrologic processes that maintain water flow, water quality,

USDA FS Stanislaus NF Forest Roads Analysis, 3003.

Whitson, Burrill, Dewey, Cudney, Lee and Parker, 1992 – publisher: The Society of Weed Science in Cooperation with the Western United States Land Grant Universities Cooperative Extension. Publisher: The Society of Weed Science in cooperation with the Western United States Land Grant Universities Cooperative Extension Services