STANISLAUS NATIONAL FOREST

BIOLOGICAL EVALUATION FOR SENSITIVE PLANTS

ENVIRONMENTAL DOCUMENT: Rim Fire Recovery Environmental Impact Statement

PROJECT: Rim Fire Recovery

RANGER DISTRICT: Groveland and Mi-Wok Ranger Districts

PREPARED BY: Jennie Haas
Jennie Haas, District Botanist

DATE: August 22, 2014

This biological evaluation has been prepared in accordance with direction in FSM 2672.4. It is in compliance with 36 CFR 219.19 and 36 CFR 241.1.

CONTENTS

INTRODUCTION 3

CONSULTATION TO DATE 4

CURRENT MANAGEMENT DIRECTION 4

DESCRIPTION OF PROPOSED PROJECT 5
- Project Location 5
- Primary Purpose 6
- Proposed Action and Alternatives 7
- Activities Common to All Action Alternatives 7
- Alternative 1 11
- Alternative 2 11
- Alternative 3 12
- Alternative 4 13
- Sensitive Plant Protection 14

EXISTING ENVIRONMENT 16
- Project Area Plant Communities 16
- Sensitive Plant Review 20
- Current Project Surveys 22
- Past Surveys 22
- Species Accounts and Habitat Status 23

EFFECTS OF THE PROPOSED PROJECT 53
- General Discussion 54
- Alternative 1 Direct and Indirect Effects 58
- Alternative 1 Cumulative Effects 61
- Alternative 2 Direct and Indirect Effects 62
- Alternative 2 Cumulative Effects 62
- Alternatives 3 and 4 Direct and Indirect Effects 63
- Alternatives 3 and 4 Cumulative Effects 63
- Compliance with Management Direction 63

DETERMINATION OF EFFECTS 63
- Summary 64
- Determination 65

MANAGEMENT RECOMMENDATIONS 74

REFERENCES 75

INTRODUCTION.

The purpose of this biological evaluation is to determine whether implementation of the Rim Fire Recovery project would result in a trend toward Federal listing of any Sensitive Plant species.

A Sensitive Plant is defined as a plant species "identified by a Regional Forester for which population viability is a concern, as evidenced by: "a. Significant current or predicted downward trends in population numbers or density." and "b. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution." (FSM 2670.5 (19).

The overall purposes of this project are to

- Capture the economic value of hazard trees and dead trees which pays for their removal from the
- forest and potentially for other future restoration treatments.
- Provide for greater worker and public safety.
- Reduce fuels for future forest resiliency.
- Improve road infrastructure to ensure proper hydrologic function.

There are three action alternatives. Treatments under the proposed action, Alternative 1, are proposed for approximately 44,641 acres. Treatments under Alternative 3 are proposed for approximately 45,652 acres. Treatments under Alternative 4 are proposed for approximately 43,518 acres. For descriptions of the proposed activities, refer to Description of Proposed Project, pages 5 through 14.

Surveys for Sensitive Plants have been conducted within the analysis area under previous, pre-fire projects. Surveys were conducted in 2014 and would be completed in 2015 within areas where project activities are proposed in this Rim Recovery project. Surveys are prioritized according to blooming periods of the target species and following the same order as proposed sales would be offered if an action alternative is selected. The goal is to have surveys completed in each proposed sale area prior to implementation of project activities. There are known occurrences of *Allium yosemitense, Balsamorhiza macrolepis, Botrychium crenulatum, Botrychium minganense, Botrychium pedunculosum, Bruchia bolanderi, Clarkia australis, Clarkia biloba* ssp. *australis, Cypripedium montanum, Eriophyllum nubigenum, Erythronium taylori, Erythronium tuolumnense, Lewisia kelloggii* ssp. *hutchisonii, Lomatium stebbinsii, Mielichhoferia elongata, Mimulus filicaulis, Mimulus pulchellus* and *Peltigera gowardii* (formerly known as *Hydrothyria venosa*) in the analysis area. There is unsurveyed suitable habitat within areas where activities are proposed under this project for these species plus the following additional species: *Allium tribracteatum, Arctostaphylos nissenana, Botrychium ascendens, Botrychium lineare, Botrychium lunaria, Botrychium montanum, Botrychium pinnatum, Cinna bolanderi, Dendrocollybia racemosa, Eriastrum tracyi, Eriogonum luteolum var. saltuarium, Fissidens aphelotaxifolius, Helodium blandowii, Horkelia parryi, Hulsea brevifolia, Lewisia kelloggii* ssp. *kelloggii, Meesia uliginosa, Mielichhoferia shevockii* and *Tauschia howellii.* For a complete list of Forest Sensitive Plants, refer to Table 3, page 20. Management requirements (pages 14 through 16) have been developed to reduce, minimize or alleviate adverse effects to occurrences of Sensitive Plants in this project (Description of Proposed Project, pages 5 through 14).

CONSULTATION TO DATE.

A list of all Federally listed Threatened, Endangered or Proposed plant species which might occur on the Stanislaus National Forest was acquired from the U.S. Fish and Wildlife Service (USFWS 2014). As indicated by the latest list, dated September 18, 2011, there are no occurrences of Federally listed plant species in the Stanislaus National Forest.

CURRENT MANAGEMENT DIRECTION.

Management of Sensitive Plants in the Stanislaus National Forest is based on Forest Service policy set out in the Forest Service Manual (FSM 2670) and the National Forest Management Act of 1976 (NFMA), the Region 5 Forest Service Handbook (FSH 2609.25), the Stanislaus National Forest Land and Resource Management Plan (Forest Plan), as amended and displayed in the “Forest Plan Direction” (USDA 2010c), the Stanislaus National Forest Sensitive Plant Management Guide (Beck and Hurley 1984) and, where applicable, Species Management Guides.

It is the Secretary of Agriculture's direction to "avoid actions 'which may cause a species to become threatened or endangered.'" (USDA 2008). Further, it is a Forest Service objective to "maintain viable populations of all native ... plant species in habitats distributed throughout their geographic range on National Forest System lands" (FSM 2670.22). Forest Service policy set out in FSM 2670.32 is to "avoid or minimize impacts to [Sensitive] species whose viability has been identified as a concern." Where it is determined that impacts cannot be avoided, "the line officer with project approval authority, [may make] the decision to allow or disallow impact, but the decision must not result in loss of species viability or create significant trends toward Federal listing."

General direction for management of Sensitive Plants under the Forest Plan is to "provide for protection and habitat needs of sensitive plants, so that Forest activities will not jeopardize their continued existence." Forest Plan standards and guidelines advise to "modify planned projects to avoid or minimize adverse impacts to sensitive plants."

Limited botanical investigations were conducted for *Clarkia australis*. Botanical investigations are "in-depth investigations of a species through its range, conducted in order to develop information on distribution, abundance, trends, ecological requirements, and management needs..." (FSH 2609.25). The study was conducted by Leslie Gottlieb, PhD of the University of California, Davis (Gottlieb and Ford 1999). Gottlieb determined that *Clarkia australis* is indeed distinct from it's more common look-alike *Clarkia virgata*. He also determined that the range for *Clarkia australis* extends northward into the previously defined *Clarkia virgata* range, and that *Clarkia virgata* extends south into the previously defined *Clarkia australis* range. Also as a result of Gottlieb’s work, there appears to be a dividing line where *Clarkia australis* lies to the east and *Clarkia virgata* lies to the west. Although he attempted to find physical characteristics to differentiate the two species, Gottlieb was not able to find characteristics which could be used in the field. Large portions of the Rim Recovery project analysis area lies within the currently

defined range of *Clarkia australis* and there are known occurrences within proposed project activity areas. Botanical investigations have not been conducted for the other species which occur or might occur in this project.

There are several conservation assessments for Sensitive Plant species known from the Stanislaus National Forest. Conservation assessments are compilations of available information about the species such as distribution, numbers and threats. They do not provide management direction, although sometimes they do provide recommendations. In 2005, a conservation assessment for *Cypripedium montanum* (Kaye and Cramer) was completed. The assessment includes a population trends and viability analysis plus recommendations for conservation actions for this species. There are numerous occurrences of *Cypripedium montanum* known within the Rim Fire Recovery project analysis area. In 2010, a conservation assessment was completed for *Peltigera gowardii*, which was known at the time as *Peltigera hydrothyria*, and previously as *Hydrothyria venosa* (Peterson). This conservation assessment discusses habitat requirements and threats, and offers management considerations. There is *Peltigera gowardii* in the Rim Fire Recovery project. A conservation assessment is in draft for *Botrychium* species (Clines 2009). This assessment will be a comprehensive compilation of life cycle, genetic and distribution information, and species descriptions and key. There are three Sensitive *Botrychium* species in the Rim Fire Recovery project including *Botrychium crenulatum, Botrychium minganense* and *Botrychium pedunculosum*.

DESCRIPTION OF PROPOSED PROJECT.

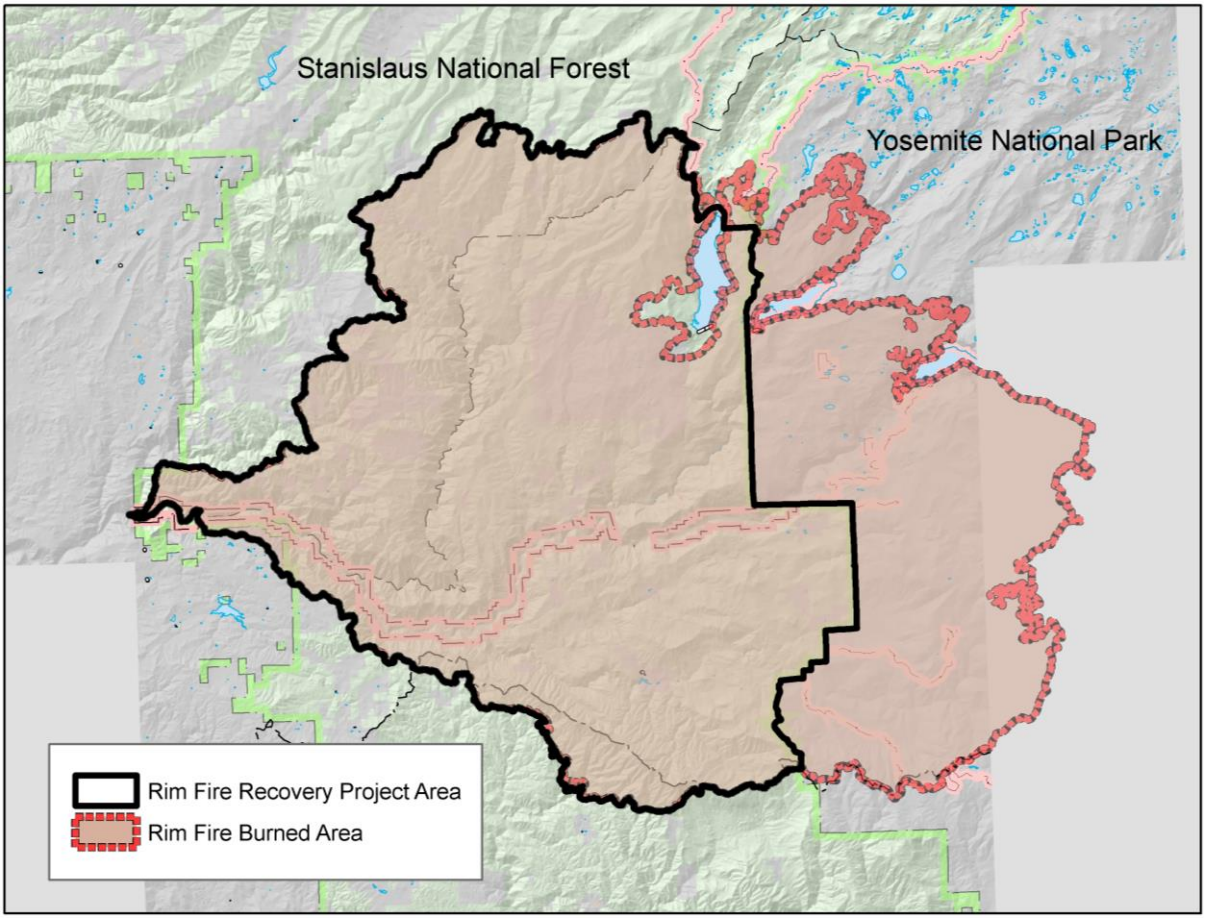
Project Location.

The Rim Fire Recovery project analysis area is located within the Rim Fire burned area in the Groveland and Mi-Wok Ranger Districts, within Tuolumne and Mariposa Counties. The project area lies west of the Yosemite National Park boundary, north of Groveland and Anderson Valley, south of Hull Creek Campground and Bourland Mountain, and east of the North Fork Tuolumne River and east of Moore Creek. The legal description of the analysis area is: portions of: T2S R19E Sec 4-6, 8-9, 16; T1S R16E Sec 1; T1S R17E Sec 20-21, 25-28, 35; T1S R18E Sec 1-2, 10-13, 15-17, 21, 24-30, 36; T1S R19E Sec 1-3, 7-11, 14-15, 17-19, 21-23, 26-27, 29-35; T1N R16E Sec 24-25; T1N R17E Sec 3, 19-21, 25, 27-31, 36; T1N R18E Sec 5-8, 17, 21-27, 29-30, 32-36; T1N R19E Sec 4-5, 8-9; T2N R17E Sec 26, 34-36; T2N R18E Sec 1-6, 8-17, 19-22, 28-32, 35-36; T2N R19E Sec 6-7, 21, 28, 31-33; T3N R18E Sec 30-33; and, T3N R19E Sec 31; MDBM.

The project area is approximately 154,530 acres. The analysis area, for the effects analysis for Sensitive Plants is defined for this project as the area within the project boundary (Figure 1).

No salvage or fuel reduction treatments are proposed within Wilderness, Inventoried Roadless Areas, or the wild classification segments of the Wild and Scenic Rivers.

Figure 1. Rim Fire Project Area



Primary Purpose.

The overall purposes of this project are to

- Capture the economic value of hazard trees and the dead trees. Removal as forest products (sawlogs, biomass) would pay for their removal from the forest and potentially provide funding for other future restoration treatments.
- Provide for greater worker and public safety.
- Reduce fuels for future forest resiliency and firefighting safety and success.
- Improve road infrastructure to ensure proper hydrologic function.
- Retain specific old forest components (large snags and down logs) and/or remove material to improve wildlife habitat.
- Utilize the unique scale and intensity of the Rim Fire to answer research questions and provide more information on a wide range of research topics.

Proposed Action and Alternatives.

The Rim Fire Recovery project Environmental Assessment has four developed alternatives. The alternatives are summarized below. Refer to the Rim Fire Recovery Environmental Impact Statement for complete descriptions of the alternatives.

Activities Common to All Action Alternatives.

Timber Salvage and Fuel Reduction. Merchantable trees which are dead at the time of harvest (have no green needles) and have sound wood (likely those greater than 16 inches diameter at breast height (dbh) by the time of harvest) would be removed as sawlogs. Non-merchantable trees of smaller diameters may be masticated, felled and lopped, machine piled and burned, or removed as biomass. Dead trees lose their value within 2 years or less depending on their diameter and species. It is anticipated that salvage harvest operations and fuel reduction activities in this project would begin as soon as September 2014 and continue for up to 5 years.

A registered borate compound would be applied to all freshly cut green tree fir stumps 14 inches and greater in diameter to limit the spread and establishment of new centers of annosum root disease within harvest areas of low and mixed severity where live trees still exist. The fungicide would not be applied within 10 feet of surface water, when rain is falling or when rain is likely that day (i.e. National Weather Service forecasts 50 percent or greater chance). All State and Federal rules and regulations applicable to this pesticide would be followed.

Harvest systems include ground-based, helicopter and skyline methods. Ground based equipment would include harvesters and rubber tired skidders. Helicopter logging or skyline systems would be utilized on steeper slopes and where necessary to meet resource objectives. Feller-bunchers may be utilized on skyline and helicopter units where slopes are less than 45 percent. All activity generated fuels would be treated to meet the fuels desired conditions.

Biomass treatments would be utilized to reduce fuels in stands of undersized trees and would entail the mechanical removal of un-merchantable trees between 4 inches and 16 inches dbh. These trees would be removed as firewood, shavings logs, pulpwood, wood chips to fuel electric cogeneration plants, or decked and left on site for public firewood cutting. The biomass treatments would likely be conducted at the same time as the thinning treatments. In some cases, this activity may occur as a second entry after the timber is removed.

Additional fuel reduction would be accomplished using machine piling and burning, jackpot burning and mastication. Machine piling is accomplished using off-road equipment such as bull dozers with a brush rake attachment instead of a blade. The equipment pushes brush skeletons, small dead trees and excess down fuels into piles for burning. Jackpot burning is the prescribed burning of heavy concentrations of down woody fuels. This type of burning would allow for the majority of the area to retain ground cover while reducing the heavy concentrations of fuels post-harvest. This treatment is proposed within the helicopter and skyline units where machine piling is not feasible. Mastication is usually accomplished by a rotating cutting blade attachment on the articulating arm of an excavator.

In units where the fuel levels in ground based salvage units exceed desired levels, whole tree yarding of merchantable trees would be employed to reduce the fuel levels in the units. Where fuel 2. Where existing fuel loads are less than or equal to 5 tons per acre, some trees may be felled and left in place or masticated into pieces less than 2 feet in length to reduce potential soil erosion and maintain soil productivity.

In watershed sensitive areas, where additional cover is needed to protect the soil and water quality resources, drop and lop treatment of the fuels would be conducted. This treatment would involve felling non-merchantable trees less than 10 inches dbh and lopping them into pieces small enough to ensure the material is not stacked and has as much ground contact as practical. Drop and lop is included in Alternatives 3 and 4, but not Alternative 1.

Hazard Tree Removal. Roadside hazard trees would be felled within striking distance of the roads, roughly 200 feet of each side of the identified lower maintenance level roads. Hazard trees along several trails would also be removed. Hazard trees would include those which are completely dead and those live trees which are deemed imminent hazards by standard characteristics such as underslung roots in road cuts, substantial defects which could cause failure, burned out root systems, among others. Hazard trees with merchantable value would be removed as sawlogs. Those without merchantable value would be felled and left in place, with slash piled and burned or scattered.

Roads. All of the road actions are proposed in order to support the removal of logs and biomass from treatment units and roadside hazard tree units. They include maintenance and reconstruction. Alternatives 1 and 3 includes new construction road work. Alternative 4 has no proposed new construction. Temporary roads would be built to minimize log skidding distances. There would be no changes in travel management for existing National Forest System roads and trails being used for the Project.

New Construction: New construction roads would be designed to engineering standards in accordance with assigned road management objectives, and added to the Forest transportation system and retained for long-term access. Construction activities would include vegetation clearing, excavation and embankment, blading and shaping, installation of drainage structures, and importing of armoring and surfacing rock material as needed. All new system roads would be gated and closed to public vehicular traffic, and would remain available for administrative use for future access and management of NFS lands.

Reconstruction: Reconstruction includes work to improve and restore roads. This work would improve the road conditions as needed for safe and efficient haul of forest products, as well as for proper hydrologic function and stream protection in accordance with applicable Best Management Practices (BMPs). Actions may include surface improvement; construction of drainage dips, culverts, riprap fills or other drainage or stabilization features with potential disturbance outside the established roadway (toe of fill to top of cut); realignment; and widening of curves as needed for log trucks and chip van passage. Reconstruction also includes the actions identified in the Maintenance category, such as removal of roadside hazard trees.

Maintenance: Roads being used for the project that are in functioning condition would be maintained during the project. Maintenance preserves the function of the road but generally does not include improvements. Maintenance activities include: blading; brushing; removal of roadside hazard trees; repair and/or replacement of road surfaces; cleaning, repair, or installation of drainage structures such as culverts, ditches, and dips; dust abatement; removal and installation of closure barriers; and installation or repair of signs. Maintenance activities generally do not disturb ground outside the existing road prism (toe of fill to top of cut) other than removal of material around culvert inlets.

Stored Roads: Some Maintenance Level 1 roads (currently closed and stored) would be opened and receive the appropriate maintenance or reconstruction treatments as described above. By definition, these roads are expected to be used intermittently when needed for project access, but kept closed for periods of years between uses. Following the project, these roads would be physically closed to all motor vehicle travel by using native material barriers such as boulders, berms, cull logs and stumps. Beyond the closure, the integrity of Maintenance Level 1 roads would be preserved to the extent practicable, implementing measures as necessary to reduce sediment delivery from the road surface and fills and reduce the risk of crossing failure and stream diversion, making it hydrologically neutral.

Temporary Road: Temporary roads are not intended to be a permanent part of the road system and would be decommissioned after use. Temporary roads may overlay existing corridors or be newly constructed features. Some NFS trails currently managed for either motor vehicle or non-motorized use are proposed as temporary access routes. These would be reverted back to their previous use after completion of the project.

Construction of temporary roads may include vegetation clearing, excavation, blading and shaping to provide for safe project access and removal of forest products. New and existing temporary roads would have improvements necessary to attain stabilization of the roadbed and fill slopes. Unlike permanent roads, temporary roads would only have the minimal investment and drainage required to minimize resource impacts while providing for safe use and passage of haul vehicles during the short life of the route.

After a temporary road has served the project purpose, it would be decommissioned. This involves removing bridges and culverts, eliminating ditches, subsoiling and out-sloping the roadbed, removing ruts and berms, effectively blocking the road to vehicular traffic, and building cross ditches and water bars.

Temporary Use of Routes, Then Reverted Post-Project. Some segments identified for temporary project use would revert to their existing use post-project. These roads are associated with authorized or other needed uses (for example, access to a water tank under special use permit), and are expected to still be utilized into the future. Temporary use routes would be improved to a minimal standard for haul, while also improved to minimize adverse environmental impacts, maintain stabilization, and ensure proper drainage. These routes would continue to exist after the project is completed.

Skid Zones. The term skid zone is being used to identify areas where landings for units harvested

using ground based equipment are not located either within or adjacent to the units. The skid zones encompass an area that skidding equipment may traverse to take logs from the unit to the landing, using a specified skid trail pattern that would be determined during harvest operations by a FS timber sale administrator. The intent is to identify areas outside units that need to be surveyed and assessed for potential impacts due to treatment activities.

Skid Trails. Main skid trails would be sub-soiled and branching skid trails would be waterbarred prior to each winter season. Main and branching secondary skid trails and landings would be subsoiled to mitigate compaction and restore hydrologic function of the soil after other project activities are completed in those areas. Pre-existing (legacy) skid trails and landings within units causing watershed issues (i.e. concentrating water, gullying), including those not used during implementation, would be sub-soiled to mitigate logging effects.

Other Infrastructure. Seven rock quarry sites have been identified to accommodate project road needs. Water sources identified for new road construction, reconstruction and maintenance as well as long-term resource needs have been identified in 95 locations.

Soil Stabilization and Water Quality Protection. Roadside disturbed areas would be stabilized with certified weed free mulch, erosion fabric, vegetation, rock, large organic materials, engineered structures, or other measures.

Wildlife Habitat Enhancement. Wildlife habitat enhancement treatments are included for critical deer range and increased snag retention. Alternatives vary by type and amount of treatments.

Research. Several research projects would take place as part of the Rim Fire Recovery project under Alternatives 3 and 4. Scientists from the Pacific Southwest Research Station (PSW) are working with Stanislaus National Forest managers and collaborating with universities and other scientists to design studies which would take advantage of the abundant research opportunities provided by the Rim Fire. The primary study design is to allocate 44 California Spotted Owl (CSO) sites affected by the Rim Fire into treatment groups. Some units are modified from one Alternative to the next based on study parameters. Sample units consist of 200 hectare (494 acres) circular core areas around the centroid (nest/main roost) for each of the 44 CSO sites. The level of salvage in the sample units has been modified from the original prescriptions into treatment groups: (1) Controls; (2) Light Salvage prescription (retain approximately 100 square feet of Basal Area); and (3) High Salvage prescription (retain approximately 30 square feet of Basal Area). Occupancy surveys would be conducted yearly for 5 years post-harvest to determine site use by California Spotted Owls.

Several other studies would take place within these sample units. Small mammal and bird monitoring would take place. Cavity use and foraging behavior of the black back woodpecker would be studied. Hillslope soil erosion would be measured using silt fences to capture the soil movement. Sediment yield and peak discharge would be monitored at creeks at high risk of degraded water quality from sediment post salvage logging. Any additional research projects would be conducted within the same units identified for research purposes.

Forest Plan Amendment. Alternatives 3 and 4 include a Forest Plan Amendment designating a Forest Carnivore Connectivity Corridor (FCCC).

Alternative 1 (Proposed Action).

This Alternative entails implementation of timber salvage, roadside hazard tree removal, fuel reduction and road repairs and improvements needed for access and to accomplish removal of merchantable logs and biomass. Treatments under Alternative 1 are proposed for approximately 44,641 acres.

Salvage and Fuel Reduction.

Treatments include salvage logging up to 28,326 acres including 24,127 acres of ground based, 16 acres of ground based/skyline swing, 2,930 acres of helicopter, and 1,253 acres of skyline treatments. Refer to the EIS for the lists of proposed units.

Proposed fuel treatments include 7,626 acres of biomass removal, 24,143 acres of machine piling and burning and 4,199 acres of jackpot burning.

Hazard Tree Removal

Fell and remove hazard trees (green and dead) adjacent to 341 miles of forest roads outside of proposed salvage units, amounting to 16,315 acres. Some non-merchantable trees may be felled and left in place.

Roads

Alternative 1 includes 5.4 miles of new road construction, 319.9 miles of road reconstruction and 216.1 miles of road maintenance along lower level roads. Approximately 3.9 miles of temporary road construction (new), 9.3 miles of temporary road construction (existing), and 8.4 miles of existing temporary roads tied to current and future uses would be used for the project and then reverted afterwards to their original use.

Wildlife Habitat Enhancement

Within Critical Winter Deer Range and adjacent to Yosemite National Park, units were identified for salvage and/or biomass removal to achieve desired forage/cover ratios and to provide for deer passage and access. These units total 1,351 acres and include: L03, L06, L07, L202, L203A, L203B, L204A, L204B, L205, L206, M201, O201, and P201.

Alternative 2 (No Action)

Under this “no action” alternative, general salvage and hazard tree abatement and removal adjacent to lower standard roads would not occur. Current management plans would continue to

guide management of the project area. None of the viable timber would be removed from this area leaving tens to hundreds of tons of fuel per acre once these trees fall down. No hazard tree removal would occur adjacent to lower standard roads, leaving thousands of existing hazard trees to fall on their own as a result of natural forces. No mastication or biomass removal fuel reduction activities, or repairs and improvements to the transportation system would be implemented to accomplish the purpose and need of the Rim Fire Recovery project. The cost of future activities where removal of this fallen material is essential to implementation would be far more expensive and perhaps cost prohibitive.

Alternative 3

This alternative responds to significant issues and concerns. Compared to Alternative 1, it addresses those issues by proposing additional wildlife habitat enhancement (including biomass removal in Critical Deer Winter Range and the FCCC Forest Plan Amendment), additional soil and watershed protection (mastication and drop and lop), and less new construction. It also includes research to help answer wildlife, fuels, watershed and soils questions. Alternative 3 includes the treatments and actions described below.

Salvage and Fuels Reduction

Alternative 3 salvage treatments are similar to Alternative 1. However, two fuel treatments have been added to mitigate impacts of the fire and logging on soil and water resources.

Treatments include salvage logging up to 30,399 acres including 26,252 acres of ground based, 16 acres of ground based/skyline swing, 3,035 acres of helicopter, and 1,096 acres of skyline treatments. Proposed fuels treatments include 8,379 acres of biomass removal, 22,036 acres of machine piling and burning and 4,147 acres of jackpot burning, 1,309 acres of mastication, and 2,228 acres of drop and lop. Refer to the EIS for the list of units and treatments.

Within SPLATs (Strategically Placed Landscape Area Treatments) coarse woody debris greater than 3 inches in diameter will be retained at 10 to 20 tons an acre. The goal is to maintain a total fuel load of 10 tons an acre, and not to exceed 20 tons an acre when it is needed to meet other resource requirements.

Hazard Tree Removal

Alternative 3 involves felling and removal of hazard trees (green and dead) adjacent to 314.8 miles of forest roads, amounting to 15,253 acres, outside of proposed salvage units. Some non-merchantable trees may be felled and left in place.

Roads

Alternative 3 includes 1.0 mile of new road construction, 323.6 miles of road reconstruction and 200.6 miles of road maintenance. Approximately 9.5 miles of temporary road construction (new), 22.7 miles of temporary road construction (existing), and 3.3 miles of existing temporary

roads tied to current and future uses would be used for the project and then reverted afterwards to their original use.

Wildlife Habitat Enhancement

Alternative 3 includes several additional treatment units to enhance the Critical Deer Winter Range. In addition, the FCCC Forest Plan Amendment provides for long-term movement of wildlife from Yosemite National Park through the Stanislaus National Forest. The corridor would lead from Yosemite National Park and North Mountain Inventoried Roadless Area (IRA) west to the Clavey River. The corridor includes the following proposed units which would be managed for Old Forest Emphasis: L02, L05, M1 through M10, M12, M13, M15, M16, M18, M19, and N1.

This Forest Plan Amendment changes the land allocation on 9,923 acres from General Forest to Old Forest Emphasis Area (OFEA). Other existing land allocations (Wild and Scenic River, PAC, HRCA, and OFEA) would remain unchanged.

Research

Alternative 3 includes Research projects. Refer to the EIS, Appendix D (Research) for details for the individual research proposals.

Alternative 4

Alternative 4 is similar to Alternative 3 except that it replaces new construction with temporary roads and drops 2,500 acres of salvage logging in highly suitable black-backed woodpecker habitat.

This alternative responds to significant issues and concerns by proposing the same action items as Alternative 3 for wildlife habitat enhancement (including biomass removal in Critical Deer Winter Range and the FCCC Forest Plan Amendment) and, soil and watershed protection (mastication and drop and lop). It also includes research to help answer wildlife, fuels, watershed, and soils questions. Compared to Alternative 3, Alternative 4 further addresses the Snag Forest Habitat issue with additional black-backed woodpecker habitat retention and the New Road Construction issue with no new construction. Alternative 4 includes the treatments and actions described below.

Salvage and Fuels Treatments

Treatments include salvage logging up to 27,826 acres including 24,176 acres of ground based, 16 acres of ground based/skyline swing, 2,568 acres of helicopter, and 1,066 acres of skyline treatments. Proposed fuel treatments include 7,975 acres of biomass removal, 20,320 acres of machine piling and burning, 3,650 acres of jackpot burning, 1,309 acres of mastication and 1,798 acres of drop and lop. Refer to the EIS for the list of units.

Hazard Tree Removal

Alternative 4 involves felling and removal of hazard trees (green and dead) adjacent to 324.6 miles of forest roads, amounting to 15,692 acres, outside of proposed salvage units. Some non-merchantable trees may be felled and left in place.

Roads

Alternative 4 has no new road construction. It does include 315.0 miles of road reconstruction and 209.3 miles of road maintenance. Approximately 8.4 miles of temporary road construction (new), 22.1 miles of temporary road construction (existing), and 3.3 miles of existing temporary use routes tied to current and future uses would be used for the project and then reverted afterwards to their original use.

Wildlife Habitat Enhancement

Alternative 4 includes the same wildlife enhancement treatments as Alternative 3. The same FCCC Forest Plan Amendment is proposed as in Alternative 3.

Research

Alternative 4 includes the same research treatments as Alternative 3.

Sensitive Plant Protection.

There are known occurrences of the Sensitive Plant species *Allium yosemitense, Balsamorhiza macrolepis, Botrychium crenulatum, Botrychium minganense, Botrychium pedunculosum, Bruchia bolanderi, Clarkia australis, Clarkia biloba* ssp. *australis, Cypripedium montanum, Eriophyllum nubigenum, Erythronium taylori, Erythronium tuolumnense, Lewisia kelloggii* ssp. *hutchisonii, Lomatium stebbinsii, Mielichhoferia elongata, Mimulus filicaulis, Mimulus pulchellus* and *Peltigera gowardii* (formerly known as *Hydrothyria venosa* then *Peltigera hydrothyria*) in the analysis area. There is unsurveyed suitable habitat within areas where activities are proposed under this project for these species plus the following additional species: *Allium tribracteatum, Arctostaphylos nissenana, Botrychium ascendens, Botrychium lineare, Botrychium lunaria, Botrychium montanum, Botrychium pinnatum, Cinna bolanderi, Dendrocollybia racemosa, Eriastrum tracyi, Eriogonum luteolum var. saltuarium, Fissidens aphelotaxifolius, Helodium blandowii*, *Horkelia parryi, Hulsea brevifolia, Lewisia kelloggii* ssp. *kelloggii*, *Meesia uliginosa, Mielichhoferia shevockii* and *Tauschia howellii.*

In order to reduce, minimize or alleviate possible adverse effects to Sensitive Plants and ensure consistency with Forest Plan and other direction for sensitive plants, management requirements have been developed for the Alternatives.

Management Requirements Common to All of the Action Alternatives.

1. Flag and avoid known and new occurrences of Sensitive Plants except as allowed below:
    a. Manual fuel reduction may take place within *Clarkia australis*, *Clarkia biloba* ssp. *australis*, *Mimulus filicaulis* or *Mimulus pulchellus* occurrences only during the dry non-growing period (Table 1). Pile or scatter all material outside of Sensitive Plant occurrences.
    b. Mastication and skid trail legacy compaction subsoiling may be conducted within *Clarkia australis* occurrences only during the dry non-growing period (Table 1). Do not track masticator through occurrences smaller than 0.25 acre. Minimize tracking in occurrences larger than 0.25 acres. Wherever possible, reach into occurrences with masticator head to conduct the work instead of tracking through.

2. In order to protect the habitat for the Sensitive Plants which occupy "lava cap" soils all equipment and vehicles will remain on roads through this habitat type (i.e. no parking off road, landing construction or staging areas).

Table 1. Growing seasons and appropriate identification periods for the Sensitive Plants for which some impacts would be allowed during the dry, non-growing period for the species.

Species	**Growing Season**	**I.D. Period**	**Dry, Non-growing Period***
Clarkia australis	Dec 1 - Aug. 15	June 15 - Aug. 15	Aug 15 - Nov 30
Clarkia biloba ssp. *australis*	Dec 1 - July 31	May 15 - July 15	Aug 1 – Nov 30
Mimulus filicaulis	Mar. 15 - July 15	Apr. 15 - June 30	July 15 – Nov 30
Mimulus pulchellus	Mar. 1 - June 15	Apr. 1 - June 1	June 15 – Nov 30

*The actual dry, non-growing period would be determined by field observations year to year by the District Botanist. The dry, non-growing period is the time when these species are most resistant to disturbance activities. All dates are approximate, varying with elevation, weather and site conditions.

Management Requirements Specific to Alternative 1.

There are no management requirements specific to Alternative 1. See Management Recommendations, page 74, for the recommended management requirements which the Decision Maker elected to exclude from the Proposed Action.

Management Requirements Specific to Alternatives 3 and 4.

These management requirements are in addition to the management requirements common to all alternatives.

3. For roadside hazard tree abatement, where it is not possible to fully avoid a Sensitive Plant occurrence, a botanist will review the site with the Sale Administrator and advise on the least impactive methods to use for the site, such as timing of impacts, directionally fall trees away

from dense concentrations, full suspension removal of the log, partial suspension, or buck and leave the log.

4. Hide, obscure or block motorized access created by project to "lava cap" habitats. Existing patches of live or dead brush or other vegetation on the edges of the "lava caps" can be utilized for this purpose.

5. In order to protect occurrences of *Peltigera gowardii*, conduct project activities in such a way that sediment is not added to or accumulates within occurrences, especially in Corral Creek at Sections 17 and 20, T1N, R18E, the unnamed tributary to Clavey River in Section 18, T1N, R18E, the unnamed tributary to Skunk Creek in Section 21, T1N, R18E and Twomile Creek in Section 36, T3N, 17E and Section 1, T2N, R17E.

6. During helicopter salvage operations, avoid flying logs over cliff habitats in and adjacent to unit X23. Off-road equipment will not track within 25 feet of the bases or tops of cliffs and large rock outcrops, or through gravelly openings with shallow soils in units X18, X19 and X23 and in the roadside hazard tree removal of Forest Roads 1S60Y, 1S79, 1S80, 2S65D, 2S66Y, and 2S66YA. Manual removal of fuels, directional felling and tree removal using an articulating arm or equipment which allows for full suspension may occur in these equipment exclusion areas during the dry, non-growing period for the rare plant species, approximately July 1 through November 30.

EXISTING ENVIRONMENT.

Project Area Plant Communities.

The burned area elevation range within the National Forest is from approximately 920 feet to 7,120 feet. The elevation range for the project analysis area is from approximately 1,400 feet to 7,000 feet. The Rim Fire resulted in heavy impacts to the native plant communities over large portions of the burned area. Before the fire, there were a variety of plant communities within the project boundaries including Westside Ponderosa Pine Forest, Sierran Mixed Conifer Forest, several different chaparral communities such as Montane Manzanita Chaparral and Northern Mixed Chaparral, Montane Meadow, White Alder Riparian Forest, Aspen Riparian Forest, Blue Oak Woodland, and other oak woodland communities (Holland 1986). Table A-1 (Appendix A) displays all of the California wildlife habitat relationship (WHR) plant communities within the burned area, the number of acres of each burned at low, moderate, high and severe levels and the total number of acres of each community in the burned area (USDA 2013c).

Over 154,000 acres of National Forest System land was affected by the Rim fire and related soil disturbing activities (Table A-1). WHR habitat types which represent large areas of varying burn severity (preliminary data from RAVG4) include Annual Grassland, Mixed Chaparral, Montane Chaparral, Montane Hardwood, Montane Hardwood Conifer, Perennial Grassland, Ponderosa Pine, and Sierran Mixed Conifer. The majority of acres burned for these habitat types are within the high and severe burn categories (USDA 2013c).

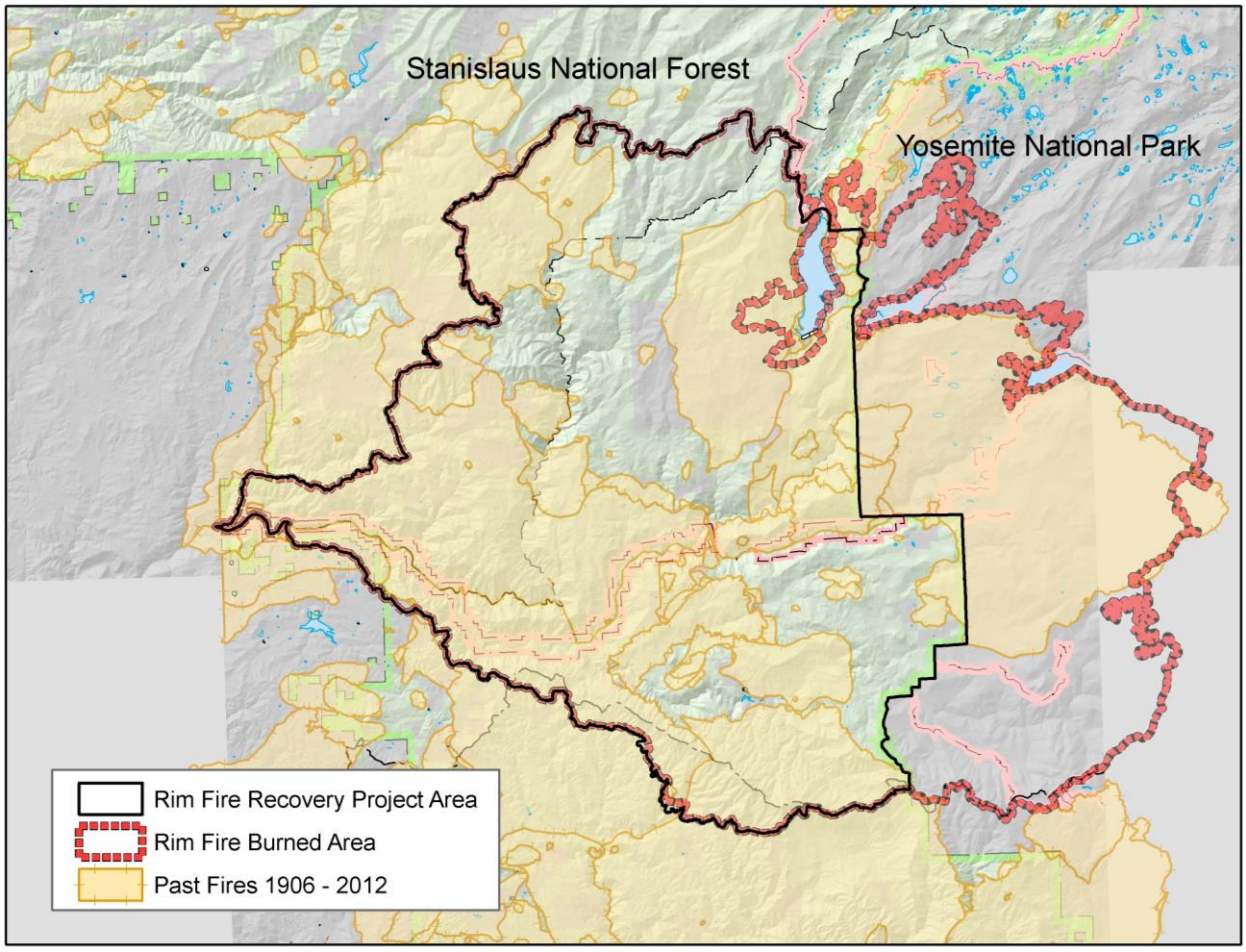
The geology of the project area is quite varied. Bedrock and soil parent material are composed of granite, especially on the eastern half of the project, metasedimentary rock primarily on the western half of the project, or volcanically derived andesitic tuff (Mehrten Formation) which is isolated on some of the ridge tops. Soils in the project area are diverse, running the full range from deep sandy or loamy granitics to rocky clays of metasedimentary origin. The andesitic tuff breccia tends to be shallow, coarse and fast draining.

There were many high functioning plant communities in the project area before the fire. Among these were stands of blue oak woodland, mixed conifer stands which hadn't burned in wildfires in more than 100 years, and streamside riparian areas which provided excellent habitat for Sensitive species such as *Peltigera gowardii* and *Cypripedium montanum*. These high functioning ecosystems were relatively free of noxious weeds, having only bull thistle (*Cirsium vulgare*), or Klamathweed (*Hypericum perforatum*) as scattered, occasional individuals. These two species are naturalized throughout the lower elevations of the Stanislaus NF and in undisturbed situations they pose little threat to the local ecosystems.

Wildfire has been an important component driving plant community composition within the analysis area during the past 100 years. Even so, there were large areas of the Rim Fire burned area which had not had any sizable wildfires since fire record-keeping began around 1906 (Figure 2). There were 124 past wildfires with boundaries which intersected the Rim Fire boundary (USDA 2010b). Some of these date back as far as 1908. The most recent occurred in 2008. The smallest recorded fire was 6.5 acres. The largest was the 1987 Stanislaus Complex Fires which totaled 141,680 acres among the seven Complex fires which intersected with the Rim Fire. The boundaries of these seven fires and many others also extended outside the Rim Fire area. Therefore the total acreage of these past fires was not necessarily contained within Rim. There were other drivers of the pre-Rim Fire mix of plant communities including past logging, cattle grazing, and effective fire suppression and prevention in the stands which hadn't burned in more than 100 years.

Many of the Ponderosa Pine areas were conifer plantations 11 to 38 years of age. Some of the plantations were isolated and the result of old clear-cut timber harvests. However, most of the plantations were planted as part of the recovery from the 1987 Stanislaus Complex fires or the 1996 Ackerson Complex or Rogge Complex fires. The Granite plantations were the result of recovery efforts from the 1973 Granite Fire. The Sawmill plantations dated to the 1960s and were also the result of post-fire recovery. Several conifer plantations in the Reynolds Creek area were dominated by Jeffrey Pine (*Pinus jeffreyi*). The past wildfires and subsequent salvage logging and reforestation activities created thousands of acres of disturbed habitat. These plantations were in various phases of growth and many had been thinned in the past fifteen years. The plantations were fairly bereft of native plant diversity. Due to their mostly early seral nature, the understories were primarily composed of disturbance followers such as non-native annual grasses and native shrubs like deer brush (*Ceanothus integerrimus*), manzanita (*Arctostaphylos* sp.), bear clover (*Chamaebatia foliolosa*) and Sierra gooseberry (*Ribes roezlii*).

Figure 2. Fire History of the Rim Fire Area, Since 1906.



Invasive species such as Klamathweed (*Hypericum perforatum*) and bull thistle (*Cirsium vulgare*) were common inhabitants of these plantations, existing mostly as scattered individual plants. Other invasive species such as yellow star-thistle (*Centaurea solstitialis*), tocalote (*Centaurea melitensis*), Italian thistle (*Carduus pycnocephalus*) and Medusahead grass (*Elymus caput-medusae*) were inhabitants of some of the post-Stanislaus Complex plantations. Other weeds of open areas were present within the burned area as well. Table 2 lists the weed species present within and adjacent to the burned area, the number of infestations of each species and the total number of acres of each species (USDA 2013c).

Table 2. CDFA noxious weeds and non-native, invasive plant species present in the burned area. Acres and number of infestations were extracted from GIS records for the Groveland and Mi-Wok Ranger Districts.

Common Name	**Scientific Name**	**CDFA Rating[1]**	**Acres**	**Number of Infestations[2]**
Barbed goatgrass	*Aegilops triuncialis*	B	1.1	16
Black locust	*Robinia pseudoacacia*	None	1.6	4
Black mustard	*Brassica nigra*	None	0.03	4

Common Name	Scientific Name	CDFA Rating[1]	Acres	Number of Infestations[2]
Bull Thistle	*Cirsium vulgare*	None	35.3	350[3]
Canada thistle	*Cirsium arvense*	B	0.25	1
Dyers Woad	*Isatis tinctoria*	B	0.74	1
Field bindweed	*Convolvulus arvensis*	C	0.73	4
French broom	*Genista monspessulana*	C	0.01	1
Himalayan blackberry	*Rubus armeniacus*	None	0.01	1
Italian thistle	*Carduus pycnocephalus*	C	7.1	119
Klamathweed	*Hypericum perforatum*	C	1.7	68[3]
Medusahead grass	*Elymus caput-medusae*	C	68.9	314
Milk thistle	*Silybum marianum*	None	0.01	4
Puncturevine	*Tribulus terrestris*	C	0.09	4
Scotch broom	*Cytisus scoparius*	C	0.09	2
Spotted knapweed	*Centaurea stoebe ssp. micranthos*	A	0.74	30
Tocalote	*Centaurea melitensis*	None	32.2	203
Tree of heaven	*Ailanthus altissima*	None	0.01	2
Woolly mullein	*Verbascum Thapsus*	None	0.1	7[3]
Yellow star-thistle	*Centaurea solstitialis*	C	178.1	662
		TOTAL	**329**	**2155**

[1]Ratings are defined at http://www.cdfa.ca.gov/plant/ipc/encycloweedia/winfo_weedratings.htm.
[2]Infestations may be represented by multiple polygons versus actual weed infestation due to growing habitat of specific weed species. In some cases, the number of infestations is over estimated due to how they were mapped.
[3]Bull thistle, Klamathweed and woolly mullein are quite common as scattered plants across the burned area. These totals represent the number of polygons where occurrences of 10 or more individuals were recorded during inventories in support of timber and fuel reduction projects.

Precipitation levels in the winter of 2013/2014 were at near record lows. It was the third drought year in a row. The winter months were exceptionally low in precipitation. The earliest blooming perennial species, notably the rare *Allium* species, had a very brief blooming period with below-normal numbers of plants showing in known occurrences. The spring months had somewhat regularly spaced periods of low levels of rain. These spring rains induced germination and sustained growth for many early blooming annual wildflower species within the project area. These included the rare annual *Mimulus* occurrences which were quite showy for an extended period of time in the burned area. The spring rains ceased and the region went into a prolonged period of above normal temperatures with very low relative humidities. Later blooming annual species, such as the *Clarkia* species, bloomed early and in great proliferation but were fairly short-lived. Later growing perennial species, such as the rare *Botrychium* species, encountered unusually dry conditions, even in typically moist meadow habitats. As a result, few of these species emerged in known occurrences and those which did, faded much earlier than normal.

Sensitive Plant Review.

The Rim Fire Recovery project analysis area is within the geographic and elevational range of 38 of the 49 Sensitive Plant species on the Regional Forester's list for the Stanislaus National Forest (Table 3). These are *Allium tribracteatum, Allium yosemitense, Arctostaphylos nissenana, Balsamorhiza macrolepis, Botrychium ascendens, Botrychium crenulatum, Botrychium lineare, Botrychium lunaria, Botrychium minganense, Botrychium montanum, Botrychium pedunculosum, Botrychium pinnatum, Bruchia bolanderi, Cinna bolanderi, Clarkia australis, Clarkia biloba* ssp. *australis, Dendrocollybia racemosa, Cypripedium montanum, Eriastrum tracyi, Eriogonum luteolum* var. *saltuarium, Eriophyllum congdonii, Eriophyllum nubigenum, Erythronium taylori, Erythronium tuolumnense, Fissidens aphelotaxifolius, Helodium blandowii, Horkelia parryi, Hulsea brevifolia, Lewisia kelloggii* ssp. *hutchisonii, Lewisia kelloggii* ssp. *kelloggii, Lomatium stebbinsii, Meesia uliginosa, Mielichhoferia elongata, Mielichhoferia shevockii, Mimulus filicaulis, Mimulus pulchellus, Peltigera gowardii* and *Tauschia howellii.* The analysis area is outside the known geographic or elevational ranges of the remaining 11 species.

Table 3. Sensitive Plant species of the Stanislaus National Forest.

Scientific Name	**Common Name**
Allium jepsonii	Jepson's onion
Allium tribracteatum	three-bracted onion
Allium yosemitense	Yosemite onion
Arctostaphylos nissenana	Nissenan manzanita
Balsamorhiza macrolepis	big-scale balsamroot
*Boechera evadens (*syn. *Arabis fernaldiana* var. *stylosa)*	hidden rockcress
Botrychium ascendens	upswept moonwort
Botrychium crenulatum	scalloped moonwort
Botrychium lineare	Slender moonwort
*Botrychium lunaria (*syn. *B. neolunaria* sp. nov. *ined.)*	common moonwort
Botrychium minganense	Mingan moonwort
Botrychium montanum	western goblin
Botrychium pedunculosum	stalked moonwort
Botrychium pinnatum	Northwestern moonwort
Botrychium tunux	moosewort
Botrychium yaaxudakeit	giant moonwort
Bruchia bolanderi	Bolander's bruchia
Calochortus clavatus var. *avius*	Pleasant Valley mariposa lily
Cinna bolanderi	Bolander’s woodreed
Clarkia australis	Small's southern clarkia
Clarkia biloba ssp. *australis*	Mariposa clarkia
Clarkia lingulata	Merced clarkia
Cypripedium montanum	mountain ladyslipper orchid
*Dendrocollybia racemosa (*syn. *Collybia racemosa)*	branched collybia
Draba asterophora var. *asterophora*	Tahoe draba

Scientific Name	Common Name
Draba asterophora var. *macrocarpa*	Cup Lake draba
Eriastrum tracyi	Tracy's eriastrum
Eriogonum luteolum var. *saltuarium*	Jack's buckwheat
Eriophyllum congdonii	Congdon's wooly sunflower
Eriophyllum nubigenum	Yosemite wooly sunflower
Erythronium taylori	Taylor's fawn lily
Erythronium tuolumnense	Tuolumne fawn lily
Fissidens aphelotaxifolius	brook pocket moss
Helodium blandowii	Blandow's bog moss
Horkelia parryi	Parry's horkelia
Hulsea brevifolia	short-leaved hulsea
Iris hartwegii ssp. *columbiana*	Tuolumne iris
Lewisia congdonii	Congdon's bitterroot
Lewisia kelloggii ssp. *hutchisonii*	Hutchison's lewisia
Lewisia kelloggii ssp. *kelloggii*	Kellogg's lewisia
Lomatium stebbinsii	Stebbin's lomatium
Meesia uliginosa	broad-nerved hump-moss
Mielichhoferia elongata	elongate copper-moss
Mielichhoferia shevockii	Shevock's copper-moss
Mimulus filicaulis	Hetch-Hetchy monkeyflower
Mimulus pulchellus	pansey monkeyflower
Peltigera gowardii (*syn. Hydrothyria venosa, P. hydrothyria*)	Goward's waterfan
Pinus albicaulis	white bark pine
Tauschia howellii	Howell's tauschia

The project area is quite large and there have been many projects within the project area over the past twenty-three years since the Forest Sensitive Plant Program has been active. Surveys for most of the Sensitive Plants listed above have been conducted within the project area in many of the past projects. Therefore, quite a lot is known about the presence and absence of Sensitive Plants in these past project areas, especially on the Groveland Ranger District portions of the project where the program has been most active during the past twenty-three years. Unfortunately, surveys have not been conducted in all of the proposed project treatment areas. Furthermore, the Sensitive Plant list was revised, effective August 15, 2013 and surveys were not conducted in the past for species new to the list. The following species are known to occur within the project area: *Allium yosemitense, Balsamorhiza macrolepis, Botrychium crenulatum, Botrychium minganense, Botrychium pedunculosum, Clarkia australis, Clarkia biloba ssp. australis, Cypripedium montanum, Eriophyllum nubigenum, Erythronium taylori, Erythronium tuolumnense, Lewisia kelloggii ssp. hutchisonii, Lomatium stebbinsii, Mielichhoferia elongata, Mimulus filicaulis, Mimulus pulchellus,* and *Peltigera gowardii*.

Species known within the immediate vicinity of the project can help predict the likelihood of the species occurring within the project area. The Sensitive Plant species within five miles of the project but not yet known within the project boundaries include *Allium tribracteatum, Bruchia*

bolanderi, Cinna bolanderi, Dendrocollybia racemosa, Eriophyllum congdonii and *Hulsea brevifolia.*

Current Project Surveys.

Due to the need to rapidly finalize the environmental analysis for the Rim Recovery so that the value of the dead trees could be recovered before rot destroys the wood, surveys for Sensitive Plants could not be completed and findings processed in proposed project activity areas prior to completion of this biological evaluation. Surveys occurred during the spring, 2014 and continued through the summer of 2014. The management requirements would apply to all occurrences found. Surveys are being conducted using a variation of the Intuitive Controlled method of surveying. For this project, the surveyor identifies areas of suitable habitat using aerial photos, topo maps and soils maps first, then surveys through the specific locations of suitable habitat which they identified.

To the extent possible, the surveys are being conducted during the appropriate identification periods of the species being surveyed. However, due to the very large area to be covered, roughly 45,000 acres, early spring surveys were conducted to rule in or out species by evaluating habitat attributes during non-blooming periods, and searching for plants in vegetative (pre- or post-bloom) states and searching for plant remnants. The prolonged drought conditions introduced additional challenges in the form of earlier and shorter than normal bloom periods, and the potential for some perennial species to stay dormant and fail to emerge during the growing season.

Past Surveys.

There have been many projects planned and implemented within the project area over the past twenty-four years since the Forest Sensitive Plant Program became active. Surveys for Sensitive Plants were conducted in most of those past projects. Therefore, quite a lot is known about the presence and absence of Sensitive Plants in those past project areas. Unfortunately, past surveys are lacking in the proposed Rim Recovery treatment areas which don't overlap with a prior project. The Regional Forester's Sensitive Plant list has been updated four times (1990, 1998, 2006 and 2013) since surveys for Sensitive Plants began in the analysis area in 1989. Each time, several new species were added to the list. Since the past botany surveys were not floristic in nature, that is, a complete identification and listing of all plant species encountered was not made, the newer additions to the list were often overlooked in past surveys. Surveys each time were conducted for the current list at the time. Additionally, over time, the ranges of some of the Sensitive Plants became better understood and species which had not been previously believed to be possible in the Stanislaus have been added to the survey list and found within the Forest. Most notable among these are the *Botrychium* species, several moss species and *Peltigera gowardii*. Within the Rim Recovery project, there are few units which have been surveyed for all Sensitive species possible according to the units' habitat attributes, given the current Sensitive list.

Past project surveys revealed occurrences of the following Sensitive Plant species within the project area: *Allium yosemitense, Balsamorhiza macrolepis, Botrychium crenulatum, Botrychium minganense, Botrychium pedunculosum, Clarkia australis, Clarkia biloba ssp. australis, Cypripedium montanum, Eriophyllum nubigenum, Erythronium tuolumnense, Lewisia kelloggii ssp. hutchisonii, Lomatium stebbinsii, Mielichhoferia elongata, Mimulus filicaulis, Mimulus pulchellus,* and *Peltigera gowardii. Erythronium taylori,* was discovered within the project area by a non-Forest Service botanist exploring the habitat. There is suitable habitat and the project is within the geographic and elevational range for the following additional species: *Allium tribracteatum, Arctostaphylos nissenana, Botrychium ascendens, Botrychium lineare, Botrychium lunaria, Botrychium montanum, Botrychium pinnatum, Bruchia bolanderi, Cinna bolanderi, Dendrocollybia racemosa, Eriastrum tracyi, Eriogonum luteolum* var. *saltuarium, Eriophyllum congdonii, Fissidens aphelotaxifolius, Helodium blandowii, Horkelia parryi, Hulsea brevifolia, Lewisia kelloggii ssp. kelloggii, Meesia uliginosa, Mielichhoferia shevockii* and *Tauschia howellii.*

Species Account and Habitat Status.

Table 4 displays the State and Federal statuses, global and State rarity rankings, and the California Rare Plant Ranks. These rankings, availability of habitat, and local threats were considered in determining the inclusion of these species in the Regional Foresters Sensitive list.

Table 4: Status of the Sensitive Plants which occur or may occur in this project.

Sensitive Plant Species	**Federal Status**	**State Status**	**Global/State Rankings[1]**	**CRPR List[2] with Threat Code Ext.[3]**
Allium tribracteatum	None	None	G2/S2	1B.2
Allium yosemitense	None	Rare	G3/S3	1B.3
Arctostaphylos nissenana	None	None	G1/S1	1B.2
Balsamorhiza macrolepis	None	None	G2/S2	1B.2
Botrychium ascendens	None	None	G3/S2	2B.3
Botrychium crenulatum	None	None	G3/S2	2B.2
Botrychium lineare	None	None	G2G3/S1	1B.3
Botrychium lunaria	None	None	G5/S2?	2B.3
Botrychium minganense	None	None	G4G5/S2	2B.2
Botrychium montanum	None	None	G3/S2	2B.1
Botrychium pedunculosum	None	None	G2G3/S1	2B.1
Botrychium pinnatum	None	None	G4?/S2	2B.3
Bruchia bolanderi	None	None	G3/S3?	4.2
Cinna bolanderi	None	None	G2S2	1B.2
Clarkia australis	None	None	G2/S2	1B.2
Clarkia biloba ssp. *australis*	None	None	G4G5T2T3 /S2S3	1B.2
Cypripedium montanum	None	None	G4/S4.2	4.2
Dendrocollybia racemosa	None	None	G2G3[4]	Not Tracked

Sensitive Plant Species	Federal Status	State Status	Global/State Rankings[1]	CRPR List[2] with Threat Code Ext.[3]
Eriastrum tracyi	None	Rare	G3Q/S3	3.2
Eriogonum luteolum var. *saltuarium*	None	None	G5T1/S1	1B.2
Eriophyllum congdonii	None	Rare	G2/S2	1B.2
Eriophyllum nubigenum	None	None	G2/S2	1B.3
Erythronium taylori	None	None	G1/S1	1B.2
Erythronium tuolumnense	None	None	G2/S2	1B.2
Fissidens aphelotaxifolius	None	None	G3G4/S1	2B.2
Helodium blandowii	None	None	G5/S1	2B.3
Horkelia parryi	None	None	G2/S2	1B.2
Hulsea brevifolia	None	None	G3/S3	1B.2
Lewisia kelloggii ssp. *hutchisonii*	None	None	G3G4T2T3Q /S2S3	3.2
Lewisia kelloggii ssp. *kelloggii*	None	None	G3G4T2T3Q /S2S3	3.2
Lomatium stebbinsii	None	None	G2/S2	1B.1
Meesia uliginosa	None	None	G4/S3	2B.2
Mielichhoferia elongata	None	None	G4/S2	2B.2
Mielichhoferia shevockii	None	None	G1/S1	1B.2
Mimulus filicaulis	None	None	G2/S2	1B.2
Mimulus pulchellus	None	None	G2G3/S2S3	1B.2
Peltigera gowardii	None	None	G3G4/S3	4.2
Tauschia howellii	None	None	G2/S2	1B.3

[1]Global/State Ranking: Global ranking " is a reflection of the overall status of [a species] throughout its global range. " State ranking "is assigned much the same way as global rank, but state ranks refer to the imperilment status only within California's state boundaries." Both the global and state ranks reflect the "combination of Rarity, Threat and Trend factors, with weighting being heavier on Rarity than the other two" (CNDDB 2014b). The following ranking system definitions are taken from CNDDB 2014b:

Global Ranking

G1 = Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2 = Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3 = Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4 = Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5 = Secure—Common; widespread and abundant.

Subspecies are given a T-rank with the G-rank which "reflects the global situation of just the subspecies or variety" (CNDDB 2014b). "Q" with the ranking indicates that there are taxonomic questions.

State Ranking

S1 = Critically Imperiled—Critically imperiled in the state because of extreme rarity (often 5 or fewer populations) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state.
S2 = Imperiled—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state.
S3 = Vulnerable—Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation from the state.
S4 = Apparently Secure—Uncommon but not rare in the state; some cause for long-term concern due to declines or other factors.
S5 = Secure—Common, widespread, and abundant in the state.

The ranking of some species is expressed as a range (e.g. S2S3). This means that the rank is somewhere between S2 and S3. Sometimes a question mark (S2?) is used to represent "more certainty than S2S3, but less certainty than S2" (CNDDB 2014b).

[2]California Rare Plant Ranks (CRPR) and their definitions (CNDDB 2014b):

1A. Presumed extirpated in California and either rare or extinct elsewhere
1B. Rare or Endangered in California and elsewhere
2A. Presumed extirpated in California, but more common elsewhere
2B. Rare or Endangered in California, but more common elsewhere
3. Plants for which we need more information - Review list
4. Plants of limited distribution - Watch list

[3]Threat Code Extensions:

.1 - Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)
.2 – Moderately threatened in California (20-80% of occurrences threatened / moderate degree and immediacy of threat)
.3 – Not very threatened in California (<20% of occurrences threatened / low degree and immediacy of threat or no current threats known)

[4]Source: Oregon Biodiversity Information Center (ORBIC 2013)and NatureServe (2014). This species is not ranked in California.

The following describes the Sensitive Plant species which occur in this project. Additionally, the suitable habitat is described for these Sensitive Plants. Suitable habitat for any species can be defined as the surroundings, substrate and environmental factors which allow that species to successfully grow and reproduce.

Rarity in plants can be the result of a number of things. Loss of habitat is a key factor for some species. Reproductive isolation through loss of populations is another factor. In many cases, the scarcity of the habitat in which the species evolved is the limiting factor which makes the species rare. Many of the rare plants considered in the Rim Recovery project are limited to specialized or scarce habitats such as cliffs, vernal pools, fens (spring-fed seep or meadow areas containing 16 inches or more of peat), or "lava caps" (prehistoric volcanic ash mud flows also known as lahars and composed of andesitic tuff). Table 5 shows the habitat characteristics or affinities of the Sensitive Plants considered in the Rim Recovery project. Some species are very closely associated with the specialized habitats listed. Others can be found in several similar specialized

habitats. Not all habitat characteristics are listed. For example, some species prefer shallow, well-drained soil whereas others prefer deep soil with a high amount of organic matter. All of the special habitats listed in these tables occur within the Rim Recovery project.

Table 5. Habitat Affinities for Rim Fire Recovery Sensitive Plants.

	Soils, Geology			**Canopy Closure**			**Elev-ation**			**Aspect**	**Special Habitats**					
Species Name	**Andesitic Tuff**	**Granitic**	**Metasedimentary**	**Open**	**Partly Open**	**Closed**	**2,000'-4,000'**	**4,000'-6,000'**	**6,000'-7,000'**	**North**	**Ridge Tops**	**Cliffs, Outcrops**	**Meadows, Seeps**	**Vernal Pools, Ponds**	**Perennial Streams**	**Fens**
Allium tribracteatum	●			●			●	●	●		●					
Allium yosemitense			●	●			●	●	●			●				
Arctostaphylos nissenana			●	●			●									
Balsamorhiza macrolepis		●	●	●			●	●								
Botrychium ascendens	●	●	●	●	●			●	●				●			●
Botrychium crenulatum	●	●	●	●	●			●	●				●			
Botrychium lineare	●	●	●	●	●				●				●		●	●
Botrychium lunaria	●	●	●	●	●	●			●				●		●	
Botrychium minganense	●	●	●	●	●	●		●	●				●		●	●
Botrychium montanum	●	●		●	●	●		●	●				●		●	●
Botrychium pedunculosum	●	●		●	●	●		●	●				●		●	●
Botrychium pinnatum	●	●	●	●	●	●			●				●		●	
Bruchia bolanderi		●			●	●		●	●				●		●	
Cinna bolanderi		●	●	●	●				●				●		●	
Clarkia australis		●	●	●	●		●	●								
Clarkia biloba ssp. *australis*	●	●	●	●	●		●	●		●						
Dendrocollybia racemosa		●	●		●	●	●	●	●	●						
Cypripedium montanum		●			●	●	●	●		●				●		
Eriastrum tracyi		●	●	●	●		●	●								
Eriogonum luteolum var. saltuarium		●		●	●			●	●							
Eriophyllum congdonii			●	●			●	●				●				
Eriophyllum nubigenum			●	●				●	●		●	●				
Erythronium taylori			●		●			●		●		●				
Erythronium tuolumnense	●	●	●		●	●	●	●		●		●			●	
Fissidens aphelotaxifolius		●			●		●	●	●	●		●			●	
Helodium blandowii	●	●		●					●				●			●
Horkelia parryi			●	●	●		●									

	Soils, Geology			Canopy Closure			Elev-ation			Aspect	Special Habitats					
Species Name	**Andesitic Tuff**	**Granitic**	**Metasedimentary**	**Open**	**Partly Open**	**Closed**	**2,000'-4,000'**	**4,000'-6,000'**	**6,000'-7,000'**	**North**	**Ridge Tops**	**Cliffs, Outcrops**	**Meadows, Seeps**	**Vernal Pools, Ponds**	**Perennial Streams**	**Fens**
Hulsea brevifolia		•			•	•		•	•							
Lewisia kelloggii ssp. *hutchisonii*	•	•		•	•			•	•		•					
Lewisia kelloggii ssp. *kelloggii*	•	•		•	•			•	•		•					
Lomatium stebbinsii											•					
Meesia uliginosa		•		•					•				•			•
Mielichhoferia elongata			•	•	•		•			•		•				
Mielichhoferia shevockii			•	•	•		•			•		•				
Mimulus filicaulis	•	•	•	•			•	•					•			
Mimulus pulchellus	•	•		•			•	•					•			
Peltigera gowardii		•			•	•	•	•	•	•					•	
Tauschia howellii		•	•	•				•	•		•					

<u>*Allium tribracteatum*</u>

Allium tribracteatum (three-bracted onion) is a perennial herb in the Onion family, Alliaceae. Torrey first described *Allium tribracteatum* in 1857. It is part of a complex of Alliums endemic to California with their distribution centering in the Sierra Nevada. The taxonomy and key characteristics of the *Allium tribracteatum* complex were examined and revised by Mortola and McNeal in 1985. Until then two-leaved plants of *Allium obtusum* were often confused with *Allium tribracteatum.* This new taxonomic understanding may not have been widely disseminated until the publication of the Jepson Manual in 1993 (Hickman, 1993). *Allium tribracteatum* is distributed in Tuolumne County, scattered on volcanic slopes and ridges (Mortola and McNeal, 1985). There is at least one occurrence in Calaveras County.

Allium tribracteatum grows on gravely lahar soils (volcanic mud flow made of andesitic tuff), often referred to locally as "lava caps." The sites are usually open with no overstory. In some instances, brush species such as manzanita (*Arctostaphylos* sp.) may be present. While there are not usually commercial conifer species growing on these sites, there are sometimes stands of trees nearby. *Allium tribracteatum* usually grows on the thin volcanic soils near the tops of ridges where there is little competition. *Allium tribracteatum* usually reproduces from seed rather than from bulb offsets. The elevation range for this species is 4,000' to 6,500'. It typically blooms March to May.

There are approximately 33 known occurrences of *Allium tribracteatum* in the Stanislaus National Forest. Most are on the Mi-Wok Ranger District. The known populations of *Allium tribracteatum* range in size from 5 individuals to more than 10,000.

There are no known occurrences of *Allium tribracteatum* within or adjacent to proposed Rim Fire Recovery units. There is a great deal of suitable habitat for this species within the Rim Fire Recovery project. Surveys were completed in spring 2014 for most unsurveyed suitable habitat in or adjacent to proposed units. However, the findings of those surveys were not available at the time of the completion of this analysis. The management requirements for the project would apply to any new occurrences found.

Allium yosemitense

Allium yosemitense (the Yosemite onion) is a perennial herb in the Onion family, Alliaceae. It sprouts from a bulb in late winter to early spring. The appropriate identification period for *Allium yosemitense* is May through early June. It grows from a bulb and reproduces by seed. *Allium yosemitense* grows in shallow soils of metasedimentary origin with a high amount of metasedimentary scree or cobble on the surface. It can also occur in granite. It is usually found on west, northwest or northeast aspects. Its elevation range is 1,500 to 7,000 feet.

Allium yosemitense has a very limited range, mostly in the Merced River watershed, in Mariposa County. There is one known occurrence within Tuolumne County in the Tuolumne River watershed. Alice Eastwood first described *Allium yosemitense* in 1934 from specimens collected at the head of Bridalveil Falls in Yosemite Valley in 1922. There are thirteen known occurrences of *Allium yosemitense*, eight in the Sierra National Forest, three in the Stanislaus National Forest and two in Yosemite National Park. All of the Stanislaus' occurrences are in the Groveland Ranger District. One of these occurs within a Rim Fire Recovery Alternative 1 unit, but outside that unit in Alternatives 3 and 4. The same occurrence grows on the edge of a Rim Recovery roadside hazard tree removal unit.

There are areas of suitable habitat in Rim Fire Recovery units and roadsides. Surveys were completed in spring 2014 for most unsurveyed suitable habitat in or adjacent to proposed units. However, the findings of those surveys were not available at the time of the completion of this analysis. The management requirements for the project would apply to any new occurrences found.

Arctostaphylos nissenana

Arctostaphylos nissenana (Nissenan manzanita) is a low-growing shrub in the Heath Family, Ericaceae. It reproduces by seed. It has no burl and, therefore, is unlikely to resprout after fire. Unlike the common local manzanita shrubs, this species has grey, shredding bark.

The range of this species is El Dorado County with one known occurrence near the town of Sonora. It grows in ancient tropical soils of the Ione Formation. There are 13 populations

currently known (CNDDB 2014a). The land ownership of the El Dorado County occurrences is a mix of private property, Bureau of Land Management (BLM) and Eldorado National Forest. In Tuolumne County, the one known occurrence is on BLM land.

There are areas on the western side of the Stanislaus National Forest where similar soils support another Ione Formation species, *Horkelia parryi*. The proximity of the Sonora occurrence and the presence of Ione Formation soils presents the possibility that *Arctostaphylos nissenana* could be found in the Forest. To date, no occurrences have been found in the Stanislaus National Forest. There are suitable soils in the Rim Fire Recovery project inside at least eleven salvage units (Proposed Action) and numerous roadside hazard tree removal units.

Balsamorhiza macrolepis

Balsamorhiza macrolepis (big-scale balsamroot) is a perennial herb in the sunflower family, Asteraceae. It reproduces by seed. *Balsamorhiza macrolepis* begins growing in late winter or early spring and blooms in mid-spring. The plant goes dormant during the summer, after seeds are produced.

The range of *Balsamorhiza macrolepis* is the Sierra Nevada Foothills from Tehama County south to Mariposa County, and the interior Coast Range from Tehama County (Mendocino National Forest) south to Santa Clara County. Only 43 occurrences are documented in the California Natural Diversity Data Base (CNDDB 2014a). One of these from private property is confirmed to be extirpated (lost from that site); another from private property is thought to possibly be extirpated (CNDDB 2014a). Fifteen of the 43 occurrences are on lands of unknown ownership. Nine occurrences are in Bureau of Land Management lands, one of which is within a parcel proposed for disposal in a land-exchange in Tehama County. One occurrence was collected in Yosemite National Park near Big Meadow in 1911. It was relocated by Park staff in 2011 after the Big Meadow Fire (Colwell 2014). An historic occurrence documented in the Plumas National Forest has not been relocated (Christofferson 2010, USDA 2012).

Balsamorhiza macrolepis inhabits a variety of soil and plant community habitats. It has been reported from ponderosa pine forest, chaparral, vernally moist meadows and grasslands or grassland within oak woodland. Most of the occurrences are found in serpentine substrates, but it is also known to grow in soils derived from sandstone, basalt, and rocky clays of metasedimentary origin. The known occurrences in the Rim Fire burned area and the Yosemite occurrence are on granitic soils. *Balsamorhiza macrolepis* is usually found in openings or under an open brush cover. The elevation range is listed as below 4,600 feet (Jepson Flora Project 2014). It occurs as high as 4,700 feet elevation in the Stanislaus National Forest.

There are four known occurrences of *Balsamorhiza macrolepis* within the Rim Fire Recovery project area. One, made up of 2 small colonies, is located inside a salvage unit. Two occurrences are within one roadside hazard tree removal unit. One is just outside another hazard tree unit. The fifth occurrence is inside a Rim Fire Hazard Tree roadside unit near powerlines. This occurrence was reportedly impacted by hazard tree removal or powerline replacement after the Rim Fire.

The habitat and soils for this species is common throughout the Rim Fire Recovery project area. It is possible that there are as-yet undiscovered occurrences in other project units. Surveys for this species were conducted through the spring and summer, 2014. However, the findings of those surveys were not available at the time of the completion of this analysis. The management requirements for the project would apply to any new occurrences found.

Botrychium species life cycle and habitat attributes.

Botrychium species are perennial herbs in the Adder's-Tongue Family, Ophioglossaceae, and are closely related to ferns. The following information is summarized from the draft conservation assessment (Clines 2009). *Botrychium* species have a complicated life cycle, reproducing by spores and dependent on mycorrhizal fungi for carbohydrates, mineral nutrients and water. The majority of the *Botrychium* life is spend under the soil surface, emerging above the soil after the first two to six years of life to produce spores. The spores are dispersed by wind but the majority stay within about five meters (16.4 feet) of the parent plant. The spores filter into the soil and, if an appropriate mycorrhizal fungi is present, they germinate into a haploid (1n) gametophyte (gamete-producing plant). The gametophyte produces gametangia, male and female reproductive structures, which produce sperm and eggs, respectively. Fertilization takes place underground on the gametophyte and a sporophyte (2n) grows on a short rhizome attached to the gametophyte. The sporophyte eventually produces one above ground leaf divided into a sterile segment and a reproductive segment. The reproductive leaf segment produces the spores (1n).

Because *Botrychium* species are completely dependent on mycorrhizal fungi, the plant community must have the right fungal partners, such as incense cedar (*Calocedrus decurrens*) trees, wild strawberry (*Fragaria* sp.) plants, twayblade (*Listera convallarioides*) and possibly trail plant(*Adenocaulon bicolor*), to produce the food taken up by the fungi and transferred to the *Botrychium*. The habitat must have the right moisture regime to support the fungi. In the Sierra Nevada, moist meadows, seeps and springs generally are habitats with favorable conditions. The rare *Botrychium* species are often found associated with uncommon soil or geologic formations, such as limestone deposits, or where springs bring water to the surface which has percolated through volcanic formations bringing unique minerals to the *Botrychium* site. According to Farrar, leaf litter of cedar trees can provide the mineral needs of Botrychiums (2011c):

> *Leaf litter of Thuja [western red cedar] is well known for supporting species of bryophytes and ferns that elsewhere grow on calcareous substrates including fens and limestone/dolomite cliffs. Species of Cupressaceae [the cypress or cedar family] are also highly supportive of the species of fungi that form mycorrhizal associations with species of Botrychium.*

While western red cedar only occurs in northern California and northward into Oregon, Washington and Canada, incense cedar has been found locally to function similarly as does western red cedar in the north (Farrar 2011c).

In the Rim Fire Recovery project, the currently known rare *Botrychium* species are found in a contact zone between a volcanic andesitic tuff lahar and granitic bedrock. This contact zone is

the point at which spring water surfaces in a stringer meadow, carrying with it the unique minerals of the volcanic substrate.

Botrychium ascendens

First described by Wagner and Wagner in 1986, *Botrychium ascendens* (upswept moonwort) is widely scattered and rare in western North America. It is normally found in damp areas of wet meadows or in riparian areas in coniferous forests. It has also been found along the dryer areas of fens. It ranges from 4,800 to 11,000 feet in elevation.

The range of this moonwort is from southern Alaska to southern Nevada, and from the Sierra Nevada in California east to the Rocky Mountains. There are scattered populations in Quebec, Newfoundland, northern Minnesota and Vermont (Farrar 2011a). In California, it is known from Butte, El Dorado, Lassen, Modoc, Mono, Placer, Plumas, Nevada, Shasta, Tehama, Tulare and Tuolumne Counties (CNDDB 2014a, CCH 2014). Most California occurrences tend to be small, usually fewer than 20 plants each (CNDDB 2014a). One contained 49 plants, another 60 plants when documented (CNDDB 2014a). One was reported to contain 200 plants (CNDDB 2014a). One confirmed occurrence is known from the Stanislaus National Forest so far (A. Colwell #08-380a). It is outside the Rim Fire burned area.

Botrychium crenulatum

Botrychium crenulatum (scalloped moonwort) was first described by Wagner and Wagner in 1981. It grows in moist habitats including meadows, seeps, springs and riparian areas. It is often found on creek banks in conifer forest. The elevation range for the species is 4,800 to 12,000 feet.

Botrychium crenulatum has the widest distribution of the sensitive botrychiums across California. CNDDB shows 77 reported occurrences for California (2014a). Not all of these have been verified and some are represented by historic herbarium specimens only. Only 22 occurrences have been accounted for in herbarium specimens (Jepson Flora Project 2014). Most of the California occurrences are small, numbering fewer than 25 plants (CNDDB 2014a). The range for *Botrychium crenulatum* extends through the western United States and western Canada. In California, the range extends from the Oregon border south through the Sierra Nevada into the Transverse Range. There are nine occurrences known in the Stanislaus National Forest. Seven of those occurrences are in the Calaveras Ranger District. One occurrence is in the Summit Ranger District. The ninth is in the Groveland Ranger District within the Rim Fire burned area. This occurrence is on the edge of a Rim Fire Hazard Tree roadside unit, in a small stringer meadow where occurrences of *Botrychium pedunculosum* and *Botrychium minganense* are also found. None of the Stanislaus occurrences are included in the 22 Jepson Flora Project occurrences. The Rim Fire occurrence is accounted for in CNDDB.

Botrychium lineare

Botrychium lineare (slender moonwort) was described as a new species in 1994 by W. H. Wagner, based on type specimens from Wallowa Co., Oregon. The habitat is moist margins of meadows, seeps, springs and riparian areas where the roots can reach mineral soil. The sites are often influenced by calcareous (contains calcium carbonate, such as marble or limestone) substrates. It ranges in elevation from 7,000 to over 13,000. Most populations range from 1 to 100 with most having fewer than 10 plants.

It is known from southern Alaska, southern Sierra Nevada in California, Colorado, northern Minnesota, Montana, southern Nevada, Washington, Quebec, Yukon and the Black hills of South Dakota and Wyoming (Farrar and Clines, 2009). There are sites reflected in historic specimen collections from Utah and New Brunswick, which have not been relocated in recent years. A collection from 1968 was made in the Sierra National Forest (Farrar and Clines, 2009). In 2008, an occurrence was found at the head of Virginia Canyon in Yosemite National Park and another was confirmed from the Stanislaus National Forest, well outside the Rim Fire area (Farrar and Clines, 2009). All three of the currently known California occurrences grow in soils influenced by calcareous substrates.

Only a small amount of the Rim Fire Recovery project is within the elevational range of this species. However, there is suitable habitat in that portion of the project area which has not been surveyed for this species. While there are no calcareous deposits there, there are volcanic soils with numerous granitic contact zones where springs and seeps might provide suitable growing conditions.

Botrychium lunaria

Botrychium lunaria (common moonwort) occurs in moist habitats, often meadows, stream sides, seeps, and springs. At high elevations, it can occur in any well-drained, moist soils, including in scree slopes. At lower elevations, it can occur in dense forests as well as in meadows. It prefers soils with neutral pH (Farrar 2011b). It ranges from 6,400 to11,200' in elevation in California.

Botrychium lunaria was once thought to have a circumboreal distribution occurring in both Europe and North America. Genetic and morphological analysis of specimens world-wide, completed in 2008 by Mary C. Stensvold, Iowa State University, revealed that the North American plants are quite different genetically from the European plants (Farrar 2011b). Stensvold proposed the name *Botrychium neolunaria* for those plants occurring in North America and retaining the name *Botrychium lunaria* for the European plants (Farrar 2011b). However, there has been no publication of this new name to date. Without a published name, the taxon remains in the Region 5 Sensitive List as *Botrychium lunaria*, with the understanding that the species in North America is synonymous with the unpublished name *Botrychium neolunaria*. For the purposes of reports and documentation for the Rim Fire Recovery, the old name *Botrychium lunaria* is used.

In North America, it occurs from Alaska to California, northern Arizona and New Mexico, the Great Lakes region and across Canada. In California, eight occurrences are documented in Modoc, Mono, Nevada, Sierra, Tulare and Tuolumne Counties (CNDDB 2014a). However, only occurrences in Modoc, Mono and Inyo Counties (Farrar 2014b) and Tuolumne County have been genetically confirmed. Occurrences on federal lands include four sites on the Modoc National Forest, two sites on the Inyo National Forest, one reported site on the Tahoe National Forest (not represented by a specimen), and one site in Yosemite National Park (CNDDB 2014a). A number of the sites are very old and have not been relocated. There are no known occurrences in the Stanislaus National Forest. However, there is suitable habitat in the Rim Fire Recovery project area.

Botrychium minganense

Botrychium minganense (Mingan moonwort) was first described in 1927 by Frere Marie Victorin from specimens collected from the Mingan Islands (Clines 2009). The habitat varies from dense forest to open meadows and can be in nearly dry sites to saturated habitats such as fens and seeps (Clines 2009).

Botrychium minganense has a wide range in North America. It occurs in 19 states and 12 Canadian provinces. There is also an occurrence which was found in recent years in Iceland. There are 55 California occurrences reported in CNDDB (2014a), some of which are historic and not relocated in recent years. The range of the species in California is from the Oregon border south through the Sierra Nevada. There are seven occurrences of *Botrychium minganense* in the Stanislaus National Forest. Five of these occur in the Calaveras Ranger District and one occurs in the Summit Ranger District. One occurrence is in the Groveland Ranger District within the Rim Fire Hazard Tree project. This occurrence is made up of two colonies and grows in the same stringer meadow as the *Botrychium crenulatum* and *Botrychium pedunculosum*.

Botrychium montanum

Botrychium montanum (western goblin) was described in 1981 by W. H. Wagner and F. S. Wagner from Lake County, Montana specimens (Farrar 2011c). It has a preference for dark, moist habitats, growing under western red cedar (*Thuja plicata*) in the northern part of its range, and under incense cedar in California (Farrar 2011c). It occurs in moist soils with high organic matter along small to mid-sized streams, in fens, seeps and meadows especially where there are perennial plants known to be fungal partners (Farrar 2011c). The elevation range for this species is 4,900 to 7,000 feet (CNDDB 2014a, Jepson Flora Project 2014).

It occurs in scattered locations from southern Alaska, British Columbia, northeastern Montana, Northern Idaho, Washington, Oregon and California (Farrar 2011c). There are 42 occurrences reported in California (CNDDB, 2014a). It is found in Butte, El Dorado, Fresno, Lassen, Modoc, Plumas, Shasta, Sierra and Tehama Counties (CNDDB 2014a) and Kern County (Farrar 2011c). Occurrences in Kern, Modoc and Tehama Counties have been genetically confirmed (Farrar 2011c). Occurrences in Butte, Tehama and Kern Counties grow under incense cedar

(Farrar 2011c). There is one reported occurrence in the Calaveras Ranger District of the Stanislaus National Forest. It is well outside the Rim Fire burned area. However, there is a great deal of suitable habitat for this species in the Rim Fire Recovery project.

Botrychium pedunculosum

Botrychium pedunculosum (stalked moonwort) was described by W.H. Wagner. It occurs in mountain meadows, under conifers or tall forbs, and sometimes in forests or woodlands and on roadsides or on scree slopes (Farrar 2011d). The elevation range of this species is 4,800 to 7,000 feet.

Botrychium pedunculosum is found in the Rocky Mountains of northwestern Montana and northern Idaho and into northeastern Oregon (Farrar 2011d). There are disjunct occurrences in northeastern Quebec, northern Alberta and on the Alaska peninsula (Farrar 2011b). There has been only one occurrence found in California. It is located in the Stanislaus National Forest, in the Rim Fire Hazard Tree project at the same meadow as the known occurrences of *Botrychium crenulatum* and *Botrychium minganense*. This occurrence of *Botrychium pedunculosum* is made up of two colonies. It is the most southerly occurrence of the species currently known.

The known occurrence of *Botrychium pedunculosum* is within a Rim Fire Hazard Tree unit and adjacent to a Rim Fire Recovery roadside hazard tree unit. There is a great deal of habitat for this species in the Rim Fire Recovery project area. The known occurrence is in a stringer meadow situated on a contact zone between granitic bedrock and a lava cap. The meadow is spring fed. The plants are closely associated with incense cedar and other fungal partners at the known site.

Botrychium pinnatum

Botrychium pinnatum was described as a new species in 1929 by Harold St. John based on specimens from the State of Washington. It is most often found growing in moist grassy sites in open forests and meadows. It can occur in closed canopy forests, and often occurs near streams (Farrar 2011e). It can also occur on shrubby slopes (Farrar 2012). The elevation range of the species in California is 6,200’ to 9, 200 feet.

Botrychium pinnatum is known from near sea level in Alaska south to California, and extends east to Colorado and Montana, and south to northern Arizona and New Mexico (Farrar 2011d). In California, it has been found so far in two locations in Siskiyou County, one in Tehama County and one occurrence in Tuolumne County (Farrar 2011e). The Tuolumne County occurrence is in the Stanislaus National Forest, well outside the Rim Fire area. There is a great deal of habitat within the Rim Fire Recovery project area which has not been surveyed for this species.

Bruchia bolanderi

Bruchia bolanderi is a rare, inconspicuous moss. It occupies organic or mineral soil on vertical banks of small streams in meadows or forests or at the edges of fens or springs (Malcolm, Malcolm, Shevock and Norris, 2009) . It is somewhat ephemeral, dying back to the soil level. It can also occupy road cuts and gully head cuts with the proper moisture regime. The elevation range for *Bruchia bolanderi* in California is 5,000 to 11,000 feet. One site in Idaho was found at about 3,000 feet elevation.

First described from Yosemite National Park, *Bruchia bolanderi* is known from Oregon, Idaho, Utah, Nevada and the Sierra Nevada of California (CNABH 2014). Within California, the range extends from Modoc County south to Tulare County and on the east side of the Sierras in Mono County. According to CNDDB, *Bruchia bolanderi* is known from 28 occurrences in California (2014a). However as of 2012, there are 54 occurrences documented among 10 National Forests and three National Parks (USDA 2012a). There are currently four confirmed occurrences of *Bruchia bolanderi* in the Stanislaus National Forest. One of these is about 0.8 mile outside the Rim Fire burned area. There is suitable habitat within the Rim Fire Recovery project.

Cinna bolanderi

Cinna bolanderi (Bolander's woodreed) is a perennial herb in the grass family, Poaceae. It grows in wet meadows and along streams. Members of the genus *Glyceria* are similar in appearance to *Cinna bolanderi* and grow in the same habitat types. It is likely that *Cinna bolanderi* has been overlooked as a result. *Cinna bolanderi* grows in both granitic and metasedimentary soils. The elevation range of this species is 6,050 to 7,900 feet.

The range of *Cinna bolanderi* is the southern Sierra Nevada from Mariposa County to Tulare County. There are no known occurrences in the Stanislaus National Forest. However, there are occurrences in Yosemite National Park. The nearest is within 1.5 miles of the Rim Fire burned area within the Forest. There is suitable habitat within the Rim Fire Recovery project.

Clarkia australis

Clarkia australis (Small's southern clarkia) is an annual herb in the Evening Primrose family, Onagraceae. It reproduces by seed. Seedlings of *Clarkia australis* can be found in the fall, after about two or more inches of rain. The appropriate identification period for *Clarkia australis* is approximately late June through mid-August, depending on elevation and weather conditions. Seed is usually ready for dispersal within one and one-half months from onset of blooming. By the time seed is ready for dispersal, the plant has dropped its leaves and, for the most part, has died. Occurrences of *Clarkia australis* range in size from one individual to thousands of individuals. The number of individuals in an occurrence can vary widely from year to year due to weather and site conditions. After wildfire, the occurrences often have numbers in the thousands due to the loss of competition and overstory, and the flush of nutrients.

Clarkia australis is usually found on slopes with a south, southwest or southeast aspect. It grows in openings in ponderosa pine and mixed-conifer stands often in association with bear clover. *Clarkia australis* tends to prefer "disturbed" sites - sites with little or no competition from more aggressive weedy species. In the natural setting, fire in the frequent-fire regime would be the disturbance agent. Bear clover does not out-compete *Clarkia australis*, probably because of the deep root system of bear clover compared to the very shallow roots of *Clarkia australis*. *Clarkia australis* does not grow well with weedy annuals like non-native grasses which out-compete it for moisture. It has not been found growing under dense stands of manzanita (*Arctostaphylos* sp.). It will grow on a site where manzanita is present in small numbers and in open areas within manzanita stands. *Clarkia australis* prefers to grow in open sun or lightly filtered sunny conditions. Soil types and depths do not appear to be limiting. When not associated with bear clover, the species is usually observed growing in bare mineral soil or with a very light layer of leaf litter. *Clarkia australis* occurs between 3,000 and 6,000 feet in elevation.

Many species of the genus *Clarkia* have been the subject of extensive research. There is often "a great deal of variation between individuals of the same colony [and] between colonies" of the same species. Under poor environmental conditions, genetic variations may lend important adaptive features to a population. There tends to be great importance in exchange of genes between populations of clarkias because of the variability of populations. Research has shown that "the vast majority of... genetically isolated groups (occurrences) are short lived and become extinct." Speciation may also result from populations becoming isolated (Lewis, 1952). Speciation is the process of evolution whereby a population of a species becomes a new and different species. It is unknown how *Clarkia australis* may fit into this scenario. Because it exhibits wide variation in petal shape and coloration, it is possible that *Clarkia australis* is also genetically variable.

Clarkia australis was described in 1971 by Ernest Small as a result of trials in cross-pollinating several species of *Clarkia* (Small, 1971). As a result of Small's work, it was assumed that *Clarkia australis* occurred south of the Tuolumne River and its virtual look-alike, *Clarkia virgata* occurred north of the river. *Clarkia australis* was described from two occurrences in its currently known range. The taxonomy of this species was re-confirmed in 1996 in more extensive and deliberate cross-pollination tests (Gottlieb and Ford, 1999).

As part of that investigation, Gottlieb discovered that the range of *Clarkia australis* extends farther to the northwest and the more common look-alike, *Clarkia virgata* extends farther to the southeast than previously believed. Six occurrences previously believed to be *Clarkia australis* were genetically proven to be *Clarkia virgata*. Four occurrences previously thought to be *Clarkia virgata* were proven to be *Clarkia australis*. If the foraging range of pollinators (small native bees and native bumblebees) is taken into consideration, it might be assumed that all occurrences within about one to two miles of these proven occurrences would then be the same species. The geographic distribution of the genetically proven occurrences indicates that there might be an east-west dividing line between the two species. In addition, based on the genetic testing, *Clarkia australis* tends to occur at higher elevations and *Clarkia virgata* tends to occur at lower elevations.

The currently known range of *Clarkia australis*, based on genetic testing, extends north of the Main Fork of the Tuolumne River, into the Jawbone Ridge area and the Cherry Lake area. It is possible that the range of *Clarkia australis* extends into the Mi-Wok Ranger District. However, this possibility has not been verified with genetic testing. For management purposes, the range has been defined as Tuolumne County south and east of Highway 108 and Mariposa County north of the Merced River. The western boundary is mapped, based on the locations of the genetically tested occurrences, as a diagonal line extending from the Forest boundary just south of Mount Provo, southeast to Highway 120 at Cherry Lake Road, then east, roughly following the highway to Harden Flat Road, then southeast to Crocker Ridge, south along the ridge to "Five Corners", then south to the southwestern ridgeline above the Merced River, from Trumbull Peak. The occurrences on the northeast side of the line are managed as assumed *Clarkia australis*. The occurrences on the southwest side of the line are managed as assumed *Clarkia virgata*, with some allowances for error. Further testing is needed to better refine the range of the species.

Currently it is assumed that there are about 300 colonies of *Clarkia australis* within five fairly distinct, extended populations. The largest concentration of occurrences is east of Cherry Lake Road, south of the Mather-Hetch Hetchy Road, west of Evergreen Road and north of Highway 120. Most of the currently known colonies of *Clarkia australis* occur in the Groveland Ranger District. One occurrence of *Clarkia australis* is known from private property within the boundaries of the Forest. Three occurrences are reported from Yosemite National Park, all within one to two miles of the boundary with the Stanislaus National Forest. There are two historic collections from the Sierra National Forest which are likely to be mis-identifications of the common *Clarkia rhomboidea* rather than *Clarkia australis*. Photos of the herbarium voucher specimens #UC1122476 and # UC1516305, accessible on-line from the Consortium of California Herbaria (CCH 2014), show characteristics of *Clarkia rhomboidea* which are inconsistent with *Clarkia australis*.

Roughly two-thirds of the known *Clarkia australis* occurrences are located within the Rim Fire burned area. There are 87 occurrences (128 colonies) within 28 Rim Fire Recovery units (Alternative 1). There is one occurrence adjacent to a 29th unit. There is previously unsurveyed suitable habitat for this species in project units. Surveys were conducted in summer 2014 in this unsurveyed suitable habitat. However, the findings of those surveys were not available at the time of the completion of this analysis. The management requirements for the project would apply to all new occurrences found.

Clarkia biloba ssp. *australis*

Clarkia biloba ssp. *australis* (Mariposa clarkia) is an annual herb in the evening primrose family, Onagraceae. It reproduces by seed. Like *Clarkia australis*, *Clarkia biloba* ssp. *australis* germinates in the fall after two or more inches of rain and it dies after setting seed. The appropriate identification period for this species is mid-spring, approximately the month of June. The more common look-alike, *Clarkia biloba* ssp. *biloba*, is difficult to distinguish from *Clarkia biloba* ssp. *australis*. When *Clarkia biloba* ssp. *australis* is suspected, exacting measurements of the petals must be taken and the ratio of width to length compared to confirm its identity.

Clarkia biloba ssp. *australis* is most often found on north, northeast or northwest-facing slopes, usually under light shade. It is occasionally found on southwest or southeast-facing slopes. It is also sometimes found in direct sunlight. *Clarkia biloba* ssp. *australis* tends to prefer "disturbed" sites - sites with little or no competition from more aggressive weedy species. In the natural setting, fire in the frequent-fire regime would be the disturbance agent. The elevation range for *Clarkia biloba* ssp. *australis* is approximately 400 to 4,600 feet (CNDDB 2014a).

According to Harlan Lewis, PhD., *Clarkia biloba* ssp. *australis* originated within the Merced River Canyon. He asserted that any specimens found outside the Merced River Canyon are intergrades between the more common *Clarkia biloba* ssp. *biloba* and *Clarkia biloba* spp. *australis* (pers. comm. June 15, 1996). However, since these occurrences fit the description of the species and represent specimens which contribute to an evolving genome, they are to be managed as *Clarkia biloba* ssp. *australis* (Jim Shevock, former Regional Botanist, pers. comm. July 2, 1996). Often times, occurrences of *Clarkia biloba* on both the Mi-Wok and Groveland Ranger Districts, have mixtures of plants with characteristics of both subspecies. That is, some plants tend to have characteristics of subspecies *biloba* and other plants in the same occurrence have characteristics of subspecies *australis.* We have defined that in order to be considered an occurrence of *Clarkia biloba* ssp. *australis,* over 50 percent of the plants must have the characteristics of that subspecies. In 1999, most occurrences discovered on both the Mi-Wok and Groveland Ranger Districts had characteristics of both subspecies leading to the conjecture that perhaps the defining characteristics are not definitive enough for these two subspecies; or perhaps that the two subspecies cannot be clearly defined within this local zone of intergradation.

Clarkia biloba ssp. *australis* was described in 1955 by Harlan and Margaret Lewis from specimens found in the Merced River Canyon. There are about 109 known occurrences of *Clarkia biloba* ssp. *australis* in existence. Of these, sixteen are known from the Merced River Canyon and it's tributary canyons. According to Lewis, these are "true" *Clarkia biloba* ssp. *australis*. Thirteen of these occur on lands managed by the Sierra National Forest and/or the Bureau of Land Management. Three are on land of unknown management or ownership.

Outside the Merced River Canyon and its tributaries, there are occurrences which match the description of *Clarkia biloba* ssp. *australis*. According to Lewis, these are "intergrades" between *Clarkia biloba* ssp. *australis* and *Clarkia biloba* ssp. *biloba*. Many of these occurrences are small, discrete colonies in close proximity to other small discrete colonies which, when considered at a landscape level, make up larger, extensive occurrences or populations. About 62 occurrences are on National Forest System land in the Groveland Ranger District and 48 occurrences are on the Mi-Wok Ranger District, of the Stanislaus National Forest. For management purposes and to conserve evolving genomes, these occurrences are managed as *Clarkia biloba* ssp. *australis*. One occurrence is on private land in the Long Gulch area. One is on private land in the Greeley Hill area. An occurrence was identified along Highway 108 right-of-way, west of Jamestown. There are two occurrences south of the Merced River: one on private land and one on land of unknown management or ownership.

Most of the Forest’s known occurrences of *Clarkia biloba* ssp. *australis* are within the Rim Fire burned area. There are 17 occurrences (30 colonies) within nine Rim Fire Recovery units

(Alternative 1). There are 3 occurrences which are adjacent to three Rim Fire Recovery units. There is suitable habitat within units and roadside hazard tree areas which have not been surveyed for *Clarkia biloba* ssp. *australis.* Surveys were conducted in spring and early summer 2014 in unsurveyed suitable habitat. However, the findings of those surveys were not available at the time of the completion of this analysis. The management requirements for the project would apply to all new occurrences found.

Cypripedium montanum

Cypripedium montanum (mountain ladyslipper orchid) is a perennial herb in the orchid family, Orchidaceae. It arises in early spring from shallow rhizomes and dies back by late summer. The appropriate identification period for this species is mid-spring, approximately early May to mid- or late June.

In the Stanislaus National Forest, *Cypripedium montanum* inhabits sites which are relatively undisturbed with a moderate to dense overstory, usually containing Douglas-fir or white fir. These sites are typically west or north-facing with fairly damp, deep loamy soils and a well-developed duff layer. Often, the sites are very small undisturbed islands surrounded by land disturbed through past logging, road building or other activities. In the Stanislaus National Forest, *Cypripedium montanum* ranges in elevation from 3,500 to 6,500 feet. The elevation range for California is listed as 650 to 7200 feet (Jepson Flora Project 2014).

Cypripedium montanum associates with mycorrhizal fungi. Researcher Richard Shefferson found that *Cypripedium* species are associated primarily with one mycorrhizal fungal family, the Tulasnellaceae (Shefferson, et. al., 2005). The associated fungi in this family are termed orchid mycorrhizae, which differentiate from ectomycorrhizal fungi in that the orchid mycorrhizae grow within the orchid root cortical cells and provide sugar to the orchid with no exchange of carbon back to the fungus. Ectomycorrhizal fungi do not grow within root cells, but exchange sugars for carbon across an "interface of cortex and mantle" (Shefferson, 2004a).

Shefferson noted "*Cypripedium* species associate with a fungus that may also have an ectomycorrhizal connection to nearby conifer species" (2004b). In compiling information about *Cypripedium montanum* habitat attributes, Kaye and Cramer (2005) found that Douglas fir (*Pseudotsuga menziesii*) was associated with *Cypripedium montanum* in 72.4 percent of the Sierran and northwestern California occurrences, as reported in occurrence sighting records. White fir (*Abies concolor*) was the second most common plant associate at 46.8 percent of occurrences. Fungi in the genus *Tulasnella* are often associated with dead wood (Kaye and Cramer, 2005), indicating a possible reliance on decomposing wood in the vicinity of *Cypripedium* species.

Cypripedium montanum requires a mycorrhizal fungi relationship for germination and growth (Shefferson, et. al., 2005; Kaye and Cramer, 2005). *Cypripedium* seed is produced with no endosperm, which is the part of the seed which provides food to the embryo. The new *Cypripedium* plant will live completely underground with its fungal associate providing water and food, growing and storing food for a number of years (Kaye and Cramer, 2005). Once the

Cypripedium has adequate stored food to support leaf production, the plant will produce above-ground stems and leaves. There are some indications that the *Cypripedium montanum* most likely requires mycorrhizal fungi relationships throughout life (Kaye and Cramer, 2005). Because it lacks a hard seed coat, *Cypripedium montanum* does not bank seed in the soil.

Mechanical disturbance to the *Cypripedium montanum* rhizomes is usually fatal. *Cypripedium montanum* will sometimes survive a low-intensity fire in which most of the duff layer is left intact. However, it usually does not survive a fire of an intensity in which the duff layer is consumed (pers. comm. D. Knecht, February 13, 1997; Kaye and Cramer, 2005).

Cypripedium montanum has a wide geographic range but is rare within its range. It ranges from the central Sierra Nevada and central Coast Ranges in California, north into Alaska. It also occurs in Montana and Wyoming. In California, in 2005, there were 202 known occurrences in eleven National Forests (Kaye and Cramer). In the Central Sierra Nevada, there are occurrences in the Eldorado, Plumas, Stanislaus and Sierra National Forests and Yosemite National Park. There are 31 known occurrences of *Cypripedium montanum* in the Stanislaus National Forest. Most of these Forest occurrences are quite small, having fewer than ten plants each. Some of these occurrences are made up of small colonies scattered across larger areas.

All but one known Forest occurrence of *Cypripedium montanum* occurs within the Rim Fire burned area. The vegetation burn severity mapping completed using remote sensing technologies showed that the burn severity in the occurrence areas ranged from very low to high. This mapping technique primarily shows the damage to the tree canopy. Post-fire monitoring of most of the *Cypripedium montanum* occurrences took place during the spring and summer, 2014. In numerous occurrences, the very low to low vegetation burn severity mapped areas did not correlate with the actual effects at ground level. There were numerous instances where the canopy was intact but ground fire had completely consumed the duff layer and ground fuels.

Monitoring revealed that in areas where the duff remained intact or intermittently burned within an occurrence, the *Cypripedium montanum* had the greatest survivorship. Where the duff was completely consumed, survivorship was low or non-existent. Complicating these results is the possibility that *Cypripedium montanum* plants might have remained dormant in some sites without growing in 2014 due to the stress caused by the direct effects of the fire and the stress of an exceptionally dry precipitation year. Therefore, sites with remaining canopy closure but lacking *Cypripedium montanum* in 2014 should not be ruled out. Monitoring should be conducted in future years at those sites.

It is likely that most of the occurrences in the moderate and high vegetation burn severity areas were either lost outright as a result of the fire or will not be sustained into the future due to the removal of the canopy as a result of the fire. Any occurrences within these areas where the canopy survived might be sustained into the future if microclimate conditions (soil moisture, shade, daytime temperatures, soil organic materials) were not altered too much by the fire and douglas fir trees and other fungal partners survived in near proximity. Without the micro-climate of a closed canopy or douglas fir trees and the soil organic matter to support the fungal partners, it is unlikely that *Cypripedium montanum* plants would be sustained.

There are twelve known occurrences (19 colonies) of *Cypripedium montanum* within seven Rim Fire Recovery units (Alternative 1). There is one occurrence adjacent to one additional unit. Post-fire monitoring data was not completely analyzed prior to completing this report. It has not yet been determined how many of these known occurrences survived and how many might have not survived the fire. The management requirements would be applied to all sites except any determined to have been extirpated through additional monitoring.

Dendrocollybia racemosa

Dendrocollybia racemosa is a saprophytic mushroom which is widespread in the Northern Hemisphere but always locally rare. This species is found on rotting or mummified remnants of agaric mushrooms, or occasionally in nutrient-rich leaf mulch in forests (Cushman and Huff 2007). The species has been found in older forests of coast live oak, Douglas-fir and tanbark oak, along riparian areas, and in other types of conifer forests. Populations are most likely to occur on wet, north facing slopes or in riparian areas with a perennial stream. The elevation range of the species is 2,500 to 7,000 feet.

Within the range of the northern spotted owl, populations are known from the western portions of Washington, Oregon, and northern California. There are approximately 37 documented sites scattered throughout California (USDA 2013a). The distribution of documented and verified occurrences on National Forest lands is as follows: Lake Tahoe Basin Unit (1 occurrence), Klamath (2: one on federal land, one on private land), Shasta-Trinity (8), Six Rivers (8), Tahoe (2): one occurrence bordering the Tahoe and Plumas National Forests in Yuba Co. in the vicinity of Bullards Bar Reservoir and the other at Skillman Campground in Nevada Co. There is one occurrence on private land within the boundary of the Mi-Wok Ranger District (USDA 2013a).

Surveys for rare plants are planned for the project area prior to the implementation of the project. The surveys would be conducted during the spring and summer, 2014. This timing would be sufficient for all of the rare plants but not for the mushroom, *Dendrocollybia racemosa* which is identifiable in winter. Winter 2013-2014 was exceptionally dry, interfering with the growth of mushrooms. Lack of surveys for this species is not expected to create situations where undocumented occurrences might be impacted by project activities. Anecdotal information received from other Forests which have this species indicates that the species does not return immediately after fire due to its reliance on the decaying fruiting bodies of mushrooms in the genuses *Russula* and *Lactarius*, which live on decaying wood in habitats with late-successional forest structure and soil characteristics. One expert speculated that if the canopy were completely lost to fire, the habitat would no longer be suitable and the mushroom would be not be sustained (S. Davison, pers. comm. with J. Haas 2014). An expert from University of California, Berkeley said that the host mushrooms (*Russula* sp. and *Lactarius* sp.) are not good colonizers and would need an intact tree canopy established before returning to the habitat (E. Vellinga, Ph.D., pers. comm. with J. Haas 2014). It might be many years before *Dendrocollybia racemosa* is able to recolonize the moderate and high burn severity areas of the burned area. It is not known if this species occurred in the burned area prior to the Rim Fire.

Eriastrum tracyi

Eriastrum tracyi is an annual member of the Phlox Family, Polemoniaceae. It grows in sunny openings in chaparral and mid-elevation woodlands. The soils are usually gravelly shale or loam, coarse granitic sand, stony clay loam or adobe (USDA 2012b). The elevation range is 1,000 to 5,400 feet.

Eriastrum tracyi occurs in northern California in Shasta, Trinity and Tehama Counties; in central California in Santa Cruz and Stanislaus Counties; and in the Southern Sierra in Fresno, Tulare and Kern Counties. There are three occurrences in the Shasta-Trinity National Forest, three in the Lassen National Forest, one in the Mendocino National Forest, 1 in the Sierra National Forest and another just outside the Sierra Forest boundary, seven in the Sequoia National Forest, seven on BLM lands and 26 in private and unknown ownership areas (USDA 2012b, CNDDB 2014). No occurrences are known within the Stanislaus National Forest. However, surveys have not been conducted in the past and suitable habitat is present in the Rim Fire Recovery project.

Eriogonum luteolum var. *saltuarium*

Eriogonum luteolum var. *saltuarium* (Jack's wild buckwheat) is an annual herb in the buckwheat family, Polygonaceae. It was described in 1989 by James Reveal from plants collected from the Dardanelle area of the Stanislaus National Forest and named for his father, former District Ranger Jack L. Reveal (Summit Ranger District, 1948-1960) (Reveal 1989). This high Sierra species blooms July through September. It grows in sandy granitic soils in in montane conifer forests and sagebrush communities. The elevation range is 5,600 to 7,400 feet.

So far, only three occurrences of this species has been documented. One is the Dardanelle vicinity location mentioned above. The species was also collected from along Highway 89 in the vicinity of Luther Pass, Alpine County and from the vicinity of the Eureka Valley Campground on Highway 108, Tuolumne County. Past surveys are lacking in the Stanislaus National Forest due to lack of knowledge of the species. There is suitable habitat in the Rim Fire burned area. There are no currently known occurrence in the Rim Fire Recovery project. There is suitable habitat in the project area.

Eriophyllum congdonii

Eriophyllum congdonii (Congdon's woolly sunflower) is an annual herb in the sunflower family, Asteraceae. This species germinates in late winter or early spring, flowers, sets seed then dies by mid-summer. The appropriate identification period is from late April through June, depending on the elevation and weather conditions. *Eriophyllum congdonii* grows in very shallow soils overlaying metasedimentary rock outcrops. These population areas are not generally considered capable of growing timber. However, commercial species are sometimes found growing near these rock outcrops and the rock is sometimes sought after for road surface repair or boulders. The elevational range for this species is from 1,800 to 6,200 feet.

Eriophyllum congdonii was described by Katherine Brandegee in 1899 from plants collected near El Portal. Its range is very narrow, occurring only in the Merced River watershed in Mariposa County. There are 32 known occurrences: nine in the Sierra National Forest, six in Yosemite National Park and 17 in the Stanislaus National Forest, all on the Groveland Ranger District. Occurrences number anywhere from several plants to tens of thousands of plants.

Eriophyllum congdonii occurs within a rock quarry outside the project area. There are isolated areas of suitable habitat for *Eriophyllum congdonii* in 20 Alternative 1 units and 19 Alternatives 3 and 4 units which contain areas of suitable habitat. These sites are the same as for Allium yosemitense. Surveys were conducted in spring and summer 2014. However the results of those surveys were not available at the time that this report was completed.

Eriophyllum nubigenum

Eriophyllum nubigenum (the Yosemite woolly sunflower) is an annual herb in the sunflower family, Asteraceae. It reproduces by seed. *Eriophyllum nubigenum* germinates in early spring and dies soon after seed set. The appropriate identification period for this species is mid- to late spring, approximately mid-May through June, depending on elevation.

Eriophyllum nubigenum is found in fairly open areas where there is a thin layer of well-drained soil, gravel or scree over bedrock of either fractured granite slabs or metamorphic rock. The substrates on which this species grows are not generally considered capable of growing timber. However, commercial species are usually found growing nearby and the bedrock is desired for repairing road surfaces and boulders. The elevational range for this species is approximately 4,500 to 9,000 feet.

Eriophyllum nubigenum was first described by Edward L. Greene in 1883 from plants collected at Clouds Rest in Yosemite National Park. It has a very limited range in Tuolumne and Mariposa Counties. There are 14 known occurrences of *Eriophyllum nubigenum*: eleven in Yosemite National Park and three in the Stanislaus National Forest, all on the Groveland Ranger District. Populations number from approximately 500 to 50,000 individuals.

There is one known occurrence in one Alternative 1 Rim Fire Recovery salvage unit. In Alternatives 3 and 4, the occurrence is outside the revised unit. There is another occurrence in a Rim Fire Hazard Tree unit. The third Forest occurrence is outside of proposed units. There is suitable habitat for *Eriophyllum nubigenum* in 20 Alternative 1 units and 19 Alternatives 3 and 4 units which contain areas of suitable habitat. These sites are the same as for *Allium yosemitense* and *Eriophyllum congdonii*. Surveys were conducted in spring and summer 2014. However the results of those surveys were not available at the time that this report was completed.

Erythronium taylori

Erythronium taylori (Taylor's fawn lily) is a perennial herb in the lily family, Liliaceae. It was

discovered by Dean Taylor, Ph.D. in 1996 in the Groveland Ranger District and described by James R. Shevock and Geraldine A. Allen (1997). It emerges from a corm in early spring and withers by mid-June. The appropriate identification period for this species is early spring, approximately the month of April.

Erythronium taylori is currently known from only one occurrence. The habitat is shaded, north-facing cliffs. Because other species of *Erythronium* can inhabit a variety of north-facing habitats, it's possible that *Erythronium taylori* might occur on sites, which are not cliff-like. The elevation of the one known occurrence is about 4,200 feet.

The one known occurrence of *Erythronium taylori* occurs within one Rim Fire Recovery salvage unit. One or more of the colonies in this occurrence might also be inside a roadside hazard tree unit. Previously unsurveyed suitable habitat for this species within Rim Fire Recovery project units was surveyed in spring 2014 during the appropriate identification period with negative results.

Erythronium tuolumnense

Erythronium tuolumnense (Tuolumne Fawn Lily) is a perennial herb in the lily family, Liliaceae. It reproduces by both seed and offsets. *Erythronium tuolumnense* emerges above ground in early March. The appropriate identification period for this species is early spring, approximately March through April, depending on elevation and weather conditions. The above-ground plant parts dry and shrivel up soon after blooming, becoming impossible to identify.

Erythronium tuolumnense tends to grow on shady, north-facing slopes. Many sites either have water flowing through the drainages with moist saturated soils or saturated soils in the form of springs or vernal seeps. The soils range from granitic clay-loams to rocky pockets of metasedimentary clays to bare granitic outcrops or volcanic lahar formations. In all cases, there is rock on or near the surface of the soil with abundant soil moisture during the growing and blooming period. Most *Erythronium tuolumnense* occurrences are found growing in chaparral, oak woodland, or ponderosa pine plant communities. The elevation range for this species is 1,200' to 5,000'.

Erythronium tuolumnense was first collected by W.C. Blasdale on June 7, 1895. Several occurrences are found on private property. Although suitable habitat exists in the Groveland, Summit and Calaveras Ranger Districts, the species has so far been found only within the boundaries of the Mi-Wok Ranger District. There are 38 confirmed occurrences and five unconfirmed reports. Only one known occurrence of *Erythronium tuolumnense* occurs within the Rim Fire burned area. It occurs within a Rim Fire Recovery roadside hazard tree unit. There are no known occurrences within Rim Fire Recovery salvage units. There is suitable habitat in the project area. Surveys were conducted in spring 2014. However the results of those surveys were not available at the time that this report was completed.

Fissidens aphelotaxifolius

Fissidens aphelotaxifolius (brook pocket-moss) is a true moss in the pocket-moss family, Fissidentaceae. It is identifiable throughout the year. It has no dormant or non-living time of year. It inhabits "wet soils, humus, and rocks along streams, near waterfalls, [and] in damp crevices of cliffs" (Pursell, 2005). It can also occur in damp or wet crevices of cliffs. It is not expected in areas where peak flows wash mosses away. The elevation range for *Fissidens aphelotaxifolius* is sea level to 6,300 feet.

Fissidens aphelotaxifolius has a wide geographic range but is rare within its range. It is known from only two occurrences in California: one in Madera county in the Sierra National Forest, the other in Siskiyou County in the Klamath National Forest. *Fissidens aphelotaxifolius* also occurs in Oregon, Washington and British Columbia. The range in California for *Fissidens aphelotaxifolius*, therefore, extends from northern California south through the Sierra National Forest. There are currently no known occurrences of *Fissidens aphelotaxifolius* in the Stanislaus National Forest. There is suitable habitat in and adjacent to Rim Fire Recovery units.

Helodium blandowii

Helodium blandowii (Blandow's bog-moss) is a moss in the family Helodiaceae. It grows in wet montane meadows, fens, and seeps, especially under willows in areas of leaf litter; also in subalpine coniferous forests and near alpine lakes (Flowers 1973, CNPS 2012). The elevation range for this species is 6500 to 10,500 feet (USDA 2012c)

Helodium blandowii has a wide range, occurring in Europe, Asia, and across the northern United States from New Jersey, Nebraska and Ohio west to California and Nevada, and northwards to Canada (Flowers 1973, Tropicos.org 2014). In California it has been reported from Fresno, Inyo, and Mono Counties. There is one occurrence on the Stanislaus National Forest in Tuolumne County. There are no currently known occurrences in the Rim Fire Recovery project. However, there is suitable habitat for this species in the project area.

Horkelia parryi

Horkelia parryi (Parry's horkelia) is a low, mat-like perennial herb in the rose family, Rosaceae. It reproduces by seed. The appropriate identification period for this species, which coincides with its blooming period, is mid-spring, approximately the month of May. It is possible to be identified most of the year by its vegetation, which is fairly distinct. *H. parryi* has a dormant period during the hottest, driest part of the summer, during which it's leaves whither and turn brown. It sends up new leaves with the first fall rains.

Horkelia parryi was described by Edward L. Greene. It grows in dry areas, mostly under brush or low-growing interior live oak branches in the Stanislaus National Forest. In the lower elevations of Amador and El Dorado Counties, it grows in openings in chaparral. Slopes are mild to flat. Soils tend to be well-drained and slightly to moderately acidic. On the Groveland

Ranger District, *Horkelia parryi* has, so far, only been found on two soil types: map unit #157: Josephine family, moderately deep - Dystric Lithic Xerocrepts association, 5 to 35 percent slopes; and map unit #161: Josephine - Sites families complex, moderately deep, 15 to 35 percent slopes (National Cooperative Soil Survey, 1981). The currently known elevation range for *Horkelia parryi* is sea level to 3,500 feet.

Horkelia parryi is endemic to California. This species is limited to the foothill region of the central Sierra Nevada from El Dorado County in the north to Mariposa County in the south. The southernmost occurrences are found in Mariposa County in the vicinity of Feliciana Mountain, just south of the Merced River (Sierra National Forest) at around 3400 feet elevation. In the Stanislaus, the majority of the occurrences are in the southern part of the Groveland Ranger District. One occurrence has been found in the Mi-Wok Ranger District. The northernmost occurrence in on the Georgetown Ranger District of the Eldorado National Forest, approximately 3 miles south of the boundary with the Tahoe National Forest.

CNDDB lists a total of 36 occurrences of *Horkelia parryi* (2014). Twelve of these are on property of unknown ownership. Seven are on private property only. Five are on a combination of private property and government agency lands (BLM, USFS, CalTrans). Four are on a combination of BLM and USFS lands. Five are on Eldorado National Forest lands only. One is on Sierra National Forest lands only, and one falls in both BLM and Sierra National Forest lands on Feliciana Ridge in Mariposa County. One is on CalTrans lands only. One is on BLM lands only.

Locally, there are four extended populations of *Horkelia parryi* made up of numerous colonies in the southwest portion of the Groveland Ranger District. These are all outside the Rim Fire burned area. The known occurrence in the Mi-Wok Ranger District is also outside the burned area. There is suitable habitat within Rim Fire Recovery units. Surveys were conducted in spring and summer 2014. However the results of those surveys were not available at the time that this report was completed.

Hulsea brevifolia

Hulsea brevifolia (short-leaved hulsea) is a short-lived perennial herb in the sunflower family, Asteraceae. It grows in exposed, rocky granitic or volcanic soils in openings as well as in shade of canopy in Upper Montane Coniferous Forest. It is regularly found under the open canopies of red fir (*Abies magnifica*) with Brewer's aster (*Aster breweri*). It can be found on north-facing slopes in Upper Montane Forests (USDA 2006). The elevation range of this species is approximately 5,000 to 9,000 feet, with one population occurreing at about 4,500 feet.

This species is limited to California in the central and southern Sierra Nevada. It has been found from Tuolumne County (Yosemite National Park) to Tulare County. There are 64 reported occurrences (CNDDB 2014a). There are approximately 46 known occurrences of *Hulsea brevifolia* in the Sierra National Forest. At least four occurrences exist in the Sequoia National Forest and four in the Inyo National Forest. In addition, there are at least 19 occurrences in Yosemite National Park and 2 in Sequoia/Kings Canyon National Parks (USDA 2006). The

northern-most occurrence is south of the Tuolumne River in Yosemite National Park.

There are currently no known occurrences of *Hulsea brevifolia* in the Stanislaus National Forest. The nearest occurrence is reported from the Merced Grove of Big Trees in Yosemite, about two miles from units in the Rim Fire Recovery project. There are other occurrences in Yosemite within about 3.5 miles of the project. There is suitable habitat in the Rim Fire Recovery project in units near the Forest boundary with Yosemite. Surveys were conducted in summer 2014. However the results of those surveys were not available at the time that this report was completed.

Lewisia kelloggii ssp. *hutchisonii*

Lewisia kelloggii ssp. *hutchisonii* (Hutchison's bitterroot) is a perennial herb in the miner's lettuce family, Montiaceae. Taxonomists had previously classified the genus *Lewisia* in the purslane family, Portulacaceae. *Lewisia kelloggii* ssp. *hutchisonii* was described by Barbara L. Wilson, Valerie D. Hipkins, Edna Rey-Vizgirdas, and Thomas N. Kaye as the result of genetic studies of the variation of *Lewisia kelloggii* (2005). *Lewisia kelloggii* ssp. *hutchisonii* grows on open rocky ridge tops or flat openings in granitics or volcanic "lava caps" with widely spaced trees in partial to full sun. Most soils are reported to be sandy granitic to erosive volcanic with granitic boulders. Plants are often visible during June and July and then dry up and disappear later in the summer after setting seed. The elevation range is 4,500 to 7,000 feet (USDA 2012d).

Lewisia kelloggii ssp. *hutchisonii* is restricted to the Klamath Range and northern Sierra Nevada, California. It is known from 56 occurrences in five National Forests in California. There are five occurrences in the Eldorado National Forest, two in the Lassen (one shared with the Plumas), 15 in the Plumas NF, 16 in the Tahoe and 17 in the Stanislaus. One occurrence on the Eldorado has been reported to be larger than 2,000 plants, but most other occurrences range in number from 50 to 250 plants. One occurrence on the Plumas has four or fewer individuals. This plant is endemic to Butte, Sierra, Plumas, Nevada, El Dorado, Amador, Calaveras, and Tuolumne Counties.

There is one known occurrence of *Lewisia kelloggii* ssp. *hutchisonii*, made up of six colonies inside the Rim Fire burned area. One of these colonies occurs within a Rim Fire Recovery salvage unit. A colony of another occurrence falls within a Rim Fire Hazard Tree roadside unit, although it occurs just outside the burned area. There is suitable habitat in the Rim Fire Recovery project area. Surveys were conducted in spring and early summer 2014. However the results of those surveys were not available at the time that this report was completed.

Lewisia kelloggii ssp. *kelloggii*

Lewisia kelloggii ssp. kelloggii (Kellogg's bitterroot) is a perennial herb in the miner's lettuce family, Montiaceae. It is closely related to *Lewisia kelloggii* ssp. *hutchisonii* and was described by the same researchers at the same time (Wilson, et. al. 2005). It is restricted to open, gravelly or sandy flats within mixed conifer forest and subalpine forest. After setting seed, the plants

wither and go dormant, becoming invisible and impossible to detect. The elevation range is 6000 to 11,000 feet.

Lewisia kelloggii ssp. *kelloggii* is endemic to California. It is known from at least 25 locations from Plumas County southward to Madera County and one occurrence in Humboldt County (USDA 2012e). Some populations are large, composed of several hundred plants, some are smaller. Little information exists on population numbers. There are at least 10 sites in Yosemite, including "almost all the domes surrounding Yosemite Valley, especially Sentinel Dome and Mt. Watkins" (Botti 2001, USDA 2012e).

There is one occurrence of *Lewisia kelloggii ssp. kelloggii* in the Calaveras Ranger District, Stanislaus National Forest. It is well removed from the Rim Fire burned area. There is suitable habitat within the Rim Fire Recovery project. Surveys were conducted in spring and early summer 2014. However the results of those surveys were not available at the time that this report was completed.

Lomatium stebbinsii

Lomatium stebbinsii (Stebbins' lomatium) is a perennial herb in the carrot family, Apiaceae. It emerges from the underground tuber and blooms soon after snowmelt. This can initiate as early as January and may continue into late May depending on the spring snowfall. It blooms from March to April. Soon after seed dispersal the aboveground portions of the plant dry and blow away. *Lomatium stebbinsii* grows on ridge tops and slopes in lahar soils (volcanic mud flow formations). These soils are high in clay content and are generally rocky. The soils are usually fairly shallow. It is often found growing with *Allium tribracteatum*. The elevation range for this species is 3,500 to 7,000 feet.

G. Ledyard Stebbins discovered *Lomatium stebbinsii* in 1971. In June of that year he examined specimens and described the type locality as, "specimens scattered over the thin-soiled, almost bare ground in volcanics (mud-flow breccia) northwest of Bald Mountain near Highway 108 at 5,600ft" (Schlessman and Constance 1979).

There are approximately 90 known occurrences of *Lomatium stebbinsii* in the Stanislaus National Forest. All except six of the known occurrences exist on the Mi-Wok Ranger District, the other occurrences are known from the Calaveras and Summit Ranger Districts. The known populations of *Lomatium stebbinsii* range in size from 75 individuals to approximately 10,000.

There are eight occurrences of *Lomatium stebbinsii* within the burned area. These eight occurrences are made up of 34 colonies. Four colonies occur in three salvage units. One of these, colony number 139B, was impacted during the Rim Fire by a bull dozed containment line. Impacts to that occurrence were monitored in 2014 to determine the extent of the occurrence impacted and if there would be lasting adverse effects. However, the results of that monitoring were not available at the time this report was completed. There are five colonies in four roadside hazard tree units. There is suitable habitat within and adjacent to Rim Fire Recovery units which was surveyed in Spring, 2014. The results of those surveys were not available at the time that

this report was completed.

Meesia uliginosa

Meesia uliginosa (broad-nerved hump-moss) is a moss which, in California, has been found only growing on decaying wood in fens or in "wet meadows" which may or may not be fens (the collection labels don't provide enough detail) (Dillingham 2005). It is sometimes found in meadows and seeps without the required 40 cm (16 inches) of peat which defines a fen. Outside of California, it commonly occurs on small, soil covered ledges on calcareous rock outcrops. It is also found on small, organic mounds in arctic and alpine tundra (Dillingham 2005). *Meesia uliginosa* is most often is found in small patches of only a few plants (Vitt 1992). The elevation range of the species is 5,500 to 9,200 feet.

Meesia uliginosa is found in the northern latitudes around the world. In North America it is widely distributed across the United States (Alaska, California, Michigan, Montana, Nevada, Washington and Wyoming), Canada (Alberta, British Columbia, Labrador, Manitoba, Newfoundland, Ontario, Quebec, Saskatchewan, Yukon) and Greenland (USDA 2012f). In California, *Meesia uliginosa* is known from eight National Forests, from the Klamath to the Sequoia, in the Sequoia and Kings Canyon National Park, and in one State Park for a total of 48 records (USDA 2012f). There are no currently known occurrences in the Stanislaus National Forest. There is suitable habitat in the Rim Fire Recovery project area.

Mielichhoferia elongata

Mielichhoferia elongata (elongate copper-moss) is an acrocarpic moss in the Family Bryaceae. It was first described from Austria in 1815. It was first recognized at the specific level in 1983 in Europe and in 1969 in North America (Shaw and Rooks 1994). Shaw and Rooks (1994) established genetically that it is distinct from *Mielichhoferia mielichhoferiana* and has more genetic variability.

Mielichhoferia elongata ranges in habitats from sea level to high arctic tundra. It occurs in alpine and subalpine sites in Colorado where it shows the greatest genetic diversity. In California it is on coastal cliffs subject to salt spray, among Douglas-fir forests, and in the Sierra foothills. Although called a "copper moss" and found in Copperopolis, it can occur on moist rocks with a high concentration of heavy metals. In the British Isles it is noted to occur on vertical faces which result in reduced light and maximum seepage (Wilkins 1977). In the Stanislaus and Sierra National Forests, *Mielichhoferia elongata* has been found growing on metasedimentary rocks, especially the reddish-bronze type as found in the Merced and Tuolumne watersheds. The substrate is often damp from seep moisture in the bedrock. The elevation range is sea level to 4,500 feet.

Mielichhoferia elongata is found in Europe and North America. In North America it is widely scattered, occurring once each in Michigan, New York and a cluster of sites in the Great Smoky Mountains. It is in about a dozen sites in the Southern Rockies in Colorado (Shaw and Rooks 1994). In California, it is known from three disjunct portions of the state: in the Sierra Nevada Mountains from Mariposa, Placer, Fresno, Tulare Counties; in the Siskiyou Mountains from

Siskiyou, Humboldt, Trinity counties; and in the central coast - Santa Cruz County (USDA 2012g). Out of 41 occurrences, 14 are from National Forest System lands, four are from Public Beach in Santa Cruz County, five are from National Parks, one is from a State Park, one is from BLM land, and 16 are from undetermined ownership (USDA 2012g).

There are four known occurrences in the Stanislaus National Forest: one is in the Tuolumne River Canyon near the Mohigan Mine, one is in the Clavey River Canyon near the confluence with the Tuolumne River, one is along Highway 120 near Rim of the World, and one is in the Merced Canyon near the community of El Portal. Only the occurrence in the Merced Canyon is outside the Rim Fire area. None of the known occurrences are within proposed Rim Fire Recovery units. The Highway 120 occurrence is within a Rim Fire Hazard Tree unit. There is suitable habitat within the Rim Fire Recovery project area.

Mielichhoferia shevockii

Mielichhoferia shevockii (Shevock's copper-moss) is another acrocarpic moss in the Family Bryaceae. It was originally described as *Schizymenium shevockii* by Jonathan Shaw in 2000. In 2009, Shaw transferred the species to genus *Mielichhoferia* after determining that a particular morphological character (the peristome structure) was not a reliable character to distinguish the two genera (Shaw 2009). Shaw determined than that the species was more closely related to other species of *Mielichhoferia* than to members of *Schizymenium.* *Mielichhoferia shevockii* grows in the same habitats as *Mielichhoferia elongata* and can sometimes be seen growing side-by-side with that species. It grows on metamorphic rocks and can also be found in woodlands on gravelly soil among rocks containing heavy metals (Malcolm, Malcolm, Shevock and Norris 2009). The elevation range for the collection sites to date is 1,200 to 3,600 feet (CNABH 2014).

Mielichhoferia shevockii is endemic to California. So far, it has only been collected from nine localities. It has been collected in Fresno, Lake, Mariposa, Monterey, Riverside, Santa Cruz, and Tulare Counties. One collection was made in the Sierra National Forest, one in the Los Padres National Forest, and two in the Sequoia National Forest (CNABH 2014). Other areas included the Bonny Doon Ecological Preserve and the Santa Margarita Ecological Preserve (CNABH 2014). There is one location in the Merced River Canyon, about one mile west of the Sierra National Forest on BLM lands (CNABH 2014, USDA 2012g). This occurrence grows on a metasedimentary rock wall next to *Mielichhoferia elongata.* While no occurrences have been located in the Stanislaus National Forest to date, there is a great deal of suitable habitat which has not been surveyed. Some of that unsurveyed suitable habitat occurs within the Rim Fire Recovery project area.

Mimulus filicaulis

Mimulus filicaulis (the slender-stemmed or Hetch-Hetchy monkey flower) is an annual herb in the Lopseed family, Phrymaceae (previously Scrophulariaceae). It was first described in 1891 by Sereno Watson. It reproduces by seed. *Mimulus filicaulis* is short-lived. It germinates in early spring and dies soon after blooming and setting seed in late spring. The appropriate identification period for *Mimulus filicaulis* is mid-spring, from late April through early June, depending on elevation and weather conditions. Any one occurrence might bloom for no more

than one week if soils aren't saturated, making it difficult to detect with only one visit to a site. In drought years or years with little rain in the spring, *Mimulus filicaulis* occurrences might be reduced in numbers and size. In very dry years, *Mimulus filicaulis* occurrences might not bloom.

Mimulus filicaulis occurs in moist soils near seeps, springs, meadows and drainages. It also occurs on sites that dry out substantially in the summer but has high soil moisture in the spring. These sites are often within mixed-conifer stands. Most of the occurrences have been observed growing under full sun or slightly filtered light conditions. *Mimulus filicaulis* prefers to grow in areas with little competition. Soil type, depth and condition don't appear to be limiting. The elevation range for this species is from 2,400 to 5,500 feet.

Mimulus filicaulis is endemic to Tuolumne and Mariposa Counties. The currently known range for *Mimulus filicaulis* is the Main Fork of the Tuolumne River south to the Mariposa District of the Sierra National Forest and east into Yosemite National Park. There are approximately 125 known occurrences of *Mimulus filicaulis* in the Stanislaus National Forest. All of those occur on the Groveland Ranger District. There are twelve known occurrences in Yosemite National Park, some made up of several colonies. There is one occurrence reported from private property near the western Forest boundary, one occurrence on private property at Ackerson Meadow and two historic occurrences on private property south of the Merced River in Mariposa County, within the boundaries of the Sierra National Forest. There is one specimen record from 1994 (Taylor # 14361) that was collected from the Sierra National Forest in the vicinity of the Chowchilla Mountains. The known occurrences of *Mimulus filicaulis* in the Groveland Ranger District range in size from five to several thousand individuals. These numbers vary from year to year based on availability of moisture from rainfall and temperature patterns.

There are 33 occurrences made up of 50 colonies, within 13 Rim Fire Recovery Alternative 1units. There are three occurrences adjacent to three additional units. There is suitable habitat in other Rim Fire Recovery units. Surveys were conducted in spring 2014. However the results of those surveys were not available at the time that this report was completed.

Mimulus pulchellus

Mimulus pulchellus (the pansy monkeyflower) is also an annual herb in the Lopseed family, Phrymaceae (previously Scrophulariaceae). The times for germination and identification are similar to those for *Mimulus filicaulis*. *Mimulus pulchellus* blooms one to two weeks earlier in most years. It grows in vernally wet to moist sites which are usually flat or with a slight slope. It prefers to grow in areas with little competition. The elevational range for this species is 3,000 to 5,000 feet.

Mimulus pulchellus is endemic to Calaveras, Mariposa and Tuolumne Counties. It is found in the Stanislaus National Forest, Yosemite National Park and near the town of Mariposa, not far from the Sierra National Forest. It occurs in the Chowchilla River watershed (near Mariposa), and the Merced, Stanislaus and Tuolumne River watersheds. There are five occurrences in Yosemite National Park and one historic occurrence in the Sierra National Forest. There are approximately 40 known occurrences of *Mimulus pulchellus* in the Stanislaus National Forest. Twenty of these are in the Groveland Ranger District, fifteen in the Mi-Wok District and five in the Calaveras Ranger District. Many of these occurrences are made up of two or more colonies.

There are 12 occurrences (19 colonies) of *Mimulus pulchellus* within seven Rim Fire Recovery Alternative 1 units. There are five occurrences adjacent to three units. There is suitable habitat in other Rim Fire Recovery units. Surveys were conducted in spring 2014. However the results of those surveys were not available at the time that this report was completed.

Peltigera gowardii

Peltigera gowardii (Goward's waterfan) is an aquatic lichen in the Peltigeraceae. There have been two taxonomic changes since 2000. The species was first described in 1856 by J. L. Russell who named it *Hydrothyria venosa* (USDA 2010a). The species was placed in the family Collemataceae. Genetic studies published by Miadlikowska and Lutzoni showed that it is better aligned with the family Peltigeraceae (2000). The species was given the name *Peltigera hydrothyria* since the name *Peltigera venosa* was already assigned to another species (Miadlikowska and Lutzoni 2000, USDA 2010a). In 2011, Lendemer and O'Brien published the results of their genetic studies which showed that there are clear genetic differences between the species in the east (*Peltigera hydrothyria*) and the species in the western states. The species in the western states was named *Peltigera gowardii* after the collector of the type specimen, Lichenologist Trevor Goward. Lendemer and O'Brien indicated that there is further genetic work needed on *Peltigera gowardii* to determine if further splitting is needed (2011). The species in northern Washington and northward appears to have different characteristics than the species from southern Washington and southward (Lendemer and O'Brien 2011).

Peltigera gowardii is identifiable year-round, having no dormant or non-living period. There are no other similar appearing species of lichens which are totally aquatic in California. *Peltigera gowardii* is usually attached to rock but is sometimes found on soil or submerged wood. It grows in clear, shallow streams fed by cold water springs where it is always submerged or in the water spray zone. The water is very clear and peak flows are not of the intensity that would lead to scouring. Increased sedimentation and nutrients, or a rise in temperature can be detrimental to occurrences (Davis, 1999). The streams rarely are more than 8 inches in depth. However, it has been observed in water exceeding three feet in depth (Davis 1999). The habitat is usually shaded or partially shaded at the mid-elevations (USDA 2010a). The elevation range is about 2,700 to 8,100 feet with one site in Yosemite National Park found at 13,000 feet (USDA 2010a).

The range of *Peltigera gowardii* is currently defined as Alaska, British Columbia, Washington, Oregon, Montana and California (Lendemer and O'Brien 2011). In California, it occurs in the Sierra Nevada in the Plumas, Eldorado, Stanislaus, Sierra, and Sequoia National Forests, in the Lake Tahoe Basin Management Unit, Calaveras Big Trees State Park and in Yosemite National Park. It is also found in the northern coast range in the Mendocino National Forest, and in northwestern California in the Shasta-Trinity National Forest. In the central Sierra Nevada, there are eleven occurrences in the Sierra National Forest, two in the Sequoia National Forest, two in Calaveras Big Trees State Park and three in Yosemite. Twenty-one occurrences are known from the Stanislaus National Forest. Nine of these are in the Groveland Ranger District. Ten are in the Calaveras Ranger district. Two are in the Mi-Wok Ranger District.

Peltigera gowardii is known to occur in ten streams within the Rim Fire Recovery project. All of these occurrences are downstream, downhill or adjacent to project units. There are streams

within the project area which contain suitable habitat and hadn't been surveyed prior to the Rim Fire. Surveys were conducted in spring and early summer 2014. However the results of those surveys were not available at the time that this report was completed.

Tauschia howellii

Tauschia howellii is a perennial herb in the carrot family, Apiaceae. It grows in openings in red fir forests on granitic gravel on ridge tops (Jepson Flora Project 2014). It is also found in decomposing granite soils, in mountain hemlock forests and on upper slopes of ridges (USDA 2013b). *Tauschia howellii* was described by Sereno Watson and named for the botanist Thomas Jefferson Howell who botanized extensively in Oregon and Southern Washington from 1875 to 1904 (Ornduff 2008). The elevation range of the species is 5,600 to 8,200 feet (USDA 2013b).

Tauschia howellii has a limited distribution in southern Oregon, where it is a Candidate for State Listing, Siskiyou County, Sierra County and Fresno County. There are nine occurrences in the Klamath National Forest, two in the Tahoe National Forest, and one in the Sierra National Forest (USDA 2013b). There are no currently known occurrences in the Stanislaus National Forest. There is suitable habitat within the Rim Fire Recovery Project. Surveys were conducted in summer 2014. However the results of those surveys were not available at the time that this report was completed.

EFFECTS OF THE PROPOSED PROJECT.

The Rim Fire Recovery project has had protective measures incorporated into it which are designed to reduce, minimize or alleviate adverse effects to known occurrences of Sensitive Plants (pages 14 through 16). Nevertheless, it is possible that some adverse effects to occurrences of Sensitive Plants might occur. Sensitive Plant occurrences would be flagged and avoided, thereby eliminating the possibility of direct impacts with the exception of some occurrences of *Clarkia australis*, *Clarkia biloba* ssp. *australis*, *Mimulus filicaulis* and *Mimulus pulchellus.* In some of these occurrences, manual fuel reduction would be allowed during the dry non-growing period when the species are present as seed, not living plants. These occurrences would be less vulnerable to loss as seed than as living plants. Mastication and legacy skid trail subsoiling to alleviate compaction would also be allowed within occurrences of *Clarkia australis* during the dry, non-growing period. Therefore, the management requirements might not completely alleviate adverse effects. At no time are the impacts to the *Clarkia australis, Clarkia biloba ssp. australis, Mimulus filicaulis and Mimulus pulchellus* occurrences expected to be so great that an entire occurrence would be eliminated. For this section, the term "impact" refers to any disturbance which might adversely affect Sensitive Plants.

In utilizing the flag and avoid management requirement, highly visible vinyl ribbon is hung from brush and trees around the perimeters of the occurrences in a manner which makes the occurrences visible to equipment operators, sawyers and other workers. The sites are marked on the contract maps as "Controlled Areas." Contractors are advised to avoid impacting these areas. Sale Administrators, Contracting Officer Representatives and project inspectors are informed of the locations and management requirements related to the occurrences. With the flag and avoid

management requirement, there would be no direct effects to Sensitive Plants except for some occurrences of *Clarkia australis*, *Clarkia biloba* ssp. *australis*, *Mimulus filicaulis* and *Mimulus pulchellus* which could be impacted during the dry, non-growing period while present as viable seed.

The effects section of this BE discloses in detail, the expected effects from the proposed salvage, fuel reduction, watershed enhancement and wildlife enhancement activities to Sensitive Plants.

General Discussion.

The activities proposed in both Alternatives 1, 3 and 4 are essentially the same except that there would be no new road construction in Alternative 4. The action alternatives differ primarily in the number or size of units with timber salvage, and whether or not some units would have a research emphasis which changes the extent of salvage. The activities planned in the project for the action alternatives include sawlog and biomass removal using conventional ground-based, skyline or helicopter methods, fuel reduction utilizing a variety of methods including machine piling, masticating small trees and brush, a minimal amount of hand thinning, hand piling, pile burning, lop and scatter woody debris disposal and jackpot burning. Watershed treatments are localized and consist of dropping small trees in areas with high erosion hazards above creeks, and lopping and scattering the wood from the trees. Wildlife enhancement activities include masticating plantation trees and shrubs in deer winter range areas to aid in the vegetation recovery and deer passage in the areas. Additionally, a fisher and other forest carnivore connectivity corridor was identified. There would be road improvements with each of the action alternatives including maintenance, reconstruction, temporary road construction and decommissioning, and, except for Alternative 4, new road construction. Because the activities are essentially the same between the action alternatives, the effects discussed in this section apply to Alternatives 1, 3 and 4.

The activities proposed in this project would be implemented over the course of one to ten years, depending on the activity. Throughout much of the proposed project, activities would be implemented in two or more entries per unit. For example, in Unit T24, which has been identified as a SPLAT (Strategically Placed Landscape Area Treatment for fuels reduction), there are occurrences of *Balsamorhiza macrolepis, Clarkia australis, Mimulus filicaulis* and *Mimulus pulchellus*. The proposed treatments in this unit would entail an entry to conduct the timber salvage and biomass operations, then a separate entry to masticate and machine pile, if the salvage and biomass operations left too great of a fuel load. There would also be an entry to conduct pile burning and possibly jackpot burning. If there are legacy skid trails with compaction issues, then the these and skid trails constructed for the current salvage effort would be subsoiled. A temporary road that would be reopened and improved for the salvage work would be decommissioned. In this example, the mastication and machine piling would not take place at the same time as the timber salvage and biomass operations since both activities would probably not be put into the same contract and there would be safety considerations for the simultaneous operations. These activities, which could cause impacts, might take place over two to three consecutive years. Some activities might not occur in consecutive years at all.

Clarkia australis, Clarkia biloba ssp. *australis* and *Mimulus filicaulis* bank seed in the soil. *Mimulus pulchellus* likely banks seed in the soil. In an unpublished extermination study, Harlan

Lewis, Ph.D. determined that only three consecutive years of disturbance could eliminate a viable seed bank of three species of *Clarkia* (pers. comm., June, 1996). The management requirements (pages 13 through 15) restrict the types and timing of activities which can be implemented in Sensitive Plants sites. Only one type of activity would be allowed within *Clarkia biloba* ssp. *australis, Mimulus filicaulis* and *Mimulus pulchellus* occurrences: manual fuel reduction (cutting of brush or small trees) and only during the dry, non-growing period. Impacts within occurrences of these species would therefore, occur in no more than two consecutive years. Manual fuel reduction, mastication and legacy skid trail subsoiling would be allowed within occurrences of *Clarkia australis,* also during the dry non-growing period. There is a chance that impacts could occurred within some occurrences of *Clarkia australis* over three consecutive years. However, none of the impacts are expected to be of such an intensity or cover so much of the occurrences that entire occurrences would be lost. Restricting the timing of impacts and, in the case of *Clarkia australis,* restricting the amount of an occurrence disturbed by masticator tracking reduces the risk of eliminating the viable seed banks. The management requirements would therefore reduce, minimize or alleviate the possible adverse effects of this project to occurrences of these species.

The following is a discussion of how various management activities have been observed to affect some of the Sensitive Plant species identified as occurring or possibly occurring in the Rim Fire Recovery project.

Any type of ground disturbance to Sensitive Plants during the growing season would cause loss of plants. The number of plants killed would vary according to species, how many plants were on the site and the type, degree and amount of disturbance. The growing season for the Sensitive Plants in this proposed project varies from species to species.

Disturbance during the non-growing season would be likely to do less harm to the annual species *Clarkia australis, Clarkia biloba* ssp. *australis, Mimulus filicaulis* and *Mimulus pulchellus* than disturbance during the growing season since there would be no plants affected. Only the seed and habitat would be affected.

Balsamorhiza macrolepis has been observed growing after wildfire and after manual fuel reduction in its habitat along Hunter Valley Mountain Access Road in Mariposa County (field observations 2011 and prior). These perennial plants would be most able to endure these types of impacts after entering dormancy in late summer.

Botrychium species might be sensitive to some habitat altering impacts. Any type of ground disturbance which damages or eliminates the fungal partners, which include wild strawberry, twayblade, trail plant and incense cedar trees in the immediate vicinity of the *Botrychium* plants, could reduce or eliminate the mycorrhizal fungi. The fungal partners contribute carbohydrates from photosynthesis and nutrients from the soil to the fungi. The fungi absorbs additional nutrients from the soil and transfers moisture and the collected nutrients to the *Botrychium* species which appear to photosynthesize very little and only when a leaf is produced aboveground. *Botrychium* species have no root hairs with which to absorb nutrients or moisture from the soil. Therefore, the *Botrychium* species are dependent on the fungi for moisture and nutrients. If the fungal partners in the vicinity of *Botrychium* plants are lost or reduced as a result of the project activities, then the fungi which sustain the *Botrychium* plants could be

reduced or lost, resulting in a reduction or loss of *Botrychium* plants. The number of plants lost would vary according to the type, degree and amount of disturbance.

Botrychium plants appear to tolerate loss of leaves through herbivory and low intensity fire (Clines 2009). Since the plants are not dependent upon photosynthesis for food production, the loss of leaves might simply result in an interruption of spore production. However, interruption of spore production through annual or consecutive year impacts could result in a reduced amount of new plant recruitment. The number of plants in an occurrence might become reduced as a result.

Studies of *Botrychium* species indicate that some species like to occupy habitats which were disturbed 15 to 50 years previously. *Botrychium minganense* is one of these in some parts of its range, sometimes being found in habitats which had been disturbed more than ten years previously (Clines 2009). However, in the western states, *Botrychium minganense* appears to be found mostly in old forest habitats (Clines 2009). *Botrychium ascendens, Botrychium lineare*, and *Botrychium pedunculosum* also appear to occupy sites of past disturbances in some parts of their range (Farrar n.d. b., 2011a, 2011d). *Botrychium pedunculosum* is sometimes found on roadsides or in second growth forests (Farrar 2011d). *Botrychium crenulatum, Botrychium lunaria, Botrychium montanum* and *Botrychium pinnatum* are not strongly associated with disturbed habitats (Farrar n.d. a., 2011b, 2011c, 2011e). While some *Botrychium* species can be found on sites which had been disturbed in the distant past, it is unlikely that those disturbances would be beneficial to the living plants when the disturbance occurs. The *Botrychium* plants likely colonized the sites after the disturbance had taken place, possibly from an undisturbed site nearby.

Clarkia australis is a "disturbance plant." For this species, this means that it prefers to germinate and grow on a site which has had competing vegetation removed. Under natural circumstances, fire in the frequent fire regime is the removal agent. *Clarkia australis* appears to have some resilience to mechanical impacts by heavy equipment at some point during the year (field observations 1989). Plants have been observed growing where machinery had passed in previous years. It is believed that the impacts occurred after the plants set seed or that plants had been left unharmed and seeded into the disturbed area. In one instance, plants that had been run over by a tractor skidder with one pass were damaged but survived and produced some seed. In another instance, a bulldozer drove through an occurrence (blade up) and no plants survived the impacts of its tracks (field observations 1990).

The habitat of *Clarkia australis* (exclusive of the plants) might be improved by introduction of disturbance to the soils by removing competing plants. *Clarkia australis* has been observed growing in road cut banks and on fill slopes. It has also been observed growing in abandoned skid trails. In most of these cases, there are plants still living on natural ground next to the roads and skid trails. The value of the improved condition of the habitat would be dependent on the numbers and subsequent reproductive success of the Sensitive Plants remaining on the site. If the occurrence is diminished to a degree beyond which it could recover, the value of the improved condition would be very low. Since population viability thresholds have not been determined for *Clarkia australis*, it isn't possible to determine at what point a disturbance effect would change from favorable to unfavorable. Additionally, encroachment of more aggressive annual plants such as non-native grass may preclude an otherwise improved condition of the

habitat. The duration of these effects would be dependent on the amount of an occurrence impacted plus the introduction and rate of spread of encroaching competing plants.

Clarkia biloba ssp. *australis* tends to inhabit areas which have had past disturbances. In the Merced River Canyon, some occurrences inhabit talus slopes, which generally exhibit some amount of surface movement of rock through the year. *Clarkia biloba* ssp. *australis* grows prolifically on the cut banks of Cherry Lake Road, which exhibit a fair amount of yearly soil erosion due to the coarse sandy granitic soils in some areas.

Cypripedium montanum is intolerant of moderate to high intensity fire. The rhizomes grow near the top of the soil, about one inch below the surface. The heat of ground fire, particularly from the burning duff or woody debris over the rhizomes kills the rhizomes and mycorrhizal fungi. Sometimes *Cypripedium montanum* plants survive the fire but are not able to survive the loss of the overstory. In the Darby Fire burned area, a previously unknown *Cypripedium montanum* occurrence survived the fire but, due to the opening of the habitat which exposed the plants, the surviving plant was grazed to the ground by range cattle the following year (pers. comm. M. Willits). Monitoring in years since has revealed that the occurrence did not survive the impacts of the fire, the opening of the habitat and subsequent grazing pressure (pers. comm. Q. Young).

Horkelia parryi seems to tolerate some amount of soil disturbance at some point in the year. One large occurrence south of Jackass Mountain, on the Groveland Ranger District, was burned in the 1987 Stanislaus Complex Fires. The burned timber on the site was logged and the site was prepared for planting by deep tilling. The disturbance from the tillage was light because the tillage was designed to break up the soil compaction and the soil was not turned over or cultivated in the process. The occurrence was discovered after the trees were planted and was then protected from herbicide applications. The occurrence appeared vigorous and recruited new plants outside the originally discovered occurrence boundaries for several years. However, eight to ten years after planting, the *Horkelia parryi* had lost that vigor and appeared to be in decline, apparently from the dense overstory and needle cast of the plantation conifers. (field observations).

Mimulus filicaulis and *Mimulus pulchellus* are species which appear to accept some disturbance. *Mimulus filicaulis* has been observed returning to sites impacted by road grading. *Mimulus pulchellus* has been observed growing in gopher mounds and in tire tracks left in the soil, where competing vegetation was sparse or lacking. It is unclear how much mechanical disturbance they may tolerate without adversely affecting the viability of an occurrence. Since they are delicate annuals, it is probable that any resistance to disturbance is highest after the majority of the plants have set seed and the soil has dried. It is unknown how many years the seed would remain viable or how ground-disturbing activities would impact their seed "banks." If seed viability is short-lived, mechanical impacts which occurred prior to seed set could possibly reduce or eliminate an occurrence.

Clarkia australis, Clarkia biloba ssp. *australis, Mimulus filicaulis* and *Mimulus pulchellus* all appear to be well adapted to the frequent fire regime of the Sierra Nevada. *Clarkia australis* was observed thriving in numerous locations in the years immediately following several wildfires on the Groveland Ranger District, including the 1987 Stanislaus Complex, the 1990 A-Rock Fire and the 1996 Ackerson Complex. *Clarkia biloba* ssp. *australis* was observed growing in several locations the year following the 1999 Pilot Fire. *Mimulus filicaulis* and *Mimulus pulchellus* were

observed vigorously growing the spring after a prescribed fire was implemented in a meadow where the two species occur. *Mimulus filicaulis* was observed growing after the 2004 Tuolumne Fire. All of these wildfires and the prescribed fire occurred after the plants had matured and produced seed.

This post-fire increase in the numbers of *Clarkia australis, Clarkia biloba* ssp. *australis, Mimulus filicaulis* and *Mimulus pulchellus* is usually short-lived. All of these Sensitive species have been observed rapidly thinning out with the influx of more aggressive weedy species such as the non-native annual grasses like cheatgrass (*Bromus tectorum*).

Peltigera gowardii occurs in small, shallow streams where scouring and sedimentation is limited or lacking. The water temperature remains low year-round as the result of shading and cold water springs. It is expected that activities which change these habitat characteristics – increased sedimentation, scouring or sun exposure – would likely lead to a reduction or loss of individuals, and depending on the degree of impact, perhaps loss of the occurrence.

Alternative 1

Direct and Indirect Effects.

The management requirements (pages 14 through 16) would protect Sensitive Plants by reducing or alleviating adverse effects to occurrences of these species. Sensitive Plant occurrences would be flagged and avoided, thereby eliminating the possibility of impacts with the exception of some occurrences of *Clarkia australis, Clarkia biloba* ssp. *australis, Mimulus filicaulis* and *Mimulus pulchellus.* In some of these occurrences, manual fuel reduction would be allowed during the dry non-growing period when the species are present as seed, not living plants. These occurrences would be less vulnerable to loss as seed than as living plants. Mastication and legacy skid trail subsoiling to alleviate compaction would also be allowed within occurrences of *Clarkia australis* during the dry, non-growing period.

There might be occurrences of Sensitive Plants occurring in roadside hazard tree removal areas which might not be completely avoided in order to mitigate a hazard to public and worker safety. There might be instances where a botanist would work with a sale administrator to minimize the amount of an occurrence impacted in order to abate a hazard. In this situation, the smallest possible portion of the occurrence would be impacted with the tree falling and removal or fuel abatement. No occurrences are expected to be eliminated as a result of this situation.

Conducting mastication or legacy skid trail subsoiling within occurrences of *Clarkia australis* after the living plants have set seed and died could cause damage or death to some of the seed. Some seed might be buried too deeply in the furrows made by the equipment working within the occurrences. When seed is buried too deeply, it will not germinate, leading to a possible reduction of the occurrence. Additionally, the physical impact of the equipment tracks on the seed might cause damage or death of some of the seed. These effects are mitigated by not allowing equipment to track through occurrences smaller than 0.25 acre and to minimize tracking through occurrences larger than 0.25 acre. These mitigations greatly reduce the risk that occurrences of *Clarkia australis* would be eliminated by these activities. Therefore, the intensity of the impacts would be low to moderate. The duration of the effects (reduction of occurrence

numbers from seed loss) of the impacts would be short-lived, provided that there is not a rapid influx of weedy competitive species. In the absence of weeds, the recovery of the *Clarkia australis* plant numbers should take two to three years.

The benefit of conducting mastication within occurrences of *Clarkia australis* is that the buildup of fuels from the small dead trees which would eventually fall or the dead brush which would contribute to fuel loading would be reduced, thereby reducing the risk that the occurrences could be lost during the next wildfire event. Additionally, mastication might help prevent or reduce the establishment of dense brush which might otherwise dramatically reduce the quality of the habitat for the *Clarkia* which prefers to grow in forest openings with little or no competition from other plants. The benefit of subsoiling legacy skid trails in *Clarkia australis* occurrences is that currently compacted soil conditions which could restrict the *Clarkia* plants would be eliminated, thus enhancing the habitat for the species. The intensity of the benefits of mastication would be low, since the benefits are related to preventing a possible future wildfire. The intensity of the benefit of breaking up compaction in an occurrence area could be great, if the soil is very compacted. The duration of the benefits is expected to be long-term. While the mastication wouldn't prevent brush from taking over a site over the long term, the benefit of reducing the dead wood fuel component, thereby possibly preventing a higher burn severity in a future wildfire would last many years. The benefit of reducing soil compaction would also last many years.

There is a low to moderate risk that conducting manual fuel reduction within occurrences of *Clarkia australis*, *Clarkia biloba* ssp. *australis*, *Mimulus filicaulis* or *Mimulus pulchellus* could cause damage to or death of some of the seeds when implemented during the dry, non-growing period. The risk would come from trampling by workers walking or standing within the occurrences while they work. Timing this work for the dry, non-growing period is critical in ensuring that the activity does not cause loss of entire occurrences. The amount of seed damaged or lost is expected to be minimal. The benefit of conducting manual fuel reduction within these occurrences is that the fuel loading caused by the standing dead brush or trees would be greatly reduced or eliminated, thereby reducing the risk that these occurrences might be lost in a future wildfire. The intensity of effects from this activity would be low. The duration of seed loss should be short-term, two to three years, while the seed banks rebuild. The duration of the benefits should be long-term.

There might be some indirect adverse effects to occurrences of Sensitive Plants, not prevented by the management requirements for this alternative. Mastication and logging activities adjacent to "lava cap" habitats could unintentionally create OHV access to these fragile habitats which can be home to Sensitive species such as *Allium tribracteatum, Lomatium stebbinsii, Lewisia kelloggii* ssp. *hutchisonii, Lewisia kelloggii* ssp. *kelloggii* and *Mimulus pulchellus*. These habitats are often mistakenly assumed by the uninformed to be barren and with no value. They can actually be quite rich in native botanical diversity, hosting plant species not found in the more common forest or chaparral ecosystems. Some of the lava caps in the project area famously produce early spring wildflower blooms enjoyed by the public. Impacts from off-trail vehicle driving can cause substantial damage to these habitats, killing rare plants, compacting soil, causing erosion and introducing disturbance favoring weedy species. The intensity of these effects could be moderate to great, depending on the type of driving that occurs. A single trail through a site would localize the impacts to a narrow footprint. However, if many tracks are made or if drivers engage in "drifting" or "spinning donuts," in the habitat, the intensity could be

extremely high. The duration of these effects would last until the activity is detected and measures are put in place to stop the activity and make repairs to stop soil erosion.

Some of the quarries, from which crushed rock or boulders would be obtained for use on road surface stabilization or closures, contain the invasive plant cheatgrass (*Bromus tectorum*). While this species is fairly common in disturbed places in the lower elevations of the Forest, it is not particularly common on the lava cap habitats. There is a possibility that cheatgrass seed could be carried to some of the lava caps with the crushed rock and boulders for road work, thereby introducing the weed to rare plant habitat. The lava caps are particularly vulnerable to weed infestation. The lava caps were disturbed by the Rim Fire and some were also disturbed by suppression activities. Before the fire, some of the lava caps were impacted by off-trail OHV driving causing localized disturbance. With the added disturbance of road work on some lava caps, currently suitable rare plant habitat could be degraded with the introduction of the very competitive cheatgrass. Cheatgrass is good at occupying space and crowding out other species. It is highly competitive for soil moisture and nutrients. It is also known to carry fire through habitats where fire wouldn't normally carry. These adverse effects could affect *Allium tribracteatum, Lomatium stebbinsii, Lewisia kelloggii* ssp. *hutchisonii, Lewisia kelloggii* ssp. *kelloggii* and *Mimulus pulchellus*. The intensity of these effects could be great and would likely be permanent. Cheatgrass is very difficult to remove, once established.

The Sensitive aquatic lichen *Peltigera gowardii* grows in small, shallow streams where scouring and sedimentation are limited or lacking. The water temperature remains low year-round as the result of shading and cold water springs. It is expected that activities which change these habitat characteristics – increased sedimentation, scouring or sun exposure – would likely lead to a reduction or loss of individuals, and depending on the degree of impact, perhaps loss of the occurrence. Sedimentation or scouring could damage the thin, gelatinous thallus (body) of *Peltigera gowardii* by abrading it, leading to death of the organisms (USDA 2010a). Sedimentation could also cover the organisms, blocking their ability to photosynthesize (USDA 2010a).

Peltigera gowardii occurs in ten or more perennial streams within the project area. Three of those streams, Corral Creek, an unnamed tributary to Skunk Creek and an unnamed tributary to the Clavey River, are in a portion of the project area which burned at moderate to high severity. The stands surrounding these occurrences would be logged with either ground-based, skyline or helicopter methods, depending on the steepness of the slopes in the various stands.

The soil and watershed Best Management Practices (BMPs) define the standard practices which reduce the risks of adverse effects to those resources from project activities. There are BMPs which are designed to reduce the risk of the project causing soil erosion or sedimentation in the streams. The fire removed soil cover (vegetation, leaf litter and woody debris) over hundreds of acres in the three watersheds listed above. The risk of erosion and sedimentation entering the *Peltigera gowardii* in these streams is high as a result of the fire effects. The proposed project would produce some sediment as a result of normal project activities. The soil and watershed BMPs should reduce the amount of activity created sediment in these occurrences but might not alleviate it due to loss of soil cover combined with the logging activities. With the BMPs in place, the intensity of the adverse effects should be low to moderate. The duration could be long-term, depending on whether the sediment is washed away the following or near future winter.

Cumulative Effects.

The combined effects of the Rim Fire Recovery Alternative 1 with past, present or foreseeable future projects, activities and incidents in the analysis area are not expected to result in adverse cumulative effects to Sensitive Plants. Individuals of some Sensitive Plant occurrences may be adversely affected by proposed project activities. However, these impacts are not expected to be so great in intensity or duration that any of these occurrences would be eliminated, even when combined with other Forest activities.

Known occurrences of Sensitive Plants and any confirmed prior to project implementation would be protected in the Rim Fire Recovery project by flagging and avoidance, or by timing project activities to reduce the number of individual Sensitive Plants affected, thereby reducing, minimizing or alleviating adverse effects. None of the known occurrences of Sensitive Plants nor any found prior to project implementation are expected to be impacted to the point of being eliminated. Any possible adverse effects from the Rim Fire Recovery project to these occurrences are expected to be temporary, limited to portions of occurrences, or limited in intensity.

The management requirements reduce the risk of loss of Sensitive Plant occurrences from the proposed project. Forest Service projects recently planned within the Rim Fire Recovery project, such as the Twomile Restoration projects, Reynolds Creek Ecological Restoration, Reynolds Creek Motorized Routes and the Soldier Creek Timber Sale, incorporated management requirements which also reduced the risk of loss of occurrences. The Rim Fire Hazard Trees project includes flagging and avoidance of Sensitive Plants.

Some species, such as some of the *Botrychium* species, *Cypripedium montanum*, *Dendrocollybia racemosa* or *Peltigera gowardii* do not do well after wildfire if the overstory has been killed, assuming that they survived the fire. The Rim Fire put a process into place for some occurrences of *Cypripedium montanum* and *Peltigera gowardii*, and possibly some of these other species, if they occurred in moderate to high fire severity areas, which may result in the permanent loss of some of the occurrences. Total overstory mortality caused by the wildfire is a profound impact to *Cypripedium montanum* which cannot be mitigated in a timeframe that would save any such occurrences. The time span required to bring a forest back to old-forest characteristics is quite long. None of the known *Cypripedium montanum* occurrences in the Stanislaus National Forest occurred in areas which had burned within the past 100 years or more. This indicates that it could take as many as 100 years of tree growth, organic soil building, fungal partner recovery and fire exclusion to bring these occurrence habitats back to health. It is unlikely that these occurrences of *Cypripedium montanum* would survive in the duration.

The Rim Fire Recovery project's contribution to this process is in the removal of the dead trees from around the occurrences. The occurrences would be flagged and direct impacts would be avoided. Removing the dead trees from around the occurrences would open up the sites more to light and heat. However, this is a process already in motion. The dead trees, if left, would eventually fall resulting in the more open condition. If left, the dead trees might fall onto the surviving plants, killing them or preventing their growth the following season. Therefore, the Rim Fire Recovery project does not add cumulative effects to this process already in motion.

The analysis area is within several active cattle grazing allotments. Most of the burned area will

not be grazed in 2014, eliminating any new grazing pressures on Sensitive Plant occurrences for that year. Trampling and grazing by cattle can prevent the plants from setting seeds or spores. In the wetter areas, trampling can cause pocking of the soil which damages the habitat and directly kills the plants. Stream bank erosion from cattle accessing the stream causes sediment to enter the water which degrades the water quality for *Peltigera gowardii* and can cause loss of individuals or entire occurrences, depending on the degree that the water quality is degraded. There is a risk of these impacts in future years when grazing is again allowed in the burned area.

The management requirements for the Rim Fire Recovery project require flagging and avoidance of Sensitive Plants, or activities timed for minimal impacts to occurrences of specific species. These management requirements would reduce or prevent adverse effects from the project to occurrences of Sensitive Plants. The Rim Fire removed much of the understory which created barriers to cattle prior to the fire, increasing the possibility that cattle might access Sensitive Plant sites more post-fire than pre-fire. The Rim Fire Recovery project might further open up access to cattle to some Sensitive Plant sites. As a result, there might be more impacts to Sensitive Plant sites from cattle grazing than occurred prior to the fire. The contribution to this effect by the Rim Fire Recovery project is expected to be very low because the fire itself opened up the understory a great deal, not leaving much for the project to contribute.

Alternative 2 (No Action)

Direct and Indirect Effects

There would be no direct effects to Sensitive Plants from this alternative.

Indirect effects might occur in the form of dead trees falling into occurrences. The dead trees could directly kill Sensitive Plants when they fall. The downed trees could block germinating seeds, cause ground level shading for sun-loving plants, and create a high fuel accumulation which would burn at a high intensity, thereby killing the Sensitive Plants which survive the falling trees.

Cumulative Effects

The Rim Fire caused varying levels of impacts to Sensitive Plants according to fire severity at each location. Alternative 2 would compound the damage done to some occurrences by not preventing the downed and falling trees from interfering with the post-fire recovery of the Sensitive Plant occurrences. A future wildfire burning through these areas of accumulated down trees could burn at such a high burn severity that occurrences could be lost through large portions of the project area.

In Alternative 2, there would be no soil and watershed enhancement activities reducing or preventing sedimentation of *Peltigera gowardii* occurrences. As a result, three occurrences are at a high risk of loss to sedimentation in this alternative.

Alternatives 3 and 4

Direct and Indirect Effects

Direct and indirect effects to Sensitive Plants would be the same as in Alternative 1 except that additional management requirements would prevent some of the impacts that might occur in Alternative 1. Project-created access to lava cap habitats would be blocked, thereby preventing unauthorized motorized access to those fragile habitats. There is a lower risk of project-created sediment causing habitat degradation or mortality to *Peltigera gowardii*.

Cumulative Effects

Cumulative effects to Sensitive Plants under Alternatives 3 and 4 would be the same as Alternative 1. The combined effects of Rim Fire Recovery Alternatives 3 and 4 with past, present or foreseeable future projects, activities and incidents in the analysis area are not expected to result in adverse cumulative effects to Sensitive Plants. Individuals of some Sensitive Plant occurrences may be adversely affected by proposed project activities. However, these impacts are not expected to be so great in intensity or duration that any of these occurrences would be eliminated, even when combined with other Forest activities.

Compliance with management direction.

The Forest Service Manual, Section 2670.32 states that "the line officer, with project approval authority, makes the decision to allow or disallow impact, but the decision must not result in loss of species viability or create significant trends toward Federal listing." It has been determined that impacts to some Sensitive Plant occurrences could be conducted on a very limited basis without creating loss of viability or trends toward listing (See Determination of Effects).

This proposed project has been modified by incorporating protective measures for known and newly discovered Sensitive Plant occurrences (pages 14 through 16). These modifications are designed to reduce, minimize or alleviate adverse effects to known or newly detected occurrences of Sensitive Plants. Therefore, this proposed project would be in compliance with current management direction and Forest Service policy.

DETERMINATION OF EFFECTS.

The Determination of Effects is made with the assumption that the project would be implemented as described in the Description of Proposed Project (pages 5 through 14). Any deviation from the description could change the determination. The Determination of Effects is presented in two sections, a summary of pertinent facts and the determination.

Summary.

Surveys for the Sensitive Plants have been conducted in many parts of the Rim Fire Recovery project. However, those surveys have been conducted over the past 23 years and through four Sensitive List revisions, the most recent being in 2013. The past surveys were species-specific, that is, they were focused on the species on the Sensitive List at the time of surveys. The surveys did not include complete accounting of all botanical species encountered. Therefore, most areas had not been surveyed for all of the current Sensitive species which might occur there.

There are known occurrences of *Allium yosemitense, Balsamorhiza macrolepis, Botrychium crenulatum, Botrychium minganense, Botrychium pedunculosum, Clarkia australis, Clarkia biloba ssp. australis, Cypripedium montanum, Eriophyllum nubigenum, Erythronium taylori, Erythronium tuolumnense, Lewisia kelloggii ssp. hutchisonii, Lomatium stebbinsii, Mielichhoferia elongata, Mimulus filicaulis, Mimulus pulchellus,* and *Peltigera gowardii* within the analysis area. There is suitable habitat for these species in the project area.

There is suitable habitat for the additional species *Allium tribracteatum, Arctostaphylos nissenana, Botrychium ascendens, Botrychium lineare, Botrychium lunaria, Botrychium montanum, Botrychium pinnatum, Bruchia bolanderi, Cinna bolanderi, Dendrocollybia racemosa, Eriastrum tracyi, Eriogonum luteolum* var. *saltuarium, Eriophyllum congdonii, Fissidens aphelotaxifolius, Helodium blandowii, Horkelia parryi, Hulsea brevifolia, Lewisia kelloggii* ssp. *kelloggii, Meesia uliginosa* and *Mielichhoferia shevockii* and *Tauschia howellii.*

Where Sensitive Plants are present, the proposed project activities (see Description of Proposed Project, pages 5 through 14; and Effects of the Proposed Project, pages 53 through 63) could cause several adverse effects. There might be instances where seed of four annual species, *Clarkia australis, Clarkia biloba* ssp. *australis, Mimulus filicaulis* and *Mimulus pulchellus* might be damaged or killed. However, these impacts would not cause the loss of any occurrences of these species and the activities should benefit the occurrences at least for the short term.

Occurrences of Sensitive Plants in roadside hazard tree units might be impacted in order to abate a hazard to the public or workers. The smallest possible portion of an occurrence would be impacted. No occurrences are expected to be eliminated in this situation.

Activities in Alternative 1 might cause indirect impacts to occurrences of *Allium tribracteatum, Lomatium stebbinsii, Lewisia kelloggii* ssp. *hutchisonii, Lewisia kelloggii* ssp. *kelloggii* and *Mimulus pulchellus.* Timber removal near the lava cap habitats of these species might open up motorized vehicle access, creating erosion problems and direct killing of plants. Rock and boulder material from quarries contaminated with cheatgrass might vector this invasive weed to fragile lava cap habitats where it would be difficult to impossible to remove, thereby degrading the habitat and possibly causing the loss of Sensitive Plants. These impacts would be avoided in Alternatives 3 and 4 which have management requirements which prevent these impacts.

Activities in Alternative 1 might result in greater sedimentation input into occurrences of *Peltigera gowardii* than Alternatives 3 and 4 due to the lack of a management requirement requiring activities to not produce sediment input into occurrences of this species. Alternative 2 might result in sediment loads so great that occurrences of *Peltigera gowardii* might decline or be lost.

Determination.

Allium tribracteatum

There are no known occurrences of *Allium tribracteatum* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Allium tribracteatum* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Allium tribracteatum.*

Allium yosemitense

There is one known occurrence (33% of the known Forest occurrences) of *Allium yosemitense* within the Rim Fire Recovery project area. This occurrence is within a unit in Alternative 1 but outside the unit in Alternatives 3 and 4. There are suitable habitat areas in other units which have not been surveyed. The management requirements would reduce or alleviate adverse effects from all project activities to occurrences of *Allium yosemitense*.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Allium yosemitense.*

Arctostaphylos nissenana

There are no known occurrences of *Arctostaphylos nissenana* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Arctostaphylos nissenana* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Arctostaphylos nissenana.*

Balsamorhiza macrolepis

Four of the five currently known occurrences (80% of the known Forest occurrences) of *Balsamorhiza macrolepis* occur within the Rim Fire Recovery project area. The fifth occurrence is within a Rim Fire Hazard Tree unit. There is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse

effects from all project activities to occurrences of *Balsamorhiza macrolepis* in the Rim Fire Recovery project.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Balsamorhiza macrolepis.*

Botrychium ascendens

There are no known occurrences of *Botrychium ascendens* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Botrychium ascendens* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Botrychium ascendens.*

Botrychium crenulatum

There is one known occurrence (about 11% of the known Forest occurrences) of *Botrychium crenulatum* within the Rim Fire Recovery project area. There is suitable habitat in the project which has not been surveyed for this species. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Botrychium crenulatum*.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Botrychium crenulatum.*

Botrychium lineare

There are no known occurrences of *Botrychium lineare* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Botrychium lineare* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Botrychium lineare.*

Botrychium lunaria

There are no known occurrences of *Botrychium lunaria* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Botrychium lunaria* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Botrychium lunaria.*

Botrychium minganense

There is one known occurrence (about 14% of the known Forest occurrences) of *Botrychium minganense* within the Rim Fire Recovery project area. There is suitable habitat in the project which has not been surveyed for this species. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Botrychium minganense*.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Botrychium minganense.*

Botrychium montanum

There are no known occurrences of *Botrychium montanum* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Botrychium montanum* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Botrychium montanum.*

Botrychium pedunculosum

There is one known occurrence (100% of the known Forest occurrences) of *Botrychium pedunculosum* within the Rim Fire Recovery project area. This occurrences is adjacent to a roadside hazard tree unit and within a Rim Fire Hazard Tree project unit. There is suitable habitat that has not been surveyed for this species. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Botrychium pedunculosum*.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Botrychium pedunculosum*.

Botrychium pinnatum

There are no known occurrences of *Botrychium pinnatum* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Botrychium pinnatum* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Botrychium pinnatum.*

Bruchia bolanderi

There are no known occurrences of *Bruchia bolanderi* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Bruchia bolanderi* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Bruchia bolanderi*.

Clarkia australis

There are 129 known colonies (about 43% of the known on the Forest) of *Clarkia australis* within or adjacent to Rim Fire Recovery units. There is suitable habitat in project units which has not been surveyed. The management requirements would reduce, minimize or alleviate adverse effects from all project activities to occurrences of *Clarkia australis*.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Clarkia australis.*

Clarkia biloba ssp. *australis*

There are 17 known occurrences (about 15% of the known Forest occurrences) of *Clarkia biloba* ssp. *australis* within Rim Fire Recovery units. There is suitable habitat in units which has not

been surveyed. The management requirements would reduce, minimize or alleviate adverse effects from all project activities to occurrences of *Clarkia biloba* ssp. *australis*.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Clarkia biloba* ssp. *australis.*

Cypripedium montanum

There are 29 known occurrences (94% of the known Forest occurrences) of *Cypripedium montanum* within the Rim Fire Recovery project area. There are areas which contained suitable habitat before the fire which have not been surveyed. These areas might contain surviving plants. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Cypripedium montanum*.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Cypripedium montanum.*

Dendrocollybia racemosa

There are no known occurrences of *Dendrocollybia racemosa* within the Rim Fire Recovery project area. While there was unsurveyed suitable habitat prior to the fire, it is unlikely that the species survived the effects of the fire (page 36). The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Dendrocollybia racemosa* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Dendrocollybia racemosa.*

Eriogonum luteolum var. *saltuarium*

There are no known occurrences of *Eriogonum luteolum* var. *saltuarium* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Eriogonum luteolum* var. *saltuarium* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Eriogonum luteolum* var. *saltuarium.*

Eriophyllum congdonii

There are no known occurrences of *Eriophyllum congdonii* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Eriophyllum congdonii* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Eriophyllum congdonii.*

Eriophyllum nubigenum

There are three known occurrences (100% of the known Forest occurrences) of *Eriophyllum nubigenum* within the Rim Fire Recovery project area. One of these occurs within an Alternative 1 unit but is outside the unit in Alternatives 3 and 4. There are suitable habitat areas in other units which have not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Eriophyllum nubigenum*.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Eriophyllum nubigenum.*

Erythronium taylori

The one known occurrence (100% of the known Forest occurrences) of *Erythronium taylori* within the Rim Fire Recovery project area, within a helicopter salvage unit. Previously unsurveyed suitable habitat for this species was surveyed in spring 2014 during the appropriate identification period with negative results. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to the occurrence of *Erythronium taylori*.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Erythronium taylori.*

Erythronium tuolumnense

There is one known occurrence (3% of the known Forest occurrences) of *Erythronium tuolumnense* within the Rim Fire Recovery project area. This occurrence is within a roadside hazard tree unit. There are suitable habitat areas in other units which have not been surveyed. The management requirements would reduce or alleviate adverse effects from all project activities to occurrences of *Erythronium tuolumnense*.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Erythronium tuolumnense.*

Fissidens aphelotaxifolius

There are no known occurrences of *Fissidens aphelotaxifolius* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Fissidens aphelotaxifolius* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Fissidens aphelotaxifolius.*

Helodium blandowii

There are no known occurrences of *Helodium blandowii* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Helodium blandowii* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Helodium blandowii.*

Horkelia parryi

There are no known occurrences of *Horkelia parryi* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Horkelia parryi* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Horkelia parryi.*

Hulsea brevifolia

There are no known occurrences of *Hulsea brevifolia* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements

for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Hulsea brevifolia* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Hulsea brevifolia.*

Lewisia kelloggii ssp. *hutchisonii*

There is one known occurrence (6% of the known Forest occurrences) of *Lewisia kelloggii* ssp. *hutchisonii* within the Rim Fire Recovery project area. There are suitable habitat areas in other units which have not been surveyed. The management requirements would reduce or alleviate adverse effects from all project activities to occurrences of *Lewisia kelloggii* ssp. *hutchisonii*.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Lewisia kelloggii* ssp. *hutchisonii.*

Lewisia kelloggii ssp. *kelloggii*

There are no known occurrences of *Lewisia kelloggii* ssp. *kelloggii* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Lewisia kelloggii* ssp. *kelloggii* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Lewisia kelloggii* ssp. *kelloggii*.

Lomatium stebbinsii

There are eight known occurrences (9% of the known Forest occurrences) of *Lomatium stebbinsii* within the Rim Fire Recovery project area. There are suitable habitat areas in other units which have not been surveyed. The management requirements would reduce or alleviate adverse effects from all project activities to the occurrence of *Lomatium stebbinsii*.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Lomatium stebbinsii*.

Meesia uliginosa

There are no known occurrences of *Meesia uliginosa* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Meesia uliginosa* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Meesia uliginosa.*

Mielichhoferia elongata

There are three known occurrences (75% of the known Forest occurrences) of *Mielichhoferia elongata* within the Rim Fire Recovery project area. None of these are in Rim Fire Recovery Units. One is inside a Rim Fire Hazard Tree unit. There is suitable habitat in units which has not been surveyed. The management requirements would reduce or alleviate adverse effects from all project activities to the occurrence of *Mielichhoferia elongata*.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Mielichhoferia elongata.*

Mielichhoferia shevockii

There are no known occurrences of *Mielichhoferia shevockii* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Mielichhoferia shevockii* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Mielichhoferia shevockii.*

Mimulus filicaulis

There are 33 known occurrences (26% of known Forest occurrences) of *Mimulus filicaulis* within Rim Fire Recovery units. There is suitable habitat which hasn't been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce, minimize or alleviate adverse effects from all project activities to occurrences of *Mimulus filicaulis.*

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the species *Mimulus filicaulis.*

Mimulus pulchellus

There are 12 known occurrences (about 30% of known Forest occurrences) of *Mimulus pulchellus* within the Rim Fire Recovery units. There is suitable habitat in units which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce, minimize or alleviate adverse effects from all project activities to occurrences of *Mimulus pulchellus.*

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the species *Mimulus pulchellus.*

Peltigera gowardii

There are ten known occurrences (45% of the known Forest occurrences) of *Peltigera gowardii* within the Rim Fire Recovery project area. There are streams within the project area which have not been surveyed for this species. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Peltigera gowardii*.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Peltigera gowardii*.

Tauschia howellii

There are no known occurrences of *Tauschia howellii* within the Rim Fire Recovery project area, however there is suitable habitat which has not been surveyed. The management requirements for Alternatives 1, 3 and 4 would reduce or alleviate adverse effects from all project activities to occurrences of *Tauschia howellii* should they be found there during project surveys.

It is my determination that the Rim Fire Recovery project, as described on pages 5 through 14, may affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability for the species *Tauschia howellii*.

MANAGEMENT RECOMMENDATIONS.

Alternative 1 (Proposed Action)

Additional management requirements were recommended to further reduce or alleviate the possibility of adverse effects to Sensitive Plants. However, the Decision Maker chose to minimize the number of management requirements to provide an opportunity for the public to suggest additional management actions or requirements in the interest of public collaboration. No additional management requirements to protect Sensitive Plants were suggested by the public

and the proposed action went forward with the Alternative 1 management requirements as shown on page 15 of this BE. The following measures are recommended to be added to Alternative 1 in order to reduce or prevent the possible adverse effects, as outlined in the effects section (pages 58 through 62), from the activities mention.

4. Hide, obscure or block appearance of motorized access created by the project to "lava cap" habitats. Existing patches of live or dead brush or other vegetation on the edges of the "lava caps" can be utilized for this purpose.

5. In order to protect occurrences of *Peltigera gowardii*, conduct project activities in such a way that sediment is not added to or accumulates within occurrences, especially in Corral Creek at Sections 17 and 20, T1N, R18E, the unnamed tributary to Clavey River in Section 18, T1N, R18E and the unnamed tributary to Skunk Creek in Section 21, T1N, R18E.

6. Placement of landings, skid trails, temporary roads, new construction roads or other operational features outside of units require the clearance of the District Botanist. When Sensitive Plants are present at a location of a proposed operational feature, the feature will be relocated to avoid the occurrence.

<u>Alternatives 1, 3 and 4</u>

The following are recommended to be added to all action alternatives to further reduce the risk of adverse impacts to Sensitive Plants.

7. Foot traffic by contractors, forest workers or work inspectors will not be allowed within or through occurrences of Sensitive Plants, except as allowed in #2, above or for the purpose of flagging the sites.

8. Implement the noxious weed management requirements found in the Rim Fire Recovery Weed Risk Assessment to prevent the introduction and spread of invasive plant species in Sensitive Plant occurrences.

REFERENCES.

Beck, T.W. and Hurley, J.F. 1984. Sensitive plant management guide. Unpubl. Sonora. USDA, Stanislaus National Forest.

Botti, S.J. 2001. An illustrated flora of Yosemite National Park. Ill. W. Sydoriak. Yosemite Association, El Portal, CA. 484pp.

California Department of Fish and Wildlife, Natural Diversity Database (CNDDB). 2014a. RareFind 5, Government Version, data set March, 2014. California Department of Fish and Game. http://www.dfg.ca.gov/biogeodata/cnddb/mapsanddata.asp. (Various dates, 2014).

California Department of Fish and Wildlife, Natural Diversity Database (CNDDB). 2014b. Special vascular plants, bryophytes, and lichens list, July 2014. Quarterly publication. 124 pp. http://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp (August 13, 2014).

Christy, J.A. 1980. Additions to the moss flora of Oregon. The Bryologist 83(3) 355-358.

Clines, J. 2009. Conservation Assessment for *Botrychium* in California National Forests (Draft). USDA Forest Service, Region 5. Unpubl.

Consortium of California Herbaria (CCH). 2014. Data provided by the participants of the Consortium of California Herbaria. http://ucjeps.berkeley.edu/consortium/ (accessed on various dates, 2013 and 2014).

Consortium of North American Bryophyte Herbaria (CNABH). 2014. http://bryophyteportal.org/portal/index.php (April 10, 2014)

Consortium of North American Lichen Herbaria (CNALH). 2014. http://lichenportal.org/portal/ (March 29, 2014).

Cushman, K. and Huff, R. 2007. Conservation Assessment for Fungi Included in Forest Service Regions 5 and 6 Sensitive and BLM California, Oregon and Washington Special Status Species Programs. USDA Forest Service Regions 5 and 6, Oregon and Washington and USDI Bureau of Land Management, California, Oregon and Washington.

Davis, W.C. 1999. Ecophysiology of Hydrothyria venosa – An Aquatic Lichen. PhD Dissertation, Arizona State University.

Farrar, D.R. [n.d. a.]. Fact sheet for *Botrychium crenulatum*. Iowa State University, Ada Hayden Herbarium. http://www.public.iastate.edu/~herbarium/botrychium.html (April 16, 2014).

Farrar, D.R. [n.d. b.]. Fact sheet for *Botrychium lineare*. Iowa State University, Ada Hayden Herbarium. http://www.public.iastate.edu/~herbarium/botrychium.html (April 16, 2014).

Farrar, D.R. 2011a. Fact sheet for *Botrychium ascendens*. Iowa State University, Ada Hayden Herbarium. http://www.public.iastate.edu/~herbarium/botrychium.html (April 9, 2014).

Farrar, D.R. 2011b. Fact sheet for *Botrychium neolunaria.* Iowa State University, Ada Hayden Herbarium. http://www.public.iastate.edu/~herbarium/botrychium.html (April 9, 2014).

Farrar, D.R. 2011c. Fact sheet for *Botrychium montanum.* Iowa State University, Ada Hayden Herbarium. http://www.public.iastate.edu/~herbarium/botrychium.html (April 9, 2014).

Farrar, D.R. 2011d. Fact sheet for *Botrychium pedunculosum*. Iowa State University, Ada Hayden Herbarium. http://www.public.iastate.edu/~herbarium/botrychium.html (April 9, 2014).

Farrar, D.R. 2011e. Fact sheet for *Botrychium pinnatum*. Iowa State University, Ada Hayden Herbarium. http://www.public.iastate.edu/~herbarium/botrychium.html (April 9, 2014).

Farrar, D.R. 2012. *Botrychium* moonwort. In: The Jepson manual, vascular plants of California, second edition. Ed.: Baldwin, B. G., et. al. University of California Press, Berkeley. 1568pp.

Farrar, D.R. and Clines, J. 2009. Fact Sheet for *Botrychium lineare* (Draft). Appendix to Draft Conservation Assessment for *Botrychium* in California National Forests (Draft). USDA Forest Service, Region 5. Unpubl.

Flowers, S. 1973. Mosses: Utah and the West. Brigham University Press, Provo, Utah. 567 pp.

Gottlieb, L.D. and Ford, V.S. 1999. The status of *Clarkia australis* (Onagraceae). American Journal of Botany 86(3): 428-435.

Hickman, J.C., ed. 1993. The Jepson manual: higher plants of California. Berkeley: Univ. Calif. Press, 1993. 1400pp.

Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. Unpubl. California Department of Fish and Game, Natural Heritage Division.

Jepson Flora Project. 2014. Jepson eFlora [on-line application]. Ed.: Baldwin, B., et. al. http://ucjeps.berkeley.edu/IJM.html. Accessed through: The Jepson Online Interchange, California Floristics, University of California, Berkeley. http://ucjeps.berkeley.edu/interchange.html (various dates, 2013, 2014).

Kaye, T.N. and Cramer, J.R. 2005. Conservation assessment for *Cypripedium fasciculatum* and *Cypripedium montanum*. USDA Forest Service, Region 5. Unpubl.

Lendemer, J.C and O'Brien, H. 2011. How do you reconcile molecular and non-molecular datasets? A case study where new molecular data prompts a revision of *Peltigera hydrothyria* s.l. in North America and the recognition of two species. *Opuscula Philolichenum,* **9**: 99-110.

Malcolm, B., Malcolm, N., Shevock, J., Norris, D. 2009. California mosses. Micro-Optics Press. 430 pp.

Miadlikowska, J. and Lutzoni, F. 2000. Phylogenetic revision of the genus *Peltigera* (lichen-forming ascomycota) based on morphological, chemical, and large subunit nuclear ribosomal DNA data. International Journal of Plant Science 161(6): pp.925-958.

Mortola, W.R. and McNeal, D.W. 1985. Taxonomy of the *Allium tribracteatum* (Alliaceae) complex. Aliso 11(1):27-35.

NatureServe. 2014. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. http://explorer.natureserve.org. (March 26, 2014).

Oregon Biodiversity Information Center (ORBIC). 2013. Rare, threatened and endangered species of Oregon. Institute for Natural Resources, Portland State University, Portland, Oregon. 111 pp. http://orbic.pdx.edu/ (March 26, 2014).

Ornduff, R. 2008. Thomas Jefferson Howell and the first Pacific Northwest flora. Kalmiopsis. 15: pp.32-41. http://www.npsoregon.org/publications.html#kalm (April 15, 2014)

Peterson, E.B. 2010. Conservation Assessment with Management Guidelines for *Peltigera hydrothyria* Miadlikowska & Lutzoni (a.k.a. *Hydrothyria venosa* J. L. Russell). USDA Forest Service, Region 5. Unpubl.

Pursell, R.A. 1976. *Fissidens aphelotaxifolius* (Bryopsida; Fissidentaceae), a new species from the Pacific Northwest of North America. Bulletin of the Torrey Botanical Club 103(1):35-38.

Reveal, J.L. 1989. New combinations and novelties in Eriogonum (Polygonaceae). Phytologia 66 (3): 264-265.

Schlessman, M.A., and Constance, L. 1979. Two new species of tuberous Lomatiums (Umbelliferae). Madroño, Vol. 26, No.1.

Shaw, A.J. and Rooks, P.E. 1994. Systematics of *Mielichhoferia* (Bryaceae: Musci) I. Morphological and genetic analyses of *M. elongata* and *M. mielichhoferiana*. Bryologist 97(1): 1-12.

Shaw, A.J. 2000. *Schizymenium shevockii* (Bryaceae), a New Species of Moss from California, Based on Morphological and Molecular Evidence. Systematic Botany 256(2): pp. 188-196.

Shaw, J.A. 2009. *Mielichhoferia shevockii*, comb. nov. (Mielichhoferiaceae). The Bryologist, 112(3): pp.605-605.

Shefferson, R.P. 2004a. E-mail exchange with David Isle, August 10, 2004.

Shefferson, R.P. 2004b. E-mail exchange with David Isle, August 24, 2004.

Shefferson, R.P., M. Weiß, T. Kull, and D. L. Taylor. 2005. High specificity generally characterizes mycorrhizal association in rare lady's slipper orchids, genus Cypripedium. Molecular Ecology, 14:613–626.

Shevock, J.R. and Allen, G.A. 1997. *Erythronium taylori* (Liliaceae), a new species from the central Sierra Nevada of California. Madrono 44:359-363.

Tropicos.org. 2014. Tropicos Database [on-line application]. Missouri Botanical Garden, St. Louis, Missouri. http://www.tropicos.org (April 11, 2014).

U.S. Department of Agriculture (USDA). 2008. Departmental Regulation 9500-004. http://www.ocio.usda.gov/sites/default/files/docs/2012/DR9500-004.pdf. (August 19, 2014).

U.S. Department of Agriculture, Forest Service (USDA). 1981. Soil survey, Stanislaus National Forest area, California. Unpubl., National Cooperative Soil Survey.

U.S. Department of Agriculture, Forest Service (USDA). 1988. R-5 Forest Service Handbook. Chapter 2609.25, threatened, endangered sensitive plants program handbook.

U.S. Department of Agriculture, Forest Service (USDA). 1990. Forest Service Manual. Chapter 2670, threatened, endangered, and sensitive plants and animals.

U.S. Department of Agriculture, Forest Service (USDA). 2005. Conservation Assessment for Meesia triquetra (three-ranked hump-moss) and Meesia uliginosa (broad-nerved hump-moss) in California with a focus on the Sierra Nevada Bioregion. Prepared by: Dillingham C.P., VMS Enterprise Team. Region 5, Forest Service, Vallejo, California. 28 pp.

U.S. Department of Agriculture, Forest Service (USDA). 2006. Region 5 sensitive plant species evaluation and documentation form, plant name: *Hulsea brevifolia* Gray, short-leaved Hulsea. Unpublished.

U.S. Department of Agriculture, Forest Service (USDA). 2010a. Conservation Assessment with Management Guidelines for *Peltigera hydrothyria* Miadlikowska & Lutzoni (a.k.a. *Hydrothyria venosa* J. L. Russell). Prepared under contract by Eric B. Peterson, Ph.D., California Native Plant Society. Unpublished. USDA Forest Service, Region 5.

U.S. Department of Agriculture, Forest Service (USDA). 2010b. FireHistory2010 [GIS shapefile of Stanislaus NF Fire History]. USDA Forest Service, Stanislaus National Forest, Sonora, CA. On file with Stanislaus National Forest.

U.S. Department of Agriculture, Forest Service (USDA). 2010c. Stanislaus National Forest, Forest Plan Direction. Stanislaus National Forest, Sonora, CA.

U.S. Department of Agriculture, Forest Service (USDA). 2012a. Region 5 sensitive plant species evaluation and documentation form, 2012, plant name: *Bruchia bolanderi* Lesquereux, Bolanders Bruchia. Unpublished.

U.S. Department of Agriculture, Forest Service (USDA). 2012b. Region 5 U.S. Forest Service sensitive vascular plant, bryophyte, & lichen species evaluation & documentation form, plant name: *Balsamorhiza macrolepis* W.M. Sharp, big-scale balsamroot. Unpublished.

U.S. Department of Agriculture, Forest Service (USDA). 2012b. Region 5 U.S. Forest Service sensitive vascular plant, bryophyte, & lichen species evaluation & documentation form, plant name: *Eriastrum tracyi* H. Mason. Unpublished.

U.S. Department of Agriculture, Forest Service (USDA). 2012c. Region 5 Sensitive Plant Species Evaluation and Documentation Form, Plant name and commonly used synonyms: *Helodium blandowii* (Web. & Mohr) Warnst., Blandow's bog-moss. Unpublished.

U.S. Department of Agriculture, Forest Service (USDA). 2012d. Region 5 sensitive plant species evaluation and documentation form, plant name: *Lewisia kelloggii* ssp. *hutchisonii*

Dempster, Kellogg's lewisia. Unpublished.

U.S. Department of Agriculture, Forest Service (USDA). 2012e. Region 5 U.S. Forest Service sensitive vascular plant, bryophyte, & lichen species evaluation & documentation form, plant name: *Lewisia kelloggii* ssp. *kelloggii*. Unpublished.

U.S. Department of Agriculture, Forest Service (USDA). 2012f. Region 5 Sensitive Plant Species Evaluation and Documentation Form, 2012, plant name: *Meesia uliginosa* Hedwig, broad-nerved hump-moss. Unpublished.

U.S. Department of Agriculture, Forest Service (USDA). 2012g. Region 5 sensitive plant species evaluation and documentation form, plant name: *Mielichhoferia elongata* (Hoppe & Hornsch. ex Hook) Nees & Hornsch. in Nees. Unpublished.

U.S. Department of Agriculture, Forest Service (USDA). 2013a. Region 5 U.S. Forest Service sensitive vascular plant, bryophyte, lichen, & fungi species evaluation & documentation form, plant name: *Dendrocollybia racemosa* (pers. : Fr.) Peterson & Redhead. Unpublished.

U.S. Department of Agriculture, Forest Service (USDA). 2013b. Region 5 U.S. Forest Service sensitive vascular plant, bryophyte, lichen, & fungi species evaluation & documentation form, plant name: *Tauschia howellii*. Unpublished.

U.S. Department of Agriculture, Forest Service (USDA). 2013c. Rim Fire Botany BAER Report. Prepared by: Haas, J. and Young, Q. USDA Forest Service, Stanislaus National Forest, Sonora, CA. Unpublished.

U.S. Department of the Interior, Fish and Wildlife Service (USFWS). 2014. Federal endangered and threatened species that may be affected by projects in the Stanislaus National Forest. http://www.fws.gov/sacramento/ES_Species/Lists/es_species_lists_NF-form-page.htm (February 19, 2014).

Vitt, D.H. 1992. The distribution of North American Bryophytes *Meesia uliginosa* Hedw. Evansia 9(2):59-60.

Wagner, W.H. and Wagner, F.S. 1994. Anther widely disjunct, rare, and local North American moonwort. American Fern Journal 84(1) pp.5-10.

Wilkins, P. 1977. Observations on ecology of *Mielichhoferia elongata* and other "copper mosses" in the British Isles. The Bryologist 80(1) pp.175-181.

Wilson B.L., Hipkins, V.D., Rey-Vizgirdas, E., Kaye, T.N. 2005. Variation in *Lewisia kelloggii* (Portulacaceae) with description of a new species endemic to Idaho. Western North American Naturalist 65(3), pp. 345–358.

Personal communications

Christofferson, Chris L. "Re: Have You Found New Sitings of *Balsamorhiza macrolepis* var. *macrolepis*?" E-mail message to J. Haas. May 10, 2010.

Colwell, Alison, PhD. "Re: *Balsamorhiza hookeri* (*macrolepis*?)" E-mail message to J. Haas. August 13, 2014. Botanist, USDI, National Park Service, Yosemite National Park.

Constance, Lincoln, Professor Emeritus, University of California, Berkeley, deceased.

---. Letter to J. Haas, Groveland District Botanist, Stanislaus National Forest. Oct. 23, 1996.

---. Letter to J. Haas, Groveland District Botanist, Stanislaus National Forest. Nov. 13, 1996.

Davison, Scott. "FW: *Dendrocollybia racemosa* Response to Wildfire?" E-mail message to E. Rentz, forwarded to J. Haas. January 15, 2014.

Park, Michael. Research Associate, University of California, Berkeley. University and Jepson Herbaria, 1001 Valley Life Sciences Building # 2465, Berkeley, CA 94720-2465. 2011.

Vellinga, Else C., Ph.D. "Re: *Dendrocollybia racemosa* Response to Wildfire?" E-mail message to J. Haas. January 15, 2014.

Willits, Margaret. Zone Botanist, Mi-Wok and Summit Ranger Districts, Stanislaus National Forest, 24695 Highway 108, Mi Wuk Village, CA 95346.

Young, Quinn. Botanist, Calaveras Ranger District, Stanislaus National Forest, P.O. Box 500, Hathaway Pines, CA 95233.

Appendix A

Table A-1. California wildlife habitat relationship viewed by Vegetation Burn Severity (RAVG4) September 2013, for Rim Fire burned area. Source: Rim Fire Botany BAER Report (USDA 2013c).

Habitat Type	Vegetation Burn Severity	Acres	Total Acres
Annual Grassland	Low	921.5	9,906.7
	Moderate	1827.0	
	High	2202.4	
	Severe	4955.7	
Barren	Low	236.1	827.9
	Moderate	244.2	
	High	155.6	
	Severe	192.0	
Blue Oak Woodland	Low	11.3	119.9
	Moderate	48.5	
	High	45.0	
	Severe	15.0	
Blue Oak-Foothill Pine	Low	128.1	972.4
	Moderate	313.3	
	High	246.2	
	Severe	284.8	
Chamise-Redshank Chaparral	Low	1.5	3.3
	Moderate	1.1	
	High	0.7	
	Severe	0.1	
Jeffrey Pine	Low	82.4	259.5
	Moderate	70.4	
	High	57.4	
	Severe	49.2	
Lacustrine	Low	16.1	31.0
	Moderate	11.8	
	High	2.1	
	Severe	1.0	
Lodgepole Pine	Low	19.2	510.9
	Moderate	49.8	
	High	68.7	
	Severe	373.3	
Mixed Chaparral	Low	774.1	20,141.8
	Moderate	1865.2	
	High	2379.9	
	Severe	15122.6	

Habitat Type	Vegetation Burn Severity	Acres	Total Acres
Montane Chaparral	Low	739.3	6,874.0
	Moderate	1229.0	
	High	1275.9	
	Severe	3629.8	
Montane Hardwood	Low	2349.2	23,356.3
	Moderate	5119.4	
	High	3960.0	
	Severe	11927.8	
Montane Hardwood-Conifer	Low	1844.3	12,057.0
	Moderate	2885.6	
	High	1853.5	
	Severe	5473.6	
Montane Riparian	Low	2.3	6.4
	Moderate	0.4	
	High	0.3	
	Severe	3.3	
Perennial Grassland	Low	190.2	1,788.9
	Moderate	302.1	
	High	281.9	
	Severe	1014.8	
Ponderosa Pine	Low	3507.7	19,797.3
	Moderate	4525.0	
	High	3166.6	
	Severe	8598.1	
Red fir	Low	33.7	59.6
	Moderate	20.6	
	High	5.2	
	Severe	0.1	
Riverine	Low	73.8	124.0
	Moderate	29.2	
	High	17.4	
	Severe	3.6	
Sierran Mixed Conifer	Low	17402.1	56,714.7
	Moderate	12797.9	
	High	7431.3	
	Severe	19083.3	
Urban	Low	15.2	45.4
	Moderate	11.2	
	High	7.8	
	Severe	11.2	

Habitat Type	Vegetation Burn Severity	Acres	Total Acres
Wet Meadow	Low	13.1	37.4
	Moderate	8.8	
	High	4.5	
	Severe	10.9	
White fir	Low	549.5	887.0
	Moderate	173.9	
	High	72.0	
	Severe	91.5	
		Total	154,521.5