

BIOLOGICAL EVALUATION
Sensitive Plant Species

Smith River Road Management and Route Designation Project

Six Rivers National Forest
Smith River National Recreation Area

2013

Prepared by: _____

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I. INTRODUCTION

The objectives of this biological evaluation are (a) to determine the effects of the proposed action on any sensitive botanical species and (b) to insure these species receive full consideration in the decision-making process to maintain species viability (FSM 2672.4).

II. CURRENT MANAGEMENT DIRECTION

Current policy for Sensitive plants as stated in the Land Management and Resource Plan for Six Rivers National Forest includes the following: After completion of the evaluation, proposed actions will be prohibited if they are found likely to jeopardize the continued existence of species or the maintenance of viable populations throughout their existing range (LRMP S&G 6-2).

Current policy for Sensitive plants as stated in the Forest Service Manual include the following elements:

-Maintain viable populations of all native and desire non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands (FSM 2670.22).

-Avoid or minimize impacts to species whose viability has been identified as a concern (FSM 2670.32).

-If impacts cannot be avoided, analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole (FSM 2670.32)

III. DESCRIPTION OF PROPOSED ACTIONS

The preferred alternative, Alternative 6, of the Smith River Road Management and Route Designation Project (SRRMRD) on Six Rivers National Forest proposes to:

- **Add 27 inventoried unauthorized routes (UARs) as roads totaling 12 miles to the NFTS.**
- **Add 77 UARs as motorized trails totaling 42.45 miles to the NFTS.**
- **Add seasonal gate closures on 10 roads and 6 motorized trails totaling 34 miles.**
- **Add mixed use to one road, 17N49.**
- **Decommission 76 closed roads totaling 39.40 miles and decommissioning 36 open NFTS roads totaling 15 miles.**
- **Restore hydrologic function to 210 UARs totaling 101 miles.**
- **Add 4 parking areas.**

The area affected by the proposal includes Smith River National Recreation Area (SRNRA). This action is needed to: provide motor vehicle access to dispersed recreation opportunities (camping, hunting, fishing, hiking, horseback riding, etc.) and provide a diversity of motorized recreation opportunities (4X4 vehicles, motorcycles, ATVs, SUVs, passenger vehicles, etc.). Actions proposed add short inventoried UARs to popular dispersed recreation sites to the NFTS; restores hydrologic function on short inventoried UARs to dispersed recreation sites not added to the NFTS; barricades inventoried UARs not added to the NFTS; and designate parking along road 17N49.

IV. EXISTING ENVIRONMENT

Background

The SRNRA is located in the Klamath-Siskiyou Ecoregion of Northwest California and Southwest Oregon which is recognized as an area of extraordinary biodiversity (Whittaker 1961; Kruckeberg 1984; Brooks 1987). The region is regarded as an “area of global botanical significance” (one of seven in North America as defined by the World Conservation Union [IUCN], a global “centre of plant diversity, and a proposed “world heritage site” and UNESCO “biosphere reserve” (Vance-Borland et al. 1995). More than 3,500 plants, including 225 endemics are known to occur in the Klamath-Siskiyou Ecoregion (Sawyer 2006).

Of the endemism characteristic of the Klamath-Siskiyou Ecoregion, the majority is represented within habitats associated with the Josephine ultramafic sheet that extends from Northwest California to Southwestern Oregon. This belt of ultramafic parent material is one of the largest in North America and has the greatest concentration of endemic plant species restricted to this substrate (Kruckeberg 1984). Ultramafic parent materials, generically called serpentine, weather into soils that are high in heavy metals and low in essential nutrients. This serpentine soil chemistry along with other biological and physical factors, gave rise to distinctive plant communities that support a preponderance of rare plant species, many of which only occur on serpentine soils, resulting in their characterization as serpentine endemics. Serpentine endemics are generally confined to serpentine because they require the reduced competition characteristic of harsh, open, rocky sites (Brooks 1987).

The important role serpentine plays in providing habitat to support a significant number of rare species in California is exemplified by the fact that only 1.5% of the State is underlain by ultramafic rock and yet 13% of the plant species endemic to California are serpentine endemics (Safford et. al. 2005). The Centre for Plant Diversity’s tracking of endemism notes that within the California Floristic Province the Josephine ultramafic sheet is one of the richest in endemics. In addition, serpentine settings support the highest number of plant associations described in the Klamath Province which includes the Six Rivers and Klamath National Forests (Jimerson 1993).

Plant Habitats

Habitats within the area that support the highest number and diversity of rare plants include seasonally dry serpentine settings and serpentine wetlands. Within these habitats

there are at least 27 plants considered rare by the California Native Plant Society, 8 which are members of the Region 5 Sensitive Plant list, and one Federally Endangered plant species.

Seasonally dry settings include outcrops and bouldery serpentine barrens, Jeffrey pine woodlands, and shrub dominated areas. Low vegetative cover, and high bare soil and surface rock cover characterize these habitats. Due to their ridge position, gradual slopes, and openness, some of the barren and woodland habitats are vulnerable to cross-country travel that can result in the loss of plants and vegetative material, habitat fragmentation, and potential water diversion.

Serpentine wetlands have saturated soils or running water year round and are generically referred to here as *Darlingtonia* fens. Wetland habitats are characterized by the presence of surface (perennial or intermittent) water or sub-surface water in the form of spring or seep flow. Topographically flat serpentine wetlands are generally termed fens and composed of rare plant species, sedges, and ericaceous shrubs with a low canopy cover dominated by Port-Orford cedar. Fens can be relatively extensive, for example, L.E. Horton Research Natural Area (RNA) spans approximately 40,000 square meters (1,560 acres) (Frost et al. 2004). Serpentine wetland seeps are usually very localized sites where sub-surface water intersects the ground surface. Serpentine wetland riparian habitats for rare plants are associated with a perennial to intermittent flow of surface water across a gradient, boulder-lined stream banks with a low cover of ericaceous shrubs (western azalea being a common associate) and a moderate canopy cover dominated by Port-Orford cedar.

Due to the array of Sensitive and rare species and their habitats and diverse plant communities in the serpentines of the Josephine ultramafic sheet, 21,370 acres of the sheet in the North Fork Smith River watershed was established as a botanical area- the North Fork Smith Botanical Area (USDA LRMP 1995). Botanical areas are established to protect areas of the Forest with important botanical resources (36 CFR 294.1). Also associated with the Josephine ultramafic sheet is the L.E. Horton Research Natural Area (RNA). RNAs are established to study and maintain biological diversity on National Forest system lands (FSM 4063). L.E. Horton (1305 acres) supports an extensive *Darlingtonia* fen with numerous rare and Sensitive species.

While the serpentine soil chemistry is a primary factor influencing the botanical distinctiveness of this area, it is the heavy metals (i.e. chromium, nickel) within the parent material that has also driven minerals mining and exploratory mining. As a result, the environment has been altered by development of roads, exploratory grids, mining spoil sites, mining pits and adits. The most recent exploratory mining occurred approximately 30-35 years ago. Mining-related disturbance is particularly evident on Gasquet Mountain.

Sensitive Species

Sensitive species are those eligible for listing under the Endangered Species Act, or whose viability is of concern. These are protected by USDA Forest Service regulations and manual direction. The Region 5 Sensitive Plant List was updated and signed July 3,

2013 by the Regional Forester. This new list supersedes earlier lists and is the one used for this biological evaluation.

There are 32 Sensitive botanical species on the SRNRA. Sensitive species considered for this analysis are those that the proposed action potentially affects (FSM 2672.42). The following Sensitive bryophyte, lichen and fungi species were not include in this analysis because critical habitat components, host trees and canopy cover will not be affected by the proposed action. Limited vegetation removal will occur at culvert removal sites at stream crossings on roads that will be decommissioned, and is not expected to exceed 16 acres total across the entire District. These species include *Boletus pulcherrimus* , *Buxbaumia viridis*, *Calicium adpersum*, *Cudonia monticola*, *Dendrocollybia racemosa*, *Fissidens pauperculus*, *Leptogium siskiyouensis*, *Mielichhoferia elongate*, *Otidea smithii*, *Peltigera gowardii*, *Phaeocollybia olivaceae*, *Ramalina thrausta*, *Sulcaria badia*, and *Tricholomopsis fulvescens*. The following Sensitive species will not be affected by the proposed action because their range does not extend onto the project area nor have botanical surveys found them to be present within the project area. These species include *Cypripedium montanum*, *Epilobium oreganum*, *Erigeron maniopotamicus*, *Eriogonum hirtellum*, *Erythronium hendersonii*, *Eucephalus vialis*, *Draba carnosula*, *Illiamna latibracteata*, *Lewisia kelloggii ssp. kelloggii*, *Pedicularis howellii*, *Sanicula tracyi*, and *Tauschia howellii*. The nearest location for *Cypripedium montanum*, *Lewisia kelloggii ssp. kelloggii* and *Thermopsis robusta* is over 20 miles south in Humboldt County on the Orleans Ranger District. *Epilobium oreganum*, *Eriogonum hirtellum*, *Draba carnosula*, *Eucephalus vialis*, *Illiamna latibracteata*, *Pedicularis howellii*, *Smilax jamesii* and *Tauschia howellii* are known to occur several miles east of the project area on the Siskiyou and Klamath National Forests. The nearest location of *Tauschia howellii* is over 4 miles east of Prescott Mountain in the Siskiyou Wilderness. The closest known sites for *Lathyrus biflorus*, *Lupinus constancei*, *Minuartia decumbens* and *Aniscocarpus scabridus* are many miles south of the project area in or adjacent to the Lassics Botanical Area in Trinity County. The closest known sites for *Erigeron maniopotamicus*, *Frasera umquaensis*, *Sanicula tracyi*, *Sedum obtusatum ssp. paradisum* and *Streptanthus oblanceolatus* are in Trinity County, a substantial distance from the project area. The closest known site for *Bensoniella oregana* is in Humboldt county over 45 miles from the project area. *Tracyina rostrata* is not known to occur on Six Rivers N.F. and known sites are located south of the Forest.

The Forest Service Sensitive species considered in project area that have the potential to be affected by the proposed action are as follows:

Howell's jewelflower – *Streptanthus howellii*
Koehler's rockcress- *Boechea koeleri*
Clustered ladys-slipper – *Cypripedium fasciculatum*
Opposite-leaved lewisia – *Lewisia oppositifolia*
Serpentine catchfly – *Silene serpentinicola*
Siskiyou bells – *Prosartes parvifolia*
Waldo gentian – *Gentiana setigera*
Western bog violet – *Viola primulifolia ssp. occidentalis*
Western ragwort – *Packera Hesperia*

Field Survey Results

Analysis of effects of proposed actions to Sensitive plant species and the compilation of species occurrence data for California utilized data on known occurrences within the project area derived from the California Natural Diversity Database (CNDDDB 2013), the Six Rivers National Forest (SRNF) botanical database combined with new occurrence data obtained from field surveys that took place in 2006, 2011, 2012 and 2013. The SRNF botanical database contains occurrence location data derived from field surveys that date from the early 1980's up through 2013.

Surveys were conducted in those areas where target species could be affected. System roads were not surveyed as their highly altered, engineered surfaces are not considered suitable habitat for the target species nor are the target species known to occur on these surfaces.

Surveys were performed to determine the presence or absence of Sensitive plant species and they also served to validate the risk ratings assigned prior to field reconnaissance. Where Sensitive plant species were not found to be present on or adjacent to (within 100 feet) routes surveyed, moderate to high risk rating associated with these routes are no longer valid. Some non-system roads proposed for decommissioning were originally assigned a botany risk of moderate because they crossed serpentine habitat. Since known sites of the target species were not found on these routes their risk ratings are no longer valid.

A total of 25.9 miles of routes were surveyed from May 9 to June 23 2006, 5.0 miles were surveyed during September 2011, 1.1 miles were surveyed from April – May 2012 and 5.0 miles from May to September 2013 by Forest Service botanists. 2013 surveys focused primarily on unauthorized routes to dispersed campsites, proposed parking areas on 17N49 and incidental findings associated with inventory of *Arabis macdonaldiana* sites prioritized for surveys in 2013. A majority of these route segments are associated with old mining roads within the North Fork and main stem Smith River watersheds on the SRNRA and located on the Gasquet, High Divide, High Plateau, and Hiouchi 7.5 minute USGS quads. In addition to surveys of non-system route surfaces, surveys were also conducted on the non-system route edges out to 100 feet on either side if suitable habitat was present to address the illegal incident of vehicles driving off the road. Surveys were performed in 2013 on routes to dispersed camp sites and on proposed parking areas on 17N49.

It is important to emphasize that surveys associated with this project were not conducted at the occurrence level. If surveys had been performed at the occurrence level, extending beyond proposed routes, the ratio of plants on routes to plants off routes would likely have been lower. Casual observations made on Pine Flat Mountain indicate a number of Sensitive plants exist outside the surveyed area. Because of its remoteness High Plateau has not been surveyed to any extent and it is likely that there are more Sensitive plants there than is currently known. Consequently, the numbers of plants provided in the following tables do not present a complete picture of the population size of the occurrences, but rather what is known based on limited surveys. In essence the population data with regards to the high percentages of plants found on route surfaces is

biased by the fact that a majority of the surveys performed for the project occurred within 100 feet of existing roads.

Sensitive botanical species not found to be present are herein removed from further analysis. The following Sensitive botanical species were found to be present within 100 feet of or on roads:

Howell's jewelflower – *Streptanthus howellii*
Opposite-leaved lewisia – *Lewisia oppositifolia*
Serpentine catchfly – *Silene serpentinicola*
Waldo gentian – *Gentiana setigera*
Western bog violet – *Viola primulifolia* ssp. *occidentalis*

Species Accounts

***Streptanthus howellii* (Howell's jewelflower) STHO**

Streptanthus howellii (species code = STHO) is a rare herbaceous perennial forb. It is often found where large rocks and boulders provide protection and along roads surrounded by dense shrub cover. It is often observed in disturbed niches which has led to speculation that this is due to such factors as improved conditions for seed germination, the reduction in competition from more aggressive plant species, passive avoidance, or morphological traits that afford some protection from negative effects and adaptation to fire disturbance. The role of passive avoidance and protective morphological traits will be discussed further in Section V. Effects of the Proposed Action.

STHO is confined to dry, brushy serpentine exposures on the Josephine ophiolite in the Siskiyou Mountains of Josephine and Curry counties, Oregon and Del Norte county in California. The California Native Plant Society rates it as List 1B.2 - Rare, threatened, or endangered in California and elsewhere. It is a Forest Service Region 5 and Region 6 Sensitive Species and is included on the BLM Oregon State Office Sensitive Species List.

There are 33 element occurrences¹ known to exist in Curry and Josephine Counties, Oregon (OHNPDB 2013). Of the 33 occurrences known from Oregon, 10 have not been observed in over 20 years and 15 have not been observed in at least 10 years. Twelve have fewer than 12 ramets², 22 have a "poor estimated viability" rating, 4 lack population counts and 5 have "good" to excellent" estimated viability in the Oregon Natural Heritage Program database.

STHO has been assigned a global conservation status rank of G2 (Imperiled) with a high risk of extinction due to its very restricted range, very few occurrences, small number of individuals, intrinsic vulnerability, and environmental specificity. Federal land management agencies (especially the Forest Service and BLM) have placed increasing emphasis on NatureServe ranks to prioritize their conservation and planning efforts.

¹ The biologically neutral term "occurrence," as defined by the state Natural Heritage Program, denotes geographically distinguishable sites (within ¼ mile of each other) for rare species (NatureServe 2006).

² Ramets represent the number of vegetative units or stems produced by a plant. For multi-stemmed plants that branch below ground they represent what is visible to the observer.

Sensitive plant surveys for the Smith River RMRD project found the following number of plants of STHO either on or adjacent to the travel surface of unauthorized routes proposed for designation as motorized trails. STHO is rhizomatous in nature. An underground stem gives rise to one to several shoots making a count of actual plants impossible without digging plants up. Excavation of one plant of STHO revealed that it produced 3 shoots. Hence an individual plant of STHO may produce 1 to 3 shoots at a minimum. Census data displayed herein records the number of shoots observed and are recorded as plants. As shown below in Table 1, of the total population of 1561 STHO plants known to occur in California, 11% occur on unauthorized routes proposed for designation and 2% are adjacent to unauthorized routes proposed for designation as motorized trails. No plants were found between 32 ft. and 100 ft. from the proposed motorized trails.

Proposed Motorized Trail	Distance in Feet From Center of Trail		
	0' to 9'	9' to 33'	33' to 100'
17N49.104	100	22	0
17N49.107	1	1	0
17N49.108	0	2	0
17N49.11	34	2	0
17N49.4	8	0	0
17N49.7	0	6	0
17N49.8	13	0	0
305.118	8	0	0
305.121B	5	1	0
305.125	0	1	0
Plant Totals	169	35	0
% of CA Population Effected	11%	2%	

Table 1 - Number of STHO Plants On or Adjacent to Proposed Motorized Trails

There are 50 occurrences of STHO in Del Norte County, California. These California occurrences are all located on Six Rivers NF on the SRNRA which supports the southern-most extension of this taxon. Some of these occurrences do not have census data. These occurrences, referred to as legacy occurrences, were recorded in the distant past where plants were found to be present but the number of plants observed were not recorded. 19 of these legacy occurrences that have not been visited since prior to 1985. These occurrences and others for which no census data exists were assigned a plant count of one. This assumption, in conjunction with the fact that the 2006 field surveys limited the survey area to areas within 100 feet of unauthorized routes, has likely resulted in an under-representation of the actual number of individuals of this species that occurs within the project area.

Table 2 shows that of the 50 known occurrences of STHO in California, 4 are traversed by unauthorized routes proposed for designation as motorized trails.

Occurrence	Proposed Motorized Trail	On Surface of Trail	Adjacent to Trail
STHO_16	305.125	0	1
STHO_017	17N49.104, 17N40.107 17N49.108, 17N49.11, 17N49.14	156	33
STHO_27	305.121B	5	1
STHO_39	305.118	8	0
Total		169	35

Table 2 – STHO Occurrences On or Adjacent to Proposed Motorized Routes

***Lewisia oppositifolia* (Opposite-leaved lewisia)**

Lewisia oppositifolia (species code = LEOP) is a rare to locally uncommon herbaceous perennial forb known only from southwestern Oregon and northwestern California. It occurs in barren, gravelly to cobbly soils of serpentine origin in shallow depressions and benches that tend to remain saturated or puddled into spring. The California Native Plant Society rates it as List 2.2 - Rare, threatened, or endangered in California but more common elsewhere. It is a Forest Service Pacific Southwest Region (Region 5) Sensitive Species. It is not on the Pacific Northwest Region's (Region 6) Sensitive species list. There are at least 29 element occurrences in Curry, Jackson and Josephine Counties, Oregon according to the Oregon Natural Heritage Program (ONHP) which stopped tracking this species in 1989 when it was removed from ONHP List 4 (Vrilakas 2005). Because this species is not Sensitive in Region 6 surveys are lacking and detailed data is not available for occurrences in Oregon. It has been assigned a global conservation status rank of G4; apparently secure but factors exist to cause some concern. These factors include intrinsic vulnerability and environmental specificity.

Sensitive plant surveys for the Smith River Road Management and Route Designation project found the following number of plants of LEOP growing either on or adjacent to the travel surface of unauthorized routes proposed for designation as motorized trails. As shown below in Table 3, of the total population of 7681 LEOP plants known to occur in California, 1% occur on unauthorized routes and 3% are adjacent to unauthorized routes proposed for designation as motorized trails. No plants were found between 32 ft. and 100 feet from the proposed motorized trails.

Proposed Motorized Trail	Distance in Feet From Center of Trail		
	0' to 8'	8' to 33'	33' to 100'
18N51.100	0	27	0
305.109	54	179	0
Plant Totals	54	206	0
% of CA Population Effected	1%	3%	0%

Table 3 - Number of LEOP Plants On or Adjacent to Proposed Motorized Routes

Table 4 shows that of the 17 known occurrences of LEOP in California, 4 are traversed by unauthorized routes proposed for designation as motorized trails. There are 17 occurrences of LEOP in California. Four, or 24% of the 17 occurrences have the potential to be affected by the proposal to designate unauthorized routes as motorized trails.

Occurrence Name	Proposed Motorized Trail	On Surface of Trail.	Adjacent to Trail
LEOP_011	305.109	12	17
LEOP_012	305.109	42	0
LEOP_013	305.109	0	162
LEOP_014	18N51.100	0	27
Total		54	206

Table 4 - LEOP Occurrences On or Adjacent to Proposed Motorized Routes

***Silene serpentinicola* (serpentine catchfly)**

Silene serpentinicola (species code = SISE10) is a rare herbaceous perennial forb known only from Del Norte county, California. Recent surveys have failed to find it in Oregon. It occurs in dry, gravelly to cobbly soils of serpentine origin on flat cross slopes. Little is known about the biology of this species although it appears to be early successional in nature with a preference for disturbed soils found on or adjacent to roads where surrounding shrub cover is fairly dense. Like STHO it is often observed in disturbed niches which has led to speculation that this is due to such factors as improved conditions for seed germination, the reduction in competition from more aggressive plant species, passive avoidance, or morphological traits that afford some protection from negative effects. The role of passive avoidance and protective morphological traits will be discussed further in Section V. Effects of the Proposed Action.

The California Native Plant Society rates it as List 1B.2 - Rare, threatened, or endangered in California and elsewhere. It is a Forest Service Pacific Southwest Region (Region 5) Sensitive Species. It is a recently described species (Nelson and Nelson 2004). Because it is recently described surveys are lacking and detailed information is not available for range wide occurrence data. Data provided here on number of plants is largely a result of surveys performed for the proposed action. It has been assigned a global conservation status rank of G2 (Imperiled) with a high risk of extinction due to its very restricted range, very few known occurrences, intrinsic vulnerability, and environmental specificity.

Like STHO, SISE10 produces ramets and like STHO, underground stem gives rise to one to several shoots making a count of actual plants impossible without digging plants up. Excavation of one plant of SISE10 revealed that it produced 5 shoots. Hence an individual plant of SISE10 may produce 1 to 5 shoots at a minimum. Census data displayed herein records the number of shoots observed and are recorded as plants. Sensitive plant surveys for the Smith River RMRD project found the following number of plants of SISE10 growing either on or adjacent to the travel surface of unauthorized routes proposed for designation as motorized trails. As shown below in Table 3, of the total population of 28431 SISE10 plants known to occur in California, 19% occur on unauthorized routes and 11% are adjacent to unauthorized routes proposed for designation as motorized trails. No plants were found between 32 ft. and 100 ft. from the proposed motorized trails.

Proposed Motorized Trail	Distance in Feet From Center of Trail		
	0' to 8'	8' to 33'	33' to 100'
17N49.101	600	0	0
17N49.102	1000	0	0
17N49.104	746	745	0
17N49.107	281	0	0
17N49.11	480	1236	0
17N49.13	94	18	0
17N49.4	375	375	0
17N49.7	1672	0	0
17N49.7A	0	600	0
17N49.8	58	0	0
305.109	46	249	0
305.121B	420	0	0
Total	5772	3223	0
% of CA Population Effected	20%	11%	0

Table 5 - Number of SISE10 Plants On or Adjacent to Proposed Motorized Routes

There are 11 occurrences of SISE10 in Del Norte County, California on Six Rivers N.F. on the Smith River National Recreation Area. There are 29 occurrences of SISE10 in California. 14, or 50% of the 29 occurrences have the potential to be affected by the proposal to designate unauthorized routes as motorized trails.

Occurrence	Proposed Motorized Trail	On Surface of Trail	Adjacent to Trail
SISE10_006	17N49.4	375	375
SISE10_007	17N49.101	300	0
SISE10_008	17N49.102	1000	0
SISE10_009	17N49.101	300	0
SISE10_011	17N49.107	281	0
SISE10_012	17N49.104	0	200
SISE10_013	17N49.7	1672	0
SISE10_014	17N49.11	480	1236
SISE10_016	17N49.8	358	350
SISE10_017	17N49.14	0	600
SISE10_018	17N49.104	446	195
SISE10_019	17N49.13	94	18
SISE10_022	17N49.121B	420	0
SISE10_027	17N49.121b	46	249
Total		5772	3223

Table 6 - Occurrences On or Adjacent to Proposed Motorized Routes

Serpentine Wetlands

Serpentine wetlands are the primary habitat for many rare plant species that occur in the Klamath-Siskiyou Ecoregion of northwest California and southwest Oregon. These wetlands, dominated by *Darlingtonia californica*, support one of the most distinctive plant communities of the ecoregion and are generally referred to as *Darlingtonia* fens, seeps or bogs. This *Darlingtonia*/serpentine wetland habitat is characterized by the presence of cold surface or sub-surface water in the form of springs or seeps which flow over soils derived from ultramafic or “serpentine” parent materials. *Darlingtonia* wetlands have a unique flora due to the serpentine geology, the intergradations of different floristic regions, as well as the mesic environment of these systems, which are surrounded by typical serpentine xeric conditions. This unique habitat restricts a number of rare species to a patchy distribution over a small portion of their range. Fens on Six Rivers NF occur at higher elevations (2410 feet) and generally exhibit higher water flows and soil moisture levels (Frost et. al. 2004) than those occurring to the north.

These wetlands are of particular interest from a conservation perspective because they are the primary habitat for five locally rare, endemic species. These taxa are *Hastingsia bracteosa*, *Hastingsia atropurpurea*, *Gentiana setigera*, *Epilobium oregonum*, and *Viola primulifolia* ssp. *occidentalis*. With the exception of one known occurrence for *Gentiana setigera* in Mendocino County, all of the known occurrences of the species brought forward in this analysis occur in Josephine and Curry Counties of southwestern Oregon and the northern portion of Del Norte County in adjacent California. *Gentiana setigera* and *Viola primulifolia* ssp. *occidentalis* are Forest Service Sensitive serpentine wetland species that occur in the project area. Small population sizes, isolated occurrences, and sensitivity to disturbance (especially affects to hydrological functioning) render these taxa vulnerable to local extinction. Concern over this vulnerability motivated the Forest Service, the Bureau of Land Management and the U. S. Fish and Wildlife Service to enter into a Conservation Agreement (USDA USDI 2006) to coordinate efforts aimed at the protection of significant biological and ecological functions and values associated with *Darlingtonia* wetlands and at the conservation of the rare taxa therein. One component of the Conservation Agreement is the identification of fens that are essential for maintaining the viability of the 5 taxa. One of the essential fens designated by the agreement, which contains both *Gentiana setigera* and *Viola primulifolia* ssp. *occidentalis* is bisected by 17N49.7, a non-system road proposed for designation as a motorized trail. However, due to a large in-board ditch and steep fill slope, this fen is not accessible by vehicles.

***Gentiana setigera* (Waldo gentian)**

Gentiana setigera is a herbaceous perennial forb that spreads by creeping rhizomes. It is known primarily from southwestern Oregon and northwestern California with one disjunct occurrence occurring on serpentines in Mendocino county. Most occurrences are relatively small and isolated by unsuitable upland habitat. It is most abundant in portions of fens with low shrub and tree cover, high graminoid cover, and fine-textured soils with moderate moisture content (Frost et. al. 2004). The California Native Plant Society rates it as List 1B.2 - Rare, threatened, or endangered in California and elsewhere. It has been assigned a global conservation status rank of G2 (Imperiled) with a high risk of extinction

due to its very restricted range, very few known occurrences, intrinsic vulnerability, and environmental specificity. *Gentiana setigera* is more abundant in Oregon than in California where there is greater concern for its viability. There are 49 element occurrences in Curry and Josephine Counties, Oregon and 5 occurrences in Del Norte County, California and one occurrence in Mendocino County, California. The 5 California occurrences in Del Norte County are all located on Six Rivers NF on the Smith River National Recreation Area and support approximately 2303 plants. No plants were found on routes proposed for designation. Occurrences in Table 7 below are ordered by decreasing number of plants. All occurrences in Table 8 are identified as essential California Darlingtonia wetland areas (USDA USDI 2006).

Table 7 – *Gentiana setigera* Occurrences in California

Occurrence Name	Occurrence Number	Plant Count	In Bot Area	On Pine Flat Mtn.	On Gasquet Mtn.	Other
Major Moores GESE2	1	1315	1315			
Gasquet Mtn. North GESE2	2	409			409	
L. E. Horton GESE2	3	276				276
Gasquet Mtn. South GESE2	4	250			250	
Peridotite Creek	5	53	53			
	Total Number of Plants	2303	1368	0	659	276
	Percent of Total	100%	59%	0%	29%	12%

***Viola primulifolia ssp. occidentalis* (Western bog violet)**

Viola primulifolia ssp. occidentalis is a herbaceous perennial forb that spreads by creeping rhizomes. It is associated with flowing water, steep slopes, and coarse textured soils, under open canopy conditions with high rock and soil cover (Frost et. al. 2004). It is known only from southwestern Oregon and northwestern California. The California Native Plant Society rates it as List 1B.2 - Rare, threatened, or endangered in California and elsewhere. It has been assigned a global conservation status rank of G5T2 (Imperiled) with a high risk of extinction due to its very restricted range, very few known occurrences, intrinsic vulnerability, and environmental specificity. There are 28 element occurrences in Curry and Josephine Counties, Oregon and 9 occurrences in Del Norte. All of the occurrences on the Forest are within the Smith Rivers National Recreation Area.

Occurrences are ordered by decreasing number of ramets within. Ramets represent the number of vegetative units or stems produced by a plant. For multi-stemmed plants that branch below ground they represent what is visible to the observer. The number of ramets produced by an individual plant is not known so the conversion of ramets to individual plants cannot be done. What is important to note is that the number of individuals plants is much lower than the count of 9848 ramets. No plants were found on routes proposed for designation. All occurrences in Table 8 with the exception of those on Stoney Creek, the Gasquet Toll Road, and the site on Gasquet Mtn. Road are identified as essential California Darlingtonia wetland areas (USDA USDI 2006).

Table 8 – *Viola primulifolia* ssp. *occidentalis* Occurrences in California

Occurrence Name	Occurrence Number	Ramet Count	In Bot Area	On Pine Flat Mtn.	On Gasquet Mtn.	Other
Gasquet Mtn. South VIPRO	1	2575			2575	
Major Moores VIPRO	2	2545	2545			
Gasquet Mtn. North VIPRO	3	2081			2081	
Gasquet Toll Road VIPRO	4	662				662
Pioneer Village	5	650				650
L. E. Horton RNA VIPRO	6	573				573
Stoney Creek VIPRO	7	423				423
Gasquet Mtn. Road VIPRO	8	215			215	
Upper Wimer	9	124				124
	Total Number of Ramets	9848	2545	0	4871	2432
	Percent of Total	100%	26%	0%	49%	25%

V. Effects of the Proposed Project

All proposed unauthorized routes on suitable habitat were surveyed. Those routes that lacked the presence of Sensitive plants were dropped from analysis due to a lack of effects.

As stated earlier, there were shortcomings to road-specific surveys in that in some areas (i.e. Pine Flat mountain) population data collected at the occurrence scale are lacking to evaluate the significance of potential effects of motorized vehicle use to plants on the road surface relative to the plants comprising the occurrence as a whole. For Gasquet Mountain, data are available beyond the road based survey efforts accomplished more recently. Given the variables associated with the data sets, the following disclosures and assumptions apply for purposes of this analysis:

- Historic occurrences (not sampled in the last 20-30 years) and occurrences sampled within the last 18 years constitute the population for respective species in California.
- While historic occurrences are accounted for, data on the number of plants at the occurrence level are lacking. This is especially true for STHO for which there are 19 occurrences for which plant counts are lacking. are primarily associated with the remote High Plateau area.
- Occurrence data (e.g. number of plants) resulting from surveys within the last 18 years and Smith River RMRD project surveys serve as the baseline for the number of plants comprising the respective occurrences and population total.
- In evaluating risk where only road surface data are available, it is assumed based upon incidental observations beyond the road surface (i.e. Pine Flat Mountain) and observed response of some species to the Biscuit wildfire which extensively burned much of the botanical area and serpentine areas west, that a proportion of the plants comprising an occurrence have not been accounted for in the baseline.

Current Use Patterns

The position of Sensitive plant species on route surfaces in relation to tire tracks indicates that under the current level of use many plants are persisting as a result of passive avoidance. Observed patterns of use indicated that wheel tracks are, for the most part, confined to only a portion of the road surface allowing plants to colonize unused portions. They have survived in niches on portions of route surfaces that vehicles avoid or where tires infrequently track. Additionally plants may be afforded some protection from rocks and rock crevices occurring on travel surfaces. Plants also persist because the level of use is low and this analysis does not assume increased motorized use associated with designation of unauthorized routes.

Table 1 shows the number of individuals, by occurrence, of *Streptanthus howellii* (STHO) growing on or adjacent to route surfaces. As noted previously, these data are biased by the fact that a majority of Sensitive plant surveys focused on areas within 100 feet of routes. Table 3 indicates that there is also a large number of individuals of SISE10 growing on route surfaces which is not surprising considering that a majority of the population data has been derived from road focused surveys. Note that this represents population data for the current known extent of the species throughout its entire range. For both STHO and SISE10 the extent to which the high percentages of these species on or adjacent to proposed motorized routes is a result of road-focused surveys is unknown and can only be determined through occurrence level surveys. It is interesting to note that no individuals of these species or any others analyzed herein were found to be present 33 feet beyond the proposed trails indicating that more than just a tolerance for disturbance may be at play.

Direct and Indirect Effects

The direct negative effects to Sensitive species as a result of the proposed action include crushing, uprooting, or otherwise damaging individual plants and recruits. Indirect negative effects pertain to 1) altering habitat beyond its capacity to support Sensitive species which includes soil compaction, reduction of water vapor transport, increases in surface temperature, reduction in soil moisture content, and the mobilization and spread of dust which blocks photosynthesis (Trombulak 2000), 2) loss of habitat niches for recruitment, 3) potential reduction in occurrence size which has implications for the vigor of the occurrence over time, and 4) potential for illegal motorized vehicle use off the road surface affecting Sensitive plant occurrences. From a beneficial effects standpoint, this project will prohibit motorized use within the North Fork Smith Botanical Area on unauthorized routes not designated and on routes barricaded (see Tables 9 and 10) affording additional protection to known locations of *Lewisia oppositifolia*, *Streptanthus howellii*, *Gentiana setigera* and *Viola primulifolia* ssp. *occidentalis* therein. Additionally the RMRD project will reduce road density across the District by decommissioning approximately 54 miles of roads and trails, and provide for improved management of motorized recreation on the Smith River National Recreation Area. In addition, the RMRD will reduce road miles in the L.E. Horton Research Natural Area (RNA) by 0.93 miles (only 0.8 miles of road will be kept, along the western boundary of the RNA). Within the L. E. Horton RNA is a terrace fen containing an occurrence of both *Viola primulifolia* ssp. *occidentalis* and *Gentiana setigera*. This fen has been designated an

essential fen in the Conservation Agreement entered into by the Forest Service, the Bureau of Land Management and the U. S. Fish and Wildlife Service (USDA USDI 2006). The RMRD project will add 42 miles of non-system road to the Forest System, the majority of which occurs in the serpentine areas. The serpentine areas contain suitable habitat for the majority of Sensitive plant species within the project area..

Streptanthus howellii and *Silene serpentinicola* do exhibit a tolerance to disturbance by virtue of their presence in disturbed settings, including road beds, but there is a threshold beyond which plants will be negatively affected. This is evidenced by the relatively fewer number of plants found on the segment of non-system roads proximal to a system road compared to distal road segments, which receive less disturbance.

The tolerance for disturbed settings noted for *Streptanthus howellii* and *Silene serpentinicola* is evidenced by the relatively high number of plants (11% and 20% respectively) on the surface of routes. Although improved seed bed conditions and poor competitive ability may explain to a certain extent their occurrence in disturbed settings, also of significance to their survival on travel surfaces is the fact that the over-wintering meristematic tissue arising from the crown of an underground root is buried under a protective layer of soil. Plant mortality depends on the amount of meristematic tissues killed (Brown et. al. 2000). The fact that these species' meristematic tissue is generated 3 to 5 inches below ground level affords some protection from direct negative effects. The loss of some above ground stems to crushing or grinding would set the plant back, perhaps preventing flowering the following season, but it would not necessarily lead to the loss of the individual.

Although over-wintering plants are afforded protection by a soil layer, above ground stems remain vulnerable and the ability of individual plants, which are relying on a flow of nutrients from these photosynthesizing stems, to survive depends on a number of factors. One of these, passive avoidance has been described above. Another factor is the ability of mature plants to produce multiple above ground stems. If one stem out of 3 is crushed a plant has greater odds of surviving than a plant with a single stem crushed to the point where nutrient transport ceases. Odds for survival are improved where more than one stem has to be crushed to avoid significant damage leading to loss of an individual plant.

Lewisia oppositifolia is also a herbaceous perennial, however it initiates new spring growth from enlarged caudices which are short almost vertical stems located at or just below ground level (Hickman 1993). Note that only 1% of *Lewisia oppositifolia* plants were found to occur on route surfaces. Because of the shallow location of the over wintering buds it is more vulnerable to the grinding effects of tires than species like *Streptanthus howellii* and *Silene serpentinicola* which bear their over wintering buds at greater depths. *Lewisia oppositifolia* is also prone to adverse effects from dewatering. It occurs in shallow depressions and benches that tend to remain saturated or puddled into spring. Actions that change the concave micro-topography can dry out occupied sites and make them no longer habitable.

Gentiana setigera and *Viola primulifolia* ssp. *occidentalis* are not present on road surfaces. They occur in wetland habitats and their preference for saturated soils or flowing water precludes their presence on route surfaces with active vehicle use. These

species habitat, *Darlingtonia* serpentine wetlands, is very sensitive to hydrological changes. Altering existing hydrological conditions such as changing culvert inlet or outlet conditions or pulling ditches along roads adjacent to occupied habitat can destroy roadside populations (USDA USDI 2006). If any roadwork is proposed in the vicinity of the site occupied by *Gentiana setigera* and *Viola primulifolia* ssp. *occidentalis* adjacent to 17N49.7, in addition to a hydrologist a botanist should be involved in formulating a recommendation. This wetland has been identified as an essential fen in the “Conservation Agreement for *Hastingsia bracteosa*, *H. atropurpurea*, *Gentiana setigera*, *Epilobium oreganum*, and *Viola primulifolia* ssp. *occidentalis* and serpentine *Darlingtonia* wetlands and fens from Southwestern Oregon and Northwestern California” (USDA USDI 2006).

The proposed action has a beneficial effect regarding *Viola primulifolia* ssp. *occidentalis*. Decommissioning routes that directly access wetland areas will prevent motorized traffic from affecting the *Darlingtonia* serpentine wetlands including 17N49.105, a fen that has been identified as an essential fen in the “Conservation Agreement for *Hastingsia bracteosa*, *H. atropurpurea*, *Gentiana setigera*, *Epilobium oreganum*, and *Viola primulifolia* ssp. *occidentalis* and serpentine *Darlingtonia* wetlands and fens from Southwestern Oregon and Northwestern California” (USDA USDI 2006).

Proposed activities associated with system roads would not affect Sensitive species due to lack of suitable habitat. In the unlikely event plants did occur on system roads their presence in small numbers in highly disturbed settings would contribute little to the species viability. Non-system road decommissioning (e.g. culvert removal, road outsloping) and barricading activities may impact Sensitive plants through the use of heavy equipment and limited vegetation removal, but the risk is offset by the benefits (e.g. deterring illegal use) of barricading and decommissioning the roads.

While *Streptanthus howellii* and *Silene serpentinicola* do occur on some unauthorized route segments experiencing use, it is not possible to state emphatically that the current level of use is not affecting plants. Nor is it possible to state with any certainty that closing these routes will either benefit the species by removing traffic or negatively affect the species by causing shrub encroachment. It is conceivable that designating routes with *Streptanthus howellii* and *Silene serpentinicola* occurring on travel surfaces would have both negative and beneficial effects to these species and that the beneficial effects would serve to moderate the negative effects.

All roads that will remain open to use will be designated and/or signed. All other roads are closed to use, and will be barricaded or decommissioned as necessary. In some cases the road will be allowed to revegetate naturally. Table 9 shows unauthorized routes that will be barricaded as part of the proposed action. Sensitive plants shown to be present on these routes will not be subject to negative effects associated with motorized use.

Road_Route	SpCode	Count_	Occurrence
17N07.2	LEOP	93	LEOP_002
17N49	STHO	1	STHO_017
17N49.100	SISE10	1139	SISE10_020
	STHO	52	STHO_014
17N49.103	SISE10	225	SISE10_009
17N49.104	STHO	6	STHO_017
	ARMA33	1	ARMA33_001
17N49.105	SISE10	864	SISE10_016
	VIPRO2	600	VIPRO2_011
	STHO	11	STHO_017
17N49.105A	SISE10	310	SISE10_016
17N49.105A	STHO	1	STHO_017
17N49.106	STHO	5	STHO_017
17N49.11N	STHO	3	STHO_002
17N49.12	SISE10	1610	SISE10_017
	STHO	92	STHO_010
17N49.4A	ARMA33	1	ARMA33_001
17N49.7	SISE10	800	SISE10_015
305.100	STHO	29	STHO_024
305.107	SISE10	200	SISE10_029
	STHO	14	STHO_047
305.109A	STHO	155	STHO_041
	LEOP	44	LEOP_011
305.115	ARMA33	17	ARMA33_039
305.126	LEOP	16	LEOP_018
	STHO	45	STHO_013
305.128	SISE10	171	SISE10_023
	STHO	7	STHO_039
305.131	STHO	52	STHO_033

Table 9 – Sensitive Plants on Routes to be Barricaded Under the Proposed Action

Species	Number of Plants
ARMA33	19
LEOP	153
SISE10	5319
STHO	473
VIPRO2	600
Total	6564

Table 10 – Number of Sensitive Plants on Routes to be Barricaded

Cumulative Effects

Incremental effects of past, present, and reasonably foreseeable related future actions that could affect species analyzed herein include mining, recreation, and competition from encroaching vegetation due to both natural succession and fire suppression practices which have lengthened fire return intervals. The geographic scope for analyzing cumulative effects is based on contiguous habitat and distribution of occurrences of the 6 species analyzed through out their known range. Given the impacts from mining, unmanaged off highway vehicle (OHV) use, and fire suppression, the time scale for analyzing past effects corresponds with the past 50 years when it is assumed these activities began affecting the species analyzed within the project area. An analysis of these past, current and foreseeable future actions follows.

The Biscuit Fire burned over 28,000 acres on the Smith River National Recreation Area on Six Rivers National Forest in 2002. *Eriogonum pendulum*, *Lewisia oppositifolia*, *Silene serpentinicola*, *Streptanthus howellii* are early successional species that are poor competitors and as such it is likely that they would respond favorably to low to moderate severity fires. Severity mapping of the Biscuit Fire showed that 80% of the area burned with low to moderate severity as is characteristic of fires burning in outcrops and bouldery serpentine barrens, Jeffrey pine woodlands and shrub dominated areas of low vegetative cover and high bare soil and surface rock cover. Biscuit Fire effects to *Gentiana setigera* and *Viola primulifolia* ssp. *occidentalis* two years following the fire found that populations appeared to be stable throughout their range (Cramer and Frost 2005). Neither species was unable to tolerate the fire. Therefore, effects from the Biscuit Fire on *Eriogonum pendulum*, *Lewisia oppositifolia*, *Silene serpentinicola*, *Streptanthus howellii*, *Gentiana setigera* and *Viola primulifolia* ssp. *occidentalis* were likely benign.

Fire Suppression - Frequent low-to-moderate severity fire was one of the more important ecological processes in the Klamath Province as well as in the eastside and southern Cascades. However, care must be taken in making generalization across all community types. The combination of wet winters and hot, dry summers characteristic of the Pacific Northwest results in low to moderate severity fire, high frequency fire regimes in the wetter areas where there is enough water for fuels to be produced and accumulate. Fire suppression has altered the successional dynamics of these types of communities that were adapted to frequent, low intensity wildfire (Agee 1993).

In drier areas where litter is sparse the result is moderate to high severity, low frequency fire. (Agee 1993). In the dry Jeffrey pine savannah, where many serpentine endemics are found, fuel accumulation is minimal and thus fire intervals may be naturally long (Atzet and Wheeler 1982). The influence of fire suppression on rare early successional species in both dry upland serpentine habitats and serpentine wetland habitats which have evolved under long fire return intervals is not as clear cut as it is in communities where biomass production and litter accumulation is higher. What may be more significant for sustaining the biodiversity and rich assemblage of rare serpentine endemics within the

Klamath-Siskiyou Ecoregion is temporal variation in fire-return intervals and spatial variation in fire intensity and patchiness (pyrodiversity).

Mining - The project area has a mining history that has left scars still visible today. Historically, mining has occurred in serpentine areas of flat topography such as Low Divide, Pine Flat Mountain, High Plateau and French Hill. Existing mining claims constitute the largest threat to rare plant resources in the Smith River Watershed. Roads related to past mining exploration have dissected habitat (serpentine barrens) and potentially removed individual plants or patches of *Eriogonum pendulum*, *Lewisia oppositifolia*, *Streptanthus howellii*, *Gentiana setigera* and *Viola primulifolia* ssp. *occidentalis*. Construction of exploratory shafts or pits has also degraded habitat and potential habitat at specific sites. With the exception of the Gasquet Mountain exploratory mining, there is no population data prior to exploration, so the extent to which these activities affected these six species is not known.

Mining not only directly removes plants and their habitat but triggers indirect and cumulative effects in the form of erosion (on slopes of certain gradients, gullies develop), water diversion (typically road-intercepted run-off which could affect rare plant-supporting wetlands), toxic mine tailings and scars that can take decades to recover. Any future proposal associated with mining on Forest Service lands will require an analysis of effects to Sensitive plant species. Effects will be mitigated to ensure that the proposed action does not lead to a loss of viability for any Sensitive plant species.

Human Uses - Del Norte County's population increased by roughly 20 percent during 1989-1991, and may grow as much as 30-40 percent in the next decade. Urban/rural interface problems could develop in the future. Subdivision of private property, both within and adjacent to the project area, and the encroachment of residential construction into the wildland will continue for several years. Additionally, it is being proposed to allow dual use, licensed and unlicensed motorized recreation vehicles, on county roads within the project area. These demographic processes may increase recreation and other resource demands in the Smith River NRA. As use of routes for motorized recreation increases so to does the potential for adverse effects to Sensitive plant species growing on the road surface, particularly *Streptanthus howellii* and *Silene serpentinicola*. Based upon the limited 2006 surveys which focused surveys on the roads and what is currently known³ these species have a high percentage (over 50%) of the detections in California growing on the surface of routes proposed for designation as motorized trails. Monitoring is essential for determining when a viability threshold is reached so that corrective action can be taken.

Current unmanaged recreational activities, particularly illegal OHV use occurring off routes has the potential to affect *Eriogonum pendulum*, *Gentiana setigera*, *Lewisia oppositifolia*, *Silene serpentinicola*, *Streptanthus howellii*, and *Viola primulifolia* ssp. *occidentalis*. Effects from this type of activity are expected to diminish following implementation of this proposed action. Restricting OHVs to designated routes will increase protection for sensitive plants and habitats on the Smith River National Recreation Area.

³ Population data for historic occurrences is lacking.

Information gaps exist regarding past, present and foreseeable actions that might occur to these species in Oregon creating uncertainty relative to cumulative effects across these species range. However, for reasons noted, it is likely that past, present and reasonably foreseeable actions associated fire suppression, mining and motorized recreation will not adversely effect *Eriogonum pendulum*, *Gentiana setigera*, *Lewisia oppositifolia*, *Silene serpentinicola*, *Streptanthus howellii*, and *Viola primulifolia* ssp. *occidentalis*.

Summary of Effects

The proposal to keep or remove system roads from the system will not affect Sensitive species due to the lack of suitable habitat on highly altered heavily disturbed system road surfaces. In the unlikely event plants did occur on system roads their presence in small numbers in highly disturbed settings would contribute little to the species viability. Non-system road decommissioning (e.g. culvert removal, road outsloping) and barricading activities may impact Sensitive plants through the use of heavy equipment and limited vegetation removal, but the risk is potentially offset by the benefits (e.g. deterring illegal use) of barricading and decommissioning the roads.

All roads that will remain open to use will be designated and/or signed. All other roads are closed to use, and will be barricaded or decommissioned as necessary. In some cases the road will be allowed to revegetate naturally. Closing certain roads or road segments will protect known populations of Sensitive plants.

Under the current low level of use the proposal to add non-system routes may affect individuals growing on travel surfaces but will not cause a trend towards listing for the following reasons.

- In spite of the long term use of a number of non-system routes proposed for designation high numbers of *Streptanthus howellii* and *Silene serpentinicola* do occur on segments of these route surfaces due to passive avoidance and the species growth habit which infers some level of tolerance.
-
- Implementation of the RMRD project is designed to provide for improved management of motorized recreation on the Smith River NRA. This increased potential to prevent illegal use and damaged sites diminishes potential negative effects to Sensitive plant species.
- No routes will be designated in the North Fork Botanical Area and road miles in the LE Horton RNA will be reduced by 0.93 miles.

IV. Determination

For reasons summarized above it is my determination that the Smith River Road Management and Route Designation project may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for *Eriogonum pendulum*, *Gentiana setigera*, *Lewisia oppositifolia*, *Silene serpentinicola*, *Streptanthus howellii*, or *Viola primulifolia* ssp. *occidentalis*.

The RMRD project will not affect any other Forest Service Sensitive plant species.

References

- Agee, J.K. 1993. Fire Ecology of Pacific Northwest Forest. Island Press, Washington, D.C.
- Brooks, R. R. 1987. Serpentine and Its Vegetation: a Multi-Disciplinary Approach. Dioscorides Press, Portland, Ore. 454 pp.
- Brown, James K.; Smith, Jane Kapler, eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 257 p.
- Carothers, S. 2005. Summary of 2005 Surveys of Historic Locations for Forest Service Plants in the Smith River National Recreation Area. On file at Six Rivers National Forest, Supervisor's Office, Eureka, CA.
- California Natural Diversity Data Base. 2006. Natural Heritage Division, California Department of Fish and Game. October 2006.
- Cramer, J. R. and E. J. Frost. 2005. The Flora of Serpentine Darlingtonia Fens in the Klamath-Siskiyou Region after the Biscuit Fire. On file at Six Rivers National Forest, Supervisor's Office, Eureka, CA.
- Frost, E.J.; R.J. Sweeney; W.L. Bigg. 2004. Distribution and Environmental/Habitat Relations of Five Endemic Plants associated with Serpentine Fens in Southwest Oregon and Northwest California. On file at Six Rivers National Forest, Supervisor's Office, Eureka, CA.
- Hickman, J.C. 1993. The Jepson Manual: Higher Plants of California. University of California Press, Berkeley, CA. 1400 pages.
- Jimerson, T.M. 1993. Preliminary plant associations of the Klamath Province, Six Rivers and Klamath National Forests. Eureka, CA. 545 pp.
- Jimerson, T.M.; L. D. Hoover; E. A. McGee, [and others]. 1995. A Field Guide to Serpentine Plant Associations and Sensitive Plants in Northwest California. R5-ECOL-TP-006, USDA-FS, Pacific Southwest Region, San Francisco, CA. 338 p.
- Kruckeberg, A.R. 1984. California serpentine. *Fremontia* 11(4):11-17.
- NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.0. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>.
- Nelson, T. W. and J. P. Nelson. 2004. A New Species of *Silene* (Caryophyllaceae) from the serpentines of Del Norte county, California. *Madrono*, Vol. 51, No. 4, pp. 384-386.

Safford, Hugh D, J. H. Viers, and S. P. Harrison. 2005 Serpentine Endemism in the California Flora: A Database of Serpentine Affinity. Madrono, Vol. 52, No. 4, pp. 222-257.

Sawyer, J.O. 2006. Northwest California: A Natural History. University of California Press. Berkeley, CA. 247 pp.

Trombulak, S. C., and C. A. Frissell. 2000. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities. Conservation Biology, Vol. 4, No. 1, pp. 18-30.

USDA Forest Service, Six Rivers National Forest. 1995. "Land and Resource Management Plan. On file at Six Rivers National Forest Supervisor's Office, Eureka, CA.

USDA Forest Service and USDI Bureau of Land Management. 2006. Conservation Agreement for *Hastingsia bracteosa*, *H. atropurpurea*, *Gentiana setigera*, *Epilobium oreganum*, and *Viola primulifolia* ssp. *occidentalis* and serpentine Darlingtonia wetlands and fens from Southwestern Oregon and Northwestern California. On file at Six Rivers National Forest, Supervisor's Office. Eureka, CA.

Vance-Borland, K., R. Noss, J. Strittholt, P. Frost, C. Carroll, and R. Nawa 1995. A biodiversity conservation plan for the Klamath/Siskiyou region. Wild Earth 5(4):52-59.

Vrilakas, S. 2005. Email response from Sue Vrilakas, Botanist/Data Manager Oregon Natural Heritage Information Center at Oregon State University containing Oregon occurrence data for *Arabis mcdonaldiana*, *Lewisia oppositifolia*, *Streptanthus howellii*, *Gentiana setigera*, and *Viola primulifolia* ssp. *occidentalis*. On file at Six Rivers National Forest, Supervisor's Office. Eureka, CA.

Whittaker, R.H. 1961. Vegetation history of the Pacific coast states and the central significance of the Klamath region. Madrono 16:5-23.

Correspondence:

2006. Letter to Mr. Jim Hodos, President Onstream Resource Managers Inc. from Mary Kay Vandiver, District Ranger, Smith River National Recreation Area. July 17, 2006. On file at Six Rivers National Forest, Supervisor's Office. Eureka, CA.