Plumas National Forest Public Wheeled Motorized Travel Management EIS:

Biological Evaluation of Potential Effects to Threatened, Endangered, and Sensitive Plant Species

Prepared for:
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Summary of Effects

The following presents an overview of the effects analysis for each alternative (Table 1). In general, the greater the number of motorized vehicle trails (and miles) proposed, the higher the risk and severity of negative impacts to rare species and their associated habitats. Alternative 1 has the greatest negative effect on rare species and habitats, primarily due to the allowance for cross-country travel, which has the potential to affect all but the most inaccessible rare species and habitats. Out of the action alternatives, Alternative 2 impacts the largest number of rare species and botanically sensitive resources. Alternative 3, which designates no unauthorized routes, has the least impact on rare species. In comparison to these alternatives, the impacts from Alternative 5 fall closer to the middle of the spectrum of potential effects.

Table 1. Summary of Effects for Botanical Resources

Indicators – Botanical Resources	Rankings of Alternatives for Each Indicator[1]				
	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Miles of unauthorized or proposed system trails open for public motorized vehicle use within or adjacent to Sensitive rare species sites.	1	2	5	4	3
Number of unauthorized or proposed trails open for public motorized vehicle use within or adjacent to Sensitive rare species sites.	1	2	5	4	3
Acres of rare plant sites or suitable habitat within 100 feet of unauthorized or proposed system trails.	1	2	5	4	3
Total number of rare plant sites within 100 feet of unauthorized or proposed trails.	1	2	5	4	3
Average for Botanical Resources	**1**	**2**	**5**	**4**	**3**

[1] A score of 5 indicates the alternative is the best for botanical resources related to the indicator; A score of 1 indicates the alternative is the worst for botanical resources related to the indicator.

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1.0 Introduction

The purpose of this Biological Evaluation is to provide an analysis of the activities proposed under the Plumas National Forest Public Wheeled Motorized Travel Management Project and to determine whether they have the potential to affect any Federally Endangered, Threatened, Candidate plant species, or Forest Service Region 5 Sensitive plants.

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

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

E.O. 13112 Invasive Species 64 FR 6183 (February 8, 1999)- To prevent and control the introduction and spread of invasive species. The Forest Service will 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 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.

Forest Service Manual and Handbooks (FSM/H 2670) - Forest Service Sensitive species are plant species identified by the Regional Forester for which population viability is a concern. The Forest Service develops and implements management practices to ensure that rare plants and animals do not become threatened or endangered and ensure their continued viability on national forests. It is forest service policy to analyze impacts to sensitive species to ensure management activities do not create a significant trend toward federal listing or loss of viability. This assessment is documented in a Biological Evaluation (BE).

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

- Noxious weeds management (Management Standard & Guidelines 36-49)
- Wetland and Meadow Habitat (Management Standard & Guideline 70)
- Riparian Habitat (Management Standard & Guideline 92)
- Bog and Fen Habitat (SNFPA ROD page 65, S&G #118)
- Sensitive Plant Surveys (Corrected Errata, April 19, 2005)

Plumas National Forest Land and Resource Management Plan (USDA Forest Service 1988)- The Forest Plan provides management direction for all Plumas National Forest Sensitive plants; that direction is to “maintain viable populations of sensitive plant species” (USDA Forest Service 1988, page 4-34). The Forest Plan also provides forest-wide standards and guidelines to:

- protect Sensitive and Special Interest plant species as needed to maintain viability;

- inventory and monitor Sensitive plant populations on an individual project basis; and
- develop species management guidelines to identify population goals and compatible management activities / prescriptions that will maintain viability.

2.0 Description of the Proposed Project

The PNF developed five alternatives: the No Action, the Proposed Action, and three other action alternatives. The five alternatives considered in detail for this analysis are listed in below in Table 2. A detailed description of the proposed action and the alternatives considered in this analysis is presented in Chapter 2 of the "Plumas National Forest Public Wheeled Motorized Travel Management Draft Environmental Impact Statement" (USDA Forest Service 2008).

Table 2. List of alternatives considered in detail

Alternative	Description
Alternative 1: No-action Alternative	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. 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 designated routes. The agency would take no affirmative action on any unauthorized routes, and they would continue to have no status or authorization as NFTS facilities. • Adds No New NFTS Facilities • Does Not Prohibit Cross Country Motorized Travel
Alternative 2: Proposed Action	The Proposed Action is the proposed changes to the NFTS and the prohibition of cross country travel as described in the NOI published January 3, 2008 (Volume 73, Number 2): 1. The prohibition of motorized vehicle travel off designated NFS roads, NFS trails and areas by the public except as allowed by permit or other authorization. 2. The addition of approximately 367 miles of existing unauthorized routes to the current system of National Forest System (NFS) roads and motorized trails currently open to the public for motorized vehicle use, and 3. The addition of 1 area, where use of motorized vehicles by the public would be allowed anywhere within those areas. • Adds: 367 Miles of NFS Motorized Trails • Adds 1 Area Open to OHV Use • Prohibits Cross Country Motorized Travel
Alternative 3:	Alternative 3 responds to the issues of cost, inventoried roadless areas and natural resource impacts by prohibiting cross country travel without adding any additional facilities to the NFTS. This alternative also provides a baseline for comparing the impacts of other alternatives that propose changes to the NFTS. • Adds No New NFTS Facilities • Prohibits Cross Country Motorized Travel
Alternative 4:	Alternative 4 responds to issues of inventoried roadless areas (IRAs) and natural resource impacts. This alternative adds no motorized routes to Citizen IRAs, semi-primitive non motorized areas, Red Legged Frog critical aquatic areas and does not add routes where resource concerns require extensive trail mitigation. • Adds: 141 Miles NFTS Motorized Trails • Prohibits Cross Country Motorized Travel

Alternative	Description
Alternative 5:	Alternative 5 responds to the issue of access and motorized recreation opportunity. During scoping the PNF received suggestions for additional routes and alternative routes that would better provide access and recreation opportunity. Alternative 5 incorporates many of those suggestions. This includes trails identified during scoping as necessary to access dispersed campsites and recreational use. Mitigation on trails with resource concerns would occur thereby allowing trails with resource concerns to be included. Trails with extensive or critical trail mitigations would be designated with this EIS but not placed on the motor vehicle use map until the mitigation has been completed. • Adds: 251 Miles NFTS Motorized Trails • Adds 1 Area Open to OHV Use • Prohibits Cross Country Motorized Travel

3.0 Effects Analysis Methodology

3.1 Geographic Area

Two geographic areas were chosen to analyze the effects of the proposed trails on botanical resources:

- Direct and indirect effects to rare species under the four action alternatives were assessed using the area within 100 feet of proposed system trails. In general, direct effects are most likely to occur within a zone of 30 feet on either side of the trail due to the need for parking and pulling off to allow for another vehicle to pass. Indirect effects are most likely to occur within a zone of 100 feet, or an additional 70 feet beyond the 30 foot zone.
- The No Action alternative, which allows for cross-country travel, was assessed using the entire Plumas NF. The Forest boundary was also used to analyze cumulative effects to rare species for all alternatives.

Those species located within these two geographic areas were considered to have the highest potential to be impacted or influenced by the proposed trail designation. Conversely, species outside of the analysis area (that is, those species that are only considered to have "potential" to occur on the Plumas NF) were not considered to have a high likelihood of being impacted by the proposed project either directly, indirectly, or cumulatively.

3.2 Analysis Methodology

The analysis of effects on rare plant species was a three-step process (FSM 2672.43). In the first step, all listed or proposed rare species that were known or were believed to have potential to occur in the analysis area were identified. This list was developed by reviewing the U.S. Fish and Wildlife List for the Plumas National Forest (U.S. Fish and Wildlife Service 2008), USDA Forest Service Region 5 Sensitive Species List (USDA Forest Service 2006), Plumas National Forest rare plant records and vegetation maps, and California Natural Diversity Database records (CNDDB 2008).

The second step was field reconnaissance surveys. To date, field surveys have been conducted on approximately 287 miles of proposed system trails (Vollmar 2007, USDA Forest Service 2007, USDA

Forest Service 2008 a, b, and c). An additional 66 miles of proposed system trail and 10 miles of existing system trails (USDA Forest Service 2003a) have also been surveyed under past management projects. For those 25 miles of trail that had not been surveyed at the time of this analysis, information from the Plumas NF rare plant records and CNDDB were used to analyze the potential effects to known rare species occurrences. In addition, potential habitat was estimated for each sensitive species using (a) the known range of the species, (b) an estimated potential dispersal distance, (c) broad vegetation types, and (d) existing available data representing more refined habitat types (i.e. serpentine, fens, streams, etc.).

Field surveys were designed around the flowering period and ecology of the rare plant species identified in step one. For each rare plant site found, information was collected that described the size of the occurrence and habitat characteristics and identified any existing or potential threats. Location information was collected using a Global Positioning System (GPS).

All of this information was used in step three of the analysis—conflict determination. Data were imported into a Global Information System (GIS) and used to analyze proximity to trails, identify detrimental effects, and develop mitigation measures.

3.3 Assumptions

In addition to those listed at the beginning of Chapter 3, the following assumptions were used in the analysis of botanical resources:

Vehicle use on and off established trails has affected or has the potential to affect rare plant populations, either directly by damage or death to individual plants from motorized vehicles (stem breaking, crushing, etc.), or indirectly by altering the habitat through soil disturbance, changes in hydrologic functioning, or by the introduction of non-native, invasive plant species that can out-compete sensitive species for water, sunlight, and nutrients.

Motorized vehicle use is unlikely to impact certain rare plant habitats due to the steep or rocky nature of the surrounding terrain; motorized vehicle use is more likely to impact other rare plant habitats, such as meadows, which exist on gentle slopes or flat terrain with little or no vegetation or natural barriers to motorized vehicles.

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

Motorized vehicle use of un-surfaced roads/trails/areas will increase sediment production and erosion. As use increases, sediment production and erosion will increase.

3.4 Methodology by Action:

Direct/indirect effects of the prohibition of cross-country motorized vehicle travel.

Short-term timeframe: 1 year.

Long-term timeframe: 20 years.

Spatial boundary: Forest.

Indicator(s):

- Miles of unauthorized routes within or adjacent to rare plant sites.
- Acres of rare plant sites within 100 feet of an existing unauthorized route.
- Total number of rare plant sites within 100 feet of an existing unauthorized route.
- Miles of unauthorized routes within fen, wet meadow, serpentine, riparian, barren, interior forest, and open forest habitats.

In addition, the following indicator measures were used to analyze the impacts to designated Research Natural Areas and proposed and existing Special Interest Areas on the Forest:

- Miles of existing unauthorized routes within Research Natural Areas or Special Interest Areas.

Methodology: GIS analysis of existing unauthorized routes.

Direct/Indirect Effects of adding facilities (presently unauthorized roads, trails, and/or areas) to the NFTS, including identifying seasons of use and vehicle class.

Short-term timeframe: 1 year.

Long-term timeframe: 20 years.

Spatial boundary: Plumas National Forest. In general, direct effects are most likely to occur within a zone of 30 feet on either side of the trail and indirect effects are most likely to occur within a zone of 100 feet.

Indicator(s):

- Number and miles of proposed system trail open for public motorized vehicle use within or adjacent to Sensitive rare species sites.
- Acres of rare plant sites within 100 feet of a proposed system trail.
- Total number of rare plant sites within 100 feet of a proposed system trail.

In addition, the following indicator measures were used to analyze the impacts to designated Research Natural Areas and proposed and existing Special Interest Areas on the Forest:

- Miles of proposed system trails open for public motor vehicle use within Research Natural Areas or Special Interest Areas.

Methodology: GIS analysis of proposed system trails and sensitive plant locations.

Changes to the existing NFTS [this can include deletions of facilities and changing the vehicle class and season of use].

The timeframe, spatial boundary, indicators and methodology would be the same as those listed under number 2 above.

Cumulative Effects

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

Long-term timeframe: 20 years.

Spatial boundary: Plumas National Forest.

Indicator(s):

- The percentage of sensitive species sites impacted by the proposed system trails, in comparison to the total number of known sites on the Forest.
- The number of rare plant locations documented along existing motorized system trails.

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

4.0 Affected Environment

The Plumas National Forest is situated at the northern end of the Sierra Nevada mountain range, just south of the Cascades. The lower elevation foothills of the forest are characterized by oak woodlands on the south-facing slopes, which are dominated by interior live oak (*Quercus wislizenii*), canyon oak (*Quercus chrysolepis*), manzanita (*Arctostaphylos* sp.) and gray pine (*Pinus sabiniana*). The lower elevation north-facing slopes are characterized by mixed conifer forests with a diverse understory of tanoak (*Lithocarpus densiflorus*), black oak (*Quercus kelloggii*), big leaf maple (*Acer macrophyllum*), and madrone (*Arbutus menziesii*). Moving eastward, the elevation increases and the foothills quickly give way to montane chaparral and mixed conifer forests that line the deep canyons of the North, Middle, and South forks of the Feather River and its tributaries.

Closer to the crest of the Sierra Nevada, the vegetation type transitions to a mixed conifer forest characterized by ponderosa pine (*Pinus ponderosa*), sugar pine (*Pinus lambertiana*), white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), and incense cedar (*Calocedrus decurrens*) in the overstory and scattered black oak and dense white fir in the understory. Jeffery pine (*Pinus jeffreyi*) and lodgepole pine (*Pinus contorta*) are occasionally found occupying shallower soils. Red fir (*Abies magnifica*) forests occur above 5,500 feet in elevation and are often mixed with sugar pine. In some of the higher elevation stands, red fir may co-occur with lodgepole pine, western white pine (*Pinus monticola*), and mountain hemlock (*Tsuga mertensiana*). On the drier, eastern slope of the Sierra, the heavily forested stands give way to broad valleys surrounded by sagebrush scrub, scattered juniper, eastside pine and mixed conifer forest.

Within these broader vegetation types there are a number of other, less geographically defined, plant communities that provide important habitat for rare plant species. These include: riparian corridors, meadows, seeps, fens, rock outcrops, and serpentine soils.

4.1 Rare species

Table 3 lists all Federally Threatened, Candidate, and Region 5 Sensitive vascular plant, moss, lichen, and fungi species that are known or thought to have potential to occur on the Plumas National Forest. Also included are the listing, number of Plumas NF occurrences, and habitat grouping for each species.

Table 3. Federally Threatened, Candidate, and Region 5 Sensitive plant and fungi species known or thought to have potential to occur on the Plumas National Forest

Species	Common Name	PNF Status[1]	Global Rank/ CNPS Rank[2]	Number of Plumas NF Occurrences[3]	Habitat Guild[4]
Allium jepsonii	Jepson's onion	S	G1 / 1B.2	15	S
Arabis constancei	Constance's rock cress	S	G3 / 1B.1	55	S
Astragalus lemmonii	Lemmon's milkvetch	S	G2 / 1B.2	P	MS
Astragalus lentiformis	lens-pod milk-vetch	S	G2 / 1B.2	67	O
Astragalus pulsiferae var. coronensis	Modoc Plateau milk vetch	S	G4T3 / 4.2	3	O
Astragalus pulsiferae var. pulsiferae	Pulsifer's milk-vetch	S	G4T2 / 1B.2	12	O
Astragalus webberi	Webber's milk-vetch	S	G1 / 1B.2	12	O
Balsamorhiza macrolepis var. macrolepis	big-scale balsamroot	S	G3G4T2 / 1B.2	HI	MS, O, S
Botrychium ascendens	upswept moonwort	S	G2G3 / 2.3	P	MS, R, F
Botrychium crenulatum	scalloped moonwort	S	G3 / 2.2	P	MS, R, F
Botrychium lineare	Moonwort	S	G1 / 1B.3	P	MS, R
Botrychium lunaria	common moonwort	S	G5 / 2.3	P	MS, R, F
Botrychium minganese	Mingan moonwort	S	G4 / 2.2	4	MS, R
Botrychium montanum	western goblin	S	G3 / 2.1	3	MS, R, F
Botrychium pinnatum	northern moonwort	S	G4? / 2.3	P	MS, R
Bruchia bolanderi	Bolander's bruchia	S	G3 / 2.2	10	MS, R
Buxbaumia viridis	buxbaumia moss	S	None	1	R
Calycadenia oppositifolia	Butte County calycadenia	S	G3 / 4.2	7	O, S
Calystegia atriplicifolia ssp. buttensis	Butte County morning-glory	S	G5T3 / 1B.2	3	O
Clarkia biloba ssp. brandegeae	Brandegee's clarkia	S	G4G5T2 / 1B.2	1	O

Species	Common Name	PNF Status[1]	Global Rank/ CNPS Rank[2]	Number of Plumas NF Occurrences[3]	Habitat Guild[4]
Clarkia gracilis ssp. albicaulis	white-stemmed clarkia	S	G5T2 / 1B.2	2	O
Clarkia mildrediae ssp. mildrediae	Mildred's clarkia	S	G3T3 / 1B.3	30	O
Clarkia mosquinii	Mosquin's clarkia	S	G1 / 1B.1	45	O
Cudonia monticola	large cudonia (fungi)	S	None	P	IF
Cypripedium fasciculatum	clustered lady's-slipper	S	G3 / 4.2	135	IF
Cypripedium montanum	mountain lady's-slipper	S	G4 / 4.2	22	IF, R
Dendrocollybia racemosa	branched collybia (fungi)	S	None	P	IF
Eleocharis torticulmis	California twisted spikerush	S	G1 / 1B.3	1	F, MS
Eriogonum umbellatum var. ahartii	Ahart's sulphur flower	S	None	11	S
Fissidens aphelotaxifolius	brook pocket-moss	S	GU / 2.2	P	R
Fissidens pauperculus	fissidens moss	S	G3? / 1B.2	2	R
Fritillaria eastwoodiae	Butte County fritillary	S	G3Q / 3.2	69	O
Helodium blandowii	Blandow's bog-moss	S	G5 / 2.3	P	F, MS
Hydrothyria venosa	hydrothyria lichen	S	None	20	R
Ivesia aperta var. aperta	Sierra Valley ivesia	S	G2T2 / 1B.2	18	MS
Ivesia sericolueca	Plumas ivesia	S	G2 / 1B.2	14	MS
Ivesia webberi	Webber's ivesia	FC	G2 / 1B.1	HI	MS
Lewisia cantelovii	Cantelow's lewisia	S	G3 / 1B.2	27	B
Lewisia kelloggii ssp. hutchisonii	Hutchison's lewisia	S	G4T2T3 / 3.3	5	B, O
Lewisia kelloggii ssp. kelloggii	Kellogg's lewisia	S	None	P	O
Lomatium roseanum	adobe parsley	S	G2G3 / 1B.2	4	B
Lupinus dalesiae	Quincy lupine	S	G3 / 4.2	260	O
Meesia longiseta	meesia moss	S	None	P	F, MS
Meesia triquetra	three-ranked hump-moss	S	G5 / 4.2	10	F, MS
Meesia uliginosa	broad-nerved hump-moss	S	G4 / 2.2	1	F, MS
Mielichhoferia elongata	elongate copper-moss	S	None	P	B, S
Monardella follettii	Follett's monardella	S	G1 / 1B.2	34	S

Species	Common Name	PNF Status[1]	Global Rank/ CNPS Rank[2]	Number of Plumas NF Occurrences[3]	Habitat Guild[4]
Monardella stebbinsii	Stebbin's monardella	S	G1 / 1B.2	7	S
Oreostemma elatum	Plumas alpine-aster	S	G2Q / 1B.2	14	F, MS, R
Packera eurycephala var. lewisrosei	cut-leaved ragwort	S	G4T2 / 1B.2	31	S
Packera layneae	Layne's ragwort	FE	G2 / 1B.2	4	S
Penstemon personatus	closed-throated beardtongue	S	G2 / 1B.2	23	O
Penstemon sudans	Susanville beardtongue	S	G2G3 / 1B.3	3	O
Phaecollybia olivacea	olive phaeocollybia (fungi)	S	G2 / None	P	IF
Pyrrocoma lucida	sticky pyrrocoma	S	G3 / 1B.2	46	MS
Sedum albomarginatum	Feather River stonecrop	S	G2 / 1B.2	15	S

[1] Status: FE – Federally listed Endangered, FC – Federal Candidate species, S – Forest Service Sensitive
[2] Global Rank: G1-Critically Imperiled; G2- Imperiled; G3-Vulnerable; G4 - Apparently secure; G5- Secure (NatureServe 2008) / CNPS Rank: 1B- Rare, Threatened, or Endangered in California and Elsewhere; 2- Rare, Threatened, or Endangered in California, But More Common Elsewhere, 3- About Which We Need More Information, 4- Plants of Limited Distribution (California Native Plant Society 2008).
[3] Occurrences are defined as plants of the same species estimated to be separated by less than a quarter mile. HI = Historic Locations. P= Potential species (i.e. it has not been documented on the Plumas NF).
[4] Habitat guilds: Fens (F), Meadows and Seeps (MS), Riparian areas (R), Serpentine (S), Barren (B), Interior Forest (IF), Open habitat (O)

4.1.1 Rare vascular species

The Plumas NF provides habitat for over 2,000 vascular plant taxa (Clifton 2005), which represents approximately 35 percent of the California flora (Hickman 1993). Of these, 43 are on the Plumas NF Sensitive Species List.

The only Federally Threatened plant species known to occur on the Plumas NF is *Packera layneae* (Layne's butterweed). This species grows in open rocky areas on gabbro and serpentine-derived soils that are between 650 and 3,300 feet in elevation. The Plumas NF has four occurrences, totaling approximately 12 acres. In 2006, the U.S. Fish and Wildlife Service developed route designation design criteria for *Packera layneae* in order to achieve a "No effect" or "May affect not likely to adversely affect" determination. This design criterion stated that no unauthorized or unclassified routes or areas would be designated that were "within Layne's butterweed occupied habitat, adjacent unoccupied habitat, and a 500 foot buffer" (U.S. Fish and Wildlife Service 2006). This criterion has been met under all of the action alternatives; none of the proposed system trails are within 500 feet of occupied or adjacent unoccupied habitat.

Two additional species of federal concern that have the potential to occur on the Plumas NF are the Federally Threatened *Orcuttia tenuis* (slender Orcutt grass) and the Candidate species *Ivesia webberi* (Webber's ivesia). *Orcuttia tenuis* is limited to relatively deep vernal pools with clay soil. *Ivesia webberi* is found in open areas of sandy volcanic ash to gravelly soils in sagebrush and eastside pine. Based on soil and geology maps and field surveys, no suitable habitat for these two species occurs within 100 feet of a proposed system trail.

Existing Conditions related to direct and indirect impacts to rare vascular plants

- There are 24 Sensitive vascular plant species (306 locations) documented within 100 feet of an existing system trail or unauthorized route on the forest (Table 4).
- All of the Sensitive vascular plant species with known occurrences on the Plumas NF (34 of the 43 rare vascular species) have the potential to be affected by cross-country motorized vehicle travel.

Table 4. Number of rare species locations within 100 feet of an unauthorized route or existing system trail.

Species	Species Type[1]	Habitat Grouping[2]	Number of rare species locations within 100'	
			Unauthorized Routes	Existing System Trail
Allium jepsonii	V	S	7	
Arabis constancei	V	S	18	
Astragalus lentiformis	V	O	37	
Astragalus pulsiferae var. coronensis	V	O	3	
Astragalus pulsiferae var. pulsiferae	V	O	7	

Species	Species Type[1]	Habitat Grouping[2]	Number of rare species locations within 100'	
			Unauthorized Routes	Existing System Trail
Astragalus webberi	V	O	2	
Botrychium sp.	V	MS, R	1	
Calycadenia oppositifolia	V	S, O	4	
Calystegia atriplicifolia ssp. buttensis	V	O	1	
Clarkia mildrediae ssp. mildrediae	V	O	36	6
Clarkia mosquinii	V	O	13	1
Cypripedium fasciculatum	V	IF	17	1
Cypripedium montanum	V	R, IF	2	
Eriogonum umbellatum var. ahartii	V	S	7	
Fritillaria eastwoodiae	V	O	9	
Hydrothyria venosa	B	R	4	
Ivesia aperta var. aperta	V	MS	7	
Ivesia sericolueca	V	MS	7	
Lewisia cantelovii	V	B	2	
Lewisia kelloggii ssp. hutchisonii	V	O, B	1	1
Lupinus dalesiae	V	O	54	
Monardella follettii	V	S	16	1
Packera eurycephala var. lewisrosei	V	S	15	
Penstemon personatus	V	O	11	
Pyrrocoma lucida	V	MS	19	
		TOTAL	**300**	**10**

[1]Vascular (V); Bryophyte (B)

[2] Fens (F), Meadows and Seeps (MS), Riparian areas (R), Serpentine (S), Barren (B), Interior Forest (IF), Open habitat (O)

4.1.2 Rare Bryophytes (mosses and lichens)

There are currently nine Sensitive mosses known or thought to have potential to occur on the Plumas NF. These mosses are generally habitat specific and occur in wetland/riparian areas or in rocks with heavy metals (e.g. *Mielichhoferia elongata*). Lichens are a combination of two different types of organisms (fungi and algae) growing together in a symbiotic relationship. One rare lichen *Hydrothyria venosa* is known to occur on the Plumas NF.

Existing Conditions related to direct and indirect impacts to rare bryophytes

- There is one Sensitive lichen (4 locations) documented within 100 feet of an unauthorized route on the forest (Table 4).

- All of the Sensitive bryophyte species with known occurrences on the Plumas NF (six of the 10 rare bryophyte species) have the potential to be affected by cross-country motorized vehicle travel.

4.1.3 Rare Fungi

Fungi are organisms without chlorophyll that digest other organic matter. There are three rare fungi known to occur on or adjacent to Plumas NF lands; these are *Cudonia monticola*, *Dendrocollybia racemosa*, and *Phaeocollybia olivacea*. Information regarding the distribution and ecology of these fungi on the Plumas NF is incomplete.

Existing conditions related to direct and indirect impacts to rare bryophytes

- There are no known fungi documented within 100 feet of an existing system trail or unauthorized route on the forest.
- All of the fungi with known occurrences on the Plumas NF (one of the three rare fungi species) have the potential to be affected by cross-country motorized vehicle travel.

5.0 Aggregating Rare Species for Analysis of Effects

While the 56 rare species on the Plumas NF vary widely in their ecological requirements and life history characteristics, many occur in similar broad habitat types where the effects of motorized vehicle use are comparable. For purpose of this analysis, Plumas NF rare species were assigned to plant-habitat groupings or "guilds" (USDA Forest Service 2003b). Rare species often occur in more than one habitat grouping; for example a species may occur in a spatially-defined group, such as a riparian forest, while also relying on the availability of a temporally brief habitat, such as tree-fall gaps, for seedling establishment (USDA Forest Service 2003b). The following groupings have been selected to represent the rare species being addressed in this analysis:

- **Fens (F) -** includes species found in wetland sites sub-irrigated by cold water, with substantial accumulations of peat.
- **Meadows and seeps (MS)** – includes species growing in openings with more or less dense grasses, sedges, and herbs that grow under moist or saturated conditions.
- **Riparian areas (R):** includes species found along the margins of perennial, intermittent, or ephemeral streams, natural lakes, reservoirs, or ponds.
- **Serpentine (S)** – includes those species restricted to serpentine rocks and soils that contain high levels of heavy metals and low availability of plant nutrients.
- **Barren (B)** – includes those species found in very open, sparsely vegetated, and in some cases barren communities, e.g. rock fields, ridge tops, talus slopes, and cliffs.

- **Interior Forest (IF)** – includes species inhabiting shaded, protected microclimates and undisturbed substrates.
- **Open Habitats (O)** – includes species inhabiting open forest types, edge-habitats, or light gaps.

5.1 Habitat Group Descriptions

The following describes the seven habitat groupings and lists the rare plant species assigned to each group.

5.1.1 Fens (F)

Fens are groundwater-fed wetland ecosystems that develop where perennially saturated soils and cool temperatures slow the decomposition of plant material, allowing it to accumulate and form organic soils, called peat (Cooper, Chimner, and Wolf 2005). Fens are considered significant resources due to their unique hydrologic characteristics (USDA Forest Service 2004); ability to support high levels of biodiversity, including rare species (USDA Forest Service 2004); relative rarity across the Sierra Nevada (Bartolome, Erman, and Schwarz 1990); and ability to remain relatively stable for long periods of time, storing plant and climatic data over millennia (Chimner and Cooper 2002).

Fens are thought to be one of the most sensitive wet habitats in the Sierra Nevada (Rundel, Parsons, and Gordon 1977). They are inherently tied to hydrological processes and it has been demonstrated that small-scale disturbances caused by water diversions, channels, trails, and other management actions can have substantial impacts on their hydrologic and biotic integrity (Woods 2001, Cooper et al. 1998, Weixelman 2007).

Over seventy fens have been documented on the Plumas NF, ranging in size from 0.04 acre to over 15 acres. Twenty nine of these (39 percent) are located in the Bucks Lake Wilderness, where motorized vehicle travel is prohibited. The inventory of fens across the forest is not complete.

Rare species in this guild are: *Botrychium ascendens, Botrychium crenulatum, Botrychium minganense, Botrychium montanum, Eleocharis torticulmis, Helodium blandowii, Meesia longiseta, Meesia triquetra, Meesia uliginosa,* and *Oreostemma elatum.*

5.1.2 Meadows and seeps (MS)

Meadows and seeps are characterized by the presence of grasses, rushes, sedges, and herbaceous plants that thrive, at least seasonally, under moist or saturated conditions. They occur at all elevations, are found on many different substrates, and may be surrounded by grasslands, forests, or shrub lands. Meadows and seeps provide valuable habitat for a diversity of plants and wildlife and perform essential ecological and hydrological functions. Due to their high levels of biological diversity, these habitats are often destination spots for Forest users.

Meadows and seeps are limited in number and distribution and have not been well documented or mapped on the Plumas NF; therefore, quantification of the amount (acreage) of this habitat affected

by the proposed system trails is limited. Plumas NF vegetation maps estimate that there are approximately 2,520 acres of meadow habitat across the forest.

Rare species occurring in the meadow and seep guild are: *Astragalus lemmonii, Balsamorhiza macrolepis var. macrolepis, Botrychium ascendens, Botrychium crenulatum, Botrychium lineare, Botrychium lunaria, Botrychium minganese, Botrychium montanum, Botrychium pinnatum, Bruchia bolanderi, Eleocharis torticulmis, Helodium blandowii, Ivesia aperta var. aperta, Ivesia sericolueca, Ivesia webberi, Meesia longiseta, Meesia triquetra, Meesia uliginosa, Oreostemma elatum,* and *Pyrrocoma lucida.*

5.1.3 Riparian areas (R)

These are areas immediately bordering the edges of streams, rivers, lakes, or other water sources. Riparian vegetation is often characterized by species that are intolerant of high moisture stress and tolerant of seasonal flooding, such as willow and aspen. It can be found under dense canopies of mixed conifer forest, in aspen groves, and along the borders of streams in montane meadows. Most riparian forest stands are even-aged, reflecting their flood-mediated, episodic reproduction.

Riparian areas are often hotspots for plant and wildlife diversity. Riparian vegetation plays a vital role in the ecological functioning of the riparian system, which includes: stabilization of the stream bank; moderation of stream light intensity and water temperatures; delivery of large woody debris to stream habitats; filtration of sediment; and maintenance of water quality. The Plumas NF has over 16,000 miles of ephemeral, intermittent, and perennial streams.

Species found in riparian habitats include: *Botrychium ascendens, Botrychium crenulatum, Botrychium lineare, Botrychium lunaria, Botrychium minganense, Botrychium montanum, Botrychium pinnatum, Bruchia bolanderi, Buxbaumia viridis, Cypripedium montanum, Fissidens aphelotaxifolius, Fissidens pauperculus, Hydrothyria venosa,* and *Oreostemma elatum.*

5.1.4 Serpentine plant communities (S)

This guild includes plants that grow on serpentine (ultramafic) rocks and soils. Serpentine soils are characterized by low levels of key plant nutrients such as calcium, nitrogen, and phosphorous and exceptionally high levels of iron, magnesium, and toxic trace elements. Serpentine soils are generally shallow and rocky, with low water-holding capacity and rooting depths. The vegetation in these plant communities tends to be sparse, slow-growing, and stunted.

The harsh conditions in serpentine communities give rise to a unique and diverse assemblage of plant species, a high number of which are serpentine-endemics or rare. California's serpentine flora is considered the richest in the temperate zone; it consists of hundreds of species that are largely or entirely confined to serpentine substrates (Safford, Viers, and Harrison 2005). Motorized vehicles negatively affect this plant community and the rare species it supports by reducing vegetative cover, creating disturbed soils that are vulnerable to increased erosion, and by introducing weeds.

On the Plumas NF, serpentine soils occur primarily in bands along the western slopes of the forest. An accurate inventory of the serpentine soils on the Plumas NF has not yet been completed; however bedrock geologic maps for the forest (Elder and Reichert 2005) estimate that the Plumas NF contains approximately 56,554 acres of serpentine soils.

Rare species restricted to serpentine rocks or soils are: *Allium jepsonii, Arabis constancei, Balsamorhiza macrolepis var. macrolepis, Calycadenia oppositifolia, Eriogonum umbellatum* var. *ahartii, Mielichhoferia elongata, Monardella follettii, Monardella stebbinsii, Packera eurycephalus* var. *lewisrosei, Packera layneae,* and *Sedum albomarginatum.*

5.1.5 Barren (B)

This guild is characterized by open, sparsely vegetated habitats that include rock outcrops, ridge tops, cliffs, and talus slopes. The plant species that grow in these harsh environments are adapted to little soil, limited nutrients, and low water availability. Species in this guild are also generally poor competitors. In many of these areas, particularly where the terrain is steep, the habitat is highly susceptible to erosion.

Rare species restricted to barren communities are: *Lewisia cantelovii, Lewisia kelloggii ssp. hutchisonii, Lomatium roseanum,* and *Mielichhoferia elongata*.

5.1.6 Interior Forest (IF)

Plant and fungi species that are dependent on interior or late-seral forest communities rely on shade, protected microclimates, and infrequently disturbed substrates. Because of mycorrhizal associations, species that are dependent on interior forest are generally intolerant of edge effects that change the temperature, moisture, and other microclimate conditions. Threats to the species in this guild include activities that disrupt litter and duff; alter soil characteristics; reduce shade and moisture; and create openings and bare soil that increase the risk of weed introduction and spread.

Sensitive species dependent on these habitats include: *Cudonia monticola, Cypripedium fasciculatum, Cypripedium montanum, Dendrocollybia racemosa,* and *Phaecollybia olivacea.*

5.1.7 Open Habitats (O)

The species in this guild are found in a wide variety of open habitat types that include: open forests (i.e. those with less than 40 percent canopy cover); forest margins, such as stabilized roadsides and old skid trails; small openings or gaps; and large openings resulting from natural events or management activities (i.e. mechanical tree removal or road construction). Species in this guild vary in their degree of tolerance to disturbance activities. A number of the species in these habitats tend to be disturbance followers that increase with infrequent, small-scale disturbances.

Species associated with open habitats include: *Astragalus lentiformis, Astragalus pulsiferae var. coronensis, Astragalus pulsiferae var. pulsiferae, Astragalus webberi, Balsamorhiza macrolepis var. macrolepis, Calycadenia oppositifolia, Calystegia atriplicifolia ssp. buttensis, Clarkia biloba ssp.*

brandegeae, Clarkia gracilis ssp. albicaulis, Clarkia mildrediae ssp. mildrediae, Clarkia mosquinii, Fritillaria eastwoodiae, Lewisia kelloggii ssp. hutchisonii, Lewisia kelloggii ssp. kelloggii, Lupinus dalesiae, Penstemon personatus, and *Penstemon sudans.*

5.2 Other Botanical Resources

5.2.1 Research Natural Areas

Research natural areas are part of a national network of ecological areas designated in perpetuity for research, education, and to maintain biological diversity on National Forest System Lands (USDA Forest Service 2005c). Research natural areas (RNA) provide essential baseline or reference condition information that land managers use to evaluate long-term ecological change, ecosystem sustainability, and the success of land management activities in equivalent systems (Andrews 1994). The guiding principle in management of a RNA is the perpetuation of unmodified conditions and the prevention of activities that directly or indirectly modify ecological processes (USDA Forest Service 2005c).

FSM 4063.3 outlines protection and management standards within a RNA. These standards do not permit roads, trails, fences, or signs on an established RNA unless they contribute to the objectives or to the protection of the area.

There are two RNAs on the Plumas NF, Mud Lake RNA and Mt. Pleasant RNA. The Mud Lake RNA was established to preserve two isolated stands of the special interest species Baker cypress (*Cupressus bakeri*). The Mt. Pleasant RNA was established to preserve red fir (*Abies magnifica*) forest and fen ecosystems and is within the Bucks Lake Wilderness where motorized vehicle use is prohibited.

Existing conditions related to direct and indirect impacts to Research Natural Areas

- There are 0.3 miles of unauthorized routes within the Wheeler Peak unit of the Mud Lake RNA (Table 5), which contains the world's largest specimen of Baker Cypress (diameter at breast height of 56 inches).

5.2.2 Special Interest Areas

Special Interest Areas (SIA) have been designated (or proposed for designation) to protect, and where appropriate foster public use and enjoyment of areas with scenic, historical, geological, botanical, zoological, palentological, or other special characteristics (Meyer 1991). FSM 2372.4 outlines protection and management standards within a SIA. These standards specify that (a) roads and trails be located without disturbing the special features of the established area and that (b) roads and trails are kept to the minimum necessary for public enjoyment. There are six designated and 12 proposed SIAs on the Plumas NF.

Existing conditions related to direct and indirect impacts to Special Interest Areas

- There are approximately 41.6 miles of unauthorized routes and existing system trail within designated and proposed SIAs (Table 5).

Table 5. Miles of unauthorized and existing system trails within Plumas NF Research Natural Areas and Special Interest Areas.

Special Interest Area	PNF Status[1]	Number of Occurrences within 100'	
		Unauthorized Routes	Existing System Trail
Brady's Camp	P	4.9	
Butterfly Valley	E	3.5	0.04
Eastern Escarpment	P	6.0	
Fales Basin	P	0.3	
Fowler Lake	P	0.1	
Little Last Chance Canyon	E	0.02	
Little Volcano	P	0.2	
McRae Meadow	P	10.3	5.6
Mount Fillmore	P	1.3	4.0
Red Hill	P	4.9	
Mud Lake RNA	E	0.3	
Soda Rock	E	0.2	
Grand total		**32**	**9.6**

[1] P = Proposed SIA, E = Existing SIA

6.0 Environmental Consequences: General Types of Impacts

6.1 Direct Effects

Direct effects occur when plants are physically impacted. Vehicles traveling on or parking off of the trail surface can result in death, altered growth, or reduced seed set through physically breaking, crushing, or uprooting plants (Wilshire, Shipley, and Nakata 1978, Cole and Bayfield 1993). Off-highway vehicle use on trails can reduce perennial and annual plant cover, plant density, and above-ground biomass (Hall 1989).

Direct effects are dependent upon the intensity and timing of disturbance. For example, direct impacts to an annual plant that has already gone to seed would not be as adverse as direct impacts to an annual plant that has not set seed (Ouren et al. 2007). Effects are also dependent upon the number of plants at a specific location and the proportion of the occurrence impacted. Repeated damage to sensitive species and other native plants can lead to the degradation of habitat and eventually to the replacement of native plant species, including sensitive plants, with species more adapted to frequent disturbance, such as invasive weeds.

6.2 Indirect Effects

Indirect effects on rare species are effects that are separated from an action in either time or space. Indirect effects from off-highway vehicle use may include changes in vegetation composition by creating edge habitats (Lovich and Bainbridge 1999 *in* Ouren et al. 2007). Adverse indirect effects are more likely to occur to those species that are intolerant of disturbance, such as those in the Interior

Forest habitat group. In contrast, for those species that tolerate or are dependent upon some level of disturbance, such as those species in the Open Habitat group that inhabit gaps and forest openings, route designation may have less detrimental indirect effects.

Off-highway vehicles have been shown to accelerate plant invasions (von der Lippe and Kowarik 2007) by reducing native plant vigor and cover (Brooks 1995 *in* Ouren et al. 2007), creating a competition-free habitat open to invasion (Frenkel 1970), and acting as a vector for seed dispersal. Once established, noxious weeds have the potential to impact rare species indirectly through allelopathy (the production and release of plant compounds that inhibit the growth of other plants) (Bais et al. 2003), as well as through direct competition for nutrients, light, and water (Bossard, Randall, and Hoshovsky 2000).

Indirect effects to rare plants and native vegetation from off-highway vehicle use are often tied to soil impacts. Soil compaction, erosion, and modification of soil properties can affect the distribution, abundance, growth rate, reproduction, and size of plants (Ouren et al. 2007). For example, studies conducted in the Mohave Desert found significantly less plant cover (Davidson and Fox 1974) and density (Vollmer et al. 1976) in areas frequented by off-highway vehicles.

Soil compaction, caused by repeated off-highway vehicle use, can result in reduced seed germination (Williams 1967 *in* Davidson and Fox 1974), seedling survival, soil water infiltration (Wilshire, Shipley, and Nakata 1978), plant and root growth (Phillips and Kirkham *in* Davidson and Fox 1974). The effects of soil erosion on plants can include undercutting of root systems as trails are enlarged by erosion; creation of new erosion channels in areas not used by vehicles; wind erosion of adjacent destabilized areas; burial of plants by debris eroded from areas of use; and reduction of the biological capability of the soil by physical modification and stripping of fertile layers (Wilshire, Shipley, and Nakata 1978).

Dust from motorized vehicle use has also been shown to decrease native plant cover and vigor by reducing rates of photosynthesis, respiration, transpiration (Spellerberg and Morrison 1998 *in* Ouren et al. 2007), and water-use efficiency. On heavily traveled roads, dust impacts have been documented up to 10 meters (32 feet) from the roadside and dust layers of up to 10 cm thick found on mosses and other vegetation of low stature (Walker and Everett 1987 *in* Ouren et al. 2007).

6.3 Cumulative Effects

A cumulative effect can result from the incremental effect of the current action when added to the effects of past, present, and reasonably foreseeable future actions. These effects are considered regardless of what agency or person undertakes the other actions and regardless of land ownership on which the other actions occur. An individual action when considered alone may not have a significant effect, but when its effects are considered in sum with the effects of other past, present, and reasonably foreseeable future actions, the effects may be significant (40 CFR 1508.7 and 1508.8 and FSH 1909.15 section 15.1).

One crucial step in assessing cumulative impacts on a particular resource is to compare the current condition of the resource (rare plants) and the projected changes as a result of management activities (such as off-highway vehicle use along a trail) to the natural variability in the resources and processes of concern (MacDonald 2000). This assessment is particularly difficult for rare plant species because long-term data are often lacking. In addition, the habitats in which many rare plant species are presently found have a long history of disturbance, making an undisturbed reference difficult to find. For some rare plants, particularly those that do not tolerate disturbance or are found under dense canopy conditions, minimizing on-site change is an effective way of reducing the potential for larger-scale cumulative impact (MacDonald 2000). If the greatest impact on a rare species is both local and immediate, then this is the scale at which the effect is easiest to detect (MacDonald 2000).

The additive effects of past actions (such as off-highway vehicle use, wildfires, wildfire suppression, timber harvest, mining, nonnative plant introductions, and ranching) have shaped the present landscape and corresponding populations of rare plants. However, data describing the past distribution and abundance of rare plant species is extremely limited, making it impossible to quantify the effects of historic activities on the resources and conditions that are present today. Rare plant surveys did not begin until the early 1980s on the Plumas NF. In many cases, even when project-level surveys were conducted, there is very little documentation that describes whether past projects avoided or protected rare plant species during project implementation. In addition to these unknowns, changes have been made to the Plumas NF Sensitive species list. Therefore, in order to incorporate the contribution of past activities into the cumulative effects of the proposed route designation project, this analysis uses the current abundance and distribution of rare plant species as a proxy for the impacts of past actions.

Undeniably, past, present, and future activities have and will continue to alter rare plant populations and their habitats to various degrees. These activities include off-highway vehicle use, grazing, timber harvest, fire suppression, prescribed fire, mining, recreational use, road construction, and noxious weed infestation. However, the approach taken in this analysis is that, if direct and indirect adverse effects on rare plant species from motorized vehicle route designation are minimal or would not occur, then they would not contribute substantially to cumulative effects on the species.

Present and future activities that are associated with the proposed trail system could impact rare species growing along or in the vicinity of a designated trail. These activities may include routine maintenance, such as brushing, signing, cleaning, or clearing of debris, or increased levels of dispersed camping or recreation along and near trails. Monitoring of road and trail conditions, which is required (see Chapter 2), will detect if resource damage is occurring to sensitive species, and will instigate the development of species-specific mitigations or trail closure. The effects of other types of future projects (i.e. vegetation management) would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

Flagging and avoiding rare plants is one of the most frequently used management strategies for reducing the cumulative impacts to known occurrences. While flag-and-avoid management can be effective in reducing cumulative impacts in most projects, it is not a practical mitigation for trail designation; therefore alternatives that minimize adverse effects are preferable to alternatives that do not.

7.0 Environmental Consequences: Effects of Alternatives on Rare Plant Species and Botanical Resources

The following sections provide a discussion of the direct, indirect, and cumulative effects of each alternative on rare species, rare plant habitats, and sensitive botanical resources. It is important to note that the analysis below represents what is known about motorized vehicle impacts along unauthorized routes at this point in time. Designation of a trail is expected to increase and concentrate motorized vehicle use; this has the potential to increase negative impacts to those rare species and habitats found along established trails. Trails and rare plant occurrences will need to be re-evaluated on a continual basis to assess and address detrimental resource affects.

Only those rare species with the potential to be affected directly or indirectly by the proposed project (that is, those within 100 feet of a proposed system trail) are discussed in detail in this document. The number of rare species locations within 100 feet of an existing system trail or unauthorized route is displayed in Table 4; the number of locations within 100 feet of a proposed system trail is displayed by action alternative in Table 8. The remainder of the effects discussion, or more specifically the analysis presented for Alternative 1, is focused on the more general effects to rare species and habitat groupings from motorized vehicle use. The following table summarizes the number of miles within each of the rare plant habitat types.

Table 6. Approximate number of miles of unauthorized routes, existing system trails, and proposed trails that occur within rare plant habitat types.

Habitat Type	Measure (miles)	Alternative				
		1 (No Action)	2	3	4	5
Riparian Areas[1]	Proposed System Trails		81		27	50
	Existing System Trails	34	34	34	34	34
	Unauthorized Routes	344				
	Total Miles	**378**	**115**	**34**	**61**	**84**
Wet Meadows[2]	Proposed System Trails		0.5			0.4
	Existing System Trails	1	1	1	1	1
	Unauthorized Routes	1.5				
	Total Miles	**2.5**	**1.5**	**1**	**1**	**1.4**
Serpentine Areas	Proposed System Trails		10		4	6.5
	Existing System Trails	3	3	3	3	3
	Unauthorized Routes	37				
	Total miles	**40**	**13**	**3**	**7**	**9.5**

Habitat Type	Measure (miles)	Alternative				
		1 (No Action)	2	3	4	5
Barren Habitats[2]	Proposed System Trails		2		0.75	1
	Existing System Trails		8.4	8.4	8.4	8.4
	Unauthorized Routes	11				
	Total miles	**11**	**10.4**	**8.4**	**9.15**	**9.4**
Interior Forest[3]	Proposed System Trail		207		75	139
	Existing System Trail	72	72	72	72	72
	Unauthorized Routes	625				
	Total miles	**697**	**279**	**72**	**147**	**211**
Open Habitat[4]	Proposed System Trail		112		59	85
	Existing System Trail	38	38	38	38	38
	Unauthorized Routes	346				
	TOTAL MILES	384	150	38	97	123

[1] Riparian Areas are defined here as ephemeral, intermittent, or perennial streams.
[2] It is important to note that these numbers are an estimate; this habitat type is not well mapped on the Forest.
[3] Interior Forest is defined here as CWHR 4M, 4D, 5M, 5D, and 6M.
[4] Open Forest ecosystems are defined here as CWHR 1-3: M, D, S, P, X, and 4P, 4S, 5P, 5S.

In addition to rare plant species and habitats, the affects to two additional botanical resources are also discussed in the analysis below; these resources are Research Natural Areas and Special Interest Areas. The number of existing and unauthorized route miles within Plumas NF SIAs and RNAs is displayed in Table 5; the number of proposed system trail miles is displayed by action alternative in Table 9.

7.1 Alternative 1 – No action

Alternative 1 has the greatest negative effect on rare species and habitats. The largest impact of this alternative is from cross-country travel, which has the potential to affect all but the most inaccessible rare species and habitats

Under this alternative, it is impossible to quantify when and where rare plant species and habitats will be impacted by motorized vehicles; therefore the analysis below uses the approximately 1,073 miles of unauthorized routes as a representation of current motorized vehicle use on the Forest. Due to the potential scope of these effects, the analysis of this alternative also focuses on a discussion of effects to plant groups, rather than to individual species.

7.1.1 Direct/Indirect Effects

Table 7. Summary of rare species indicator measures for Alternative 1 (No Action)

Indicator Measure	Value
Miles of unauthorized routes within or adjacent to rare plant sites	30 miles
Acres of rare plant sites within 100 feet of an existing unauthorized route	509 acres
Total number of rare plant sites within 100 feet of an existing unauthorized route	304 sites

Fens

Implementation of Alternative 1 has the highest risk of direct and indirect effects to rare species dependent upon fen ecosystems, primarily due to the allowance for cross-country travel. At present, there are no known rare fen species occurrences within 100 feet of an unauthorized route; however at least one unauthorized route comes within 100 feet of one fen and vehicle tracks have been documented in close proximity to another. Motorized vehicle use has been listed as a potential threat to almost all of the fens outside of the Bucks Lake Wilderness (Plumas NF Fen Inventory files 2008).

Motorized vehicle use within or in close proximity to fen habitats, has the potential to disrupt key hydrologic processes essential to maintaining the integrity of the fen system. In situations where the hydrologic function of a fen has been disrupted and the water table lowered, the peat quickly oxidizes and decomposes. This reduces the peat depth, alters hydrologic patterns, increases the risk of pocket gopher invasion, and can result in shifts in species diversity and composition (Cooper 1990 *in* Weixelman 2007). All of these factors can have detrimental effects to rare fen species.

Meadows and seeps

Implementation of Alternative 1, and the allowance for cross-country travel, provides the greatest access to meadows (Table 6) and seeps; it also carries the highest risk of direct and indirect effects to rare species dependent upon meadow and seep ecosystems. Meadows and seeps often have high scenic value, which makes them a destination spot for motorized recreation and tends to concentrate use in these areas. There are currently four rare Meadow and Seep species, with a total of 34 locations, within 100 feet of an unauthorized route or existing system trail (Table 4).Unauthorized routes often lack water bars or other design features that slow water flow, decrease erosion, and prevent sedimentation into the meadows and seeps situated adjacent to routes. Motorized vehicle use results in soil disturbance, soil compaction, and removal of vegetation in and around routes; all of these can have a substantial impact on the hydrologic and biotic integrity of the meadow and seep ecosystems. Meadows and seeps are also highly susceptible to invasion from noxious weed species that thrive under wet conditions, such as Canada thistle (*Cirsium arvense)* and perennial pepperweed (*Lepidium latifolium*).

Riparian Areas

Alternative 1 has highest number of existing unauthorized routes and system trails (378 miles) within riparian ecosystems (Table 6). There are also three rare Riparian species, with a total of seven locations, within 100 feet of existing unauthorized routes or system trail (Table 4.) These factors, in combination with the allowance for cross-country travel, result in Alternative 1 carrying the highest risk of effects to rare species within riparian systems. Unauthorized routes have not been designed to reduce impacts to riparian ecosystems. Motorized vehicles traveling on and off of these routes negatively impact riparian species and habitats by reducing the vegetative cover in and around trails, compacting soils, increasing erosion, altering patterns of water flow, and reducing water quality by depositing petroleum products and/or sediment into streams. Removal of vegetation can alter the microclimate and lead to warmer and drier conditions that are not favored by the rare species in this guild. Riparian areas, like meadows and seeps, are highly susceptible to invasion from noxious weed species that thrive under wet conditions, such as Canada thistle (*Cirsium arvense)* and perennial pepperweed (*Lepidium latifolium*).

Serpentine areas

Alternative 1 has an estimated 40 miles of unauthorized and existing system trail within serpentine areas (Table 6). There are also six rare Serpentine species, with a total of 68 locations, within 100 feet of an unauthorized or existing system trail (Table 4). Serpentine areas often lack natural barriers to motorized vehicles (i.e. dense vegetation), which makes this habitat type particularly inviting to cross-country travel. All of these factors result in Alternative 1 carrying the highest risk of effects to rare species within Serpentine areas.

Serpentine soils are generally shallow and rocky, with low water-holding capacity and rooting depths. These conditions inhibit plants from developing deep root systems and also increase the vulnerability of serpentine soils to erosion (Whittaker 1954). Motorized vehicles negatively affect this unique plant community and the rare species that it supports by creating disturbed soils that are highly vulnerable to increased erosion. In areas where motorized vehicle use has occurred, vegetation and soil recovery rates are generally very slow (Harrison et. al 2006). While these nutrient-poor ecosystems tend to be less invaded by non-native species than other habitat types (Harrison 1999), motorized vehicles still increase the risk of noxious weed introduction and spread in these communities.

Barren Habitats

Alternative 1 has highest estimated number of unauthorized routes (11 miles) on rock outcrops, ridge tops, cliffs, and talus slope ecosystems (Table 6). Two rare species, with a total of four locations, also occur within 100 feet of unauthorized or existing system trail (Table 4). These factors, in combination with the allowance for cross-country travel, result in Alternative 1 carrying the highest risk of effects to rare species within these “barren” ecosystems.

Some of the species in this group (i.e. *Lewisia cantelovii*) grow in sites that are inaccessible to motorized vehicles, such as steep cliffs or rocky habitats. In these areas, where natural barriers to motorized vehicle use exist, the likelihood of direct impacts from this alternative is much lower than it is for rare species that grow in more accessible habitat types (i.e. forest openings or serpentine areas). In contrast, other species in this group, such as *Lewisia kelloggii* ssp. *hutchisonii*, grow in flatter, more open terrain, where the risk of direct effects from motorized vehicle travel is much higher.

In many of these ecosystems, particularly where the terrain is steep, disturbance from motorized vehicles can increase the rates of erosion, causing significant indirect impacts to rare species. In addition, plants dependent on Barren habitat types generally do not compete well with other vegetation; therefore weed introduction or spread can be a significant risk in those areas with more developed soils.

Interior Forest Habitats

Implementation of Alternative 1 has the highest risk of direct and indirect effects to rare species dependent upon interior forest ecosystems. Alternative 1 has 697 miles of unauthorized and existing system trail within interior forest habitats (Table 6). There are also two rare Interior forest orchid species, with a total of 19 locations, within 100 feet of unauthorized or existing system trail (Table 4).

Rare species that are dependent upon interior forest communities often require shade, protected microclimates, and infrequently disturbed substrates. Many of these species, particularly the *Cypripedium* species, have complex mycorrhizal associations that require sufficient organic matter in the duff layer. Motorized vehicle use within interior forest habitats can alter the temperature, moisture, and other microclimate conditions; disrupt underground mycorrhizal networks; disturb litter and duff layers; change soil characteristics; and create open areas of bare soil that increase the risk of weed introduction and spread. Increased route and road density in interior forest habitat also has the potential to fragment rare plant populations that are dependent upon closed canopy systems.

The species in the Interior Forest habitat group may not be as impacted by cross-country travel as those in the previously discussed species groups (i.e. meadows or serpentine species) due to the higher density and size of trees or other natural barriers to motorized vehicle travel that exist in this habitat type; however, the Interior Forest species are also highly intolerant of disturbances, such as those from motorized vehicles. This latter factor greatly increases the risk to these species from Alternative 1.

Open Habitats

The species in this guild are found in a wide variety of open habitat types that include open forests, forest margins, stabilized roadsides, old skid trails, and forest openings or gaps. Because many of these habitats are ephemeral in nature or occur along habitat edges, a quantification of some of these habitat types cannot be completed. An estimate of the number of miles within open forest habitat is presented in Table 6. In general, these habitats are highly accessible to and utilized by

motorized vehicles. In addition, many of these types (i.e. stabilized roadsides, forest margins) are often created as a result of motorized vehicle travel. This grouping contains the largest number of species (12) and locations (186) within 100 feet of an unauthorized or existing system trail (Table 4).

In general, the rare species in this plant association colonize open areas, multiply rapidly, and persist for a short while. They are often poor competitors, and may persist only until stronger competitors move in and shade them out. Many are well adapted to take advantage of the high-light intensities found along routes. Species in this guild vary in their degree of tolerance to disturbance activities; many tend to be disturbance-followers that increase with infrequent, small-scale disturbances.

The edge of motorized routes may provide open habitat for some rare species; however any beneficial effect to these species (i.e. increased light or low levels of competition) could easily be overcome by negative direct effects such as repeated trampling or death of individuals; continual soil disturbance, which could lead to soil erosion and degradation of the seedbed; and noxious weed introduction and spread. Open habitats are highly susceptible to noxious weed invasions, particularly from species such as yellow starthistle (*Centaurea solstitialis*), knapweed (*Centaurea* species), or annual grasses such as medusahead (*Taeniatherum caput-medusae*).

7.1.2 Cumulative Effects

Implementation of Alternative 1 would not improve conditions for rare species or their habitats. Unmanaged motorized vehicle use on the Plumas NF has the potential for negative direct and indirect effects to all of the rare species known to occur on the forest (Table 2); therefore the potential for cumulative effects to these species is high.

Under this alternative, motorized vehicles traveling on and off of unauthorized routes would continue to trample, kill, and uproot rare species. Indirect effects to rare species and their associated habitats could include reduction of native plant cover, creation of edge-habitats, increased rutting, erosion, and soil compaction. One of the largest potential impacts from cross-country motorized is the increased risk of noxious weed introduction and spread. Noxious weeds reduce the quality of native (including rare plant) habitat by displacing native species, altering nutrient and fire cycles, degrading soil structure, and decreasing the quality and availability of forage for wildlife (Bossard, Randall, and Hoshovsky 2000). Noxious weeds are spread by roads, motorized trails, recreational activities (such as camping, hiking, horseback riding, and hunting), and ongoing land management activities. Under this alternative, all but the most inaccessible habitats are at risk of noxious weed invasion and spread from cross-country motorized vehicle travel.

Many of the Plumas NF plant communities (discussed above) have been degraded or altered by historic human activities. Riparian areas, fens, meadows, seeps, and springs on the Plumas NF have been altered by water diversions, habitat type conversion (i.e. meadow to annual grassland), intense grazing by domestic livestock, and construction of roads and trails. Serpentine areas and barren, rocky habitats have been impacted by gold and gravel mining, timber harvest, road construction, and

recreation. Interior or late-successional forests across the Sierra Nevada have been altered by past timber management practices, wildfire suppression, and road construction. Open, or early to mid-successional forests, have also been heavily impacted by past timber management practices, which tended to favor removal of larger, more dominant trees (i.e. overstory removal). This management practice, as well as the suppression of wildfire, has resulted in a greater number of dense forests that are dominated by small trees and a reduction in open forest habitat across the landscape. Forest openings or edges, which are not a specific habitat type, are continually being created as trees or other vegetation dies. While the specific amount of habitat reduction or alteration is unknown, it can be presumed that these activities and others have impacted rare species directly, indirectly, and cumulatively by reducing the amount of suitable habitat across the Plumas NF.

Past management activities, such as timber harvest, have also created skid trails and temporary roads that often contribute to cross-country travel and the creation of unauthorized routes. The number of forest users, and subsequently the number of unauthorized routes, continues to grow each year with many having negative impacts to rare species and their habitats. Under this alternative, these negative impacts would not be addressed or mitigated and would continue to occur at an increased rate. These routes and use-areas lack the planning and design features that are important for limiting disturbance and damage to sensitive botanical resources.

The effects of present and future projects on rare species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

7.1.3 Effects to Other Botanical Resources under Alternative 1

Under this alternative, motorized vehicle use would continue to occur within the Mud Lake Research Natural Area and the 18 Plumas NF Special Interest Areas (Table 5). These areas were designated (or proposed for designation) to protect significant geological, botanical, and/or historical features. Unmanaged motorized vehicle use within these areas has the potential to significantly degrade or disturb these special features.

8.0 Action Alternatives (2-5): Summary of Environmental Consequences for Individual Species

The following sections provide a discussion of the direct, indirect, and cumulative effects of each alternative on those rare species with the potential to be affected directly or indirectly by the proposed project (that is, those within 100 feet of a proposed system trail). These sections also provide information on the abundance, distribution (both on a global and local scale), and habitat specificity for each of the rare species (organized by habitat grouping) found within 100 feet of a proposed system trail. Sections of the Plumas NF rare species management prescriptions (USDA Forest Service 2007) that are relevant to route designation are also provided. The Plumas NF species management

prescriptions are based on field visits, monitoring, and professional observations; individual species conservation assessments and guides; and known species ecology.

In general, the types of impacts to rare species would be similar to those described under Alternative 1 (No Action); however due to the prohibition of cross-country travel, the action alternatives would negatively affect far fewer rare species (Table 8), rare plant habitats (Table 6), and Special Interest Areas (Table 9). In general, the greater the number of motorized vehicle trails (and miles) proposed, the higher the risk and severity of negative impacts to rare species and their associated habitats.

Table 8. The number of rare plant locations within 100' of a proposed system trail displayed by action alternative.

Species	Habitat Grouping[1]	Action Alternatives		
		2	**4**	**5**
Allium jepsonii	S	2		2
Arabis constancei	S	2	1	1
Astragalus lentiformis	O	8	1	4
Astragalus pulsiferae var. pulsiferae	O	3		
Botrychium sp.	MS, R	1		
Calycadenia oppositifolia	S, O	2		2
Clarkia mildrediae ssp. mildrediae	O	11	4	7
Clarkia mosquinii	O	1		
Cypripedium fasciculatum	IF	6	5	5
Eriogonum umbellatum var. ahartii	S	7		
Hydrothyria venosa	R	2		1
Ivesia aperta var. aperta	MS	2		2
Ivesia sericolueca	MS	2		
Lewisia kelloggii ssp. hutchisonii	O, B	1		
Lupinus dalesiae	O	22	11	15
Monardella follettii	S	3	1	2
Penstemon personatus	O	2		1
Pyrrocoma lucida	MS	2		2
TOTAL		**79**	**23**	**44**

[1]Fens (F), Meadows and Seeps (MS), Riparian areas (R), Serpentine (S), Barren (B), Interior Forest (IF), Open habitat (O)

Table 9. Miles of proposed system trails within Plumas NF Special Interest Areas displayed by action alternative

Special Interest Area	PNF Status[1]	Action Alternative		
		2	**4**	**5**
Brady's Camp	P	2.8		1.5
Butterfly Valley	E	0.2		0.2

Fowler Lake	P	0.1		
McRae Meadow	P	1.2	1.2	1.2
Grand total		**4.4**	**1.2**	**3**

[1] P = Proposed SIA, E = Existing SIA

8.1 Meadows and seeps

The following four meadow and seep species occur within 100 feet of a proposed system trail: *Botrychium sp.*, *Ivesia aperta* var. *aperta*, *Ivesia sericolueca,* and *Pyrrocoma lucida*.

8.1.1 Botrychium (moonworts)

Botrychium are small, inconspicuous, perennial ferns that are commonly referred to as moonworts. Some of these species are widely distributed across North America. In California, *Botrychium* have been reported from the Oregon border as far south as the San Bernardino mountain range (Laeger 2002). Despite this wide range, *Botrychium* occurrences are often scattered and consist of only a few individuals.

In California, *Botrychium* are most often found in high latitudes and high elevation montane or forest habitats. Within these habitat types, *Botrychium* occur in meadows, springs, and fens; along stream banks and alpine lakeshores; and in wet crevices in outcrops (Laeger 2002). Important habitat requirements include sufficient canopy cover, soil moisture, organic matter, and because *Botrychium* are closely associated with mycorrhizal fungi at all life stages, the avoidance of root and mycorrhizal disturbance.

Population trends are difficult to define for *Botrychiums* because individuals do not appear above ground every year. Threats from management activities include grazing and trampling by livestock; road construction and maintenance; recreation, including off-road vehicles use; changes in the hydrologic regime; and harvesting of plants as special forest products. The dispersal strategies and population dynamics (i.e. metapopulation dynamics) of these species make it particularly important to protect unoccupied suitable habitat. Although many of these species may be found in areas of old disturbance (greater than 10 years old), continuous, heavy soil disturbance can be very detrimental (Laeger 2002).

The *Botrychium's* small size, inconspicuous growth form, and potential for dormancy make survey and identification particularly challenging. On the Plumas NF, fifteen sites have been identified as supporting unidentified *Botrychium* species (i.e. where the taxonomy has yet to be confirmed). *B. ascendens, B. crenulatum, B. lineare, B. lunaria* and *B. pinnatum* have not been documented on the Plumas NF but are considered to have the potential to occur. *B. minganese* and *B. montanum* have been found on the Plumas NF.

PNF prescription**:** Protect all plant occurrences from ground disturbance. Maintain hydrologic conditions in riparian areas where these plants occur. Do not allow machinery in occupied habitat. Develop a monitoring strategy for habitat enhancement activities as needed. Evaluate other activities on a site-by-site basis considering species abundance, population size, and known species ecology.

Direct and Indirect Effects:

One *Botrychium* location was documented within 100 feet of a trail proposed under Alternative 2 (Table 10). Due to the difficulty of identification, a species determination for this *Botrychium* has not been made; therefore for purpose of this analysis this species will be treated as one of the eight Plumas NF Sensitive *Botrychium* species (Table 1) and protected according to the management prescription described below.

Table 10. *Botrychium* occurrence within 100' of the trail proposed under Alternative 2

Occurrence	Route ID	Number of acres with potential for impact			Action Alternatives		
		Within 0-30' route	Within 30-100'	Size of Occurrence (acres)	2	4	5
6	17M05	0.1	0.01	0.11	X		

Due to its close proximity to the route proposed under Alternative 2, the individuals within Occurrence 6 are at a high risk of direct impacts (i.e. trampling or death) from motorized vehicle use. This small occurrence contains only eight individuals; all of which are located along the banks of a small spring that crosses the proposed trail. Soil disturbance from motorized vehicle use, particularly when it occurs on a regular basis, could have an adverse effect on the *Botrychium* at this site.

The habitat where this species is found is particularly sensitive to the impacts of motorized vehicle use. Motorized vehicles can disrupt key hydrologic processes, alter the timing and direction of water flow and infiltration, and increase rates of erosion. This habitat is also highly susceptible to invasion from aggressive noxious weed species that thrive under wet conditions, such as Canada thistle (*Cirsium arvense)* and perennial pepperweed (*Lepidium latifolium*).

There would be no direct or indirect effects to the *Botrychium* from implementation of Alternatives 3, 4, or 5.

Cumulative Effects:

Past activities, such as grazing by domestic livestock and construction of roads and trails, have resulted in water diversions and habitat type conversions of seeps, springs, and meadows across this species' range. These past management activities have likely had a negative impact on *Botrychium* individuals and areas of suitable habitat.

Implementation of the action alternatives will reduce impacts to this species by banning cross-country travel; however Alternative 2 will not eliminate the impacts to all occurrences or areas of suitable habitat. The occurrence that may be impacted by use of the proposed system trails represents approximately five percent of all known *Botrychium* occurrences on the Plumas NF (Figure 1).

The proposed route appears to be relatively well-established; therefore the largest impact to this occurrence most likely occurred at the time the route was created or constructed. Continued use of this route will likely threaten the individuals within this occurrence, by directly impacting individuals and indirectly increasing rates of erosion. The effects of present and future projects on this species

would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

There are no direct or indirect effects to *Botrychium* from implementation of Alternatives 3, 4, or 5; therefore the cumulative effects from these alternatives would be negligible.

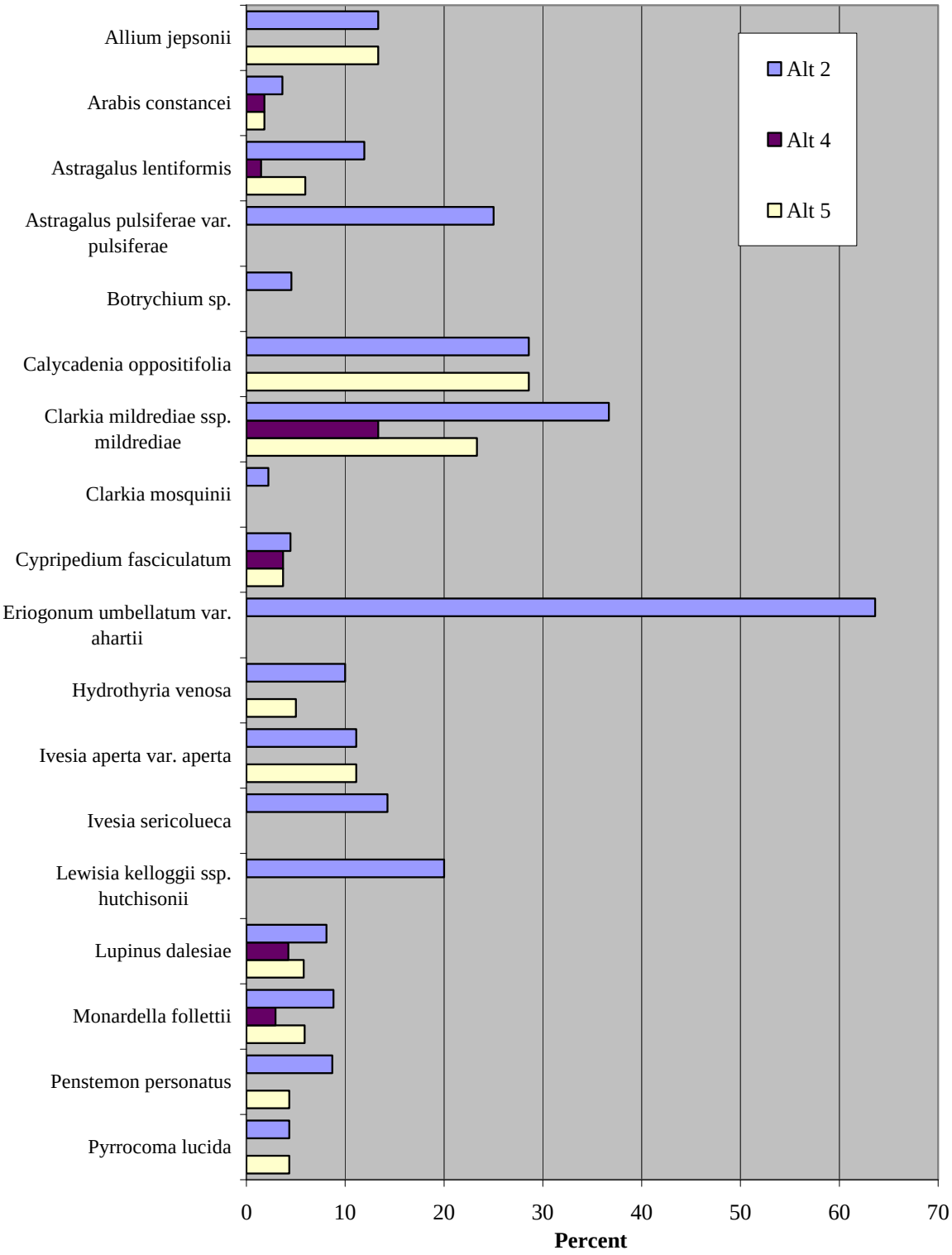
8.1.2 Ivesia aperta var. aperta (Sierra Valley Ivesia)

This species has a limited range that consists of scattered occurrences in Washoe County, Nevada and Plumas, Lassen, and Sierra counties in California. On the Plumas NF, *Ivesia aperta* var. *aperta* has been documented at 18 locations. Thirty three occurrences have been recorded from Bureau of Land Management (BLM), Forest Service, State, and private lands adjacent to the Plumas NF (CNDDB 2008).

Ivesia aperta var. *aperta* is found in sagebrush plant communities at the eastern base of the Sierra Nevada. Within these communities, it is associated with meadow flats, meadow borders, rocky ephemeral stream channels, gentle rocky slopes with sparse vegetative cover, and vernal pools (USDA Forest Service 1992). This species appears to be in decline across its range. Threats include livestock grazing and trampling, road construction and maintenance, mining, fire suppression activities (fire camps), and off-highway vehicle use. Off-highway vehicles impact this species and habitat by compaction of soils and physical damage to the plants. Observations have shown that motorized vehicle trails on the Plumas NF have removed “strips” from *Ivesia* populations (USDA Forest Service 1992).

PNF prescription**:** At least 30 percent of the known occurrences within a project area should be protected from all ground disturbing actions. Avoid impacting more than 50 percent of the known individuals within a project area over any 10 year period. To the degree possible, incorporate known aspects of the species’ ecology into design elements of proposed actions to protect or enhance species viability. Evaluate activities and use mitigations consistent with Riparian Management Objectives (HFQLG FEIS) or Riparian Conservation Objectives (Sierra Nevada Forest Plan Amendment ROD, p. 32-35) depending on which standards apply, species abundance, population size, geographic distribution, and known species ecology. In general, strive to avoid direct impacts.

Figure 1. Percentage of Plumas NF occurrences impacted by the proposed routes.



Direct and Indirect Effects

Two locations of *Ivesia aperta* var. *aperta* are situated within 100 feet of a trail proposed under Alternatives 2 and 5 (Table 11).

Table 11. Locations of *Ivesia aperta* var. *aperta* within 100 feet of the trails proposed under the Action Alternatives

Occurrence	Route ID	Number of acres with potential for impact			Action Alternatives		
		Within 0-30' route	Within 30-100'	Size of Occurrence (acres)	2	4	5
2	16M04A	0.4	1	125	X		X
10	15M04	0.5	1.1	9	X		X

Ivesia aperta var. *aperta* individuals within 30 feet of a proposed system trail will have a high probability of direct effects (i.e. trampling or death) from motorized vehicle use; however because this species is dependent upon wet meadow habitats and is less likely to inhabit the drier conditions associated with the trail bed or shoulder, indirect effects to adjacent habitats are most likely to have an adverse impact.

The habitat where this species is found is particularly sensitive to the impacts of motorized vehicle use. Motorized vehicle use within or in close proximity to this habitat has the potential to disrupt key hydrologic processes, which could have adverse indirect effects on the species. Ruts caused by motorized vehicles in wet meadows can alter the timing and direction of water flow and infiltration. Increased rates of erosion and creation of head-cuts can also become so severe that a large portion of wet meadow habitat is degraded. These habitats are also highly susceptible to invasion from aggressive noxious weed species that thrive under wet conditions, such as Canada thistle (*Cirsium arvense)* and perennial pepperweed (*Lepidium latifolium*).

There would be no direct or indirect effects to *Ivesia aperta* var. *aperta* from implementation of Alternatives 3 or 4.

Cumulative Effects

Past activities, such as grazing by domestic livestock and construction of roads and trails, have resulted in water diversions and habitat type conversions of meadows across this species' range. These past management activities have likely had a negative impact on *Ivesia aperta* var. *aperta* individuals and areas of suitable habitat.

At present, the two *Ivesia aperta* var. *aperta* occurrences that are potentially impacted by the proposed system trails are also impacted by ongoing livestock grazing. Preliminary monitoring of this species has shown lower recruitment numbers and higher mortality levels in areas that are grazed by domestic livestock (M. Friend, personal communication). Occurrence 10 also has a channel headcut, which may accelerate the hydrologic degradation of the habitat. These conditions, in combination with motorized vehicle use on the proposed trails, have the potential to negatively impact *Ivesia aperta* var. *aperta* habitat and threaten individuals.

Implementation of the action alternatives will reduce impacts to this species by banning cross-country travel; however Alternatives 2 and 5 will not eliminate the impacts to all occurrences or areas of suitable habitat. The two occurrences that may be impacted by use of the proposed system trails represent approximately eleven percent of all known occurrences on the Plumas NF (Figure 1) and four percent of the known occurrences in California (CNDDB 2008).

Both of the proposed routes appear to be relatively well-established; therefore the largest impact to these two *Ivesia aperta* var. *aperta* occurrences most likely occurred at the time the route was created or constructed. Designation of these routes under the action alternatives will have some negative impact on this species; however it will likely not reduce the overall viability of *Ivesia aperta* var. *aperta* due to the small proportion of the two occurrences affected (less than eighteen percent) and the relatively small amount of suitable habitat potentially impacted. The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

There are no direct or indirect effects to *Ivesia aperta* var. *aperta* from implementation of Alternatives 3 or 4; therefore the cumulative effects from these alternatives would be negligible.

8.1.3 Ivesia sericolueca (Plumas Ivesia)

This species has a limited range that consists of scattered occurrences in Washoe County, Nevada, and Plumas, Lassen, Nevada, and Sierra counties in California. *Ivesia sericolueca* has been recorded at 14 locations on the Plumas NF and 52 occurrences outside of the Plumas NF on County, Forest Service, State, and private lands (CNDDB 2008).

This plant is found in vernally wet portions of meadows and alkali flats, and in vernal pools. These habitats are not widespread and are sensitive to changes in hydrology and impacts from erosion. *Ivesia sericolueca* has a downward trend across its range due to low levels of reproduction and high levels of disturbance at known sites. Threats to this species include recreation activities, off-highway vehicle use, firewood gathering, target shooting, livestock grazing, mining, fire suppression, military practice camps, timber harvest activities, changes in hydrology, and erosion.

PNF management prescription: At least 30 percent of the known occurrences within a project area should be protected from all ground disturbing actions. Avoid impacting more than 50 percent of the known individuals within a project area over any 10 year period. To the degree possible, incorporate known aspects of the species' ecology into design elements of proposed actions to protect or enhance species viability. Evaluate activities and use mitigations consistent with Riparian Management Objectives (HFQLG FEIS) or Riparian Conservation Objectives (Sierra Nevada Forest Plan Amendment ROD, p. 32-35) depending on which standards apply, species abundance, population size, geographic distribution, and known species ecology. In general, strive to avoid direct impacts.

Direct and Indirect Effects

Two locations of *Ivesia sericolueca* occur within 100 feet of a trail proposed under Alternative 2 (Table 12). No occurrences of this species are impacted under any of the other action alternatives.

Table 12. Locations of *Ivesia sericolueca* within 100' of a trail proposed under Alternative 2.

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
5	13M10	0.6	1.1	52	X		
6	13M10	0.04	0.4	17	X		

Ivesia sericolueca individuals within 30 feet of a proposed system trail will have a high probability of direct effects (i.e. trampling or death) from motorized vehicle use; however because this species is dependent upon wet meadow habitats and is less likely to inhabit the drier conditions associated with the trail bed or shoulder, indirect effects to adjacent habitats are most likely to have an adverse impact.

Ivesia sericolueca occupies habitats that are particularly sensitive to the impacts of motorized vehicle use. Motorized vehicle use within or in close proximity to this habitat has the potential to disrupt key hydrologic processes, which could have adverse indirect effects on the species. Ruts caused by motorized vehicles in wet meadows can alter the timing and direction of water flow and infiltration. Increased rates of erosion and creation of head-cuts can also become so severe that a large portion of wet meadow habitat is degraded. These habitats are also highly susceptible to invasion from aggressive noxious weed species that thrive under wet conditions, such as (*Cirsium arvense)* and perennial pepperweed (*Lepidium latifolium*).

There would be no direct or indirect effects to *Ivesia sericolueca* from implementation of Alternatives 3, 4, or 5.

Cumulative Effects

Past activities, such as grazing by domestic livestock and construction of roads and trails, have resulted in water diversions and habitat type conversions of meadows across this species' range. These past management activities have likely had a negative impact on *Ivesia sericolueca* individuals and areas of suitable habitat.

Current livestock grazing on the Plumas NF impacts occurrences of *Ivesia sericolueca* by reducing recruitment levels and increasing mortality rates (M. Friend, personal communication). This management activity, in combination with motorized vehicle use along some of the proposed trails, may accelerate the hydrologic degradation of suitable habitat for this species across the Forest.

Implementation of the action alternatives will reduce impacts to this species by banning cross-country travel; however Alternative 2 will not eliminate the impacts to all occurrences or areas of suitable habitat. The two occurrences that may be impacted by use of the proposed system trail

represent approximately 14 percent of all known occurrences on the Plumas NF (Figure 1) and three percent of the known occurrences in California (CNDDB 2008).

The proposed route (13M10) is relatively well-established; therefore the largest impact to these two occurrences most likely occurred at the time the route was created or constructed. Designation of this route under Alternative 2 will have some negative impact on this species; however it will likely not reduce the overall viability of *Ivesia sericolueca* due to the small proportion of the two individual occurrences affected (less than three percent) and the relatively small amount of suitable habitat potentially impacted. The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

There are no direct or indirect effects to *Ivesia sericolueca* from implementation of Alternatives 3, 4, or 5; therefore the cumulative effects from these alternatives would be negligible.

8.1.4 Pyrrocoma lucida (sticky Pyrrocoma)

This perennial tap rooted species is known from 76 occurrences in Sierra, Plumas, Yuba, and Lassen counties (CNDDB 2008). It is endemic to the eastern portion of the Beckwourth Ranger District of the Plumas NF, the Sierra Valley area on the Sierraville Ranger District of the Tahoe NF, and adjacent private lands. The Plumas NF currently has 46 occurrences.

Pyrrocoma lucida is found in vernally saturated soils of alkaline clay meadows within sagebrush scrub habitats below 6000 ft. Within these habitats it occurs in the drier sagebrush-meadow ecotones rather than in the perennially wet meadows. It is also found in ephemeral drainages and swales, roadside ditches, and historic railroad ditches.

The trend for this species is not known. Documented occurrences are numerous and individuals are estimated to exceed 383,000 plants with over half occurring on state or federal lands. In spite of this substantial number of occurrences and abundance of individuals, nearly every occurrence is disturbed by one or more factors. Threats include reservoir development, meadow restoration, off-highway vehicle use, recreation activities, fire suppression camps, military camps, prescribed burning and other fuel treatments, activities associated with timber harvest (i.e. landings), fuel wood gathering, grazing, and land exchanges.

PNF management prescription: At least 30 percent of the known occurrences within a project area should be protected from all ground disturbing actions. Avoid impacting more than 50 percent of the known individuals within a project area over any 10 year period. To the degree possible, incorporate known aspects of the species' ecology into design elements of proposed actions to protect or enhance species viability. Evaluate activities and use mitigations consistent with Riparian Management Objectives (HFQLG FEIS) or Riparian Conservation Objectives (Sierra Nevada Forest Plan Amendment ROD, pp. 32-35) depending on which standards apply, species abundance, population size, geographic distribution, and known species ecology. In general, strive to avoid direct impacts.

Direct and Indirect Effects

Two locations of *Pyrrocoma lucida* occur within 100 feet of a trail proposed under Alternatives 2 and 5 (Table 13)

Table 13. Locations of *Pyrrocoma lucida* within 100' of the trails proposed under the Action Alternatives

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
4	16M04A		0.2	63	X		X
5	16M04	0.05	0.4	100	X		X

Pyrrocoma lucida is found along the edges of vernally moist meadows and alkali flats. Because of their sparse vegetation and open terrain, these habitats are particularly inviting to motorized vehicle use. The trails within the vicinity of these two occurrences are both well-established roads/trails; therefore the likelihood of individuals occurring within the trail is relatively low. Motorized vehicles pulling off of the trail to park may directly affect individuals within Occurrence 5 if plants occupy the area between 0-30 feet of the trail.

Indirect effects to this species include increased risk of noxious weed invasion, particularly from aggressive noxious weed species that thrive under wet conditions, such as Canada thistle (*Cirsium arvense)* and perennial pepperweed (*Lepidium latifolium*). Motorized vehicle use within or in close proximity to this habitat can also disrupt key hydrologic processes, alter the timing and direction of water flow and infiltration, and increase rates of erosion.

There would be no direct or indirect effects to *Pyrrocoma lucida* from implementation of Alternatives 3 or 4.

Cumulative Effects

Past activities, such as grazing by domestic livestock and construction of roads and trails, have resulted in water diversions and habitat type conversions of meadows across this species' range. These past management activities have likely had a negative impact on *Pyrrocoma lucida* individuals and areas of suitable habitat. Current livestock grazing within occurrences, in combination with motorized vehicle use along some of the proposed trails, may accelerate the degradation of habitat for this species across the Forest.

Implementation of the action alternatives will reduce impacts to this species by banning cross-country travel; however Alternatives 2 and 5 will not eliminate the impacts to all occurrences or areas of suitable habitat. The two occurrences that may be impacted by use of the proposed system trail represent approximately four percent of all known occurrences on the Plumas NF (Figure 1) and three percent of the known occurrences in California (CNDDB 2008).

The proposed routes are relatively well-established; therefore the largest impact to these two occurrences most likely occurred at the time the route was created or constructed. Designation of these routes under the action alternatives will have some negative impact on this species; however it

will likely not reduce the overall viability of *Pyrrocoma lucida* due to the small proportion of the two individual occurrences affected (less than 0.5 percent) and the relatively small amount of suitable habitat potentially impacted. The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

There are no direct or indirect effects to *Pyrrocoma lucida* from implementation of Alternatives 3 or 4; therefore the cumulative effects from these alternatives would be negligible.

8.2 Riparian Areas

One riparian species, *Hydrothyria venosa*, occurs within 100 feet of a proposed system trail.

8.2.1 Hydrothyria venosa (veined water lichen):

This aquatic lichen has a broad distribution that includes five eastern states, Oregon, Washington, British Columbia, and California. In California, it is found in streams along the western slope of the Sierra Nevada and northern Coast ranges. Twenty occurrences of *Hydrothyria venosa* have been documented on the Plumas NF. Outside of the Plumas NF, 25 occurrences are known from Forest Service and State Park lands. Where populations do occur, individuals are generally few in number.

Hydrothyria venosa is found in cold, unpolluted streams in mixed conifer forests. It is in decline throughout its historic range. Threats to this species include activities that change the water chemistry, alter the stream channel, or significantly alter the riparian vegetation. These changes increase the water temperature and/or increase flows that scour the gravel and rocks where this lichen is attached. Management activities of concern include grazing, off-highway vehicles, sedimentation from roads, herbicides, dispersed camping, and recreational water use.

PNF management prescription: Protect all locations from disturbance. Maintain hydrologic conditions in streams where occurrences are found. Coordinate stream activities up and downstream of known occurrences. Consider a protection buffer to maintain canopy cover. If the establishment of a no-disturbance buffer is appropriate, consider the following when determining the size and shape of the buffer: site conditions, topographic position, slope, aspect, stand structure (including canopy height), intensity of the proposed management activity, and proximity to water.

Direct and Indirect Effects

Two locations of *Hydrothyria venosa* occur within 100 feet of the trails proposed under Alternatives 2 and 5 (Table 14)

Table 14. Locations of *Hydrothyria venosa* within 100' of the trails proposed under the Action Alternatives

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
6	5M20		0.04	42	X		X
11	5M28	0.5	0.2	1.6	X		

This aquatic lichen requires perennial streams, with relatively stable water flows and clear, cool water (Dillingham 2005). This lichen also cannot tolerate too much physical disruption; therefore those individuals in Occurrence 11 that occupy portions of the stream that intersect the proposed system trail will likely be negatively impacted (i.e. killed) by motorized vehicle use.

Designation of the proposed system trails could also indirectly impact the two occurrences listed above if use of the trails result in alteration of the stream channel, removal of riparian vegetation, or modification of the water chemistry. These changes can increase the water temperature and/or increase flows that scour the gravel and rocks where this lichen is attached.

There would be no direct or indirect effects to *Hydrothyria venosa* from implementation of Alternatives 3 or 4.

Cumulative Effects

This species has likely lost individuals and suitable habitat in the past as a result of management activities that include water diversions, habitat type conversion, and construction of roads and trails. Implementation of the action alternatives will reduce impacts to *Hydrothyria venosa* by banning cross-country travel; however Alternatives 2 and 5will not eliminate the impacts to occurrences or areas of suitable habitat.

The two occurrences that may be impacted by use of the proposed system trails represent approximately 10 percent of all known occurrences on the Plumas NF (Figure 1) and four percent of the known occurrences in California (CNDDB 2008). Designation of these trails under Alternatives 2 and 5 will have some negative impact on this species and its habitat. These impacts will likely not reduce the overall viability of *Hydrothyria venosa* due to the small number of occurrences affected and the relatively low amount of suitable habitat potentially impacted. The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

There are no direct or indirect effects to *Hydrothyria venosa* from implementation of Alternatives 3 or 4; therefore the cumulative effects from these alternatives would also be negligible.

8.3 Serpentine plant communities

The following five serpentine species are within 100 feet of a proposed system trail: *Allium jepsonii, Arabis constancei, Calycadenia oppositifolia, Eriogonum umbellatum* var. *ahartii,* and *Monardella follettii.*

8.3.1 Allium jepsonii (Jepson's onion)

This plant is known from 23 occurrences in eastern Butte and Tuolumne Counties in the northern Sierra Nevada (CNDDB 2008). In Butte County, it grows on serpentine soils in foothill woodland or mixed conifer forest. On the Plumas NF, this plant is known from fifteen occurrences that are found on steep, relatively undisturbed, serpentine outcrops between 1,400 and 3,800 feet in elevation in the western portion of the Forest. Most occurrences are small, containing only hundreds of individuals.

The trend for this plant on the Plumas NF appears to be stable for those plants located on rock outcrops; however, population numbers may fluctuate in serpentine soils located off of outcrops depending on climatic fluctuation. In Butte County threats to this species include road construction, and for the few occurrences not on rock outcrops, timber harvest, prescribed burning, and off-highway vehicle use.

PNF management prescription: Protect all plant occurrences from ground disturbance. Evaluate activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

Direct and Indirect Effects

There are two occurrences of *Allium jepsonii* within 30-100 feet of the trails proposed under Alternatives 2 and 5 (Table 15)

Table 15. Locations of *Allium jepsonii* within 100' of the trails proposed under the Action Alternatives

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
2	5M02		0.2	11.1	X		X
5	5M05		0.02	0.2	X		X

The two *Allium jepsonii* occurrences are situated more than 30 feet from the system trails proposed under Alternatives 2 and 5; therefore the potential for direct effects to individuals is low. There is some potential for indirect effects, such as increased erosion and noxious weed invasion; however only a small portion (less than 10 percent) of each occurrence is located within 100 feet of the proposed system trails, making the potential for significant effects to the entire occurrence low.

There would be no direct or indirect effects to *Allium jepsonii* from implementation of Alternatives 3 or 4.

Cumulative Effects

This rare onion is found on rocky, low productivity, serpentine soils and has not been observed in areas of recent or high disturbance. This species has likely lost individuals and suitable habitat over the past 150 years as a result of ground disturbing activities such as gold and gravel mining, timber harvest, road construction, and recreation. Implementation of the action alternatives will reduce impacts to *Allium jepsonii* by banning cross-country travel; however Alternatives 2 and 5 will not eliminate the impacts to all occurrences or areas of suitable habitat.

The two *Allium jepsonii* occurrences that may be indirectly impacted by use of the proposed system trails represent approximately 13 percent of all known occurrences on the Plumas NF (Figure 1) and nine percent of the known occurrences in California (CNDDB 2008). Based on the low likelihood of direct effects to the known occurrences and the relatively small amount of suitable habitat impacted, it is predicted that implementation of the action alternatives will not reduce the overall viability of *Allium jepsonii*. The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

There would be no direct or indirect effects to *Allium jepsonii* from implementation of Alternatives 3 or 4; therefore cumulative effects from these alternatives would also be negligible.

8.3.2 Arabis constancei (Constance's rock cress)

This species occurs on undisturbed serpentine-derived soils in scattered locations on the Plumas NF and southernmost part of the Lassen NF, in Plumas and Sierra counties. There are 55 occurrences on the Plumas NF that occur in several parallel bands of serpentine. Only one occurrence is known from outside of the Plumas NF; it is found on the Lassen NF (CNDDB 2008). Occurrences are found between 3,200 and 6,600 feet in elevation and range in size from a few individuals on small serpentine outcrops to over a hundred individuals within larger areas of productive serpentine soil.

The known occurrences of this plant seem to be stable if they have not been impacted; however, many of the known occurrences have been impacted by various activities including mining, road building, timber harvest, off-highway vehicle use, and recreation activities.

PNF management prescription: Protect all plant occurrences from ground disturbance. Evaluate activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

Direct and Indirect Effects

There are two occurrences of *Arabis constancei* within 30-100 feet of the trails proposed under Alternatives 2, 4, and 5 (Table 16).

Table 16. Locations of *Arabis constancei* within 100' of the trails proposed under the Action Alternatives.

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
12C2	8M11		0.03	1.3	X	X	X
43	8M13		0.3	12	X		

A review of the Plumas NF files indicates that this species has a very low tolerance to soil disturbance. It may be found occupying very old areas of disturbance, but it is not found in new areas of disturbance.

The potential for direct effects to individuals is low in the two *Arabis constancei* occurrences because individuals are situated more than 30 feet from the proposed system trails. There is some potential for indirect effects, such as increased erosion and noxious weed invasion; however only a small portion (less than three percent) of each occurrence is located within 100 feet of the proposed system trails, making the potential for significant effects to the entire occurrence low.

There would be no direct or indirect effects to *Arabis constancei* from implementation of Alternative 3.

Cumulative Effects

This species has likely lost individuals and suitable habitat over the past 150 years as a result of ground disturbing activities such as gold and gravel mining, timber harvest, road construction, and recreation. Implementation of the action alternatives will reduce impacts to *Arabis constancei* by banning cross-country travel; however Alternatives 2, 4, and 5 will not eliminate the impacts to all occurrences or areas of suitable habitat.

The two *Arabis constancei* occurrences that may be impacted by use of the proposed system trails represent approximately four percent of all known occurrences on the Plumas NF (Figure 1) and in California (CNDDB 2008). It is predicted that implementation of action Alternatives 2, 4, and 5 will not reduce the viability of *Arabis constancei* due to this relatively small scale of potential impact; the low likelihood of direct effects to the two occurrences that are within 30-100 feet of the proposed trails; and the relatively small proportion of the occurrence affected (less than three percent). The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

There are no direct or indirect effects to *Arabis constancei* from implementation of Alternative 3; therefore the cumulative effects from this alternative would also be negligible.

8.3.3 Calycadenia oppositifolia (Butte County calycadenia)

Calycadenia oppositifolia is an annual herb that is restricted to a narrow band of habitat in the foothills of the Sierra Nevada and Cascade Mountain Range in Butte County, California. There are seven occurrences on the Plumas NF.

Calycadenia oppositifolia is found in grassy openings in woodland, chaparral, and forested habitats below 3,100 feet in elevation. It often occurs on shallow, serpentine soils, but can also be found on volcanic or granitic parent materials. Threats to this species include livestock grazing, road construction and maintenance, off-highway vehicle use, and urban development. *Calycadenia oppositifolia* has been observed in disturbed areas; however the greatest concentrations of the species have been found in undisturbed openings (State of California, Department of Water Resources 2004).

PNF management prescription: Protect occurrences from ground disturbance before seed set. Evaluate any disturbance outside the growing season to determine if effect would be detrimental to the species. For any other activities, evaluate on a site-by-site basis considering the species abundance, population size, geographic distribution, and known species ecology.

Direct and Indirect Effects

Two occurrences of *Calycadenia oppositifolia* occur within 30-100 feet of the trails proposed under Alternatives 2 and 5 (Table 17).

Table 17. Locations of *Calycadenia oppositifolia* within 100' of the trails proposed under the Action Alternatives.

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
6	5M02		1.4	18.2	X		X
12	5M01		0.3	0.3	X		X

Field surveys of the proposed routes did not find *Calycadenia oppositifolia* individuals growing directly in or along the trail (L. Janeway, personal communication 2008); therefore the potential for direct effects to individuals is low. There is some potential for negative indirect effects, particularly in Occurrence 12, which has 100 percent of its individuals located within 100 feet of the trail and occurs in open and highly accessible habitat. Negative impacts to individuals within this location could result in the elimination of the entire occurrence.

There would be no direct or indirect effects to *Calycadenia oppositifolia* from implementation of Alternatives 3 or 4.

Cumulative Effects

Past ground disturbing activities, such as off-highway vehicle use, mining, logging, and road building, have most likely affected *Calycadenia oppositifolia* individuals and areas of suitable habitat. It is unclear to what extent these past activities have affected this species due to the fact that it has been observed growing in both disturbed and undisturbed habitats (State of California, Department of Water Resources 2004).

Implementation of the action alternatives will reduce impacts to *Calycadenia oppositifolia* by banning cross-country travel; however Alternatives 2 and 5 will not eliminate the impacts to all occurrences or areas of suitable habitat. The two *Calycadenia oppositifolia* occurrences that may be impacted by use of the proposed system trails represent approximately 29 percent of all known occurrences on the Plumas NF (Figure 1). This relatively substantial percentage of occurrences affected increases the risk of negative cumulative impacts to *Calycadenia oppositifolia*; however this species' tolerance for disturbance, in combination with the low likelihood of direct impacts, makes the overall risk to the species' viability much lower. The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

There are no direct or indirect effects to *Calycadenia oppositifolia* from implementation of Alternatives 3 or 4; therefore the cumulative effects from these alternatives would also be negligible.

8.3.4 Eriogonum umbellatum var. ahartii (Ahart's sulphur flower)

This newly described sub-shrub species is restricted to Butte, Yuba, and Plumas Counties in California. Eleven occurrences have been recorded on the Plumas NF and an additional three occurrences are on Lassen NF lands that are administered by the Plumas NF.

This species occurs on serpentine slopes in open chaparral and mixed conifer forests. The current trend for this species is unknown. Threats include timber harvest, off-highway vehicle use, prescribed burning, and road construction on public lands.

PNF management prescription: Protect all plant occurrences from ground disturbance. Evaluate other activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

Direct and Indirect Effects

Seven locations of *Eriogonum umbellatum var. ahartii* occur within 100 feet of the trails proposed under Alternative 2 (Table 18). No occurrences of this species are impacted under any of the other action alternatives.

Table 18. *Eriogonum umbellatum var. ahartii* occurrences within 100' of Alternative 2 proposed trails.

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
10	7M09	0.07	0.007	0.07	X		
11 (1)	7M10		0.04	0.04	X		
11 (2)	7M10	0.3	0.3	0.7	X		
11 (3)	7M10		0.04	0.04	X		
11 (4)	7M10		0.2	0.8	X		
11 (5)	7M10	0.002	0.04	0.04	X		
11 (6)	7M10	0.02	0.02	0.04	X		

The response of this serpentine sub-shrub to disturbance is presently unknown. While it is found in open, rocky habitats, it has not been observed in recently disturbed areas. Surveys of trails 7M09 and 7M10 did not observe individuals in the trails and motorized vehicle disturbance was not observed to extend beyond the trails (L. Janeway, personal communication 2008). These two factors lower the probability of direct disturbance to *Eriogonum umbellatum var. ahartii* individuals.

As seen in Table 18, all seven locations are at risk of indirect effects from motorized vehicle use under this alternative. Five of these locations are small, with 100 percent of their occurrence at risk of being indirectly impacted. Indirect effects, such as erosion or noxious weed invasion, within these small sites could result in the elimination or degradation of the entire sub-occurrence.

There are no direct or indirect effects to *Eriogonum umbellatum var. ahartii* from implementation of Alternatives 3, 4, or 5.

Cumulative Effects

Little is known about the past distribution and abundance of this newly described species, making it difficult to determine the effects of past management activities on this species. As is the case with many of the serpentine species, *Eriogonum umbellatum var. ahartii* has most likely been affected by historic ground disturbing activities, such as off-highway vehicle use, mining, logging, and road building. Implementation of the action alternatives will reduce impacts to *Eriogonum umbellatum var. ahartii* by banning cross-country travel; however Alternative 2 will not eliminate the impacts to all occurrences or areas of suitable habitat.

The seven occurrences that may be impacted by use of the system trails proposed under Alternative 2 represent approximately 64 percent of all known occurrences on the Plumas NF (Figure 1) and 50 percent of the known occurrences in California (CNDDB 2008). This large percentage of occurrences with the potential to be impacted greatly increases the risk of negative cumulative impacts to *Eriogonum umbellatum var. ahartii* under Alternative 2. There are no direct or indirect effects to *Eriogonum umbellatum var. ahartii* from implementation of Alternatives 3, 4, or 5; therefore the cumulative effects from these alternatives would be negligible.

The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

8.3.5 Monardella follettii (Follett's monardella)

This species is known from Plumas County in the northern Sierra Nevada and from one historic occurrence in Nevada County that has not been relocated since 1916. There are currently 35 known occurrences in California (CNDDB 2008), 34 of which occur on the Plumas NF.

The Plumas NF occurrences occur within a band of serpentine that extends from Meadow Valley to Red Hill. Plants are often found in open, rocky areas and openings in mixed conifer forest. Occurrences range in size from a few individuals to thousands of individuals scattered over a large area. Threats to this species include off-highway vehicle use, rock collection and mining, timber harvest, road construction and maintenance, and canopy closure resulting from fire suppression.

PNF management prescription: Protect 50 percent of known occurrences within a project area from ground disturbance. Favor protection of locations that have open tree and shrub canopies (less than 50 percent cover) over those with closed tree and shrub canopies. Favor allowing ground disturbance and prescribed fire in areas of dense shrub or tree cover. Evaluate other activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

Direct and Indirect Effects

Three occurrences of *Monardella follettii* occur within 100 feet of the trails proposed under Alternatives 2, 4, and 5 (Table 19).

Table 19. Locations of *Monardella follettii* within 100' of trails proposed under the Action Alternatives.

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
1S	8M23	0.003	0.2	27	X		X
4	8M13		0.3	8	X		
9	8M11	3.0	6.6	183	X	X	X

This perennial herb is found in undisturbed and disturbed sites, such as abandoned roads, skid trails, and on old landings (Griggs 2001). Occurrences of this species often cover large areas that range from one to 100 acres and individuals within occurrences are often abundant and patchily distributed.

Although this species is found in areas of disturbance, any beneficial affect of these open sites (i.e. increased light or low levels of competition) could easily be overcome by the negative direct effect of repeated trampling or death of individuals. Two of the occurrences are in close proximity to the proposed system trails. Within these occurrences, those individuals that are within 30 feet of the

trail will likely be negatively impacted by motorized vehicle use. Indirect effects, such as increased erosion and noxious weed invasion, may also negatively impact all of the three occurrences.

Cumulative Effects

Monardella follettii individuals and areas of suitable habitat have likely been affected by past ground disturbing activities, such as off-highway vehicle use, mining, logging, and road building; however the ability of this species to colonize both previously disturbed and undisturbed sites suggests that at least some of these past management activities may not have been detrimental to the species.

Implementation of the action alternatives will reduce impacts to *Monardella follettii* by banning cross-country travel; however Alternatives 2, 4, and 5 will not eliminate the impacts to all occurrences or areas of suitable habitat. One large *Monardella follettii* occurrence (11B) occurs along an existing system trail; use of this trail and any associated impacts to this occurrence will continue under all of the action alternatives.

As noted above, the close proximity of this species to the proposed system trails will increase the probability of negative direct effects, which may outweigh the positive indirect effects to the species (i.e. increased light availability or low levels of competition). The three *Monardella follettii* occurrences that may be impacted by use of the proposed system trails represent approximately nine percent of all known occurrences on the Plumas NF (Figure 1) and in California (CNDDB 2008). These factors, in combination with the large size (between 8 and 183 acres) of the *Monardella follettii* occurrences, and consequently the relatively low number of individuals with potential to be directly and indirectly affected, reduce the overall negative impact to this species from the proposed trail designation. The effects of present and future projects on *Monardella follettii* would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

8.4 Barren Habitats

One barren habitat species, *Lewisia kelloggii ssp. huchinsonii*, occurs within 100 feet of a proposed system trail.

8.4.1 Lewisia kelloggii ssp. huchinsonii (Hutchinson's lewisia)

In California, *Lewisia kelloggii* ssp. *huchinsonii* occurs at 18 sites ranging from the southern Cascade Range to the central Sierra Nevada (USDA Forest Service 2008). On the Plumas NF, it is limited to five occurrences, all of which occur in the southwestern portion of the forest in an area of approximately 20 square miles.

This species is found in granitic gravel on ridge tops and flats, sparsely vegetated by Jeffrey pine and lodgepole pine woodlands, with patches of upland sedge (*Carex* sp.) and rock garden wildflowers. One of the largest threats to this species is off-highway vehicles, which travel easily

across the flat open terrain where *Lewisia kelloggii* ssp. *huchinsonii* is found. Other threats include horticultural collection, camping, hiking, and activities that compact soil and trample plants.

PNF management prescription: Protect all plant occurrences from ground disturbance that result in soil displacement. Evaluate other activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

Direct and Indirect Effects

One occurrence of *Lewisia kelloggii* ssp. *huchinsonii* occurs within 30-100 feet of a proposed system trail (Table 20).

Table 20. Locations of *Lewisia kelloggii* ssp. *huchinsonii* within 100' of the trails proposed under the Action Alternatives.

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
5	9M24		0.06	0.4	X		

This species is found in gravelly, exposed sites with sparse vegetation and little to no natural barriers to motorized vehicle use. The response of this species to disturbance is presently unknown; however motorized vehicles have been identified as a significant threat to this species (USDA Forest Service 2005a).

The distance to the trail makes the likelihood of direct effects to individuals low; however the small size of the occurrence, it's isolation from other occurrences, and the fragility of the habitat increase the potential for indirect effects to this occurrence. The substrate where *Lewisia kelloggii* ssp. *huchinsonii* occurs is highly susceptible to erosion; therefore effects from soil erosion may be a concern at this site.

There are no direct or indirect effects to *Lewisia kelloggii* ssp. *huchinsonii* from implementation of Alternatives 4 or 5.

Cumulative Effects

Scientific research recently identified this species as being genetically distinct from other subspecies of *Lewisia kelloggii* (USDA Forest Service 2008); this recent distinction means that little is actually known about this species' past distribution or about how management activities have affected individuals or areas of suitable habitat. The presence of this species in areas that are susceptible to erosion and off-highway vehicle use suggests that past ground disturbing management activities have likely had a negative effect on *Lewisia kelloggii* ssp. *huchinsonii.*

Implementation of the action alternatives will reduce impacts to *Lewisia kelloggii* ssp. *huchinsonii* by banning cross-country travel; however Alternative 2 will not eliminate the impacts to all occurrences or areas of suitable habitat. One occurrence of *Lewisia kelloggii* ssp. *huchinsonii* (#2)

occurs along an existing system trail; use of this trail and any associated impacts to this occurrence will continue under all of the action alternatives.

The *Lewisia kelloggii* ssp. *huchinsonii* occurrence that may be impacted by use of trail proposed under Alternative 2 represents approximately 20 percent of all known occurrences on the Plumas NF (Figure 1) and 6 percent of the occurrences documented in California (CNDDB 2008). Inclusion of this route under Alternative 2 is likely to have a negative impact on this occurrence. This relatively large percentage of occurrences with the potential to be impacted greatly increases the risk of negative cumulative impacts to *Lewisia kelloggii* ssp. *huchinsonii* under Alternative 2. There are no direct or indirect effects to *Lewisia kelloggii* ssp. *huchinsonii* from implementation of Alternatives 4 or 5; therefore the cumulative effects from these alternatives would be negligible.

The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

8.5 Interior Forest Habitat

One Interior Forest species, *Cypripedium fasciculatum*, occurs within 100 feet of a proposed system trail.

8.5.1 Cypripedium fasciculatum (Clustered Lady's Slipper)

This orchid has a wide distribution that extends from British Columbia, south to the Sierra Nevada and Coast Ranges of California, and east to the Rocky Mountains. While the distribution of this species is broad, occurrences are often small and widely scattered. In California, the highest distribution of *Cypripedium fasciculatum* is on the Klamath and Plumas National Forests. There are 135 occurrences on the Plumas NF; these range in size from two to over 3,000 stems. A total of 200 occurrences have also been recorded on the Six Rivers, Shasta-Trinity, Klamath, Mendocino, and Tahoe National Forests (Kaye and Cramer 2005).

In California, *Cypripedium fasciculatum* is most commonly associated with mixed conifer forests in the mid-to-late stages of successional development. The best conditions for this species are thought to exist when crown canopy cover is between 50 and 75 percent, with 60 percent being optimal (Kaye and Cramer 2005). It appears that the optimum habitat conditions for *Cypripedium fasciculatum* are not found in early successional communities (Kagan 1990). This species has an apparent intolerance to intense disturbance that directly reduces the duff layer. It is usually found in areas that have not been disturbed, or in areas where the disturbance was light or in the distant past. Mycorrhizal fungi play a pivotal role in the biology of orchids. Several stages in the orchid's life-cycle, particularly the early stages of seedling development, depend on mycorrhizal fungal symbioses.

Threats include any direct ground disturbance from activities such as timber harvest, intense fire, recreational activities, livestock grazing, road and trail maintenance, and illegal collection. Given this species' complicated life history, narrow range of environmental factors necessary for establishment,

apparent intolerance to intense disturbance and occurrence on private lands, the trend for this species is thought to be declining.

PNF management prescription: Buffer all plant occurrences by approximately 100 feet from ground disturbance to maintain canopy closure, hydrologic conditions, and mycorrhizal relationships. Do not advertise locations, to minimize poaching. Evaluate other activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

Direct and Indirect Effects

Six occurrences of *Cypripedium fasciculatum* occur within 100 feet of the trails proposed under Alternatives 2, 4, and 5 (Table 21)

Table 21. Locations of *Cypripedium fasciculatum* within 100' of the trails proposed under the Action Alternatives.

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
31	7M16	0.0001	0.3	8	X	X	X
51	8M35		0.02	0.02	X	X	X
126	5M28	0.001	0.00005	0.02	X	X	X
132	8M26		0.0001	0.001	X	X	X
135A	9M55	0.0001	0.3	0.0001	X	X	X
137	9M20	0.02		0.02	X		

Formal studies of the response of *Cypripedium fasciculatum* to disturbance are limited; however this orchid is most commonly found in areas that have not been disturbed, or in areas where the disturbance was light or in the distant past. Several stages in the orchid's life-cycle, particularly the early stages of seedling development, depend on mycorrhizal fungal symbioses; therefore occurrences are usually found in those areas where suitable conditions for the fungi exist (i.e. sites that are moist, shady, and have adequate organic matter). *Cypripedium fasciculatum* is most frequently found in late successional, closed-canopy stands and is much less common in early to mid-successional forests. The habitat that this species is dependent upon makes it highly unlikely that individuals would inhabit or colonize the open sites associated with trail beds or shoulders.

At this time, no individuals are known to occur within any of the proposed system trails. There are however, four occurrences documented within 0-30 feet of a proposed system trail. Individuals within these occurrences may be at risk of direct effects (i.e. trampling or death) from motorized vehicle use.

The close proximity (within 100 feet) of these six occurrences to the trails greatly increases the potential for negative edge-effects, such as reduced shade, moisture, and duff levels, which could alter the orchid's microhabitat conditions. Designation of these trails will also provide access to these orchid occurrences, which could increase the potential for illegal collection.

Cumulative Effects

Cypripedium fasciculatum has likely lost individuals and a considerable amount of suitable habitat over the last 150 years due to human activities related to mining, logging, road building, fire suppression, and homesteading. All of these activities have, to one extent or another, resulted in a reduction in canopy cover, modification of stand dynamics, alteration in fire frequency and intensity, and change in microclimate conditions.

Implementation of the action alternatives will reduce impacts to *Cypripedium fasciculatum* by banning cross-country travel; however Alternatives 2, 4, and 5 will not eliminate the impacts to all occurrences or areas of suitable habitat. One occurrence of *Cypripedium fasciculatum* (#31B) occurs along an existing system trail and many of the trails proposed under the action alternatives are old skid trails or temporary roads; this suggests that the largest impact to these six *Cypripedium fasciculatum* occurrences most likely occurred at the time the route, skid trail, or temporary road was created or constructed.

The six occurrences impacted by use of the proposed system trails represent approximately four percent of all known occurrences on the Plumas NF (Figure 1) and two percent of the occurrences documented on National Forests in California (Kaye and Cramer 2005). It is predicted that implementation of action Alternatives 2, 4, and 5,will not reduce the overall viability of *Cypripedium fasciculatum* due to this relatively small scale of potential impact.

The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

8.6 Open Habitats

The following eight Open Habitat species are within 100 feet of a proposed system trail: *Astragalus lentiformis, Astragalus pulsiferae var. pulsiferae, Calycadenia oppositifolia, Clarkia mildrediae ssp. mildrediae, Clarkia mosquinii, Lewisia kelloggii ssp. hutchisonii, Lupinus dalesiae,* and *Penstemon personatus.* The individual species discussion for *Calycadenia oppositifolia* is included above under the “Serpentine plant communities” section. *Lewisia kelloggii ssp. hutchisonii* is discussed under the “Barren habitat” section.

8.6.1 Astragalus lentiformis (lens-pod milk-vetch)

This perennial herb is limited to Plumas County. There are presently 67 documented occurrences of this species on the Plumas NF, all of which are located within the eastern portion of the Forest. Two occurrences occur outside of the Plumas NF on private land (CNDDB 2008). This plant is found on bare, xeric volcanic soils in flat to gently sloping sagebrush/pine woodlands between 4,900 and 6,400 feet in elevation. It is considered an edaphic specialist.

The tolerance of this milk-vetch to disturbance is presently unknown. This species has been observed growing in areas that have been disturbed; however the intensity, extent, and frequency of

the disturbance have not been quantified. Certain levels of soil displacement and disturbance may be beneficial. Threats to this species include fire suppression, livestock grazing, timber harvest, road construction, mining, reservoir construction, and utility line construction. Although this species recruits after disturbance, it is unknown to what extent these activities cause local extinction and seed burial.

PNF management prescription: Protect at least 30 percent of all known occurrences within a project analysis area from all disturbances associated with management activities. In small populations (containing less than 50 individuals or less than one quarter acre) avoid ground disturbance. Evaluate other activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

Direct and Indirect Effects

There are nine locations of *Astragalus lentiformis* within 100feet of the trails proposed under Alternatives 2, 4, and 5 (Table 22)

Table 22. Locations of Astragalus lentiformis within 100' of trails proposed under the Action Alternatives.

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
13	13M08	8.5	18	341.9	X		
13B	13M10	0.1	0.004	0.07	X		
14/39	13M09	1.3	3.1	232.6	X	X	X
	13M09A	0.3	1.1		X		
31	14M05	1.6	3.7	95.3	X		X
	14M06	3	6.4		X		X
41	13M32	0.003	0.2	24.2			X
43	13M10		0.01	0.02	X		
68	13M08	0.1	0.01	0.07	X		
69	13M10	0.1	0.01	0.09	X		
70	13M10	0.5	0.9	1.7	X		

Astragalus lentiformis is a perennial herb that is found in both undisturbed and disturbed sites. In general, this species appears to respond favorably to light-to-moderate disturbance and Plumas NF botanists have observed this species growing directly in roadbeds. Surveys conducted during the summer of 2007 also noted individual plants growing in the center of and along the edge of the proposed system trails (Vollmar 2007). While past management has demonstrated that certain levels of soil displacement and disturbance may be beneficial, the intensity and frequency of disturbance that is tolerable to this species has not been fully quantified.

The *Astragalus lentiformis* occurrences that are within 30 feet of the trail may be directly affected by the proposed system trails. Some individuals are likely to have their vigor and productivity

reduced or to be killed by motorized vehicles parking or driving over them. None of the locations have 100 percent of their individuals within 0-30 feet of the trail; however those occurrences that contain less than 50 individuals or are less than one quarter acre are at a high risk of being negatively impacted.

A number of the occurrences listed in Table 22 are large and/or have additional sub-occurrences in the vicinity that are not at risk of being impacted under these alternatives. All of the occurrences also have a portion of their occurrence between 30-100 feet from the edge of the trail, where direct effects are less likely to occur. Individuals that are greater than 30 feet from the trail may benefit from the indirect effects (i.e. increased light or low levels of competition) of the trail. Some negative indirect effects, such as increased erosion and noxious weed invasion, could negatively impact these occurrences.

There would be no direct or indirect effects to *Astragalus lentiformis* from implementation of Alternative 3.

Cumulative Effects

The ability of *Astragalus lentiformis* to colonize both previously disturbed and undisturbed sites suggests that this species may have benefited from past management activities that created open conditions and increased light reception to the understory. Suitable habitat for this locally abundant species has likely been impacted by past timber management practices, which generally favored removal of larger, more dominant trees (i.e. overstory removal). This management practice, as well as the suppression of wildfire, has resulted in a greater number of dense forests that are dominated by small trees and a reduction in open forest habitat across the landscape.

Implementation of the action alternatives will reduce direct impacts to this species by banning cross-country travel; however Alternatives 2, 4, and 5 will not eliminate the potential for direct impacts to all occurrences. The close proximity of this species to the proposed system trails will increase the probability of negative direct effects, which may outweigh the positive indirect effects to the species (i.e. increased light availability or low levels of competition).

The nine locations of *Astragalus lentiformis* that may be impacted by use of the proposed system trails represent approximately 13 percent of all known occurrences on the Plumas NF (Figure 1) and 13 percent of the known occurrences in California (CNDDB 2008).

Designation of these trails under the action alternatives may have some negative direct impacts to this species; however these will likely not reduce the overall viability of *Astragalus lentiformis* due to its ability to tolerate, and even thrive, in disturbed sites; the large occurrence size and close proximity to adjacent sub-occurrences; and the low amount of suitable habitat potentially impacted. The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

There are no direct or indirect effects to *Astragalus lentiformis* from implementation of Alternative 3; therefore the cumulative effects from this alternative would also be negligible.

8.6.2 Astragalus pulsiferae var. pulsiferae (Pulsifer's milk-vetch)

Pulsifer's milk-vetch is known to occur in Lassen, Modoc, Plumas, and Sierra Counties in California, as well as in two counties in the state of Nevada. This species is presently known from a total of 16 occurrences, 12 of which are located on the Plumas NF (CNDDB 2008).

Pulsifer's milk-vetch typically occupies steep, sandy, or gravelly slopes in Great Basin scrub, pinyon, and juniper woodlands and lower montane coniferous forests between 4,200 and 6,000 feet in elevation. It is considered to be an "unusual edaphic" species, which means that it is often more influenced by soil conditions than by light regimes (USDA Forest Service 2003b). In many cases, the substrate where this species occurs inhibits the growth of other species, resulting in a lower accumulation of biomass. Although this species recruits after disturbance, it is unknown to what extent these activities cause local extinction and seed burial.

PNF management prescription: Protect at least 30 percent of all known occurrences within a project analysis area from all disturbances associated with management activities. Protect all plant occurrences from soil displacement activities. Allow for at least 5 years rest between disturbance prescriptions to the same occurrence. Evaluate other activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

Direct and Indirect Effects

Three occurrences of *Astragalus pulsiferae* var. *pulsiferae* occur within 100 feet of the trails proposed under Alternative 2 (Table 23). No occurrences of this species are impacted under any of the other action alternatives.

Table 23. Locations of *Astragalus pulsiferae* var. *pulsiferae* within 100' of the trails proposed under the Action Alternatives

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
3	15M01	0.02		0.02	X		
3A	15M01	0.8	1.6	17	X		
	15M01A	0.4	1.26		X		
7C	12M16	0.02		0.02	X		

Astragalus pulsiferae var. *pulsiferae* is found in sandy or gravelly sites with sparse vegetation and little to no natural barriers to motorized vehicle use. Although plants have been located in old road beds, they are more often found scattered across lightly vegetated side slopes. This species has been shown to recruit after disturbance; however it is unknown at what extent soil disturbing activities cause extirpation and seed burial.

All three of these occurrences are at high risk of direct effects from motorized vehicle use along these trails. Individuals may be killed or damaged by vehicles parking on or driving over them. Soil displacement can easily dislodge individuals, bury seeds, and damage or destroy seedlings (USDA Forest Service 2005d). Due to their small size and close proximity, the death of individuals in Occurrences 3 and 7C could result in the elimination of the entire sub-occurrence. Occurrence 3A is large enough (only 25 percent has the potential to be directly or indirectly affected) that impacts would likely not result in a significant negative effect over the entire occurrence. Indirect effects to these three occurrences include increased risk of noxious weed introduction and spread, soil erosion, and soil compaction.

There would be no direct or indirect effects to *Astragalus pulsiferae* var. *pulsiferae* from implementation of Alternatives 3, 4, or 5.

Cumulative Effects

Suitable habitat for this species has likely been impacted by past management practices, such as overstory removal and wildfire suppression, which has resulted in a greater number of dense forests that are dominated by small trees and a reduction in open forest habitat across the landscape. The ability of *Astragalus pulsiferae* var. *pulsiferae* to colonize previously disturbed sites suggests that this species may benefit from some management activities that create open habitat conditions; however it is also not known to what extent or intensity this species is able to survive soil disturbing activities.

Implementation of the action alternatives will reduce direct impacts to this species by banning cross-country travel; however Alternative 2 will not eliminate the potential for direct impacts to all occurrences. The close proximity of this species to the proposed system trails will increase the probability of negative direct effects, which may outweigh any positive indirect effects to the species such as increased light availability or lower levels of competition.

Livestock grazing has historically occurred in the area where occurrence 3 and 3A are found. Monitoring of these sites in 1994 documented some disturbance from cattle; however the steepness of the site was thought to prevent heavy grazing and access to *Astragalus pulsiferae* var. *pulsiferae* individuals. This present management activity, in combination with motorized vehicle use on the proposed trails, may have the potential to negatively impact habitat and threaten individuals.

The three *Astragalus pulsiferae* var. *pulsiferae* that may be impacted by use of the proposed system trails represent approximately 25 percent of all known occurrences on the Plumas NF and 19 percent of the known occurrences in California (CNDDB 2008). Implementation of action Alternative 2 will likely have some negative direct impacts to this species; however it is predicted that it will not reduce the overall viability of *Astragalus pulsiferae* var. *pulsiferae* due to the species' ability to recruit after disturbance, its presence in areas of disturbance (i.e. road cuts), the large occurrence size or close proximity to adjacent sub-occurrences and the relatively small scale of potential impact.

There are no direct or indirect effects to *Astragalus pulsiferae* var. *pulsiferae* from implementation of Alternatives 3, 4, or 5; therefore the cumulative effects from these alternatives would be negligible.

8.6.3 Clarkia mildrediae ssp. mildrediae (Mildred's clarkia)

This annual plant is limited to eastern Butte County and western Plumas County in the northern Sierra Nevada and southern Cascades of California. There are 30 *Clarkia mildrediae* ssp. *mildrediae* occurrences on the Plumas NF, the majority of which are located in the Feather River Canyon. Ten occurrences are found outside of the forest boundary.

This species occurs in cismontane woodland and in lower montane coniferous forest, usually on sandy granitic substrate. The current trend for this species is unknown; however most occurrences appear to be stable (USDA Forest Service 2005b). Wildfire suppression has likely restricted the amount of suitable habitat for this species. As a result, most occurrences are found on road cut banks, where there is minimal plant competition and open light conditions. This increases the potential for impact from road widening and maintenance activities. Activities that create soil disturbance may negatively impact plants and the soil seed bank.

PNF prescription: Protect occurrences from ground disturbance before seed set. Evaluate ground disturbance outside the growing season; however in general, disturbance (without major habitat alteration) after plants had set seed could occur. Canopy removal in and adjacent to occurrences is encouraged to open the habitat. Evaluate other activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

Direct and Indirect Effects

There are 11 locations of *Clarkia mildrediae* ssp. *mildrediae* within 100 feet of the trails proposed under Alternatives 2, 4, and 5 (Table 24).

Table 24. Locations of *Clarkia mildrediae* ssp. *mildrediae* within 100' of the trails proposed under the Action Alternatives

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
0	5M29	0.02		0.02	X	X	X
8	5M23	0.01	0.01	70.6	X		
8A (1)	5M23	8.2	1.5	17.5	X		
	5M26	0.3	0.01		X	X	X
8A (2)	5M27	0.4	0.6	1.8	X		
8A (3)	5M28	0.1	0.3	0.5	X	X	X
8A (4)	5M28		0.08	1.2	X	X	X
8C	5M21		0.2	14.8	X		
	5M24	1.3	2.0		X		X
8D (1)	5M20	0.02		0.02	X		X

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
8D (2)	5M20		0.01	0.02	X		X
8D (3)	5M21		0.02	0.02	X		
8D (4)	5M21	0.01	0.01	0.02	X		

This early seral species is found in very exposed, sunny openings and road cuts on erodable, granitic soils. It has primarily been observed in areas of past disturbance, but is not found in areas of recent disturbance.

All of the *Clarkia mildrediae* ssp. *mildrediae* occurrences that are within 30 feet of the trail may be directly affected by the proposed system trails. Some individuals are likely to have their vigor and productivity reduced or to be killed by motorized vehicles. The two locations, (8D(1) and 0) that have almost 100 percent of their individuals within 0-30 feet of the trail have the highest risk of negative effects. The death of individuals within these locations could result in the elimination of the entire occurrence.

The remaining sites have a portion of their occurrence between 30-100 feet from the edge of the trail, where direct effects are less likely to occur. Individuals that are greater than 30 feet from the trail may benefit from the indirect effects (i.e. increased light or low levels of competition) of the trail. Due to their proximity to the trail, negative indirect effects, such as increased erosion and noxious weed invasion, may also negatively impact these occurrences.

Cumulative Effects

The ability of *Clarkia mildrediae* ssp. *mildrediae* to colonize both previously disturbed and undisturbed sites suggests that this species has benefited from past management activities that created open conditions and increased light reception to the understory. Past wildfire suppression activities have likely restricted the amount of suitable habitat for this species.

Implementation of the action alternatives will reduce direct impacts to this species by banning cross-country travel; however Alternatives 2, 4, and 5 will not eliminate the potential for direct impacts to all occurrences. Six locations of *Clarkia mildrediae* ssp. *mildrediae* have been documented along one of the existing system trails; use of this trail and any associated impacts to these locations will continue under all of the action alternatives. The close proximity of this species to the proposed system trails will increase the probability of negative direct effects, which may outweigh the positive indirect effects to the species (i.e. increased light availability or low levels of competition).

The nine locations of *Clarkia mildrediae* ssp. *mildrediae* that may be impacted by use of the proposed system trails represent approximately 30 percent of all known occurrences on the Plumas NF (Figure 1) and 23 percent of the known occurrences in California (CNDDB 2008). Designation of these trails under the action alternatives may have some negative direct impacts to this species;

however these will likely not reduce the overall viability of *Clarkia mildrediae* ssp. *mildrediae* due to its ability to tolerate, and even thrive, in disturbed sites. The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

8.6.4 Clarkia mosquinii (Mosquin's clarkia)

This annual species occurs in the foothill woodland and lower elevation mixed conifer forest of Butte and Plumas Counties. This species was thought to be extinct when the only known location was eliminated with the formation of Lake Oroville. *Clarkia mosquinii* was rediscovered in 1992, initiating surveys for this species on the Plumas NF. To date, 45 occurrences have been documented within the lower elevations of the Plumas NF, while 14 occurrences have been reported from outside of the Forest boundary.

Clarkia mosquinii is probably a fire-follower and wildfire suppression has likely restricted the amount of suitable habitat for this species. This species often occurs in road cuts and on decomposing granite. Threats from management activities include road construction and maintenance, and timber harvest. This species is considered highly vulnerable because of the high risk to occurrences outside of National Forest lands.

PNF management prescription: Protect occurrences from ground disturbance before seed set. Evaluate ground disturbance outside of the growing season; however in general, disturbance (without major habitat alteration) after plants have set seed can occur. Canopy removal in and adjacent to occurrences is encouraged to open the habitat. Evaluate other activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

Direct and Indirect Effects

One occurrence of *Clarkia mosquinii* occurs within 100 feet of a trail proposed under Alternative 2 (Table 25). No occurrences of this species are impacted under any of the other action alternatives.

Table 25. *Clarkia mosquinii* location within 100' of the trails proposed under the Action Alternatives

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
13B	5M06		0.04	0.04	X		

Like many of the species in this guild, *Clarkia mosquinii* is often found in exposed, disturbed habitats such as roadsides. Motorized vehicle trails may create some suitable edge habitat for this species (i.e. increased light availability and low levels of competition); however these effects could easily be overcome by the negative direct effect of repeated trampling or death of individuals. Indirect effects, such as increased erosion and noxious weed invasion, may negatively impact occurrence 13B.

Cumulative Effects

It is difficult to determine how *Clarkia mosquinii* has responded to past management activities because this species was thought to be extinct until its re-discovery in 1992. The presence of *Clarkia mosquinii* on exposed, disturbed habitats such as roadsides suggests that this species may benefit from management activities that create open conditions and increase light reception to the understory. Past wildfire suppression activities have likely restricted the amount of suitable habitat for this species.

Implementation of the action alternatives will reduce direct impacts to this species by banning cross-country travel; however Alternative 2 will not eliminate the potential for direct impacts to all occurrences. One occurrence of *Clarkia mosquinii* (12C) occurs along an existing system trail; use of this trail and any associated impacts to this occurrence will continue under all of the action alternatives. The one location of *Clarkia mosquinii* that may be impacted by use of the trail proposed under Alternative 2 represents approximately two percent of all known occurrences on the Plumas NF (Figure 1) and the known occurrences in California (CNDDB 2008).

Designation of this trail under Alternative 2 may have some negative indirect impacts to this species; however these will likely not reduce the overall viability of *Clarkia mosquinii* due to its presence in areas of disturbance (i.e. road cuts) and the relatively small scale of potential impact. The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

8.6.5 Lupinus dalesiae (Quincy lupine)

This perennial lupine species is known to occur in Plumas County and in isolated occurrences in Sierra and Yuba counties in California. Within this limited range, *Lupinus dalesiae* is locally abundant. There are currently 260 occurrences documented on the Plumas NF. Outside of the Plumas NF, there are 22 occurrences, all of which occur on lands adjacent to the National Forest.

Lupinus dalesiae is found in a variety of habitats that include undisturbed and disturbed sites (such as old skid trails and road cut banks), openings in chaparral, cismontane woodlands, and mixed conifer forests. Recent visits to old project areas have shown that this species tolerates and even thrives on disturbance; however the intensity, extent, or frequency of the disturbance associated with these occurrences has not been quantified in a manner that facilitates the development of prescriptions that consistently mimic historical disturbance regimes.

The trend for this plant is stable. Threats include road construction and maintenance; timber harvest, release, and site preparation activities; mining; off-highway vehicle use; and development on private lands. The California Native Plant Society recently lowered the listing status of *Lupinus dalesiae* (from List 1B to List 4) based on the number of mapped occurrences in the California Fish and Game's California Native Diversity Data Base (CNDDB).

PNF management prescription: Protect 30 percent of known occurrences within a project area from ground disturbance. Favor protection of locations that have open tree and shrub canopies (less than 50 percent cover) over those with closed tree and shrub canopies. Favor allowing ground disturbance and prescribed fire in areas of dense shrub or tree cover. Evaluate other activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

Direct and Indirect Effects

There are 22 locations of *Lupinus dalesiae* within 100 feet of the proposed system trails (Table 26).

Table 26. Locations of *Lupinus dalesiae* within 100' of the trails proposed under the Action Alternatives

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
0	9M54	0.01	0.001	0.01	X	X	X
2E	8M19	0.005	0.23	0.35	X		
10A	8M13		0.006	0.02	X		
10B	8M13		0.02	0.02	X		
23F	8M18	0.8	1.5	2.79	X		
23J	8M17	0.1		0.1	X		
35	7M16	2.9	5.6	29.6	X	X	X
41D	8M42	0.71	1.72	19	X		X
	8M43	0.27	0.88		X	X	X
44A	9M37	0.2	0.50	111	X		X
66	9M37	0.02	0.003	0.02	X		X
	9M37A		0.003		X		
79	8M28	2.49	5.64	23	X	X	X
	8M28A	0.79	2.10		X		
88	9M35	0.8	1.2	5.10	X		X
89A	9M35		0.02	0.02	X		X
89B	9M33	0.03	0.1	0.1	X		
140A1	10M12		0.01	0.01	X	X	X
140A2	10M12		0.006	0.02	X	X	X
141A	10M12		0.03	5.14	X	X	X
160	11M09	0.07		0.07	X		
161	9M39A		0.01	0.01	X	X	X
165	7M15	0.01		0.01	X	X	X
166A	7M15	0.01		0.01	X	X	X
166B	7M15	0.002		0.002	X	X	X

Lupinus dalesiae is a perennial herb that is found in disturbed sites, such as old skid trails and road cut banks, and undisturbed sites. Past management has demonstrated that this species tolerates and even thrives on disturbance. For example, a survey of Occurrence 35 found *Lupinus dalesiae* occupying all of the areas that had been previously disturbed by mechanical timber harvest and disturbance and road building were thought to have been one cause for this population's increase (Rotta 1983). Surveys conducted during the summer of 2007 also noted individual plants growing in the center of and along the edge of the proposed system trails (Vollmar 2007).

All of the *Lupinus dalesiae* occurrences that are within 30 feet of the trail may be directly affected by the proposed system trails. Some individuals are likely to have their vigor and productivity reduced or to be killed by motorized vehicles. The five locations (23J, 160, 165, 166A, and 166B) that have 100 percent of their individuals within 0-30 feet of the trail have the highest risk of negative effects. The death of individuals within these locations could result in the elimination of the entire occurrence.

The remaining sites have a portion of their occurrence between 30-100 feet from the edge of the trail, where direct effects are less likely to occur. Individuals that are greater than 30 feet from the trail may benefit from the indirect effects (i.e. increased light or low levels of competition) of the trail.

There would be no direct or indirect effects to *Lupinus dalesiae* from implementation of Alternative 3.

Cumulative Effects

The ability of *Lupinus dalesiae* to colonize both previously disturbed and undisturbed sites, and tolerate and even thrive on disturbance, suggests that this species may have benefited from past management activities that created open conditions and increased light reception to the understory.

Implementation of the action alternatives will reduce direct impacts to this species by banning cross-country travel; however Alternatives 2, 4, and 5 will not eliminate the potential for direct impacts to all occurrences. The close proximity of this species to the proposed system trails will increase the probability of direct effects; however these effects will likely not be severe enough to negatively impact this species due to its high tolerance to disturbance.

The 22 locations of *Lupinus dalesiae* that may be impacted by use of the proposed system trails represent approximately eight percent of all known occurrences on the Plumas NF (Figure 1) and seven percent of the known occurrences in California (CNDDB 2008). Designation of these trails under the action alternatives may have some negative direct impacts to individuals; however these will likely not reduce the overall viability of *Lupinus dalesiae* due to its ability to tolerate, and even thrive, in disturbed sites and the low percentage of sites impacted. The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

There are no direct or indirect effects to *Lupinus dalesiae* from implementation of Alternative 3; therefore the cumulative effects from this alternative would be negligible.

8.6.6 Penstemon personatus (closed-throated beardtongue)

This rhizomatous species is limited to 31 occurrences in Butte, Nevada, Plumas, and Sierra counties. On the Plumas NF, this species occurs in 23 large but localized populations and population size varies from thousands of stems to less than 10.

Penstemon personatus occurs in west side mixed conifer and red fir forests. It appears to tolerate limited disturbance, as long as it does not change the microhabitat or result in soil compaction. Observations have shown that plants that grow in complete canopy cover typically have a shorter stature and do not flower, whereas plants in partial sun are reproductive. A report on the biology of *Penstemon personatus* in 2001 found that the species is typically less abundant and less tolerant of disturbance on south-facing slopes.

Although there may be local fluctuations in population size, the overall trend for this species appears stable. General threats to this species include road construction and maintenance, timber site preparation and release, landing construction, high intensity pile burns, grazing, mining activity, and off-highway vehicle use. A species management guide was written for this species in 1987.

PNF management prescription: Use guidance in the Preferred Alternative of the approved *Penstemon personatus* Species Management Guide of 1987 to develop a set of key *Penstemon personatus* Areas (occurrences or portions of occurrences) within each metapopulation, which will be protected from management disturbances. These key areas would be established within occupied habitat to maintain the species' geographic distribution. Priority for the delineation of key areas would be given to those occurrences that currently exhibit a diversity of habitat types. Avoid building landings or temporary roads through known occurrences. Avoid sub-soiling through known occurrences. Evaluate other activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

Direct and Indirect Effects

Two locations of *Penstemon personatus* intersect the trails proposed under Alternatives 2 and 5 (Table 27)

Table 27. Locations of *Penstemon personatus* within 100' of the trails proposed under the Action Alternatives

Occurrence	Route ID	Number of acres with potential for impact		Size of Occurrence (acres)	Action Alternatives		
		Within 0-30'	Within 30-100'		2	4	5
7I	8M04	3.2	6.3	148	X		
12	7M11	1.3	2.8	83	X		X

Penstemon personatus is a perennial herb that is found in disturbed and undisturbed sites. For example, surveys of the above occurrences found *Penstemon personatus* along the edges of old skid

trails and in other disturbed sites where the soil had not been compacted (Carter 1992). Past management indicates that this species is able to tolerate and even increase in abundance or vigor following ground disturbance. Although this species does tolerate a number of different types of disturbance, it is not required for regeneration or survival.

Within the two occurrences, the distribution and abundance of *Penstemon personatus* in relation to the trail is unknown; therefore those individuals that are within the trail will likely be negatively impacted by motorized vehicle use. Indirect effects, such as increased erosion and noxious weed invasion, may also negatively impact the two occurrences. The large size (over 80 acres) of these occurrences, and consequently the relatively low number of individuals with potential to be directly and indirectly affected, will reduce the overall negative impact to this species from the proposed route designation.

There would be no direct or indirect effects to *Penstemon personatus* from implementation of Alternatives 3 or 4.

Cumulative Effects

Suitable habitat for *Penstemon personatus* has been impacted by past timber management practices, which generally favored removal of larger, more dominant trees (i.e. overstory removal). This management practice, as well as the suppression of wildfire, has resulted in a greater number of dense forests that are dominated by small trees and a reduction in open forest habitat across the landscape. The ability of *Penstemon personatus* to colonize both previously disturbed and undisturbed sites suggests that this species may have benefited from past management activities that created open conditions and increased light reception to the understory.

Implementation of the action alternatives will reduce direct impacts to this species by banning cross-country travel; however Alternatives 2 and 5 will not eliminate the potential for direct impacts to all occurrences. The close proximity of this species to the proposed system trails will increase the probability of direct effects; however these effects will likely not be severe enough to negatively impact this species due to its high tolerance to disturbance.

The two locations of *Penstemon personatus* that may be impacted by use of the proposed system trails represent approximately nine percent of all known occurrences on the Plumas NF and two percent of the known occurrences in California (CNDDB 2008). Designation of these trails under the action alternatives may have some negative direct impacts to individuals; however these will likely not reduce the overall viability of *Penstemon personatus* due to its ability to tolerate, and even thrive, in disturbed sites and the low percentage of sites impacted. The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed mitigations) remain in place.

There are no direct or indirect effects *Penstemon personatus* from implementation of Alternatives 3 or 4; therefore the cumulative effects from these alternatives would be negligible.

9.0 Action Alternatives (2-5): Summary of Environmental Consequences

The following section presents an overview of the effects analysis for each action alternative. In general, the greater the number of motorized vehicle trails (and miles) proposed, the higher the risk and severity of negative impacts to rare species and their associated habitats. Alternative 2 impacts the largest number of rare species and botanically sensitive resources. Alternative 3, which does not designate unauthorized routes, has the least impact on rare species. In comparison to these alternatives, the impacts from Alternative 5 fall near the middle of the spectrum of potential effects.

9.1 Alternative 2 – Proposed Action

9.1.1 Direct/Indirect Effects

Table 28. Summary of rare species indicator measures for Alternative 2

Indicator Measure	Value
Miles of proposed system trail open for public motorized vehicle use within or adjacent to Sensitive rare species sites	5.2 miles
Number of trails open for public motorized vehicle use within or adjacent to Sensitive rare species sites	54 trails
Acres of rare plant sites within 100 feet of a proposed system trail	133 acres
Total number of rare plant sites within 100 feet of a proposed system trail	79 locations

Alternative 2 prohibits cross-country travel, adds approximately 367 miles of unauthorized routes to the trail system, and makes no changes to the existing system trails. In comparison to the other action alternatives, Alternative 2 has the highest impact on rare species and their habitats. It has the highest number of trails (54 trails) and trail miles (5.2 miles) that intersect rare species occurrences or associated habitat. This alternative also has the potential to impact 18 rare species (79 locations) both directly and indirectly.

The following species have been documented within 100 feet of a trail proposed under Alternative 2: *Botrychium* sp., *Ivesia aperta var. aperta, Ivesia sericolueca,* and *Pyrrocoma lucida* (Meadow and Seep species); *Hydrothyria venosa* (Riparian Area species); *Allium jepsonii, Arabis constancei, Calycadenia oppositifolia, Eriogonum umbellatum var. ahartii,* and *Monardella follettii* (Serpentine species); *Lewisia kelloggii ssp. huchinsonii* (Barren and Open Habitat species); *Cypripedium fasciculatum* (Interior Forest species); and *Astragalus lentiformis, Astragalus pulsiferae var. pulsiferae, Clarkia mildrediae ssp. mildrediae, Clarkia mosquinii, Lupinus dalesiae,* and *Penstemon personatus* (Open Habitat species). Six of these species are only impacted by this alternative and none of the other action alternatives; these are: *Astragalus pulsiferae* var. *pulsiferae, Botrychium sp., Clarkia mosquinii, Eriogonum umbellatum var. ahartii, Ivesia sericolueca,* and *Lewisia kelloggii* ssp. *hutchisonii*. Refer to the analysis in the section above ("Action Alternatives (2-5): Summary of Environmental Consequences for Individual Species") for a detailed discussion of effects to individual species. Overall, Alternative 2 has the potential to negatively all of these species.

In general, occurrences with individuals that are in or within 30 feet of the trail are at a high risk of direct effects from motorized vehicle use. These effects could include death, altered growth, or reduced seed set from physically breaking, crushing, or uprooting plants (Wilshire, Shipley, and Nakata 1978, Cole and Bayfield 1993).

Indirect effects to species are dependent upon a number of species-specific factors that include habitat type, tolerance to disturbance, distance from trail, amount of occurrence impacted, and intensity and timing of disturbance. All of the rare species listed above (i.e. those within 100 feet of a proposed trail) have a high risk of indirect effects from noxious weed introduction and spread. Species that are intolerant of disturbance, such as *Cypripedium fasciculatum*, may be indirectly impacted by increased light levels and duff or litter disturbance along the edges of motorized trails. In contrast, for those species that tolerate some degree of disturbance, such as *Astragalus lentiformis* or *Lupinus dalesiae*, designation of motorized trails may have fewer detrimental indirect effects.

The largest improvement over Alternative 1 is the prohibition of cross-country travel. This reduces vehicle access and impacts to rare plants and their habitats, lowers the risk of noxious weed introduction and spread throughout the forest, and concentrates use on maintained trails that will be managed and improved to reduce resource damage.

Special Interest Areas

Alternative 2 has highest number of proposed system trails (4.4 miles) within Plumas NF Special Interest Areas (Table 9). Implementation of this alternative proposes the addition of unauthorized trails in Brady's Camp (2.8 miles), Butterfly Valley (0.2 miles), and Fowler Lake (0.1 miles) SIA. An additional 1.2 miles of unauthorized routes would also be added to the existing 5.6 miles of system trail in the proposed McRae Meadow SIA. Some of the unique botanical features for which these Special Interest areas were designated (or proposed for designation) include large meadow and stream complexes, aquatic plant communities, red fir and lodgepole forests, and sub-alpine plant communities (Meyer 1991). While some of these "unauthorized routes" are relatively well-established, motorized vehicle use within these areas still has the potential to significantly degrade or disturb these special features if trail design features are not in place.

9.1.2 Cumulative Effects

All of the rare species locations (78 sites) located within 100 feet of a proposed system trail have the potential to be directly or indirectly affected by trail designation; therefore these species are also at risk of being cumulatively impacted.

In comparison to the other action alternatives, Alternative 2 has the greatest number of miles in riparian areas, wet meadows, serpentine areas, barren habitats, interior forest, and open forest (Table 6); therefore implementation of this alternative also has the potential to affect suitable habitat for a number of rare species on the Plumas NF.

Of the eighteen species with the potential to be directly and indirectly impacted by Alternative 2, fourteen have 25 percent or less of their known Plumas NF locations impacted by the proposed system trails (Figure 1). Four species have greater than 25 percent of their known locations affected; these are: *Eriogonum umbellatum var. ahartii* (64 percent), *Clarkia mildrediae ssp. mildrediae* (57 percent), *Calycadenia oppositifolia* (29 percent), and *Astragalus pulsiferae* var. *pulsiferae* (25 percent). Because of this large percentage of occurrences impacted, direct and indirect effects to locations along the proposed system trails could have a significant cumulative effect to these species.

Overall, cumulative effects to rare species under this alternative are far less than those under Alternative 1. This is primarily due to the ban on cross-country travel. Of the action alternatives, this alternative has the largest cumulative impact on Sensitive rare species due to the large number of miles proposed, the amount of suitable habitat impacted, and the number of species directly and indirectly affected by the proposed system trails.

9.2 Alternative 3

9.2.1 Direct/Indirect Effects

Table 29. Summary of rare species indicator measures for Alternative 3

Indicator Measure	Value
Miles of proposed system trail open for public motorized vehicle use within or adjacent to Sensitive rare species sites	0 miles
Number of trails open for public motorized vehicle use within or adjacent to Sensitive rare species sites	0 trails
Acres of rare plant sites within 100 feet of a proposed system trail	0 acres
Total number of rare plant sites within 100 feet of a proposed system trail	0 locations

Alternative 3 prohibits cross-country travel, adds no unauthorized routes to the trail system, and makes no changes to the existing trail system. In comparison to the other action alternatives, Alternative 3 has lowest impact on rare species and their associated habitats. It proposes no trails that intersect rare species occurrences or associated habitat.

Of those species that have been documented along a trail proposed under Alternatives 2, 4, or 5, the following five are known to occur along existing system trails: *Monardella follettii* in Serpentine Areas; *Lewisia kelloggii* ssp. *huchinsonii* in Barren and Open Habitats; *Cypripedium fasciculatum* in Interior Forest habitats; and *Clarkia mildrediae* ssp. *mildrediae* and *Clarkia mosquinii* in Open Habitats. Use of the existing system trails may have some negative effects to these five species, but they would not contribute to a trend toward federal listing. This is due to the low number of sites that are potentially impacted, as well as the fact that many of the existing system trails are already well-established and frequently utilized roads and trails where species have either adapted to the existing condition or been extirpated by past motorized vehicle use. Impacts to species along existing system trails would continue under all of the action alternatives; no additional impacts would occur to Plumas NF Sensitive species under Alternative 3 because no unauthorized routes are proposed.

Special Interest Areas

Alternative 3 proposes no new trails within Plumas NF Special Interest Areas or Research Natural Areas; therefore, it places no additional adverse impact on these unique botanical resources. There are approximately 9.6 miles of existing system trail in the Butterfly Valley SIA and the proposed McRae Meadow and Mount Fillmore SIAs (Table 5). Use of these existing trails would continue under all of the action alternatives.

9.2.2 Cumulative Effects

Overall, cumulative effects to rare species under this alternative are far less than those under Alternative 1 or the action alternatives. This is primarily due to the ban on cross-country travel and elimination of all unauthorized routes. No unauthorized routes are proposed under this alternative; therefore none of the Plumas NF rare species are at risk of being cumulatively impacted by Alternative 3.

9.3 Alternative 4

9.3.1 Direct/Indirect Effects

Table 30. Summary of rare species indicator measures for Alternative 4

Indicator Measure	Value
Miles of proposed system trail open for public motorized vehicle use within or adjacent to Sensitive rare species sites	1.3 miles
Number of trails open for public motorized vehicle use within or adjacent to Sensitive rare species sites	14 trails
Acres of rare plant sites within 100 feet of a proposed system trail	33 acres
Total number of rare plant sites within 100 feet of a proposed system trail	23 locations

Alternative 4 prohibits cross-country travel, adds approximately 141 miles of unauthorized routes to the trail system, and makes no changes to the existing trail system. In comparison to the other action alternatives, Alternative 4 has second lowest impact on rare species and their associated habitats. It has the second lowest number of trails (14 trails) and trail miles (1.3 miles) that intersect rare species occurrences or associated habitat. This alternative has the potential to impact 6 rare species (23 locations) both directly and indirectly.

The following species have been documented within 100 feet of a trail proposed under Alternative 4: *Arabis constancei* and *Monardella follettii* (Serpentine Area species); *Cypripedium fasciculatum* (Interior Forest species); and *Astragalus lentiformis, Clarkia mildrediae ssp. mildrediae*, and *Lupinus dalesiae* (Open Habitat species). A detailed discussion of direct, indirect, and cumulative effects to these species from motorized vehicle use is provided under “Action Alternatives (2-5): Summary of Environmental Consequences for Individual Species”. While Alternative 4 may negatively affect some of these species, it would not contribute to a trend toward federal listing.

In comparison to Alternative 2, this alternative provides a greater level of protection for the following seven rare species: *Astragalus pulsiferae* var. *pulsiferae*, *Astragalus lentiformis*, *Botrychium sp.*, *Clarkia mosquinii*, *Eriogonum umbellatum var. ahartii*, *Ivesia sericolueca*, and *Lewisia kelloggii* ssp. *hutchisonii*. This is because a number of the routes that were in violation of the Plumas NF management prescriptions for individual species (i.e. those that had the potential to directly impact individuals or small occurrences) were excluded from the proposed trail system. In addition, this alternative avoids impacts to *Ivesia aperta var. aperta* and *Pyrrocoma lucida* (Meadow and Seep species); *Hydrothyria venosa* (Riparian Area species); *Allium jepsonii* and *Calycadenia oppositifolia* (Serpentine Area species); and *Penstemon personatus* (Open Habitat species).

In general, occurrences with individuals that are in or within 30 feet of the trail are at a high risk of direct effects from motorized vehicle use. These effects could include death, altered growth, or reduced seed set from physically breaking, crushing, or uprooting plants (Wilshire, Shipley, and Nakata 1978, Cole and Bayfield 1993).

Indirect effects to species are dependent upon a number of species-specific factors that include habitat type, tolerance to disturbance, distance from trail, amount of occurrence impacted, and intensity and timing of disturbance. All of the rare species listed above (i.e. those within 100 feet of a proposed system trail) have a high risk of indirect effects from noxious weed introduction and spread. Species that are intolerant of disturbance, such as *Cypripedium fasciculatum*, may be indirectly impacted by increased light levels and duff or litter disturbance along the edges of motorized trails. In contrast, for those species that tolerate some degree of disturbance, such as *Astragalus lentiformis* or *Lupinus dalesiae*, designation of motorized trails may have fewer detrimental indirect effects.

The largest improvement over Alternative 1 is the prohibition of cross-country travel. This reduces vehicle access and impacts to rare plants and their habitats, lowers the risk of noxious weed introduction and spread throughout the forest, and concentrates use on maintained trails that will be managed and improved to reduce resource damage.

Special Interest Areas

Alternative 4 has the lowest number of motorized trails (1.2 miles) within Plumas NF Special Interest Areas (Table 9). Under this alternative, 1.2 miles are proposed in the McRae Meadow SIA, which currently contains 5.6 miles of existing system trail. Some of the unique botanical features for which this SIA has been proposed for designation include large meadow complexes, a state-designated Wild Trout stream, unique old-growth forests, and unusual geologic features (Meyer 1991). While some of these “unauthorized routes” are relatively well-established, motorized vehicle use within these areas still has the potential to significantly degrade or disturb these special features if trail design features are not in place. None of the remaining Plumas SIAs or RNAs are impacted by the routes proposed under Alternative 4 (Table 9).

9.3.2 Cumulative Effects

All of the rare species locations (23 sites) located within 100 feet of a proposed system trail have the potential to be directly or indirectly affected by route designation; therefore these species are also at risk of being cumulatively impacted.

In comparison to the other action alternatives, Alternative 4 has the second lowest number of proposed route miles in riparian areas, wet meadows, serpentine areas, barren habitats, interior forest, and open forest (Table 6). Because this alternative does propose routes within these sensitive habitat types, implementation of this alternative has the potential to affect suitable habitat for a number of rare species on the Plumas NF. Of the six species with the potential to be directly and indirectly impacted by Alternative 4, all have 13 percent or less of their known Plumas NF locations impacted by the proposed system trails (Figure 1).

Overall, cumulative effects to rare species under this alternative are far less than those under Alternative 1. This is primarily due to the ban on cross-country travel. Of the action alternatives, this alternative has the second lowest cumulative impact on Sensitive rare species due to the low number of miles proposed, amount of suitable habitat impacted, and the lower number of species directly and indirectly affected.

9.4 Alternative 5

9.4.1 Direct/Indirect Effects

Table 31. Summary of rare species indicator measures for Alternative 5

Indicator Measure	Value
Miles of proposed system trail open for public motorized vehicle use within or adjacent to Sensitive rare species sites	2.6 miles
Number of trails open for public motorized vehicle use within or adjacent to Sensitive rare species sites	30 trails
Acres of rare plant sites within 100 feet of a proposed system trail	67.8 acres
Total number of rare plant sites within 100 feet of a proposed system trail	44 locations

Alternative 5 prohibits cross-country travel, adds approximately 251 miles of unauthorized routes to the trail system, and makes no changes to the existing trail system. Of the action alternatives, implementation of Alternative 5 has the second greatest impact to rare species and their associated habitats. It has the second highest number of trails (30 trails) and trail miles (2.6 miles) that intersect rare species occurrences or associated habitat. This alternative also has the potential to impact 12 rare species (44 locations) both directly and indirectly.

The following species have been documented within 100 feet of a trail proposed under Alternative 5: *Ivesia aperta var. aperta* and *Pyrrocoma lucida* (Meadow and Seep species); *Hydrothyria venosa* (Riparian Area species); *Allium jepsonii, Arabis constancei, Calycadenia oppositifolia,* and *Monardella follettii* (Serpentine species); *Cypripedium fasciculatum* (Interior Forest species); and *Astragalus lentiformis, Clarkia mildrediae ssp. mildrediae, Lupinus dalesiae,* and

Penstemon personatus (Open Habitat species). A detailed discussion of direct, indirect, and cumulative effects to these species from motorized vehicle use is provided under "Action Alternatives (2-5): Summary of Environmental Consequences for Individual Species". While Alternative 5 may negatively affect some of these species, it would not contribute to a trend toward federal listing.

In comparison to Alternative 2, this alternative provides a greater level of protection for the following seven rare species: *Astragalus pulsiferae* var. *pulsiferae*, *Astragalus lentiformis*, *Botrychium sp.*, *Clarkia mosquinii*, *Eriogonum umbellatum var. ahartii*, *Ivesia sericolueca*, and *Lewisia kelloggii* ssp. *hutchisonii*. This is because a number of the routes that were in violation of the Plumas NF management prescriptions for individual species (i.e. those that had the potential to directly impact individuals or small occurrences) were excluded from the proposed trail system.

In general, occurrences with individuals that are in or within 30 feet of the trail are at a high risk of direct effects from motorized vehicle use. These effects could include death, altered growth, or reduced seed set from physically breaking, crushing, or uprooting plants (Wilshire, Shipley, and Nakata 1978, Cole and Bayfield 1993).

Indirect effects to species are dependent upon a number of species-specific factors that include habitat type, tolerance to disturbance, distance from trail, amount of occurrence impacted, and intensity and timing of disturbance. All of the rare species listed above (i.e. those within 100 feet of a proposed trail) have a high risk of indirect effects from noxious weed introduction and spread. Species that are intolerant of disturbance, such as *Cypripedium fasciculatum*, may be indirectly impacted by increased light levels and duff or litter disturbance along the edges of motorized trails. In contrast, for those species that tolerate some degree of disturbance, such as *Astragalus lentiformis* or *Lupinus dalesiae*, designation of motorized trails may have fewer detrimental indirect effects.

The largest improvement over Alternative 1 is the prohibition of cross-country travel. This reduces vehicle access and impacts to rare plants and their habitats, lowers the risk of noxious weed introduction and spread throughout the forest, and concentrates use on maintained trails that will be managed and improved to reduce resource damage.

Special Interest Areas

Of the action alternatives, Alternative 5 has second highest number of motorized trails (3 miles) within Plumas NF Special Interest Areas (Table 9). Implementation of this alternative proposes the addition of unauthorized routes in Brady's Camp (1.5 miles), Butterfly Valley (0.2 miles), and McRae Meadow (1.2 miles) SIA. Two of these SIAs, Butterfly Valley and McRae Meadow, already have existing system trails within their boundary (Table 5). Some of the unique botanical features for which these Special Interest areas were designated (or proposed for designation) include large meadow and stream complexes, aquatic plant communities, red fir and lodgepole forests, and sub-alpine plant communities (Meyer 1991). While some of these "unauthorized routes" are relatively well-established, motorized vehicle use within these areas still has the potential to significantly

degrade or disturb these special features if trail design features are not in place. None of the remaining Plumas SIAs or RNAs are impacted by the routes proposed under Alternative 5 (Table 9).

9.4.2 Cumulative Effects

All of the rare species locations (44 sites) located within 100 feet of a proposed system trail have the potential to be directly or indirectly affected by route designation; therefore these species are also at risk of being cumulatively impacted.

In comparison to the other action alternatives, Alternative 5 has the second greatest number of miles in riparian areas, wet meadows, serpentine areas, barren habitats, interior forest, and open forest (Table 6); therefore implementation of this alternative also has the potential to affect suitable habitat for a number of rare species on the Plumas NF.

Of the 12 species with the potential to be directly and indirectly impacted by Alternative 5, eleven have 25 percent or less of their known Plumas NF locations impacted by the proposed system trails (Figure 1). One species, *Calycadenia oppositifolia,* has 23 percent known locations affected. Because of this large percentage of occurrences impacted, direct and indirect effects to locations along the proposed system trails could have a significant cumulative effect to this species.

Overall, cumulative effects to rare species under this alternative are far less than those under Alternative 1. This is primarily due to the ban on cross-country travel. Of the action alternatives, this alternative has the second largest cumulative impact on Sensitive rare species due to large number of miles proposed, the amount suitable habitat impacted, and the number of species directly and indirectly affected.

10.0 Summary of Determinations

Table 32 presents the determinations for all of the Plumas NF rare species. These determinations are based on professional experience and judgment; the existing condition of botanical resources within the analysis area, and the potential impacts of the alternatives. An effects determination is also the culmination of potential direct, indirect, and cumulative effects. Even if the potential direct effects are low, there is often the potential for the indirect or cumulative effects to affect the viability of the species.

Table 32. Summary of species determinations. Shaded cells indicate a "may affect" determination.

Species	Alternative				
	1	2	3	4	5
Allium jepsonii	MA (T)	MA (NT)	WN	WN	MA (NT)
Arabis constancei	MA (NT)	MA (NT)	WN	MA (NT)	MA (NT)
Astragalus lemmonii	WN	WN	WN	WN	WN
Astragalus lentiformis	MA (NT)	MA (NT)	WN	MA (NT)	MA (NT)
Astragalus pulsiferae var. coronensis	MA (NT)	WN	WN	WN	WN

Species	Alternative				
	1	2	3	4	5
Astragalus pulsiferae var. pulsiferae	MA (NT)	MA (NT)	WN	WN	WN
Astragalus webberi	MA (T)	WN	WN	WN	WN
Balsamorhiza macrolepis var. macrolepis	WN	WN	WN	WN	WN
Botrychium ascendens	MA (NT)	MA (NT)	WN	WN	WN
Botrychium crenulatum	MA (NT)	MA (NT)	WN	WN	WN
Botrychium lineare	MA (T)	MA (NT)	WN	WN	WN
Botrychium lunaria	MA (NT)	MA (NT)	WN	WN	WN
Botrychium minganese	MA (NT)	MA (NT)	WN	WN	WN
Botrychium montanum	MA (NT)	MA (NT)	WN	WN	WN
Botrychium pinnatum	MA (NT)	MA (NT)	WN	WN	WN
Bruchia bolanderi	MA (NT)	WN	WN	WN	WN
Buxbaumia viridis	MA (NT)	WN	WN	WN	WN
Calycadenia oppositifolia	MA (NT)	MA (NT)	WN	WN	MA (NT)
Calystegia atriplicifolia ssp. buttensis	MA (NT)	WN	WN	WN	WN
Clarkia biloba ssp. brandegeae	MA (NT)	WN	WN	WN	WN
Clarkia gracilis ssp. albicaulis	MA (NT)	WN	WN	WN	WN
Clarkia mildrediae ssp. mildrediae	MA (NT)	MA (NT)	WN	MA (NT)	MA (NT)
Clarkia mosquinii	MA (T)	MA (NT)	WN	WN	WN
Cudonia monticola	WN	WN	WN	WN	WN
Cypripedium fasciculatum	MA (NT)	MA (NT)	WN	MA (NT)	MA (NT)
Cypripedium montanum	MA (NT)	WN	WN	WN	WN
Dendrocollybia racemosa	WN	WN	WN	WN	WN
Eleocharis torticulmis	MA (T)	WN	WN	WN	WN
Eriogonum umbellatum var. ahartii	MA (NT)	MA (NT)	WN	WN	WN)
Fissidens aphelotaxifolius	WN	WN	WN	WN	WN
Fissidens pauperculus	MA (NT)	WN	WN	WN	WN
Fritillaria eastwoodiae	MA (NT)	WN	WN	WN	WN
Helodium blandowii	WN	WN	WN	WN	WN
Hydrothyria venosa	MA (NT)	MA (NT)	WN	WN	MA (NT)
Ivesia aperta var. aperta	MA (NT)	MA (NT)	WN	WN	MA (NT)
Ivesia sericolueca	MA (NT)	MA (NT)	WN	WN	WN
Ivesia webberi	WN	WN	WN	WN	WN
Lewisia cantelovii	MA (NT)	WN	WN	WN	WN
Lewisia kelloggii ssp. hutchisonii	MA (NT)	MA (NT)	WN	WN	WN
Lewisia kelloggii ssp. kelloggii	WN	WN	WN	WN	WN
Lomatium roseanum	MA (NT)	WN	WN	WN	WN

Species	Alternative				
	1	2	3	4	5
Lupinus dalesiae	MA (NT)	MA (NT)	WN	MA (NT)	MA (NT)
Meesia longiseta	WN	WN	WN	WN	WN
Meesia triquetra	MA (NT)	WN	WN	WN	WN
Meesia uliginosa	MA (NT)	WN	WN	WN	WN
Mielichhoferia elongata	WN	WN	WN	WN	WN
Monardella follettii	MA (T)	MA (NT)	WN	MA (NT)	MA (NT)
Monardella stebbinsii	MA (T)	WN	WN	WN	WN
Oreostemma elatum	MA (NT)	WN	WN	WN	WN
Packera eurycephala var. lewisrosei	MA (NT)	WN	WN	WN	WN
Packera layneae	MA (FT)	WN (FT)	WN (FT)	WN (FT)	WN (FT)
Penstemon personatus	MA (NT)	MA (NT)	WN	WN	MA (NT)
Penstemon sudans	MA (NT)	WN	WN	WN	WN
Phaecollybia olivacea	WN	WN	WN	WN	WN
Pyrrocoma lucida	MA (NT)	MA (NT)	WN	WN	MA (NT)
Sedum albomarginatum	MA (NT)	WN	WN	WN	WN

For Sensitive Species:

•WN: It is my determination that the routes proposed under this Alternative will not affect this species.

•MA (NT): It is my determination that the routes proposed under this Alternative may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability for the species.

• •MA (T): It is my determination that the routes proposed under this Alternative may affect individuals, and is likely to result in a trend toward federal listing or loss of viability for the species.

For Federally Listed Species:

•WN (FT): It is my determination that the routes proposed under this Alternative will not affect this species or its designated critical habitat.

•MA (FT): : It is my determination that the routes proposed under this Alternative may affect and is likely to jeopardize the continued existence of the species

11.0 Summary of Effects Analysis across All Alternatives

The following presents an overview of the effects analysis for each alternative (Table 33). In general, the greater the number of motorized vehicle trails (and miles) proposed, the higher the risk and severity of negative impacts to rare species and their associated habitats. Alternative 1 has the greatest negative effect on rare species and habitats, primarily due to the allowance for cross-country travel, which has the potential to affect all but the most inaccessible rare species and habitats. Out of the action alternatives, Alternative 2 impacts the largest number of rare species and botanically sensitive resources. Alternative 3, which designates no unauthorized routes, has the least impact on rare species. In comparison to these alternatives, the impacts from Alternative 5 fall closer to the middle of the spectrum of potential effects.

Table 33. Summary of Effects for Botanical Resources

Indicators – Botanical Resources	Rankings of Alternatives for Each Indicator[1]				
	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5

Miles of unauthorized or proposed system trails open for public motorized vehicle use within or adjacent to Sensitive rare species sites.	1	2	5	4	3
Number of unauthorized or proposed trails open for public motorized vehicle use within or adjacent to Sensitive rare species sites.	1	2	5	4	3
Acres of rare plant sites or suitable habitat within 100 feet of unauthorized or proposed system trails.	1	2	5	4	3
Total number of rare plant sites within 100 feet of unauthorized or proposed trails.	1	2	5	4	3
Average for Botanical Resources	**1**	**2**	**5**	**4**	**3**

[1] A score of 5 indicates the alternative is the best for botanical resources related to the indicator; A score of 1 indicates the alternative is the worst for botanical resources related to the indicator.

12.0 Compliance with the Forest Plan and Other Direction

Alternative 1 does not comply with the Forest Plan or other management direction for botanical resources. It does not prohibit cross-country travel and has the highest impact on rare species and botanical resources. Alternative 1 does not protect sensitive species as needed to maintain viability (FSM/H 2670). It also does not protect the resource values within the established Mud Lake RNA from motorized vehicle travel (SNFPA 2004).

The proposed action alternatives are consistent with the Forest Plan and other direction. Under these alternatives, sensitive plant species are protected (albeit to differing degrees) as needed to maintain viability. Motorized vehicle travel in the Mud Lake RNA is also prohibited under all action alternatives (SNFPA 2004).

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Appendix A

Plumas National Forest Public Wheeled Motorized Travel Management: Botanical Report on Special Interest Species

Prepared for:
Mt Hough Ranger District
Plumas National Forest
USDA Forest Service

October 10, 2008

Prepared by: _____ Date: _____
Michelle Coppoletta
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Prepared by: _____ Date: _____
Jim Belsher-Howe
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1.0 Introduction

The Plumas National Forest maintains a watch list of plant species and habitats that are of conservation concern, but have not been designated as sensitive by the Regional Forester. The Plumas "Special Interest Plant List" includes species that are newly described, locally rare, range extensions or disjunct populations, plants of specific public interest, or species with too little information to determine their appropriate status (Hanson 2006). According to the Regional Forester, these species should be considered during project planning with corresponding documentation maintained in the planning file (Sprague 1998). These species make an important contribution to forest biodiversity and should be maintained under the provisions of the National Forest Management Act (NFMA).

2.0 Current Management Direction

Plumas Special Interest species are organized into two categories. Special Interest Category 1 species are those species that are globally rare enough to be considered for sensitive status but were not included because there is not enough information to determine the species' status or the taxonomy of the species is presently unclear. For these plants, project-level surveys need to occur and conservation measures recommended. Special Interest Category 2 plants include species that are not globally rare enough to be considered for sensitive status but are locally rare, of public interest, or are a range extension of a more widespread species. For these plants, occurrences need to be reported and conservation measures recommended.

Individual species conservation strategies, or species management guidelines, for the Plumas National Forest have not been completed for most of the Plumas NF Special Interest plants. Until these conservation strategies have been completed, the Plumas National Forest has developed Interim Management Prescriptions that will be followed (Madrid 1996). Relevant species-specific prescriptions are provided in section 5.1.

3.0 Description of Proposed Action

For a detailed description of the proposed project refer to Section 2.0 in the "Plumas National Forest Public Wheeled Motorized Travel Management EIS: Biological Evaluation of Potential Effects to Threatened, Endangered, and Sensitive Plant Species" (i.e. the "Travel Management BE").

4.0 Methodology for Assessing Impacts

The methodology and geographic area used to assess impacts to Plumas NF Special Interest Species is described in Section 3.0 of the Travel Management BE. In general, direct effects to special interest species are most likely to occur within a zone of 30 feet on either side of the route and indirect effects are most likely to occur within a zone of 100 feet.

5.0 Plumas NF Special Interest Species

Table A-1 lists all of the Plumas NF Special Interest Species that are known or thought to have potential to occur on the Plumas NF. Also included are the listing category, global rank, and the number of locations documented within 100 feet of a proposed, existing, or unauthorized route.

Table A-1. Special interest species known or thought to have potential to occur on the Plumas National Forest

Species	Common Name	Special Interest Category	Global Rank[1]	Number of locations within 100 feet of:		
				Proposed routes	Existing system trails	Unauthorized routes
Agrostis hendersonii	Henderson's bent grass	2	G1Q			
Allium sanbornii var. sanbornii	Sanborn's onion	1	G3T3			
Anomobryum julaceum	moss	1	G4			1
Antennaria umbrinella	brown everlasting	2	G5			
Arabis microphylla var. microphylla	small-leaved rock cress	2	G5T4?			
Arnica fulgens	hillside arnica	2	G5			
Astragalus whitneyi var. lenophyllus	woolly-leaved milk-vetch	1	G5T3			
Botrychium simplex	Yosemite moonwort	1	G5			
Bulbostylis capillaries	thread-leaved beakseed	2	G5			
Cardamine pachystigma var. dissectifolia	dissected-leaf toothwort	1	G3G5T3			1
Carex gigas	Siskiyou sedge	2	G3G4	2		2
Carex inops ssp. inops	long-stoloned sedge	2	G5T4?			
Carex lasiocarpa	slender sedge	2	G5			
Carex limosa	shore sedge	2	G5			
Carex petasata	Liddon's sedge	1	G5			
Carex sheldonii	Sheldon's sedge	2	G4	1		6
Caulanthus major var. nevadensis	Nevada jewelflower	2	G4T3?			
Chenopodium simplex	large-seeded goosefoot	2	G5			
Clarkia mildrediae ssp. lutescens	golden-anthered clarkia	1	G3T3	1	1	7
Claytonia cordifolia	cordate-leaved claytonia	2	G5			
Claytonia palustris	marsh claytonia	1	G3			1

Species	Common Name	Special Interest Category	Global Rank[1]	Number of locations within 100 feet of:		
				Proposed routes	Existing system trails	Unauthorized routes
Claytonia umbellate	Great Basin claytonia	1	G5?			
Corallorhiza trifida	northern coralroot	2	G5			
Cupressus bakeri	Baker's cypress	1	G3			2
Cupressus macnabiana	MacNab Cypress	2	G4			
Cypripedium californicum	California lady's-slipper	2	G3			1
Darlingtonia californica	California pitcherplant	2	G3G4			
Didymodon norrisii	Norris's beard-moss	1	G2G3			
Drosera rotundifolia	round-leaved sundew	2	G5			
Epilobium luteum	yellow willowherb	2	G5			
Erigeron lassenianus var. deficiens	Plumas rayless daisy	1	G3?TNR			7
Erigeron nevadincola	Nevada daisy	2	G5T4			
Erigeron petrophilus var. sierrensis	northern Sierra daisy	2	G4T3	7	2	17
Erigeron reductus var. reductus	California rayless daisy	2	G3G4T1T3			
Eremogone cliftonii	Clifton's eremogone		G3	22		41
Frangula purshiana ssp. ultramafica	Caribou coffeeberry		G4T1	3		3
Ivesia baileyi var. baileyi	Bailey's ivesia	1	G5T4			
Juncus dudleyi	Dudley's slender rush	1	G5			
Lilium humboldtii ssp. humboldtii	Humboldt lily	1	G4T3			3
Lomatium foeniculaceum var. macdougalii	MacDougal's lomatium	2	G5T4T5			
Lycopus uniflorus	northern bugleweed	2	G5			
Mimulus glaucescens	shield-bracted monkeyflower	1	G3			1
Mimulus pygmaeus	Egg Lake monkeyflower	1	G4	1		1
Orobanche lucoviciana var. arenosa	Suksdorf's broomrape	2	G5T5			
Penstemon janishiae	Janish's beardtongue	2	G4		1	
Perideridia bacigalupii	Bacigalupi's yampah	1	G3			
Pinus washoensis	washoe pine	2	G3Q			

Species	Common Name	Special Interest Category	Global Rank[1]	Number of locations within 100 feet of:		
				Proposed routes	Existing system trails	Unauthorized routes
Polystichum lonchitis	holly fern	2	G5			
Potamogeton praelongus	white-stemmed pondweed	2	G5			
Pseudostellaria sierrae	Sierra starwort	2	G2G3	2		4
Rhynchospora alba	white beaked-rush	2	G5			
Rhynchospora capitellata	brownish beaked-rush	1	G5			
Scirpus subterminalis	water bulrush	2	G4G5			
Scopelophila ligulata	moss	2	G5?			
Scutillaria galericulata	marsh skullcap	1	G5			
Silene invisa	cryptic catchfly	2	G4	4	4	8
Sphagnum spp.	Sphagnum moss	2	G4, G5, G5, G3G4	1		1
Trichodon cylindricus	moss	2	G4G5			1
Trifolium lemmonii	Lemmon's clover	1	G4?	16		29
Veronica cusickii	Cussick's speedwell	2	G5		1	
Viola tomentosa	woolly violet	1	G3			1

[1] Global Rank: G1-Critically Imperiled; G2- Imperiled; G3-Vulnerable; G4 - Apparently secure; G5- Secure (NatureServe 2008) / CNPS Rank: 1B- Rare, Threatened, or Endangered in California and Elsewhere; 2- Rare, Threatened, or Endangered in California, But More Common Elsewhere, 3- About Which We Need More Information, 4- Plants of Limited Distribution (California Native Plant Society 2008).

5.1 Special Interest Species Prescriptions

The following section provides the Plumas NF management prescriptions (USDA Forest Service 2007) for those special interest species that have the potential to be affected by the proposed project (that is, they occur within 100 feet of a proposed system trail). The Plumas NF species management prescriptions are based on field visits, monitoring, and professional observations; individual species conservation assessments and guides; and known species ecology.

5.1.1 Carex gigas

Maintain hydrologic conditions. Evaluate activities and use mitigations consistent with Riparian Management Objectives (HFQLG FEIS) or Riparian Conservation Objectives (Sierra Nevada Forest Plan Amendment, ROD, pp. 32-35) as appropriate. If the establishment of a no-disturbance buffer is appropriate, consider the following when determining the size and shape of the buffer: site conditions, topographic position, slope, aspect, stand structure (including canopy height), intensity of the proposed management activity, and proximity to water.

5.1.2 Carex sheldonii

Maintain hydrologic conditions. Evaluate activities and use mitigations consistent with Riparian Management Objectives (HFQLG FEIS) or Riparian Conservation Objectives (Sierra Nevada Forest Plan Amendment, ROD, pp. 32-35) as appropriate. If the establishment of a no-disturbance buffer is appropriate, consider the following when determining the size and shape of the buffer: site conditions, topographic position, slope, aspect, stand structure (including canopy height), intensity of the proposed management activity, and proximity to water.

5.1.3 Clarkia mildrediae ssp. lutescens

Evaluate all project activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

5.1.4 Eremogone cliftonii

This is a very recently described species; therefore no species-specific management prescription has been developed at this time. In general, evaluate all project activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

5.1.5 Erigeron petrophilus var. sierrensis

Evaluate all project activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

5.1.6 Frangula purshiana ssp. ultramafica

This is a very recently described species; therefore no species-specific management prescription has been developed at this time. In general, evaluate all project activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

5.1.7 Mimulus pygmaeus

Protect occurrences from ground disturbance. Establish no-disturbance buffers of a size and shape appropriate to the site (e.g. distance of one site-potential tree, or approximately 100 ft.). Consider specific habitat components that may be altered by the proposed action.

5.1.8 Pseudostellaria sierrae

Evaluate all project activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

5.1.9 Silene invisa

Protect at least 30 percent of all known occurrences within a project analysis area from all disturbances associated with management activities. Allow for at least 5 years rest between disturbance prescriptions to the same occurrence. Evaluate other activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

5.1.10 Sphagnum sp.

Protect all occurrences from ground disturbance. Maintain hydrologic conditions. Evaluate activities and use mitigations consistent with Riparian Management Objectives (HFQLG FEIS) or Riparian Conservation Objectives (Sierra Nevada Forest Plan Amendment, ROD, pp. 32-35) as appropriate. If the establishment of a no-disturbance buffer is appropriate, consider the following when determining the size and shape of the buffer: site conditions, topographic position, slope, aspect, stand structure (including canopy height), intensity of the proposed management activity, and proximity to water.

5.1.11 Trifolium lemmonii

Protect at least 30 percent of all known occurrences within a project analysis area from all disturbances associated with management activities. In small populations (containing less than 50 individuals or less than one quarter acre) avoid ground disturbance. Allow for at least three years rest between disturbance prescriptions to the same occurrence. Evaluate other activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

6.0 Impacts from the Alternatives

6.1 Alternative 1 (No Action)

Alternative 1 has the greatest negative impact on the Plumas NF special interest species. The largest impact of this alternative is from cross-country travel, which has the potential to affect all but the most inaccessible of the special interest species listed in Table A-1. In general, the impacts to Plumas NF special interest species would be similar to those described under Section 6.0 of the Travel Management BE.

Under this alternative, it is impossible to quantify when and where special interest species will be impacted by motorized vehicles; therefore this analysis uses the approximately 1,073 miles of unauthorized routes as a representation of current motorized vehicle use on the Forest. Using this analysis methodology, Alternative 1 has highest number of special interest species (21 species) and locations (138 sites) within 100 feet of an unauthorized route (Table A-1).

6.2 Alternative 3 (Existing system trails only)

Alternative 3 prohibits cross-country travel, adds no unauthorized routes to the trail system, and makes no changes to the existing trail system. In comparison to the other action alternatives, Alternative 3 has lowest impact on special interest species. It proposes no trails that intersect special interest species occurrences.

Five special interest species (with a total of nine locations) are known to occur along existing system trails. Impacts to these species from use of the existing system trails would continue under all of the action alternatives; no additional impacts would occur to Plumas NF special interest species under Alternative 3 because no unauthorized routes are proposed.

6.3 Action Alternatives (2, 4, and 5)

The following section presents a summary of potential impacts of the action alternatives on Plumas NF special interest species. It is important to note that only those special interest species with the potential to be impacted directly or indirectly by the proposed project (that is, those within 100 feet of a proposed system trail) are discussed in detail.

Table A-2 summarizes the impacts to Special Interest species from the proposed action alternatives (Alternatives 2, 4, and 5) in relation to the existing Plumas NF Interim Management Prescriptions for Special Interest Plants (USDA Forest Service 2007) described above in Section 5.1. These impacts are based on a GIS intersection of the proposed routes with documented species locations. Filled blocks with bold text highlight impacts that are greater than those allowed under the Plumas NF management prescriptions. Unfilled blocks indicate that the impacts to the species fall within the limits of the management prescription.

Table A-2. Special interest species locations within 100 feet of the trails proposed under the Action Alternatives.

Species	Route ID	Location within		Action Alternatives		
		0-30' of proposed route	30-100' of proposed route	2	4	5
Carex gigas	7M10	X	X	X		
Carex sheldonii	13M36		X		X	X
Clarkia mildrediae ssp. lutescens	6M06		X	X		
Eremogone cliftonii	4M01	X	X	X		X
	4M02	X	X	X		
	5M20	X	X	X		X
	5M21	X	X	X		
	5M22	X	X	X		
	5M23	X	X	X		
	5M24	X	X	X		X
	5M25	X	X	X		X
Eremogone cliftonii	5M25A	X	X	X		
	5M26	X	X	X	X	X
	5M27	X	X	X		
	5M28 (E)	X	X	X	X	X
	5M28 (W)	X	X	X		
Erigeron petrophilus var. sierrensis	5M05		X	X		X
	7M10	X		X		
	8M11	X	X	X	X	X
	8M23		X	X		X
	9M32 (E)	X	X	X		
	9M32 (W)	X	X	X	X	X
Frangula purshiana ssp. ultramafica	7M10	X	X	X		
Mimulus pygmaeus	**13M10**	**X**	**X**	**X**		
Pseudostellaria sierrae	10M25		X	X	X	X
	11M17	X	X	X		X
	11M18	X	X	X		X
	11M18A	X	X	X		X
Silene invisa	11M02	X	X	X		X
	11M10		X	X		
	13M01	X	X	X	X	X
Sphagnum subsecundum	6M22		X	X		X

Species	Route ID	Location within		Action Alternatives		
		0-30' of proposed route	30-100' of proposed route	2	4	5
Trifolium lemmonii	13M07		X	X		
	13M08	X	X	X		
	13M09	**X**	**X**	**X**	**X**	**X**
	13M10	**X**	**X**	**X**		
	13M11		X	X		
	13M19	X	X	X		
	13M38	X	X		X	X
	14M02	X	X	X		
	14M05	X	X	X		X
	14M10	**X**		**X**	**X**	**X**
	15M08		X		X	X

5.1.12 Alternative 2

Alternative 2 prohibits cross-country travel, adds approximately 367 miles of unauthorized routes to the trail system, and makes no changes to the existing system trails. In comparison to the other action alternatives, Alternative 2 has the highest impact on special interest species.

It has the highest number of trails (38 trails) that intersect special interest species locations; it also has the highest number of special interest species (10 species) potentially impacted. Alternative 2 has four routes that have impacts that are greater than those allowed under the Plumas NF management prescriptions (Table A-2)

5.1.13 Alternative 4

Alternative 4 prohibits cross-country travel, adds approximately 141 miles of unauthorized routes to the trail system, and makes no changes to the existing trail system. In comparison to the other action alternatives, Alternative 4 has second lowest impact on rare species and their associated habitats.

It has the second lowest number of trails (11 trails) that intersect special interest species locations; it also has the second lowest number of special interest species (6 species) potentially impacted. Alternative 4 has two routes that have impacts that are greater than those allowed under the Plumas NF management prescriptions (Table A-2).

5.1.14 Alternative 5

Alternative 5 prohibits cross-country travel, adds approximately 251 miles of unauthorized routes to the trail system, and makes no changes to the existing trail system. Of the action alternatives, implementation of Alternative 5 has the second greatest impact to rare species and their associated habitats.

It has the second highest number of trails (23 trails) that intersect special interest species locations; it also has the second highest number of special interest species (7 species) potentially impacted. Alternative 5 has two routes that have impacts that are greater than those allowed under the Plumas NF management prescriptions (Table A-2)

7.0 Summary of Impact Analysis across All Alternatives

The following presents an overview of the impacts analysis for each alternative (Table A-3). In general, the greater the number of motorized vehicle trails (and miles) proposed, the higher the risk and severity of negative impacts to special interest species. Alternative 1 has the greatest negative effect on special interest species, primarily due to the allowance for cross-country travel. Out of the action alternatives, Alternative 2 impacts the largest number of special interest species. Alternative 3, which designates no unauthorized routes, has the least impact on special interest species.

Table A-3. Summary of Effects for Botanical Resources

Indicators – Botanical Resources	Rankings of Alternatives for Each Indicator[1]				
	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Total number of unauthorized routes or proposed system trails open for public motorized vehicle use within or adjacent to special interest species sites.	1	2	5	4	3
Total number of special interest species sites within 100 feet of unauthorized routes or proposed trails.	1	2	5	4	3
Average for Botanical Resources	**1**	**2**	**5**	**4**	**3**

[1] A score of 5 indicates the alternative is the best for special interest species related to the indicator; A score of 1 indicates the alternative is the worst for special interest species related to the indicator.

Appendix B

Plumas National Forest Public Wheeled Motorized Travel Management EIS: Noxious Weed Risk Assessment

Prepared for:
Plumas National Forest
USDA Forest Service

October 3, 2008

Prepared by: _____ Date: _____
Michelle Coppoletta
Botanist, Mt Hough Ranger District

Reviewed by: _____ Date: _____
Jim Belsher-Howe
District Botanist, Mt Hough Ranger District

Summary of Effects

The proposed system trails would greatly increase the risk of noxious weed introduction and spread by creating disturbed conditions that favor noxious weed establishment and spread. Implementation of standard management prevention practices is not practical for this project and the limited numbers of noxious weed control mitigation measures that are available do not completely eliminate the risk of noxious weed spread along and among routes.

The risk of noxious weed introduction and spread varies among the proposed alternatives due to the number and mileage of routes within or adjacent to noxious weed infestations and the total number and acreage of weed infestations within 100 feet of a proposed system trail. Alternative 1 has the highest risk of noxious weed introduction and spread, primarily due to the allowance for cross-country travel, which provides potential access to all but the most inaccessible weed infestations and native plant habitats. Out of the action alternatives, Alternative 2 poses the highest risk from noxious weeds, while Alternative 3, which designates no unauthorized routes, has the lowest risk of weed introduction and spread. In comparison to these alternatives, the impacts from Alternative 5 fall closer to the middle of the spectrum of potential effects.

Table 1: Summary of Noxious Weed risk under each Alternative

Indicators – Noxious Weeds	Rankings of Alternatives for Each Indicator[1]				
	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Miles of unauthorized or proposed system trails open for public motorized vehicle use within or adjacent to noxious weed sites.	1	2	5	4	3
Number of unauthorized or proposed trails open for public motorized vehicle use within or adjacent to noxious weed sites.	1	2	5	4	3
Acres of noxious weed infestations within 100 feet of unauthorized or proposed system trails.	1	2	5	4	3
Total number of noxious weed sites within 100 feet of unauthorized or proposed trails.	1	2	5	4	3
Overall Risk of Noxious Weed Spread	**1**	**2**	**5**	**4**	**3**

[1] A score of 5 indicates the alternative has the lowest risk from noxious weeds (in realation to the indicator measure); A score of 1 indicates the alternative is the worst for noxious weeds (highest risk).

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1.0 Introduction

This Noxious Weed Risk Assessment has been prepared to evaluate the effects of the proposed Plumas NF Travel Management project on noxious weeds and other invasive non-native plant species.

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

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

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

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

Sierra Nevada Forest Plan Amendment (SNFPA) - The Record of Decision (ROD) for the 2004 Sierra Nevada Forest Plan Amendment identified standards and guidelines applicable to motorized travel management and noxious weeds, which will be considered during the analysis process. Appendix A of the SNFPA 2004 Record of Decision (page 36) establishes goals for noxious weed management using an integrated weed management approach according to the priority set forth in Forest Service Manual 2081.2. The three goals/priorities include:

1. Prevent the introduction of new invaders.
2. Conduct early treatment of new infestations.
3. Contain and control established infestations.

2.0 Non-Proposed Action Dependent Factors

2.1 Inventory

To date, field surveys have been conducted on approximately 287 miles of proposed system trails (Vollmar 2007, USDA Forest Service 2007, USDA Forest Service 2008 a, b, and c). An additional 66 miles of proposed system trail and 10 miles of existing system trails (USDA Forest Service 2003) have also been surveyed under past management projects. For those 25 miles of trail that had not been

surveyed at the time of this analysis, information from the Plumas NF noxious weed records were used to analyze the potential risk from known noxious weed infestations.

Assessment Summary: Field surveys of the proposed system trails are sufficient to complete the analysis.

2.2 Known Noxious Weeds

Twenty five invasive plant species are considered to be a high management concern for the Plumas National Forest. Of these, fifteen have been documented on the Plumas NF. These weed species, which are known from about 1,280 locations, occupy a total area of almost 700 acres. Of these known occurrences, 551 (or 43 percent) are within 100 feet of an existing Forest Service road. The weed sites on the Plumas NF range in size from 1 square foot to over 150 acres, with the majority of infestations (over 80 percent) occupying an area less than 0.25 acre.

Table 2 lists all noxious weed species that are known to occur on the Plumas National Forest. Also included in the table are the ratings from the California Department of Food and Agriculture's noxious weed list (CDFA 2007) and the California Invasive Plant Council's invasive plant inventory (Cal-IPC 2006). The CDFA list divides noxious weeds into three categories: A, B, and C. A-listed weeds are those for which eradication or containment is required at the state or county level. Eradication or containment of B-listed weeds is at the discretion of the County Agricultural Commissioner, and C-listed weeds require eradication or containment only when found in a nursery or at the discretion of the County Agricultural Commissioner. Cal-IPC categorizes invasive plants as high, moderate, or limited, based on the species' negative ecological, rather than economic or management, impact in California.

Table 2. Plumas NF noxious weed species.

Species	Common Name	CDFA rating	Cal-IPC rating	Number of PNF locations	Total acres on the PNF
Aegilops triuncialis	barb goatgrass	B	High	5	0.8
Cardaria draba	hoary cress	B	Moderate	2	0.1
Carduus nutans	musk thistle	A	Moderate	1	< 0.001
Centaurea maculosa	spotted knapweed	A	High	18	1.8
Centaurea solstitialis	yellow starthistle	C	High	207	269
Chondrilla juncea	rush skeletonweed	A	Moderate	8	1.8
Cirsium arvense	Canada thistle	B	Moderate	597	139
Cytisus scoparius	Scotch broom	C	High	97	131
Genista monspessulana	French broom	C	High	64	20.5
Isatis tinctoria	dyer's woad	B	Moderate	3	0.1
Lepidium latifolium	perennial pepperweed	B	High	128	8.7
Linaria genistifolia ssp. dalmatica	Dalmation toadflax	A	Moderate	4	0.1

Species	Common Name	CDFA rating	Cal-IPC rating	Number of PNF locations	Total acres on the PNF
Rubus armeniacus	Himalaya blackberry	None	High	2	0.05
Spartium junceum	Spanish broom	None	High	5	0.6
Taeniatherum caput-medusae	Medusahead	C	High	123	98

[1] 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.

2.2.1 Species that occur within 100 feet of a proposed system trail

The following summarizes the noxious weed species that are known to occur within 100' of a proposed system trail.

Centaurea solstitialis (yellow starthistle)

Yellow starthistle is considered a high priority for control and eradication in Plumas County as well as on the Plumas National Forest (Karl Bishop, Plumas-Sierra Counties Agricultural Commissioner, personal communication). In California alone, this invasive species is estimated to cover approximately 12 million acres of rangeland and wildland.

Yellow starthistle reproduces exclusively from seed, with most long-distance dispersal (greater than 16 feet) attributed to wildlife or human-related factors. The control or eradication of this species requires elimination of seed production as well as depletion of the soil seedbank (seeds residing in the soil that have not germinated). The size of the seedbank is dependant upon the age of the infestation; on average it takes 5 to 10 years to deplete the seedbank. This species is actively treated on the Plumas National Forest where control methods have ranged from hand pulling to limited herbicide control.

Cirsium arvense (Canada thistle)

This perennial thistle spreads rapidly by producing long horizontal underground roots that give rise to aerial shoots (Bossard, Randall, and Hoshovsky 2000). Canada thistle has an extensive root system; the species has been shown to produce over 66 feet of new roots over a two-year period, some of which have been shown to grow 15–20 feet deep. This species is considered particularly difficult to eradicate. Several insect species have been identified as possible biocontrol agents, but none of them have been shown to be effective controls (Bayer 2000, Nuzzo 1997, Tu et al. 2001). Mechanical methods, such as hand pulling or mowing, are generally not recommended because they may exacerbate the problem by spreading root fragments to new locations (Bossard, Randall, and

Hoshovsky 2000). The most effective method is herbicide control, which is oftentimes used in conjunction with revegetation activities (Bossard, Randall, and Hoshovsky 2000).

Cytisus scoparius (Scotch broom)
Scotch broom is an invasive shrub that currently occupies more than 700,000 acres in the central to northwest coastal and Sierra Nevada foothill regions of California (Bossard 2000). In disturbed areas, this species has been shown to form dense thickets that decrease native plant diversity and have the potential to modify fire frequency and intensity. Scotch broom spreads by producing large quantities of seed; one medium-sized plant can produce over 12,000 seeds (Bossard 2000). Scotch broom is also capable of stump sprouting after cutting, freezing, or fire.

Rubus armeniacus (Himalayan blackberry)
This robust shrub effectively and rapidly displaces native species by forming impenetrable thickets along disturbed roadsides, right-of-way corridors, and riparian areas. It can grow in a wide variety of conditions and on a number of different soil types, including barren and infertile soils (Hoshovsky 2000). Himalayan blackberry has rapid growth rates; canes have been shown to grow up to twenty three feet in a single growing season (Hoshovsky 2000). It spreads both vegetatively and through the production of large quantities of seed, which are readily dispersed by mammals, birds, and via rivers and streams. The most effective treatment methods for Himalayan blackberry are mechanical removal, burning, and in some cases herbicide application (Hoshovsky 2000). At present, this species is not actively treated on the Plumas National Forest and efforts to document infestations are in the early stages.

Taeniatherum caput-medusae (medusahead)
Over the past 10 years, managers of public lands in the western United States have witnessed an explosive spread of this invasive grass species (Bisson 1999). This species spreads primarily by seed, which is dispersed by wind and water, although it can be dispersed to more distant sites by grazing animals, machinery, vehicles, and clothing (Bossard, Randall, and Hoshovsky 2000). Medusahead is able to grow in a wide range of climatic conditions and has been documented in plant communities up to 7,000 feet in elevation.

Traditional methods of control (such as mowing and hand pulling) are not considered practical for medusahead because they are nonselective, oftentimes fail to remove the active portion of the plant where new growth originates, and are not recommended along roadsides after seed set because of increased potential for seed dispersal (CDFA 2004). Other management options, such as biological, cultural, and chemical control methods, have also shown variable effectiveness (CDFA 2004).

Assessment Summary: High, medium, and low priority noxious weed species (according to the state pest rating and the Plumas-Sierra Agricultural Commissioner) are found along the proposed

system trails. There are also a number of other aggressive weed species that occur on the Plumas NF that may act as seed sources for new infestations.

2.3 Habitat Vulnerability

A large portion of the Plumas NF is considered relatively free of noxious weeds, with most infestations concentrated along roads (43 percent) or in areas of past and present disturbance, such as timber harvest units, skid trails, temporary roads, unauthorized motorized vehicle routes, mining claims, and grazing allotments. The lower elevations on the Forest and the mid-elevation valleys contain many of the high noxious weed concentrations. These areas often provide entry points or "seed sources" for weeds moving into the less-invaded parts of the forest.

Motorized vehicle travel both on and off of roads and trails has been a part of forest recreation for many years. This activity has created a disturbed condition that greatly increases the vulnerability of the landscape to noxious weed invasion and spread. The Plumas NF has been heavily influenced over the last 150 years by activities that include mining, livestock grazing, timber harvest, fire exclusion, large high-severity wildfires, and non-motorized recreational activities such as camping, hiking, biking, and horseback riding. Undeniably, the additive effects of recent and past actions have shaped the present landscape and corresponding noxious weed infestations.

Over the past few years, a number of large wildland fires have occurred on the Forest. These recent events increase the vulnerability of the landscape to weed establishment and spread by increasing the availability of resources, such as light and nitrogen, and decreasing competition from native plant species. In their comparison of low-severity and high-severity burns, Turner et al. (1997) found that the density of the invasive Canada thistle after severe surface and crown fires was two to four times greater than the density of Canada thistle after a light surface fire.

Beyond these recent events, the effect of specific past management actions on noxious weed species is largely unknown. Targeted noxious weed surveys at the project-level first began relatively recently on the forest. While it is often difficult to draw definitive conclusions regarding the effects of past project activities on noxious weeds, the high level of past activity, combined with the current level of weed infestation, suggest that past activities have had a significant effect on noxious weed introduction and spread across Plumas NF.

Assessment Summary: The level of previous disturbance across the Forest is considered high. The current condition of the habitat is variable; there are areas of open habitat with low canopy and sparse ground cover (e.g. old burns, roads, ridge tops, and rock outcrops) as well as areas with high canopy and ground cover. The habitat directly adjacent to the proposed system trails is the most vulnerable to noxious weed invasion and spread.

2.4 Non-Project Dependent Vectors

Noxious weed introduction occurs when plant propagules are moved from one infestation (the "seed source") to a new and often un-invaded habitat. In general, any activity that moves soil or plant parts from one location to another has the potential to facilitate weed introduction and invasion. These activities may include (but are not limited to): road construction and use; mining; timber management; wildfire fire suppression; livestock grazing; and non-motorized recreational activities such as camping, hiking, biking, and horseback riding.

Of the 1,280 noxious weed locations (covering approximately 700 acres) that have been documented to date on the Plumas NF, about 160 locations are treated annually using mechanical, cultural, and in some limited cases, chemical methods. In addition, one future project is designed to treat noxious weeds found within 50 feet of existing roads. While these ongoing and future actions would decrease the potential for these occurrences to spread along roads, the actions would not greatly reduce the extent of noxious weed infestations over the forest landscape.

Assessment Summary: There is a moderate risk of noxious weed invasion from non-project dependent vectors.

3.0 Proposed Action Dependent Factors

For a detailed description of the proposed system trail designation refer to Section 2.0 in the "Plumas National Forest Travel Management: Biological Assessment/Evaluation of Potential Effects to Threatened, Endangered, and Sensitive Plant Species" (Coppoletta 2008) as well Chapter 2 of the "Plumas National Forest Public Wheeled Motorized Travel Management Draft Environmental Impact Statement" (USDA Forest Service 2008).

3.1 Habitat Alteration Expected as a Result of Project

Noxious weed species pose a serious threat to biological diversity because of their ability to displace native species, alter nutrient and fire cycles, decrease the availability of forage for wildlife, and degrade soil structure (Bossard, Randall, and Hoshovsky 2000). Noxious weed species have the potential to affect native plant species indirectly through allelopathy (the production and release of plant compounds that inhibit the growth of other plants) (Bais et al. 2003), as well as through direct competition for nutrients, light, and water (Bossard, Randall, and Hoshovsky 2000). Noxious weed infestations can also reduce the recreational or aesthetic value of native habitats.

Noxious weed species are oftentimes classified as "pioneer" species or invaders. Therefore, disturbance, such as that associated with motorized vehicle use, often creates ideal conditions for weed introduction and establishment. Natural areas that have experienced minimal levels of human disturbance are generally less invaded by noxious weeds than those areas that have been directly disturbed (Rejmánek 1989 *in* Daehler 2003). Noxious weed colonization into disturbed sites is often

due to the removal of natural barriers that frequently keep invasive species in check, such as unsuitable light, soil, or moisture conditions (Parendes and Jones 2000).

Motorized vehicles greatly increase the amount of disturbance along and in the vicinity of the proposed system trails. Indirect effects from motorized vehicle use, such as soil compaction, increased erosion, and modification of soil properties, can impact the distribution, abundance, and vigor of native vegetation (Brooks 1995 *in* Ouren et al. 2007). The removal of native vegetation increases light levels and reduces the amount of competition for water and nutrients, making these edge-habitats highly susceptible to noxious weed invasion.

Assessment Summary: The high level of disturbance associated with motorized vehicle use along routes, in combination with the existing environment, results in a high risk of noxious weed invasion or spread.

3.2 Increased Vectors as a Result of Route Designation

Motorized vehicle routes contribute to dispersal of noxious weed species because they (1) create suitable habitat by altering environmental conditions, (2) make invasion more likely by stressing or removing native species, and (3) allow for easier movement by wild or human vectors (Trombulak and Frissell 2000).

High concentrations of noxious weeds have been observed in close proximity to roads and areas of motorized vehicle use in many different ecosystems (Gelbard and Harrison 2003, Parendes and Jones 2000, and others). One study in the Mohave Desert determined that non-native, early successional species were more common at sites disturbed by off-highway motorcycles (Davidson and Fox 1974). Another study in the Mohave Desert, found that the biomass of a non-native grass increased in plots disturbed by off-highway vehicle use and grazing when compared to areas excluded from these activities (Brooks 1995).

Roads, whether they are major highways, general forest roads, or motorized vehicle trails, are often the primary conduit for weed introduction and establishment. For example, in their study of invasive species along roads and streams in Oregon, Parendes and Jones (2000) found weed species along nearly all of the high and low-use roads that they sampled.

Seeds and propagative plant parts often get lodged in the tires or undercarraiges of motorized vehicles and can be transported along and between routes into un-invaded portions of the forest. In one National Park in Australia, weed seed was found to be most often transported into and around the park by visitor's vehicles that had been driven off-road (Lonsdale and Lane 1994). Maintenance (i.e. brush clearing) of routes can also facilitate the spread of noxious weeds by disturbing the soil, removing native vegetation, and transporting soil and weed seed to new locations.

At the site-specific level, the risk of noxious weed establishment and the potential for spread is largely dependent upon the type and frequency of disturbance associated with each route. For

example, plant communities adjacent to routes that receive high vehicle traffic would be expected to be more invaded than those adjacent to infrequently used areas (Parendes and Jones 2000). Also, the risk of weed introduction would be highly dependent upon if a vehicle had been in an area infested with noxious weeds in the recent past.

Assessment Summary: The proposed system trail designation would result in a high risk of weed introduction and spread as a result of the increased number of vectors associated with motorized vehicle use.

3.3 Mitigation Measures

Standard weed prevention practices, such as cleaning off-road vehicles and flagging and avoiding weed infestations, are not practical mitigations for route designation. Weed prevention practices that are practical include: education, outreach, and continued cooperation with federal, state, and private entities; requirements for use of weed-free materials for erosion control, route maintenance, and revegetation; cleaning of equipment used in route maintenance; and monitoring. Educational materials that emphasize weed prevention measures should be incorporated into the final NFTM maps or associated materials. In addition, the weed mitigations (i.e. hand-pulling) listed in Appendix C have been designed to reduce the risk of noxious weed spread along the proposed system trails.

3.4 Anticipated Weed Response to Proposed Action

3.4.1 Summary of Effects

The proposed system trails would greatly increase the risk of noxious weed introduction and spread by creating disturbed conditions that favor noxious weed establishment and spread. Implementation of standard management prevention practices is not practical for this project and the limited numbers of noxious weed control mitigation measures that are available do not completely eliminate the risk of noxious weed spread along and among routes.

The risk of noxious weed introduction and spread varies among the proposed alternatives due to the number and mileage of routes within or adjacent to noxious weed infestations and the total number and acreage of weed infestations within 100 feet of a proposed system trail. Alternative 1 has the highest risk of noxious weed introduction and spread, primarily due to the allowance for cross-country travel, which provides potential access to all but the most inaccessible weed infestations and native plant habitats. Out of the action alternatives, Alternative 2 poses the highest risk from noxious weeds, while Alternative 3, which designates no unauthorized routes, has the lowest risk of weed introduction and spread. In comparison to these alternatives, the impacts from Alternative 5 fall closer to the middle of the spectrum of potential effects.

Table 3: Summary of Noxious Weed risk under each Alternative

Indicators – Noxious Weeds	Rankings of Alternatives for Each Indicator[1]				
	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Miles of unauthorized or proposed system trails open for public motorized vehicle use within or adjacent to noxious weed sites.	1	2	5	4	3
Number of unauthorized or proposed trails open for public motorized vehicle use within or adjacent to noxious weed sites.	1	2	5	4	3
Acres of noxious weed infestations within 100 feet of unauthorized or proposed system trails.	1	2	5	4	3
Total number of noxious weed sites within 100 feet of unauthorized or proposed trails.	1	2	5	4	3
Overall Risk of Noxious Weed Spread	**1**	**2**	**5**	**4**	**3**

[1] A score of 5 indicates the alternative has the lowest risk from noxious weeds (in realation to the indicator measure); A score of 1 indicates the alternative is the worst for noxious weeds (highest risk).

3.4.2 Methodology for Assessing Risk

3.4.2.1 Geographic Area

Two geographic areas were chosen to analyze the effects of the proposed system trails on noxious weeds:

- Direct and indirect effects to noxious weeds under the four action alternatives were assessed using the area within 100 feet of proposed system trails. In general, weed infestations located in close proximity to the proposed system trails (i.e. within 100 feet) will have a high risk of spread to areas along the route and to other parts of the Forest.
- The No Action alternative, which allows for cross-country travel, was assessed using the entire Plumas NF.

Those noxious weed species located within these two geographic areas were considered to have the highest potential to be impacted or influenced by the proposed system trail designation. Conversely, species outside of the analysis area were not considered to have a high likelihood of being impacted by the proposed project either directly, indirectly, or cumulatively.

3.4.2.2 Assumptions

In addition to those listed at the beginning of Chapter 3 of the DEIS, the following assumptions were used in the analysis of noxious weeds:

1. This project is assumed to be a ground-disturbing activity, which requires a weed risk assessment.

2. Existing weed infestations will continue to spread and the rate of spread will be increased by motorized vehicle activity. Infestations located along routes will spread further along the route. Motorized vehicles will bring in weed seeds and propagative parts from home areas and other areas where they have traveled.

3. When completing the risk assessments, the following categories were assigned to determine the risk of noxious weed spread or introduction: high, medium, or low. These categories were assigned based on the following factors:

    - A high risk of spread or introduction was assigned based on the presence of weed infestations along portions of a route that were heavily used, a high level of invasiveness (i.e. the species was considered an A-rated species by the California Department of Agriculture or invasive by the California Invasive Plant Council.), or route inventories were lacking or incomplete. A high risk of spread was assumed when there was no information on weed populations.
    - The risk of spread was considered medium if noxious weed infestations did not occur directly along a travel route or occurred on a portion of the route where travel was prohibited; treatment mitigations were available and feasible; or the species was listed as a B or C-rated species by the California Department of Agriculture or was considered to be less invasive and already fairly well-distributed.
    - The risk of introduction or spread was considered low if existing inventories demonstrated that noxious weed populations were not present along the route.

3.4.2.3 Methodology by Action

1. **Direct/indirect effects of the prohibition of cross-country motorized vehicle travel.**
   Short-term timeframe: 1 year.
   Long-term timeframe: 20 years.
   Spatial boundary: Plumas National Forest.
   Indicator(s):
    - Miles of unauthorized routes within or adjacent to noxious weed sites.
    - Total number of weed sites within 100 feet of an existing unauthorized route.

2. **Direct/Indirect Effects of adding facilities (presently unauthorized roads, trails, and/or areas) to the NFTS.**
   Short-term timeframe: 1 year.
   Long-term timeframe: 20 years.
   Spatial boundary: Plumas National Forest.
   Indicator(s):

- Number and miles of proposed system trail open for public motorized vehicle use within or adjacent to noxious weed sites.
- Acres of noxious weed sites within 100 feet of a proposed system trail.
- Total number of noxious weed sites within 100 feet of a proposed system trail.

3. Direct/Indirect effects of identifying vehicle class and season of use on the NFTS.

The timeframe, spatial boundary, indicators and methodology would be the same as those listed under number 2 above.

4. Cumulative Effects

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

Long-term timeframe: 20 years.

Spatial boundary: Plumas National Forest.

Indicator(s):

- Number and miles of proposed system trail assigned a "high" risk of noxious weed spread.

4.0 Environmental Consequences: Effects of Alternatives on Noxious Weed Species

The following sections provide a discussion of the direct, indirect, and cumulative effects of each alternative on noxious weeds. It is important to note that the analysis below represents what is known about motorized vehicle impacts along unauthorized routes at this point in time. Designation of a route is expected to increase and concentrate motorized vehicle use; this has the potential to increase the risk of noxious weed introduction and spread. Routes, infestations, and mitigations or control measures will need to be re-evaluated on a continual basis to assess and address the risk from noxious weeds.

4.1 Environmental Consequences: No Action (Alternative 1)

4.1.1 Direct/Indirect Effects

Alternative 1 carries the highest risk of noxious weed introduction and spread. The largest impact of this alternative is from cross-country travel, which has the potential to introduce new noxious weeds to areas that are not currently infested and to aid in the expansion of existing infestations.

Under this alternative, it is impossible to quantify when and where noxious weeds will be encountered, spread, or introduced by motorized vehicles; therefore the 1,073 miles of unauthorized routes were used as a representation of current motorized vehicle use on the Forest. There are presently 159 noxious weed locations (68 acres) documented within 100 feet of unauthorized routes

and existing system trails (Table 4). This represents 13 percent of the noxious weed locations documented on the Plumas NF.

Table 4. High priority noxious weed species documented within 100 feet of an unauthorized route or existing system trail and their percentage relative to the total percent and acreage on the Plumas NF.

Species	Number (and acres) of noxious weed infestations within 100'		% of known PNF infestations	% of total PNF acres
	Unauthorized Routes	Existing System Trail		
Centaurea maculosa (spotted knapweed)	5 infestations (0.2 acres)		28	11
Centaurea solstitialis (yellow starthistle)	41 infestations (26.2 acres)	8 infestations (8 acres)	24	13
Cirsium arvense (Canada thistle)	38 infestations (6.7 acres)	3 infestations (0.9 acres)	7	5
Cytisus scoparius (Scotch broom)	11 infestations (4.8 acres)		11	4
Genista monspessulana (French broom)	2 infestations (11.6 acres)		3	57
Isatis tinctoria (dyer's woad)	2 infestations (0.04 acre)		67	40
Lepidium latifolium (perennial pepperweed)	1 infestation (0.02 acre)		1	0.2
Linaria dalmatica ssp. dalmatica (Dalmatian toadflax)	3 infestations (0.1 acres)		75	100
Rubus armeniacus (Himalaya blackberry)	1 infestation (0.002 acres)	1 infestation (0.05 acre)	100	100
Taeniatherum caput-medusae (medusahead)	34 infestations (9.4 acres)	9 infestations (0.25 acre)	35	10
TOTAL	**138 infestations (59 acres)**	**21 infestations (9.25 acres)**	**13**	**10**

Under this alternative, motorized vehicles traveling on and off of unauthorized routes would continue to create areas of disturbance that are highly vulnerable to weed invasion. Noxious weeds would continue to reduce the quality of native plant communities by displacing native species, altering nutrient and fire cycles, degrading soil structure, and decreasing the quality and availability of forage for wildlife (Bossard, Randall, and Hoshovsky 2000). Under this alternative, all but the most inaccessible habitats would be at risk of noxious weed invasion and spread from cross-country motorized vehicle travel.

4.1.2 Cumulative Effects

As the number of forest users, and subsequently the number of unauthorized routes, continues to grow each year, the risk of new invasive species introductions also increases. The high number of past, on-going, and planned activities on the Forest also increases the vulnerability of the landscape to noxious weed spread. Existing vectors for spread, which are unrelated to the motorized vehicle travel, include

mining, livestock grazing, timber harvest, fire exclusion, large high-severity wildfires, and non-motorized recreational activities such as camping, hiking, biking, and horseback riding. These would continue to aide in the dispersal and spread of noxious weed species across the forest.

Standard management practices, such as cleaning off-road vehicles and flagging and avoiding weed infestations, are often used to reduce the risk of noxious weed introduction and spread. While these practices can be effective in reducing cumulative impacts in most projects, it is not a practical mitigation for route designation. Some of the Plumas NF standard management guidelines and mitigation measures (i.e. the requirement to use weed-free materials for erosion control, maintenance, and revegetation) would reduce the risk of weed invasion from route reconstruction and maintenance; however in general, those alternatives that avoid or mitigate existing weed infestations have a lower risk of weed spread than those alternatives that do not.

4.2 Action Alternatives (2-5): Environmental Consequences for Individual Species

The following sections provide a discussion of the effects of each action alternative (2 through 5) on those noxious weed species with the highest potential to be directly or indirectly impacted by the proposed project (Table 5).

Table 5. The number of noxious weed infestations within 100' of a proposed system trail displayed by action alternative.

Species	Action Alternatives		
	2	4	5
Centaurea solstitialis	8	1	5
Cirsium arvense	8	2	5
Cytisus scoparius	2	1	1
Rubus armeniacus	1	1	1
Taeniatherum caput-medusae	12	2	2
TOTAL	**31**	**7**	**14**

4.2.1 Individual Species Analysis

The following summarizes effects to noxious weed species that are known to occur within 100 feet of a proposed system trail.

Centaurea solstitialis (yellow starthistle)

There are eight yellow starthistle infestations within 100 feet of the routes proposed under Alternatives 2, 4, and 5 (Table 6**Error! Reference source not found.**).

Table 6. Yellow starthistle occurrences within 100' of the proposed system trails.

Site ID	Route ID	Number of acres with potential for impact		Size of infestation (acres)	Proposed Mitigation[1]	Action Alternatives		
		Within 0-30'	Within 30-100'			2	4	5
CESO3_198	10M39	0.02	0.2	1.5		X		

Site ID	Route ID	Number of acres with potential for impact		Size of infestation (acres)	Proposed Mitigation[1]	Action Alternatives		
		Within 0-30'	Within 30-100'			2	4	5
CESO3_201	10M40	0.4	0.3	0.8	FP	X		X
CESO3_292	11M25		0.002	0.002	HP	X	X	X
CESO3_309	5M06		0.1	0.9	HP	X		
CESO3_332	10M36	0.04		0.04	HP	X		X
CESO3_333	10M36		0.002	0.002	HP	X		X
CESO3_339	10M42	0.1	0.3			X		
CESO3_344	6M08	0.1	0.1	0.4	HP (O)	X		X

[1]HP: Hand-pull individuals within infestation prior to route designation; HP (O): Hand-pull individuals within infestation / route open for designation; FP: Infestation proposed for treatment under future project

The five infestations situated less than 30 feet from the proposed system trail will have the highest risk of spread from motorized vehicles. Although seed dispersal in yellow starthistle is generally poor, with most seeds falling within two feet of the mother plant, dispersal distances of over 16 feet have been documented (Roché 1991). Long-distance dispersal events are often attributed to wildlife or human factors, such as dispersed camping, vehicle use, or hiking along routes. Experimental results suggest that seeds remain viable in the soil for three to ten years (DiTomaso 2004). These factors, in combination with the close proximity (less than 100 feet) from the routes, place all of the seven routes listed above at high risk due to yellow starthistle.

None of the infestations in Table 4 are currently treated on an annual basis. One infestation, CESO3_201, is proposed for treatment under the Keddie Hazardous Fuels Project. Four additional infestations (CESO3_292, CESO3_309, CESO3_332, and CESO3_333) require mechanical treatment (i.e. hand-pulling) prior to the route being open for motorized use. One of these infestations, CESO3_292, occurs on an old, disturbed landing, which also appears to be used as a dispersed campsite (Coppoletta, personal observation 2007). This site is the starting point for route 11M25 and would likely be utilized for staging off-road vehicles, making the risk of yellow starthistle spread from this infestation along route 11M25 and the adjacent 11M24 route high.

Yellow starthistle infestations are also found along some of the Forest Service system roads and existing system trails that are adjacent to the proposed routes (i.e. 5M09, 5M32, and 6M08). Restricting motorized vehicle access on these routes through the route designation process would not remove the risk of spread from other licensed vehicles utilizing these existing roads and trails; however in a few of the higher risk situations, routes have been proposed for designation (i.e. they will be open to the public) with the intent of mechanically treating the noxious weeds along the access routes.

Cirsium arvense (Canada thistle)

There are ten Canada thistle infestations within 100 feet of the routes proposed under Alternatives 2, 4, and 5 (Table 7).

Table 7. Canada thistle occurrences within 100' of the proposed system trails.

Site ID	Route ID	Number of acres with potential for impact		Size of infestation (acres)	Proposed Mitigation[1]	Action Alternatives		
		Within 0-30'	Within 30-100'			2	4	5
CIAR4_040	13M03	0.1	0.2	2.2		X		
	13M04A		0.002			X		
CIAR4_081	10M40	0.002		0.002	FP	X		X
CIAR4_089	10M43	0.01		0.005		X		
CIAR4_270	11M42	0.02	0.01	0.04		X		
CIAR4_355	12M22	0.005	0.2	0.2	FP	X		
CIAR4_358	12M21		0.05	0.05	FP	X		X
	12M21A		0.04		FP	X		X
CIAR4_372	12M34		0.003	0.003	FP		X	X
CIAR4_390	12M34		0.01	0.01	FP		X	X
CIAR4_495	11M42	0.3	0.05	0.5		X		
CIAR4_546	12M24	0.1	1.4	14.8		X		

[1] FP: Infestation proposed for treatment under future project

Seven of the Canada thistle infestations are situated less than 30 feet from a proposed system trail, making the risk of spread from motorized vehicles very high. Canada thistle poses a large threat to native plant communities on the Plumas NF due to its abundance and distribution, particularly in the northern portion of the Forest. The rates of Canada thistle spread that are documented in scientific literature range from less than 2 feet per year to over 40 feet per year (Donald 1990; USGS 2005; Nuzzo 1997; Bond and Turner 2004).

Canada thistle is a shade-intolerant species, and its growth is shown to be discouraged in areas where there are low levels of disturbance and sufficient competition from native species. For example, in Rocky Mountain National Park, it was found that dry upslope conditions, thick canopies from woody species, and well-established grass meadows inhibited Canada thistle invasion and population size over time (Beck 1994). However, it was also noted that only a minor amount of disturbance (such as from elk grazing) was necessary to promote Canada thistle invasion and establishment.

This species is considered particularly difficult to eradicate and none of the infestations listed above are treated on an annual basis. Mechanical methods, such as hand pulling or mowing, are generally not effective (Bossard, Randall, and Hoshovsky 2000). At present, the most successful control method for Canada thistle is herbicide treatment (Bossard, Randall, and Hoshovsky 2000). Canada thistle sites that are not actively treated will continue to expand along roadsides, routes, and into riparian and other native plant communities.

One infestation, CIAR4_081, is proposed for treatment under the Keddie Hazardous Fuels Project. Four additional infestations (CIAR4_355, CIAR4_358, CIAR4_372, and CIAR4_390) are being considered for treatment under a future weed treatment project. To reduce the high risk of spread along these proposed routes, some of these routes will remain closed until future treatments are complete.

Cytisus scoparius (Scotch broom)

There are two scotch broom infestations within 100 feet of the routes proposed under Alternatives 2, 4, and 5 (Table 8).

Table 8. Scotch broom occurrences within 100' of the proposed system trails.

Site ID	Route ID	Number of acres with potential for impact		Size of infestation (acres)	Proposed Mitigation[1]	Action Alternatives		
		Within 0-30'	Within 30-100'			2	4	5
CYSC4_147	9M50 (W)		0.01	0.3		X	X	X
CYSC4_154	9M50 (E)	0.03	0.07	0.1		X		

CYSC4_147 and CYSC4_154 are situated opposite the proposed system trails on a paved Forest Service system road. These two sites have been treated annually since 2005. To date, the mechanical methods used to treat Scotch broom on the Forest have been effective. This on-going treatment, as well as the location of these infestations in relation to the proposed routes, lowers the risk of spread along the proposed routes.

Rubus armeniacus (Himalayan blackberry)

There is one Himalayan blackberry infestation within 100 feet of a route proposed under Alternatives 2, 4, and 5 (Table 9).

Table 9. Himalayan blackberry occurrences within 100' of the proposed system trails.

Site ID	Route ID	Number of acres with potential for impact		Size of infestation (acres)	Proposed Mitigation[1]	Action Alternatives		
		Within 0-30'	Within 30-100'			2	4	5
RUAR_002	8M36	0.002		0.002		X	X	X

This small infestation is situated less than 30 feet from the proposed system trail and poses a high risk of spread from motorized vehicles. Himalayan blackberry has rapid growth rates and spreads both vegetatively and by seed. At present, this species is not actively treated on the Plumas National Forest and efforts to document infestations are in the early stages.

Taeniatherum caput-medusae (medusahead)

There are twelve medusahead infestations within 100 feet of the routes proposed under Alternatives 2, 4, and 5 (Table 10).

Table 10. Medusahead occurrences within 100' of the proposed system trails.

Site ID	Route ID	Number of acres with potential for impact		Size of infestation (acres)	Proposed Mitigation	Action Alternatives		
		Within 0-30'	Within 30-100'			2	4	5
TACA8_031	10M22		0.05	0.2		X		
TACA8_051	10M20		0.01	0.02		X	X	X
	10M21		0.02			X		X
TACA8_085	10M39	0.02	0.2	1.5		X		
TACA8_087	10M39		0.001	0.005		X		
TACA8_088	10M39		0.02	0.03		X		
TACA8_094	10M38		0.01	0.02		X		
TACA8_097	10M38	0.03		0.03		X		
TACA8_098	10M38	0.01		0.009		X		
TACA8_172	10M14	0.03	0.2	1.5		X	X	X
TACA8_186	10M42	0.002		0.002		X		
TACA8_187	10M42	0.07		0.07		X		
TACA8_188	10M42	0.01		0.01		X		

Under these alternatives, the seven medusahead infestations that are situated less than 30 feet from the proposed system trails have a very high risk of spread from motorized vehicles. This invasive grass is primarily dispersed by wind and water, although it can be dispersed to more distant sites by machinery, vehicles, and clothing (Bossard, Randall, and Hoshovsky 2000). Medusahead is of significant concern on the Plumas NF because it occurs in areas of high visitor use where there is increased potential for spread and traditional treatment methods (mechanical, chemical, biological, etc) are not practical or effective for large-scale control. These factors, in combination with the close proximity (less than 100 feet) from the routes, place all of the seven routes listed above at high risk due to medusahead.

TACA8_051 and TACA8_172 are situated directly off of County Roads; therefore restricting motorized vehicle access on routes through the route designation process may not remove the entire risk of spread from other licensed vehicles utilizing the road. Many of these routes (10M20, 10M21, and 10M22) occur in an area that is heavily infested with medusahead. There are currently no feasible or effective mitigation measures to control the spread of this invasive species; therefore the risk of spread is high in these areas.

4.3 Action Alternatives (2-5): Summary of Environmental Consequences

The following section presents an overview of the effects analysis for each action alternative. In general, the greater the number of motorized vehicle trails (and miles) and the less mitigation proposed, the higher the risk of noxious weed spread. Of the action alternatives, Alternative 2 carries the highest risk from noxious weeds, whereas Alternative 3, which designates no unauthorized routes, has the lowest risk of weed introduction and spread. In comparison to these alternatives, the risk of

noxious weed spread and introduction from the routes proposed under Alternative 5 is closer to the middle.

4.3.1 Alternative 2 – Proposed Action.

Direct/Indirect Effects:

Table 11. Summary of noxious weed indicator measures for Alternative 2

Indicator Measure	Value
Miles of proposed system trail open for public motorized vehicle use within or adjacent to noxious weed sites	1.2 miles
Number of trails open for public motorized vehicle use within or adjacent to noxious weed sites	21 trails
Acres of noxious weed sites within 100 feet of a proposed system trail	5 acres
Total number of noxious weed sites within 100 feet of a proposed system trail	31 locations

Alternative 2 prohibits cross-country travel, adds approximately 367 miles of unauthorized routes to the trail system, and makes no changes to the existing system trails. In comparison to the other action alternatives, Alternative 2 poses the greatest risk of noxious weed introduction and spread due the high number of routes within or adjacent to noxious weed infestations (21 routes), the total number (31 sites) and acreage (5 acres) of weed infestations within 100 feet of a proposed system trail, and the lack of feasible treatment and control options for some of these infestations.

The following noxious weeds have been documented within 100 feet of a route proposed under Alternative 2: yellow star-thistle (8 locations), Canada thistle (8 locations), Scotch broom (2 locations), Himalayan blackberry (1 location), and medusahead (12 locations). A detailed discussion of the risk associated with these individual species is provided in the Section 3.6.1 above.

Of the 31 noxious weed sites that are located within 100 feet of a trail proposed under Alternative 2, twelve are proposed for treatment either prior to or concurrent with the route being open to the public. Of those 19 infestations that are not proposed for treatment, three (CYSC4_147, TACA8_051, and TACA8_172) are situated on a paved Forest Service road on the side opposite of the proposed route; the risk of spread from these infestations onto the proposed routes is considered moderate. Five of the remaining untreated sites are Canada thistle and nine are medusahead; these two weed species do not have mitigation options available that fall within the scope of this route designation project. Under this alternative, those locations that are left untreated will greatly increase the risk of spread along the proposed routes and into adjacent unoccupied habitat.

Cumulative Effects:

In comparison to Alternative 1, the risk of noxious weed spread under this alternative is far less, primarily due to the ban on cross-country travel; however in comparison to the other action alternatives, Alternative 2 carries one of the highest cumulative risks from noxious weed introduction and spread. This is largely due to the number (20 routes) and mileage (12.8 miles) of “high risk”

routes. Under this alternative, the 31 noxious weed sites that are located within 100 feet of a proposed system trail and are not actively treated will have a high risk of spread from motorized vehicle use. These noxious weed infestations would continue to expand along routes and into uninvaded native plant communities and would act as sources of seed for new weed introductions to nearby routes.

As the number of forest users continues to grow each year, the risk of new invasive species introductions also increases. The high number of past, on-going, and planned activities on the Forest also increases the vulnerability of the landscape to noxious weed spread. Existing vectors for spread, unrelated to motorized vehicle use, would continue to aide in the dispersal and spread of noxious weed species across the forest.

4.3.2 Alternative 3

Direct/Indirect Effects:

Table 12. Summary of noxious weed indicator measures for Alternative 3

Indicator Measure	Value
Miles of proposed system trail open for public motorized vehicle use within or adjacent to noxious weed sites	0 miles
Number of trails open for public motorized vehicle use within or adjacent to noxious weed sites	0 trails
Acres of noxious weed sites within 100 feet of a proposed system trail	0 acres
Total number of noxious weed sites within 100 feet of a proposed system trail	0 locations

Alternative 3 prohibits cross-country travel, adds no unauthorized routes to the trail system, and makes no changes to the existing trail system. In comparison to the other action alternatives, Alternative 3 has the lowest risk of noxious weed introduction and spread due to the fact that it proposes no new system trails that intersect noxious weed occurrences.

Of those species that have been documented along a trail proposed under Alternatives 2, 4, or 5, the following four are known to occur along existing system trails: yellow star-thistle (8 locations), Canada thistle (3 locations), Himalayan blackberry (1 location), and medusahead (9 locations). Use of the existing system trails will increase the risk of noxious weed introduction and spread onto Plumas NF lands; however motorized use of existing system trails would continue under all of the action alternatives. No additional risk of noxious weed spread and introduction would occur under Alternative 3 because no unauthorized routes are proposed.

Cumulative Effects:

Overall, cumulative effects to noxious weeds under this alternative are far less than those under Alternative 1 or the action alternatives. This is primarily due to the ban on cross-country travel and elimination of all unauthorized routes. No unauthorized routes are proposed under this alternative; therefore none of the noxious weed infestations that have been documented along unauthorized routes pose a risk under Alternative 3.

4.3.3 Alternative 4

Direct and Indirect Effects:

Table 13. Summary of noxious weed indicator measures for Alternative 4

Indicator Measure	Value
Miles of proposed system trail open for public motorized vehicle use within or adjacent to noxious weed sites	0.14 miles
Number of trails open for public motorized vehicle use within or adjacent to noxious weed sites	5 trails
Acres of noxious weed sites within 100 feet of a proposed system trail	0.3 acres
Total number of noxious weed sites within 100 feet of a proposed system trail	7 locations

Alternative 4 prohibits cross-country travel, adds approximately 141 miles of unauthorized routes to the trail system, and makes no changes to the existing trail system. In comparison to the other action alternatives, Alternative 4 has the second lowest risk of noxious weed introduction and spread due to the lower number of routes within or adjacent to noxious weed infestations (5 routes), and the reduced number (7 sites) and acreage (0.3 acres) of weed infestations within 100 feet of a proposed system trail.

The following noxious weeds have been documented within 100 feet of a route proposed under Alternative 4: yellow star-thistle (1 location), Canada thistle (2 locations), Scotch broom (1 location), Himalayan blackberry (1 location), and medusahead (2 locations). A detailed discussion of the risk associated with these individual species is provided in the Section 3.6.1 above.

Of the seven noxious weed sites that are located within 100 feet of a trail proposed under Alternative 2, three are proposed for treatment either prior to or concurrent with the route being open to the public. Of those four infestations that are not proposed for treatment, three (CYSC4_147, TACA8_051, and TACA8_172) are situated on a paved Forest Service road on the side opposite of the proposed route; the risk of spread from these infestations onto the proposed route is considered moderate. The remaining infestation is Himalayan blackberry, which is not currently treated on the Plumas NF.

In comparison to Alternatives 2 and 5, the exclusion of a number of “high risk” routes and the proposed weed treatment mitigations greatly reduce the risk of noxious weed spread along and among the Alternative 4 proposed system trails.

Cumulative Effects:

In comparison to Alternative 1, the risk of noxious weed spread under this alternative is far less, primarily due to the ban on cross-country travel. In comparison to the other action alternatives, Alternative 4 carries the second lowest cumulative risk of noxious weed introduction. This is largely due to the lower number (2 routes) and mileage (0.7 miles) of “high risk” routes.

Under this alternative, the seven noxious weed sites that are located within 100 feet of a proposed system trail and are not actively treated have a high to moderate risk of spread from motorized vehicle use. These noxious weed infestations could continue to expand along routes and into uninvaded native plant communities and may act as sources of seed for new weed introductions to nearby routes.

As the number of forest users continues to grow each year, the risk of new invasive species introductions also increases. The high number of past, on-going, and planned activities on the Forest also increases the vulnerability of the landscape to noxious weed spread. Existing vectors for spread, unrelated to motorized vehicle use, would continue to aide in the dispersal and spread of noxious weed species across the forest.

4.3.4 Alternative 5

Direct/Indirect Effects:

Table 14. Summary of noxious weed indicator measures for Alternative 5

Indicator Measure	Value
Miles of proposed system trail open for public motorized vehicle use within or adjacent to noxious weed sites	0.6 miles
Number of trails open for public motorized vehicle use within or adjacent to noxious weed sites	14 trails
Acres of noxious weed sites within 100 feet of a proposed system trail	1.6 acres
Total number of noxious weed sites within 100 feet of a proposed system trail	14 locations

Alternative 5 prohibits cross-country travel, adds approximately 251 miles of unauthorized routes to the trail system, and makes no changes to the existing trail system. In comparison to the other action alternatives, Alternative 5 has the second highest risk of noxious weed introduction and spread due the high number of routes within or adjacent to noxious weed infestations (14 routes), and the high number (14 sites) and acreage (1.6 acres) of weed infestations within 100 feet of a proposed system trail.

The following noxious weeds have been documented within 100 feet of a route proposed under Alternative 5: yellow star-thistle (5 locations), Canada thistle (5 locations), Scotch broom (1 location), Himalayan blackberry (1 location), and medusahead (2 locations). A detailed discussion of the risk associated with these individual species is provided in the Section 3.6.1 above.

Of the 14 noxious weed sites that are located within 100 feet of a trail proposed under Alternative 5, ten are proposed for treatment either prior to or concurrent with the route being open to the public. Of those four infestations that are not proposed for treatment, three (CYSC4_147, TACA8_051, and TACA8_172) are situated on a paved Forest Service road on the side opposite of the proposed route; the risk of spread from these infestations onto the proposed route is considered moderate. The remaining infestation is Himalayan blackberry, which is not currently treated on the Plumas NF.

In comparison to Alternative 2, the exclusion of a number of "high risk" routes and the proposed weed treatment mitigations greatly reduce the risk of noxious weed spread along and among the Alternative 5 proposed system trails.

Cumulative Effects:

In comparison to Alternative 1, the risk of noxious weed spread under this alternative is far less, primarily due to the ban on cross-country travel; however in comparison to the other action alternatives, Alternative 5 carries the second highest cumulative risk from noxious weed introduction and spread. This is largely due to the number (10 routes) and mileage (5.2 miles) of "high risk" routes.

Under this alternative, the 14 noxious weed sites that are located within 100 feet of a proposed system trail and are not actively treated will have a high to moderate risk of spread from motorized vehicle use. These noxious weed infestations could continue to expand along routes and into uninvaded native plant communities and may act as sources of seed for new weed introductions to nearby routes.

As the number of forest users continues to grow each year, the risk of new invasive species introductions also increases. The high number of past, on-going, and planned activities on the Forest also increases the vulnerability of the landscape to noxious weed spread. Existing vectors for spread, unrelated to motorized vehicle use, would continue to aide in the dispersal and spread of noxious weed species across the forest.

5.0 Compliance with the Forest Plan and Other Direction

Alternative 1 does not prohibit cross-country travel and carries a high risk of noxious weed spread and introduction. This alternative is not consistent with Forest Service Manual direction (FSM 2081.03), which requires the identification of noxious weed control measures in areas of high risk.

The proposed action alternatives are consistent with the Forest Plan and other direction. A noxious weed risk assessment has been completed for each alternative (FSM 2081.03 and SNFPA 2004); the public has been informed of the risk and effects from motorized vehicle travel and noxious weeds (SNFPA 2004); and under some of the alternatives, noxious weed control measures (i.e. route closure or restricted access) have been identified in areas of high risk (FSM 2081.03).

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Appendix C

Plumas National Forest Public Wheeled Motorized Travel Management EIS: Route Risk Assessment

Prepared for:
Plumas National Forest
USDA Forest Service

October 3, 2008

Table C-1: Proposed Routes with Botanical Resource Impacts or High Risk of Noxious Weed Spread

Trail #	Botanical Resources[1]	Noxious Weeds
5M01	*Calycadenia oppositifolia* - Moderate Risk; No mitigation measures recommended.	
5M02	*Allium jepsonii* and *Calycadenia oppositifolia* - Moderate Risk; No mitigation measures recommended.	
5M05	*Allium jepsonii* - Moderate Risk; No mitigation measures recommended.	
5M06	*Clarkia mosquinii* - Moderate Risk; No mitigation measures recommended.	Yellow starthistle - High risk; Mitigation: Hand pull weeds prior to opening the route to the public.
5M09		Yellow starthistle – Moderate Risk due to location along USFS road; Mitigation: Hand-pull infestation concurrent with opening the route to the public.
5M20	*Hydrothyria venosa* and *Clarkia mildrediae* ssp. *mildrediae* (2 locations)–Moderate Risk; No mitigation measures available.	
5M21	*Clarkia mildrediae* ssp. *mildrediae* (3 locations) - Moderate Risk; No mitigation measures recommended.	
5M23	*Clarkia mildrediae* ssp. *mildrediae* (2 locations) - Moderate Risk; No mitigation measures recommended.	
5M24	*Clarkia mildrediae* ssp. *mildrediae* - Moderate Risk; No mitigation measures recommended.	
5M26	*Clarkia mildrediae* ssp. *mildrediae* - Moderate Risk; No mitigation measures recommended.	
5M27	*Clarkia mildrediae* ssp. *mildrediae* - Moderate Risk; No mitigation measures recommended.	
5M28 E	*Hydrothyria venosa* and *Cypripedium fasciculatum* – High Risk; No mitigation measures available. *Clarkia mildrediae* ssp. *mildrediae* (2 locations)–Moderate Risk; No mitigation measures recommended.	
5M29	*Clarkia mildrediae* ssp. *mildrediae* - Moderate Risk;. Mitigation: Avoid impacts to occurrence during mitigation activities.	
6M08		Yellow starthistle - High risk; Mitigation: Hand-pull weeds concurrent with opening the route to the public.
6M14	*Eremogone cliftonii* – High Risk; Mitigation: Monitor to determine overall abundance. Assess impact from proposed mitigations.	

Trail #	Botanical Resources[1]	Noxious Weeds
6M16	*Eremogone cliftonii* – High Risk; Mitigation: Monitor to determine overall abundance. Assess impact from proposed mitigations.	
7M01		Scotch broom – Moderate Risk due to location along USFS road; Mitigation: Hand-pull infestation concurrent with opening the route to the public.
7M09	*Eriogonum umbellatum var. ahartii* – High Risk; No mitigation measures available.	
7M10	*Eriogonum umbellatum var. ahartii* (6 locations) – High Risk; No mitigation measures available.	
7M11	*Penstemon personatus* –Moderate Risk. No mitigation measures recommended.	
7M15	*Lupinus dalesiae* (3 locations) Moderate Risk. No mitigation measures recommended.	
7M16	*Cypripedium fasciculatum* and *Lupinus dalesiae* - Moderate Risk; No mitigation measures recommended.	
8M04	*Penstemon personatus* – Moderate Risk. No mitigation measures recommended.	
8M11	*Arabis constancei* and *Monardella follettii* - Moderate Risk; No mitigation measures recommended.	
8M13	*Arabis constancei* - Moderate Risk; *Monardella follettii* and *Lupinus dalesiae* (2 locations) – Low Risk; No mitigation recommended.	
8M17	*Lupinus dalesiae* – Moderate Risk. No mitigation measures recommended.	
8M18	*Lupinus dalesiae* – Moderate Risk. No mitigation measures recommended.	
8M19	*Lupinus dalesiae* – Moderate Risk. No mitigation measures recommended.	
8M23	*Monardella follettii* - Moderate Risk;. Mitigation: Avoid impacts to occurrence during mitigation activities.	
8M26	*Cypripedium fasciculatum* - Moderate Risk;. Mitigation: Avoid impacts to occurrence during mitigation activities.	
8M28	*Lupinus dalesiae* – Moderate Risk. No mitigation measures recommended.	
8M28A	*Lupinus dalesiae* – Moderate Risk. No mitigation measures recommended.	
8M35	*Cypripedium fasciculatum* - Moderate Risk; No mitigation measures recommended.	

Trail #	Botanical Resources[1]	Noxious Weeds
8M36		Himalayan blackberry – Moderate Risk; No mitigation measures recommended.
8M42	*Lupinus dalesiae* – Moderate Risk. No mitigation measures recommended.	
8M43	*Lupinus dalesiae* – Moderate Risk. No mitigation measures recommended.	
9M20	*Cypripedium fasciculatum* - Moderate Risk; No mitigation measures recommended.	
9M24	*Lewisia kelloggii ssp. huchinsonii* –High Risk; No Mitigation Available. Route is within Fowler Lake SIA.	
9M33	*Lupinus dalesiae* – Moderate Risk. No mitigation measures recommended.	
9M35	*Lupinus dalesiae* (2 locations)– Moderate Risk. No mitigation measures recommended.	
9M37	*Lupinus dalesiae* (2 locations) Moderate Risk. No mitigation measures recommended.	
9M37A	*Lupinus dalesiae* – Low Risk. No mitigation measures recommended.	
9M39A	*Lupinus dalesiae* – Low Risk. No mitigation measures recommended.	
9M46	Route is within Butterfly Valley SIA.	
9M50		Scotch broom – Moderate Risk; No mitigation measures recommended.
9M50		Scotch broom – Moderate Risk; No mitigation measures recommended.
9M54	*Lupinus dalesiae* – Moderate Risk. No mitigation measures recommended.	
9M55	*Cypripedium fasciculatum* - Moderate Risk; No mitigation measures recommended.	
10M12	*Lupinus dalesiae* (3 locations) Low Risk. No mitigation measures recommended.	
10M14		Medusahead – Moderate risk due to location on USFS road; No feasible mitigation measures available.
10M20		Medusahead – Moderate risk due to location on USFS road; No feasible mitigation measures available.
10M21		Medusahead – Moderate risk due to location on USFS road; No feasible mitigation measures available.
10M22		Medusahead – High risk; No feasible mitigation measures available.
10M36		Yellow starthistle (2 infestations)- High risk; Mitigation: Hand pull weeds prior to opening

Trail #	Botanical Resources[1]	Noxious Weeds
		the route to the public.
10M38		Medusahead (3 locations) – High risk; No feasible mitigation measures available.
10M39		Yellow starthistle and Medusahead – High risk; No feasible mitigation measures available.
10M40		Yellow starthistle and Canada thistle - High risk; Mitigation: Infestation proposed for treatment under Keddie Project. Close route until treatments are complete.
10M42		Yellow starthistle and Medusahead – High risk; No feasible mitigation measures available.
10M43		Canada thistle – High risk; No feasible mitigation measures available.
11M02	Route is within McRae Meadow SIA.	
11M05	Route is within McRae Meadow SIA.	
11M06	Route is within McRae Meadow SIA.	
11M07	Route is within McRae Meadow SIA.	
11M09	*Lupinus dalesiae* – Moderate Risk. No mitigation measures recommended.	
11M13	Route is within Brady's Camp SIA; Mitigation: Decrease the density of routes in the SIA.	
11M13A	Route is within Brady's Camp SIA; Mitigation: Decrease the density of routes in the SIA.	
11M13B	Route is within Brady's Camp SIA; Redundant - alternative routes are available. Mitigation: Decrease the density of routes in the SIA.	
11M13C	Route is within Brady's Camp SIA; Redundant - alternative routes are available. Mitigation: Decrease the density of routes in the SIA.	
11M13D	Route is within Brady's Camp SIA; Redundant - alternative routes are available. Mitigation: Decrease the density of routes in the SIA.	
11M14	Route is within Brady's Camp SIA; Redundant - alternative routes are available. Mitigation: Decrease the density of routes in the SIA.	
11M15	Route is within Brady's Camp SIA; Mitigation: Decrease the density of routes in the SIA.	
11M15A	Route is within Brady's Camp SIA; Redundant - alternative routes are available. Mitigation: Decrease the density of routes in the SIA.	
11M24		Yellow starthistle at staging area for connected route – High to Moderate risk; Mitigation: Hand pull weeds prior to opening the route to the public.
11M25		Yellow starthistle - High risk; Mitigation: Hand pull weeds prior to opening the route to the

Trail #	Botanical Resources[1]	Noxious Weeds
		public.
11M42		Canada thistle (2 infestations) – High risk; No feasible mitigation measures available.
12M16	*Astragalus pulsiferae* var. *pulsiferae* – High Risk; No mitigation measures available.	
12M21		Canada thistle - High risk; Mitigation: Infestation proposed for treatment under future project (Moonlight Weeds). Close route until treatments are complete.
12M21A		Canada thistle - High risk; Mitigation: Infestation proposed for treatment under future project (Moonlight Weeds). Close route until treatments are complete.
12M22		Canada thistle - High risk; Mitigation: Infestation proposed for treatment under future project (Moonlight Weeds). Close route until treatments are complete.
12M24		Canada thistle – High risk; No feasible mitigation measures available.
12M34		Canada thistle – High to moderate risk due to 2 locations along existing USFS Road; Mitigation: Infestation proposed for treatment under future project (Moonlight Weeds).
13M03		Canada thistle – High risk; No feasible mitigation measures available.
13M04A		Canada thistle – High risk; No feasible mitigation measures available.
13M08	*Astragalus lentiformis* (2 occurrences) - Moderate Risk; No mitigation measures recommended.	
13M09	*Astragalus lentiformis* - Moderate Risk;. Mitigation: Avoid impacts to occurrence during mitigation activities.	
13M09A	*Astragalus lentiformis* - Moderate Risk; No mitigation measures recommended.	
13M10	*Ivesia sericolueca* (2 occurrences) and *Astragalus lentiformis* (3 occurrences) Moderate Risk; *Astragalus lentiformis* (1 occurrence)- High Risk; No mitigation measures available.	
13M32	*Astragalus lentiformis* - Moderate Risk; No mitigation measures recommended.	
14M05	*Astragalus lentiformis* - Moderate Risk;. Mitigation: Avoid impacts to occurrence during mitigation activities.	
14M06	*Astragalus lentiformis* - Moderate Risk;. Mitigation: Avoid impacts to occurrence	

Trail #	Botanical Resources[1]	Noxious Weeds
	during mitigation activities.	
15M01	*Astragalus pulsiferae* var. *pulsiferae* – High Risk; No mitigation measures available.	
15M01A	*Astragalus pulsiferae* var. *pulsiferae* – High Risk; No mitigation measures available.	
15M04	*Ivesia aperta* var. *aperta* - Moderate Risk;. Mitigation: Avoid impacts to occurrence during mitigation activities.	
16M04	*Pyrrocoma lucida* - Moderate Risk; No mitigation measures available.	
16M04A	*Ivesia aperta* var. *aperta* Moderate Risk; *Pyrrocoma lucida* – Low Risk; No mitigation measures available.	
17M05	*Botrychium sp*. – High Risk; No mitigation measures available.	

[1] Risk to botanical resources was assessed using the following measures:

- ***High Risk:*** Sensitive species found along route; in conflict with Plumas NF prescription.
- ***Moderate Risk:*** Sensitive species found along route and either (a) meets Plumas NF prescription and is within 30' of route, (b) does not meet prescription, but is greater than 30' from route, or (c) does not meet Plumas NF prescription but is determined to be of moderate risk based on specific site information or professional expertise. Species for which (c) applied were *Cypripedium fasciculatum, Clarkia mildrediae* ssp. *mildrediae,* and *Lewisia kelloggii ssp. huchinsonii*
- ***Low Risk:*** Sensitive species not found along route or sensitive species found along route but meets Plumas NF prescription and is within 30-100' of route