BOTANY REPORT

RIM FIRE RECOVERY

STANISLAUS NATIONAL FOREST
GROVELAND RANGER DISTRICT

PREPARED BY: Jennie Haas DATE: August 25, 2014
Jennie Haas, District Botanist

INTRODUCTION.

This report provides the background information and analysis of effects for rare plants which are not Regional Forester Sensitive Plants in the Rim Recovery project. The rare plants in this analysis are species included in the Forest Watchlist and Botanical Interest Species list. Additionally, information and effects analysis is provided in this document for the Pacific Madrone Special Interest Area (SIA).

Analysis is provided for Sensitive Plants in the Biological Evaluation for Sensitive Plants, a separate document. Analysis for the risk of weed introduction and spread is provided in the Noxious Weed Risk Assessment, also a separate document. Sensitive Plants and noxious weeds are not addressed in this report. This report is not required by Forest Service policy or law. It contains supplemental information which is considered in the analysis of effects documented in the Rim Recovery Environmental Impact Statement (EIS). This report is incorporated by reference into the EIS.

The Pacific Madrone Special Interest Area was created in the 1991 Forest Land and Resource Management Plan. Special Interest Areas (SIA) are a type of Management Area which were designated in response to issues, concerns and opportunities developed during the planning process. The management emphasis for Special Interest Areas is to "protect and manage unique geological, scenic, historical, archaeological, botanical and memorial features, to make educational opportunities available and preserve the integrity of the special interest feature for which the areas were established" (USDA 2010c). Under the Forest Plan Direction, a wide range of resource activities is permitted, provided the unique features of each area are protected (USDA 2010c).

In general, management of rare plants in the Stanislaus National Forest is based on the National Forest Management Act of 1976 (NFMA), Forest Service policy set out in the Forest Service Manual (FSM 2670) and the 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 (USDA 1984) and, where applicable, Species Management Guides and Conservation Strategies.

Management of Forest Watchlist and Botanical Interest Species is supported by the diversity clause of NFMA, the diversity and viability portions of the Forest Plan and Departmental Regulation 9500-004. NFMA requires the Forest Service to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives" [16 U.S.C. 1604(g)(3)(B)]. Departmental Regulation 9500-004 describes the US Department of Agriculture's policy to "assure that the values of fish and wildlife are recognized, and that their habitats, both terrestrial and aquatic, including wetlands, are recognized and enhanced, where possible, as the Department carries out its overall missions". Additionally, it is a policy of the Department to "avoid actions which may cause a species to become threatened or endangered" (USDA 2008).

Forest Plan Direction related to management of species diversity and viability which can be applied to Forest Watchlist and Botanical Interest species includes the Forest Goal to "provide habitat for viable populations of all native and desired non-native wildlife, fish and plants" (USDA 2010c). Species viability is a goal of the Aquatic Management Strategy: "Maintain and restore habitat to support viable populations of native and desired non-native plant, invertebrate and vertebrate riparian-dependent species" (USDA 2010c). Concerning fish and wildlife habitat standards and guidelines, Forest Plan Direction includes general direction to "provide habitat for diverse and viable populations of all native and desired non-native wildlife and fish and all native plants" (USDA 2010c).

Forest Watchlist plant species include those which "are locally rare (as opposed to declining throughout their range), are of public concern, occur as disjunct populations, are newly described taxa, or [lack] sufficient information on population size, threats, trend, or distribution. Such species make an important contribution to forest biodiversity and should be maintained under provisions of NFMA, and addressed as appropriate through the NEPA process. … Regardless of inclusion on any list, concerns related to NFMA diversity and viability requirements for any species or its habitat can be raised as a NEPA issue, and should be tracked through the planning process" (Regional Forester letter to Forest Supervisors, June 10,1998). The Forest Watchlist was reviewed and updated in 2013 concurrent with the Sensitive Plant list revision.

Botanical interest species are those which are protected or enhanced, on a case-by-case basis, for the purpose of conserving botanical richness or diversity within the National Forest. These are typically species which are uncommon in the Forest but not necessarily uncommon at a regional or global scale. They are sometimes species at the extent of their geographic ranges, disjunct from areas where they're common, or are limited by habitats which are uncommon in the Forest but more numerous elsewhere. Management of these species falls under the diversity clause of NFMA [16 U.S.C. 1604(g)(3)(B)] and is in line with Regional direction (USDA 1998). A list of botanical interest species was compiled in conjunction with the 2013 Regional Sensitive Plant List revision to gain consistency across the Forest. This list is meant to be fluid or dynamic, with species being designated when a need to conserve occurrences is recognized based on the type of project or the particular life history of the particular species.

The Pacific Madrone Special Interest Area occurs within the Rim Fire Recovery project. There is suitable habitat for 18 Forest Watchlist species and known occurrences of eight of these species within the project area. There is suitable habitat for 15 Botanical Interest species and known occurrences of seven of these species within the project area.

DESCRIPTION OF PROPOSED PROJECT.

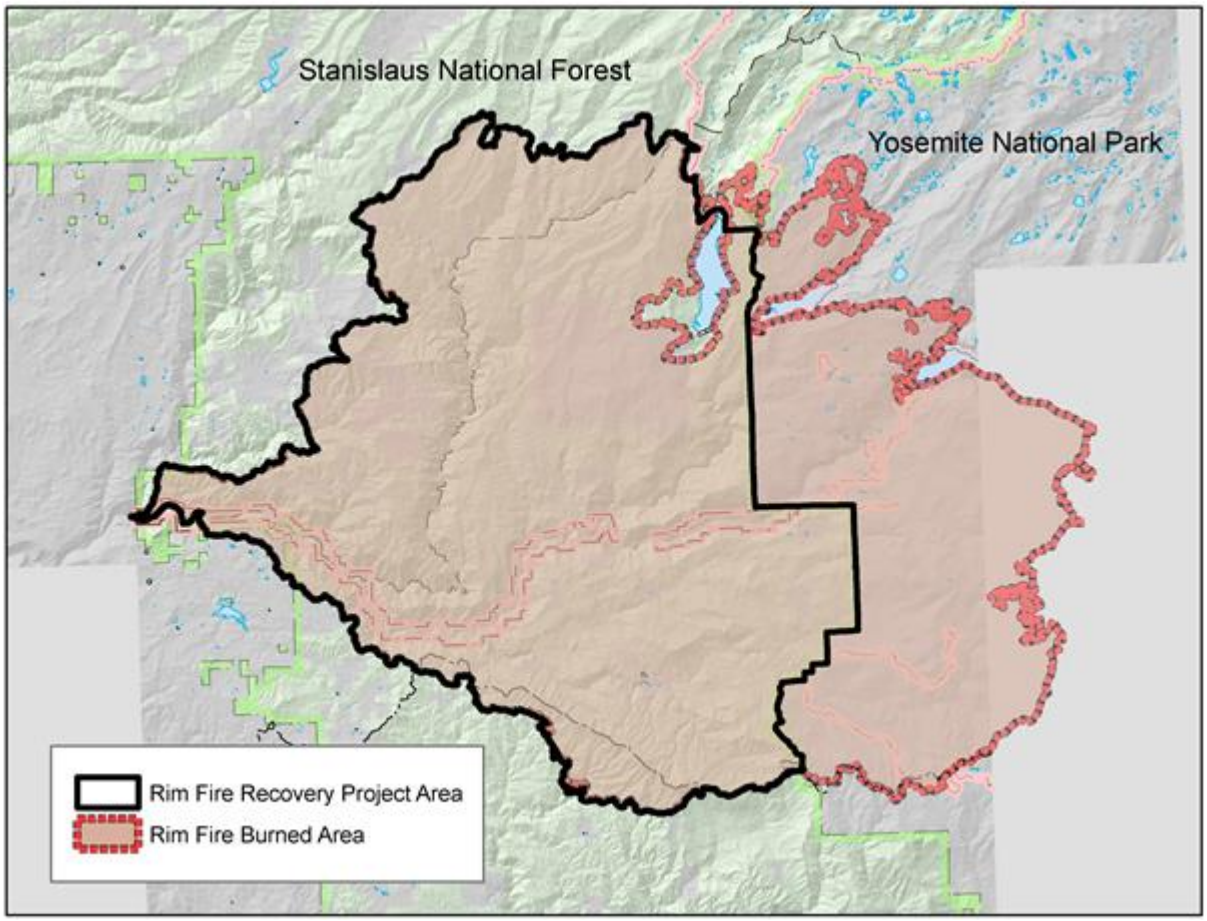
Project Location.

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.

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

The project area is approximately 154,530 acres. The analysis area, for the effects analysis of Forest Watchlist and Botanical Interest plant species is defined for this project as the area within the project boundary (Figure 1).

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 Impact Statement 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.

Protection Measures for the Pacific Madrone Special Interest Area.

There are no specific management requirements in the Rim Fire Recovery project to protect the SIA. Forest Plan Direction allows management activities which are compatible "provided the unique features of [the SIA] are protected" (USDA 2010c). The unique features of the Pacific Madrone SIA are the madrone trees, seedlings and saplings. In timber harvest, Forest Plan Direction is to use "special cutting methods" to "salvage mortality or improve the quality of resources other than the timber resource" (USDA 2010c).

Protection Measures for Forest Watchlist and Botanical Interest Species.

Management Requirements Specific to Alternative 1.

There are no management requirements for Alternative 1 which would avoid adverse effects to the Forest Watchlist or Botanical Interest Species.

Management Requirements Specific to Alternatives 3 and 4.

The Decision Maker elected to have the following as the only management requirement for Forest Watchlist and Botanical Interest Species:

1. Avoid adverse effects to Pacific Madrone (*Arbutus menziesi*i), Tanoak (*Notholithocarpus densiflorus*), California nutmeg (*Torreya californica*) and Sierra sweet bay (*Myrica hartwegii*) trees and saplings during all project activities. During road reconstruction activities, avoid these species unless the trees or saplings create a safety hazard or interfere with the integrity of the road surface. Prune limbs to obtain sight distance rather than masticate the trees or saplings.

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 of the Sensitive Plant Biological Evaluation 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 2013).

Over 154,000 acres of National Forest System land was affected by the Rim fire and related soil disturbing activities (USDA 2013). 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 2013).

The geology of the project area, as it relates to rare plant habitat, 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 and surrounding slopes (USDA 1981). 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. This variety of soils and parent material allows for a variety of plant communities and therefore, a variety of rare plants, many of which have affinities for very specific types of soils or parent material.

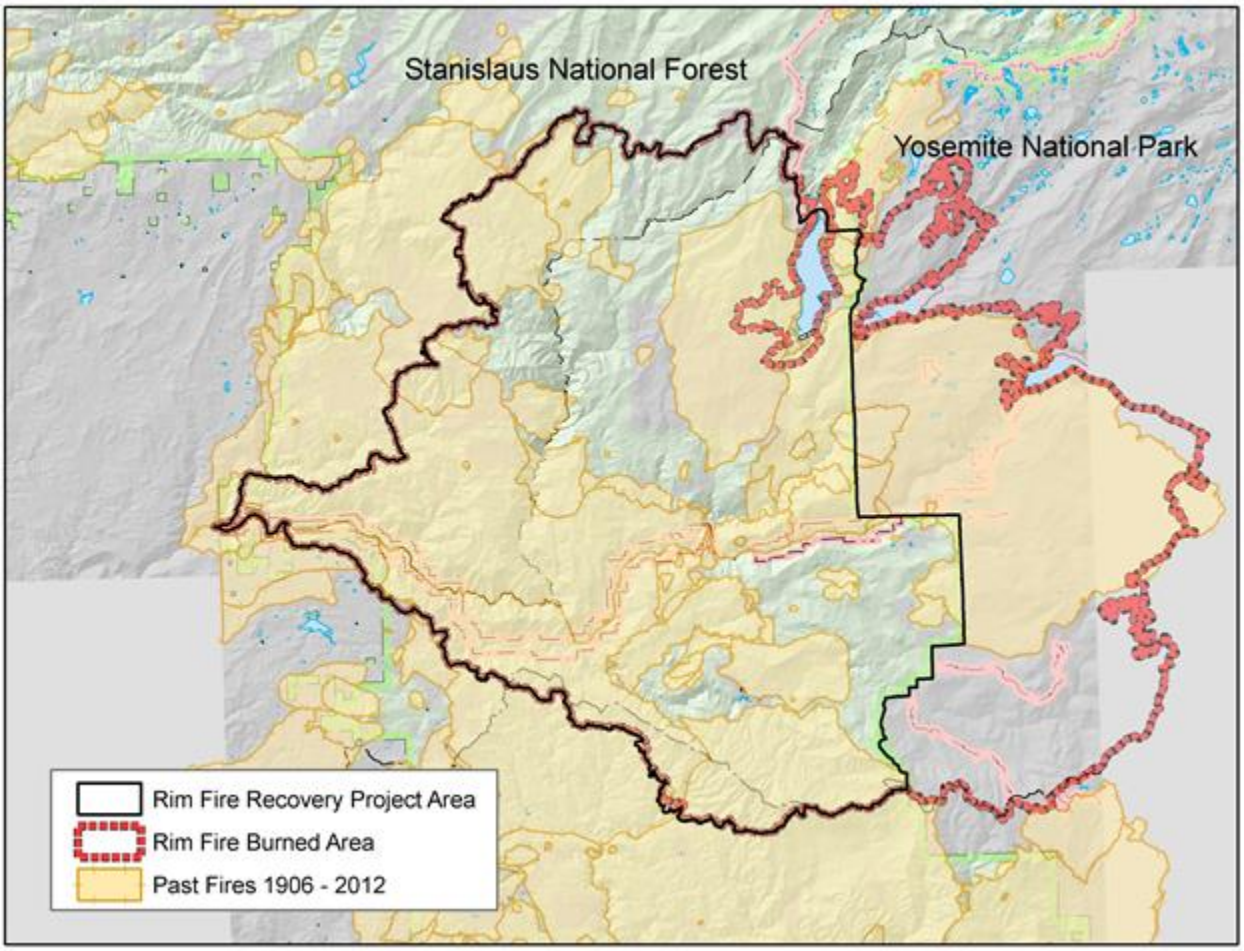
Existing Condition.

There were many high functioning plant communities in the project area before the Rim Fire. Among these were stands of blue oak woodland, mixed conifer stands which hadn't burned in wildfires in more than 100 years, and provided excellent habitat for occurrences of *Trillium angustipetalum*. Many of these high functioning ecosystems burned with a moderate to high intensity in the Rim Fire where the conifer overstory was completely killed.

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 which were either partially or completely contained within the Rim Fire boundary and dating back as far as 1908 (USDA 2010a). 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. Some of the past fire areas overlapped with other fire areas, burning some areas three, four or even five times within the 100 years prior to Rim. There were other drivers of the pre-Rim Fire mix of plant communities including past logging, reforestation activities, cattle grazing, and effective fire suppression and prevention in the stands which hadn't burned in more than 100 years.

Many of the Westside Ponderosa Pine Forest areas were conifer plantations 10 to 40 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 the1973 Granite Fire, the 1987 Stanislaus Complex fires and the 1996 Ackerson Complex or Rogge Complex fires. The Wrights Creek plantations dated from the 1950s and the Sawmill plantations dated from 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*) instead of ponderosa pine. 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 1 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 2013).

Table 1. 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
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.

Species Account.

This section provides descriptions of the Forest Watchlist and Botanical Interest species which occur or might occur in this project. Additionally, the suitable habitat is described for these species. Suitable habitat for any species can be defined as the surroundings, substrate and environmental factors which allow that species to successfully grow and reproduce. Table 2 lists the State and Federal statuses, global and State rarity rankings, and the California Rare Plant Ranks.

Surveys are not routinely conducted for Forest Watchlist or Botanical Interest plant species. There is no Federal law or Forest Service policy which requires surveys of these species.

Typically, if they are observed while surveys for Sensitive Plants are conducted, they are noted in survey records and sometimes documented in species occurrence forms and GPS points. Surveys are conducted for the undescribed species *Eryngium* sp. nov. which is expected to be placed on the Regional Forester's Sensitive list once described due to its rarity and susceptibility to impacts. The following Forest Watchlist plant species are known to occur in the Rim Recovery project area: *Arbutus menziesii, Carex tompkinsii, Drosera rotundifolia, Dryopteris filix-mas, Perideridia bacigalupii, Rhynchospora capitellata* and *Eryngium* sp. nov. There is suitable habitat for the following additional Forest Watchlist species: *Agrostis humilis, Anomobryum julaceum, Bolandra californica, Botrychium simplex* var. *simplex, Carex davyi, Epilobium howellii, Lilium humboldtii* ssp. *humboldtii, Meesia triquetra, Taxus brevifolia, Tritomaria exsectiformis* and *Viola nephrophylla.*

The following Botanical Interest species are known to occur within the Rim Fire Recovery project area: *Alectoria sarmentosa, Brasenia schreberi, Clarkia virgata, Didymodon norrisii, Myrica hartwegii, Notholithocarpus densiflorus* var. *echinoides, Quercus garryana* var. *semota, Rhynchospora alba, Torreya californica* and *Trillium angustipetalum.* There is an occurrence of *Wyethia elata* within one mile of the project area and suitable habitat within the project area. There is suitable habitat for the additional following Botanical Interest species within the project area: *Delphinium hansenii* ssp. *ewanianum, Potamogeton epihydrus, Potamogeton robbinsii* and *Schoenoplectus subterminalis.*

Table 2: Status of the Forest Watchlist plants which occur or may occur in this project.

Forest Watchlist Species	**Federal Status**	**State Status**	**Global/State Rankings[1]**	**CRPR List[2] with Threat Code Ext.[3]**
Agrostis humilis	none	none	G4Q/S2	2B.3
Anomobryum julaceum	none	none	G4G5/S2	4.2
Arbutus menziesii	none	none		Not tracked
Bolandra californica	none	none	G3/S3.3	4.3
Botrychium simplex var. *simplex*	none	none		Not tracked
Carex davyi	none	none	G2/S2	1B.3
Carex tompkinsii	none	Rare	G3/S3.3	4.3
Drosera rotundifolia	none	none		Not tracked
Dryopteris filix-mas	none	none	G5/S2	2B.3
Epilobium howellii	none	none	G4/S4	4.3
Eryngium sp. nov.	none	none	none	none
Lilium humboldtii ssp. *humboldtii*	none	none	G4T3/S3.2	4.2
Meesia triquetra	none	none	G5/S4	4.2
Perideridia bacigalupii	none	none	G3/S3	4.2
Rhynchospora capitellata	none	none	G5/S1	2B.2
Taxus brevifolia	none	none		Not tracked
Tritomaria exsectiformis	none	none		Not tracked
Viola nephrophylla	none	none		Not tracked

Botanical Interest Species	Federal Status	State Status	Global/State Rankings[1]	CRPR List[2] with Threat Code Ext.[3]
Alectoria sarmentosa	none	none		Not tracked
Brasenia schreberi	none	none	G5/S2	2B.3
Clarkia virgata	none	none	G3/S3.3	4.3
Delphinium hansenii ssp. *ewanianum*	none	none	G4T3/S3.2	4.2
Didymodon norrisii	none	none	G3G4/S3S4[4]	2B.2
Myrica hartwegii	none	none	G3G4/S3S4	4.3
Notholithocarpus densiflorus var. *echinoides*	none	none		Not tracked
Potamogeton epihydrus	none	none	G5/S2S3	2B.2
Potamogeton robbinsii	none	none	G5/S3	2B.3
Quercus garryana var. semota	none	none		Not tracked
Rhynchospora alba	none	none	G5/S2	2B.2
Schoenoplectus subterminalis	none	none	G4G5/S3	2B.3
Torreya californica	none	none		Not tracked
Trillium angustipetalum	none	none		Not tracked
Wyethia elata	none	none	G3/S3.3	4.3

[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 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]Global and State Ranking obtained from CNPS on-Line Rare and Endangered Plant Inventory (2014).

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 3 shows the habitat characteristics or affinities of the Forest Watchlist plant species considered in the Rim Recovery project. Table 4 shows the habitat affinities of the Botanical Interest plant species. 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 3. Habitat Affinities for Rim Fire Recovery Forest Watchlist Plants.

	Soils, Geology			Canopy Closure			Elevation			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**
Agrostis humilis		•	•	•	•			•	•				•	•		
Anomobryum julaceum		•	•	•	•		•	•	•			•				
Arbutus menziesii		•	•	•	•		•	•		•					•	
Bolandra californica		•	•	•	•	•	•	•	•			•			•	
Botrychium simplex var. simplex	•	•	•	•	•	•		•	•				•		•	•
Carex davyi		•		•				•	•				•			
Carex tompkinsii		•	•	•	•		•	•		•						
Drosera rotundifolia		•		•			•	•	•				•			•
Dryopteris filix-mas	•	•	•	•	•	•		•	•		•	•				
Epilobium howellii	•	•	•		•	•			•				•		•	•
Eryngium sp. nov.		•		•	•			•						•		
Lilium humboldtii ssp. humboldtii		•	•	•	•		•	•								
Meesia triquetra	•	•		•	•			•	•				•			•
Perideridia bacigalupii			•	•	•		•				•					
Rhynchospora capitellata		•	•	•	•		•	•	•				•			•
Taxus brevifolia		•	•		•	•	•	•		•						
Tritomaria exsectiformis		•	•		•	•	•	•	•				•			•
Viola nephrophylla		•		•	•		•	•	•				•	•	•	•

Table 4. Habitat Affinities for Rim Recovery Forest Botanical Interest Species.

	Soils, Geology			Canopy Closure			Elevation			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**
Alectoria sarmentosa	•	•	•		•	•	•	•	•	•						
Brasenia schreberi		•		•			•	•	•					•	•	

	Soils, Geology			Canopy Closure			Elevation			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**
Clarkia virgata		•	•	•	•		•									
Delphinium hansenii ssp. *ewanianum*			•	•	•		•									
Didymodon norrisii	•	•	•	•			•	•	•		•	•				
Myrica hartwegii		•	•	•	•		•	•							•	
Notholithocarpus densiflorus var. *echinoides*			•	•	•		•	•	•							
Potamogeton epihydrus		•	•	•			•	•	•					•	•	
Potamogeton robbinsii		•	•	•				•	•					•		
Quercus garryana var. semota	•		•	•	•		•	•								
Rhynchospora alba		•	•	•	•		•	•	•				•			•
Schoenoplectus subterminalis		•	•	•	•			•	•					•	•	
Torreya californica		•	•	•	•	•	•	•	•	•						
Trillium angustipetalum	•	•	•			•	•	•	•	•						
Wyethia elata		•	•	•	•		•	•								

Pacific Madrone Special Interest Area

The Pacific Madrone Special Interest Area (SIA) consists of two small groves of madrones covering approximately 15 acres. It is located along Road 1S13C in Packard Canyon. Roadside hazard trees are proposed to be removed along Road 1S13C. The management emphasis of this SIA is to protect and manage the unique botanical features for which it was designated, namely the madrone groves. This SIA contains the southern-most groves of *Arbutus menziesii* in the Sierra Nevada. Resource activities, such as roadside hazard tree removal, is allowed within the SIA provided that the integrity of the SIA is protected (USDA 2010c). The discovery in recent years of young trees and saplings of madrones outside of the SIA indicates that the SIA madrones have been successfully reproducing and expanding their distribution in the vicinity.

The Pacific Madrone SIA occurs within an area which had not burned for more than 100 years. Timber harvest had occurred in the SIA in the past but no management activities had taken place there in recent years. The understory had become overgrown with regeneration conifers. The habitat tends to be comparatively cool and damp owing to the northeast aspect and position in the bottom of a perennial stream drainage. Madrone trees in the SIA survived the Rim Fire, likely due to the microclimate of the site. It is possible that the fire burned through this area at night when the fire activity was lower.

Forest Watchlist Plant Species

The following plant profiles are for species which might be impacted by project activities.

Eryngium sp. nov.

Eryngium sp. nov. (un-named button celery) is a perennial herb in the carrot family, Apiaceae. It reproduces by seed. *Eryngium* sp. nov. begins growing in late winter or early spring. It has two types of leaves: hollow floating leaves and late season, typical leaves. The floating leaves appear first while the meadow is under water. They are able to photosynthesize, even while submerged near the water surface. The later leaves follow after the pond water has evaporated. The flowers and seed are produced in late summer through early fall.

Eryngium sp. nov. is a newly discovered plant species not yet described and published. It was discovered in 1996 by the Forest Service and verified by Lincoln Constance, Professor Emeritus, (deceased) as a new taxon (letters and personal communications, 1996 and 1997). Michael Park, Research Associate with U.C. Berkeley, conducted genetic testing of this taxon and verified that it is unique from other known species of *Eryngium* (pers. comm., with J. Haas 2011). *Eryngium* sp. nov. is on the Forest watchlist rather than the Sensitive Plant list because it is a new species which has not yet been officially described and published. The type locality (the occurrence from which the species is originally described) for this species is Abernathy Meadow.

As with other species of *Eryngium*, *Eryngium* sp. nov. lives in vernal pool habitats. Vernal pools are unusual above the low elevation valley and foothill areas. A vernally wet meadow, such as Abernathy Meadow, can mimic the characteristics of a vernal pool (ponding water in the winter, drying in summer). The habitat of this species completely dries by mid-summer and is sometimes not recognizable as a meadow or pond. The currently known elevation range for *Eryngium* sp. nov. is about 3,800 to 4,900 feet.

There are only five confirmed occurrences of this species, raising the concern about its viability. All but one of the occurrences are within the Rim Fire area. One of the occurrences is on private property. The location of a second reported occurrence is unconfirmed but is believed to also be on private property. The remaining are on NFS lands. It is unlikely that more occurrences would be found because the very specific type of growing conditions is uncommon within the range of the species. The range of the species is north of Highway 120, south of the Tuolumne River, west of Cherry Lake Road and east of the Yosemite National Park boundary. One of the five known occurrences grows in an artificial pond near the Groveland Ranger District office. This occurrence is believed to have been transported there decades ago by activities related to the Hetch Hetchy railroad. It is a very small occurrence with few plants. No occurrences have been found within Yosemite.

The *Eryngium* sp. nov. in this project occurs in vernally wet meadows in two different units, one is at Abernathy Meadow, the other is near Bear Mountain. These are spring and run-off fed meadows which fill with water during the winter, forming ponds. Through the spring and summer, the water evaporates or drains away. The soil surface becomes quite dry and hard by the end of summer. The habitat near Bear Mountain barely resembles meadow habitat by mid-

summer. It is very dry and appears to be scruffy openings in the forest. Before the Rim Fire, the plant community surrounding the *Eryngium* sp. nov. meadows was West Side Ponderosa Pine Forest (Holland, 1986). The dominant tree species surrounding the meadows were ponderosa pine, incense cedar and black oak. Plants in the meadows are mostly herbaceous and include grasses and sedges.

Anomobryum julaceum

Anomobryum julaceum (slender silver moss, syn. *Anomobryum filiforme*) is a moss which grows on "acidic seepy or damp soil, soil over rock, ledges" (FNANM 2014). It can also be found in cliff crevices and in late snow melt sites (USDA 2010b, USDA 2012). This species has not yet been collected within the Stanislaus National Forest. The nearest known occurrences are in Yosemite National Park. One is at Rancheria Flat, just outside the boundary of the Forest. Within California, there are 19 specimen records of *Anomobryum julaceum*, including the two in Yosemite. Across the USA, outside of California there are 37 specimen records in nine states. There is suitable habitat along Lumsden Road which closely resembles the habitat at Rancheria Flat. This habitat has not been surveyed for rare mosses. There are likely other roadside areas with suitable habitat in the Rim Fire Recovery project.

Arbutus menziesii

Arbutus menziesii (Pacific madrone) is an evergreen, broadleaved tree which grows in seemingly common habitats: conifer and oak forests (Jepson Flora Project 2014). *Arbutus menziesii* is identified as a member of montane hardwood forests in Lower Westside Hardwood Ecosystems (USDA 2010c). In the Stanislaus National Forest, *Arbutus menziesii* is quite uncommon. The southern-most grove in the Sierra Nevada occurs in the Rim Fire burned area and is contained within the Pacific Madrone Special Interest Area (SIA). The habitat of *Arbutus menziesii* in Tuolumne County tends to be north-facing aspects, where the air is cooler and moisture stays in the soil longer than other aspects. The discovery in recent years of young trees and saplings of madrones outside of the SIA indicates that the SIA madrones have been successfully reproducing and expanding their distribution in the vicinity. Madrone trees outside the SIA have been reported to have sustained canopy mortality in the Rim Fire. *Arbutus menziesii* is known to resprout from the root crown after fire so it is likely that many of these trees with canopy mortality survived the fire (Chappell and Giglio 1999).

Bolandra californica

Bolandra californica (Sierra bolandra) is a perennial herb which inhabits seasonally moist soils along streams, in rock crevices or slabs and seepy areas. This species blooms late for a member of this family – July through August. It is endemic to the Central Sierra Nevada ranging from Eldorado County to Madera County. It is encountered infrequently within this range (Taylor 2010). There are 12 documented occurrences within the Stanislaus National Forest. One of these is within the burned area, documented along Cherry Lake Road in 1951 (CCH 2014). The

status of this and other occurrences in the Forest has not been verified in recent years. However, private photographs of other species in the suitable habitat area from 2012 revealed possible *Bolandra californica* plants still occurring there. Private photos of plants from Lumsden Road also show plants which could be *Bolandra californica.*

<u>*Botrychium* species life cycle and habitat attributes</u>.

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 spent 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 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. Sometimes locally rare *Botrychium* species are found in contact zones between volcanic andesitic tuff breccia lahar (also known locally as "lava caps") and granitic outcrops. This type of contact zone is the point at which spring water surfaces in a stringer meadow, carrying with it the unique minerals of the volcanic substrate.

According to Farrar, leaf litter of cedar trees can provide the mineral needs of Botrychiums (2011):

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 2011).

Botrychium simplex var. *simplex*

Botrychium simplex var. *simplex* (least moonwort) is a perennial herb which occurs among saturated mosses or sedge mats around hard water seeps or streams (Farrar 2012). Only 9 occurrences of this species have been found in the Stanislaus National Forest, all in the Calaveras Ranger District, well outside the burned area. A closely related variety, *Botrychium simplex* var. *compositum* is known from one location inside the burned area. *Botrychium simplex* var. *simplex* in California is represented by only two specimen collections, one in Modoc County, the other in Siskiyou County (CCH 2014). The species has been reported from six other National Forests. Hard water seeps and springs are common within the burned area at granitic and volcanic bedrock contact zones. These areas are not always readily identifiable as special aquatic features, especially in dry years when they may look merely like non-descript grassy areas.

Carex tompkinsii

Carex tompkinsii (Tompkins' sedge) is a sedge once thought to be quite rare and located primarily in the vicinity of El Portal. It is a California listed Rare plant due to the past understanding of its rarity and distribution. Over the past 25 years, surveys for it in Yosemite National Park, Sierra National Forest, Sequoia National Forest and Stanislaus National Forest revealed numerous occurrences with a much wider distribution. The current range extends from the west-facing slopes above Cherry Creek south of Cherry Lake, south through Yosemite National Park and Sierra National Forest into the Sequoia National Forest and Kings Canyon National Park. An occurrence was collected in Calaveras County in 2012 near West Point [Helmkamp, #19108], and another in Nevada County [Matson, #1225], providing substantial range extensions, if these collections are accurately identified (CCH 2014). It was removed from the Sensitive list in the 1998 list revision and placed on the Forest Watchlist. It has not been removed from the California Rare list, although it has a California Rare Plant Rank (CRPR) of 4, "Plants of Limited Distribution - A Watch list" (CNDDB 2014b). Two occurrences were documented in the Rim Fire burned area after the 1996 Ackerson Complex Fires. The occurrences were flagged and avoided with salvage and reforestation activities following the Ackerson Complex. A third occurrence was documented west of Highway 108 near Long Barn, well outside the Rim Fire burned area in the Mi-Wok Ranger District. Surveys have not been conducted for this species in recent years. There are likely more occurrences in the National Forest which have not been documented.

Dryopteris filix-mas

Dryopteris filix-mas (male fern) is a perennial fern in the wood fern family, Dryopteridaceae. In California it is reported from granitic cliffs and boulders in pine forests (CCH 2014, USDA 2011). In northeastern North America, it occurs in "dense woods and talus slopes on limestone"

and in "open woods among boulders and talus of granite or igneous rock" in the Rocky Mountains (FNA 2014). The elevation range is below 10,000 feet.

There are two currently known occurrences of *Dryopteris filix-mas* within the Stanislaus National Forest. Both occur within Rim Fire Recovery roadside hazard tree units. Surveys for this species were initiated in 2013 after it was learned that the Forest was within the range of the species. One of the two occurrences in the Stanislaus is made up of ten colonies distributed along a ridge over 3.25 miles. The other occurrence is isolated less than one mile away from the first. In California, this species is represented by only six other occurrences. Four are in the White Mountains, one is in the Eldorado National Forest, and one is an historic occurrence in the San Bernardino Mountains which has not been documented in recent times (USDA 2011). The species has a wide range outside of California.

Lilium humboldtii ssp. *humboldtii*

Lilium humboldtii ssp. *humboldtii* (Humboldt lily) is a perennial herb which grows in openings in chaparral and conifer forests below 4,200 feet elevation. It closely resembles the more common leopard lily (*Lilium pardalinum*) which grows in wet meadows and streamsides. It is uncommon within its range, numbering fewer than 50 documented occurrences from Lassen County south to Mariposa County (USDA 2012). Only one occurrence has been discovered within the Stanislaus National Forest, in the Calaveras Ranger District. None have been found within the burned area, however, surveys have not been conducted for it. Because it resembles *Lilium pardalinum*, the leopard lily, it might be easily overlooked even though the habitat is different.

Perideridia bacigalupii

Perideridia bacigalupii (Bacigalupi's yampah) is a perennial herb which grows on open rocky ridges in metasedimentary habitats. It was considered for inclusion as a Sensitive Plant at the start of the Sensitive Plant program in the 1980s but was rejected on the advice of a local botanist who felt that the population was secure at that time. Monitoring in recent years has revealed that some of the occurrences have become reduced in numbers or are apparently no longer extant (no longer present). *Perideridia bacigalupii* has a fairly wide distribution in the central Sierra Nevada ranging from Butte County south to Fresno County. There are 45 known occurrences, made up of 110 colonies, within the boundaries of the Stanislaus National Forest, including eight known sites on private property. Nearly half of the known colonies occur within the Rim Fire burned area.

Taxus brevifolia

Taxus brevifolia (Pacific yew) is an evergreen conifer which grows on shaded, north-facing slopes. The Stanislaus National Forest occurs at the southern extent of this species' range in the Sierra Nevada. An historic occurrence was documented in the Merced Canyon on the western

edge of Yosemite National Park (Brandegee 1891, CCH 2014). It has not been relocated in recent attempts. There is one confirmed grove approximately one mile west of the burned area within the Mi-Wok Ranger District. This grove is currently the only known location of this species in the Forest and the southern-most verifiable living grove in the Sierra. *Taxus brevifolia* occurs in Calaveras Big Trees State Park. There is suitable habitat within the burned area which has not been surveyed.

Botanical Interest Plant Species

The following plant profiles are for species which might be impacted by project activities.

Alectoria sarmentosa

Alectoria sarmentosa (witch's hair) is an arboreal lichen, hanging from conifer limbs where the habitat maintains higher than usual humidity for the central Sierras. It is known to occur in the "Carlon Refugia," an area along the South Fork Tuolumne River in Yosemite National Park and the Forest, where the unusual conditions and lack of wildfire in the last 100 years provided habitat for certain rare plants and some botanical oddities not normally seen in the Sierra Nevada. The Rim Fire burned through the Carlon Refugia at varying burn intensities. *Alectoria sarmentosa* normally occurs in northwestern California and northward into Oregon, Washington and Canada. This species also occurs in central and northern Europe and the Patagonia region of South America (CNALH 2014).

Clarkia virgata

Clarkia virgata (Sierra clarkia) is an annual herb in the Evening Primrose family, Onagraceae. It reproduces by seed. Seedlings of *Clarkia virgata* can be found in the fall, after about two or more inches of rain. The appropriate identification period for *Clarkia virgata* 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 virgata* can range in size from several individuals to thousands of individuals. The number of individuals in an occurrence can vary widely from year to year due to weather and site conditions.

Clarkia virgata is usually found on slopes with a south, southwest or southeast aspect. It grows in openings in conifer forests, oak woodland and chaparral. It is sometimes found growing with bear clover (*Chamaebatia foliolosa*). *Clarkia virgata* tends to prefer 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. *Clarkia virgata* does not grow well with weedy annuals like grass 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 virgata* prefers to grow in open sun or lightly filtered sunny conditions. Soil types and depths do not appear to be limiting. The

species is usually observed growing in bare mineral soil or with a very light layer of leaf litter. *Clarkia virgata* occurs between 1,300 and 5,500 feet in elevation.

Clarkia virgata was described in 1895 by E. Greene. The distribution of the species at the time it was described was believed to be Sonoma and Amador Counties. Lewis (1955) examined the Sonoma county voucher and found that sample to be a similar and wide-spread species, *Clarkia rhomboidea*. Lewis described the range of *Clarkia virgata* as being Amador, Calaveras, Eldorado, Madera, Mariposa and Tuolumne Counties. E. Small did cross-pollination studies of several similar species of *Clarkia* and found that some of the plants being called *Clarkia virgata* were in fact a new species, *Clarkia australis* (1971). Small's work led to the assumption that *Clarkia australis* was limited to areas south of the Tuolumne River since the two tested occurrences determined to be *Clarkia australis* occurred south of the Tuolumne River. The assumption was also made that *Clarkia virgata* only occurred north of the main fork Tuolumne River. Questions arose about the taxonomic determination because *Clarkia australis* is absolutely identical in appearance to *Clarkia virgata.* Many new occurrences were found in the assumed range of the new species. The taxonomy of the new 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 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* have been 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, *Clarkia australis* tends to occur at higher elevations and *Clarkia virgata* tends to occur at lower elevations. The actual number of occurrences of *Clarkia virgata* in the Stanislaus National Forest is unknown. However, based on surveys prior to 1999 and the genetic testing which verified the species identities, it's believed that there were at least 200 occurrences of *Clarkia virgata* in the Groveland Ranger District, south of the Tuolumne River. The occurrences have not been monitored since before 1999 and the actual number of occurrences still extant today is unknown. Occurrences which were not genetically confirmed are not protected from project impacts.

There are four genetically verified occurrences of *Clarkia virgata* in the Rim Fire Recovery project area. These occurrences are important as a seed sources for future study of this species and its relationship to other *Clarkia* species, such as *Clarkia australis*.

Delphinium hansenii ssp. *ewanianum*

Delphinium hansenii ssp. *ewanianum* (Ewan's larkspur) is a perennial herb which grows in low elevation grassland and oak woodland habitats. Its range is from El Dorado County to Tulare County. It is infrequently encountered (Taylor 2010). The nearest known occurrence is an undocumented occurrence in the Tuolumne Canyon on Wards Ferry Road, outside the Forest and

burned area. There is suitable habitat along Lumsden Road within the burned area which has not been surveyed for this species. Lumsden Road is identified for road maintenance in Alternative 1 but is not included in Alternatives 3 or 4.

Didymodon norrisii

Didymodon norrisii (Norris' beard moss) is a moss which grows in seasonally damp or wet rocky habitats. There are two documented occurrences within the Forest. One of these is within the Rim Fire burned area. Since being described in 1999, more than 50 occurrences have been found, mostly in California in the Sierra Nevada, but ranging as far north as one occurrence in British Columbia. This species was removed from the Regional Forester's Sensitive list in 2013 due to the expanded range and placed on the Forest Botanical Interest list due to the very small number of occurrences known in the Forest.

Myrica hartwegii

Myrica hartwegii (Sierra sweet bay) is a deciduous shrub which grows in riparian areas along perennial streams. From a distance, it resembles a small willow (*Salix* sp.) shrub. However, its fragrant leaves give away its true identity. It is found primarily in Eldorado, Tuolumne, Mariposa and Madera Counties with one occurrence each reported in Nevada, Yuba and Fresno Counties (CCH 2014, Calflora 2014). It is reported to occur in Oregon (Bornstein 2012), however there are no specimen records in the Consortium of California Herbaria (CCH 2014) to support this report. Calflora and the Flora of North America report that the species as a California endemic (limited to a distribution only in California) (Calflora 2014, FNA 2014). There are specimens which represent 35 locations in California documented in CCH (2014, Jepson Flora Project 2014). There are four additional locations in the Stanislaus National Forest which are not represented in the CCH. Calflora shows 39 occurrences including those in CCH (2014). *Myrica hartwegii* has been documented in eight streams in Tuolumne County, all in the Stanislaus National Forest. These are Bourland Creek, Trout Creek, Bull Meadow Creek, Reed Creek, Clavey River, South Fork Tuolumne River, Middle Fork Tuolumne River and North Fork Tuolumne River. There is an additional historic specimen record (C. M. Belshaw #87, 1935) which lists the location as "Reynolds Creek by Rosasco Cabin." It is possible that this site refers to what is currently known as Reed Creek. The Clavey River, Trout Creek and part of the Bourland Creek populations occur outside the Rim Fire Recovery project area. The remaining populations are inside the project area.

Notholithocarpus densiflorus var. *echinoides*

Notholithocarpus densiflorus var. *echinoides* (tan oak) is a small, uncommon evergreen tree or shrub which grows in mixed-conifer forests. It occurs in scattered populations from the Klamath and Cascade Ranges in Northern California south through the Sierra Nevada. There are specimens in the herbaria representing 74 locations in California (Jepson Flora Project 2014, CCH 2014). None of these include the occurrences in Tuolumne County. Three populations

have been documented in the Stanislaus National Forest. All are within the Rim Fire burned area. One, found in the Mi-Wok Ranger District is outside of any treatment units. A second, very small grove occurs on the edge of Unit H13B. The third occurs in the Groveland Ranger District and is made up of scattered clusters and individual trees along Pilot Ridge and some of the north-facing slopes below the ridge.

Quercus garryana var. *semota*

Quercus garryana var. *semota* is an uncommon variety of Oregon oak which grows as small trees in dry habitats. It is the only form of Oregon oak in the Sierra Nevada. This form rarely grows taller than 16 feet and is sometimes mistaken as black oak (*Quercus kelloggii*) due to the leaf shape. There are eight known groves of this species in the Stanislaus National Forest. Two of these are within the Rim Fire burned area. The range of this variety is the Cascade Range in Northern California south, through the Sierra Nevada and the interior parts of the coast range south to Marin County. In the Sierra Nevada, this species occurs as scattered groves in discontinuous patches in the mid-elevations (Pavlik, Muick, Johnson and Popper 1991). The habitat preferences of this species of oak is similar to those of blue oak (*Quercus douglasii*) and black oak.

Torreya californica

Torreya californica (California nutmeg) is a unique conifer tree in that it reproduces by producing large, plum-sized fleshy drupes (a large seed covered by soft tissue) instead of woody cones. The fruits are produced at the ends of drooping branches, making them difficult to access by wildlife. Its needles are tipped by a sharp prickle, making it memorable to brush against. It grows on north-facing slopes where soil moisture is plentiful, usually in river canyons or deep stream or creek drainages. Occasionally they can be found on ridges at the tops of drainages and at springs. The species is scattered through the Sierra Nevada and Coast Range. The large seed is a high-fat food sought-after by grey squirrels which typically scavenge the majority of fruits which fall to the ground. As a result, recruitment of seedlings can be low. The number of occurrences in the Stanislaus National Forest is not known. It has not been consistently documented or tracked. There are occurrences in the Hunter Creek drainage, the Clavey River canyon, and in the Tuolumne River Canyon, all inside the Rim Fire area.

Trillium angustipetalum

Trillium angustipetalum (narrow-petaled wakerobin or trillium) is a perennial herb in the False-Hellebore Family (Melanthiaceae). It sprouts from a rhizome in the spring. Each plant produces one above-ground stalk. On mature plants, each stalk has a set of three whorled triangular leaves directly under a single flower which sits in the axis of the leaves. The plant dies back in the fall after hard frost and lies dormant in the soil until the following spring. Trilliums reproduce by seed. Their rhizomes do not produce clones or off-sets. When encountered, *Trillium angustipetalum* occurrences typically have fewer than 20 plants.

Trillium angustipetalum grows in shade in dense forested habitats, often in association with fir trees such as Douglas fir or white fir. It is sometimes referred to as an old-growth or old forest associate. Douglas fir is known to be associated with mycorrhizal fungi and might be a fungal partner to the *Trillium* through mycorrhizal fungi nutrient and moisture exchanges. *Trillium angustipetalum* is often found near streams or creeks in deep loamy soil with thick duff. It grows best under deep shade with a full tree canopy. *Trillium angustipetalum* occurs in a twelve county area in California. Its elevation range is from 300 feet to 6,500 feet.

Trilliums are long-lived lily-like plants which are adversely affected by habitat fragmentation and disturbance (Jules, 1998). While not considered rare or particularly uncommon at this point in time, conservation of trilliums in the Rim Fire burned area is a desirable objective to complement the long-term recovery to a forested condition of the area.

The reproductive status of trillium plants is correlated with their age and rhizome size (Hanzawa and Kalisz, 1993). Trilliums can be aged by counting the constrictions in their rhizomes (Hanzawa and Kalisz, 1993; and Jules, 1998). Hanzawa and Kalisz found that the average age of reproductive *Trillium grandiflorum* was 22.8 years while the non-reproductive plants averaged 13.3 years in his study (1993). The minimum age of the reproductive plants in the study population was 17 years. The ages of the *Trillium grandiflorum* in the study population ranged from 1 to 30 years (Hanzawa and Kalisz, 1993). Hanzawa and Kalisz found no seed bank in their study population. In a study of *Trillium erectum*, the average age of reproductive plants was 20.6 years and non-reproductive plants was 14.5 years (Hanzawa and Kalisz, 1993). In his study, Jules (1998) found several *Trillium ovatum* plants which were at least 72 years old. The length of time that trilliums require to reach reproductive maturity is an important issue for consideration in implementing project activities which might cause adverse impacts. Unlike many Sierran plant species, trilliums appear not to bank seed. Successful regeneration from seed appears to be low in at least some species (Hanzawa and Kalisz, 1993). Hypothetically, if a trillium occurrence were to be impacted to the point in which many or most of the individual plants were removed, the occurrence would require a very long time to recover to pre-impact numbers. If the habitat characteristics were no longer favorable to the species, the recovery would be more prolonged or prohibited.

Trillium angustipetalum has a limited range from southern Oregon, western Klamath Ranges, the Sierra Nevada, the south central coast range, and the outer south coast ranges (McNeal and Ness, 2012). Specimen collections from California account for 47 occurrences through the state (Jepson Flora Project 2014, CCH 2014). Two occurrences of *Trillium angustipetalum* are documented within the burned area. There are likely more occurrences, especially in the areas which hadn't burned in the previous 100 years.

Wyethia elata

Wyethia elata (Hall's mule's ears, syn. *Agnorhiza elata*) is a perennial herb in the Sunflower family, Asteraceae. It reproduces by seeds. *Wyethia elata* blooms May through August, depending on the elevation of the occurrence. It is unique in the Groveland Ranger District, in

that it is the only tall mule's ears species to be found here – as tall as three feet. All other species locally are less than about 1-1/2 feet tall. The plant emerges from dormancy in early spring and goes into dormancy in mid- to late summer.

Wyethia elata is found in openings in chaparral, oak woodlands, ponderosa pine and mixed-conifer forests. The sites sometimes have poor or low quality soils. The elevation range for *Wyethia elata* is 1,700 to 4,600 feet.

Wyethia elata has a narrow distribution, ranging from a single occurrence in northern Tulare County in the Sequoia National Forest, to a single occurrence in southern Tuolumne County, in the Stanislaus National Forest, Groveland Ranger District. This Tuolumne County occurrence is the only occurrence in the Stanislaus National Forest known so far, and the only one known north of the Merced River. There are about 55 documented occurrences of *Wyethia elata* throughout its range, based on herbarium specimens (Jepson Flora Project 2014, CCH 2014). The majority of occurrences are in Mariposa and Madera Counties.

The known occurrence of *Wyethia elata* is north of Smith Peak. This site occurs within one mile of the burned area and is located directly under power lines. This occurrence is quite small – roughly three feet by three feet in size and numbered 9 plants in 2007. A brief visit on April 11, 2008 revealed that gopher activity had apparently reduced the occurrence to six plants. In 2013, there were still six plants and the gopher activity had subsided but was still present. This occurrence was flagged and avoided in the China Flat HFRA project. There is suitable habitat within the burned area which has not been surveyed for this species.

EFFECTS OF THE PROPOSED PROJECT.

The following Forest Watchlist species are unlikely to be directly affected by project activities. They grow in habitats which typically do not contain commercial conifers or there are watershed BMPs which would prevent conducting logging activities, mastication or biomass removal there. *Agrostis humilis* and *Rhynchospora capitellata* occupy meadows, seeps and margins of vernal or seasonal pools. *Drosera rotundifolia* grows in fens, floating mats in small lakes and wet meadows with fen characteristics. *Epilobium howellii* and *Viola nephrophylla* inhabit seeps, wet meadows, perennial stream banks and the margins of fens. *Meesia triquetra* grows in fens. *Tritomaria exsectiformis* occurs in meadows, seeps and fens.

The following Botanical Interest species are unlikely to be affected by project activities. They also grow in habitats which are not likely to be impacted by the logging or hazard tree removal activities because the watershed BMPs would prevent widespread impacts in the habitats. *Brasenia schreberi, Potamogeton epihydrus, Potamogeton robbinsii* and *Schoenoplectus subterminalis* occur in vernal pools, ponds, and perennial streams. *Rhynchospora alba* inhabits wet meadows, seeps and fens.

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.

The activities proposed in this project would be implemented over the course of five to ten years. Throughout much of the proposed project, activities would be implemented in two or more entries per unit. For example, in Unit T27A, which has been identified as a SPLAT (Strategically Placed Landscape Area Treatment for fuels reduction), there is an occurrence of *Eryngium sp. nov*. 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 these and skid trails constructed for the current salvage effort would be subsoiled. Two temporary roads which would be opened and improved for the salvage work would be decommissioned. However, these roads are not near the *Eryngium* sp. nov. occurrence. In this unit 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 virgata 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). There are no protective measures in place which would prevent impacts to the genetically confirmed occurrences of *Clarkia virgata*, making it possible for this project to cause the reduction or elimination of these occurrences. The ability, or lack there-of, of the remaining species to bank seed is unknown. The mosses, lichens, fern and moonwort produce spores, not seeds. Spores aren't known for banking in the soil. In the example, above, it is unknown whether or not *Eryngium* sp. nov. banks seed or how many consecutive year impacts might exhaust the seed bank, if such exists.

Ground disturbance to occurrences of Forest Watchlist or Botanical Interest plant species during the growing season would likely 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 species 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 virgata* than disturbance during the growing season since there would be no plants affected. Only the seed and habitat would be affected. Perennial species and the evergreen trees are susceptible to mechanical ground disturbances at all times of the year.

Jackpot and pile burning would likely cause loss of plants and seed regardless of the time of year. In both cases, there would be concentrations of fuel burned. The heat would be concentrated and the length of time that the high heat would be present and concentrated would be long. It is unlikely that any of the Forest Watchlist or Botanical Interest species would survive pile or jackpot burning directly on them.

Alternative 1

There are no management requirements in Alternative 1 to ensure that adverse effects would not impact Forest Watchlist and Botanical Interest species in the project area.

The following Forest Watchlist plants and Botanical Interest plants might be impacted by Alternative 1 activities: *Arbutus menziesii, Bolandra californica, Botrychium simplex var. simplex, Carex davyi, Carex tompkinsii, Dryopteris filix-mas, Eryngium* sp. nov., *Lilium humboldtii ssp. humboldtii, Perideridia bacigalupii, Taxus brevifolia, Alectoria sarmentosa, Clarkia virgata, Delphinium hansenii* ssp. *ewanianum, Didymodon norrisii, Myrica hartwegii, Notholithocarpus densiflorus var. echinoides, Quercus garryana* var. *semota, Torreya californica, Trillium angustipetalum* and *Wyethia elata.* Impacts to plants or entire occurrences could come from the felling of trees, skidding or yarding logs or whole trees, mastication, machine piling and pile burning, jackpot burning, rock quarrying, and providing soil cover in the form of logging slash, straw or wood chips for the purposes of protecting water quality and soil. These activities could damage or kill plants. In some cases, entire occurrences could be eliminated if they are small or the activity occurs throughout the occurrence area.

<u>Direct and Indirect Effects</u>.

Pacific Madrone Special Interest Area

Forest Plan Direction reduces the risk that the integrity of the Pacific Madrone SIA would be damaged by the removal of the roadside hazard trees. Where removal of the hazard trees would jeopardize the integrity of the SIA by damaging or killing madrones, “special cutting methods” for abating the hazards would be implemented, such as falling and leaving the hazard trees (USDA 2010c).

Forest Watchlist Plant Species

Eryngium sp. nov. occurs at two locations on NFS lands within the burned area, one is at Abernathy Meadow, the other is within a unit near Bear Mountain. At Abernathy Meadow, no impacts from the Rim Fire Recovery project are expected to occur. The occurrence near Bear Mountain is composed of two small sites which barely resemble meadows or ponds at the height of summer when they are dry. The Bear Mountain sites would be flagged as meadows or special aquatic features (BMPs, EIS Table 2.03-3) and impacts would be avoided.

Outside the Pacific Madrone SIA, *Arbutus menziesii* would not be protected from impacts by salvage logging. There are no management requirements in Alternative 1 protecting these madrones. As a result, there is a high risk in this alternative, that these trees and saplings could be impacted by the activities along the roadsides and in the salvage units. The fire caused the canopies of the madrones to die. They should resprout from the root crowns. Winter 2013-2014 was exceptionally dry, further stressing the madrones and possibly killing some. They would be sensitive to additional impacts.

Since *Anomobryum julaceum* occurs in shallow soil over bedrock and cliff crevices, the risk of impacting this species with tree falling is very low and impacts from skidding would be extremely low. The greater risk would come from road widening or maintenance activities. Any loss would be impossible to quantify since no occurrences are known at the time of completion of this document. With only 56 documented occurrences in North America, the loss of one or two occurrences within the project might not threaten the viability of the species. Without knowing how many total occurrences there might be in the Stanislaus National Forest, it is difficult to determine what the impact of losing one or two occurrences within the Forest might be in terms of maintaining viable populations within the Forest.

Bolandra californica occurs along Cherry Lake road within the burned area. This road is not part of the Rim Fire Recovery. It is, however part of the Rim Hazard Tree EA project. There would be no direct effects to this occurrence from the Rim Fire Recovery project. There are likely other, undocumented occurrences within the project. The unconfirmed occurrence along Lumsden Road might be impacted by hazard tree removal and road maintenance activities.

Botrychium simplex var. *simplex* is not yet known from the burned area. The habitat in which it can grow is common within the burned area. The most likely places to find this species would be grassy perennial seeps, meadows or the banks of small streams in or near contact zones between granitic and volcanic substrates. While the meadows and streams would be largely protected with soil and water quality BMPs, small grassy seeps are not always easily recognized as special aquatic features and therefore, not always protected under soil or water quality BMPs. It is possible, then, that occurrences of this species could be impacted, possibly to the point of complete loss at the site of impact.

Since *Botrychium simplex* var. *simplex* is dependent on year-round soil water, any interruption in the flow of water through the soil to the occurrence could cause plants or the entire occurrence to be lost. Running off-road “heavy” equipment on slopes immediately above or on the ground

near to the occurrences could cause compaction and interference with shallow aquifers. It is unlikely that deep aquifers could be impacted this way.

The two known *Carex tompkinsii* occurrences in the Rim Fire area were flagged and avoided with salvage and reforestation activities following the 1996 Ackerson Complex. They would not be flagged and avoided during the activities related to the Rim Fire Recovery. Depending on the time of year that impacts took place, occurrences impacted by tree falling and skidding might be impacted to the point that occurrences could be lost. If impacts take place after seed set, then there is a chance that an occurrence would survive as seed, then germinate and grow in the next growing season. If impacts take place before seed set, it is possible that the occurrence could be lost.

Since *Dryopteris filix-mas* typically occurs in small groupings of one to five plants, the risk of eliminating the plants from a site is greater than for most species which tend to have larger occurrence areas. Ground disturbance would damage or kill these perennial plants. Even if every plant in the colonies aren't killed, enough damage could be done to reproductively isolate individuals making it difficult for the species to re-colonizing the habitat area. With no management requirement to protect occurrences of this species, there is no guarantee that the species would not be eliminated from the project area and therefore, the Forest. Extirpation of the species from the Forest could be considered an adverse effect to plant diversity within the Forest.

Because *Lilium humboldtii* ssp. *humboldtii* occurs in dry land habitats among trees and brush, it would be afforded no protections under the Rim Fire Recovery project. Falling trees, skidding, masticating, machine piling and pile burning would likely cause loss of plants. There are currently no known occurrences in the Rim Fire Recovery project area, however there is a large amount of suitable habitat which has not been surveyed for this species.

Perideridia bacigalupii is sometimes found growing along roads, and particularly roads that follow rocky ridge habitats. In the Rim Fire Recovery project, there are 45 colonies which occur within roadside hazard tree removal units. These areas are also proposed to have road maintenance conducted along them. These 45 colonies would likely be impacted by the hazard tree removal and road maintenance activities. Road maintenance activities in the past likely spread the seed, expanding the occurrences artificially (USDA 1980). Road maintenance activities such as grading and curve widening could kill plants growing in the traveled way of the roads. Maintenance activities might also spread seed further along the roads, providing opportunities for more expansion of the occurrences. Hazard tree removal could kill plants as far as 200 feet from the roads on each side of the roads. For colonies which occur completely within the hazard tree units, this could mean complete loss of plants at those sites.

If it occurs within the burned area within a project unit, *Taxus brevifolia* is at risk of being impacted by falling of trees, mastication, biomass, machine piling and pile or jackpot burning. Damage to the trees from these activities could kill the trees or cause disease or insect infestation. The species is reportedly somewhat intolerant of burning, so it is possible that some occurrences, if there before the fire, have been damaged to the point of being lost already. However, there are areas where the conifer canopy was only partly damaged with only some

dead trees needing to be removed from the green islands to protect nearby roads and public access. It is possible that, if it occurs in these areas, the *Taxus brevifolia* trees could have survived the fire and be vulnerable to the direct and indirect effects of conducting project activities there.

Botanical Interest Plant Species

Because *Alectoria sarmentosa* lives among the limbs of conifers, it is subject to any impacts that might affect the tree in a fire or a project such as this. Most likely the heat or flames from the fire killed the lichen where the fire severity consumed or killed the tree canopies in the habitat areas. However, where the fire left some or all of the canopy intact, *Alectoria sarmentosa* also likely survived. Falling dead trees to abate roadside hazard trees among the living trees containing the lichen could knock some of the lichen out of the canopy. The habitat conditions on the ground are not consistent with the biology of the lichen and the organism would perish.

The four genetically confirmed occurrences of *Clarkia virgata* within the burned area would not be protected from impacts by the Rim Fire Recovery project. Three of the four occur within roadside hazard tree removal areas, one is inside and adjacent to a salvage unit. Tree falling and skidding through these occurrences could kill the plants and interrupt seed production. However, in only one of these cases, is the entire mapped occurrence within units. The remaining have portions of the occurrences outside the units. Therefore, only one occurrence is at risk of being completely impacted.

If it occurs along Lumsden Road, *Delphinium hansenii* ssp. *ewanianum* might be impacted by road maintenance activities and roadside hazard tree removal under Alternative 1. It is possible that plants could occur in the travelled way (roadbed), having seeded there from the slope or cut bank above. However, the Lumsden Road roadbed is maintained on a nearly yearly basis which would prevent the species from becoming established in the roadbed. Clean up of slope or cut bank slip outs from the roadbed is part of the routine maintenance and might impact plants. Falling and removing hazard trees might damage or kill *Delphinium* plants, if they occur there. For Lumsden Road, these are impacts which are normal parts of the maintenance activities.

In the Stanislaus National Forest, *Didymodon norrisii* has been found in lava cap habitats. The one currently known occurrence in the project area is on a lava cap adjacent to a unit identified as a timber salvage and biomass unit utilizing ground based equipment. A management requirement is in place restricting equipment and vehicles to roads in lava cap habitats. There are no roads going through this occurrence's habitat so this occurrence should remain unaffected by the project activities. Furthermore, there is an occurrence of *Mimulus filicaulis* nearby in the same habitat. The presence of the *Mimulus* should convey some protection to *Didymodon norrisii* in this site.

There might be other occurrences of *Didymodon norrisii* which have not yet been found. If they occur with Sensitive species, such as *Allium tribracteatum* or *Lomatium stebbinsii*, the occurrences would be protected by the same management requirements as the Sensitive species. In practice, the Stanislaus National Forest typically avoids impacts to lava cap habitats. However, there might be instances in the Rim Fire Recovery where decisions are made to place

landings or other project features on lava caps when Sensitive Plants are not present. In those cases, there is a risk of impacts to *Didymodon norrisii* which might cause the loss of one or more occurrences.

Myrica hartwegii is known to occur on the edges of seven Rim Fire Recovery units and one roadside hazard tree unit. The water quality BMPs exclude mechanical harvesting and mastication within 15 feet of perennial streams and prohibits skidding within 50 feet of the streams. The BMPs do not exclude tree falling and the logs can be "end-lined" out of this exclusion zone. End-lining entails attaching cables to the logs and dragging the logs to the skidder which would be positioned outside the exclusion zone. Additionally, the BMPs allow up to two water crossings within each mile of stream. If *Myrica hartwegii* occurs where any of these activities occur, shrubs might be damaged or killed by the activities. With the exception of units U03 and T04A which contain a substantial portion of one of the two Middle Fork Tuolumne occurrences, most of the seven units intersect small portions of the known populations. Up to 15 percent of the Bourland Creek/Reed Creek population might be impacted. Up to 36 percent of the Bull Meadow Creek population might be impacted. Up to 6 percent of the South Fork Tuolumne River population might be impacted. Up to 71 percent of the Middle Fork Tuolumne River population might be impacted.

The two groves of *Notholithocarpus densiflorus* var. *echinoides* in the Mi-Wok Ranger District are unlikely to be impacted by project activities. One is well away from any proposed unit or activity area. The other is mapped just outside a unit. The population at Pilot Ridge occurs in several roadside and salvage units. If the roadside trees have dead canopies, they would likely be cut down to prevent injury to people or damage to the roads. *Notholithocarpus densiflorus* var. *echinoides* should resprout from the root crown in low to moderate burn severity situations. The resprouts would be at risk of damage or loss from logging activities.

Quercus garryana var. *semota* is currently known from one roadside site along Road 1S08Y within the Rim Fire Recovery project and one roadside site at Rainbow Pool within the Rim Fire Hazard Tree project. It is likely that the canopies of some or all of these trees were killed by the fire and will need to be cut down to provide for public safety and to protect the integrity of the roads from damage by falling trees. Provided that the root crowns survived the effects of the fire, the oaks should resprout. Some of the resprouts might be damaged by falling and removing the dead limbs and trunks. Similar impacts might occur in timber units or mastication areas if the species is present there. The intensity of impacts in treatment units might be greater than in roadside areas because of equipment skidding or tracking.

All of the known occurrences of *Torreya californica* in the burned area intersect either a roadside hazard tree unit or a salvage unit, or is in a Rim Fire Hazard Tree unit. This species has thin bark and the canopy is often lost in fires (USDA 1992). The species resprouts from the root crown following fire (USDA 1992). Trees with dead canopies in Rim Fire Recovery roadside units would be cut down if deemed a hazard to the road or public. As with the oaks and madrone, *Torreya californica* resprouts are susceptible to damage or loss from tree falling and skidding activities.

Trillium angustipetalum produces only one flower per plant per year and reproduces only through seed production. It can take 20 years or more for a young plant to reach reproductive maturity. *Trillium angustipetalum* requires a full or nearly full canopy cover to be sustained in a site. In a study of *Trillium ovatum* habitat fragmentation, researcher Erik Jules (1998) found that not only were 97.6 percent of the trillium lost to clearcutting and reforestation activities in the study area, but that there was also no recruitment of new plants in the 30 years after those activities were conducted. The lack of recruitment was attributed to the increased solar radiation and the increased exposure to drying winds which blow through the open forest edges. The Rim Fire produced large areas of moderate to high burn severity where the tree canopies were completely killed through suitable habitat areas. In these areas, there is little chance that *Trillium angustipetalum* would survive into the future without the tree canopy. However, in the low to very low burn severity areas there is a moderate to high likelihood that *Trillium angustipetalum* survived the fire and would survive into the future if there is little or no disturbance. These areas were not generally targeted for timber salvage activities because of the high survivorship of the conifers, except for roadside hazard tree removal. Falling and skidding hazard trees through *Trillium angustipetalum* occurrences would cause the loss of plants. If the occurrence is small, the entire occurrence might be lost.

If *Wyethia elata* occurs within Rim Fire Recovery units or roadside hazard tree project areas, it would be vulnerable to loss from impacts by tree falling and skidding, mastication, machine or hand piling and pile or jackpot burning. The species grows in openings in forest or chaparral habitats. These areas tend to be selected because of their openness for skidding and landing construction.

There are many areas of the Rim Fire burned area which contain noxious weeds. Additionally, non-native invasive plants, including annual grasses are ubiquitous across the lower elevations of the Forest, and the burned area. The moderate and high burn severity areas of the burned area are especially vulnerable to weed spread as a result of the fire. Some of the low and very low severity areas might also be at increased vulnerability of weed spread. Competition against the Forest Watchlist and Botanical Interest species from these existing occurrences of noxious weeds, non-native invasive plants and non-native annual grass species would increase as a result of the fire. Disturbance from salvage operations and fuel reduction activities would increase the possibility that the weeds would spread even further, even though there are management requirements in place which would prevent project activities from causing the actual spread of weeds by vectoring the weeds to other places. The disturbance prepares the ground for successful recruitment of weed seed vectored by other means, including wildlife.

There are numerous infestations of the noxious weeds yellow star-thistle, tocalote, bull thistle and Klamathweed in the burned area. Medusahead grass and Italian thistle have spread into more open areas in recent years. Barbed goatgrass has been detected more frequently in recent years and appears to be spreading. Spotted knapweed occurs as scattered infestations intermingled with NFS lands and private lands. All of these species respond well to disturbance by growing larger and producing more seed. They are especially competitive and rapidly occupy sites. The potential for this indirect effect of the salvage project is high. The intensity of this effect would depend on the site conditions (e.g., how much disturbance, aspect, availability of moisture), the weed species involved, and the Forest Watchlist or Botanical Interest species

involved. The duration would be long-term and perhaps permanent for some species or locations. New weed treatment projects are not within the foreseeable future.

Cumulative Effects.

Pacific Madrone Special Interest Area

Forest Plan Direction would ensure that Rim Fire Recovery project activities would not degrade the integrity of the Pacific Madrone SIA. There are no other current or foreseeable future projects planned for the SIA location. Therefore, the integrity of the SIA would remain intact.

Forest Watchlist Plant Species

The combined effects of Alternative 1 of the Rim Fire Recovery project might contribute adverse cumulative effects to Forest Watchlist species. There are no management requirements which prevent the loss of occurrences of these species.

The Rim Fire Recovery project is unlikely to contribute cumulative effects to *Eryngium* sp. nov. No direct or indirect effects are expected to occurrences of this species on NFS lands. Therefore, there would be no combined effects with current or foreseeable future projects in the habitat of the *Eryngium*.

Cumulative effects are expected for *Arbutus menziesii*. While the madrones in the Pacific Madrone SIA would be avoided to protect the integrity of the SIA, there are no management requirements in Alternative 1 which protect the madrones outside the SIA. There have been no projects in the vicinity of the SIA for more than ten years. The last large timber sale in the area was related to the 1987 Stanislaus Complex Fire timber salvage. The SIA was outside of the salvage areas. There was a small salvage sale which removed insect-killed timber during the early 1990s. However, the young madrone trees and saplings outside the SIA grew in areas which had been salvage logged. One tree occurred on the edge of a post-'87 plantation. These past projects had no apparent lasting adverse effects on the madrones that grew there after the activities were completed.

The Rim Fire killed the canopies of the madrones outside the SIA. The trees should resprout from the root crowns. However, the winter of 2013-2014 was exceptionally dry. The dry weather likely caused a large degree of stress to the resprouting trees. Conducting the salvage and fuel reduction activities in the habitat where the resprouting madrones might be damaged by tree falling, skidding, or mastication would compound the stress. It is likely that some of the stressed and damaged madrone trees could die. It is impossible to determine how many of the madrones might die under this alternative. The loss of madrone trees outside the SIA does not affect the integrity of the SIA. However, it is a setback for the species which had been expanding from its restricted distribution. This effect is expected to last through the period of time in which management activities cause widespread disturbance in the area, preventing the recruitment of new trees.

Because of the widespread loss of forest canopy in the vicinity of the SIA, the upland habitat will likely convert to a hotter, dryer shrubby habitat. The SIA is located low in a perennial stream drainage which tends to maintain a higher level of humidity than the uplands surrounding the SIA. This habitat characteristic is thought to be an important reason that the madrones have been sustained in this part of the Sierras. Without a conifer and oak canopy in the surrounding areas where the madrone had been expanding, the hotter, dryer habitat might impede easy recruitment of new madrone trees, thereby interfering with the expansion of the species in the area. This effect would last into the future unless the area is reforested. It is unlikely that a forest would return naturally considering the extent of the forest lost in the fire and the apparent shift of the regional climate to warmer and dryer. Therefore, the loss of madrones as the result of damage from the Rim Fire Recovery salvage and fuel reduction activities combined with the effects of the Rim Fire and the possible impacts of climate change could result in the permanent loss of madrone trees outside of the SIA.

It is unknown how many occurrences of *Anomobryum julaceum* might occur within the Stanislaus National Forest or if it is even present. There are many areas of suitable habitat both inside and outside the burned area. Suitable habitat areas in roadside hazard tree removal areas and road widening areas would be at greatest risk of impacts from the Rim Fire Recovery project. The Rim Fire might have caused impacts to occurrences, causing damage or loss to those which burned at moderate to high severity. The Rim Fire Hazard Tree project might cause impacts to occurrences, if they are within that project's units. While it is possible that the combination of impacts from these projects and the Rim Fire itself would contribute to cumulative effects, it is unlikely that these cumulative effects would cause the species to be extirpated from the Forest due to the large amount of suitable habitat across the Forest.

The combination of the activities in the Rim Fire Recovery project with the past and foreseeable future road maintenance activities along Cherry Lake Road and Lumsden Road could contribute to the loss of occurrences of *Bolandra californica*. This is a common risk to plants growing within road corridors. The risk of loss of botanical diversity is weighed against the risk of loss of life, injury or damage to roads or vehicles by not maintaining the roadways. *Bolandra californica* also occurs along small streams and probably occurs scattered through habitat areas in the Tuolumne Canyon, Clavey Canyon and perhaps other waterways within the burned area. Therefore, while the loss of occurrences along accessible roads might prove inconvenient for monitoring or educational purposes, it is unlikely that *Bolandra californica* would be lost completely from the project area as a result of the cumulative effects from the Rim Fire Recovery and other projects. The species should remain secure within the Stanislaus National Forest.

There is a possibility for cumulative effects from the Rim Fire Recovery to occurrences of *Botrychium simplex* var. *simplex*. Like other species of *Botrychium*, *Botrychium simplex* var. *simplex* is dependent on the availability of year-round soil moisture. The elimination of trees from the landscape caused by the Rim Fire might cause additional soil water to be available due to fewer trees respiring on the landscape. This effect could be positive, if the site had been marginally damp before, or it could be an adverse effect if more water than needed becomes available. Furthermore, some species of conifer, notably Douglas fir (*Pseudotsuga menziesii*) and incense cedar (*Calocedrus decurrens*) are known fungal partners for other species which are

dependent on relationships with mycorrhizal fungi. Botrychiums are often associated with incense cedar and in Northern California, Oregon and Washington, with western red cedar (*Thuja plicata*). The Rim Fire might have adversely affected *Botrychium simplex* var. *simplex* where the fire killed incense cedar in the vicinity of the occurrences due to loss of this important fungal partner.

Meadows, streams and grassy seeps are often areas where cattle concentrate. Cattle grazing and trampling in damp soil can cause loss of plants if the cattle linger longer than the plants can tolerate. Sometimes, plants are able to be sustained under the low-hanging branches of nearby trees where the cattle tend to not graze or trample. The result of cattle grazing can be an overall reduction of plants within otherwise suitable habitat areas.

The combination of effects from the activities of the Rim Fire Recovery, the Rim Fire itself and range cattle grazing could prove to cause more stress than an occurrence could tolerate. The loss of occurrences as the result of these combined stressors is difficult to quantify. The 9 known occurrences in the Calaveras Ranger District grow intermingled with Sensitive Botrychium species in the Prather-Medusa Landscape Restoration project where they'll receive some level of protection from project activities. Furthermore, some of these occurrences would be included in project activities designed to protect the rare *Botrychium* species from continued impacts from cattle grazing. Therefore, at least some of these 9 occurrences should be secure within the Forest. Loss of occurrences within the Rim Fire Recovery project would not cause the species to be completely extirpated from the Forest.

The combination of effects from the Rim Fire Recovery with other projects is not expected to cause cumulative adverse effects to *Carex tompkinsii*. The species was protected in previous projects within the Rim Fire area. There are no foreseeable future projects proposed for the known occurrences areas. The one documented occurrence outside the Rim Fire boundary in the Mi-Wok Ranger District grows among brush and trees on a lava cap near occurrences of *Lomatium stebbinsii*. There are likely occurrences both inside and outside the burned area that are yet to be identified and documented. Therefore, *Carex tompkinsii* should be secure within the Stanislaus National Forest.

Dryopteris filix-mas grows in sites where few management activities have taken place in recent years. There are no current projects being implemented at these sites and there are no foreseeable future projects being planned there other than the Rim Fire Recovery. Therefore, there would be no combined effects from the Rim Fire Recovery and any past, present or foreseeable future projects. However, since there are no management requirements to protect *Dryopteris filix-mas,* and both occurrences grow within Rim Fire Recovery roadside hazard tree removal units, there is a risk that the project alone might extirpate the species from the Forest. This could be considered an adverse effect to plant diversity within the Forest.

It is not possible to determine if the Rim Fire Recovery might contribute to cumulative effects for *Lilium humboldtii* ssp. *humboldtii* since there are no known occurrences within the project area. However, surveys have not been conducted for this species and large amounts of suitable habitat exists in the project area. With 50 documented occurrences in California and only one in the National Forest outside the burned area, it is unlikely that the project would destabilize the

viability of the species as a whole. However, it is possible that the project could contribute to the loss of the species locally in the project area and create more isolation of populations of the species, should it be found to occur there.

Implementation of Rim Fire Recovery Alternative 1 might cause cumulative effects to *Perideridia bacigalupii*. Fifty-one of the known colonies are in the burned area. Some of the ridge top colony sites are in fuel breaks which are maintained for use during fires. Other ridges are not maintained as fuelbreaks but are potentially available as fire breaks during wildfires. During the Rim Fire, dozer lines (holding lines built by bull dozers) were constructed along some of those rocky ridges containing *Perideridia bacigalupii*. Nine colonies on National Forest System (NFS) lands and four colonies on private property were impacted by the dozer work. Of these, six colonies on NFS lands also occur within Rim Fire Recovery roadside hazard tree removal and road maintenance areas. One colony impacted by a dozer line is in a Rim Fire Hazard Tree roadside unit and would not be protected from impacts. The three colonies impacted by a dozer line on private property and three on NFS lands along Road 1N02 also would have been impacted in 1987 by dozer line construction during the Stanislaus Complex Fires.

Post Rim Fire monitoring of these colonies is not possible until August, 2014 due to the bloom period for the species. Therefore, it isn't possible to determine if the colonies impacted by the dozer lines are still extant (present and living) or extirpated (damaged to the point that the occurrence is lost at the site). The addition of impacts to the six NFS colonies from the Rim Recovery roadside hazard tree removal could cause the loss of one to four of these colonies. Three of these are quite small, falling completely within the roadside hazard tree units. The fourth is large but is almost completely contained within the roadside hazard tree removal unit.

There are 39 additional colonies of *Perideridia bacigalupii* which occur within Rim Recovery roadside hazard tree units. Seven of these colonies extend at least 50 percent beyond the unit boundaries and are unlikely to be extirpated by the hazard tree removal. Twenty-seven are completely contained within roadside hazard tree unit boundaries and five are more than 70 percent within the unit boundaries. There is high risk that these 27 colonies, and a moderate risk that the five colonies might be impacted to the point that they would be extirpated.

The combined loss of the 32 colonies in roadside hazard tree units only plus the four which were also impacted by dozer lines totals 33 percent of the Forest colonies. In terms of entire occurrences, six of the 45 total Forest occurrences are at risk of complete loss from the Rim Fire Recovery project. This represents a loss of 13 percent of the Forest occurrences. This would be a substantial impact to the population as a whole. However, the Rim Fire Recovery project would not lead to the loss of the species within the project area nor in the National Forest as a whole.

Taxus brevifolia might have survived in some areas where the fire burn severity was not so great that all of the individuals would have been killed, if it occurs within the project area. Project surveys in support of past and foreseeable future projects in the Rim Fire Recovery project have not detected new occurrences so it is unlikely that there would be contributions to cumulative effects from those projects. Not all of the suitable habitat has been surveyed for this species. It

is possible that, if there is *Taxus brevifolia* in the project area, that the combination of the Rim Fire Recovery project with the effects from the Rim Fire could lead to localized cumulative effects. To date, the verified living, southern-most occurrence of *Taxus brevifolia* is secure and does not occur in a current or foreseeable future project. It is therefore unlikely to be lost as a result of management activities into the foreseeable future. So, while the Rim Fire Recovery might cause localized cumulative effects to as-yet un-discovered occurrences within the burned area, the species is, so far, secure in the National Forest.

Botanical Interest Plant Species

The combined effects of Alternative 1 of the Rim Fire Recovery project might contribute adverse cumulative effects to Forest Watchlist species and Botanical Interest species. There are no management requirements which prevent the loss of occurrences of these species.

The Rim Fire Recovery project is unlikely to contribute cumulative effects to *Alectoria sarmentosa*. There are no current or foreseeable future projects within the Carlon Refugia where this species is known to occur. The Rim Fire damaged or destroyed a small portion of the habitat there but the majority of the habitat is intact, having burned at a low burn severity. The Rim Fire Hazard Tree project would conduct hazard tree removal along Evergreen Road which crosses through the refugia and at the Carlon Day Use area which is in the refugia. The fire severity in these areas was also low and few hazard trees would need to be removed. Therefore, the population of *Alectoria sarmentosa* in the National Forest should be secure.

Two of the roadside occurrences of *Clarkia virgata* are large enough that they intersect Rim Fire Hazard Tree roads. Even so, the occurrences are large enough that the combined effects of both the Rim Fire Recovery project and the Rim Fire Hazard Tree project should not cause the loss of the entire occurrences. Large portions of the occurrences might be lost. In past projects intersecting with these occurrences, the entire occurrences or portions with the largest concentrations of plants were flagged and project activities were avoided in the flagged areas. This way, the viability of the sites as collection sites of genetically confirmed plant specimens or seed was maintained for future research. It isn't possible to know if the densest portions of the occurrences would be maintained or not in the Rim Fire Recovery project. Conditions have changed in these occurrences over the years and the dense areas might have shifted from previous locations within the occurrence areas. It is possible that the projects could impact the densest areas and only outlier plants could remain.

The Rim Fire Recovery is unlikely to contribute adverse cumulative effects to *Clarkia virgata* since there are numerous occurrences within its range. It would remain secure within the Forest. The greatest impact would come from possibly impacting one genetically confirmed site to the point that it is lost, thereby reducing the number of available locations to collect seed from the genetically tested occurrences for future study.

The combination of the Rim Fire Recovery with the normal yearly road maintenance activities are not likely to result in cumulative effects to *Delphinium hansenii* ssp. *ewanianum*. A great deal of road maintenance and reconstruction has taken place on Lumsden Road over the past ten years. If *Delphinium hansenii* ssp. *ewanianum* occurs there, it likely would have been affected

by the road maintenance activity in the past. If this species is present in this part of the canyon, it is likely that it occurs on the slopes above and below the road and would therefore be secure in that portion of the canyon and in the Forest.

The Stanislaus National Forest rarely conducts highly impactive management activities in lava cap habitats due to the sensitivity of this habitat. The primary impacts in the habitat come from unsanctioned off-trail OHV riding and fire line construction during wildfires. During the Rim Fire, contingency dozer lines were constructed through lava caps on the perimeter of the burned area and outside the burned area. *Didymodon norrisii* was not documented from those lines. However, surveys for the species had not been conducted there so presence or absence has not been established there. Lava caps are attractive places to drive off-highway vehicles because they tend to be open and many have mild to moderate slopes, providing riders with some of the challenges they seek in that activity. This type of off-road activity is not permitted under Travel Management and is being curtailed with blocking and decommissioning of user-created trails. However, past instances of this activity may have contributed to loss of occurrences from repeated disturbance and habitat modification.

The current known distribution of *Didymodon norrisii* occurrences in the Forest is very restricted, with only two known. These known occurrences are reproductively isolated, having no way to exchange genes unless there are other occurrences in between. Further loss of occurrences would increase the isolation. Isolating populations of organisms can lead to loss of adaptability to habitat changes or environmental changes where, as the habitat changes or, in the case of climate change, the environment becomes dryer or wetter, without the free exchange of genes among populations, the isolated populations might lose members and eventually die off. *Didymodon norrisii* is currently believed to be secure in its range with more than 50 occurrences through the Pacific states. It is unlikely that the Rim Fire Recovery project combined with past and present activities or foreseeable future projects would cause the complete loss of the species in the Forest in the foreseeable future.

The combination of effects from the Rim Fire Recovery project and other current and foreseeable future projects might cause cumulative effects to *Myrica hartwegii* in the Stanislaus National Forest. The Bourland Creek/Reed Creek population intersects the Rim Fire Hazard Tree project at Road 3N01 at the north end of the burned area which is also the site of a Rim Fire suppression dozer line. About 600 feet of the occurrence might be impacted by the Rim Fire Hazard Tree project. This increases the impacts to this population by 2 percent bringing the total impacts to this population to 17 percent. The South Fork Tuolumne River population also intersects with the Rim Fire Hazard Tree project at Evergreen Road where about 550 feet of the population might be impacted by that project. This would account for an additional 3 percent of the population bring the total impacts to 9 percent. While these impacts are substantial, they are not likely to eliminate *Myrica hartwegii* from the project area. The species would still be present within the Forest and is believed to be secure throughout its range.

There are no current or foreseeable future projects in the vicinity of any of the populations of *Notholithocarpus densiflorus* var. *echinoides*. The Rim Fire likely damaged the canopies of a large number of the Pilot Ridge *Notholithocarpus densiflorus* var. *echinoides* trees, stimulating resprouting from the root crown. It might take up to 30 years for the resprouting trees to reach

reproductive maturity. Most of the trees in the Pilot Ridge population grow where one of the 1987 Stanislaus Complex fires burned. That fire would have impacted the seed production of the trees 26 years before the Rim Fire. It is not known if any of the current trees were reproducing prior to the Rim Fire. Impacts from the Rim Fire Recovery project could further delay the recovery of this population by damaging or killing trees in the roadside and salvage units. All but one of the documented trees or tree clusters in this area occur within a Rim Recovery unit and are therefore at risk of delayed recovery or loss. The combination of the Rim Fire Recovery with the effects of the Rim Fire in the Pilot Ride occurrence, could contribute cumulative effects to the population. However, the species would not be lost from the Forest since there are two occurrences in the Mi-wok Ranger District which should not be affected by the Rim Fire Recovery project or other current or foreseeable future projects.

The Rim Fire might have damaged the canopies of existing occurrences of *Quercus garryana* var. *semota*, stimulating resprouting from the root crowns of some or all of the trees in each occurrence. Resprouting oaks are easily overlooked as valuable contributors to ecosystem health since it takes roughly 30 years to produce an acorn crop. Roadside and fuelbreak young oaks and oak resprouts are subjected to thinning for fire safety. Young oaks and resprouts are browsed more heavily by deer and are subject to more intensive grazing pressure by livestock. The grazing and browsing pressure on oak resprouts in the Rim Fire burned area will be great for several years until enough other food becomes available. Combining these effects with the Rim Fire Recovery effects could increase the impacts to *Quercus garryana* var. *semota* in the burned area. It is not likely that any grove would be impacted to the point that it would be completely lost. However, enough damage could be done that it might take decades for a grove to recover in terms of mature tree numbers.

There is a risk of cumulative effects from the Rim Fire Recovery project to occurrences of *Torreya californica*. The Rim Fire likely damaged some of the trees, causing loss of the canopies and possibly killing some of the trees. The exceptionally dry winter might have further stressed the damaged trees causing additional mortality. One occurrence of about ten trees was impacted by dozer line construction during the Rim Fire and about one-third of the occurrence area was inside the burned area. The fire burned at low and very low burn severity through that area. It's unknown how many of the trees might have been affected by the dozer work and fire effects. About two-third of this occurrence is also within a Rim Fire Hazard Tree unit. Up the slope from this occurrence is a cluster of three trees which are completely inside a Rim Fire Recovery roadside hazard tree unit. The combined effect of the fire, the dozer line construction, and the hazard tree removal of both projects could lead to the loss of up to two thirds of this occurrence.

An occurrence of about ten *Torreya californica* trees in a tributary to Hunter Creek occurs completely within a Rim Fire Recovery roadside hazard tree unit for Road 1N27. The fire burned at a high severity through the occurrence area. It is likely that all of the trees' canopies were killed. At least some of the trees should resprout. With the combination of the fire effects, the dry winter and the effects of the hazard tree removal, the mortality of this occurrence is likely to increase.

One tree was documented growing along Road 1N01 just east of the Clavey River. This road is included as a Rim Fire Recovery hazard tree unit. The fire burned at a low severity level, giving some chance that the tree canopy was not killed by the fire. There are few conifers in this area offering a lower risk that the hazard tree abatement would damage or kill the *Torreya californica* tree.

There are a number of *Torreya californica* along Cherry Lake Road on the north-facing slope dropping into Early Intake. This road is a Rim Fire Hazard Tree unit. The fire burn severity through this occurrence varied from very low to moderate with a high survivorship of the known trees, including a large specimen tree which appeared to have not been affected by the fire. With good survivorship, these trees should sustain few impacts from the hazard tree abatement, providing that the hazard trees are not felled into them. The ground is too steep for typical skidders or forwarders.

There are several *Torreya californica* trees at the Adit 56 Spring adjacent to Road 1S23. This area is within the Rim Fire Hazard Tree project, which includes both roadside and powerline hazard tree removal. The fire burned at high severity through this area, probably killing the canopies of the *Torreya californica* trees. Because of the spring, it is possible that at least some of the trees survived and will resprout. The canopies would likely be cut down, exposing the resprouts to impacts and possibly being lost as a result.

There are *Torreya californica* trees along Lumsden Road which is a Rim Fire Recovery project roadside hazard tree unit. Most of the roadside area burned at a moderate to high severity. As with the Adit 56 Spring trees, the resprouting trees along Lumsden Road would be at risk of loss from damage by hazard tree abatement. The ground is too steep for typical skidders or forwarders so the risk would be from falling the surrounding dead trees.

The north-facing slopes of the Tuolumne River Canyon contain a great deal of suitable habitat for *Torreya californica.* There are likely some unknown number of trees scattered through the habitat areas of these slopes. Except for the slopes south of Early Intake, the burn severity for the habitat was high throughout the habitat area. The trees which lost their canopies but resprout from the root crowns will not reach reproductive maturity for two to three decades. During this time, there would be recruitment of *Torreya californica* only where trees did not lose their canopies. Even so, the species should continue to grow in the areas away from the roadside hazard tree removal areas, reducing the risk that the Rim Fire Recovery project would eliminate the species from the Forest.

While *Trillium angustipetalum* is not considered rare or uncommon, the overall trend of the species appears to be one of reduction in numbers through impacts, habitat fragmentation and lack of recruitment. *Trillium angustipetalum* is not at risk of being lost from the Stanislaus National Forest in the foreseeable future. However, due to the plant's preference for old-growth habitat characteristics, it cannot be said that the species is secure in the Forest through the long-term due to the Forest-wide emphasis on reducing the risk of future losses to wildfires by thinning, underburning and opening conifer stands. PACs set aside for spotted owls and goshawks would be excellent reserves for *Trillium angustipetalum* if they occur in those areas. However, this is not always the case. The Rim Fire likely caused the loss of some unknown

number of occurrences of *Trillium angustipetalum* in moderate to high vegetation burn severity areas. The Rim Fire Recovery could contribute more losses through roadside hazard tree removal in the very low to low burn severity areas. The two occurrences known to be in the burned area are in a low burn severity area outside of any units, including roadside hazard tree areas. So those two occurrences should be sustained through the future if they survived the fire.

Wyethia elata is currently represented by one occurrence in the Stanislaus National Forest. This occurrence is located less than one mile outside the Rim Fire burned area. The occurrence grows under a powerline and adjacent to a post-1987 Stanislaus Complex conifer plantation. It was protected from plantation thinning in the China Flat HFRA project with flagging and avoidance. It has sustained gopher damage for a number of years and might be declining as a result. If this species occurs in a Rim Fire Recovery project unit or hazard tree removal area, it would not be protected from impacts. The risk of loss of the species inside the project area could be great, if occurrences only grow in project activity areas. The impact of losses of occurrences in the Stanislaus National Forest are unlikely to destabilize the species as a whole. However, the loss of the species from the Forest due to the combination of impacts from the Rim Fire Recovery project, any impacts from the fire or fire suppression, and the impacts from gopher damage in the occurrence outside the burned area could be considered an adverse effect to plant diversity within the Forest.

Alternative 2 (No Action)

Direct and Indirect Effects

Pacific Madrone Special Interest Area

There would be no direct effects to the Pacific Madrone SIA from this alternative. Indirect effects might occur in the form of dead trees falling into madrones. The falling dead trees could damage the madrone trees and saplings, or kill the seedlings. The downed trees could block germinating seeds, cause excess ground level shading for seedlings and create a high fuel accumulation which would burn at a high intensity, thereby causing crown mortality of the madrones, and possibly killing some of the trees, saplings or seedlings.

Forest Watchlist Plant Species and Botanical Interest Plant Species

There would be no direct effects to Forest Watchlist or Botanical Interest plant species from this alternative.

Indirect effects might occur in the form of dead trees falling into occurrences. The dead trees could directly kill Forest Watchlist or Botanical Interest 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 plants which survive the falling trees.

Cumulative Effects

Pacific Madrone Special Interest Area

The Rim Fire caused a mix of vegetation fire severity in the Pacific Madrone SIA, from very low severity to high severity. A future wildfire burning through areas of high fuels caused by accumulated down trees could burn at such a high burn severity that madrones might be lost in the SIA, thereby affecting the integrity of the SIA.

Forest Watchlist Plant Species and Botanical Interest Plant Species

The Rim Fire caused varying levels of impacts to Forest Watchlist and Botanical Interest 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 rare 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.

Alternatives 3 and 4

Direct and Indirect Effects

Pacific Madrone Special Interest Area

Direct and indirect effects to the Pacific Madrone SIA would be the same as in Alternative 1.

Forest Watchlist Plant Species and Botanical Interest Plant Species

Direct and indirect effects to NFMA and Botanical Interest species would be the same as in Alternative 1 except that in Alternatives 3 and 4, Lumsden Road roadside hazard tree removal is not included and an additional management requirement for Alternatives 3 and 4 provides for some protection of Pacific Madrone (*Arbutus menziesii*), Tanoak (*Notholithocarpus densiflorus*), California nutmeg (*Torreya californica*) and Sierra sweet bay (*Myrica hartwegii*) where needed to maintain viable populations within the project area. Timber salvage, hazard tree removal, fuel reduction and road maintenance activities would avoid madrones, thereby allowing the recovery of the trees and saplings which were dispersing beyond the confines of the Pacific Madrone SIA. Impacts to Forest Watchlist and Botanical Interest plants from hazard tree removal and road maintenance activities along Lumsden Road would not occur in these alternatives of the Rim Fire Recovery project. The *Eryngium* sp. nov. sites would continue to be protected in the meadow habitats in accordance with the BMPs. Other species of Forest Watchlist or Botanical Interest species would not be avoided in other places in the Rim Fire Recovery project and the effects for these species would be the same as in Alternative 1.

Cumulative Effects

Pacific Madrone Special Interest Area

Cumulative effects to the Pacific Madrone SIA would be the same as in Alternative 1.

Forest Watchlist Plant Species and Botanical Interest Plant Species

Cumulative effects to *Arbutus menziesii*, *Notholithocarpus densiflorus*, *Torreya californica* and *Myrica hartwegii* would be much reduced in Alternatives 3 and 4 compared to Alternative 1. The *Eryngium* sp. nov. sites would continue to be protected in the meadow habitats because of the BMPs. Avoiding these species by Rim Fire Recovery activities would eliminate cumulative effects to those species. Cumulative effects to the remaining Forest Watchlist and Botanical Interest plant species would be the same as in Alternative 1.

Compliance with Management Direction.

Pacific Madrone Special Interest Area

The Rim Fire Recovery project would be consistent with Forest Plan Direction by employing "special cutting methods" in order to avoid degrading the unique features of the Pacific Madrone SIA.

Forest Watchlist Plant Species and Botanical Interest Plant Species

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."

Alternative 1 does not include protective measures which would reduce or alleviate adverse effects to Forest Watchlist or Botanical Interest species. Alternatives 3 and 4 have a management requirement which protects *Arbutus menziesii*, a Forest Watchlist species and *Myrica hartwegii*, *Notholithocarpus densiflorus* var. *echinoides* and *Quercus garryana* var. *semota*, three Botanical Interest plant species. This modification is designed to reduce or alleviate adverse effects to known or newly detected occurrences of these species. The *Eryngium* sp. nov. sites would be protected in the meadow habitats because of the BMPs.

The remaining Forest Watchlist and Botanical Interest species would receive no protection from impacts. While impacts might be substantial for most, they would continue to be present within the National Forest. However, two species are at risk of being lost from the Forest, due to their rarity in the Forest. They are not rare at the national or global scale.

Dryopteris filix-mas has, so far, been found only in one area of the Forest, Pilot Ridge. All colonies of this species occur within roadside hazard tree removal units of the Rim Fire Recovery project. There are no management requirements to protect this species from impacts

by the project. Without protection, the project might impact the colonies to the point that the species is extirpated from the Forest. Loss of this or any other native species from the Forest could be considered an adverse effect to plant diversity within the Forest. Surveys for Sensitive Plants are being conducted concurrently with the analysis of this project in the Rim Fire Recovery area. It is possible that additional occurrences of this species could be found in the course of those surveys. If occurrences are located outside of project units, the risk that the species could be lost from the Forest would be much reduced.

Wyethia elata is currently known from only one occurrence in the Stanislaus National Forest, outside the Rim Fire burned area. This occurrence has sustained gopher damage for several years and might be in decline. The species occurs south of the Forest in greater numbers and is secure as a species. If there are occurrences in Rim Fire Recovery units, they would not be protected from adverse impacts and there is a risk that they could be damaged to the point of loss. The combined effect of natural impacts from gopher damage to the known occurrence and the possible loss of occurrences from the Rim Fire Recovery project could eliminate the species from the National Forest. The loss of this species from the Forest could be considered an adverse effect to plant diversity within the Forest. More occurrences might be located in the course of conducting surveys for Sensitive Plant species. If occurrences are found outside of project units, the risk of the species being lost from the Forest would be much reduced.

SUMMARY

Table 5. Summary of effects across all alternatives to Forest Watchlist species. For species not yet confirmed in the project area, presence is assumed for the purposes of comparison of Alternatives. The term "impact" used here refers to adverse impacts.

Forest Watchlist Plant Species	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
Agrostis humilis	No impact	Some impact	No impact	No impact
Anomobryum julaceum	Some impact	No impact	Some impact	Some impact
Arbutus menziesii	Moderate impact	Moderate impact	Some impact	Some impact
Bolandra californica	Some impact	Some impact	Some impact	Some impact
Botrychium simplex var. simplex	Some impact	Some impact	Some impact	Some impact
Carex davyi	No impact	Some impact	No impact	No impact
Carex tompkinsii	Moderate impact	Greatest Impact	Moderate impact	Moderate impact
Drosera rotundifolia	No impact	Some impact	No impact	No impact
Dryopteris filix-mas	Great Impact	Some impact	Great Impact	Great Impact
Epilobium howellii	No impact	Some impact	No impact	No impact
Eryngium sp. nov.	No impact	Moderate impact	No impact	No impact
Lilium humboldtii ssp. humboldtii	Moderate impact	Greatest Impact	Moderate impact	Moderate impact
Meesia triquetra	No impact	Some impact	No impact	No impact
Perideridia bacigalupii	Great Impact	Moderate impact	Great Impact	Great Impact
Rhynchospora capitellata	No impact	Moderate impact	No impact	No impact
Taxus brevifolia	Moderate impact	Moderate impact	Moderate impact	Moderate impact

Forest Watchlist Plant Species	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Tritomaria exsectiformis	No impact	Some impact	No impact	No impact
Viola nephrophylla	No impact	Some impact	No impact	No impact

Table 6. Table 5. Summary of effects across all alternatives to Forest Watchlist species. For species not yet confirmed in the project area, presence is assumed for the purposes of comparison of Alternatives. The term "impact" used here refers to adverse impacts.

Botanical Interest Plant Species	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Alectoria sarmentosa	Some impact	Moderate impact	Some impact	Some impact
Brasenia schreberi	No impact	Some impact	No impact	No impact
Clarkia virgata	Moderate impact	Moderate impact	Moderate impact	Moderate impact
Delphinium hansenii ssp. ewanianum	Some impact	Some impact	Some impact	Some impact
Didymodon norrisii	Some impact	Some impact	Some impact	Some impact
Myrica hartwegii	Moderate impact	Moderate impact	Moderate impact	Moderate impact
Notholithocarpus densiflorus var. echinoides	Moderate impact	Greatest Impact	Moderate impact	Moderate impact
Potamogeton epihydrus	No impact	Moderate impact	No impact	No impact
Potamogeton robbinsii	No impact	No impact	No impact	No impact
Quercus garryana var. semota	Moderate impact	Moderate impact	Moderate impact	Moderate impact
Rhynchospora alba	No impact	Some impact	No impact	No impact
Schoenoplectus subterminalis	No impact	Some impact	No impact	No impact
Torreya californica	Moderate impact	Moderate impact	Moderate impact	Moderate impact
Trillium angustipetalum	Moderate impact	Greatest Impact	Moderate impact	Moderate impact
Wyethia elata	Moderate impact	Greatest Impact	Moderate impact	Moderate impact

MANAGEMENT RECOMMENDATIONS

The Decision Maker elected to have only the management requirement for Forest Watchlist and Botanical Interest species shown on page 12. The following management recommendations are recommended to be added to the project in order to reduce or alleviate adverse effects to Forest Watchlist and Botanical Interest plant species. For *Dryopteris filix-mas* and *Wyethia elata* these management recommendations would ensure that the project would not cause the loss of plant diversity in the Forest. If adopted, these management recommendations would be in addition to the existing management requirement for Alternatives 3 and 4.

1. Flag and avoid occurrences of *Eryngium* sp. nov. (an un-named button celery), *Dryopteris filix-mas* (male fern) and *Wyethia elata* (Hall's mules ears).

2. Flag and avoid occurrences of *Perideridia bacigalupii* (Bacigalupi's yampah) smaller than 0.25 acre. Up to 10 percent of occurrences larger than 0.25 acre and containing 100 or more plants can be impacted by tree falling and yarding, masticating or biomass removal. In these cases, avoid heavy concentrations of plants when the occurrences are of unequal density

throughout. Placement of new material sources in occurrences of *Perideridia bacigalupii* should be avoided, or, if necessary, should impact no more than 10 percent of an occurrence.

3. Genetically verified occurrences of *Clarkia virgata* (Sierra Clarkia) will be conserved in the following ways: in and adjacent to Units R20, R32 and in the roadside hazard tree removal of Forest Road 2S40, and at the roadside hazard tree removal of Forest Roads 2S01 and 2S01C, and in the roadside hazard tree removal Road 1S23E, flag and avoid one acre of the densest concentration of the *Clarkia* plants with the best habitat; or during the dry, non-growing period, approximately August 15 through November 30, directionally fall hazard trees away from the these 1 acre protection areas, or use equipment with an articulating arm or other equipment which allows for full suspension of the logs out of the flagged areas. The flagged protection areas can be entirely outside of the units, if the occurrence is well represented by dense, healthy, reproductive plants. Do not flag plants within the road prisms of these roads. Flag and avoid one acre containing the largest concentration of the plants with the best habitat, for all other activities, regardless of timing.

4. Flag and avoid occurrences of *Trillium angustipetalum* found in areas of very low or low burn severity where there is a possibility that the species would survive the impacts of the fire.

5. Minimize or avoid impacts to *Bolandra californica, Botrychium simplex* var. *simplex, Didymodon norrisii, Lilium humboldtii* ssp. *humboldtii* and *Taxus brevifolia*.

REFERENCES.

Bornstein, A. J. 2012. Myricaceae, wax myrtle family. In: The Jepson manual, vascular plants of California, second edition. Ed.: Baldwin, B. G., et. al. University of California Press, Berkeley. 1568pp.

Brandegee, K. 1891. The flora of Yo Semite. Zoe. 2:155:167.

Calflora. 2014. Information on California plants for education, research and conservation, with data contributed by public and private institutions and individuals, including the Consortium of Calif. Herbaria. [web application]. Berkeley, California. http://www.calflora.org/. (April 2, 2014).

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).

California Native Plant Society (CNPS). 2014. Inventory of rare and endangered plants (on-line edition v8-02). Sacramento, CA. http://www.rareplants.cnps.org/ (August 19, 2014).

Chappell, C.B. and Giglio, D.F. 1999. Pacific Madrone Forests of the Puget Trough, Washington. In: Adams, A.B., ed. and Hamilton C.W., ed. The Decline of Pacific Madrone (*Arbutus menziesii* Pursh): Current Theory and Research Directions. Proceedings of the April 28, 1995 Symposium. Save Magnolia's Madrones, Center for Urban Horticulture, Ecosystems Database Development & Research. http://soilslab.cfr.washington.edu/madrone/book.html (April 19, 2014).

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

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

Farrar, D. 2012. Fact sheet for *Botrychium simplex*. Iowa State University, Ada Hayden Herbarium. http://www.public.iastate.edu/~herbarium/botrychium.html (April 16, 2014).

Flora of North America (FNA). 2014. Online application accessed through eFloras. Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, Cambridge, MA http://www.efloras.org (April 2, 2014).

Flora of North America North of Mexico (FNANM). 2014. Volume 28, Bryophyta, part 2. Ed. Flora of North America Editorial Committee. Oxford University Press, New York. 736pp.

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

Hanzawa, F.M., and S. Kalisz. 1993. The relationship between age, size, and reproduction in *Trillium grandiflorum* (Liliaceae). American Journal of Botany. 80(4):405-410.

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).

Jules, E.S. 1998. Habitat fragmentation and demographic change for a common plant: trillium in old-growth forest. Ecology. 79(5):1645-1656.

Lewis, H. and M.E. Lewis. 1955. The genus *Clarkia*. University of California Publications in Botany. 20:241-392.

Pavlik, B. M., Muick, P. C., Johnson, S. and Popper, M. 1991. Oaks of California. Cachuma Press and the California Oak Foundation, Los Olivos, CA. 184pp.

Small, E. 1971. The systematics of *Clarkia*, section Myxocarpa. Canadian Journal of Botany, 49:1211-1217.

Taylor, D.W. 2010. Flora of the Yosemite Sierra. Lulu Press, Raleigh, N.C. USA. 382pp.

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). 1980. Sensitive species population record: Species: *Perideridia bacigalupii*. Prepared under contract by Blaine Rogers. Unpublished report. USDA, Stanislaus National Forest.

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

U.S. Department of Agriculture, Forest Service (USDA). 1992. Index of species information, species: *Torreya californica*. In: Fire Effects Information System (FEIS). Prepared by: Howard, J. L. Rocky Mountain Research Station, Fire Science Laboratory. http://www.feis-crs.org/beta/ (April 3, 2014).

U.S. Department of Agriculture, Forest Service (USDA). 1998. Sensitive Species List 1998, Letter to Forest Supervisors. June 10, 1998. Signed by Jody Cook (for) G. Lynn Sprague, Regional Forester. Internal document, unpublished. USDA Forest Service, Region 5.

U.S. Department of Agriculture, Forest Service (USDA). 2006. *Botrychium simplex* E. Hitchcock (little grapefern), a technical conservation assessment. Prepared by: Anderson, D.G., Colorado Natural Heritage Program, Colorado State University, Fore Collins. USDA, Forest Service, Rocky Mountain Region, Species Conservation Project. http://www.cnhp.colostate.edu/download/documents/Spp_assessments/botrychiumsimplex.pdf (April 19, 2014)

U.S. Department of Agriculture, Forest Service (USDA). 2010a. Fire History (Computer GIS Shapefile). Unpublished. USDA, Stanislaus National Forest.

U.S. Department of Agriculture, Forest Service (USDA). 2010b. Species Fact Sheet for *Anomobryum julaceum* (Schrad. Ex P. Gaertn., B. Mey. & Schreb.) Schimp. Prepared by Harpel, J.A., Huff, R. (ed.) and Duncan, C. (ed.). USDA Forest Service Region 6 and USDI Bureau of Land Management, Oregon and Washington.

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). 2011. Species review form for *Dryopteris filix-mas* (L.) Schott (male fern). Prepared under contract by Naomi Fraga, Conservation Botanist, Rancho Santa Botanic Garden. February 14, 2011. Unpublished.

U.S. Department of Agriculture, Forest Service (USDA). 2012. Species review form for *Lilium humboldtii* ssp. *humboldtii* Roezl & Leichtlin ex Duchartre, Humboldt lily. Stanislaus National Forest. Unpublished.

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

Personal Communications.

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

---. Letter to Author. Oct. 23, 1996.

---. Letter to Author. Nov. 13, 1996.

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

Appendix A

Forest Watchlist Plant Species

Agrostis humilis	mountain bent grass
*Anomobryum julaceum*** (syn. *Anomobryum filiforme*)	slender silver moss
Arbutus menziesii	Pacific madrone
Bolandra californica	Sierra bolandra
Botrychium simplex var. simplex	least moonwort
Carex davyi	Davy's sedge
Carex tompkinsii	Tompkins' sedge
Cryptantha crymophila	subalpine cryptantha
Drosera rotundifolia	round-leaved sundew
Dryopteris filix-mas	male fern
*Entosthodon kochii***	Koch's cord moss
Epilobium howellii	subalpine fireweed
*Eryngium pinnatisectum***	Tuolumne button celery
Eryngium sp. nov.	undescribed button celery, coyote thistle
Helianthemum suffrutescens	Bisbee Peak rush-rose
Lilium humboldtii ssp. *humboldtii*	Humboldt lily
Lupinus gracilentus	slender lupine
*Meesia longiseta***	long-stalked hump moss
Meesia triquetra	three-ranked hump-moss
*Orthotrichum spjutii***	Spjut's bristle moss
Perideridia bacigalupii	Bacigalupi's yampah
Preissia quadrata	Blister ribbon
Rhynchospora capitellata	beaked sedge
Taxus brevifolia	Pacific yew
Tritomaria exsectiformis	little brownwort
Viola nephrophylla	Leconte violet

**These Forest Watchlist plant species are not yet known from the Stanislaus National Forest. However, they are either suspected to occur within the boundaries of the Forest, the Forest is within the range of the species, or there are occurrences near enough to the boundaries to warrant including them on this list.

Forest Botanical Interest Species

Alectoria sarmentosa	witch's hair
Astragalus kentrophyta var. *danaus*	Sweetwater Mtns. milk-vetch
Brasenia schreberi	watershield
Chaenactis douglasii var. *alpina*	alpine dusty maids
Clarkia rostrata	beaked Clarkia
Clarkia virgata	Sierra Clarkia
Claytonia megarhiza	fell-fields Claytonia
Delphinium hansenii ssp. *ewanianum*	Ewan's larkspur
Didymodon norrisii	Norris' beard moss
Moerckia hibernica	liverwort
Myrica hartwegii	Sierra sweet bay
Notholithocarpus densiflorus var. ? (syn. *Lithocarpus densiflorus*)	tanbark oak
Potamogeton epihydrus	Nuttall's ribbon-leaved pondweed

Potamogeton robbinsii	Robbins' pondweed
Quercus garryana var. *semota*	Oregon oak
Rhynchospora alba	white beaked-rush
Schoenoplectus subterminalis	water bulrush
Solorina spongiosa	fringed chocolate chip lichen
Torreya californica	California nutmeg
Trillium angustipetalum	Trillium
Wyethia elata (syn. *Agnorhiza elata*)	Hall’s mule-ears