

Botanical Resources

This section describes the affected environment for rare, threatened, and endangered plant species, as well as the effects of the alternatives. It will describe the area potentially affected by the alternatives and existing resource conditions within that area. Measurement indicators are used to describe the existing conditions for the Modoc National Forest. The measurement indicators will be used in the analysis to quantify and describe how well the proposed action and alternatives meet the project objectives and address resource concerns.

Summary

The Modoc National Forest has a wide diversity of native plant species, with approximately 1100 known species recorded within the Forest as of July 2009. Of these, one species is federally listed as Endangered, one species is federally listed as Threatened, 30 species are Forest Service listed as Sensitive, and 68 species are listed on the Modoc National Forest Watch List for rare plants.

Motorized vehicle use on the Forest can impact rare plant species both directly and indirectly. Vehicles driven over plants can impact them directly through smashing, uprooting, and killing them. Vehicles can also impact plants indirectly by covering them with dust, and by introducing invasive noxious weeds which can destroy rare plant habitats and squeeze out existing rare plant occurrences.

The greatest threat to these rare plant species from motorized vehicle use comes from cross-country vehicle traffic. Therefore, by banning cross-country motorized vehicle use, all of the action alternatives (Alternatives 2, 3, 4, and 5) provide a large measure of protection for rare plant species relative to the No Action Alternative, Alternative 1. Of the action alternatives, Alternative 3 provides the greatest protection for rare plants by not adding any unauthorized routes to the NFTS.

Alternatives 2, 4, and 5 vary slightly in their potential impacts on rare plants, with slightly higher risk of negative impacts under Alternative 5 relative to Alternative 2, and slightly lesser risk of negative impacts under Alternative 4 relative to Alternative 2.

Introduction

Of the Forest Service regions, the Pacific Southwest Region contains the largest assemblage of sensitive plant species in comparison to its land base. Of the more than 8,000 vascular plant species occurring in California, well over half are known to occur on National Forest System (NFS) lands. This is due to topography, geography, geology and soils, climate and vegetation, the same factors that account for the exceptionally high endemic flora of the state. Over 100 plant species are found only on Forest Service (FS) lands and nowhere else in the world (Powell 2001).

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

In addition to the Regional Forester's Sensitive plant list, the Modoc National Forest maintains a Watch List of plant species. Watch List plants are species that do not currently meet the criteria to be

included on the Regional Forester's Sensitive list, but are of sufficient concern that they should be considered in the planning process (Regional Forester letter to Forest Supervisors, 07/27/2006). The Watch List species list may include species that are locally rare, are of special interest, are widely disjunct from the main distribution of the species, are largely endemic to the Forest, or species for which very little, if any, information is available, but existing information may indicate some cause for concern. Watch List species are typically represented by more individuals, more occurrences, or a wider overall distribution than most Sensitive species; however, in general, there is less information on specific locations of occurrences and on habitat requirements for Watch List species than for Sensitive species.

The majority of the proposed unauthorized routes are very short in length and have been in existence for over 40 years. New impacts along these routes are not likely to occur because of the nature of the geology and in most cases, no further impact to plants should occur if the public remains within the road prism. That said, if it is discovered that damage is occurring and threatens a plant community, immediate action will be taken to remedy the situation. Management decisions related to motorized travel can affect plant and fungi species, their habitats, and natural communities. Effects include, but are not limited to, death or injury to plants and habitat modification, habitat fragmentation, and habitat quality including increased risk of weed introduction and spread, change in hydrology, increased erosion, compaction, and sediment, risk to pollinators, loss of vegetation, over-collection, or other factors reducing or eliminating plant growth and reproduction (Trombulek and Frissell 2000). The FS provides a process and standard through which rare plants receive full consideration throughout the planning process, reducing negative impacts on species and enhancing opportunities for mitigation by developing and implementing management objectives for populations and habitats of sensitive species. It is Forest Service policy to minimize damage to soils and vegetation, avoid harassment to wildlife, and avoid significant disruption of wildlife habitat while providing for motorized public use on NFS lands (FSM (Forest Service Manual) 2353.03(2)). Therefore, management decisions related to motorized travel on NFS lands must consider effects to plant species, fungi species, and their habitats.

Analysis Framework: Statute, Regulation, Modoc LRMP, and Other Direction

Direction Relevant to the Proposed Action as it Affects Botanical Resources

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

Executive Order 13112: Invasive Species 64 FR 6183 (February 8, 1999): to prevent and control the introduction and spread of invasive species

Forest Service Manual and Handbooks (FSM/H 2670): Forest Service Sensitive (FSS) species are plant species identified by the Regional Forester for which population viability is a concern. The Forest Service develops and implements management practices to ensure that rare plants and animals do not become threatened or endangered and ensure their continued viability on national Forests. It is Forest Service policy to analyze impacts to sensitive species to ensure management activities do not

create a significant trend toward Federal listing or loss of viability. This assessment is documented in a Biological Evaluation (BE) and is summarized or referenced in this chapter.

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

Noxious weeds management (Management Standards & Guidelines 36-49)

Wetland and Meadow Habitat (Management Standard & Guideline 70): See Water Resources section.

Riparian Habitat (Management Standard & Guideline 92): See Water Resources section.

Bog and Fen Habitat (SNFPA ROD page 65, S&G #118): Prohibit or mitigate ground-disturbing activities that adversely affect hydrologic processes that maintain water flow, water quality, or water temperature critical to sustaining bog and fen ecosystems and plant species that depend on these ecosystems. During project analysis, survey, map, and develop measures to protect bogs and fens from such activities as trampling by livestock, pack stock, humans, and wheeled vehicles.

Sensitive Plant Surveys (Corrected Errata, April 19, 2005): Conduct field surveys for Threatened, Endangered, Proposed, and Sensitive (TEPS) plant species early enough in project planning process that the project can be designed to conserve or enhance TEPS plants and their habitat. Conduct surveys according to procedures outlined in the Forest Service Handbook (FSH 2609.25.11). If additional field surveys are to be conducted as part of project implementation, survey results must be documented in the project file (Management Standard & Guideline 125). The standards and guidelines provide direction for conducting field surveys, minimizing or eliminating direct and indirect impacts from management activities, and adherence to the Regional Native Plant Policy (USDA Forest Service 2004).

Modoc National Forest Land and Resource Management Plan (MDF LRMP): Guidelines for Sensitive plant management are enumerated on page 4-21 of the Modoc LRMP (USDA Forest Service 1991). Our direction is to “manage and conserve sensitive plant species and their habitats to ensure that viable populations are maintained.” To these ends, we are to

Conduct inventories prior to project implementation if potential habitat or known populations are identified, in accordance with FS Handbook procedures.

Allow no new disturbance of identified sensitive plant habitat without an environmental analysis.

To help the Forest meet its LRMP guideline requirements, several conservation strategies and conservation assessments have been developed:

Draft Updated Conservation Strategy for *Rorippa columbiae* (Columbia cress): This strategy provides proposed management actions for maintaining and restoring habitat for known populations, and guidelines for monitoring (Cavaille et al. 2007).

Gratiola heterosepala Conservation Strategy: This strategy provides guidelines for maintaining long-term species viability (Corbin et al. 1994).

Conservation Assessment for *Ptilidium californicum* (Aust.) Underw.: Conservation guidance for the species (Harpel and Hoover 2006).

Conservation Assessment for *Meesia triquetra* (L.) Aongstr. (three-ranked hump-moss) and *Meesia uliginosa* Hedwig (broad-nerved hump-moss) in California with a focus on the Sierra Nevada Bioregion: Conservation guidance for these species (Dillingham 2005).

Conservation Assessment for *Cypripedium fasciculatum* and *Cypripedium montanum*: Conservation guidance for these species (Kaye and Cramer 2005).

Conservation Assessment for *Buxbaumia viridis* (DC.) Moug. & Nestl.: Conservation guidance for this species (Harpel and Hoover 2006).

Draft Interim Management Prescription: Management guidelines for TES plant species (Modoc National Forest 2009).

Effects Analysis Methodology

Area of Effect for Botanical Resources

Three geographic areas were chosen to analyze the effects of the proposed routes on botanical resources:

- The No Action Alternative (Alternative 1), which allows for cross-country travel, was assessed using the entire Modoc National Forest, except for the South Warner Wilderness. This analysis area was also used to analyze cumulative effects to rare species for all alternatives.
- Direct and indirect effects to Sensitive and Watch List plant species were assessed using the area within 100 feet of existing or proposed routes. In general, direct effects are most likely to occur within a zone of 30 feet on either side of the route, due to the need for parking and pulling off to allow 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.
- Direct and indirect effects to federally listed species were assessed using the area within 300 feet of existing or proposed routes. This buffer was used to meet the criteria established by USFWS in its programmatic consultation agreement with Region 5 USFS, Route Designation: Project Design Criteria for “No effect” or “May Affect Not Likely to Adversely Affect” Determination for TE Species (USFWS 2006). This buffer meets the 250-foot buffer designated by USFWS, with additional buffer space to accommodate the average distance from road center (baseline for the buffer) to the road edge plus potential mapping error. This 300-foot distance is also used as the default buffer to assess impacts to the vernal pools providing habitat for the two federally Listed species, *Tuctoria greenei* and *Orcuttia tenuis*.

Analysis of Methodology

The analysis of effects on rare plant species was a two-step process. 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 Modoc National Forest (USFWS 2008), Region 5 Sensitive Plant List (USDA FS 2006), Modoc National Forest rare plant records, TEPS and Watch List GIS plant layers (2008), as well as California Natural Diversity Database (CNDDDB) records (2008). The Watch List plant species included are those submitted for the 2008 Modoc Land and Resource Management Plan (LRMP) Revision.

All of this information was used in step two of the analysis—conflict determination. Data were imported into a geographical information system (GIS) data base and used to analyze potential habitat, identify proximity of known TES and Watch List plant occurrences to routes, and analyze effects.

Assumptions for Botanical Resource Effects Analyses

- Vehicle use on and off established routes has affected or has the potential to affect rare plant populations, either directly by damage or death to individual plants from motor 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.

- Motor vehicle use is unlikely to impact certain rare plant habitats due to the steep or rocky nature of the surrounding terrain; motor vehicle use is more likely to impact other rare plant habitats, such as meadows and lava caps, which exist on gentle slopes or flat terrain with little or no vegetation or natural barriers to motor vehicles.
- Without specific prevention and control measures, invasive non-native plants (weeds) will continue to spread along and within surfaced and unsurfaced motor vehicle roads and trails.
- Motor vehicle use of unsurfaced vehicle roads and trails will increase sediment production and erosion. As use increases, sediment production and erosion will increase.
- Change of vehicle class on NFTS roads has no impact to rare plants or their associated habitats.
- Seasonal closures of NFTS roads have no impact to rare plants or their associated habitats.

Data Sources

1. Route inventories collected in Step 1 of the Travel Management project
2. Existing botanical records within the Modoc National Forest GIS databases. These botanical records include the following:
 - Occurrences of Threatened, Sensitive, and Watch list (TESW) plant populations which have been surveyed and delineated by Modoc NF Botany staff
 - California Natural Diversity Database (CNDDDB) rare plant data
 - Vernal pools delineated by Dr. Robert Holland (2006)
 - Fens and wet meadows, delineated by Dr. Robert Holland (2006) and partially updated by the Modoc National Forest Botany staff
 - Soils mapped to the level of Great Groups
 - Maps of existing vegetation (EVeg)
 - Modoc National Forest Terrestrial Ecological Unit Inventory (TEUI) data
 - Previous botany surveys. No road-specific surveys were performed for this project, although some proposed roads pass through previously surveyed areas.
 - Botany surveys conducted in July 2008 for *Orcuttia tenuis* in all previously unsurveyed vernal pools within 300 feet of proposed routes.

GIS Data Analysis Assumptions

For the purposes of GIS analysis, the following assumptions were made for determining effects of routes on TES and WL plant species and their habitats:

- Roads are assumed to be 12 feet wide, and the road inventory lines demarcating roads to be added are assumed to be center lines.
- Nine feet of error in delineating plant population occurrences is assumed, based on typical Garmin GPS accuracy (<http://www8.garmin.com/aboutGPS/>). Garmin GPS units were most commonly used for collecting rare plant occurrence data on this Forest; otherwise, more accurate Trimble GPS units have sometimes been used as well.

- Thirty-six feet of error in delineating vernal pools and fen and wet meadow habitats is assumed, based on typical accuracy of digitizing polygons based on paper maps or, in this case, digital aerial photos.
- Vernal pools and swales delineated by Dr. Robert Holland (2006) are potential habitat for the Threatened vernal pool plant species *Orcuttia tenuis* and the Sensitive vernal pool plant species *Mimulus evanescens* and *Phacelia inundata*. They also provide habitat for three Modoc National Forest Watch List plant species: *Gratiola heterosepala*, *Pogogyne floribunda*, and *Potentilla newberryi*. All unsurveyed vernal pool habitats are assumed to be occupied by these species for the purposes of analysis.
- Fens and other wet meadow habitats delineated by Dr. Robert Holland (2006) and updated by the Modoc National Forest Botany staff are potential habitat for the Sensitive plant species *Botrychium ascendens*, *B. crenulatum*, *B. minganense*, *B. montanum*, *Bruchia bolanderi*, *Buxbaumia viridis*, *Meesia triquetra*, and *M. uliginosa*. Again, all unsurveyed fen habitats are assumed to be occupied by these species for the purposes of analysis.
- For Sensitive and Watch List plants that are neither fen nor vernal pool species (or at least, not exclusively such), the Forest botany GIS layer was overlain with the Forest soils GIS layer, the Forest existing vegetation GIS layer, and Terrestrial Ecological Unit Inventory (TEUI) (Smith and Davidson 2003) ecological region GIS layer. Using existing Sensitive and Watch List plant occurrences, and their locations within certain soil, vegetation, and eco-region types (TEUI 2003), predictions were made for the locations of potential habitats that might exist across the Forest for these plant species. This methodology provides a coarse filter for potential TES plant habitat. Although limited in its predictive accuracy, it provides our best available method for estimating potential habitat across the Forest, based on available information. These were broken down into barren, forested, riparian, and sage steppe habitats, in addition to the vernal pool-swale and fen-wet meadow-seep habitats mentioned above.

Please note that GIS data are derived from a variety of different sources (e.g., remote sensing, GPS data, data digitized from hardcopy maps and aerial photos), which will have differing levels of accuracy. The amount by which these approximations of natural phenomena (such as soil type, habitat type, TES plant occurrence boundaries, and ecological unit boundaries) differ from nature is extremely difficult to quantify. However, we have used the best available data for our analyses. Therefore, although the numbers presented as a result of GIS analysis can appear very precise, please understand that they are only approximations; which, however, are still useful as estimates. Using our best professional judgment, we have ensured that our analyses are meaningful and can reasonably account for mapping errors.

Botanical Resources Indicators

The following indicator measures related to motorized routes located in or near rare plant occurrences or habitats, were used to assess the impacts of the alternatives.

- Miles of unauthorized routes within or adjacent to sensitive plant sites or within suitable sensitive plant habitat
- Miles of unauthorized routes within or adjacent to fens or wet meadows
- Miles of unauthorized routes within or adjacent to vernal pools
- Acres of potential habitat within 100 feet of routes, to address the effects on potential habitat for rare plants
- Miles of routes and areas open for motor vehicle use within riparian habitat, including lake margins and stream banks

Botanical Resources Methodology, by Action

For all the actions described below, botanical resources will be analyzed for short-term impacts (one year) and long-term impacts (20 years). Indicators are described for each action below.

Direct and Indirect Effects of the Prohibition of Cross-Country Motor Vehicle Travel

Indicators: (1) miles of unauthorized routes within 100 feet of rare plant sites or within or adjacent to suitable rare plant habitat, (2) the number of acres of potential habitat for rare plants within 100 feet of unauthorized routes, and (3) the number of known rare plant occurrences within 100 feet of unauthorized routes.

Spatial boundary: Forest

Methodology: GIS analysis of existing unauthorized routes within or adjacent to rare plant sites or potential habitat

Direct and Indirect Effects of Adding Facilities (presently unauthorized roads and trails) to the National Forest Transportation System (NFTS), Including Identifying Seasons of Use and Vehicle Class

Indicators: (1) miles of routes open for motor vehicle use within or adjacent to sensitive plant sites, (2) miles of routes open for motor vehicle use within riparian habitat, including lake margins and stream banks, (3) number of vernal pools and fens within 100 feet of routes, and (4) number of known rare plant occurrences within 100 feet of routes

Spatial boundary: Forest. Direct and indirect effects will be analyzed using a 100-foot buffer along roads.

Methodology: GIS analysis of existing unauthorized routes with or adjacent to rare plant sites or potential habitat.

Direct and Indirect Effects of Changes to the Existing NFTS—Mixed Use on Level 3 Roads, and Seasonal Closures

Indicators: (1) miles of NFTS roads open for motor vehicle use within or adjacent to sensitive plant sites, (2) miles of NFTS roads with seasonal closures within or adjacent to sensitive plant sites, (3) number of vernal pools and fens within 100 feet of NFTS level 3 roads open to mixed use, (4) number of vernal pools and fens within 100 feet of NFTS level 3 with seasonal closures, (5) number of known rare plant occurrences within 100 feet of NFTS level 3 roads open to mixed use, and (6) number of known rare plant occurrences within 100 feet of NFTS level 3 roads with seasonal closures

Spatial boundary: Forest. Direct and indirect effects will be analyzed using a 100 foot buffer along roads

Methodology: GIS analysis of NFTS roads within or adjacent to rare plant sites or potential habitat

Cumulative Effects

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

Long-term time frame: 20 years

Spatial boundary: Forest

Indicators: (1) miles of routes open for motor vehicle use within or adjacent to sensitive plant sites, (2) miles of routes open for motor vehicle use within riparian habitat, including lake margins and stream banks, and (3) number of TES plant occurrences and acreage of TES habitat within 100 feet of routes.

Miles of routes within rare plant habitats was used for analysis rather than number of routes. Because many of the routes are short road segments of less than one mile, while others are several miles in length, the total mileage of routes potentially impacting rare plant habitats provides a more accurate indicator value than does the number of routes.

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

Affected Environment and Environmental Consequences

Affected Environment

The Modoc National Forest is located in the extreme northeastern corner of the State of California. Federally owned lands within the proclaimed Forest boundary amount to over 1.6 million acres. Elevations range from 4,000 to almost 10,000 feet. A coarse overview of the landscapes and vegetation of the Forest shows five major landscapes: the Warner Mountains, the Devil's Garden sage-steppe plateau, yellow pine forest, the Big Valley Mountains, and the Medicine Lake Highlands.

The Warner Mountains are generally steep, rather cold and moist, and well forested with yellow pine, fir, and high-elevation pine species such as lodgepole and western white pine, with whitebark pine at the highest elevations. Because of its variety of elevations, temperature regimes, precipitation regimes, and its complex topography, the Warner Mountains are home to many of the Forest's Sensitive plant species. Fens, although very rare throughout the Forest, are most common in the Warner Mountains.

The central and northwest areas of the Forest are a sage-steppe plateau, called the Devil's Garden or Clear Lake Plateau. It is relatively warm and dry, and is characterized by extensive sage steppe scrub and woodland communities of varying densities. Vernal pools, vernal playas, and other vernal wet places are the principle rare plant habitats in this area. The only federally listed Threatened plant species on the Forest is a vernal pool endemic.

The Big Valley conifer Forest covers a large area in the southwestern portions of the Forest. The Big Valley Mountains are mostly mixed white fir and ponderosa pine, and contain special shallow, gravelly flats which constitute a special habitat for a suite of local endemic Sensitive plant species.

Affected Environment and Existing Conditions

The Modoc National Forest encompasses a diversity of floristic regions, including the Modoc Plateau and Warner Mountain regions of the Great Basin Province, extending into the Southern Cascades Province. The Warner Mountain Ranger District encompasses the highest elevations on the Forest, rising to 9,892 feet on Eagle Peak. Vegetation ranges from sagebrush, grading into ponderosa pine and mixed conifer Forest, and extending up through whitebark pine subalpine Forest into alpine ridge tops. This is the most botanically diverse district on the Forest. The Devil's Garden Ranger District encompasses the Modoc Plateau, and is largely vegetated with sagebrush interspersed with juniper woodlands; this is known as the sage steppe. This district is rich in vernal pools. Big Valley Ranger District consists primarily of low-elevation mountains covered with mixed conifer forests, interspersed with sagebrush flats and vernal pools. The Doublehead Ranger District encompasses the Medicine Lake Highlands, a vegetatively diverse area which includes mixed conifer forests, sagebrush flats, lava flows, and chaparral.

Rare Species (Federally Listed, Sensitive Species, Watch List Species)

The Modoc National Forest provides habitat for 1,087 vascular plant taxa (Modoc National Forest Plant List, 2007), which represents approximately 17 percent of the California Flora (Hickman 1993). Of these, 98 are considered rare plants (S and WL) on the Modoc NF.

There are currently two federally listed plant species within the analysis area: *Tuctoria greenei* (awnless spiralgrass, an Endangered species) and *Orcuttia tenuis* (slender Orcutt grass, a Threatened species).

Tuctoria greenei, awnless spiralgrass, is federally listed as Endangered and state listed as Rare; no critical habitat on the Modoc National Forest has been designated by the U.S. Fish and Wildlife service. It is a small annual grass which can be identified by its distinctive spikelets, which resemble those of *Orcuttia tenuis* but have more numerous yet smaller, less regular and more ragged teeth on the lemma. It inhabits vernal pools or similar habitats with clayey soils. The only known occurrence on the Modoc National Forest is 33 acres contained within a vernal pool, with small patches of this plant dispersed throughout this area in favorable micro sites. Although potentially affected by unmanaged cross-country travel, no known unauthorized routes have been identified within or nearby this occurrence. No routes proposed for addition in any alternative are within or nearby the occurrence.

Orcuttia tenuis, slender Orcutt grass, is federally listed as Threatened and state listed as Endangered; currently, no critical habitat for this species has been designated by U.S. Fish and Wildlife Service on the Modoc National Forest. It is a small, annual grass distinguishable from other grasses by its five-toothed lemma. It is limited to drying and dried beds of relatively deep vernal pools or vernal pool-type habitat with clay soils. On the Modoc NF it is known from fifteen occurrences totaling approximately 284.33 acres, and all of these occurrences are found within areas currently open to cross-country travel.

Rare plant species, as referred to in this analysis, include federally listed, as well as Sensitive and Watch List species. Sensitive plant species are those species identified by the Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density, significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution, or such low numbers or limited distribution that special management consideration is required to maintain their presence and viability, regardless of current trend (FSM 2670.5, FSH 2609.25, 1.31). A viable population is defined as one that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its existing range within the planning area (FSM 2670.5).

In addition to the Regional Forester's Sensitive plant list, the Modoc National Forest maintains a Watch List of plant species that are of special interest. Watch List plants are species that do not currently meet the criteria to be included on the Regional Forester's Sensitive list, but are of sufficient concern that they should be considered in the planning process (Regional Forester letter to Forest Supervisors, 07/27/2006). Watch List species are not addressed in the Forest Land and Resource Management Plan and are not bound by guidelines in that plan. The Watch List species list may include species that are locally rare, are of special interest, are widely disjunct from the main distribution of the species, are largely endemic to the Forest, and species for which very little, if any, information is available but existing information may indicate some cause for concern. Watch List species are typically represented by more individuals, more occurrences, or a wider overall distribution than most Sensitive species; however, in general, there is less information on specific locations of occurrences and on habitat requirements for Watch List species than for Sensitive species.

So currently, there are one federally listed Endangered, one federally listed Threatened, 30 Region 5 Sensitive, and 68 Modoc NF Watch List plant species designated on the Forest. A majority of these have known occurrences on the Forest; however, some are only suspected to occur at this point, as potential habitat may exist, but no occurrences have been documented. For most species, an occurrence refers to a relatively discreet group of individuals, separated from the next nearest group of the same species, by at least 1/4 mile. Of the 99 species designated as rare on the Forest, one

Endangered, one Threatened, 24 Sensitive, and 29 Watch List species (53 total) are known to occur within the analysis area for this project. There are 276 mapped occurrences of TES species, and 191 mapped occurrences of Watch List plant species within the project boundary (Table 3-37). Table 3-37 lists all federally listed, Region 5 Sensitive, and Modoc National Forest Special Interest plant species that are known on the Modoc National Forest. Also included are the listings, number of Modoc National Forest occurrences, and habitat groupings (described below) for each species.

A few species are omitted from this analysis because they grow in aquatic habitats and are inaccessible to off-highway vehicles (OHVs). These unanalyzed aquatic species are *Alisma gramineum*, *Potamogeton filiformis*, *Potamogeton zosteriformis*, *Riella americana*, and *Utricularia intermedia*. All are Special-Interest species.

In addition, those Sensitive and Watch List plant species that have no known occurrences on the Forest were also dropped from the analysis because it is unknown if these species exist on the Forest, and the location of potential habitat is undetermined. See the Biological Evaluation and Watch List Botanical Report for a complete list of these species and why they were dropped from the analysis.

Table 3-37. Species Considered in Analysis, Status, Known Occurrences, and Habitats

Species	Status ¹	Number of mapped occurrences in Project Area	Habitats ²
<i>Tuctoria greenei</i> (Greene's tuctoria)	E, CR	1	VP
<i>Orcuttia tenuis</i> (Slender Orcutt grass)	T, CE	9	VP
<i>Astragalus anxius</i> (Ash Valley milkvetch)	S	4	B in sage steppe
<i>Astragalus lemmonii</i> (Lemmon's milkvetch)	S	1	R
<i>Astragalus pulsiferae</i> var. <i>coronensis</i> (Crown milkvetch)	S	15	SS, F
<i>Botrychium ascendens</i> (Upswept moonwort)	S	1	R, FE
<i>Botrychium crenulatum</i> (Scalloped moonwort)	S	8	R, FE
<i>Botrychium lunaria</i> (Moonwort)	S	5	MS, R
<i>Botrychium minganense</i> (Mingan moonwort)	S	1	MS, R, FE
<i>Botrychium montanum</i> (Western goblin)	S	1	R, FE
<i>Botrychium pinnatum</i> (Northwestern moonwort)	S	1	FE, R
<i>Bruchia bolanderi</i> (Bolander's candlemoss)	S	2	R, FE
<i>Buxbaumia viridis</i> (Bug-on-a-stick)	S	8	On rotting logs in R, FE
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i> (Long-haired star tulip)	S	91	Meadows in F
<i>Cypripedium montanum</i> (Mountain lady's-slipper)	S	34	F
<i>Eriogonum prociduum</i> (Prostrate buckwheat)	S	19	B, SS
<i>Eriogonum umbellatum</i> var. <i>glaberrimum</i> (Green buckwheat)	S	6	SS, F
<i>Galium glabrescens</i> ssp. <i>modocense</i> (Modoc bedstraw)	S	17	B in sage steppe
<i>Galium serpenticum</i> ssp. <i>warnerense</i> (Warner Mountain bedstraw)	S	12	B, R, F
<i>Ivesia paniculata</i> (Ash Creek mousetail)	S	32	B, SS, F
<i>Lupinus latifolius</i> var. <i>barbatus</i> (Bearded lupine)	S	1	R, F
<i>Meesia triquetra</i> (Three-ranked hump-moss)	S	5	FE
<i>Meesia uliginosa</i> (Broad-nerved hump-moss)	S	1	FE
<i>Mimulus evanescens</i> (Ephemeral monkey-flower)	S	5	VP, R
<i>Phacelia inundata</i> (Playa phacelia)	S	3	VP, R
<i>Rorippa columbiae</i> (Columbia yellow-cress)	S	3	R

Species	Status ¹	Number of mapped occurrences in Project Area	Habitats ²
<i>Arnica fulgens</i> (Hillside arnica)	WL	8	SS
<i>Betula pumila</i> var. <i>glandulosa</i> (Bog birch)	WL	3	FE
<i>Carex halliana</i> (Hall's sedge)	WL	11	Openings in F
<i>Carex vallicola</i> (Valley sedge)	WL	1	MS
<i>Carex petasata</i> (Liddon sedge)	WL	1	F, FE
<i>Cordylanthus capitatus</i> (Yakima bird's-beak)	WL	6	SS
<i>Delphinium stachydeum</i> (Spiked larkspur)	WL	10	SS
<i>Dimeresia howellii</i> (Doublet)	WL	11	F
<i>Drosera anglica</i> (English sundew)	WL	3	FE, FE
<i>Erigeron acris</i> ssp. <i>debilis</i> (Snowy fleabane)	WL	1	FE, B
<i>Gratiola heterosepala</i> (Boggs lake hedge-hyssop)	WL, CE	17	VP, R
<i>Hulsea nana</i> (Little hulsea)	WL	4	B
<i>Iliamna bakeri</i> (Baker's globemallow)	WL	44	especially post-fire in SS, B
<i>Ivesia baileyi</i> var. <i>beneolens</i> (Owyhee ivesia)	WL	1	F
<i>Lomatium foeniculaceum</i> var. <i>macdougalii</i> (MacDougal's lomatium)	WL	3	SS
<i>Mertensia longiflora</i> (Long bluebells)	WL	2	SS
<i>Nemophila breviflora</i> (Great Basin nemophila)	WL	2	FE, R, F
<i>Phacelia sericea</i> var. <i>ciliosa</i> (Blue alpine phacelia)	WL	9	SS, B
<i>Phlox hoodii</i> ssp. <i>muscooides</i> (Moss phlox)	WL	13	B, SS
<i>Pogogyne floribunda</i> (Profuse-flowered pogogyne)	WL	51	VP, RA
<i>Potentilla newberryi</i> (Newberry's cinquefoil)	WL	7	VP, R
<i>Ribes hudsonianum</i> var. <i>petiolare</i> (Western black currant)	WL	1	R
<i>Salix bebbiana</i> (Gray willow)	WL	2	R
<i>Scutellaria galericulata</i> (Marsh skullcap)	WL	2	FE, R
<i>Silene oregana</i> (Oregon campion)	WL	1	SS, F
<i>Sphagnum</i> spp. (Sphagnum)	WL	3	FE, F
<i>Stenotus lanuginosus</i> (Woolly stenotus)	WL	2	SS, FE
<i>Triteleia grandiflora</i> ssp. <i>howellii</i> (Howell's triteleia)	WL	2	SS

¹ Status: E – federally listed Endangered, T – Federally listed Threatened, S – Forest Service Sensitive,

WL—Forest Service Watch List, CR – State listed Rare, CE – State listed Endangered

² Habitats: B—Barren; FE – Fens, Wet Meadows, and Seeps; F – Forest; R – Riparian Areas; SS—Sage Steppe; VP—Vernal Pools and Swales

Aggregating Rare Species for Analysis of Effects

As many of these species occur in the same or similar habitats, and the effects of motor vehicle use may vary by habitat, the rare plant species being considered in this analysis have been grouped into different habitats, based on habitat requirements. The following habitats have been selected to represent the species being addressed:

Habitat Descriptions

The following describes the six habitats and lists the rare plant species assigned to each group. Each of the habitats includes one or more vegetation types identified in the Terrestrial Ecological Unit Inventory (TEUI) Land Type Associations Modoc National Forest (Smith and Davidson 2003), or are

in existing Modoc National Forest GIS data layers for fens and vernal pools. Each of the species may occur in one or more habitats; e.g., crown milkvetch occurs in Sage Steppe (SS) and Forest (F) habitats. There are also several species which occur in edge habitats, sites where two habitats come together. For these species, elements of two different habitat types are important. The project record for this analysis contains additional information on the species contained within each habitat, and the vegetation types assigned to each habitat.

- Barren (B) – includes species found in talus, rocky gravel, scree, rock outcrops and lava flows.
- Fens, Wet Meadows, and Seeps (FE) – includes species found in wetland sites sub-irrigated by cold water, with substantial accumulations of peat, as well as meadows with more or less dense grasses, sedges, and herbs that grow under moist or saturated conditions.
- Forested (F) – includes those species found in ponderosa pine, Jeffrey pine, lodgepole pine, white fir, or mixed conifer forested communities, generally montane to subalpine.
- Riparian Areas (R) – includes species found along the margins of perennial or intermittent streams, natural lakes, reservoirs, playas, or stock ponds.
- Sage Steppe (SS) – includes species found in Great Basin and montane woodland and shrub communities, e.g., western juniper, big sagebrush, silver sage, low sage, greasewood, and bitterbrush.
- Vernal Pools and Swales (VP) – includes species found in depressions and swales with relatively impermeable soils that accumulate rainwater during winter and spring, and dry up during warm weather.

Barren (B)

This plant habitat embraces a wide variety of rocky habitat types. It includes alpine scree and talus fields, which occur only at the highest points within the Forest. It also includes rock outcrops, open gravelly hill slopes, bare road cuts, and lava beds and talus fields occurring at all elevations throughout the Forest. These sites provide harsh growing conditions for plants, with little soil, although cracks and shallow basins within the rocks can capture and hold water for plants. These sites provide specialized niches for several rare plant species.

The single Modoc National Forest Sensitive species occurring in Barren sites is *Galium serpenticum* ssp. *warnerense*. Modoc National Forest WL species occurring in Barren habitats include *Erigeron acris* ssp. *debilis*, *Hulsea nana*, *Ivesia baileyi* var. *beneolens*, *Phacelia sericea* var. *ciliosa*, and *Phlox hoodii* ssp. *muscoides*.

There are currently no known Barren species occurring within 100 feet of existing unauthorized routes, and no routes within Barren habitats.

Fens and Wet Meadows (FE)

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 2004a); ability to support high levels of biodiversity, including rare species (USDA Forest Service 2004a); 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, Cooper, and Parsons 2002).

Fens are thought to be one of the most sensitive wet habitats in the Sierra Nevada region (Rundel, Gordon, and Parsons 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 (Chimner

and Cooper 1998, Weixelman 2007). They support a suite of plants, many of which occur only in fens, as well as other species which may occur in wet meadows as well.

There were 132 mapped fens within the Warner Mountains Ranger District from the fen mapping project completed by Dr. Robert Holland in 2006. However, only 21 percent of these were ground verified, and based on ground-verified results, Dr. Holland estimates approximately 60 true fens are present in the Warner Mountains outside of the South Warner Wilderness Area (Holland 2006). The remaining 72 sites mapped by Dr. Holland are classified as wet meadows. Because these sites have not all been analyzed to determine whether they are true fens or wet meadows, and because many of these plants grow in both habitats, these sites are grouped together as a habitat. As a result, this habitat type includes open areas vegetated with more or less dense grasses, sedges, and forbs that prefer seasonally moist or saturated conditions, as well as moist areas surrounding small seeps. Sensitive species that occur in Fens and Wet Meadows are *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. minganense*, *B. montanum*, *B. pinnatum*, *Bruchia bolanderi*, *Buxbaumia viridis*, *Meesia triquetra*, and *M. uliginosa*. Modoc National Forest WL species occurring in fens and wet meadows are *Betula pumila* var. *glandulosa*, *Drosera anglica*, and *Sphagnum* spp.

The following Fen and Wet Meadow species are found within 100 feet of existing unauthorized routes: *Botrychium lunaria*, *B. pinnatum*, *Calochortus longebarbatus* var. *longebarbatus*, and *Sphagnum* spp.

Forested (F)

The Forest habitat includes mixed conifer forests and white fir forests. They may include any possible canopy mix of white fir, Douglas fir, Shasta fir, Jeffrey pine, ponderosa pine, Washoe pine, whitebark pine, sugar pine, western white pine, lodgepole pine, knobcone pine, mountain hemlock, and incense cedar. These range from relatively dense forests with high canopy covers in the Warner Mountains and the Medicine Lake Highlands, to relatively open yellow pine forests. These forests extend from the sagebrush and chaparral zones up to subalpine Forest, ranging in elevation from approximately 4,000 to over 9,500 feet. Understory plant communities are often sparse, ranging from communities of annual and bunch grasses, and forb species in yellow pine forests, to almost no understory plants under dense white fir canopies.

Modoc National Forest Sensitive species that occur in forest habitat are *Astragalus pulsiferae* var. *coronensis*, *Calochortus longebarbatus* var. *longebarbatus*, *Cypripedium montanum*, *Eriogonum umbellatum* var. *glaberrimum*, *Galium serpenticum* ssp. *warnerense*, *Ivesia paniculata*, and *Lupinus latifolius* var. *barbatus*. Modoc National Forest WL species that occur in Forest habitat are *Cordylanthus capitatus*, *Dimeresia howellii*, *Ivesia baileyi* var. *beneolens*, *Nemophila breviflora*, and *Silene oregana*.

The following Forest species are found within 100 feet of existing unauthorized routes: *Calochortus longebarbatus* var. *longebarbatus*, *Carex halliana*, *Cypripedium montanum*, *Eriogonum umbellatum* var. *glaberrimum*, and *Dimeresia howellii*.

Riparian Areas (R)

These are areas immediately bordering the edges of streams, rivers, lakes, or other water sources. Forested riparian areas include stream banks under dense forest canopies in mixed conifer forests, but they also occur in aspen, yellow pine, and lodgepole pine forests. More open riparian areas range from montane meadows with willows, alders, and dense sedges, to alkaline playas adjacent to lakes, as well as borders of reservoirs and stock ponds. Riparian vegetation along streams helps to maintain the water table by holding stream banks in place, and shades the water to keep stream temperatures cooler. It is also critically important for preventing erosion and sedimentation in streams and other water bodies.

Modoc National Forest TES species that occur in Riparian Areas are *Botrychium ascendens*, *B. crenulatum*, *B. lunaria*, *B. manganense*, *B. montanum*, *B. pinnatum*, *Bruchia bolanderi*, *Buxbaumia viridis*, *Galium serpenticum* ssp. *warnerense*, *Lupinus latifolius* ssp. *barbatus*, *Mimulus evanescens*, and *Phacelia inundata*. Modoc National Forest WL species occurring in Riparian Areas are *Gratiola heterosepala*, *Nemophila breviflora*, *Pogogyne floribunda*, *Potentilla newberryi*, *Ribes hudsonianum* var. *petiolare*, *Salix bebbiana*, and *Scutellaria galericulata*.

The following Riparian species are found within 100 feet of existing unauthorized routes: *Botrychium lunaria*, *B. pinnatum*, *Buxbaumia viridis*, *Gratiola heterosepala*, *Pogogyne floribunda*, *Potentilla newberryi*, *Ribes hudsonianum* var. *petiolare*, and *Salix bebbiana*.

Sage Steppe (SS)

This habitat type includes typical Great Basin sagebrush habitats, such as big sagebrush, silver sagebrush habitat, and low sagebrush flats. Soils are commonly shallow heavy clays, resting on basalt bedrock. Sites are often rocky, with sagebrush shrub communities frequently forming mosaics with juniper woodlands and yellow pine forests of varying tree densities. Sage steppe habitats are also common surrounding vernal pool sites. Much of the Devil's Garden District consists of this habitat type. In the Warner Mountains, sagebrush habitat is more mesic (characterized by or requiring a moderate amount of moisture) and occurs at higher elevations, often grading into yellow pine and white fir Forests. Southwest of the Medicine Lake Highlands, is an area that includes sagebrush but grades into manzanita and Ceanothus chaparral. Because there are no Modoc National Forest TES or WL species that occur exclusively or even primarily in this habitat, it is included with the sage steppe habitat type for the purposes of this analysis.

Modoc National Forest Sensitive species that occur in sage steppe habitats are *Astragalus anxius*, *A. pulsiferae* var. *coronensis*, *Eriogonum prociduum*, *E. umbellatum* var. *glaberrimum*, and *Ivesia paniculata*. Modoc National Forest WL species occurring in sage steppe sites are *Arnica fulgens*, *Carex petasata*, *Cordylanthus capitatus*, *Delphinium stachydeum*, *Iliamna bakeri*, *Lomatium foeniculaceum* var. *macdougalii*, *Mertensia longiflora*, *Phacelia sericea* var. *ciliosa*, *Phlox hoodii* ssp. *muscooides*, *Stenotus lanuginosus*, and *Triteleia grandiflora* ssp. *howellii*.

The following sage steppe species, a watch list plant, is found within 100 feet of existing unauthorized routes: *Cordylanthus capitatus*.

Vernal Pools and Swales (VP)

These are depressions or swales with relatively impermeable soils that fill with water in the winter and during spring snowmelt, and gradually dry out as summer progresses. This group includes vernal pools as well as other vernal wet areas, such as low sage and silver sage communities that hold water early in the season. They areas are dominated by low-growing species of annual grasses and forbs adapted to germination and early growth under water. On the Modoc National Forest these areas and associated species can be found primarily upon sage steppe in the Devil's Garden Ranger District, but are also common within yellow pine Forests of the Big Valley and parts of the Doublehead Districts. A vernal pool study completed by Dr. Robert Holland in 2006 delineated 660 vernal pools within the Devil's Garden and Doublehead Ranger Districts based on aerial photography with partial ground-verifying to test accuracy. However, many of these have been negatively affected by livestock or wildlife management activities (Holland 2006). Range management activities have been responsible for hydrologically altering natural vernal pools by digging them out, making the pools deeper but sometimes removing the underlying hardpan and allowing the pools to drain more easily in spring, drying them out earlier in the year and thus not permitting them to maintain the same flora as previously. Also, vernal pool outlets have sometimes been dammed, flooding the pool to depths that create a perennial pond instead of one that slowly dries out over the course of the warm seasons. This flooded rare plant habitats and pushed rare plants to the new edge of the pool, which in some cases is former upland that is not necessarily suitable and perhaps not sustainable as rare plant habitat. Some of these reservoirs, stock tanks, and naturally occurring vernal pools had been given

over to nesting island construction. These roughly circular piles of aggregate, which often harbor invasive weeds such as Canada thistle, are intended as nesting sites for migratory birds. If they are successful, they may serve as an attractant to cross-country vehicle travel by bird hunters. If built atop rare plant habitat, they prevent light from reaching the plants. The effect of their weight upon the topography and the soils underlying vernal pools is as yet unknown. Constructing the islands (sometimes referred to as “goose bumps”) caused disturbance to vernal pool environs in the past, in some instances degrading rare plant habitat by compacting the soil with heavy machinery.

Currently the Modoc National Forest has two federally listed plant species. One, *Tuctoria greenei*, is Endangered, and the other, *Orcuttia tenuis*, is Threatened; these only occur in vernal pool habitat. Modoc National Forest Sensitive species occurring in vernal pools and swales are *Mimulus evanescens* and *Phacelia inundata*. Modoc National Forest WL species occurring in vernal pools and swales are *Gratiola heterosepala*, *Pogogyne floribunda*, and *Potentilla newberryi*.

The following Vernal Pool and Swale species are found within 100 feet of existing unauthorized routes: *Gratiola heterosepala*, *Pogogyne floribunda*, *Potentilla newberryi*, and *Orcuttia tenuis*.

Environmental Consequences

General Types of Impacts

Impacts to rare plants and their habitats vary across all alternatives, and no alternative completely eliminates potential adverse effects to rare plants, considering the entire NFTS. In general, alternatives with fewer miles of routes open for public wheeled motor vehicle use show reduced effects to rare plants and their habitats.

Direct Effects

Direct effects occur when individual plants are broken, crushed, or trampled by vehicles traveling or parking off road surfaces, or their habitat is physically impacted by disturbing or compacting the soil. Vehicles traveling on or parking off the route 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). Root exposure and direct root damage may occur due to vehicle passes over vegetation, particularly in loose soils, or in wet soils susceptible to rutting; these impacts can affect plant vigor and survival success.

Direct effects are dependent upon the intensity and timing of disturbance. Effects are also dependent upon the number of plants at a specific location and the proportion of the occurrence impacted. Repeated damage of this type weakens the compensatory capabilities of rare plants, which can lead to degradation of habitat and eventually to the replacement of native plants species with non-native species more adapted to frequent disturbances, such as invasive weeds.

Indirect Effects

Indirect effects are caused by the action and are later in time, or further removed in distance, but are still reasonably foreseeable. Indirect impacts to rare plants can occur from soil erosion or compaction, dust fugitives, or from the potential displacement of rare and native species with non-native or invasive species. Indirect impacts to soil from repeated off-road vehicle use can lead to the degradation of habitat for rare plants and other native plant communities. Soil compaction, erosion, and modification of soil properties can affect the distribution, abundance, growth rate, reproduction, and size of plants (Ouren et al. 2007). Wilshire and Nakata (1976) report that initial use by OHVs results in a loss of cohesion and lateral displacement of soils, while repeated use leads to compaction. The effects of soil erosion on plants can include undercutting of root systems as routes 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 et al. 1978).

Soil compaction and the subsequent decrease in infiltration and distribution of water through the soil profile can lead to decreased moisture available for plant growth (Snyder et al. 1976). Compaction caused from 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). Meadows are particularly susceptible to compaction due to the fact that most meadows remain wet into August, with many staying wet year-round. In rare plant habitat, soils subjected to vehicular traffic that become compacted and eroded due to wheel ruts may become unsuitable for seedling development and the sustainability or expansion of that rare plant population could be affected.

Compaction by vehicles also contributes to roadside invasions of exotic plant species by reducing native plant vigor and creating areas of competition-free space that are open to invasion (Ouren et al. 2007, Munger et al. 2003, Trombulak & Frissell 2000, Wilshire et al. 1978a). Trombulak & Frissell (2000) report the spread of exotics by vehicles through habitat alteration, stress on native species, and creation or maintenance of movement corridors. Repeated damage to rare plant species can lead to the degradation of habitat and eventually to the replacement of native plant species, with species more adapted to frequent disturbance, such as invasive weeds. Off-highway vehicles have been shown to accelerate plant invasions (von der Lippe and Kowarik 2007) by reducing native plant vigor and cover (Brooks and Lair 1995), creating a competition-free habitat open to invasion (Frenkel 1970), and acting as a vector for seed dispersal. For a more detailed discussion of the effects of roads and vehicles on weed invasion, and the effects of weeds on native vegetation, refer to the effects section for invasive plant species.

Dust from motor 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. Dust can block photosynthesis, respiration, and transpiration, and may even be sufficient in some cases to alter community structure (Trombulak & Frissell 2000).

Cumulative Effects

A cumulative effect can result from the incremental impact of the action when added to the effects of past, present, and reasonably foreseeable future actions. Past activities are considered part of the existing conditions and are discussed within the Affected Environment section above. This is because the existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed to those effects.

The Forest boundary outside of the South Warner Wilderness Area, and excluding private inholdings within the proclaimed Forest boundary, was chosen as the cumulative effects analysis area for all rare species within this analysis. Ongoing or future actions on private lands within the Forest boundary may also have cumulative impacts on these species, but since survey requirements and mitigations for rare plant species are not known, the type and extent of the potential impacts to rare plant species on private lands cannot be quantified.

The existing condition of rare plants on the Modoc National Forest is the result of multiple past disturbances on multiple scales across the landscape, including volcanic activity, erosion, and fire, as well as human-caused disturbances, which have created a diversity of plant habitats on both spatial and temporal scales. Knowledge of rare plants, their locations on the Forest, and their habitat needs have increased over the years, but remains incomplete. Botanical surveys for Modoc National Forest projects are conducted with a primary focus on known potential habitat for TES and WL plant species. They do not cover entire project areas due to lack of available staff for intensive surveying.

Also, many species of concern are very small in stature and are easily overlooked during surveys. Therefore, it is possible that isolated populations are overlooked during surveys. It is probable that documented occurrences of TES and WL plant species are a very incomplete representation of occurrences actually present on the Forest. Scientific understanding of rare plant ecological needs has increased with time, but for most rare plant species little is known about specific ecological requirements and responses to different types of disturbances. Overall, there is no way to determine what impact past activities have or have not had on each species and their potential habitat, due to a lack of historical knowledge and detailed habitat requirements for these species.

Present and future activities that are associated with the proposed route system could impact rare species growing along or in the vicinity of a designated trail. These activities may include routine maintenance, such as clearing brush, posting signs, cleaning, or clearing of debris, or increased levels of dispersed camping or recreation along and near routes. Future projects in timber harvest and vegetation treatments, range management, fuel treatments, dam construction and maintenance, recreation, reforestation, railroad rights-of-way vegetation management, road decommissioning, and special uses may also contribute impacts to rare plant species. Monitoring of road and trail conditions, which is required (see appendix C), will detect if resource damage is occurring to sensitive species, and will instigate the development of species-specific mitigations or route closure. The effects of other types of future projects (e.g., 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.

Effects of Alternatives on Rare Plant Species

The following sections provide a discussion of the direct, indirect, and cumulative effects of each alternative to and rare plant species and their habitats. Only those rare plant species with the potential to be affected directly or indirectly by the proposed project (those within 100 feet of a proposed route) are discussed in detail in this document. The remainder of the discussion is focused on the general effects to rare species and habitats from motor vehicle use.

Addendum to Effects Analysis

Note: After this effects analysis was completed, (July 9, 2009) Alternative 5 was adjusted to remove unauthorized routes from consideration for addition that potentially affect the three remaining sensitive species (*Buxbaumia viridis*, *Eriogonum umbellatum* var. *glaberrimum*, and *Calochortus longebarbatus* var. *longebarbatus*). The very minor effect of this change is reflected in the revised Monitoring Plan and in the Record of Decision. It did not justify the added work that would have been necessary to make these corrections throughout the entire botany section.

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. Cross-country travel by merely one vehicle has the potential to crush or grind up rare plants. Kellomaki and Saastmoinen (1975, in Yorks et al. 1997) noted that the initial use of a trail creates the greatest deterioration; even as few as 1 to 20 passes have been shown to reduce plant cover by stunting plants (Adams et al. 1982 in Ouren et al. 2007). Vehicles traveling through mud easily alter surface hydrology, potentially blocking water from Sensitive plant habitat, or conversely, potentially flooding it.

Under this alternative, it is impossible to quantify when and where rare plant species and habitats would be impacted by motor vehicles; therefore, the analysis below uses the 490.5 miles of unauthorized routes as a representation of current motor 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.

Direct and Indirect Effects

Of the 676 mapped occurrences within the project area, there are 23 Sensitive, and 40 Special-Interest plant occurrences currently documented within 100 feet of the 490.53 miles of unauthorized routes on the Modoc National Forest. In addition, there are currently five occurrences of *Orcuttia tenuis*, found within 100 feet of unauthorized routes within the analysis area. This represents approximately nine percent of the rare plant occurrences on the Forest.

With the implementation of the No Action Alternative, cross-county travel would continue on the Forest, which would continue the threat of impacts to known and potential rare plant habitat across the Forest. As a result, this alternative has the greatest negative effect on all habitats and their associated species.

Under this alternative, there would be no seasonal closures of NFTS roads. Seasonal closures could potentially provide a minimal reduction in impacts to adjacent rare plant occurrences. Under this alternative, there would continue to be no mixed use allowed on NFTS level 3 roads, which may provide a minimal reduction in noxious weed risk for adjacent rare plant occurrences. However, potential negative and positive effects from no seasonal closures and no mixed use on NFTS roads are miniscule relative to the direct and indirect effects resulting from continued cross-country motor vehicle use.

Barren Habitats

Barren habitats have not been heavily impacted by off-road travel on the Modoc National Forest. There are no unauthorized routes currently present within the Barren habitat, so there are no known impacts to rare plants within this habitat from off-road vehicle use. It is possible that rare plant occurrences growing in barren habitats could be impacted in the future with continued cross-country travel under the No Action Alternative. However, there is no evidence of negative impacts to rare plant species in barren habitats at this time.

Fen and Wet Meadow Habitats

With the implementation of the No Action Alternative, cross-county travel would continue on the Forest, which would continue the threat of impacts to fen and wet meadow habitats and their associated rare plant species. Fens and wet meadows can also be degraded by long-term OHV use, directly or indirectly, by de-watering, rutting, changing the drainage patterns to these systems, or by moving sediments into these areas. Species within open, wet habitats are the most susceptible to continued long-term impacts from use of these areas. Fens are particularly susceptible to impacts from OHV use within them as motor vehicle use has the potential to disrupt key hydrological processes essential to maintaining the integrity of the fen system. With continued use, there is the potential to remove or kill vegetation, which can de-water the fen, and oxidize the peat.

Currently, there are three fen and meadow species, with a total of four occurrences that are found within 100 feet of existing unauthorized routes across the Forest (Table 3-38). Both true fen and perennially wet meadow sites are susceptible to impacts from cross-country travel.

Table 3-38. The number of Fen and Meadow Species Occurrences Known Within 100 Feet of Unauthorized Routes, by Alternative

Species	Alternative				
	1	2	3	4	5
<i>Botrychium lunaria</i>	1	0	0	0	0
<i>Botrychium pinnatum</i>	1	0	0	0	0

Species	Alternative				
	1	2	3	4	5
<i>Sphagnum spp.</i>	2	0	0	0	0
Total number of rare plant occurrences	4	0	0	0	0

Roads within these habitats can be detrimental to the functionality of the hydrologic process, due to the fact that wet meadows and fens remain wet year-round. Routes that pass through or along edges of fens and wet meadows cause long-term adverse impacts to rare plant habitat and individuals, which can include impacts such as a loss of vegetation, changes in hydrology, accelerated erosion, and soil compaction. Soil compaction can influence drainage patterns as well as cause ruts in these well-defined soils. In either case, water infiltration into fens and wet meadow soils is slowed or drainage patterns altered. These effects can permanently convert rare fen and wet meadow habitats into dry meadows. In addition, these habitats can be highly susceptible to invasion from noxious weed species that thrive in wet conditions such as Canada thistle (*Cirsium arvense*).

Currently there are 13.71 miles of unauthorized routes located within 100 feet of fen and wet meadows habitats on the Modoc National Forest. There are currently 10.45 acres located within 100 feet of existing unauthorized roads that have the potential to be directly or indirectly impacted by the No Action Alternative (Table 3-39).

Table 3-39. Approximate Number Of Miles and Acres of Habitat of Unauthorized (Alt. 1) or Proposed (Alts. 2-5) Routes Within 100 Feet of Fens and Wet Meadows Habitat¹

Measure	Alternative				
	1	2	3	4	5
Miles of Proposed Routes	0	0.09	0	0.09	0.09
Miles of Unauthorized Routes	13.71	0	0	0	0
Total Miles	13.71	0.09	0	0.09	0.09
Acres of Potential Habitat ²	10.45	0.10	0	0.10	0.10

¹ Analysis includes mapped fens (Holland) combined with CalVeg types HJ and HM.

² Calculated within 100 feet of existing unauthorized routes and proposed routes, within fen and wet meadow habitats

Forested Habitats

Currently, there are five species living principally within Forest habitats, with a total of 20 occurrences that are found within 100 feet of existing unauthorized routes across the Forest (Table 3-40), making this one of the habitats most vulnerable to cross-country motor vehicle travel. This habitat encompasses a variety of Forest types. Some areas have dense timber stands and are not amenable to cross-country vehicle travel, while other areas are in relatively open yellow pine stands where cross-country travel has a greater risk of damaging rare plant potential habitats. Meadow openings within Forests are important habitats for *Carex halliana* and *Calochortus longebarbatus* var. *longebarbatus*.

Table 3-40. The Number of Forest Species Occurrences Known Within 100 Feet of Unauthorized (Alt. 1) or Proposed (Alts. 2-5) Routes, by Alternative

Species	Alternative				
	1	2	3	4	5
<i>Carex halliana</i>	5	1	0	1	1

Species	Alternative				
	1	2	3	4	5
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	12	4	0	2	4
<i>Cypripedium montanum</i>	1	0	0	0	0
<i>Dimeresia howellii</i>	1	1	0	0	1
<i>Eriogonum umbellatum</i> var. <i>glaberrimum</i>	1	1	0	1	1
Total number of Rare plant occurrences	20	7	0	4	7

Currently there are 64.53 miles of unauthorized routes located within Forest habitat on the Modoc National Forest. There are currently 1,709 acres of Forest rare plant habitat located within 100 feet of existing unauthorized roads that have the potential to be directly or indirectly impacted by the No Action Alternative (Table 3-41).

Table 3-41. Approximate Number of Miles and Acres of Habitat of Proposed Routes and Unauthorized Routes Within Forest Habitat Type¹, and Acres of Potential Habitat Within 100 Feet of Routes

Measure	Alternative				
	1	2	3	4	5
Miles of Proposed Routes within Potential Habitat	0	55.62	0	42.47	55.62
Miles of Unauthorized Routes within Potential Habitat	64.48	0	0	0	0
Total Miles	64.48	55.62	0	42.47	55.62
Acres of Potential Habitat²	1,709.10	1,472.25	0	1,126.22	1,472.25

¹ Calveg types used in analysis include EP, JJ, MF, WF.

² Calculated within 100 feet of existing unauthorized routes, within forested habitats.

Riparian Habitats

The Riparian habitat has the greatest number of rare plant species and occurrences potentially affected by cross-country travel in the No Action Alternative. Like the Fen and Wet Meadow habitats, Riparian areas occurring along both streams and lake shores can also be permanent impacted by cross-country travel. Species can be impacted by long-term use in their habitats. Currently there are eight species, with a total of 26 occurrences, found within 100 feet of unauthorized roads across the Forest (Table 3-42).

Table 3-42. The Number of Riparian Species Occurrences Known within 100 feet of Unauthorized (Alt. 1) and Proposed (Alts. 2-5) Routes, by Alternative

Species	Alternative				
	1	2	3	4	5
<i>Botrychium lunaria</i>	1	0	0	0	0
<i>Botrychium pinnatum</i>	1	0	0	0	0
<i>Buxbaumia viridis</i>	4	0	0	0	0

Species	Alternative				
	1	2	3	4	5
<i>Gratiola heterosepala</i>	9	4	0	3	4
<i>Pogogyne floribunda</i>	8	3	0	3	3
<i>Potentilla newberryi</i>	1	0	0	0	0
<i>Ribes hudsonianum</i> var. <i>petiolare</i>	1	0	0	0	0
<i>Salix bebbiana</i>	1	0	0	0	0
Total number of Rare plant occurrences	26	7	0	6	7

Currently there are 12.29 miles of unauthorized routes located within 100 feet of Riparian habitats on the Modoc National Forest. There are 312.74 acres of Riparian habitats located within 100 feet of existing unauthorized roads that have the potential to be directly or indirectly impacted by the No Action Alternative.

Table 3-43. Approximate Number of Miles and Acres of Potential Habitat of Proposed Routes and Unauthorized Routes within 100 Feet of Streams and Lake Shores

Measure	Alternative				
	1	2	3	4	5
Miles of Proposed Routes	0	4.85	0	3.68	4.85
Miles of Unauthorized Routes	12.29	0	0	0	0
Total Miles	12.29	4.85	0	3.68	4.85
Acres of Potential Habitat¹	686.74	262.56	0	208.87	262.56

¹ Calculated within 100 feet of existing unauthorized routes, within riparian habitats

Sage Steppe Habitats

Although the sage-steppe habitat type is one of the most common and extensive habitat types on the Forest, there currently is only one known rare plant species occurring within 100 feet of unauthorized routes (Table 3-44). This habitat is particularly vulnerable to invasion by weedy annual grasses, particularly cheatgrass and Medusahead, which have the potential to severely alter ecological functions of the sage steppe. This is also a relatively open habitat type, which is vulnerable to cross-country motor vehicle travel.

Table 3-44. The Number of Sage Steppe Species Occurrences Known within 100 Feet of Unauthorized (Alt. 1) and Proposed (Alts. 2-5) Routes, by Alternative

Species	Alternative				
	1	2	3	4	5
<i>Cordylanthus capitatus</i>	2	0	0	0	0
Total number of Rare plant occurrences	3	1	0	1	1

Currently there are 22.14 miles of unauthorized routes located within sage steppe habitat on the Modoc National Forest. There are currently 574.99 acres located within 100 feet of existing unauthorized roads that have the potential to be directly or indirectly impacted by the No Action Alternative (Table 3-45).

Table 3-45. Approximate Miles and Acres Adjacent to Habitat of Potential Habitat of Proposed Routes and Unauthorized Routes within Sage Steppe Habitat Type

Measure	Alternative				
	1	2	3	4	5
Miles of Proposed Routes within Potential Habitat	0	11.24	0	6.75	11.24
Miles of Unauthorized Routes within Potential Habitat	22.14	0	0	0	0
Total Miles	22.14	11.24	0	6.75	11.24
Acres of Potential Habitat ¹	574.99	292.27	0	178.27	292.27

¹ Calculated within 100 feet of existing unauthorized routes, within sage steppe habitats

Vernal Pools and Swales Habitat

The Vernal Pools and Swales habitat supports the greatest number of TES species on the Forest, including the single federally listed Endangered plant species, *Tuctoria greenei*, and the single federally listed Threatened plant species on the Forest, *Orcuttia tenuis*. At the same time, this is one of the most vulnerable habitat types to disturbance.

With the implementation of the No Action Alternative, cross county travel would continue on the Forest, which would continue the threat of impacts to vernal pool and swales habitats and their associated rare plant species. Vernal pools and swales can also be degraded by long-term OHV use, directly or indirectly, by rutting, changing the drainage patterns to these systems, or moving sediments into these areas. Species within open, wet habitats are the most susceptible to continued long-term impacts from use of these areas. Vernal pools and swales are particularly susceptible to impacts from OHV use within them, as motor vehicle use has the potential to remove or kill vegetation, which consists largely of ephemeral annual species. Damage to plants prior to seed set can interfere with reproductive capability of plants and, over time, deplete the soil seed bank.

Currently, there are five Vernal Pool and Swale species, including one federally listed Endangered and one federally listed Threatened species, with a total of 22 occurrences that are found within 100 feet of existing unauthorized routes across the Forest (Table 3-46).

Table 3-46. The Number of Vernal Pool and Swale Species Occurrences Known within 100 Feet of Unauthorized (Alt. 1) or Proposed (Alts. 2-5) Routes, by Alternative

Species	Alternative				
	1	2	3	4	5
<i>Orcuttia tenuis</i> (federally Threatened)	6	2	0	0	2
<i>Gratiola heterosepala</i>	9	3	0	0	3
<i>Pogogyne floribunda</i>	8	3	0	0	3
<i>Potentilla newberryi</i>	1	0	0	0	0
Total number of rare plant occurrences	24	8	0	0	8

Currently there are 21.81 miles of unauthorized routes located within 100 feet of Vernal Pools and Swales habitat on the Modoc National Forest. There are currently 454.31 acres located within 100 feet of existing unauthorized roads that have the potential to be directly or indirectly impacted by the No Action Alternative (Table 3-47).

Table 3-47. Approximate Miles of Proposed Routes and Unauthorized Routes within 100 Feet of Vernal Pools and Swales

Measure	Alternative				
	1	2	3	4	5
Miles of Proposed Routes within Potential Habitat	0	6.89	0	3.99	6.89
Miles of Unauthorized Routes within Potential Habitat	21.81	0	0	0	0
Total Miles	21.81	6.89	0	3.99	6.89
Acres of Potential Habitat¹	454.31	75.75	0	50.74	75.75

¹ Calculated within 100 feet of existing unauthorized routes, within vernal pools and swales habitat

Orcuttia tenuis

Because *Orcuttia tenuis* is a federally listed Threatened species, it is analyzed here separately from other vernal pool rare plant species. There are seven known occurrences of *Orcuttia tenuis* located in vernal pools within 300 feet of unauthorized routes, inside the analysis area (Table 3-48). The 300-foot analysis buffer is being used for this species analysis to facilitate compliance with the Endangered Species Act.

Table 3-48. The Number of Federally Listed, Threatened *Orcuttia Tenuis* Occurrences Located in Vernal Pools within 300 Feet of Presently Proposed, Unauthorized Routes

Species	Alternative				
	1	2	3	4	5
Total number of <i>Orcuttia tenuis</i> occurrences	7	6	0	0	6

Off-highway vehicle use on unauthorized roads is currently impacting vernal pool plants directly by driving on plants and rutting vernal pool habitats, or indirectly by impacting the sites with sediments and potentially changing the hydrology of the pool. There are currently 1152.57 acres of Vernal Pool habitat located within 300 feet of 30.78 miles of unauthorized routes across the Modoc National Forest (Table 3-49).

Table 3-49. Approximate Miles And Acres Of Habitat of Proposed Routes and Unauthorized Routes within 300 Feet Of Vernal Pools

Measure	Alternative				
	1	2	3	4	5
Miles of Proposed Routes	0	12.04	0	6.78	12.04
Miles of Unauthorized Routes	30.78	0	0	0	0
Total Miles	30.78	12.04	0	6.78	12.04

Measure	Alternative				
	1	2	3	4	5
Acres of Potential Habitat ¹	1152.57	273.60	0	168.50	273.60

¹ Calculated within 300 feet of existing unauthorized routes, within Vernal Pool habitats

Cumulative Effects

The implementation of Alternative 1 would not improve conditions for rare plant species or their habitats. Cross-country vehicle travel would continue, and the proliferation of routes would increase within the project area. Unmanaged motor vehicle use on the Modoc National Forest has the potential for negative direct and indirect effects to all of the rare species known to occur within the project area (Table 3-50).

Under this alternative, motor vehicles traveling on and off unauthorized route would continue to trample, kill, and uproot rare species. Indirect effects to rare species and their associated habitats described in the general effects section could apply to all occurrences and species found within the project analysis area. However, the potential impacts would most likely occur to those species within 100 feet of existing unauthorized routes. Habitats which are open and accessible, such as the Fens and Wet Meadows and the Riparian habitats, are most susceptible.

One of the largest potential impacts from cross-country motorized use 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, recreational activities (such as camping, hiking, horseback riding, and hunting), and ongoing land management activities such as road maintenance and range management. Under this alternative, all but the most inaccessible habitats are at risk of noxious weed invasion and spread from cross-country motor vehicle travel, due to the potential for all roads within the project area to spread weeds.

Ongoing and foreseeable future actions, such as grazing and range management, dam construction and maintenance, timber harvest, fuels management, wildfires and prescription burns, and woodcutting activities, have also created temporary roads and skid trails that often contribute to cross-country travel and the creation of unauthorized routes. Under this alternative, these negative impacts would continue to occur. For a complete list of ongoing and foreseeable future actions for the Modoc National Forest, refer to the Modoc National Forest Travel Management Final Environmental Impact Statement (FEIS), appendix E.

Negative direct and indirect impacts to rare plants and their habitats from Forest management activities are minimized by conducting botany surveys prior to project implementation, with flagging and avoidance of all rare plant occurrences. Compliance with the Modoc National Forest weed management strategies (USDA Forest Service 2005) during all management activities minimizes the risk for introduction and spread of noxious weeds.

Action Alternatives

Detailed discussions of potential effects on rare plant species for the action alternatives are found below (Table 3-50). When data are available, acres of affected habitat and species are provided. Many of our Sensitive and Watch List plant species on the Forest, however, were not mapped accurately, and the exact acres for these occurrences are estimates based on the original discovery documentation. Also, many of these occurrences have not been revisited since their initial discovery, some as long as 20 years ago, and the current status of these populations is unknown. Analysis is based on available records. No field surveys were conducted specifically along proposed routes.

Impacts to rare plants from the action alternatives would be similar to those from those discussed within the No Action Alternative above; however, with the prohibition of cross-country travel, and the closure of many of the unauthorized routes within the Proposed Action, impacts to rare plant species would be far fewer. Over the short term there would be little difference between any of the alternatives, as it takes time for roads to heal. However, over the long term (20 years) unauthorized roads not designated would begin to re-vegetate, and could potentially become re-colonized by rare species. As a result, any negative impacts would be decreased with time.

Table 3-50. Rare Plant Species Located Within 100 Feet of Unauthorized Routes (Alt. 1) or Proposed Routes (Alts. 2, 4, 5)

Species (Habitat)	Status	Occurrence or Suboccurrence	Route Number	Alternatives				
				1	2	3	4	5
<i>Botrychium lunaria</i> (R)	Sensitive	1	BA436	X				
<i>Botrychium pinnatum</i> (R)	Sensitive	1	BA419	X				
<i>Buxbaumia viridis</i> (R)	Sensitive	1	BA473 BA474	X	X		X	X
<i>Buxbaumia viridis</i> (R)	Sensitive	4	BA406 BA407	X	X		X	X
<i>Buxbaumia viridis</i> (R)	Sensitive	6	BA419	X				
<i>Buxbaumia viridis</i> (R)	Sensitive	7	BA472	X	X		X	X
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i> (FE, F)	Sensitive	10	ML414	X				
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i> (FE, F)	Sensitive	11	ML444	X				
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i> (FE, F)	Sensitive	12 / A, B, C	ML444	X				
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i> (FE, F)	Sensitive	20	TR310	X	X		X	X
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i> (FE, F)	Sensitive	70 / A	ML2099 ML2100	X				
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i> (FE, F)	Sensitive	77	JW2135	X	X		X	X
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i> (FE, F)	Sensitive	78 / A	BA143	X	X			X
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i> (FE, F)	Sensitive	79	ML459	X				
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i> (FE, F)	Sensitive	82	ML432	X	X			X
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i> (F)	Sensitive	85 / A	BA2300	X				
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i> (FE, F)	Sensitive	86	ML422	X				
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i> (FE, F)	Sensitive	89	ML414	X				

Species (Habitat)	Status	Occurrence or Suboccurrence	Route Number	Alternatives				
				1	2	3	4	5
<i>Carex halliana</i> (F)	Watch List	4	BA2212	X				
<i>Carex halliana</i> (F)	Watch List	5	BA2211	X				
<i>Carex halliana</i> (F)	Watch List	7	BA2204 BA2050	X	X		X	X
<i>Carex halliana</i> (F)	Watch List	9	BA2190 BA2191	X				
<i>Carex halliana</i> (F)	Watch List	10	BA2192	X				
<i>Cordylanthus capitatus</i> (SS)	Watch List	4	BA436	X				
<i>Cordylanthus capitatus</i> (SS)	Watch List	6	SS741 SS748	X				
<i>Cypripedium montanum</i> (F)	Sensitive	11	ML2089	X				
<i>Dimeresia howellii</i> (F)	Watch List	2	BA497	X	X			X
<i>Eriogonum umbellatum</i> var. <i>glaberrimum</i> (F)	Sensitive	6	SS551	X	X		X	X
<i>Gratiola heterosepala</i> (R, VP)	Watch List	1	SS72	X				
<i>Gratiola heterosepala</i> (R, VP)	Watch List	2	SS73	X				
<i>Gratiola heterosepala</i> (R, VP)	Watch List	4	SS54 SS55	X				
<i>Gratiola heterosepala</i> (R, VP)	Watch List	6	ML476	X				
<i>Gratiola heterosepala</i> (R, VP)	Watch List	9	BA173	X	X			X
<i>Gratiola heterosepala</i> (R, VP)	Watch List	13	ML584	X	X		X	X
<i>Gratiola heterosepala</i> (R, VP)	Watch List	16	BA55	X	X		X	X
<i>Gratiola heterosepala</i> (R, VP)	Watch List	17	ML290	X				
<i>Gratiola heterosepala</i> (R, VP)	Watch List	18	BA2217	X	X		X	X
<i>Iliamna bakeri</i> (SS)	Watch List	7 / A, E, O, P	ML327 ML328 ML329 ML330 ML336 ML343 ML344 ML404 ML405 ML406 ML1300 ML1304 ML1305 ML1306 ML1307	X	X		X	X

Species (Habitat)	Status	Occurrence or Suboccurrence	Route Number	Alternatives				
				1	2	3	4	5
			ML1308 ML1310 ML2018 PK6 PK8 PK9 PK10 PK11 PK13 PK14 PK15					
<i>Iliamna bakeri</i> (SS)	Watch List	35	SS238	X	X		X	X
<i>Iliamna bakeri</i> (SS)	Watch List	44	PA39	X	X		X	X
<i>Orcuttia tenuis</i> (VP)	Threatened	1	ML450 ML451	X				
<i>Orcuttia tenuis</i> (VP)	Threatened	4	ML440	X				
<i>Orcuttia tenuis</i> (VP)	Threatened	11	ML461	X	X			X
<i>Orcuttia tenuis</i> (VP)	Threatened	12b	ML474	X	X			X
<i>Orcuttia tenuis</i> (VP)	Threatened	13	SS330	X				
<i>Orcuttia tenuis</i> (VP)	Threatened	17	ML460	X				
<i>Pogogyne floribunda</i> (R, VP)	Watch List	1	SS72	X				
<i>Pogogyne floribunda</i> (R, VP)	Watch List	3	SS73	X				
<i>Pogogyne floribunda</i> (R, VP)	Watch List	4	BA71	X	X		X	X
<i>Pogogyne floribunda</i> (R, VP)	Watch List	6	ML122	X				
<i>Pogogyne floribunda</i> (R, VP)	Watch List	9	BA49	X				
<i>Pogogyne floribunda</i> (R, VP)	Watch List	10	ML299	X	X		X	X
<i>Pogogyne floribunda</i> (R, VP)	Watch List	29	SS312	X	X		X	X
<i>Pogogyne floribunda</i> (R, VP)	Watch List	34	ML450, ML45	X				
<i>Potentilla newberryi</i> (R)	Watch List	4 / A, B	ML277 ML280	X				
<i>Ribes hudsonianum</i> var. <i>petiolare</i> (R)	Watch List	1	SS943 SS945 SS947	X				
<i>Rorippa columbiae</i> (R)	Sensitive	1	ML268	X				
<i>Rorippa columbiae</i> (R)	Sensitive	2	ML280	X				
<i>Rorippa columbiae</i> (R)	Sensitive	3	ML277	X				

Species (Habitat)	Status	Occurrence or Suboccurrence	Route Number	Alternatives				
				1	2	3	4	5
<i>Salix bebbiana</i> (R)	Watch List	1	SS943 SS945 SS947	X				
<i>Sphagnum</i> spp. (FE)	Watch List	1	BA418	X				
<i>Sphagnum</i> spp. (FE)	Watch List	2	BA417	X				

Alternative 2 – The Proposed Action

Direct and indirect Effects: Prohibition of Cross-Country Motor vehicle Travel and the Addition of Unauthorized Roads to the NFTS

Sensitive and Special-Interest Plant Species and Associated Habitats

Alternative 2 prohibits cross-country travel, and adds approximately 336 miles of roads to the NFTS. This alternative has the second-highest level of impact to rare plant species and their associated habitats, equivalent to that of Alternative 5, and lower in impact only to Alternative 1.

Table 3-51. Summary of Indicator Measures for the Analysis of Effects to Rare Plant Species for the Prohibition of Cross-Country Travel and the Addition of Routes Under Alternative 2

Measure	Total*
Miles of proposed routes within 100 feet of rare plant sites, or within or adjacent to suitable rare plant habitat.	125.80 miles
The number of acres of potential habitat for rare plants within 100 feet of routes.	2,840.43 acres
Total number of plant occurrences within 100 feet of proposed routes.	21

There are currently eight known species of rare plants documented within 100 feet of routes proposed for addition under Alternative 2, found within the Riparian, Fen and Wet Meadows, Forest, Sage Steppe, and Vernal Pool habitats. These species will be discussed below. If species are found in more than one habitat, they will be discussed in the habitat that is perceived to have the highest potential (most open) for impacts from off-road vehicles.

Riparian Habitat

Currently there is one rare plant species, *Buxbaumia viridis*, within Riparian habitat, found along routes proposed for addition that may be directly or indirectly impacted with the implementation of Alternative 2. In addition, there are currently 4.85 miles of routes, with a total of approximately 122.56 acres, within Riparian habitats that have the potential to be impacted by the implementation of this alternative.

Buxbaumia viridis (Bug-on-a-stick)

There are currently three occurrences of *Buxbaumia viridis* within 100 feet of unauthorized routes proposed for addition within Alternative 2. All three occurrences are in the Warner Mountains.

Table 3-52. Potential Impacts to *Buxbaumia viridis* from Alternative 2

Occurrence or Suboccurrence	Route	Individuals with Potential for Impact	Total Size of Occurrence (Individuals)	Percent of Occurrence Affected
1	BA473 BA474	12 plants	12 plants	100
4	BA406 BA407	2 plants	2 plants	100
7	BA472	9 plants	9 plants	100

This is a minute moss species found only on decaying logs within and adjacent to streams, and populations have been documented with numbers of individuals rather than acreages. It occurs only on decaying logs within or adjacent to streams.

Occurrence #1: This occurrence was discovered in 2004, and is located near routes BA473 and BA 474, at the head of Mill Creek.

Occurrence #4: This occurrence had two individuals when it was discovered in 2005, and is located near routes BA406 and BA407, at the headwaters of Goose Creek.

Occurrence #7: This occurrence had nine individuals when it was discovered in 2007, and is located near route BA472, also at the head of Mill Creek.

Alternative 2 has the potential to both directly and indirectly affect Occurrences #4 and #7, and to indirectly affect Occurrence #1. Potential impacts include removal or damaging of riparian logs which provided required habitat. Because of low population sizes and stringent habitat requirements, damage to or loss of a single log could potentially eliminate an entire occurrence. This unique habitat of rotting logs in streams makes *Buxbaumia viridis* unlikely to suffer direct impacts from being driven over. However, hydrologic alterations diverting water away from habitat logs, or drying up the springs and streams that keep habitat logs moist, are potential indirect impacts.

Fens and Wet Meadows Habitat

Currently there are no known rare plant species within the Fens and Wet Meadows habitat found within 100 feet of proposed route additions under Alternative 2. However, there are currently 13.71 miles of routes, with a total of approximately 10.45 acres, within Fens and Wet Meadows habitats that have the potential to be impacted by the implementation of this alternative.

Vernal Pool Habitat

Currently there are two rare plant species, *Gratiola heterosepala* and *Pogogyne floribunda*, that are within Vernal Pool habitat, found along routes proposed for addition, and potentially directly or indirectly impacted with the implementation of Alternative 2. In addition, there are currently 21.81 miles of routes, with a total of approximately 454.31 acres, within Vernal Pool habitats that have the potential to be impacted by the implementation of this alternative.

***Gratiola heterosepala* (Boggs lake hedge-hyssop)**

This is a Watch List species known from 17 occurrences on the Forest. This member of the snapdragon family inhabits vernal pools and similar wet clay habitats. There are currently four occurrences of *Gratiola heterosepala* within 100 feet of unauthorized routes proposed for addition within Alternative 2 (Table 3-53). Occurrence #9 had an estimated population of 10,000,000 plants when it was discovered in 1993, and is located in the Mowitz buttes area, near Williams Reservoir. Occurrence #13 had an estimated 300 plants when it was discovered in 1994, and is located in the Devil’s Garden District near Lower Cummings Reservoir. Occurrence #16 had approximately 100

plants when it was discovered in 1997, and is located near a small, unnamed vernal pool in the vicinity of Quaking Aspen Spring. Occurrence #18 had 2 plants when it was discovered in 1997, and is located in the Medicine Lake Highlands east of Alcohol Crater.

Gratiola heterosepala habitat ranges from moist to submerged during the months when vehicles can access the Forest. This makes the habitat subject to hydrologic alteration. Also, the dry upland surroundings of Devil’s Garden vernal pools can be very dusty beginning in early summer, so motor vehicle use in the vicinity may spread dust over adjacent plants. However, this is a relatively widespread species across the Forest, and addition of the proposed routes would not impact the viability of this species, particularly combined with the prohibition of cross-country travel, which is the much greater threat to vernal pool species.

Table 3-53. Potential Impacts to *Gratiola heterosepala* from Alternative 2

Occurrence or Suboccurrence	Route	Acres with potential for impact	Total size of Occurrence (Acres)	Percent of Occurrence affected
9	BA173	0.18	357	<1%
13	ML584	0.06	51.4	1%
16	BA55	0.38	0.5	76%
18	BA2217	1.63	1.6	102% ¹

¹ This percentage exceeds 100%, probably due to rounding error of reported total site acreage.

Pogogyne floribunda (Profuse-flowered pogogyne)

This Watch List species is known from 42 occurrences across the Forest. A member of the mint family, it grows in vernal pools and similarly vernal wet areas. There are currently three occurrences of *Pogogyne floribunda* within 100 feet of unauthorized routes proposed for addition within Alternative 2. Occurrence #4 had approximately 75 plants when it was discovered in 1988, and is located east of Lone Pine Lake. Occurrence #10 had approximately 2,000 plants when it was last visited in 1998, and is located adjacent to the OTHB radar installation. Occurrence #29 had approximately 50 plants when it was discovered in 2001, and is located in the Mowitz Buttes area, about 1 1/2 miles northeast of Knobcone Butte. This species appears to tolerate moderate disturbance well. With the number and size of occurrences on the Forest, addition of the proposed routes would not impact the viability of this species.

Table 3-54. Potential Impacts to *Pogogyne floribunda* from Alternative 2

Occurrence or Suboccurrence	Route	Acres with potential for impact	Total size of Occurrence (Acres)	Percent of Occurrence affected
4c	BA71	0.47	1.6	29%
10	ML299	0.12	8.2	2%
29	SS312	0.80	24	3%

Forest Habitat

Currently there are four rare plant species, *Eriogonum umbellatum* var. *glaberrimum*, *Calochortus longebarbatus* var. *longebarbatus*, *Carex halliana*, and *Dimeresia howellii*, which are within the Forest habitat, found along routes proposed for addition, and potentially directly or indirectly impacted with the implementation of Alternative 2. In addition, there are currently 64.48 miles of

routes, with a total of approximately 1,709.10 acres, within Forest habitats that have the potential to be impacted by the implementation of this alternative.

Calochortus longebarbatus* var. *longebarbatus (Long-haired star tulip)

There are currently four occurrences of *Calochortus longebarbatus* var. *longebarbatus* within 100 feet of unauthorized routes proposed for addition within Alternative 2 (Table 3-55).

Table 3-55. Potential Impacts to *Calochortus longebarbatus* var. *longebarbatus* from Alternative 2

Occurrence or Suboccurrence	Route	Acres with potential for impact	Total size of Occurrence (Acres)	Percent of Occurrence affected
20	TR310	0.61	1.3	47%
77	JW2135	4.3	186	2%
78A	BA143	0.16	31	1%
82	ML432	0.24	3.3	7%

Occurrence #20: This occurrence is located near route TR310, 0.5 mile west of Mud Springs.

Occurrence #77: This is a large occurrence which surrounds the proposed route, JW2135, west of Ambrose Station. It also surrounds Vernal Pool #301.

Occurrence #78A: This occurrence is located near route BA143, southeast of Hog Lake.

Occurrence #82: This small occurrence is located near route ML432, west of Duncan Lake and County Road 10.

This species occurs in meadows openings within forests. Alternative 2 has the potential to impact three occurrences of *Calochortus longebarbatus* var. *longebarbatus* both directly and indirectly, and to impact a fourth occurrence indirectly. Potential impacts include trampling of plants and associated compaction and erosion of the meadow habitats, as well as the potential introduction of noxious weeds into these sites. Since this is a meadow species, its habitat can be very susceptible to degradation due to repeated and continued use, especially during the spring months when these areas are wet. Occurrence #20 is the most vulnerable due to its relatively small size and percentage of the population potentially impacted. For the other three occurrences, due to the large sizes of the occurrences, any impacts would be confined to only a portion, so the viability of these occurrences would be maintained. This species is known from 138 occurrences across the Forest (USDA Forest Service 2008). Due to the size and number of occurrences, and stability of the species on the Forest, addition of the proposed routes would not impact the viability of *Calochortus longebarbatus* var. *longebarbatus* within the project area or throughout the Forest.

Eriogonum umbellatum* var. *glaberrimum (Green buckwheat)

This sensitive species is known from six occurrences on the Forest. There is currently one known occurrence of *Eriogonum umbellatum* var. *glaberrimum* within 100 feet of unauthorized routes proposed for addition within Alternative 2 (Table 3-56). This occurrence is located at the north end of the Warner Mountains, near County Road 2. It had 20 plants when it was last monitored in 2003.

Table 3-56. Potential impacts to *Eriogonum umbellatum* var. *glaberrimum* from Alternative 2.

Occurrence or Suboccurrence	Route	Acres with potential for impact	Total size of Occurrence (Acres)	Percent of Occurrence affected
6	SS551	0.09	1	9%

Carex halliana (Hall’s sedge)

This Watch List species is known from 11 occurrences across the Forest. There is currently one occurrence of *Carex halliana* within 100 feet of unauthorized routes proposed for addition within Alternative 2 (Table 3-57). This occurrence is located west of the Glass Mountain Geologic Area, and had approximately 4,000 plants when it was discovered in 1997.

Table 3-57. Potential impacts to *Carex halliana* from Alternative 2

Occurrence or Suboccurrence	Route	Acres with Potential for Impact	Total size of Occurrence (Acres)	Percent of Occurrence Affected
7	BA2204 BA2050	0.71	29.2	2%

Dimeresia howellii (Doublet)

This Watch List species is known from 11 occurrences on the Forest. It is a diminutive member of the sunflower family, inhabiting gravelly, dry volcanic soils. Because of its small size, growing to about the size of a quarter, driving over the plant can readily crush and grind it into the volcanic gravel where it grows. There is currently one occurrence of *Dimeresia howellii* within 100 feet of unauthorized routes proposed for addition within Alternative 2 (Table 3-58). This occurrence is located in steep volcanic scree, west of Cedarville, in a site not readily accessible to OHVs. It had approximately 100 plants when it was discovered in 1987.

Table 3-58. Potential Impacts to *Dimeresia howellii* from Alternative 2

Occurrence or Suboccurrence	Route	Acres with Potential for Impact	Total size of Occurrence (Acres)	Percent of Occurrence Affected
2	BA497	0.0003	0.6	<1%

Sage Steppe Habitat

Currently there is one rare plant species, *Iliamna bakeri*, which is within the sage steppe habitat, found along routes proposed for addition, and potentially directly or indirectly impacted with the implementation of Alternative 2 (Table 3-59). In addition, there are currently 22.14 miles of routes, with a total of approximately 574.99 acres, within sage steppe habitats that have the potential to be impacted by the implementation of this alternative.

Iliamna bakeri (Baker’s Globe-Mallow)

This Watch List species is known from 61 occurrences across the Forest. There are currently three occurrences of *Iliamna bakeri* within 100 feet of unauthorized routes proposed for addition within Alternative 2 (Table 3-59). One of these occurrences includes five sub-populations potentially impacted by proposed route additions. Occurrence #7 consists of a collection of 17 sub-populations

with a total estimated population of 1,000,000 plants. Sub-populations were discovered between 1999 and 2003. This occurrence is located in the Damon/Long wildfire site, south of Tionesta, where 23,398 acres burned in August 1996. Occurrence #35 had approximately 3,600 plants when it was discovered in 2002. It is located near route SS238, within the 2001 Bell wildfire, 20 miles north-northwest of Canby. Occurrence #44 had approximately 150 plants when it was discovered in 2002, and 42 plants when it was revisited in 2003. It is located on the east side of Timber Mountain, an area which burned in the 1992 Timber wildfire. *Iliamna bakeri* is a species which thrives in recently burned sites, and not only tolerates but thrives with disturbance. Addition of the proposed routes would not affect the viability of this species within any of the known occurrences or across its range.

Table 3-59. Potential Impacts to *Iliamna bakeri* from Alternative 2

Occurrence or Suboccurrence	Route	Acres with Potential for Impact	Total Size of Occurrence (Acres)	Percent of Occurrence Affected
7, 7O, 7P	ML327	219.74	23,571.4	<1%
	ML328			
	ML329			
	ML330			
	ML336			
	ML343			
	ML344			
	ML404			
	ML405			
	ML406			
	ML1300			
	ML1304			
	ML1305			
	ML1306			
	ML1307			
	ML1308			
	ML1310			
	ML2018			
	PK6			
	PK8			
PK9				
PK10				
PK11				
PK13				
PK14				
PK15				
35	SS238	7.24	53.1	14%
44	PA39	1.52	137.8	1%

Federally listed Plant Species

Orcuttia tenuis

There is one known occurrence of *Orcuttia tenuis* located within 100 feet of proposed route additions, located in the Devil’s Garden Ranger District (Table 3-60).

Table 3-60. Potential impacts to *Orcuttia tenuis* from Alternative 2

Occurrence or Suboccurrence	Route	Acres with potential for impact	Total size of Occurrence (Acres)	Percent of Occurrence potentially affected
11	ML461	0.4	0.6	67%

Occurrence #11: This population is located in vernal pool #217 near route ML461. Population size was estimated at approximately 5,000 plants in 2008. Although the proposed route addition, ML461, is located within 100 feet of this occurrence, it is not likely to affect the occurrence. Forest Road 40N06 separates ML461 from the vernal pool where Occurrence #11 is located, and the proposed route runs south from Road 40N06, and away from the vernal pool.

There are four known *Orcuttia tenuis* occurrences located in vernal pools that are within 300 feet of proposed route additions, all within the Devil’s Garden Ranger District.

Occurrence #4: This population is located in the eastern half of Hackamore Reservoir, with an estimated population of 2,000,000 plants in 2003. The proposed routes within 300 feet of the pool are ML372, ML374, and ML375, all located at the western end of the reservoir more than 2,000 from the mapped *Orcuttia tenuis* occurrence. No impact to *Orcuttia tenuis* is expected from adding the proposed routes, because the routes access Hackamore Reservoir dam, do not impact the vernal pool, and are more than 0.5 mile from the known population.

Occurrence #12: This occurrence is located in Duncan Reservoir near route ML488. Population size was estimated at approximately 10,000 plants in 2008. Addition of route ML488 is not like to impact the *Orcuttia tenuis* occurrence here, because it is more than 1,500 feet from the closest *Orcuttia tenuis* population. It is an existing route that does not affect the vernal pool habitat.

Occurrence #14: This occurrence has two sub-populations, located in Williams Reservoir. Population A is located along the southwestern shoreline, with an estimated population of 18,500,000 plants. Population B is located on the eastern shoreline, and has an estimated population of 75,000 plants. Both sub-populations were discovered in 2008. No effect is expected from adding the proposed route, BA173, because this established road accesses the lake shoreline more than 1,000 feet from either *Orcuttia tenuis* sub-population, and does not impact the occurrence or its habitat.

Occurrence #15: This occurrence is located along the northeastern shorelines of Vernal Pool #264, in the central pool south and east of Henski Reservoir. This occurrence was found in 2008, and the population size was estimated at 500,000 in the main population on the eastern shoreline of this middle pool, and approximately 50 plants in the southern edge of this pool. No impacts to *Orcuttia tenuis* are expected from adding proposed routes BA2289 and BA2290, because these routes access the dam area and are more than 0.5 mile from the populations.

All of the known occurrences of *Orcuttia tenuis* have persisted since the user-created, non-system routes became established. Most are located more than 1,000 feet from proposed routes, in large vernal pools expanded by artificial earth-fill dams. There would be no effect on the *Orcuttia tenuis* due to addition of the routes that are more than 1,000 feet from occurrences. All of these proposed routes currently exist, and would not result in any new ground disturbance or disturbance to the vernal pool hydrology or habitats for *Orcuttia tenuis*.

The occurrence with proposed routes closer than 1,000 feet will not be impacted by adding proposed routes, since the closest route leads away from the pool habitat with an established NFTS road between it and the pool habitat.

Changes to the Existing NFTS

Sensitive and Watch List Plant Species and Associated Habitats

In addition to the prohibition of cross-country travel and addition of unauthorized routes, Alternative 2 also proposes to enact seasonal closures on 312 miles of NFTS roads, and to allow mixed use on an additional 138 miles of NFTS roads. Seasonal closures occurring during the months when roads are wet and muddy may potentially slightly reduce impacts to rare plant occurrences within 100 feet of the affected roads, as a result of reduced ground damage along and adjacent to muddy roadways. There are currently 30 known rare plant occurrences within 100 feet of NFTS roads scheduled for seasonal closures under Alternative 2 (Table 3-61).

Table 3-61. Rare Plant Species Located within 100 Feet of NFTS Roads Proposed for Seasonal Closures, for all Alternatives

Species (Guild)	Status	Occurrence or Suboccurrence	Road Number	Alternatives				
				1	2	3	4	5
<i>Carex halliana</i> (F)	Watch List	1	43N47 43N48 43N56		X		X	X
<i>Carex halliana</i> (F)	Watch List	2	43N47A		X		X	X
<i>Carex halliana</i> (F)	Watch List	9	43N47		X		X	X
<i>Carex halliana</i> (F)	Watch List	10	43N47B		X		X	X
<i>Carex halliana</i> (F)	Watch List	11	43N47A		X		X	X
<i>Cordylanthus capitatus</i> (SS)	Watch List	6	46N06A				X	
<i>Gratiola heterosepala</i> (VP, R))	Watch List	1	47N10 46N05C 46N05 46T05CA		X		X	X
<i>Gratiola heterosepala</i> (VP, R)	Watch List	2	46N05		X		X	X
<i>Gratiola heterosepala</i> (VP, R))	Watch List	4	46B02B 46B02JB 46B02J		X		X	X
<i>Hulsea nana</i> (B)	Watch List	1	44N53		X		X	X
<i>Iliamna bakeri</i> (SS,B)	Watch List	4	46N02		X		X	X
<i>Iliamna bakeri</i> (SS,B)	Watch List	5	46N02 46N02E		X		X	X
<i>Iliamna bakeri</i> (SS,B)	Watch List	6	42N31				X	
<i>Iliamna bakeri</i> (SS,B)	Watch List	20	39N01				X	
<i>Iliamna bakeri</i> (SS,B)	Watch List	28	39N01				X	
<i>Iliamna bakeri</i> (SS,B)	Watch List	32	42N43		X		X	X
<i>Meesia triquetra</i> (FE)	Sensitive	4	46N06		X		X	X
<i>Phacelia sericea</i> var. <i>ciliosa</i> (SS, B)	Watch List	1	42N43		X		X	X

Species (Guild)	Status	Occurrence or Suboccurrence	Road Number	Alternatives				
				1	2	3	4	5
<i>Phlox hoodii</i> ssp. <i>muscooides</i> (B, SS)	Watch List	1	42N43		X		X	X
<i>Pogogyne floribunda</i> (VP, R)	Sensitive	1	47N10 46N05C 46N05 46T05CA		X		X	X
<i>Pogogyne floribunda</i> (VP, R)	Sensitive	2	46N05		X		X	X
<i>Pogogyne floribunda</i> (VP, R)	Sensitive	3	46N05		X		X	X
<i>Pogogyne floribunda</i> (VP, R)	Sensitive	13	46N05		X		X	X
<i>Pogogyne floribunda</i> (VP, R)	Sensitive	24	46N02 46B02J		X		X	X
<i>Pogogyne floribunda</i> (VP, R)	Sensitive	25	45N06		X		X	X
<i>Pogogyne floribunda</i> (VP, R)	Sensitive	26	46A02Y 46N02A 46N02		X		X	X
<i>Pogogyne floribunda</i> (VP, R)	Sensitive	27	46N02		X		X	X
<i>Pogogyne floribunda</i> (VP, R)	Sensitive	28	46N02		X		X	X
<i>Pogogyne floribunda</i> (VP, R)	Sensitive	32	45N28		X		X	X
<i>Pogogyne floribunda</i> (VP, R)	Sensitive	33	45N28		X		X	X

Vernal pool and fen habitats are both vulnerable to changes in hydrology, which can be impacted by roads. Although effects of seasonal closures on NFTS roads would likely be minimal, these are the two rare plant habitat types most likely to experience potential positive effects from seasonal closures during winter and early spring months. Therefore, the number of vernal pools and fens located within 100 feet of proposed NFTS seasonal road closures was considered (Table 3-62).

Table 3-62. Vernal Pools and Fens Within 100 Feet of NFTS Roads Proposed for Seasonal Closures, for all Alternatives

Habitat Type	Alternative				
	1	2	3	4	5
Number of Vernal Pools within 100 feet of roads	0	35	0	35	35
Number of Roads within 100 feet of vernal pools	0	29	0	29	29
Miles of Roads within 100 feet vernal pools	0	8.16	0	8.16	8.16
Number of fens within 100 feet of roads	0	0	0	2	0
Number of roads within 100 feet of fens	0	0	0	3	0
Miles of Roads within 100 feet of fens	0	0	0	0.33	0

Allowing mixed use on NFTS roads would probably have no direct effects on rare plant occurrences. However, it could have negative indirect effects resulting from increased risk of noxious weed propagule spread and introduction, since OHVs might be more likely to have traveled through weed-infested sites than passenger vehicles prior to entering the Forest. This potential for increase weed

risk may be partially mitigated by routine maintenance along level 3 roads, which includes noxious weed treatment. Overall, this potential increased risk would be minute relative to impacts from cross-country travel or travel on level 2 roads which do not receive annual maintenance. There are currently three known rare plant occurrences within 100 feet of NFTS level 3 roads proposed for mixed use under Alternative 2 (Table 3-63).

Table 3-63. Rare Plant Species Located Within 100 Feet of Level 3 NFTS Roads Proposed for Mixed Use, for all Alternatives

Species (Guild)	Status	Occurrence or Suboccurrence	Road Number	Alternatives				
				1	2	3	4	5
<i>Astragalus anxius</i> (B)	Sensitive	1	38N04					X
<i>Astragalus pulsiferae</i> var. <i>coronensis</i> (SS, JW, F)	Sensitive	1A	38N04					X
<i>Calochortus longebarbatus</i> var. <i>longebaratus</i> (F)	Sensitive	5	42N56					X
<i>Calochortus longebarbatus</i> var. <i>longebaratus</i> (F)	Sensitive	19	40N13 41N11					X
<i>Calochortus longebarbatus</i> var. <i>longebaratus</i> (F)	Sensitive	21	41N11					X
<i>Calochortus longebarbatus</i> var. <i>longebaratus</i> (F)	Sensitive	23	39N17					X
<i>Calochortus longebarbatus</i> var. <i>longebaratus</i> (F)	Sensitive	24	41N11					X
<i>Calochortus longebarbatus</i> var. <i>longebaratus</i> (F)	Sensitive	33	41N11					X
<i>Calochortus longebarbatus</i> var. <i>longebaratus</i> (F)	Sensitive	36	41N11					X
<i>Calochortus longebarbatus</i> var. <i>longebaratus</i> (F)	Sensitive	37	41N11					X
<i>Calochortus longebarbatus</i> var. <i>longebaratus</i> (F)	Sensitive	68	41N44					X
<i>Carex halliana</i> (F)	Watch List	1	43N48					X
<i>Carex halliana</i> (F)	Watch List	4	43N21					X
<i>Carex halliana</i> (F)	Watch List	9	43N47B					X
<i>Carex halliana</i> (F)	Watch List	10	43N47B					X
<i>Cordylanthus capitatus</i> (SS)	Watch List	6	46N06A		X			X
<i>Cypripedium montanum</i> (F)	Sensitive	1	40N12					X
<i>Cypripedium montanum</i> (F)	Sensitive	3	41N11 40N37					X
<i>Cypripedium montanum</i> (F)	Sensitive	7	40N05					X
<i>Cypripedium montanum</i> (F)	Sensitive	9	40N05					X
<i>Cypripedium montanum</i> (F)	Sensitive	10	40N05A					X
<i>Cypripedium montanum</i> (F)	Sensitive	11	41N44					X
<i>Cypripedium montanum</i> (F)	Sensitive	12	40N05					X
<i>Cypripedium montanum</i> (F)	Sensitive	13	40N05					X

Species (Guild)	Status	Occurrence or Suboccurrence	Road Number	Alternatives				
				1	2	3	4	5
<i>Cypripedium montanum</i> (F)	Sensitive	20	40N11					X
<i>Cypripedium montanum</i> (F)	Sensitive	30	40N11					X
<i>Gratiola heterosepala</i> (VP, R))	Watch List	12	46N10					X
<i>Gratiola heterosepala</i> (VP, R))	Watch List	14	46N10					X
<i>Iliamna bakeri</i> (SS, B)	Watch List	6	42N31					X
<i>Iliamna bakeri</i> (SS,B)	Watch List	7	44N77					X
<i>Iliamna bakeri</i> (SS,B)	Watch List	7	42N56		X			X
<i>Iliamna bakeri</i> (SS,B)	Watch List	20	39N01					X
<i>Iliamna bakeri</i> (SS,B)	Watch List	28	39N01					X
<i>Iliamna bakeri</i> (SS,B)	Watch List	33	46N10					X
<i>Iliamna bakeri</i> (SS,B)	Watch List	35	46N10					X
<i>Ivesia paniculata</i> (B, SS, F, JW)	Sensitive	1	37N11					X
<i>Ivesia paniculata</i> (B, SS, F, JW)	Sensitive	2	38N04					X
<i>Ivesia paniculata</i> (B, SS, F, JW)	Sensitive	3	38N04					X
<i>Ivesia paniculata</i> (B, SS, F, JW)	Sensitive	4	38N04 37N11					X
<i>Ivesia paniculata</i> (B, SS, F, JW)	Sensitive	9	38N46					X
<i>Ivesia paniculata</i> (B, SS, F, JW)	Sensitive	15	37N11					X
<i>Ivesia paniculata</i> (B, SS, F, JW)	Sensitive	19	38N04					X
<i>Meesia triquetra</i> (FE)	Sensitive	4	46N06		X			X
<i>Mertensia longiflora</i>	Watch List	2	40N37					X
<i>Pogogyne floribunda</i> (VP, R)	Watch List	20	45N09					X
<i>Pogogyne floribunda</i> (VP, R)	Watch List	29	44N11					X
<i>Potentilla newberryi</i> (VP,R)	Watch List	4	47N06					X

Because of available moisture, fen and vernal pool habitats adjacent to NFTS roads could also be potentially more vulnerable to weed infestations than other rare plant habitats. They are also important for many rare plant species on the Modoc National Forest. Therefore, the number of vernal pools and fens located with 100 feet of NFTS level 3 roads proposed for mixed use was considered (Table 3-64). As for known rare plant occurrences, allowing mixed use would likely have only a minimal indirect effect of slightly increased risk of noxious weed introduction.

Table 3-64. Vernal Pools and Fens within 100 Feet of NFTS Roads Proposed For Mixed Use, for all Alternatives

Habitat Type	Alternative				
	1	2	3	4	5
Number of vernal pools within 100 feet of roads	0	2	0	0	11
Number of roads within 100 feet of vernal pools	0	2	0	0	8

Habitat Type	Alternative				
	1	2	3	4	5
Miles of roads within 100 feet vernal pools	0	0.08	0	0	0.79
Number of fens within 100 feet of roads	0	2	0	0	2
Number of roads within 100 feet of fens	0	4	0	0	4
Miles of roads within 100 feet of fens	0	0.38	0	0	0.38

Federally Listed Plant Species

The same potential factors apply to the federally listed species, *Orcuttia tenuis*, as are described above for Sensitive and Special-Interest plant species. However, there are no known occurrences of *Orcuttia tenuis* located within 100 feet of any NFTS roads proposed for either seasonal closures or mixed use under Alternative 2. Therefore, there would be no direct or indirect effects from seasonal closures or mixed use classification of level 3 NFTS roads under Alternative 2.

Cumulative Effects

Implementation of Alternative 2 would improve conditions for rare plant species and their habitats by prohibiting cross-country motor vehicle travel and limiting the number of currently existing unauthorized routes to be added to the NFTS. It would discontinue the proliferation of unauthorized routes across the project area, and compared with Alternative 1, the probability of negative direct effects on rare plants is drastically reduced. Over the long term (20-plus years) this would have a positive indirect effect on rare plant species by reducing the cumulative negative effect from motor vehicle traffic. Designation of routes would have a small cumulative effect on rare plants, because these routes are already present and in use by motor vehicles across the Forest. Placing these routes on the MVUM as part of the route designation process could potentially increase the amount of motor vehicle use on these routes, which would in turn increase the potential for negative direct and indirect effects on rare plants. However, overall recreational use on the Modoc Forest is relatively light, in comparison with other Region 5 forests, and increases on newly designated routes are expected to be small.

Under Alternative 2, the highest risk of weed introduction and spread by motor vehicles would be reduced to NFTS roads, including the proposed route additions. Locating and treating these weeds would be more efficient, and occurrences along roads (as opposed to those in the Forest interior) might be easier to locate and treat before becoming large infestations threatening rare plant habitats. The prohibition of travel on unauthorized roads, along with maps guiding the public, would insure that road-like disturbances due to timber harvesting or fire-line construction would not become de facto new roads, allowing those trails and temporary roads to recover rare plant habit qualities over time (Lovich and Bainbridge 1999). The Sage Steppe Restoration Projects may benefit rare plant species which grow in this habitat type; these benefits would be augmented by implementing Alternative 2 compared with Alternative 1, since any benefits would not be counteracted by the possibility of cross-country damage to the plants or their habitats.

As described under Alternative 1 cumulative effects, ongoing Forest management activities may contribute to impacts on rare plant species, but are protected by standard botany surveying, flagging and avoidance of occurrences, and weed-prevention measures. For a complete list of ongoing and foreseeable future actions for the Modoc National Forest, see appendix E. Alternative 2 is expected to have a low contributory effect on the cumulative effects from Forest management activities.

Alternative 3

Direct and Indirect Effects: Prohibition of cross-country motor vehicle travel and the addition of unauthorized roads to the NFTS

Sensitive and Watch List Plant Species and Associated Habitats

Alternative 3 prohibits cross-country travel, and does not add any new roads to the NFTS. Under this alternative, the Boles Road would remain open to motor vehicles, and the pumice road would remain open to OHV use.

Alternative 3 would have the fewest direct and indirect effects on rare plants. The banning of cross-country motor vehicle use would have the same effects for Alternative 3 as for Alternative 2, and these effects are described in greater detail in the Alternative 2 effects discussion. In summary, banning cross-country motor vehicle use would prevent direct and indirect negative effects to rare plant occurrences caused by trampling, dust, erosion, and invasive noxious weeds. Because no routes would be added to the NFTS, all of the rare plant occurrences currently within 100 feet of unauthorized routes would be protected from future motor vehicle disturbance. This alternative would provide the greatest benefit to rare plants and their habitats.

Federally Listed Plant Species

Alternative 3 would have no negative effect on the federally listed Threatened species, *Orcuttia tenuis*. Because no new routes would be added to the NFTS, and because cross-country motor vehicle traffic would be prohibited, Alternative 3 could have an indirect positive effect on this species by removing motor vehicle use from areas adjacent to vernal pool habitats.

Changes to the Existing NFTS

Sensitive and Watch List Plant Species and Associated Habitats

Under Alternative 3, there would be no proposed changes to the existing NFTS; there would be no direct or indirect effects on Sensitive and Special-Interest plant species or on their associated habitats.

Federally Listed Plant Species

Because there are no proposed changes to the existing NFTS, there would be no direct or indirect effects on the federally listed Threatened species, *Orcuttia tenuis*.

Cumulative Effects

For a complete list of ongoing and foreseeable future actions for the Modoc National Forest, refer to the Modoc National Forest Travel Management FEIS, chapter 3, appendix E). There would be no negative direct or indirect effects to rare plant species under Alternative 3, so there would be no cumulative negative effects under this alternative. The prohibition of cross-country motor vehicle use could potentially have an indirect positive effect on rare plant species. However, the prohibition of cross-country travel does not eliminate the presence of unauthorized routes currently on the ground. Therefore, any benefits would be minor in the short term and would occur only over the long term (20 or more years) as routes heal over naturally.

Alternative 4

Direct and Indirect Effects: Prohibition of cross-country motor vehicle travel and the addition of unauthorized roads to the NFTS

Sensitive and Watch List Plant Species and Associated Habitats

Under Alternative 4, a total of 286 miles of unauthorized roads would be added to the NFTS, 53 miles fewer than would be added under Alternatives 2 and 5. Of these roads, 57.79 miles would be within 100 feet of 16 rare plant sites, and would be within 100 feet of 1,452.29 acres of potential rare plant habitat (Table 3-65). Alternative 4 has the second-lowest impact of the five alternatives the rare plant

species. There are currently seven rare plant species with known occurrences located within 100 feet of proposed routes under this alternative: *Buxbaumia viridis*, *Calochortus longebarbatus* var. *longebarbatus*, *Carex halliana*, *Eriogonum umbellatum* var. *glaberrimum*, *Gratiola heterosepala*, *Iliamna bakeri*, and *Pogogyne floribunda*.

Alternative 4 prohibits cross-country travel, and adds approximately 286 miles of roads to the NFTS. This alternative has the second lowest level of impact to rare plant species and their associated habitats, higher in impact only to Alternative 3.

Table 3-65. Alternative 4: Summary of Indicator Measures for the Analysis of Effects to Rare Plant Species for the Prohibition of Cross-Country Travel and the Addition of Routes

Measure	Total
Miles of unauthorized routes within 100 feet of rare plant sites, or within or adjacent to suitable rare plant habitat	57.79 miles
Number of acres of potential habitat for rare plants within 100 feet of routes	1452.29 acres
Total number of plant occurrences (NFTS) within 100 feet of unauthorized routes.	16

There are currently seven known species of rare plants documented within 100 feet of routes proposed for addition under Alternative 4, found within the Riparian, Fen and Wet Meadows, Forest, Sage Steppe, and Vernal Pool habitats. These species are the same as for Alternatives 2 and 5, with the exception that there are no occurrences of *Dimeresia howellii* within 100 feet of any Alternative 4 proposed routes. Species will be discussed by habitats below. As for Alternative 2, if species are found in more than one habitat, they will be discussed in the habitat that is perceived to have the highest potential (most open) for impacts from off-road vehicles. Because there is considerable overlap and similarity in effects for Alternative 2 and Alternative 4, the discussion will focus on differences between these two alternatives.

Riparian Habitat

Currently there is one rare plant species, *Buxbaumia viridis*, within Riparian habitat, found along routes proposed for addition that may be directly or indirectly impacted with the implementation of Alternative 4. In addition, there are currently 3.68 miles of routes, with a total of approximately 96.87 acres, within Riparian habitats that have the potential to be impacted by the implementation of this alternative.

Buxbaumia viridis (Bug-on-a-stick)

There are currently three occurrences of *Buxbaumia viridis* within 100 feet of unauthorized routes proposed for addition within Alternative 4, which are identical to those affected under Alternative 2 (Table 3-52). Refer to the Alternative 2 discussion for full details.

Fens and Wet Meadows Habitat

Currently there are no rare plant species within Fens and Wet Meadows found along routes proposed for addition with the implementation of Alternative 4. There are currently 0.9 miles of routes, with a total of approximately 0.18 acres, within Fens and Wet Meadows habitats that have the potential to be impacted by the implementation of this alternative.

Vernal Pool Habitat

Currently there are two rare plant species, *Gratiola heterosepala* and *Pogogyne floribunda*, that are within Vernal Pool habitat, found along routes proposed for addition, and potentially directly or

indirectly impacted with the implementation of Alternative 4. In addition, there are currently 3.99 miles of routes, with a total of approximately 50.74 acres, within Vernal Pool habitats that have the potential to be impacted by the implementation of this alternative.

Gratiola heterosepala (Boggs Lake hedge-hyssop)

There are currently three occurrences of *Gratiola heterosepala* within 100 feet of unauthorized routes proposed for addition within Alternative 4 (Table 3-66). This is one less occurrence than those affected under Alternative 2.

Table 3-66. Potential Impacts to *Gratiola heterosepala* from Alternative 4

Occurrence or Suboccurrence	Route	Acres with potential for impact	Total size of Occurrence (Acres)	Percent of Occurrence affected
13	ML584	0.06	51.4	1%
16	BA55	0.38	0.5	76%
18	BA2217	1.6	1.6	100%

Pogogyne floribunda (Profuse-flowered pogogyne)

There are currently three occurrences of *Pogogyne floribunda* within 100 feet of unauthorized routes proposed for addition within Alternative 4. These are identical to those affected under Alternative 2. Refer to Alternative 2 for a complete discussion of these occurrences.

Forest Habitat

Currently there are three rare plant species, *Calochortus longebarbatus* var. *longebarbatus*, *Eriogonum umbellatum* var. *glaberrimum* and *Carex halliana*, which are within Forest habitat, found along routes proposed for addition, and potentially directly or indirectly impacted with the implementation of Alternative 4. This is one less species than is impacted within Forest habitat under Alternative 2. There are only two occurrences of *Calochortus longebarbatus* var. *longebarbatus* located within 100 feet of proposed routes under this alternative, compared to three occurrences under Alternative 2 (Table 3-50). For details of these rare plant occurrences, refer to the Alternative 2 discussion.

Table 3-67. Potential Impacts to *Calochortus longebarbatus* var. *longebarbatus* from Alternative 4

Occurrence or Suboccurrence	Route	Acres with Potential for Impact	Total Size of Occurrence (Acres)	Percent of Occurrence Affected
20	TR310	0.61	1.3	47%
77	JW2135	4.3	186	2%

In addition, there are currently 42.47 miles of routes, with a total of approximately 1,126.23 acres, within Forest habitats that have the potential to be impacted by the implementation of this alternative.

Eriogonum umbellatum* var. *glaberrimum (Green buckwheat)

There is currently one occurrence of *Eriogonum umbellatum* var. *glaberrimum* within 100 feet of unauthorized routes proposed for addition within Alternative 4 (Table 3-50). Refer to Alternative 2 for a complete discussion of this occurrence.

Carex halliana (Hall’s sedge)

There is currently one occurrence of *Carex halliana* within 100 feet of unauthorized routes proposed for addition within Alternative 4 (Table 3-50). This is the same occurrence potentially affected under Alternative 2, and a complete discussion of this species can be found under Alternative 2.

Sage Steppe Habitat

Currently there is one rare plant species, *Iliamna bakeri*, which is within the Sage Steppe habitat, found along routes proposed for addition, and potentially directly or indirectly impacted with the implementation of Alternative 4 (Table 3-44). In addition, there are currently 6.75 miles of routes, with a total of approximately 178.27 acres, within Sage Steppe habitats that have the potential to be impacted by the implementation of this alternative.

Iliamna bakeri (Baker's globe-mallow)

There are currently three occurrences of *Iliamna bakeri* within 100 feet of unauthorized routes proposed for addition within Alternative 4. One of these occurrences includes five sub-populations potentially impacted by proposed route additions. These occurrences are identical to those under Alternative 2; refer to Alternative 2 for a detailed discussion of effects.

Federally Listed Plant Species

Orcuttia tenuis

There are no known occurrences of *Orcuttia tenuis* within 100 feet of any proposed routes under Alternative 4. There are no known vernal pools containing *Orcuttia tenuis* within 300 feet of any proposed routes under this alternative. Therefore, there would be no effect to *Orcuttia tenuis* under this alternative.

Changes to the Existing NFTS

Sensitive and Special-Interest Plant species and associated Habitats

Under Alternative 4, there would be seasonal closures on the same 312 miles of existing NFTS roads as under Alternative 2, plus an additional 112 miles of NFTS roads in the Warner Mountains. A total of 424 miles of NFTS roads would have seasonal closures under Alternative 4. Relative to Alternative 2, this alternative would provide a slight increase in seasonal protections from road closures for four known rare plant occurrences, one occurrence of *Cordylanthus capitatus* and three occurrences of *Iliamna bakeri*. It would also provide the minimal increase in protection from seasonal road closures for two fens in the Warner Mountains.

Under Alternative 4, no level 3 NFTS roads would be opened to mixed use. Therefore, there would be no effect from mixed use of NFTS roads on rare plants under this alternative. The Boles Road would be closed to motor vehicles and the pumice road would be closed to OHVs, the same as in Alternative 2 and Alternative 5.

Federally Listed Plant Species

There are no known occurrences of *Orcuttia tenuis* located within 100 feet of any NFTS road proposed for seasonal closures under Alternative 4. Therefore, there would be no impact on federally listed plant species.

Cumulative Effects

The implementation of Alternative 4 would be very similar to implementation of Alternative 2, so the discussion here will focus on the differences in cumulative effects between Alternative 2 and Alternative 4. For a more detailed discussion of the identical cumulative effects, refer to the cumulative effects discussion for Alternative 2. Alternative 4 would add 53 fewer miles of roads to the NFTS than Alternative 2, which would reduce both direct and indirect effects to rare plants. Specifically, Alternative 4 would have direct and indirect effects on 16 known rare plant occurrences,

while Alternative 2 would have direct and indirect effects on 22 known plant occurrences. Alternative 4 would also have lesser potential direct and indirect effects on the federally listed Threatened species, *Orcuttia tenuis*, since it would not add any routes occurring within 100 feet of any known *Orcuttia tenuis* occurrence and would add only 26 routes located within 100 feet of vernal pools. By contrast, Alternative 2 would add routes occurring within 100 ft of one known *Orcuttia tenuis* occurrence, and 41 routes passing within 100 feet of vernal pools. Because several routes near rare plant occurrences and important rare plant habitats would be excluded from the NFTS under Alternative 4, this alternative would have fewer negative direct and indirect effects on rare plants and their habitats.

As described under Alternative 1 cumulative effects, ongoing Forest management activities may contribute to impacts on rare plant species, but are protected by standard botany surveying, flagging and avoidance of occurrences, and weed-prevention measures. For a complete list of ongoing and foreseeable future actions for the Modoc National Forest, refer to the Modoc National Forest Travel Management FEIS, Chapter 3, appendix E. Alternative 4 is expected to have a low contributory effect on the cumulative effects from Forest management activities.

Alternative 5

Direct and Indirect Effects: Prohibition of cross-country motor vehicle travel and the addition of unauthorized roads to the NFTS

Note: After this effects analysis was completed (July 9, 2009), Alternative 5 was adjusted to remove unauthorized routes from consideration for addition that potentially affect the three remaining sensitive species (*Buxbaumia viridis*, *Eriogonum umbellatum* var. *glaberrimum*, and *Calochortus longebarbatus* var. *longebarbatus*). The very minor effect of this change is reflected in the revised Monitoring Plan and in the Record of Decision. It did not justify the added work that would have been necessary to make these corrections throughout the entire botany section.

Sensitive and Watch List Plant Species and Associated Habitats

Under Alternative 5, the routes proposed for addition to the NFTS are identical to those proposed under Alternative 2, as well as the closure of Boles Road to all motor vehicles and the closure of pumice road to OHVs. The direct and indirect effects of prohibition of cross-country motor vehicle travel and the addition of unauthorized roads to the NFTS on Sensitive and Watch List plant species and associated habitats under Alternative 5 would be identical to those effects under Alternative 2. They are described under Alternative 2, above.

Federally Listed Plant Species

The direct and indirect effects of prohibition of cross-country motor vehicle travel and the addition of unauthorized roads to the NFTS on *Orcuttia tenuis* and its associated Vernal Pool habitat under Alternative 5 would be identical to those effects under Alternative 2, and are described under Alternative 2 above.

Changes to the Existing NFTS

Sensitive and Special-Interest Plant Species and Associated Habitats

In addition to the prohibition of cross-country travel, and addition of unauthorized routes, Alternative 5 also proposes to enact seasonal closures on 312 miles of NFTS roads, and to allow mixed use on 531 miles of level 3 NFTS roads. The proposed seasonal closures are for the same roads as in Alternative 2, but the seasons of closure are for only two seasons of use, as opposed to four seasons of use under Alternative 2. The difference in effects of the differences in closure dates would be minimal, since both closure schedules would close roads during the muddy season. Therefore, the effects of seasonal closures on rare plants under Alternative 5 would be similar to those under Alternative 2.

Alternative 5 would allow mixed use on the same 138 miles of NFTS level 3 roads as in Alternative 2, plus an additional 392 miles of level 3 roads. As with Alternative 2, allowing mixed use on NFTS roads might potentially increase the risk of noxious weed propagule introduction, since OHVs might be more likely to have traveled through weed-infested sites than passenger vehicles prior to entering the Forest. However, as described under Alternative 2, this risk is partially mitigated by routine road maintenance along level 3 roads, which includes weed treatment. The comparatively small indirect effect of increased weed risk could potentially affect a total of five Sensitive plant species and six Watch List species located within 100 feet of roads, with a combined total of 47 rare plant occurrences. The Sensitive species are *Astragalus anxius*, *Astragalus pulsiferae* var. *coronensis*, *Calochortus longebarbatus* var. *longebarbatus*, *Cypripedium montanum*, and *Ivesia paniculata*. The Watch List species are *Carex halliana*, *Gratiola heterosepala*, *Iliamna bakeri*, *Mertensia longiflora*, *Pogogyne floribunda*, and *Potentilla newberryi*. In addition, there are 11 vernal pools located within 100 feet of proposed mixed-use roads which could also receive potential indirect effects from increased weed introduction risk. There are also two fens located within 100 feet of proposed mixed-use roads, the same as in Alternative 2. Alternative 5 would overall have the greatest negative effect from changes in the NFTS of the four action alternatives. However, this effect would still be small relative to the effects from continued cross-country travel under Alternative 1.

Federally Listed Plant Species

There are no known occurrences of *Orcuttia tenuis* located within 100 feet of any NFTS roads proposed for seasonal closures or mixed use under Alternative 5, so there would be no effects from these actions on federally listed plant species.

Cumulative Effects

The implementation of Alternative 5 would have similar direct and indirect effects as implementation of Alternative 2, except for minimally greater potential indirect effects from allowing mixed use on all NFTS level 3 roads. Therefore, cumulative effects would also be similar for both of these alternatives. For a complete discussion of cumulative effects, refer to the Alternative 2 cumulative effects section. The only difference under Alternative 5 would be a slightly greater risk of negatively impacting rare plants and vernal pool habitats with noxious weed introductions due to addition of OHV traffic on NFTS level 3 roads.

Summary of Determinations

Alternative 2

With the restriction of cross-country travel and the addition of 336 miles of new system roads, the Modoc National Forest Travel Management Project implementation of Alternative 2 would have no effect on any currently known occurrences of the following species: *Astragalus anxius*, *Astragalus lemmonii*, *Astragalus pulsiferae* var. *coronensis*, *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium lunaria*, *Botrychium minganense*, *Botrychium montanum*, *Botrychium pinnatum*, *Bruchia bolanderi*, *Cypripedium montanum*, *Eriogonum prociduum*, *Galium glabrescens* ssp. *modocense*, *Galium serpenticum* ssp. *warnerense*, *Ivesia paniculata*, *Lupinus latifolius* var. *barbatus*, *Meesia triquetra*, *Meesia uliginosa*, *Mimulus evanescens*, *Phacelia inundata*, and *Rorippa columbiae*. The implementation of Alternative 2 may have effects on *Buxbaumia viridis*, *Calochortus longebarbatus* var. *longebarbatus*, and *Eriogonum umbellatum* var. *glaberrimum*, but would not lead toward a trend to Federal listing (the rationale may be found in the effects discussions above). Because none of the routes proposed for addition was surveyed, there is a potential that currently unknown occurrences of these species and their habitat may be impacted. Implementation of Alternative 2 would have no effect on any occurrence of the federally listed Threatened species, *Orcuttia tenuis*.

Alternative 3

With the restriction of cross-country travel, the Modoc National Forest Travel Management Project implementation of Alternative 3 would have no effect on the following species: *Astragalus anxius*, *Astragalus lemmonii*, *Astragalus pulsiferae* var. *coronensis*, *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium lunaria*, *Botrychium minganense*, *Botrychium montanum*, *Botrychium pinnatum*, *Bruchia bolanderi*, *Buxbaumia viridis*, *Calochortus longebarbatus* var. *longebarbatus*, *Cypripedium montanum*, *Eriogonum prociduum*, *Eriogonum umbellatum* var. *glaberrimum*, *Galium glabrescens* ssp. *modocense*, *Galium serpenticum* ssp. *warnerense*, *Ivesia paniculata*, *Lupinus latifolius* var. *barbatus*, *Meesia triquetra*, *Meesia uliginosa*, *Mimulus evanescens*, *Phacelia inundata*, and *Rorippa columbiae*. Implementation of Alternative 3 would not affect the federally listed Threatened species, *Orcuttia tenuis*.

Alternative 4

With the restriction of cross-country travel and the addition of 286 miles of new system roads, the Modoc National Forest Travel Management Project implementation of Alternative 4 would have no effect on any currently known occurrences of the following species: *Astragalus anxius*, *Astragalus lemmonii*, *Astragalus pulsiferae* var. *coronensis*, *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium lunaria*, *Botrychium minganense*, *Botrychium montanum*, *Botrychium pinnatum*, *Bruchia bolanderi*, *Cypripedium montanum*, *Eriogonum prociduum*, *Galium glabrescens* ssp. *modocense*, *Galium serpenticum* ssp. *warnerense*, *Ivesia paniculata*, *Lupinus latifolius* var. *barbatus*, *Meesia triquetra*, *Meesia uliginosa*, *Mimulus evanescens*, *Phacelia inundata*, and *Rorippa columbiae*. The implementation of Alternative 4 may have effects on *Buxbaumia viridis*, *Calochortus longebarbatus* var. *longebarbatus*, and *Eriogonum umbellatum* var. *glaberrimum*, but would not lead toward a trend to listing (the rationale may be found in the effects discussions above). Because none of the routes proposed for addition was surveyed, there is a potential that currently unknown occurrences of these species and their habitat may be impacted. Implementation of Alternative 4 would not affect the federally listed Threatened species, *Orcuttia tenuis*.

Alternative 5

With the restriction of cross-country travel and the addition of 336 miles of new system roads, the Modoc National Forest Travel Management Project implementation of Alternative 5 would have no effect on any currently known occurrences of the following species: *Astragalus anxius*, *Astragalus lemmonii*, *Astragalus pulsiferae* var. *coronensis*, *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium lunaria*, *Botrychium minganense*, *Botrychium montanum*, *Botrychium pinnatum*, *Bruchia bolanderi*, *Cypripedium montanum*, *Eriogonum prociduum*, *Galium glabrescens* ssp. *modocense*, *Galium serpenticum* ssp. *warnerense*, *Ivesia paniculata*, *Lupinus latifolius* var. *barbatus*, *Meesia triquetra*, *Meesia uliginosa*, *Mimulus evanescens*, *Phacelia inundata*, and *Rorippa columbiae*. The implementation of Alternative 5 may have effects on known occurrences *Buxbaumia viridis*, *Calochortus longebarbatus* var. *longebarbatus*, and *Eriogonum umbellatum* var. *glaberrimum*, but would not lead toward a trend to listing (the rationale may be found in the effects discussions above). Because none of the routes proposed for addition was surveyed, there is a potential that currently unknown occurrences of these species and their habitat may be impacted. Implementation of Alternative 5 would not affect the federally listed Threatened species, *Orcuttia tenuis*.

Summary of Effects Analysis Across all Alternatives

Alternative 1, which allows continued cross-country motor vehicle use, would affect the greatest number of rare plant species and occurrences, as well as the greatest amount of rare plant habitats, including fens and vernal pools, and would have the greatest risk of noxious weed spread.

Of the action alternatives, Alternative 3 would provide the greatest protection for rare plants and their habitats, since it would ban cross-country travel and continued travel on unauthorized routes.

Alternative 4 would be the second-most favorable alternative for rare plants. While it is similar in effect to Alternatives 2 and 5, it would provide greater protection to vernal pool species, and would affect fewer known rare plant occurrences. Alternatives 2 would have marginally lower impacts to rare plants than Alternative 5, and Alternative 5 would offer the lowest protections for rare plants. However, because all of the action alternatives ban cross-country motor vehicle use, they all provide a significant level of protection for rare plant species and their habitats across the Forest.

Table 3-68. Effects Summary for Rare Plants, Habitats, and Noxious Weeds

Measure		Alt 12	Alt 23	Alt 33	Alt 43	Alt 53
Number of plant occurrences ¹ within 30 feet (direct and indirect effect)	Occurrence	48	16	0	12	16
	Occurrence	14	6	0	4	6
Total number of plant occurrences (NFTS) within 100 feet of routes		62	22	0	16	22
Percent of known occurrences (NFTS) within 100 feet of routes		13.2%	4.7%	0%	3.4%	4.7%
Number of vernal pools within 30 feet of routes		48 (206.65 acres)	29 (25.07 acres)	0 (0 acres)	18 (18.84 acres)	29 (25.07 acres)
Number of vernal pools within 100 feet of routes		59 (454.31 acres)	41 (75.75 acres)	0 (0 acres)	26 (50.74 acres)	41 (75.75 acres)
Number of vernal pools within 300 feet of routes		81 (1152.57)	59 (273.60)	0 (0 acres)	40 (168.5 acres)	59 (273.60)
Number of fens within 30 feet of routes		1 (4.49 acres)	0 (0 acres)	0 (0 acres)	0 (0 acres)	0 (0 acres)
Number of fens within 100 feet of routes		3 (10.45 acres)	1 (0.09 acre)	0 (0 acres)	1 (0.09 acre)	1 (0.09 acre)
Miles of weed infested roads (weeds within 100 feet of routes)		28.78	16.09	0	14.19	16.09
Acres of weed infestations within 100 feet of routes		79.71	71.86	0	71.61	71.86

¹ Occurrences affected by more than one route were counted only once. Occurrences counted within 0 to 50 feet of a route were not counted again within 50 to 100 feet of route.

² Impacts related to continued use of unauthorized routes

³ Impacts related to changes to the NFS system, including additions of roads to the NFS, changes to season of use, and changes in vehicle class.

Compliance with the Modoc LRMP and Other Direction

No Action—Alternative 1

Alternative 1 does not accomplish with the SNFPA's goal to maintain and restore springs, seeps, vernal pools, fens, bogs, and marshes, because it allows cross-country motor vehicle use throughout the Forest, including within these special aquatic habitats. Alternative 1 does not comply with section 2670 of the Forest Service Manual (FSM), which requires the Forest Service to develop and implement management practices to ensure that rare plants do not become threatened or endangered, and to ensure their continued viability on National Forests, because it allows indiscriminant use of motor vehicles through rare plant populations and habitats. Alternative 1 does not comply with the directives of Executive Order 13112—Invasive Species 64 FR 6183 (February 8, 1999), because it allows a known, high-risk vector of noxious weeds (OHVs) to operate off established roads throughout the Forest.

Action Alternatives—Alternatives 2, 3, 4, and 5

By prohibiting cross-country motor vehicle traffic, and not adding routes that would negatively impact any Threatened or Sensitive species, Alternatives 3 and 4 comply with the MDF LRMP, the SNFPA, Executive Order 13112, and the Endangered Species Act, as well as the Forest Service Manual and Handbook. The greatest threat to rare plant species from motorized vehicle use comes from cross-country vehicle traffic. Therefore, the banning of cross-country motorized vehicle use, present in all of the action alternatives (Alternatives 2, 3, 4, and 5) provides a large measure of protection for rare plant species relative to the No Action Alternative, Alternative 1. Of the action alternatives, Alternative 3 provides the greatest protection for rare plants by not adding any unauthorized routes to the NFTS. Alternatives 2, 4, and 5 vary slightly in their potential impacts on rare plants, with slightly higher risk of negative impacts under Alternative 5 relative to Alternative 2, and slightly lesser risk of negative impacts under Alternative 4 relative to Alternative 2. Alternative 3 would provide the greatest protections for rare plant species, while Alternative 4 would provide compliant, but reduced protection. Alternatives 2 and 5 would provide the lowest levels of protection.