Species Report
for the
Two Red Mountain Plants:

Red Mountain Buckwheat
(*Eriogonum kelloggii*)

and

Red Mountain Stonecrop
(*Sedum eastwoodiae*)

Red Mountain - South Fork Eel River Wilderness (Photo: BLM)

U.S. Fish and Wildlife Service
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Species Report for two Red Mountain plants: Red Mountain buckwheat (*Eriogonum kelloggii*) and Red Mountain stonecrop (*Sedum eastwoodiae*)

PURPOSE

The purpose of this species report is to provide the best available scientific and commercial information about *Eriogonum kelloggii* and *Sedum eastwoodiae* and their habitat. The information will be part of our biological basis for any listing, recovery, or consultation recommendations under the Endangered Species Act of 1973 as amended (Act), (16 U.S.C. 1531 *et seq.*).

EXECUTIVE SUMMARY

The Red Mountain buckwheat (*Eriogonum kelloggii*) and Red Mountain stonecrop (*Sedum eastwoodiae*) are plant species endemic to serpentine habitat of lower montane forest. The distribution for both species is limited to between 1,900 and 4,100 feet (ft) (580 and 1,250 meters (m)) elevation in the Red Mountain area of northern Mendocino County, California (Figure 1). *Eriogonum kelloggii* extends further south than *S. eastwoodiae* to a 900 square-foot (ft^2) (84 m^2) area on adjacent Little Red Mountain where *S. eastwoodiae* is absent. The area occupied by both species at Red Mountain is scattered over approximately 4 square miles (mi^2) (10.4 square kilometers (km^2)). The distribution of *E. kelloggii* and *S. eastwoodiae* generally overlaps with the federally endangered McDonald's rockcress (*Arabis macdonaldiana*) (43 FR 44810; September 28, 1978).

Monitoring indicates that both species have fairly stable populations relative to their distribution. However, population trend monitoring is needed for both species. A 2008 wildfire and its suppression likely reduced the number of individual plants for both species. However, the exact extent of the fire's impact on the two species is not known.

The Bureau of Land Management (BLM) and California Department of Fish and Wildlife (CDFW; formerly known as the California Department of Fish and Game (CDFG)) are the two largest land managers in the Red Mountain area. Both agencies support plant conservation and have participated in monitoring and reducing stressors on the two species and their habitat. The BLM is working to acquire private lands that would help consolidate their ownership. In addition, portions of the BLM lands in the Red Mountain area have been designated by Congress as part of the South Fork Eel River Wilderness through the Northern California Coastal Wild Heritage Wilderness Act of October 17, 2006 (Public Law 109–362) (Figure 4). Under the designation, BLM is directed to manage designated Wilderness in a manner that retains the wilderness character for future generations. For example, BLM's regulation of the use of mechanized equipment and activities constitutes a management action limiting activities that may degrade the "wildness" of an area. In addition, the presence of rare species contributes to wilderness character; therefore, designated Wilderness in the Red Mountain area should be managed for conservation of *Eriogonum kelloggii* and *Sedum eastwoodiae* into the future. The CDFW listed *E. kelloggii* as an endangered plant in April of 1982 (CDFW 2005, unpaginated; CDFW 2014a, pp. 1–6).

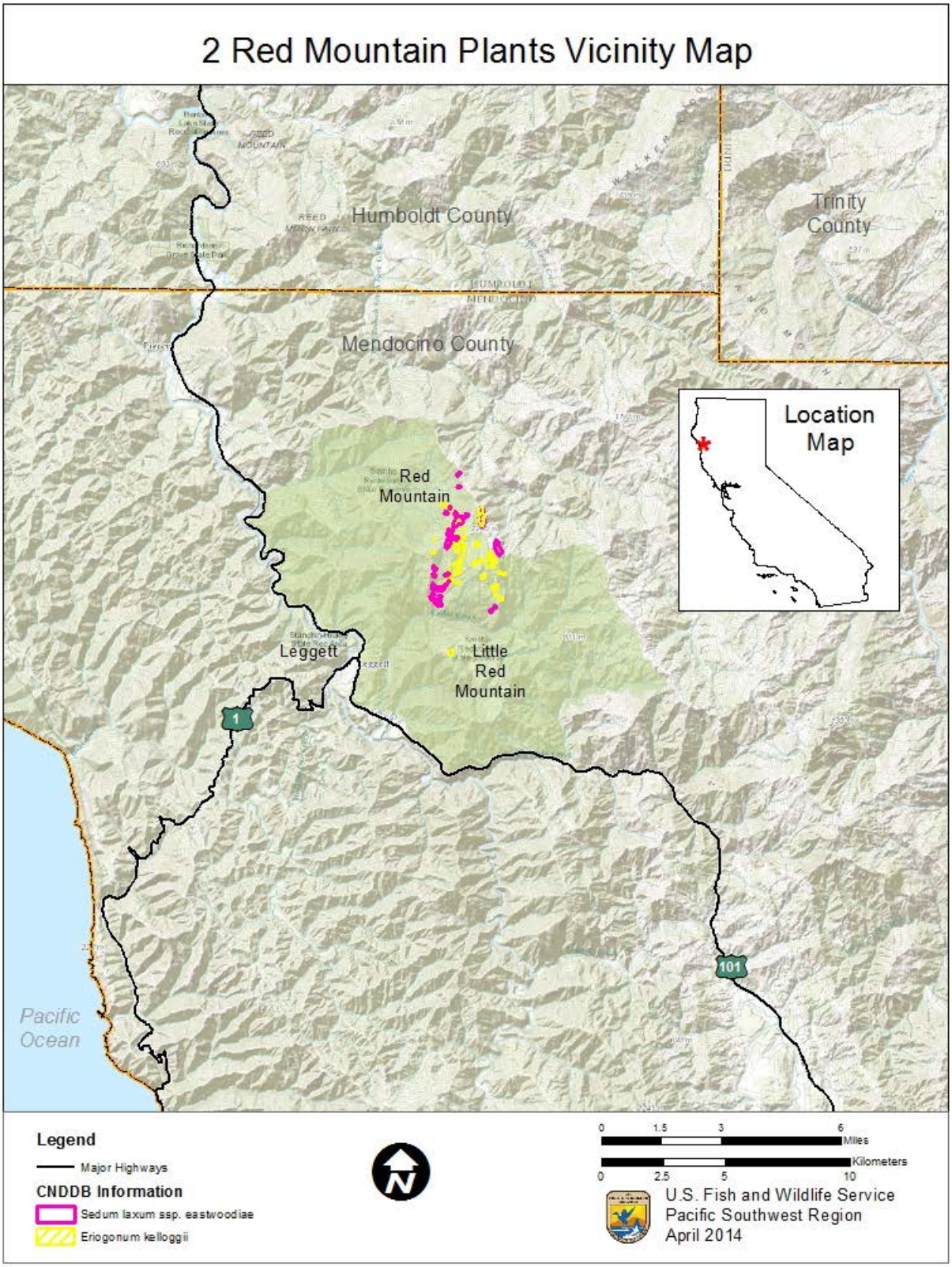

Figure 1. Distribution of *Eriogonum kelloggii* and *Sedum eastwoodiae* in California

The primary historical and current potential stressor to *Eriogonum kelloggii* and *Sedum eastwoodiae* and their habitat is potential large-scale surface mining for chromium, nickel, and potentially cobalt. Other stressors consist of unauthorized off-highway vehicle (OHV) use (some of which is associated with illegal marijuana cultivation), wildfire and wildfire suppression, and small population size. The potential effects of climate change are not well understood, but considering the limited distribution of both *E. kelloggii* and *S. eastwoodiae* due to serpentine soil association, climate change could act as a stressor to both species and its habitat.

PREVIOUS FEDERAL ACTIONS

On January 9, 1974, as directed by section 12 of the Act, the Secretary for the Smithsonian Institution submitted a report to Congress on potential endangered and threatened plant species of the United States (Smithsonian 1975, entire). The report identified 1,999 plant species as either endangered or threatened, including *Eriogonum kelloggii* (Smithsonian 1975, p. 92). On July 1, 1975, we published in the **Federal Register** (40 FR 27823) our notification that we considered this report to be a petition to list *E. kelloggii* as either endangered or threatened under the Act. The notice solicited information from Federal and State agencies, and the public, on the status of the species. In 1978, the Smithsonian Institution submitted an additional report (Ayensu and DeFilipps 1978, entire) that revised the list of plant species to be considered as endangered or threatened. We considered this revised report as a supplement to the original 1975 petition. The revised report identified *Sedum eastwoodiae* [as *Sedum laxum* ssp. *eastwoodiae*] as a potential endangered or threatened species (Ayensu and DeFilipps 1978, p. 106). On December 15, 1980, we published in the **Federal Register** (45 FR 82479) our notice of review of plant taxa for listing as endangered or threatened species. Both *E. kelloggii* and *S. eastwoodiae* were identified as Category 1 species (taxa for which we had enough biological information to support listing as either endangered or threatened). As a result, we considered *E. kelloggii* and *S. eastwoodiae* to be candidates for addition to the Federal List of Endangered and Threatened Plants. The December 15, 1980, notice (45 FR 82479) again solicited information from Federal and State agencies, and the public, on the status of the species (Service 1981, pp. 1, 4–5).

Eriogonum kelloggii (Red Mountain Buckwheat):

Eriogonum kelloggii was identified as a candidate species for Federal listing under the Act and added to our candidate species list in 1975 (40 FR 27823), through a report to Congress from the Smithsonian Institution (Smithsonian 1975, entire). Subsequently, we were petitioned to list *Sedum eastwoodiae* on May 11, 2004 (Center for Biological Diversity *et al*. 2004, entire). We determined that the petition did not contain new information on the species and that the listing was warranted, but continued to be precluded by other higher priority listing actions (70 FR 24869; May 11, 2005).

Through our candidate review process, we continued to solicit information from the public regarding the life history and current status of both species, including historical and current distribution and abundance, potential factors for the two species decline, and ongoing conservation measures being taken to protect the two species (71 FR 53756, September 12 2006; 72 FR 69034, December 6, 2007; 73 FR 75176, December 10, 2008; 74 FR 57804, November 9,

2009; 75 FR 69222, November 10, 2010; 76 FR 66370, October 26, 2011; 77 FR 69993, November 21, 2012; and 78 FR 70103, November 22, 2013).

Sedum eastwoodiae (Red Mountain Stonecrop):

Sedum eastwoodiae was first petitioned for listing in 1978 by a report by the Smithsonian Institution and World Wildlife Fund (Ayensu and DeFilipps 1978, entire). The report was a supplement to an original petition by the Secretary of the Smithsonian submitted to Congress in 1974 (Smithsonian 1975, entire). In 1980, we published in the **Federal Register**, our determination that there was enough information to consider *S. eastwoodiae* (*Sedum laxum* spp. *eastwoodiae* as an endangered or threatened species (identified as a candidate species for Federal listing under the Act through a report to Congress from the Smithsonian Institution (Smithsonian 1975, entire). Subsequently, the U.S. Fish and Wildlife Service (Service) was petitioned to list *S. eastwoodiae* on May 11, 2004 (Center for Biological Diversity *et al*. 2004). We reviewed the petition and determined that it did not contain new information on the species and that the listing was warranted, but continued to be precluded by other higher priority listing actions (70 FR 24869; May 11, 2005).

Multi-District Litigation

In 2011, in resolution of litigation brought by WildEarth Guardians and the Center for Biological Diversity, we agreed to submit either a proposed rule or a not-warranted finding for 251 candidate species no later than September 30, 2016 (*re Endangered Species Act Section 4 Deadline Litigation, Misc. Action No. 10–377 (EGS), MDL Docket No. 2165* (D.D.C., September 9, 2011)). We have developed this Species Report to assist in providing the biological evaluation on whether *Eriogonum kelloggii* or *Sedum eastwoodiae* should be considered for listing under the Act.

SPECIES DESCRIPTIONS

Eriogonum kelloggii:

Eriogonum kelloggii (Figure 2) is a perennial herb and member of the buckwheat family (Polygonaceae) which forms loose spreading mats 8–17.5 in. (20–50 cm) in diameter. The leaves are clustered on low stems and the leaf blades are 1.7–4 in. (4–10 cm) in length, and are oblanceolate, and silvery-silky, especially below. The blooms are ball-shaped, composed of several smaller flowers about 0.25–0.37 in. (5–7 mm) in size and whitish to rose in color with reddish midribs (Hickman 1993, pp. 854–877). The species is similar to *E. douglassii* and *E. caespitosum* but with a smaller flowering head, smaller leaves, and is more condensed and alpine-like in form (Gray 1870, p. 293).

Eriogonum kelloggii is a serpentine endemic which is found on dry ridges in rocky barren, openings in lower montane coniferous forests between 1,900 and 4,100 ft (580 and 1,250 m) in elevation (Munz and Keck 1973, p. 339; Jennings 2003, pp. 1–8). The exact lifespan of *E. kelloggii* is not known although other *Eriogonum* species occupying similar restricted habitats and which are adapted to similar environmental and ecological conditions (e.g., xeric conditions,

limited resources, tolerance of unique soils) have long lifespans and tend to grow slowly and favor individual persistence (Anderson 2006, pp.1–73). Although we cannot quantify the exact lifespan for the species, based on the persistence of monitored *E. kelloggii* populations we would expect the lifespan of plants to also be long.

Figure 2. *Eriogonum kelloggii*, Red Mountain, Mendocino County California (USFWS).

Sedum eastwoodiae:

Sedum eastwoodiae (Figure 3) is a perennial succulent and member of the stonecrop family (Crassulaceae) that stands 2.7–7.1 inches (in.) (7–19 centimeters (cm)) tall. The leaves are rounded to barely notched and form rosettes that are 0.8–2.7 in. (1–6 cm) in diameter. Rosette leaves are 0.8–1.14 in. (10–29 millimeters (mm)), widest at approximately 0.34 in. (6 mm) below the tip, and 0.07–0.2 in. (2–5 mm) thick. The leaves on the stem stalk are 0.2–0.7 in. (4–17 mm), and are truncated to rounded at the base. The blooms are composed of 10–26 dark pink to dark red flowers with light red to purple anthers (Denton 1993, pp. 531–533). The species sometimes forms tufted mats.

Sedum eastwoodiae occupies relatively barren, rocky openings and cliffs, generally on west-faced slopes, in lower montane coniferous forest habitats between 1,900 to 4,100 ft (580 to 1,250 m) in elevation (Jennings 2003, p. 2). The species occurs on soils that are derived from serpentine rock. The exact lifespan of *S. eastwoodiae* is not known although other *Sedum* species occupying similar restricted habitats and which are adapted to localized environmental and ecological conditions (e.g., xeric conditions, limited resources, tolerance of unique soils) have long lifespans. Although we cannot quantify the exact lifespan for the species, based on the persistence of monitored *S. eastwoodiae* populations we would expect the lifespan of plants to also be long.

Figure 3. *Sedum eastwoodiae*, Red Mountain, Mendocino County California (Photograph ©2014 Carex Working Group (CalFlora)).

TAXONOMY

Eriogonum kelloggii:

Gray (1870, p. 293) described this taxon from specimens collected in 1869 by Dr. A. Kellogg from the type locality at Red Mountain, Mendocino County, California. The species is sometimes known as Kellogg's buckwheat (Hickman 1993, p. 874; CDFG 2005, unpaginated; CDFW 2014a, pp. 1–6). Based on the available information, this species is a valid taxon.
Sedum eastwoodiae:

Nathaniel Britton first described this taxon as *Gormania eastwoodiae* in 1903, based on specimens from Red Mountain, Mendocino County, California, collected by Alice Eastwood (Britton and Rose 1903, p. 31). Nomenclatural changes followed, and in 1975 the taxon was reduced to the sub-specific level by Robert Clausen, renaming it *Sedum laxum* ssp. *eastwoodiae* (Clausen 1975, pp. 399–403). Melinda Denton returned the species to *S. eastwoodiae* (Denton 1982, p. 65; Denton 1993, pp. 531–533). Based on the available information, this species is a valid taxon.

SPECIES LOCATION AND LAND OWNERSHIP/MANAGEMENT

Species Location

The Red Mountain buckwheat (*Eriogonum kelloggii*) and Red Mountain stonecrop (*Sedum eastwoodiae*) are plant species endemic to serpentine habitat of lower montane forest in the northern Coast Range at Red Mountain in Mendocino County, California. The majority of the range of both species overlap except where *E. kelloggii* extends farther south than *S. eastwoodiae* to a 900-square-foot (ft^2) (84-square-meter (m^2)) area on adjacent Little Red Mountain. The area occupied by both species at Red Mountain is scattered over approximately 4 square miles (mi^2) (10.4 square kilometers (km^2)).

Land Ownership

Land ownership within the Red Mountain and Little Red Mountain area includes Federal (BLM), State (CDFW), and private lands. The majority of areas containing *Eriogonum kelloggii* and *Sedum eastwoodiae* populations are owned and managed by BLM and the CDFW (Figures 4 and 5). The remaining populations are located on lands previously owned by Coombs Tree Farm of Garberville, California. The majority of these areas have been recently acquired by the BLM. The BLM is working to acquire additional private lands from willing landowners within the area that would help consolidate their ownership. Only one portion of the areas mapped as containing *E. kelloggii* and two portions of the areas mapped containing *S. eastwoodiae* are located on private land.

Land Management Designations

In 1979, BLM designated 6,173 acres (ac) (2,498 hectares (ha)) of BLM land at Red Mountain as a wilderness study area (WSA). In 1984 (updated in 1989), BLM also designated 6,895 ac (2,790 ha) of the area as an Area of Critical Environmental Concern and Research Natural Area (ACEC/RNA).These designations provide protection and focused management direction toward conservation of the unique botanical and soils values of the Red Mountain area (BLM 1995, pp. 3–6 to 3–9). As a result of these designations, BLM developed a resource management plan (RMP) for the area (BLM 1995, pp. 2–32 to 2–37). The Red Mountain ACEC/RMP is site-specific and excludes livestock grazing and off-road vehicle use from the area and guides overall management activities within BLM's Arcata Field Office's jurisdiction.

In addition, the BLM lands in the Red Mountain area (including those identified above) have also been designated by Congress as part of the South Fork Eel River Wilderness Area

through the Northern California Coastal Wild Heritage Wilderness Act of October 17, 2006 (Pub. L. 109–362) (Figure 5).

The designation removed the WSA status for the area and officially designated the area as wilderness. Under the designation, BLM is directed to manage designated wilderness in a manner that retains the wilderness character for future generations. Within Wilderness areas, no new roads can be developed and no mechanical equipment can be used.

Figure 4: South Fork Eel Wilderness Area (Photo: M. Kauffmann)

The portion of Little Red Mountain containing one population of *Eriogonum kelloggii* is owned and managed by CDFW as an ecological reserve (Little Red Mountain Ecological Reserve). State ecological reserves are established to provide protection for rare, endangered, or threatened native plants, wildlife, aquatic organisms and specialized terrestrial or aquatic habitat types. The CDFW designated *E. kelloggii* as a State endangered plant in April of 1982 (CDFG 2005, unpaginated; CDFW 2014a, pp. 1–6). Public entry and use of ecological reserves are to be compatible with the primary purposes of the reserve, and subject to the applicable general rules and regulations for conservation of the area as outlined in Title 14 of the California Code of Regulations at section 630 (CDFW 2014b, pp. 1–14).

Population Surveys

Survey efforts for the species were conducted in 1986 (Baad 1987, p. 4) and again in 2003 (Jennings 2003, p. 8). These efforts mapped the majority of *Eriogonum kelloggii* and *Sedum eastwoodiae* occurring within the Red Mountain and Little Red Mountain area including some surveys on private lands. Most of the occurrences mapped by Baad on BLM land in 1986 (Baad 1987, p. 4) were also found by Jennings in 2003 (Jennings 2003, p. 8). These limited monitoring efforts indicate that both species have fairly stable populations relative to their distribution in this timeframe. BLM has been informally monitoring the populations and habitat periodically and have not observed any major declines or expansions of the populations monitored although the survey efforts have not been of the complete area or on a regular basis. The single occurrence documented on Little Red Mountain (50 plants in 2003) is under the jurisdiction of the CDFW within the Little Red Mountain Ecological Reserve (Dave Imper, U.S. Fish and Wildlife Service, 2003, p. 1) (Figure 5). See the POPULATION ESTIMATES/TRENDS section below for additional information.

Eriogonum kelloggii:

Of the 44 occupied polygons mapped on Red Mountain by Jennings (2003, p. 2), 42 are located entirely on BLM lands and the 1 population is partly on BLM land, and 1 population on State land. Almost the entire population is located on lands managed by the BLM; however, less than one percent is under the management of the CDFW.

Sedum eastwoodiae:

Of the 27 known occupied polygons mapped or documented on Red Mountain by Jennings (2003, pp. 1–8), 25 polygons were located on BLM lands. In October 2006, the BLM portion of the distribution was designated the Red Mountain Unit of the South Fork Eel River Wilderness Area. The remaining two polygons are located partly on BLM lands and partly on private lands. Some of the private lands were previously owned by Coombs Tree Farm of Garberville, California, and the Silver Peak Mining Company, but these lands were recently acquired by BLM in 2013. Additional undocumented occurrences may exist on private land. Based on presence of suitable soils in the area, an additional 5 to 20 percent of the distribution is expected to occur on private property, with the remainder on BLM property (Figure 5).

Historical and Current Range/Distribution

Both *Eriogonum kelloggii* and *Sedum eastwoodiae* occupy relatively barren, rocky openings and cliffs, generally on west-faced slopes, in lower montane coniferous forest habitats. Soils are derived from serpentine rock and are restricted in distribution by their dependence on serpentine soils. Consequently, their occurrence is limited to suitable soil deposits and morphology. Soil disturbance, for the most part, has been limited to construction of roads and fire breaks, and exploratory mining. The amount of soil disturbance has not been quantified, and a correlation of soil disturbance to plant abundance and distribution has not been made.

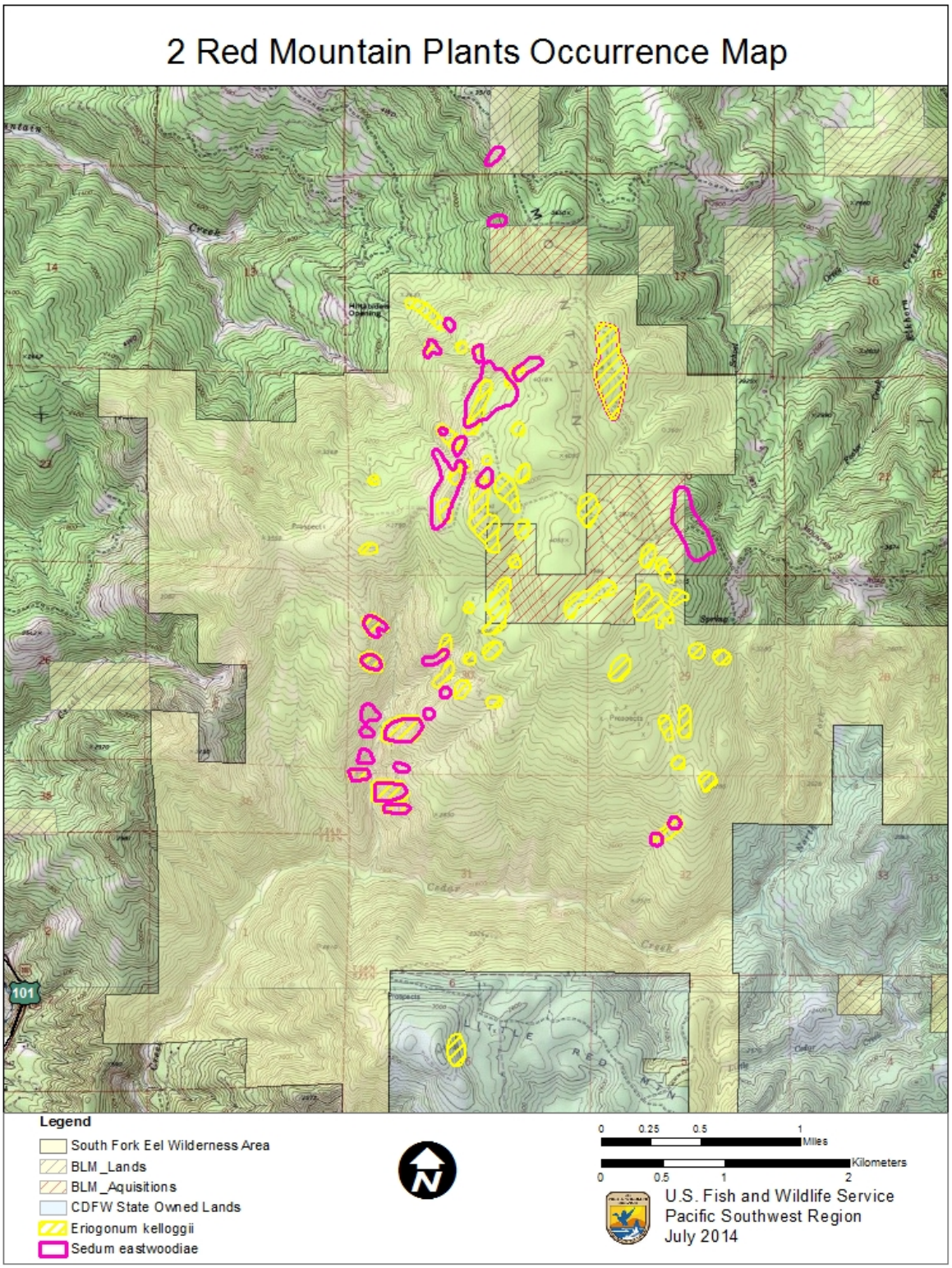

Figure 5: Land Ownership and *Eriogonum kelloggii* and *Sedum eastwoodiae* occurrence information for the Red Mountain Area

Eriogonum kelloggii:

Eriogonum kelloggii also appears to have always been rare, and is currently known to occupy 900 ft^2 (80 m^2) of habitat at Little Red Mountain, and an estimated 81 ac (32 ha) of habitat scattered over 4 mi^2 (10.4 km^2) at Red Mountain, Mendocino County, California. *E. kelloggii* was as listed as an endangered plant by the State of California in 1982 under the California Endangered Species Act (CESA) (CDFW 2014a, pp. 1–6).

Sedum eastwoodiae:

Sedum eastwoodiae appears to have always been rare, and is currently known to occupy approximately 54 ac (22 ha) of habitat scattered over about 4 mi^2 (10.4 km^2) on Red Mountain, Mendocino County, California.

Further studies are being conducted to determine the location and size of existing *Eriogonum kelloggii* cluster and their associates on Red Mountain serpentines. Populations of this species occur on BLM land, and a small area of this species' habitat occurs within the CDFW's Little Red Mountain Ecological Reserve. There is no management plan for the Little Red Mountain Ecological Reserve and, due to workload priorities, a plan will not likely be forthcoming in the near future (S. Koller, CDFW, pers. comm. 2013).

Population persistence

The location, distribution, and abundance of *Eriogonum kelloggii* and *Sedum eastwoodiae* populations coincide with their known historical distribution and have remained fairly stable relative to their distribution over at least the past 30 years. This is based on information from botanical records and observations (Gray 1870, p. 293; Britton and Rose 1903, p. 31), petition information (Smithsonian 1975, entire; Ayensu and DeFilipps 1978, entire), candidate determinations (40 FR 27823, July 1, 1975; 45 FR 82479, December 15, 1980), population monitoring (Baad 1987; Baad 1998; Baad 2002; Jennings 2003), and candidate assessments and reviews (71 FR 53756, September 12 2006; 72 FR 69034, December 6, 2007; 73 FR 75176, December 10, 2008; 74 FR 57804, November 9, 2009; 75 FR 69222, November 10, 2010; 76 FR 66370, October 26, 2011; 77 FR 69993, November 21, 2012; 78 FR 70103, November 22, 2013).

LIFE HISTORY

Habitat Requirements

Both *Eriogonum kelloggii* and *Sedum eastwoodiae* are serpentine endemics found in rocky barren openings in lower montane coniferous forests between elevations of about 1,900 ft (580 m) on the south-faced slope above Cedar Creek, up to about 4,100 ft (1,250 m) at the top of Red Mountain and onto Little Red Mountain (Jennings 2003, p. 2). Serpentine soils are those formed from weathered rock that contains serpentine minerals or other heavy metals such as chrysolite, antigorite, lizardite and others (University of California 1993, pp. 1–3). The serpentine habitat of the lower montane forest in the northern Coast Range at Red Mountain in

Mendocino County, California, are thinly soiled and often support plant species which have become uniquely adapted to this harsher environment, including *E. kelloggii* and *S. eastwoodiae* (Whittaker 1954, pp. 258–288; Kruckeberg 1984, pp. 6–12, 18–21, 34–35, 48–50, 113, 121). *Eriogonum kelloggii* generally occurs with an open overstory that may include *Pinus jeffreyi* (Jeffrey pine), *P. lambertiana* (sugar pine), and *Calocedrus decurrens* (incense cedar), and in a few cases, dense *P. attenuata* (knobcone pine); whereas *S. eastwoodiae* occurs in rocky, open habitat with little if any canopy cover (Goforth 1980, pp. 16–19). The shrub canopy may include *Garrya buxifolia* (silk tassel), *Quercus vaccinifolia* (huckleberry oak), *Arctostaphylos canescens* (hoary manzanita), and *Ceanothus pumilus* (Siskiyou mat). The northernmost occurrence of *Cupressus sargentii* (Sargent cypress), a species considered "vulnerable" by the International Union for Conservation of Nature and Natural Resources (IUCN) (Farjon 2013, entire), overlaps with the distribution of *E. kelloggii* and *S. eastwoodiae* on the south side of Red Mountain.

Based on survey and monitoring information (Baad 2002; Jennings 2003), *Eriogonum kelloggii* is sometimes found on very steep and unstable ground and some occupied areas are located in the extreme upper reaches of shallow draws, which experience some seasonal moisture. One unusual observation of *E. kelloggii* was located on flat ground (identified as site B9) that bore some resemblance to a vernal pool which still held standing water in mid-June (Jennings 2003, p. 2). Survey and monitoring information has suggested that *E. kelloggii* appears to exhibit a slight preference for southern exposures, though this trend is weak and would need further corroboration (Jennings 2003, p. 2).

Soils

Eriogonum kelloggii and *Sedum eastwoodiae* are restricted to ultramafic rocks, chiefly peridotite, and soils ranging from recently exposed serpentine to very old weathered lateritic soil (a red residual soil rich in iron and aluminum). The parent ultramafic rocks are rich in magnesia, silica, and iron and contain various amounts of nickel (Kruckeberg as cited in Whittaker 1954, p. 267). As a result of weathering over long periods, reddish soils form in areas such as the summit dome of Red Mountain, where iron has been oxidized, and the silica and magnesia leached out. Residual metals, including iron, nickel, and chromium, occur in relatively high concentrations. Nickel concentrations, for example, may exceed 2 percent nickel oxide (Jenny 1977, p. 1). The ultramafic rock exposure and associated soils at Red Mountain and Little Red Mountain (referred to hereafter as the RM-LRM serpentine exposure) are isolated from other ultramafic deposits in northern California, and are associated with all current and historic locations recorded for *E. kelloggii* and *S. eastwoodiae*. The RM-LRM exposure occupies approximately 6,000 ac (2,400 ha) straddling Cedar Creek, and exhibits four distinct soil map units (equivalent to soil types) found nowhere else in Mendocino County (Rittman and Thorson 1988, p. 155). The RM-LRM is distinguished by the proportions of the following three soil series it contains: (1) Shallow Entisols (Hiltabidel Series); (2) moderately deep Inceptisols (Dann Series); and (3) very deep Ultisols (Littlered Series). These are reddish (2.5–5 YR hues) soils that are slightly acid to neutral. A sample from the Littlered subsoil at the type location contained 33 percent citrate-dithionite extractable iron, which would contain some percentage of ferric oxyhydroxide (FeOOH) or goethite (Fe_2O_3). The soil probably contains appreciably more goethite than hematite, although it is hematite that imparts the reddish hues to the soils. A more compete

analyses of the Littlered soil on Red Mountain indicate that it is classified as a Xeric Kanhapudult soil type (Alexander *et al.* 2007, pp. 318–319).

Of the four soils that cover this area, the Dann-Hiltabidel Complex, on 30–50 percent slopes, and the Dann-Littlered-Hiltabidel Complex, on 5–30 percent slopes, together cover just over half of the RM-LRM serpentine exposure. The Hiltabidel-Dann complex soil, on 5–75 percent slopes, covers about a third of the area. These soils are all less than 31 in. (79 cm) deep. The remainder of the exposure, including a small area just below the top of Red Mountain, and much of the top of Little Red Mountain, are mapped as Littlered clay loam, a deep lateritic soil found normally on mild slopes. Based on the current distribution map for *Eriogonum kelloggii* and *Sedum eastwoodiae,* the two species occur on all four of the soil types, although rarely associated with the Littlered clay loam.

Climate

Climate at Red Mountain is classified as Mediterranean, with hot dry summers, cool wet winters, and a majority of precipitation occurring between November and April. Mean annual precipitation at Richardson Grove State Park, 9 mi (14 km) northwest of Red Mountain at a 200 ft (61 m) elevation is 69 in. (175 cm) (Western Regional Climate Center 2009). Average daily minimum and maximum temperatures at Richardson Grove in July and August are 53º and 86º Fahrenheit (F) (11º and 30º Celsius (C)), and in December are 37º and 49º F (3º and 9º C) respectively. Climate is somewhat more extreme on top of Red Mountain where *Eriogonum kelloggii* and *Sedum eastwoodiae* are more likely to occur.

Fire

Fire is an important factor affecting vegetation patterns in general across the Klamath Bioregion and appears particularly important in maintaining many open habitats, including at least a portion of *Eriogonum kelloggii* and *Sedum eastwoodiae* habitat (Skinner *et al.* 2006, pp. 175–178; Skinner *et al*. 2009, pp. 76–98). Pre-European settlement fire-return intervals for Jeffrey pine/grassland communities, while variable, in some cases ranged as little as 8 to 15 years between fire events (Skinner *et al*. 2009, pp. 83–84). A decline in fire frequency in the 20th century due to fire suppression has allowed conifer encroachment and establishment of dense shrub stands in many areas of the region.

POPULATION ESTIMATES/TRENDS

Eriogonum kelloggii:

Mapping efforts for the species were conducted by Baad in 1986 (BLM lands) (Baad 1987, p. 4) and again by Jennings in 2003 and 2004 (BLM and Private lands) (Jennings 2003, p. 8). Jennings (2003, p. 8) mapped the majority of *Eriogonum kelloggii* occurring on Federal lands within the Red Mountain area, and a portion of the species occupying privately held lands at Red Mountain in 2004. Those private lands have been recently acquired by BLM during 2013. The 2003–2004 mapping effort identified 41 polygons, which encompassed approximately 67 ac (27 ha), scattered over about 4.0 mi^2 (10.4 km^2) that were mapped on BLM

lands, and three polygons encompassing an estimated 14 ac (5 ha) on the acquired private lands. The polygons ranged in size from less than 1 ac (0.4 ha) to nearly 10 ac (4 ha). Jennings (2003, p. 2) estimated a minimum total population of *E. kelloggii* of approximately 6,500 plants (Table 1). A total of 44 polygons have been mapped for this species (Table 1; Figure 5). However, the above area and species population estimates do not include potential habitat located on the steep slope above Cedar Creek or on private lands located away from access roads. Based on the distribution of suitable soils in the area, the unsurveyed areas may be occupied and could contribute up to an additional 20 percent (approximately 12,600 plants) to the estimate of total occupied habitat and population although these areas would need to be surveyed to confirm occupation. As stated above, BLM has recently acquired additional lands within the area of Red Mountain. Surveys are planned to determine if *E. kelloggii* occurs on those newly acquired lands, possibly as soon as 2014.

Table 1. Summary of habitat variables for all polygons. Aspect numbers show the percentage of polygons for each species that fall within a quadrant bordered by +/- 45 degrees to either side of the cardinal direction (Jennings 2003).

	ERKE	SEEA
Avg. Elevation (ft)	3,300	2,950
Max. Elevation (ft)	4,100	4,100
Min. Elevation (ft)	1,900	1,900
Avg. Shrub Cover	34 %	19 %
Avg. Canopy Cover	8 %	6 %
Avg. Slope	47 %	128 %
Aspect	N: 26%	N: 14 %
	E: 13%	E: 19 %
	S: 32%	S: 10 %
	W: 29%	W: 57 %
Number of polygons	44	25
Minimum population estimate	6,500	5,300

In 2003, on Little Red Mountain, staff from the Service and CDFW located what is thought to be the historical site for *Eriogonum kelloggii* collected by Dr. A. Kellogg in 1869 (Dave Imper, U.S. Fish and Wildlife Service, pers. comm. 2003). The site is owned by the State of California and managed by CDFW. A total of 50 plants were observed in 2003. A search of suitable habitat elsewhere on Little Red Mountain found no additional plants.

Baad annually monitored 13 permanent plots which were 16 ft^2 (5 m^2) in size, at three study sites on Red Mountain between 1987 and 1998, and again in 2002 (Baad 2002, pp. 2–39). Individual plants were counted, mapped, measured, and classified as to reproductive class. His research showed considerable annual variation in plant density and reproductive success, but no discernible long-term trends at two of the three study sites (Baad 2002, p. 5). One study site exhibited a decline in plant density by 65 percent over the past 11 years, and a second area exhibited a pronounced reduction in reproductive success since 1998. The latter study area is located adjacent to and within a stand of *Pinus attenuata* that burned approximately 40 years

ago. The decline in reproductive success may be a result of progressive growth of trees and shrubs leading to canopy closure as part of the recovery from fire (Baad 2002, pp. 5–6).

As with *Sedum eastwoodiae*, most of the historic occurrences of *Eriogonum kelloggii* mapped by Baad on BLM land in 1986 (Baad 1987, p. 4) were again found by Jennings in 2003 (Jennings 2003, p. 2). However, the low resolution of the 1986 mapping effort and the limited scope of the 2003 mapping effort makes it difficult to determine population trends.

Sedum eastwoodiae:

Mapping efforts for the species were conducted by Baad in 1986 (Baad 1987, p. 4) and again by Jennings in 2003 (Jennings 2003, p. 8). These efforts mapped the majority of *Sedum eastwoodiae* occurring within the Red Mountain Wilderness. Most of the historic occurrences mapped by Baad on BLM land in 1986 (Baad 1987, p. 4) were also found by Jennings in 2003 (Jennings 2003, p. 8). Jennings identified 25 occupied polygons encompassing an estimated 54 ac (22 ha) on BLM lands. The polygons ranged in size from less than 0.25 ac (0.1 ha) to nearly 10 ac (4 ha). At least two occupied polygons, not included in the survey, occur on private lands nearby. Those private lands have recently been acquired by BLM during 2013. Those polygons probably encompass less than 1 ac (0.4 ha) total (Dave Imper, U.S. Fish and Wildlife Service, pers. comm., 2003). Jennings (2003, p. 2) provided a conservative estimate of 5,300 plants as the minimum total population of *S. eastwoodiae* observed in his survey effort. Future surveys may be conducted on the newly acquired lands, possibly as soon as 2014.

Baad monitored eight, 16 ft^2 (5 m^2) permanent plots within four general areas of Red Mountain annually from 1987 to 1998, and again in 2002 (Baad 2002, pp. 2–42). Individual plants were counted and mapped in each plot and classified as seedlings, non-reproductive, or reproductive plants. The canopy cover of *Sedum eastwoodiae* in the plots ranged between 64–104 in^2/plot (414 and 671 cm^2/plot) between 1988 and 2002, with no consistent trend exhibited over that period (Baad 1998, p. 8). Plant densities for *S. eastwoodiae* were more stable from year-to-year than its canopy coverage, apparently due to strong survivorship; however seedling success and inflorescence production varied even more than canopy coverage over the 15-year study (Baad 2002, p. 6). One of the plots was lost between 1998 and 2002, due to a rockslide prior to the 2002 sampling period (Baad 2002, p. 6). Sampling and censusing data were focused primarily on *S. eastwoodiae*, though one polygon also contained *E. kelloggii* and two contained *A. macdonaldiana* (Tables 2 and 3).

Table 2. *Eriogonum kelloggii* (ERKE) and *Sedum eastwoodiae* (SEEA) census data for two polygons ((Jennings 2003)).

Polygon	Area (ft2)	SEEA	ERKE
D11	2,400	297	0
A17, B32, D12	8,000	158	2

Table 3. *Eriogonum kelloggii* (ERKE) and *Sedum eastwoodiae* (SEEA) census data from polygon B30 and D10 (Adapted from Jennings 2003).

	SEEA	ERKE
Transect area	3770 ft^2	3770 ft^2
% of polygon	9%	9%
Abundance in transect	168	117
Extrapolated abundance in polygon	1867	1300

As stated above, most of the historic occurrences mapped by Baad on BLM land in 1986 (Baad 1987, p. 4) were also found by Jennings in 2003 (Jennings 2003, p. 8). However, the low resolution of the 1986 mapping effort and the limited scope of the 2003 mapping effort makes it difficult to determine population trends for the species.

STRESSORS

Introduction

Although this species report is intended to identify the biological information, requirements, and stressors affecting the two species, we will ultimately be required to use this information to make a determination under section 4 of the Act, and its implementing regulations at 50 CFR part 424, as to whether the two species need to be added to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on any of the following five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence. Listing actions may be warranted based on any of the above factors, singly or in combination. In order to organize the biological information for a later listing determination, we have organized the stressors affecting the two species by the five factors. By doing so, we are not concluding that the information presented here rises to the level of needing protection under the Act, as this determination will only be made after review of this information in the context of a listing determination under the Act. The information pertaining to the two species organized by the five factors is discussed below. In addition, Table 4 (below) summarizes the stressors for both species over time since the species was first identified as a candidate for listing.

Definition of Terms for Table 4:

Stressors: Stressors are the activities or processes that have caused, are causing, or may cause in the future, impacts to *Eriogonum kelloggii* and *Sedum eastwoodiae*, or their habitat. Stressors are primarily related to human activities, but can be natural events. Impacts of human activities may be direct, such as destruction of habitat, or indirect, such as introduction of invasive species. Stressors may be currently observed or inferred, or they may be projected to

occur into the near future. Overlaying stressors, such as human population growth, are not included.

Scope: Scope is the proportion of the *Eriogonum kelloggii* and *Sedum eastwoodiae* population that can reasonably be expected to be affected by a stressor (expressed as a percentage), given continuation of current circumstances and trends (defined below). Current circumstances and trends include both existing and potential new stressors.

Timing: Although timing (immediacy) is recorded for each stressor, it is not used in the calculation of impact. Additionally, the impact is not calculated for the stressor where timing values are long-term future or past/historical. The following are Timing Categories:

Ongoing – continuing (presently occurring or a concern)

Near-term future – only in the future (could happen in the short-term [< 10 years]), or now suspended, but could come back in the short-term

Long-term – only in the future (could happen in the long-term [10+ years]), or now suspended but could come back in the long-term.

Table 4. Stressors Identified as Impacting *Eriogonum kelloggii* and *Sedum eastwoodiae* Over Time

Stressor	At Time of Petitions 1974/1978	As Candidates 1980-2012	Present 2013-2014	Current Scope
Mining	Yes	Ongoing	Greatly Reduced or Eliminated	Red Mountain
OHV Use	Not Identified	Yes	Decreased	Red Mountain
Road Construction	Not Identified	Yes	Decreased	Red Mountain
Trail Construction (authorized)	Not Identified	Potential	Potential	Red Mountain
Illegal Marijuana Cultivation	Not Identified	Yes	Decreased	Lower Elevations
Wildfire (Mgt. and Suppression)	Not Identified	Yes	Stable	Everywhere
Vegetation Encroachment/Mgt.	Not Identified	Yes	Potential	Portions of Range
Effects of Climate Change	Not Identified	Yes	Stable (changes may offset each other)	Everywhere
Small Population Size	Yes	Yes	Stable (adapted to small population size)	Everywhere
Inadequacy of Regulatory Mechanisms	Yes	Yes	No	Everywhere

STRESSORS AFFECTING *Eriogonum kelloggii* and *Sedum eastwoodiae*:

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

Some of the same potential activities that affect the habitat of *Eriogonum kelloggii* and *Sedum eastwoodiae* can also affect individual *E. kelloggii* and *S. eastwoodiae* plants. While these impacts to *E. kelloggii* and *S. eastwoodiae* fit under Factor E (Other Natural or Manmade Factors Affecting Its Continued Existence), they are included here in the Factor A discussion for ease of analysis.

Mining

Much of Red Mountain is administered by BLM, but because of chromium, nickel, and chromium deposits, extensive mining claims exist. Although the region has been recognized by BLM as an Area of Critical Environmental Concern (ACEC) and Wilderness, it remains open to mining on existing claims and there is the potential that the rare plants and their habitat may be subject to disturbance from mining activities. Little Red Mountain is managed by CDFW as an Ecological Reserve and is not subject to mining claims.

The entire known distribution of *Eriogonum kelloggii* and *Sedum eastwoodiae* at Red Mountain continues to be held under unpatented lode and/or placer mining claims, or occurs on privately owned lands owned by individuals with past or current mining interests (BLM 2009, unpaginated). The single population of *E. kelloggii* at Little Red Mountain is protected from mining. Mining could remove plants, degrade habitat, alter drainage, compact soils, and introduce contaminants. However, no mining is currently conducted on BLM or private lands, and no validity exams have been conducted on any of the mining claims (see information on validity claim process below). During 2013, BLM was able to acquire some of these private lands (see Figure 5). Consequently, the previously private lands are now within designated Wilderness, and subject to BLM's management.

On October 17, 2006, under the Northern California Coastal Wild Heritage Wilderness Act of 2006 (Public Law 109-362), 6,500 ac (2,630 ha) on and around Red Mountain were designated as wilderness, and added to the existing South Fork Eel Wilderness Area. That legislation specifically retained valid land rights, such as mining claims, in existence on the date of enactment. However, the area was withdrawn from all new forms of: (1) entry to, appropriation, or disposal of lands under the public land laws; (2) locating, entering, and establishing new patents under Federal Mining Law, and (3) disposition under all laws pertaining to mineral and geothermal leasing or mining of materials. Consequently, no new mining claims can be established within the South Fork Eel Wilderness Area; however, existing claims may continue under strict regulation.

For the existing claims within Wilderness Areas, before BLM may approve a mining plan of operations, the BLM minerals staff must conduct a validity examination to determine if the claim is valid (J. Willoughby, BLM, pers. comm. 2007). The validity exam involves a determination of whether a mining operation on the claim was economically viable at the time

the claim was filed. Because there are different claimholders on Red Mountain that likely filed claims at different times, separate validity exams would need to be performed, raising the cost of conducting the examination. Due to the high cost of the validity examinations, BLM typically only does them when a plan of operations is filed by a claimholder (J. Willoughby, BLM, pers. comm. 2007). The BLM has 60 days to determine if sufficient information was provided to conduct a validity examination, and then 2 years to complete the examination. If the validity examination fails, the claim is cancelled. If the claim is determined to be valid, the claimant may file patent to gain ownership to the land, although for short-lived mining operations a patent is often not filed. The BLM does not have the right to deny such a patent; however, they can impose protective measures that avoid or reduce impacts to wilderness characteristics. The majority of recently conducted validity examinations in California have failed (J. Willoughby, BLM, pers. comm. 2007).

Mining activities that occur, have occurred, or potentially could occur at Red Mountain include recreational (casual use), small-scale, and potential commercial (large-scale) mining operations. The historical mining activity that has occurred has been slight (BLM 1994, pp. 1–2).

Recreational and Small-Scale Mining: Recreational mining includes individuals with hand equipment (e.g., shovels, picks), mostly collecting rocks or looking for other mineral deposits and would involve digging and movement of rocks and other small-impact disturbance. Such activity could also destroy or trample individual plants if it occurred within an area occupied by *Eriogonum kelloggii* or *Sedum eastwoodiae*. This type of recreational mining activity has occurred in the past but most likely has diminished due to designation of most of the Red Mountain area as an ACEC and Wilderness Area. Mining activity has also included small-scale mining efforts using mechanical equipment that have been conducted in the past by individuals prior to the area being designated as an ACEC or Wilderness Area or currently on private lands by individual landowners. These areas are typically localized and limited in scope. According to U.S. Geological Survey (USGS) information on mine locations at Red Mountain, 13 mine locations have been identified within the area (USGS-Mineral Resource On-line Spatial Data 2014). Of these mine sites, only two are located within the areas known to contain *E. kelloggii* and *S. eastwoodiae*. This type of activity if it was to occur within an area occupied by *E. kelloggii* or *S. eastwoodiae*, would most likely destroy individual plants by direct removal, crushing, or burying. Review of aerial imagery of these two mine sites shows very limited habitat disturbance of the two areas and no recent activity. In order for mining activities to resume at these small-scale mining sites, they would require authorization by BLM within the ACEC and Wilderness Area (see Figure 6 below).

If recreational, or small-scale mining activities occur in areas occupied by *Eriogonum kelloggii* and *Sedum eastwoodiae*, there may be some limited destruction of plants and habitat. However, the amount of wide-scale recreational and small-scale mining activity on Red Mountain is minimal due to access constraints and these activities have not impacted *E. kelloggii* and *S. eastwoodiae* populations or habitat to a large degree since they were identified as candidate species.

Commercial mining on Red Mountain would most likely be an open-face bench type mining that would involve removal and processing of the mineral-bearing ore containing nickel, chromium, and possibly cobalt (Service 1990, p. 14). Commercial mining activities would remove plants, degrade habitat, alter drainage, compact soils, and introduce contaminants in the affected area. Although an operation plan for such mining activities would require restoration of the affected areas, plant species composition would undoubtedly be altered. Moreover, there is no evidence in the literature indicating *Eriogonum kelloggii* and *Sedum eastwoodiae* are able to recolonize soils once they are disturbed.

With regard to the potential for Red Mountain to be commercially mined, a Bureau of Mines Preliminary Feasibility Study conducted at Red Mountain in 1978 concluded the nickel deposits met the minimum tonnage grade test at the time (i.e., 35 million short tons of material containing an average 0.8 percent nickel) (K. Geer, Service, pers. comm. 1995). However, commercial mining at Red Mountain was not considered economically feasible at the time due to the relatively low grade of the resource (low metal concentrations) and the high cost of mining the material (Geer, pers. comm. 1995). According to current USGS data (Kelly and Matos 2013 [Comps.], entire) on nickel and chromium production and pricing between 1900 and 2014, the unit value (as calculated in 1998 dollars) of both nickel and chromium has not increased significantly since the values reported in 1978 (USGS 2014a, pp. 1–7; USGS 2014b, pp. 1–8). The unit value (1998 dollars) for cobalt as of 2012 has decreased since the values reported in 1978 (USGS 2014c, pp. 1–6). The likelihood and extent of future mining will depend on the future economic feasibility and demand for minerals found in the area. The economic feasibility of mining will be determined by the current market value of the mined ore, as well as cost of extraction, processing, and transportation. As discussed above, over the past 35 years since the last economic feasibility report, the price of nickel, chromium, and cobalt has either risen only slightly or decreased. In addition, because Red Mountain is within designated wilderness, avoidance and mitigation measures to reduce or offset impacts to wilderness characteristics may be added to the cost of extraction and feasibility of mining the area.

The majority of *Eriogonum kelloggii* and *Sedum eastwoodiae* occurrences are within the South Fork Eel River Wilderness Area. The legislation designating the wilderness area specifically retained valid land rights, such as mining claims, in existence on the date of enactment (October 17, 2006). However, the area was withdrawn from all new forms of: (1) Entry to, appropriation, or disposal of lands under the public land laws; (2) locating, entering, and establishing new patents under Federal Mining Law; and (3) disposition under all laws pertaining to mineral and geothermal leasing or mining of materials. Consequently, no new mining claims can be established within the South Fork Eel River Wilderness Area.

For the existing mining claims within the South Fork Eel River Wilderness Area, before BLM may approve a mining plan of operations on existing claims, it must conduct a validity examination to determine if the claim is valid (S. Flanagan, BLM, pers. comm., 2014; 43 CFR 3809.11; 43 CFR 3809.100). The validity examination includes a determination of whether a mining operation on the claim would be economically viable at the time the claim was filed. Because there are different claimholders on Red Mountain that likely filed claims at different times, separate validity exams are performed for each claim, raising the cost of conducting the examination. Due to the high cost of the validity examinations, BLM typically only does them

when a plan of operations is filed by a claimholder (S. Flanagan, BLM, pers. comm., 2014). The BLM has 60 days to determine if sufficient information was provided to conduct a validity examination, and then 2 years to complete the examination. If the validity examination fails, the claim is cancelled. If the claim is determined to be valid, the claimant may file patent to gain ownership to the land, although for short-lived mining operations a patent is often not filed. The BLM does not have the right to deny such a patent; however, it can impose protective measures that avoid or reduce impacts to wilderness characteristics. However, the majority of recently conducted validity examinations in California have failed, and BLM does not expect any new validity examinations to be conducted within the area (S. Flanagan, BLM, pers. comm., 2014).

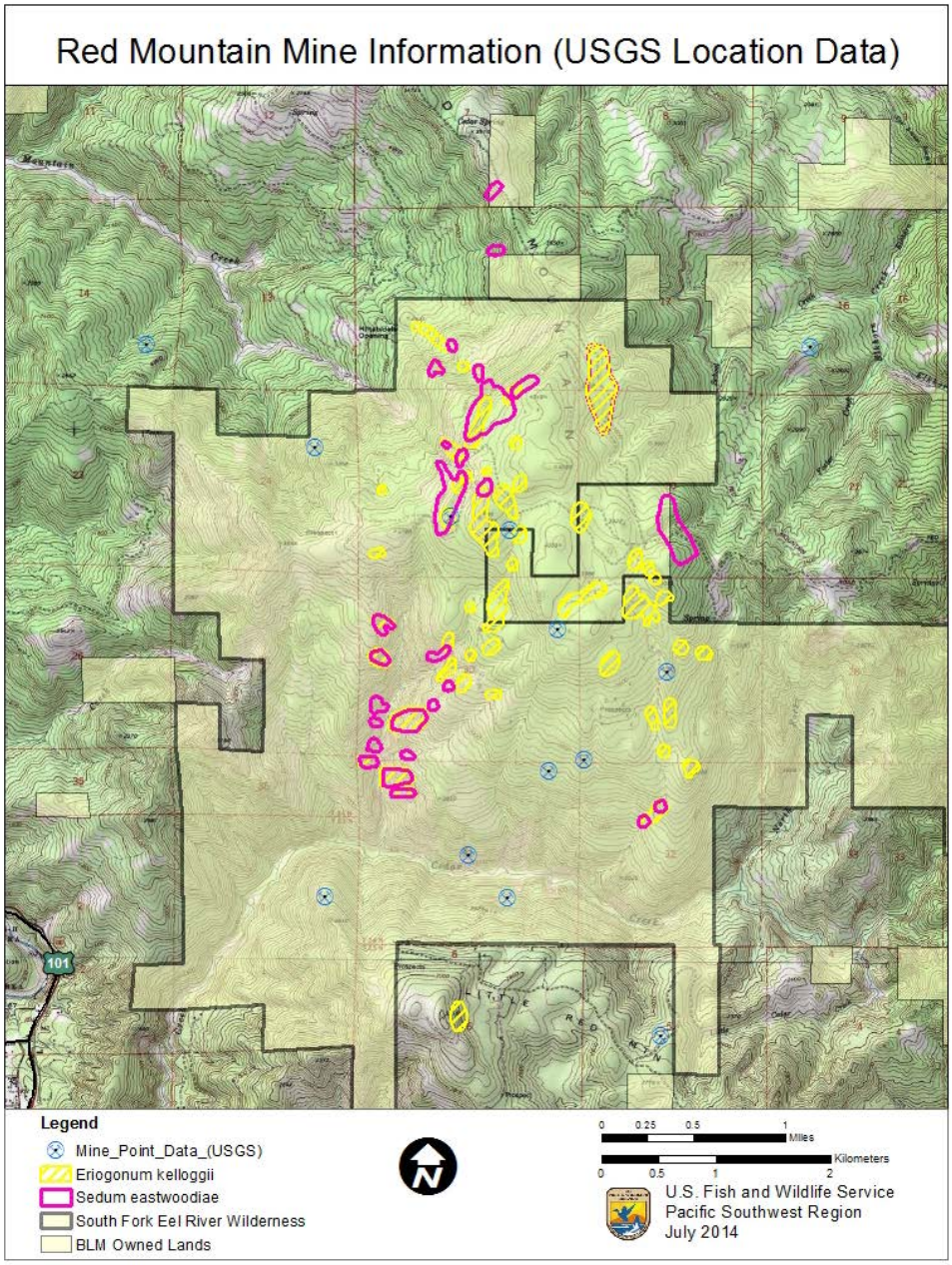

Figure 6. Mines identified within the Red Mountain Area. Point data from USGS Mine Location Information.

Currently, no small-scale or commercial mining activities are being conducted on BLM or adjacent private lands, and no validity exams have been conducted on any of the mining claims within the Red Mountain area. Some recreational mining activities have occurred in the area in the past; however, with the designation of the majority of the area as an ACEC and Wilderness Area, we do not expect these types of activities to be a major concern for *Eriogonum kelloggii* or *Sedum eastwoodiae* or their habitat.

Habitat Disturbance Activities

Activities associated with habitat disturbance in the Red Mountain area other than those discussed above under mining include: Road construction, wildfire management construction activities, unauthorized off-highway vehicle (OHV) use, illegal marijuana cultivation, and trail development. The majority of past habitat disturbance in the Red Mountain area has been caused by road construction, both for access and fire control (Imper and Wheeler, unpubl. data 2009). However, due to the designation of the Red Mountain area as an ACEC and part of the South Fork Eel River Wilderness Area and Little Red Mountain as a State ecological reserve, no new road construction or use of mechanical equipment is permitted in the area. One exception that would still be permitted in the area is for the purpose of wildfire management activities (which may include presuppression, fire-break construction, and access road construction) (16 U.S.C. 1133(d)(1)). See the *Wildfire and Wildfire Management* section, below, for further discussion of these activities and how they may affect the habitat of *Eriogonum kelloggii* and *Sedum eastwoodiae*.

The current unauthorized OHV use and associated habitat disturbance at Red Mountain is largely related to illegal marijuana cultivation. Unauthorized OHV use by illegal marijuana growers crushes vegetation and loosens soil, making it more likely to erode during a rain event. Clearing of vegetation, creation of water impoundments, and diversion of streams can also greatly alter local site conditions. These types of activities should they occur in occupied areas would remove, crush, or destroy individual *Eriogonum kelloggii* or *Sedum eastwoodiae* plants and disturb or alter their habitat. However, currently the majority of known sites on Red Mountain where marijuana cultivation has occurred are at the lower elevation areas adjacent to private lands, near existing roads, or with access to streams, and not near locations where *E. kelloggii* and *S. eastwoodiae* occur (J. Knisley, BLM, pers. comm. 2014). The Red Mountain area where *E. kelloggii* and *S. eastwoodiae* occur is more open to observation and has less forest or vegetation cover, and as a result is most likely less desirable for illegal marijuana cultivation sites. BLM, CDFW, and County law enforcement officials have been working with a local nonprofit organization to remove the growing infrastructure (i.e., irrigation, planting materials, and other debris) from the area (Eel River Recovery Project 2014, pp. 1–5). General public access to the area by vehicle is controlled. Considering the extent of illegal marijuana cultivation in northern California, the potential for these activities to be a threat to *E. kelloggii* and *S. eastwoodiae* is a concern. However, based on the current extent of these activities within the Red Mountain area and the best available scientific and commercial information, we do not consider these activities to result in significant impacts to *E. kelloggii* and *S. eastwoodiae* as a whole, nor do we expect them to become significant in the future.

A proposal to enhance recreational use of the South Fork Eel River Wilderness Area through construction of a foot or horse trail would encourage public use and likely discourage marijuana growing and unauthorized vehicle use (J. Wheeler, pers. comm. 2009). Trail construction will be considered once a wilderness management plan is developed for Red Mountain, and would likely be simple delineation using posts rather than soil disturbance (J. Wheeler, pers. comm. 2013). Habitat for *Eriogonum kelloggii* and *Sedum eastwoodiae* could also potentially be impacted by logging operations, such as cable logging (C. Golec, CDFW, pers. comm. 2005); however, logging of any kind in the absence of a wilderness management plan will not occur. BLM currently does not have a specific timeline for development of a wilderness management plan for the area, and as a result, no trail or logging activities will be authorized for the area in the near future. Due to the tendency of *E. kelloggii* and *S. eastwoodiae* to occur on rock outcrops and rocky slopes, none of the above activities is expected to impact a significant portion of the two species' or their habitat.

Wildfire and Wildfire Management

Fire has been shown to be an important factor affecting vegetation patterns and maintenance of many open habitats, similar to the habitat of *Eriogonum kelloggii* and *Sedum eastwoodiae*, across the Klamath Bioregion (Skinner *et al.* 2006, pp. 175–178; Skinner *et al.* 2009, pp. 76–98). Historically in California, frequent natural and cultural ignitions maintained these disturbance-prone ecosystems dependent on recurrent fire (Holmes *et al*. 2008, pp. 551–552). Pre-European settlement fire-return intervals for mixed conifer stands are thought to have been variable and in some cases ranged as little as 6 to 8 years between events (Skinner *et al.* 2009, pp. 83–84). A decline in fire frequency since European settlement has allowed conifer encroachment or establishment of dense shrub stands in many areas of the region. BLM's general policy is to restore fire to its natural role in the ecosystem (BLM 2012a, pp. 1-25–1-27), except where these activities threaten human life, property, or high value resources on adjacent nonwilderness lands, or where these would result in unacceptable change to the wilderness resource. Wildfire or prescribed burning under certain specific conditions may be used as a wildlife management tool if carefully designed to maintain or enhance the wilderness resource (BLM 2012a, p. 1-26–1-27).

BLM may conduct fire suppression activities within wilderness areas. Fire suppression activities involving uses generally prohibited in wilderness areas (use of motorized equipment or motor vehicles, mechanical transport, construction of roads, and construction of structures or installations) can only occur if authorized by the applicable BLM State Director, unless this authority has been delegated to the District or Field Manager (BLM 2012a, pp. 1-12–1-15, 1-26). These types of activities may have a direct impact on *Eriogonum kelloggii* and *Sedum eastwoodiae* by removing or crushing plants and their habitat.

Indirectly, fire suppression impacts *Eriogonum kelloggii* and *Sedum eastwoodiae* by allowing vegetation to encroach and to become decadent. Relatively dense growth adjacent to areas occupied by *E. kelloggii* and *S. eastwoodiae* can lead to shading, changing the micro-climate around plant clusters, and using moisture in a xeric landscape. Another consequence of long-term fire suppression is the increase in fire hazards when vegetation is permitted to become relatively dense in a dry environment, thereby leading to a potential in more severe fire events,

which may lead to greater habitat destruction. The threat of fire is lessened for *E. kelloggii* and *S. eastwoodiae* in that the plants occur mostly in rocky areas, which in most cases do not contain large build-ups of vegetation. Natural and prescribed fires will be supervised and may be allowed to burn under certain conditions. When fire threatens human life or property, motorized equipment may be used to eliminate or minimize the threat. However, in all cases, the equipment and tactics used to manage fires are designed to minimize the impact to wilderness values (BLM 2012a, pp. 1-25–1-27).

Two fires appear to have influenced the Red Mountain area over the past 90 years: the 1952 Lynch Fire and the 2008 Red Mountain Fire. The 1952 Lynch Fire was the only fire included in the Fire and Resource Map Project's (FRAP) online historical fire database (California Department of Forestry and Fire Protection 2009) for the immediate area of Red Mountain since the 1920s. Evidence suggests the Lynch Fire may have stimulated germination and growth of *Pinus attenuata* (knobcone pine) in some areas within the distribution of *Eriogonum kelloggii* and *Sedum eastwoodiae* on the mountain, which has encroached on their habitat (Service 2013, p. 18), but only in a few cases (Goforth 1980, pp. 16–19). See the *Vegetation Encroachment* section, below, for further discussion of the potential effects of vegetation encroachment. The effects of climate change may also impact habitat conditions and fire frequency and intensity for the Red Mountain area.

The 2008 Red Mountain fire, which was caused by lightning, burned approximately 3,000 ac (1,214 ha) within the South Fork Eel River Wilderness Area (BLM 2008, p. 1). The fire burned some 1,000 ac (405 ha) at the top of Red Mountain, with reportedly 80 percent mortality of brush and 10 percent tree mortality (J. Wheeler, BLM, pers. comm. 2008). The actual burn footprint was highly irregular, and the majority of the burned habitat appeared to have experienced a relatively low intensity ground fire, with little crowning (Imper and Wheeler, unpublished data 2009). The fire also extended to Little Red Mountain and burned to near the boundary of one of the populations of *Eriogonum kelloggii*; the population may have been impacted by the fire control efforts, but no survey of the area was completed (S. Koller, CDFW, pers. comm. 2009). Regardless, in an attempt to restore the impacts of the fire suppression activities, CDFW staff worked extensively with California Department of Forestry and Fire Protection (CalFire) to redistribute the pushed up earth material back over the disturbed areas that had been created for safety zones during the 2008 fires (S. Koller, CDFW, pers. comm. 2014). Some 25 percent of the polygons occupied by *Sedum eastwoodiae* and 42 percent of the polygons occupied by *E. kelloggii* mapped by Jennings (2003, pp. 2 and 8) occur within the boundary of 2008 fire, but the extent to which habitat occupied by either species was directly affected by the fire is unknown.

Changes to wildfire regimes (frequency and intensity) and factors influencing fire (temperature, precipitation, vegetation) have been predicted as a result of climate change (Lenihan *et al*. 2003, pp. 1678–1680; Fried *et al*. 2004, pp. 177–188; Westerling and Bryant 2008, pp. 244–248; Krawchuk *et al*. 2009, pp. 8–10; Cornwell *et al*. 2012, pp. 1–89). However, the results of fire modeling are variable, as the likelihood of future fires and wildfire severity depend on many factors, including pre-suppression activities, fire suppression strategies, human settlement patterns, ignition sources, variability of local climatic conditions, vegetation type, and fuel loading (Fried *et al*. 2004, p. 185; Westerling and Bryant 2008, pp. 231–235; Krawchuk *et*

al. 2009, p. 1; Point Reyes Bird Observatory (PRBO) Conservation Science 2011, pp. 1–59). A 2004 modeling study on the effects of climate change and fire frequency for northern California suggested that there may be an increase in fire risk for northern California as a whole (Fried *et al*. 2004, pp. 177–188), but that northern coastal areas (as represented by the CalFire Humboldt Ranger District) would not change. This was attributed to the models prediction of slower winds and higher humidity offsetting any temperature increases (Fried *et al*. 2004, p. 177). The researchers stated that the majority of fires under both present and predicted future climate scenarios would be of moderate intensity and rates of spread, and are unlikely to become large, damaging fires (Fried *et al*. 2004, p. 177).

With the history of only two recorded fires over the past 90 years, with one of those fires being a low-intensity ground fire with little crowning, the Red Mountain area being more open and less vegetated than surrounding areas, and management focus increased as a result of its designation as wilderness in part for the conservation of rare plants, we do not currently consider wildfire or wildfire suppression to be a significant threat to the habitat of *Eriogonum kelloggii* and *Sedum eastwoodiae* and do not expect the fire conditions or management to change significantly.

Vegetation Encroachment

Habitat modification as a result of natural vegetation changes in the absence of, or as a result of, fire is a stressor to *Eriogonum kelloggii* and *Sedum eastwoodiae*. Encroachment of vegetation into *E. kelloggii* and *S. eastwoodiae* habitat results in the modification of ecological conditions through shading, competition for resources (light, water, nutrients), and greater susceptibility to the effects of fire due to increased fuel. These habitat changes may result in conditions that are not suitable for populations of *E. kelloggii* and *S. eastwoodiae* and may lead to loss of individual plants for both species.

As stated above, fire may have stimulated germination and growth of *Pinus attenuata* (knobcone pine) in some areas within the distribution of *Eriogonum kelloggii* and *Sedum eastwoodiae* on the mountain and encroached on their habitat, but only in a few cases (Goforth 1980, pp. 16–19; Service 2013, p. 18). In addition, Baad (2002, pp. 6–7) recognized suppressed reproductive output in *E. kelloggii* at one site on Red Mountain, and attributed the impact to conifer invasion following a fire that occurred 40 years previously. Baad's monitoring efforts (2002, entire) did not observe specific impacts from vegetation encroachment on *S. eastwoodiae*, but the study was not designed to provide that information. In absence of fire, Baad concluded that *S. eastwoodiae* located on rocky ridge tops and with little woody vegetation appeared relatively stable, but populations situated on deeper soils in more sheltered sites are more vulnerable to shading by competing vegetation (Baad 2002, pp. 6–7). The manner and degree to which the 2008 Red Mountain Fire affected *E. kelloggii* or *S. eastwoodiae*, either positively, by setting back natural succession within their habitat, or negatively, by killing plants, is not known.

Although vegetation encroachment is a concern for both *Eriogonum kelloggii* and *Sedum eastwoodiae*, based on the extent of observed effects, persistence of known populations, and increased management of the area, we do not consider vegetation encroachment to be a significant threat to habitat

Factor B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The best available scientific and commercial information does not indicate that overutilization for commercial, recreational, scientific, or educational purposes is now, or will be in the future, a stressor to *Eriogonum kelloggii or Sedum eastwoodiae*.

Factor C. Disease or Predation

It is likely that predation from invertebrates, insects, and animals on *Eriogonum kelloggii*'s and *Sedum eastwoodiae*'s seeds, vegetative tissue, and roots is occurring on an ongoing basis. Service biologists have documented severed flowering stems, which most likely occurred from small mammal predation (Ken Fuller, U.S. Fish and Wildlife Service, pers. comm. 1994). Because *E. kelloggii* and *S. eastwoodiae* have evolved within this habitat, both species have adapted to some level of predation. There is no evidence from observations of predation on *E. kelloggii* and *S. eastwoodiae* that individuals have been killed from this activity. It is more likely that predation reduces the vigor, including reproductive output, of the two species. However, the best available scientific and commercial information indicates that this level of predation is not a current or expected future significant threat to *E. kelloggii* and *S. eastwoodiae*. In addition, disease is not known to be a current or expected future stressor to *E. kelloggii* and *S. eastwoodiae*.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

Federal Protections

Special Status Species Management: BLM's policy for Special Status Species Management (BLM Manual 6840) includes guidance for the conservation of BLM special status species and their habitat on BLM-administered lands. BLM special status plant species include federally endangered or threatened species and species requiring special management (as determined by BLM State Directors). Management actions are to promote the special status plant conservation for recovery and reduce the likelihood and need for any potential future listing under the Act. Species with "Special Status" receive a higher level of scrutiny on proposed projects with a greater emphasis on species conservation under existing environmental laws and implementing regulations. BLM accomplishes this by implementing proactive conservation measures that reduce or eliminate threats to BLM sensitive species. These measures include: (1) Development of rangewide and or site-specific management plans; (2) implementation of BLM actions that are consistent with objectives for management of those species; (3) actions that at least maintain or improve the species and its habitat at each occurrence; and (4) monitoring populations to determine whether management objectives are being met (BLM 2012b, entire; BLM 2012c, entire). The BLM California State Director has identified California 1B ranked species (including *Eriogonum kelloggii* and *Sedum eastwoodiae*) as BLM Special Status Plants for management and conservation purposes (BLM 2013, pp.1–6).

Areas of Critical Environmental Concern: As stated above, BLM designated the Red Mountain Area as an Area of Critical Environmental Concern (ACEC) Research Natural Area (RNA) in 1984. The area was established in part to protect and conserve sensitive animal and

plant species on the specialized habitat at Red Mountain (BLM 1989, p. 2). The management objectives include: (1) Protect and monitor existing populations of *E. kelloggii* and *S. eastwoodiae*; (2) acquire private lands from willing sellers to consolidate and enhance land management within the Red Mountain area; (3) develop a fire management plan and implement measures to reduce the impacts of suppression activities on sensitive species and their habitat; (4) close the area to public vehicle use and limit private vehicle access to existing roads; (5) close the area to grazing activities; and (6) post boundary signs to assist in appropriate visitor access (BLM 1989, pp. 1–17; BLM 1995, pp. 2–32 to 2–37).

South Fork Eel River Wilderness Area Designation: As stated above, the Red Mountain Area was designated as part of the South Fork Eel River Wilderness Area in 2006. Wilderness areas are those Federal lands recognized as an area where the earth and its community of life are untrammeled by human activity and retain their primeval character and influence, without permanent improvements or human habitation. These areas are protected and managed so as to preserve their natural conditions and (1) generally appear to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) have outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) have at least 5,000 ac (2,023 ha) of land or are of sufficient size as to make practicable their preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

Under the designation, BLM is directed to manage the designated wilderness at Red Mountain in a manner that retains the wilderness character for future generations. Within wilderness areas, there shall be no commercial enterprise and no permanent road within any wilderness area designated and, except as necessary to meet minimum requirements for the administration of the area, there shall be no temporary roads, no use of motor vehicles, no use of motorized equipment, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.

State Protections

California Endangered Species Act: The California Endangered Species Act (CESA) makes it illegal to import, export, “take,” possess, purchase, sell, or attempt to do any of those actions to species that are designated as endangered, threatened, or candidates for listing, unless permitted by CDFW. “Take” is defined as “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill.” Under CESA, CDFW may permit take or possession of endangered, threatened, or candidate species for scientific, educational, or management purposes, and may also permit take of these species that is incidental to otherwise lawful activities if certain conditions are met. Some of the conditions for incidental take are that the take is minimized and fully mitigated, adequate funding is ensured for this mitigation, and that the activity will not jeopardize the continued existence of the species.

California Native Plant Protection Act: The California Native Plant Protection Act (NPPA) was enacted in 1977, and allows the California Fish and Game Commission to designate plants as rare or endangered. The NPPA prohibits take of rare or endangered native plants, but includes some exceptions for agricultural, nursery, and timber operations; emergencies; mining

assessments; and after properly notifying CDFW for vegetation removal from canals, roads, and other sites, changes in land use, and in certain other situations. Section 1911 of the NPPA requires that all State departments and agencies to consult with the CDFW, and use their authorities to carry out programs for the conservation of rare or endangered native plants. Such programs include, but are not limited to, the identification, delineation, and protection of habitat critical to the continued survival of rare or endangered native plants. Please see California Fish and Game Code section 1900 *et seq*. for more information.

California Environmental Quality Act: The California Environmental Quality Act (CEQA) is a law that requires public agencies to analyze and publicly disclose the environmental impacts from projects they approve, and adopt feasible alternatives and mitigation measures to mitigate for the significant impacts they identify. During CEQA review, State public agencies must evaluate and disclose impacts plant species protected under CESA, and in most cases must mitigate all significant impacts to these species to a level of less than significant. In addition, during the CEQA process, public agencies must also address plant species that may not be listed under CESA, but that may nevertheless meet the definition of rare or endangered provided in CEQA. The CDFW advises public agencies during the CEQA process to help ensure that the actions they approve do not significantly impact such resources and often advises that plant species with an appropriate California Rare Plant Rank (as identified by the State or California Native Plant Society) be properly analyzed by the lead agency during project review to ensure compliance with CEQA.

The State of California listed *Eriogonum kelloggii* as endangered under CESA in 1982 (CDFG 2005, unpaginated; CDFW 2014a, p. 4). As a State-listed species, *E. kelloggii* is subject to the conservation provisions of CESA and NPPA, and to the provisions of CEQA. *Sedum eastwoodiae* is not listed by the State of California as an endangered, threatened, or candidate species, but it is identified as a 1B species (rare and endangered throughout its range) maintained by the California Native Plant Society (CNPS) (Smith and Berg (eds.) 1988, pp. 49, 104). Therefore, impacts to *S. eastwoodiae* are evaluated by the lead agency under CEQA, and the lead agency must adopt feasible mitigation measures to mitigate for any significant impacts that they identify.

Factor E. Other Natural or Manmade Factors Affecting its Continued Existence

For ease of discussion, the impacts to individual *Eriogonum kelloggii* and *Sedum eastwoodiae* plants from mining, habitat disturbance activities (unauthorized OHV use, illegal marijuana cultivation, and trail development), wildfire suppression and management, and vegetation encroachment associated with this factor are discussed under Factor A. For a complete discussion of potential impacts to both habitat and individual plants from these activities, see our Factor A discussion, above.

Small Population Size

Other natural or human-caused stressors for *Eriogonum kelloggii* and *Sedum eastwoodiae* are related to its small distribution and overall population size, and the potential impacts of climate change on the species and its habitat. Generally, small populations are more prone to

impacts from random environmental events, and from genetic impoverishment as a result of habitat fragmentation, genetic isolation, and declining effective population size (Saunders *et al.* 1991, pp. 18–32; Meffe and Carroll 1997, pp. 269–304).

General conservation principles indicate that endemic species limited to small areas are inherently more vulnerable to extinction than are widespread species, because of the increased risk of genetic bottlenecks; random demographic fluctuations; climate change effects; and localized catastrophes, such as drought and fire due to changes in demography, the environment, genetics, or other factors (Gilpin and Soulé 1986, pp. 24–34; Pimm *et al.* 1988, p. 757; Mangel and Tier 1994, p. 607). These problems are further magnified when these geographically restricted and small numbers of populations contain small numbers of individuals in these populations. Small, isolated populations can often also exhibit reduced levels of genetic variability, which diminishes the species' capacity to adapt and respond to environmental changes, thereby lessening the probability of long-term persistence (Barrett and Kohn 1991, p. 4; Newman and Pilson 1997, p. 361). Small, isolated populations are also more susceptible to reduced reproductive vigor due to ineffective pollination and inbreeding depression. In response, although a tenet of conservation biology is that larger, well-distributed populations of species are less vulnerable and insure persistence, many narrow endemic plants combine small population ranges and sizes with long-term persistence, depending on how they have adapted to their unique environments (Lavergne *et al*. 2004, pp. 505–518; Matthies *et al*. 2004, pp. 481–488; García 2008, pp. 106–113).

For *Eriogonum kelloggii* and *Sedum eastwoodiae*, their small population size and the extent of stress factors impacting the two species was one of the primary reasons they were first identified as Federal candidate species. As stated above, the distribution of the two species is extremely limited, and the identified potential threats facing the two species occur throughout their distribution. However, the known distribution and population size of the species has always been limited and small in size. *Eriogonum kelloggii* and *S. eastwoodiae* are narrow endemic species that have evolved and adapted to the particular serpentine habitats in which they occur. Although there are stressors acting on the two species, their populations are dispersed throughout the Red Mountain area, making it less likely for a single or multiple single events to significantly impact the species. In addition, the populations of *E. kelloggii* and *S. eastwoodiae* have persisted and remained stable since the two species were first identified as Federal candidate species. As a result, we do not consider small population size a threat to *E. kelloggii* or *S. eastwoodiae* now or in the near future.

The Effects of Climate Change

The effects of climate change may be affecting both *Eriogonum kelloggii*'s and *Sedum eastwoodiae*'s habitat (Factor A) and individual plants (Factor E) through several means. For the ease of analysis, the discussion of the effects of climate change has been included with discussion of each threat as applicable or discussed below.

The terms "climate" and "climate change" are defined by the Intergovernmental Panel on Climate Change (IPCC). The term "climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements

(IPCC 2013a, p. 1450). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (for example, temperature or precipitation) that persists for an extended period, whether the change is due to natural variability or human activity (IPCC 2013a, p. 1450). Various types of changes in climate can have direct or indirect effects on species. Scientific measurements spanning several decades demonstrate that changes in climate are occurring, and that the rate of change has increased since the 1950s. Examples include warming of the global climate system, and substantial increases in precipitation in some regions of the world and decreases in other regions (for these and other examples, see Solomon *et al*. 2007, pp. 35–54, 82–85; IPCC 2013b, pp. 3–29; IPCC 2014, pp. 1–32).

Climate change predictions are variable for the area within the range of *Eriogonum kelloggii* and *Sedum eastwoodiae*. Predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying (Field *et al*. 1999; Cayan *et al*. 2005; IPCC 2007). According to one downscaled climate model (California Natural Resources Agency 2012, pp. 7–12) for northern California, temperatures and drought intensity would increase. The effects of climate change can impact and influence any one of the stressors impacting *E. kelloggii* and *S. eastwoodiae* and outside the threat of large-scale mining may be the greatest influence on the two species. The effects of climate change may result in shifts in vegetation types, increased competition between species like *E. kelloggii* and *S. eastwoodiae* and other native and nonnative species (Loarie *et al.* 2008, pp. 1–10), or result in habitat changes resulting from altered fire frequency as discussed above. However, another study found that the area would experience slower winds (less drying effect) and higher humidity, thereby offsetting any temperature increases which as a result limit the effects of climate change (Fried *et al*. 2004, p. 177).

Predicting how *Eriogonum kelloggii* and *Sedum eastwoodiae* may react to the effects of climate change is difficult. The majority of the distribution of *E. kelloggii* and *S. eastwoodiae* occurs in upland, often exposed, xeric habitats that are expected to offer less refuge under drying or warming conditions. The distribution of both species is also limited to specific edaphic and geologic features on the landscape, which would limit the two plant's ability to spread to more hospitable or suitable habitat overtime. Despite these concerns, the populations of both species have remained stable based on the limited survey information available. Although more recent modeling shows the area may be affected by climate change, without long-term information or observed population declines the impacts of such climate change are difficult to determine or predict. As a result, we do not find that the effects of climate change are negatively impacting populations of *E. kelloggii* and *S. eastwoodiae* now or into the foreseeable future.

Combination of Threats and Cumulative Threats

When conducting our reviews about the potential stressors affecting *Eriogonum kelloggii* and *Sedum eastwoodiae*, we also assessed whether the two species may be affected by a combination of factors. Here we identify multiple potential threats that may have interrelated impacts on *E. kelloggii* and *S. eastwoodiae* individuals or populations or their habitat.

For example, mining activities and exploration results in the loss of habitat; depending on the nature of mining activities, these impacts can be permanent and irreversible (conversion to

land uses unsuitable to the species) or less so (minor ground disturbance and loss of individual plants) (Factors A and E). When mineral development and exploration occurs in-between (but not within) populations, this can eliminate corridors for pollinator movement, seed dispersal, and population expansion. Fire suppression activities, such as grading fire breaks and maintaining access roads, may have direct impacts by removing or crushing plants and habitat. Indirectly, fire suppression impacts *Eriogonum kelloggii* and *Sedum eastwoodiae* by allowing other vegetation to encroach and to become dominant. Relatively dense growth can lead to shading of *E. kelloggii* and *S. eastwoodiae*, changing the micro-climate around plant clusters, and can also result in competition for space, moisture, nutrients, and light with other plant species in a xeric-restricted landscape. Another consequence of long-term fire suppression is the increase in fire hazards when vegetation is permitted to become relatively dense in a dry environment, thereby leading to a potential of more severe or frequent fire events, which may lead to greater habitat destruction or alteration. OHV and other road corridors can exacerbate habitat loss and fragmentation, and tend to be associated with (accompanying or following) fire suppression, recreational, or illegal marijuana cultivation activities (Factors A and E). OHV and road corridors tend to create conditions that favor increased habitat disturbance beyond the footprint of the road or OHV corridor, leading to further deterioration of habitat because of increased access (Factors A and E). Climate change has the potential to alter landscape features and conditions, including precipitation and temperature regimes that in turn influence the establishment and persistence of vegetation, which then may influence the frequency and intensity of wildfire (Factors A and E). Because of the limited distribution and restricted nature of the habitat available to the two species, climate change and altered precipitation and temperature regimes may interfere with seedling recruitment and persistence of the two species on the landscape (Factors A and E). Because *E. kelloggii and S. eastwoodiae* are localized endemics with small ranges that are restricted by soil type, they are susceptible to the cumulative effects from the stressors depicted above. *Eriogonum kelloggii and S. eastwoodiae* may also be vulnerable to stochastic events, of which wildfire is the most likely. While we do consider stressors working in combination a factor impacting the existence of *E. kelloggii and S. eastwoodiae* to be of potential concern, the current best available scientific and commercial information does not show that these combined impacts are currently resulting in significant impacts to the two species as a whole.

All or some of the potential stressors could also act in concert to result as a cumulative threat to *Eriogonum kelloggii* and *Sedum eastwoodiae*. However, the best available scientific and commercial information currently does not indicate that these stressors singularly or cumulatively are causing now or will cause in the future a substantial decline of the total extant population of the species or have large impacts to *E. kelloggii* and *S. eastwoodiae* at the species level.

Conservation Measures Planned or Implemented

The designation of 6,173 ac (2,498 ha) of BLM land at Red Mountain as a wilderness study area (WSA) in 1979, and 6,895 ac (2,790 ha) as an Area of Critical Environmental Concern (ACEC)/Research Natural Area (RNA) in 1984 (updated in 1989), and the recent designation of the area as a Wilderness Area has focused management concern and direction toward conservation of the unique botanical and soils values of the Red Mountain area, including

conservation of *Eriogonum kelloggii* and *Sedum eastwoodiae* (BLM 1995, pp. 3–6 to 3–9). Annual visits to Red Mountain are generally conducted by BLM staff to ensure that no new road construction occurs (J. Wheeler, BLM, pers. comm. 2005). Most, or all, of the occupied or suitable habitat for *E. kelloggii* and *S. eastwoodiae* in the vicinity of the South Fork Eel River Wilderness Area was recommended for acquisition (willing landowners) in the resource management plan (RMP) for the area (BLM 1995, pp. 2–32 to 2–37), and several parcels have been acquired. The RMP excludes livestock grazing and off-road vehicle use from the area, guides overall BLM management activities, and is site-specific. There is overlap with the management designations of the Red Mountain ACEC/RNA and the South Fork Eel River Wilderness Area as the entire ACEC/RNA is encompassed by the Wilderness Area designation (J. Wheeler, BLM, pers. comm. 2013).

Conservation measures implemented in 2009 for *Eriogonum kelloggii* and *Sedum eastwoodiae* included only a visual inspection and photo-documentation of a portion of their habitat. Previous conservation measures included initiation of the long-term life history and population monitoring in 1987 (Baad 2002, pp. 2–8); field mapping of occupied habitat on public lands in 2003 (Jennings 2003, pp. 1–8); and general ongoing public outreach activities, such as public field trips and academic visitation. BLM staff applied for grant funding in 2010, to conduct an ecological assessment for the two species. That effort was unsuccessful, but both Service and BLM staff will continue to seek funding to implement complete population inventories, and ecological assessments of the two species and their habitat.

South Fork Eel River Wilderness Area

The designation of the area as the South Fork Eel River Wilderness Area has invoked numerous conservation measures related to maintaining and protecting *Eriogonum kelloggii* and *Sedum eastwoodiae* and their habitat. Signs indicating the wilderness boundary have been posted in many locations. Mechanized or motorized vehicles are not allowed in the wilderness area. Camping is allowed and limited to 14 days. Campfires are allowed unless prohibited during seasonal fire restrictions. Gathering wood for campfires, when permitted, is limited to dead and down materials, and cutting live vegetation is prohibited.

AUTHORS

This document was created as part of a team process with input from the Arcata Fish and Wildlife Office, Regional Office, and Headquarters Office staff. The primary authors of this document are the staff members of the Arcata Fish and Wildlife Office.

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