BIOLOGICAL ASSESSMENT
FOR FEDERALLY LISTED THREATENED OR ENDANGERED PLANT SPECIES

AND

BIOLOGICAL EVALUATION
FOR FOREST SERVICE SENSITIVE PLANT SPECIES

for
Boulder Creek Fuel Restoration Project
Hume Lake Ranger District
Giant Sequoia National Monument
Fresno & Tulare Counties
California

August 2012

Prepared/Approved by /s/Fletcher Linton DATE 11/15/12

Fletcher Linton
Forest Botanist
Giant Sequoia National Monument

I. INTRODUCTION

Fire has played an important role in the ecology of the Sierra Nevada for thousands of years. Before the area was settled by Euro-Americans, fires were generally frequent throughout much of the range. The natural landscape, soil, plant communities, and wildlife have developed/evolved in concert with the natural process of fire for at least the 10 thousand years.

Management strategies in the twentieth century have reduced the influence of fires in the ecosystem and contributed to the forest conditions that encourage high-severity fires. Live and dead fuels increased along with the development of denser brush and mixed conifer forests. The majority of the Boulder Creek drainage has missed the last five fire return intervals (100+ years of fire exclusion).

The Hume Lake Ranger District proposes to use prescribed fire to reintroduce fire into the lower portion of the Boulder Creek drainage. The project area encompasses approximately 14,385 acres of the watershed, of which 6,000 to 9,000 acres would be proposed for under-burning.

The purpose of this biological assessment (BA) and biological evaluation (BE) is to review the proposed Boulder Creek Fuel Restoration Project in sufficient detail to determine the potential effects on Threatened, Endangered, and Sensitive (TES) plant species. Specifically, the BA will document effects on proposed, threatened, or endangered species and/or critical habitat; and determine whether formal consultation or conference is required with the United States Department of Interior, Fish and Wildlife Service (USFWS), pursuant to the Endangered Species Act. The BE will analyze effects on Forest Service sensitive plant species in order to determine whether the proposed action will result in a trend toward a sensitive species becoming Federally listed. This BA/BE was prepared in compliance with standards and direction established in Forest Service Manual 2670.3 and 2672.42 and conforms with legal requirements set forth under Section 7 of the Endangered Species Act (19 U.S.C. 1536 (c), 50 CFR 402.12 (f) and 402.14 (c).

No federally proposed or listed plant species would be expected to occur in the project area.

The Forest Service sensitive plant species considered in this Biological Evaluation are:

- Hall's Daisy, (*Erigeron aequifolius*)
- Sequoia False Goldenaster, (*Heterotheca monarchensis*)
- Short-Leaved Hulsea, (*Hulsea brevifolia*)
- Congdon's Bitterroot, (*Lewisia congdonii*)
- Marble Rockmat, (*Petrophyton caespitosum* ssp. *acuminatum*)
- Tehipite Valley Jewel-Flower, (*Streptanthus fenestratus*)

Please see Appendix A and 'Species and Habitat Accounts' in Existing Environment for the rationale behind including and dismissing specific sensitive plants in this analysis.

II. CONSULTATION TO DATE

Pursuant to 50 CFR 402.12, the staff received a species list from the US Fish and Wildlife Service (USFWS) showing which federally listed, proposed, or candidate species might be affected by projects in the Sequoia National Forest (NF) and Giant Sequoia National Monument (NM). The species list was obtained from the USDI Fish and Wildlife Service, Sacramento Field Office web site:

www.fws.gov/sacramento/es_species/Lists/es_species_lists_NF-form-page.htm

This list is updated on a project-by-project basis and every 90 days. The list was updated July 17th, 2012 and is reflected in Appendix A. The list contains and 1 category of critical habitat and 2 plant species that occur within the Forest.

Keck's checkerbloom (*Sidalcea keckii)* is only known from outside the Forest to the north in clay soils below 1,400 feet. The proposed critical habitat for *Sidalcea keckii* falls entirely outside the national forest boundary.

The Sequoia NF and Giant Sequoia NM currently have two plant species federally listed by the USFWS and 62 species designated as sensitive, i.e., identified by the United States Department of Agriculture (USDA) Forest Service (FS) Regional Forester for Region 5 (R5) as requiring special management attention (See Appendix A).

Springville clarkia (*Clarkia springvillensis*), is listed by the USFWS as threatened, is restricted to the foothills of the Tule River drainage. There is neither potential habitat nor likelihood for it to exist within the analysis area for the Boulder project, therefore, it may be eliminated from further consideration and preparation of a Biological Assessment (BA) is not required. Bakersfield cactus (*Optunia basilaris* var. *treleasei*), is listed by the USFWS as threatened. It is endemic to a limited area of central Kern County in the vicinity of Bakersfield. There is neither potential habitat nor likelihood for it to exist within the analysis area for the Boulder Creek Fuel Restoration Project, therefore it may be eliminated from further consideration and preparation of a BA is not required.

III. CURRENT MANAGEMENT DIRECTION

Existing management direction for federally listed or candidate species and Forest Service Pacific Southwest Region sensitive plant species is summarized as follows:

Forest Service Manual 2672 - Provides standards for biological evaluations and provides a list of all Regional Forester designated sensitive wildlife and plant species occurring on National Forest System lands. Supplemented by: 2006 *Region 5 Revised Sensitive Plant and Animal Lists* (FSM 2600).

Forest Service Manual (FSM 2672.4) - Specific management direction for sensitive plants: Current policy as shown in the Forest Service Manual (FSM 2672.4) is to conduct a pre-field review of available information, and in instances where there is evidence of sensitive plant species or habitat, conduct a field reconnaissance if necessary to determine whether the project poses a threat to sensitive plants. The results of surveys and conflict determination are documented in the BE.

Sequoia NF Land and Resource Management Plan - (FLRMP, USDA FS, 1988) as amended. Sensitive species and their habitats are managed to ensure conservation or enhancement of their populations and habitats so that the species do not become federally listed or suffer loss of viability (FSM 2670.2 and 2670.3).

2012 Giant Sequoia National Monument Final Environmental Impact Statement and Monument Management Plan (USDA 2012) - Applicable standards and guidelines for the management of TES plants are found on page 93 of the Management Plan:

- Conduct field surveys for threatened, endangered, proposed, and sensitive (TEPS) plant species early enough in the project planning process so that the project can be designed to conserved or enhance TEPS plants and their habitat. Conduct surveys according to procedures outlined in Forest

Service Handbook (FSH 2609.25.11). If additional surveys are conducted as part of project implementation, document the survey results in the project file.

- Minimize or eliminate direct and indirect impacts from management activities on TEPS plant unless the activity is designed to maintain or improve plan populations (FSM 2670).

Giant Sequoia National Monument Proclamation (2000)

IV. DESCRIPTION OF PROPOSED PROJECT

The Hume Lake Ranger District proposes to use prescribed fire to reintroduce fire into the lower portion of the Boulder Creek drainage. The Boulder Creek Fuel Restoration Project proposes to treat the area with prescribed fire ignited on the ground with drip torches and from helicopters using potassium permanganate 'ping-pong' balls. Old fire lines, roads, and trails will used as control lines and reinforced with crews using hand tools. The project area encompasses approximately 14,385 acres of the watershed, of which 6,000 to 9,000 acres would be proposed for under-burning. The smaller amount of treatment acres is due to large areas of rock and other small features that would need other treatments prior to, or instead of, prescribed fire.

V. EXISTING ENVIRONMENT

The Boulder Creek Fuel Restoration Project is located in the southern middle portion of the Kings River Canyon, mainly in Boulder, Little Boulder, Evans, and Redwood Creek watersheds. Plant communities in the project area consist of Giant Sequoia groves, Sierra hardwood forest and lower mixed conifer forest, and montane meadow. Dominant species include Giant Sequoia (*Sequoiadendron giganteum*), California black oak (*Quercus kelloggii*), white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), and sugar pine (*Pinus lambertiana*).

The project area can be accessed off of the Evans and Big Meadows Roads from the South, whereas the northern portion, along the Kings River is very steep and inaccessible.

Species and Habitat Accounts

The latest available update (July, 2012) of CDFG's database program *RAREFIND 3* (CNDDB, 2012) was used to retrieve Natural Diversity Data Base (NDDB) records for *Special Plants List* species listed for the U.S. Geological Survey quadrangle maps included in the Boulder Creek Fuel Restoration Project area (Wren Peak and Muir Grove). Potential habitat and likelihood of occurrence were determined by established habitat parameters of elevation, soil, slope, aspect, and associated plant communities, as well as proximity to locations of known species' occurrences and sub-watershed boundaries.

TES Species were eliminated from further consideration if: 1) they had no known occurrences in or near the project area; and/or 2) no potential habitat existed in the project area.

The analysis area has known populations of the following R5 Sensitive plant species:

- Hall's Daisy, (*Erigeron aequifolius*)
- Sequoia False Goldenaster, (*Heterotheca monarchensis*)
- Marble Rockmat, (*Petrophyton caespitosum* ssp. *acuminatum*)

The analysis area also has potential habitat for the following R5 Sensitive plant species:

- Short-Leaved Hulsea, (*Hulsea brevifolia*)
- Congdon's Bitterroot, (*Lewisia congdonii*)
- Tehipite Valley Jewel-Flower, (*Streptanthus fenestratus*)

None of the above plants are federally listed as endangered or threatened with the USFWS. The project area has no potential habitat for any of the three USFWS listed species that occur or have potential to occur on the Giant Sequoia NM.

The Boulder Creek Fuel Restoration Project analysis area was not surveyed formally. The Forest Botanist is familiar with the Sensitive plant species and more accessible areas of the Project area. Because the proposed action does not include any mechanical disturbance of soils, the FSM does not require comprehensive Sensitive plant surveys.

Those species with potential to be found in the project area but which were not found in the treatment units, are also included in the analysis.

Species Accounts for Species found within Proposed Treatment Units

Hall's Daisy, (*Erigeron aequifolius*)

Abundance: Approximately 14 occurrences have been reported, with 10's to 100's of plants scattered throughout each site.
Range/Distribution: *Erigeron aequifolius* is found primarily from the Needles and the Golden Trout Wilderness of the Kern and Little Kern River drainages of Tulare County to the Kings River drainage of Fresno County. Most recorded occurrences are on the Sequoia NF (10), with one each on the Sierra NF, the Inyo NF and in Kings Canyon National Park. One disjunct population is also known to occur on BLM land in Kern County (Owens Peak). Additional occurrences are likely to exist throughout the range but may never be seen because of the ruggedness and inaccessibility of the habitat.
Trend: Unknown
Protection of Occurrences: Steep, rugged, often inaccessible habitat type affords natural protection. Several occurrences in Wilderness.
Threats: The only potential threat for known *Erigeron aequifolius* populations, especially those along trails, would be from hikers/rock climbers. Likelihood of adverse impact is negligible.
Fragility/habitat specificity: *Erigeron aequifolius* is found only in steep, rocky, granitic crevices with little or no competition from other species. It is generally found on dry ridges, approx. 5200'-8000' in elevation in mixed conifer forests. Populations are relatively stable due to steep, rugged nature of the habitat, making them inaccessible for timber harvest, grazing, and most recreation.

Sequoia False Goldenaster, (*Heterotheca monarchensis*)

Abundance: Locally common on limestone formation northeast of the Horseshoe Bend of the Kings River near Boyden Cave. To date, known only from this area.
Range/Distribution: Fresno County, found on both Sequoia and Sierra National Forest lands in the Monarch Wilderness.
Trend: Unknown, but probably stable since habitat is reported to be in excellent condition and removed from most human disturbance.
Protection of Occurrences: Occurs in remote, rugged area of the Monarch Wilderness which experiences little to no human impacts.

Threats: The only discernible threat may be competition from exotic annual grasses such as Bromus madritensis var. rubens which is a dominant species associated with *Heterotheca monarchensis*.
Fragility/habitat specificity: Found scattered on south-facing slopes of limestone in cracks, ledges and flats, with higher densities of plants seen in the coarse sandy flats at the base of cliffs, from 3650 - 6000 feet elevation.

Marble Rockmat, (*Petrophyton caespitosum* ssp. *acuminatum*)

Abundance: 3 occurrences reported in CNDDB; no other information available.
Range/Distribution: Fresno, Inyo, and Tulare Counties. Kings River Cyn near Boyden Cave (Sequoia NF); W of Independence, Symmes Ck (Inyo NF); Big Arroyo, Tulare County (Seq/Kings NP).
Trend: Unknown
Protection of Occurrences: Inyo NF occurrence near Wilderness boundary, growing on cliff across creek from trail, somewhat inaccessible
Threats: No likely threats to INF or Sequoia NF occurrences.
Fragility/habitat specificity: Lower and upper montane coniferous forest, on carbonate or granitic, rocky substrates; 1200-2300 meters.

Those species with potential to be found in the project area but which were not found in the treatment units, are also included in the analysis. For species accounts of plants not found in proposed treatment units see Appendix B.

VI. EFFECTS OF THE ALTERNATIVES

The effects section discusses effects to known occurrences as well as suitable habitat and any possible undiscovered sensitive plants that might grow in the project area.

Direct and Indirect Effects of No-Action Alternative

No direct effects to sensitive plant species are expected with the No-Action Alternative

By not implementing the Boulder Creek Fuel Restoration Project, indirect effects to sensitive plant habitat and species (where present) may occur. The No Action alternative has the risk of severe wildfire followed by shortened fire return intervals perpetuating the ecosystem in a lowered seral state that could degrade habitat for the sensitive plant species dependent on older forest ecosystems, such as the Short-Leaved Hulsea. The three known species (Hall's Daisy, Sequoia False Goldenaster, & Marble Rockmat) and the other two potential species (Congdon's Bitterroot & Tehipite Valley Jewel-Flower) are lithophiles (they grow on rock outcrops) and would not be affected. Also, without treatment of fuels, fires in the future could likely be more intense and widespread.

Direct and Indirect Effects of Action Alternative

Very limited direct effects to sensitive plants are expected with the action alternative. The three known species (Hall's Daisy, Sequoia False Goldenaster, & Marble Rockmat) and the other two potential species (Congdon's Bitterroot & Tehipite Valley Jewel-Flower) are lithophiles and will not be affected by the prescribed fire. Direct effects to undiscovered populations of Short-Leaved Hulsea by the treatments (prescribed fire) are possible, but would be short and transient to this perennial plant.

Indirect effects from soil movement as a result of the proposed activities (prescribed fire consumption of litter) are possible, and would be of short duration (i.e. less than 5 years). Movement of soil into occupied R5 Sensitive plant occurrences and their habitats could affect them indirectly by changing their habitat. This could be a possibility for Short-Leaved Hulsea, but not for Hall's Daisy, Sequoia False Goldenaster,

Marble Rockmat, Congdon's Bitterroot & Tehipite Valley Jewel-Flower. In the mid and long-term, treatment of the fuels in the Boulder area would meet the overall goals of reducing the risk of catastrophic wildfire and possibly greater soil movement/plant habitat effects.

In the Action Alternative, short-term increases in risks from the introduction and spread of noxious weeds from equipment/ personnel used during implementation of the project as well as reductions of soil cover can be expected. Reductions of soil cover increases the risk of introduction that weeds can become established. Noxious weed infestations are a threat to sensitive plants and their habitats. Mitigations to prevent the introduction and spread of noxious weeds into the proposed treatment areas have been built into the project. These mitigations include:

- avoiding any known infestations during project implementation and staging of fire crews
- requiring equipment and personnel (boots/tools) to be free from weeds and soil before working in the project area

These practices would eliminate the risk of negative indirect effects from noxious weeds on sensitive plants.

Cumulative Effects of Action Alternative

A critical step in cumulative effects analysis is to compare the current condition and the projected changes due to management activities. This can be difficult because of the background natural variability in the resources and processes of concern. Plant and population ecology is not known for most sensitive plants on the Sequoia NF and Giant Sequoia NM. Additionally, many sensitive plant habitats in the forest have a long history of disturbance and an undisturbed reference habitat is often lacking. Minimizing on-site changes to sensitive plants can be the most effective way of reducing cumulative impacts. If adverse effects have not been minimized at the local level, cumulative effects could occur. Management activities that have cumulatively impacted sensitive plant occurrences within the analysis area include grazing, fire suppression, sivicultural planting/release, mining, and recreational use. These cumulative impacts have altered the present landscape to various degrees. Cumulative impacts will vary from species to species.

Past and current activities on National Forest System lands have altered potential habitats for the following sensitive plant species found of with potential to be in the Boulder Project area: Short-Leaved Hulsea, Sequoia False Goldenaster, Marble Rockmat, Congdon's Bitterroot, and Tehipite Valley Jewel-Flower. Effects have resulted from forest road development, timber harvest, mining, recreation activities, invasive/exotic/noxious weed invasions, and changes in hydrology. Most of the cumulative effects are located in the higher more accessible southern portion of the project area. Short-Leaved Hulsea has the potential to occur in this part of the project and is/could be the most affected by past, present, and future activities. The direct/indirect effects of a cooler fall burn on Short-Leaved Hulsea are minimal so the effect on cumulative effects of the Boulder Project are minimal as well. The rest of the Boulder project area is located in the steep inaccessible Kings River gorge, and most of the Sensitive plants that have habitat in the project area grow on rock outcrops. Minimal adverse cumulative effects are expected for the Action Alternative.

VII. DETERMINATION

For Threatened and Endangered Species

It is my determination that the Boulder Creek Fuel Restoration Project would have no effect on threatened,

endangered or proposed plant species.

For Sensitive Species

It is my determination that the Boulder Creek Fuel Restoration Project:

1) would have no effect on Sequoia False Goldenaster, Marble Rockmat, Congdon's Bitterroot and Tehipite Valley Jewel-Flower.

2) may affect undiscovered individuals but is not likely to result in a trend toward federal listing or loss of viability for Short-Leaved Hulsea.

Other plant species listed on the Sequoia National Forest as Forest Service Sensitive do not have habitat within the project area, and therefore will not be impacted by the project (see Appendix A for a summary of rationale supporting this statement).

VIII. REFERENCES

CNDDB, 2012. California Natural Diversity Database. California Department of Fish and Game. Online: http://www.dfg.ca.gov/whdab/html/cnddb.html

CNPS, 2012. California Native Plant Society's Inventory of Rare and Endangered Plants of California. Online www.cnps.org

Hickman, J.C. 1993. The Jepson Manual – Higher Plants of California. James C. Hickman, Editor. University of California Press, Berkeley.

1990 United States Department of Agriculture (USDA) Forest Service. Forest Service Manual. Washington D.C.

USDA Forest Service. 1988. Sequoia National Forest Land and Resource Management Plan. San Francisco, California.

USDA Forest Service. 2006. Sequoia National Forest Sensitive Plant List. Pacific Southwest Region, Vallejo, CA (on file at Sequoia Nation Forest, Porterville, CA).

USDA Forest Service. 2012. Giant Sequoia National Monument FEIS and Management Plan. Vallejo, California.

USDI, 2012. United States Department of Interior, Fish and Wildlife Service. Federal Endangered and Threatened Species that may be affected by Projects in the Sequoia National Forest. Database last updated October 2nd, 2006. www.fws.gov/sacramento/es_species/Lists/es_species_lists_NF-form-page.htm

Appendix A - Region 5 **Sensitive Plants** with Potential to Occur in the **Boulder Creek Fuel Restoration Project** Area

SPECIES	HABITAT TYPE / SOILS	ELEVATION	FLOWERING	Potential to Occur in Project Area
Scalloped Moonwort (Botrychium crenulatum)	Among Thick Grass and Herbs in Wet Meadows Moist Fine Sediment and Peaty Soils	4,500 to 10,000 ft.	June and July	No
Unexpected Larkspur (Delphinium inopinum)	Open Rock Outcrops & Ridges in Conifer and Red Fir Forest Metamorphic Substrates (Granite Occasionally)	5,500 to 9,000 ft.	June to August	No
Tulare County Bleeding Heart (Dicentra nevadensis)	Sandy, Gravelly Slopes or Crevices in Lodgepole & Sub-Alpine Forest Decomposed Granite Soil	7,500 to 10,000 ft.	May to June	No
Hall's Daisy (Erigeron aequifolius)	Steep, Rocky, Crevices in Conifer Forest & P-J Woodland Granitic Substrate (Carbonate or Basalt Occasionally)	5,200 to 8,000 ft.	June and July	Yes
Sequoia False Goldenaster (Heterotheca monarchensis)	South-Facing Ledges and Cracks on Cliffs Surrounded by Chaparral Carbonate Outcrop (Limestone or Marble)	3,560 to 6,000 ft.	June and July	Yes
Short-Leaved Hulsea (Hulsea brevifolia)	Openings in Lower and Upper Montane Conifer Forest Soils Formed in Decomposed Granite or Volcanic Pumice	4,900 to 10,500 ft.	May and June	Yes
Water Fan Lichen (Hydrothyria venosa)	Attached to Rocks in Small Streams within Montane Coniferous Forest Streams that are Fed by Cold Springs and/or Groundwater	5,000 to 8,000 ft.	June to September	No
Congdon's Bitterroot (Lewisia congdonii)	Rocky Cliffs and Ledges within Chaparral and Conifer Forest Rock, Talus and Sand derived from Granitie or Metamorphic Rock	1,650 to 9,200 ft.	March to June	Yes
Yosemite Bitterroot (Lewisia disepala)	Gravel Shelves in Rock Outcrops within Conifer Forest Decomposed Granite Deposits	3,400 to 11,500 ft.	March to June	No
Three-Ranked Hump-Moss (Meesia triquetra)	Meadows within Conifer Forest with Sphagnum, Drosera, & Vaccinium Cold Spring-Fed Acidic Fens (Organic Meadow Soils)	7,000 to 11,000 ft.	August and September	No
Broad Nerved Hump-Moss (Meesia uliginosa)	Short-Grass Meadows within Conifer Forest Spring-Fed meadows that are permanently wet	8,000 to 11,500 ft.	August and September	No
Slender-Stalked Monkeyflower (Mimulus gracilipes)	Openings in Burned chaparral, Oak Savanna, and Lower Conifer Forest Granitic soil in cracks in granite	1,650 to 4,250 ft.	April and May	No
Purple Mountain-Parsley (Oreonana purpurascens)	Open Areas within Lodgepole-Red Fir Forest Dry Sandy Gravelly Soils in Granitic or Metamorphic Substrates	7,900 to 9,400 ft	May to July	No
San Joaquin Adobe Sunburst (Psuedobahia peirsonii)	Valley Grassland or Oak Savanna Heavy Adobe Clay Derived from Metamorphic Substrate (Ophiolite)	600 to 2,000 ft	March to April	No
Marble Rockmat (Petrophyton caespitosum ssp. acuminatum)	Rock Outcrops within Montane Conifer Forest Rock Cliffs & Ledges in Carbonate (Limestone/Marble) or Granite Areas	3,900 to 7,550 ft.	August to September	Yes
Keck's Checkerbloom (Sidalcea keckii)	Valley Grassland and Open Areas in Blue Oak Savanna Heavy Red Clay Soils in Mafic Intrusive (Gabbro) Substrate	600 to 2,000 ft	March to June	No
Tehipite Valley Jewel-Flower (Streptanthus fenestratus)	Rocky Areas within Conifer Forest Rock Cliffs and Ledges in Carbonate or Carbonate-Influenced Substrate	2,000 to 5,000 ft.	April to June	Yes

Appendix B

Species Accounts of Plants not found in Boulder Creek Fuel Project Proposed Treatment Units

Short-Leaved Hulsea, (*Hulsea brevifolia*)

Abundance: There are approximately 46 known occurrences of Hulsea brevifolia on the Sierra National Forest as of December 2005. At least 4 occurrences exist on the Sequoia National Forest, 4 on the Inyo National Forest. In addition, there are at least 19 occurrences in Yosemite National Park and 2 in Sequoia/Kings Canyon National Parks. Occurrences tend to be found in red fir or mixed conifer forest, above 5000 ft. It is likely that more populations are extant in the Sierra NF and other locations but have not been identified due to the extremely large area of potential habitat in the Sierra Nevada.
Range/Distribution: Sierra Nevada from Tulare County, northward through Fresno, Madera, and Mariposa counties to Tuolumne County. Elevational range- 5,000 to 9,000 feet (1500 to 2800m). An Eldorado County record exists in CNDDB but remains to be verified.
Trend: Assumed stable.
Protection of Occurrences: Four of the Sierra NF occurrences are in the Kaiser Wilderness, the rest are on lands managed for fuels reduction, timber harvest, grazing, recreation, and other uses. The Yosemite NP occurrences appear to be near roads or trails. The Sequoia NF occurrence is cited as being at the junction of Dorst Creek and the General's Highway, how near it is to the road and associated impacts is not known. Inyo NF populations are in or near wilderness, near heavily used trailsl
Threat(s): Off-highway vehicles (OHV) - new route construction and illegal traffic, timber harvest, road maintenance/construction, possibly prescribed burning if done in spring or early summer.
Fragility/habitat specificity: In exposed, rocky granitic or volcanic soils in openings as well as in shade of canopy in Upper Montane Coniferous Forest. Is regularly found under partial canopy of Abies magnifica with Aster breweri. Is also noted to be found commonly on north-facing slopes in Upper Montane Forests. H. brevifolia is a short-lived perennial with limited seed dispersal and an unknown seed longevity. Many large populations have a wide range of age classes and hundreds if not thousands of individuals, these populations appear to be resilient to disturbance. Smaller populations may be susceptible to stochastic disturbances or accidental extirpations.

Congdon's Bitterroot, (*Lewisia congdonii*)

Abundance: Known from 8 occurrences. Estimates of population size range from less than 100 plants to over 10,000. Most consist of at least several hundred plants.
Range/Distribution: Disjunct distribution between the Kings River Canyon and the Merced River Canyon 50 miles to the north. All but one population are in the Merced River drainage. Elevation ranges from 2000 to 7000 feet (615 to 2092m).
Trend: Unknown; apparently stable. The type location at Hennessey Ranch has not been relocated, but whether this is because it was extirpated or just described in vague terms so it could not be found is not known.
Protection of Occurrences: Sierra NF: One population is in the Devil Peak Botanical Area, 3 are in remote, seldom visited areas, and one extends down from an abandoned barite mine, where it seems to have recolonized well, to Highway 140. Stanislaus NF: The only occurrence is at Trumbull Peak, with no visible threats. Sequoia NF: The only occurrence is directly next to Highway 180.
Threat(s): Most populations face few to no threats. The populations that extend down to the roadside at Highway 180 and Highway 140 are known about by Caltrans and the Forest Service, and protective measures are taken when highway maintenance is proposed.
Fragility/habitat specificity: Plants are found on rock faces, cracks and ledges in rocky areas, on talus and scree, and on spoil piles of the abandoned barium mine. The Kings River population grows on granitics, the other populations are found on metamorphics. Plant communities range from chaparral to coniferous forest.

Tehipite Valley Jewel-Flower, (*Streptanthus fenestratus*)

Abundance: Known from less than 10 occurrences, all within the South Fork and Middle Fork Kings River drainages. Large metapopulations are found from 4,000 - 7,500 feet elevation, consisting of hundreds to many thousands of plants, depending on the rainfall pattern each year.
Range/Distribution: All occurrences are in Fresno County, mostly in Kings Canyon National Park. Most populations occur within Sequoia-Kings Canyon National Park. One population was recently found on the Monarch Divide between the Sequoia and Sierra National Forests, and a large population was discovered on the Sequoia NF near Boyden Cave. The entire worldwide distribution of this rare plant is contained within an area of 100 square miles.
Trend: Stable, but most populations have not been seen since the 1980s (CNDDB).
Protection of Occurrences: Knowledge of the presence of these populations should allow the USFS and NPS to protect these plants in the event of trail maintenance or construction.
Threats: Most occurrences face no threats, some are along trails or in areas where groups may be likely to set up camp. Two occurrences are in the Monarch Wilderness, far from trails.
Fragility/habitat specificity: The most vigorous and dense populations are found on carbonate soils, but populations are also found in granitic soils.