

***Eriogonum apricum* (inclusive of vars.  
*apricum* and *prostratum*)  
(Ione Buckwheat = Irish Hill Buckwheat)**

***Arctostaphylos myrtifolia*  
(Ione Manzanita)**

**5-Year Review:  
Summary and Evaluation**



**U.S. Fish and Wildlife Service  
Sacramento Fish and Wildlife Office  
Sacramento, California**

**July 6, 2010**

## 5-YEAR REVIEW

*Eriogonum apricum* (inclusive of vars.  
*apricum* and *prostratum*)  
(Ione buckwheat = Irish Hill buckwheat)

*Arctostaphylos myrtifolia*  
(Ione Manzanita)

### I. GENERAL INFORMATION

#### Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Endangered Species Act (Act) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.

#### Species Overview:

As summarized from the Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Plant *Eriogonum apricum* (inclusive of vars. *apricum* and *prostratum*) (Ione Buckwheat) and Threatened Status for the Plant *Arctostaphylos myrtifolia* (Ione Manzanita): Final Rule (Service 1999, p. 28404), the species *Eriogonum apricum*, including the two varieties: *Eriogonum apricum* var. *apricum* (Ione buckwheat) and *E. apricum* var. *prostratum* (Irish Hill buckwheat), and *Arctostaphylos myrtifolia* (Ione manzanita) occur primarily on outcrops of the Ione Formation within a limited area in the foothills of the central Sierra Nevada, California.

*Eriogonum apricum* is a perennial herb in the buckwheat family (Polygonaceae). *Eriogonum apricum* var. *apricum* is glabrous and grows upright to 8 to 20 centimeters (cm) (3 to 8 inches (in.)) in height. Its leaves are basal, round to oval, and 3 to 10 millimeters (mm) (0.1 to 0.4 in.) wide and flowers from July to October. The calyx (outer whorl of flower parts) is white with reddish midribs. *E. apricum* var. *prostratum* has smaller leaves, prostrate inflorescences (flower clusters) and an earlier flowering time. *Eriogonum apricum* is typically found growing interspersed within populations of *Arctostaphylos myrtifolia*.

*Arctostaphylos myrtifolia* is the dominant and characteristic species of Ione chaparral, where it occurs in pure stands. *Arctostaphylos myrtifolia* is an evergreen shrub of the heath family (Ericaceae) and can be distinguished from other species in the same genus by its smaller stature and the color of its leaves. *Arctostaphylos myrtifolia* appears as a low and spreading shrub that typically attains a height of less than 1.2 meters (m) (3.9 feet (ft)). The shrub's bark is red, smooth, and waxy with narrowly elliptic olive green leaves 5 to 15 mm (0.2 to 0.6 in.) long. The white or pinkish urn-shaped flowers appear from January to February with fruit that is more or less cylindrical.

### **Methodology Used to Complete This Review:**

Staff of the Sacramento Fish and Wildlife Office prepared this review using information contained in published journal articles, unpublished technical reports, and the California Natural Diversity Database (CNDDDB) maintained by the California Department of Fish and Game. We received one comment from Ted Swiecki, Ph.D., Plant Pathologist, in response to our Federal Notice initiating this 5-year review. The recent publications and personal communications with species experts were our primary sources of information used to update the species status and threats sections of this review. This review was prepared following the Region 8 guidance issued in March 2008 (Service 2008, pp 1–10).

### **Contact Information:**

**Lead Regional Office:** Larry Rabin, Deputy Division Chief for Listing, Recovery, and Habitat Conservation Planning, Region 8; (916) 414-6464.

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**Federal Register (FR) Notice Citation Announcing Initiation of This Review:** A notice announcing initiation of the 5-year review of these taxa and the opening of a 60-day period to receive information from the public was published in the Federal Register on March 05, 2008 (73 FR 11945-11950). As a result of the notice, one comment was received.

### **Listing History:**

#### **Original Listing**

**FR Notice:** 64 FR 28403-28413

**Date of Final Listing Rule:** May 26, 1999

**Entity Listed:** *Eriogonum apricum* (inclusive of vars. *apricum* and *prostratum*) (Ione Buckwheat = Irish Hill buckwheat)

**Classification:** Endangered

**Entity Listed:** *Arctostaphylos myrtifolia* (Ione manzanita)

**Classification:** Threatened

**State Listing** *Eriogonum apricum* var. *apricum* was listed by the State of California as endangered in August of 1981 and *Eriogonum apricum* var. *prostratum* was listed by the State of California as endangered in January of 1987. *Arctostaphylos myrtifolia* is not currently listed by the State of California.

**Associated Rulemakings:** None

**Review History:** No formal status reviews have been conducted for these species since the time of their initial listing.

**Species' Recovery Priority Number at Start of 5-Year Review:** The recovery priority number for *Eriogonum apricum* (vars. *apricum* and *prostratum*) is 2C according to the Service's 2009 Recovery Data Call for the Sacramento Fish and Wildlife Office, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (Endangered and Threatened Species Listing and Recovery Priority Guidelines, 48 FR 43098, September 21, 1983). This number indicates that the taxon is a species that faces high degree of threat and has a high potential for recovery. The "C" indicates conflict with construction or other development projects or other forms of economic activity.

The recovery priority number for *Arctostaphylos myrtifolia* is 5C according to the Service's 2009 Recovery Data Call for the Sacramento Field Office. This number indicates that the taxon is a species that faces high degree of threat and has a low potential for recovery. The "C" indicates conflict with construction or other development projects or other forms of economic activity.

### **Recovery Plan or Outline**

**Name of Plan or Outline:** None

## **II. REVIEW ANALYSIS**

### **Application of the 1996 Distinct Population Segment (DPS) Policy**

The Endangered Species Act defines "species" as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate wildlife. This definition of species under the Act limits listing as distinct population segments to species of vertebrate fish or wildlife. Because the species under review are plants, the DPS policy is not applicable, and the application of the DPS policy to the species' listing is not addressed further in this review.

### **Information on the Species and its Status**

#### Species Biology and Life History

*Eriogonum apricum* var. *apricum*, *E. apricum* var. *prostratum*, and *Arctostaphylos myrtifolia* grow on the Ione Formation (see discussion in Habitat or Ecosystem section) in a California vegetation type designated as the Ione Manzanita Series. The Ione Manzanita Series is

dominated by mixed-evergreen deciduous shrubland, less than 2 meters in height and growing on upland slopes at elevations of 100 to 300 m (328 to 984 ft) (Sawyer and Keeler-Wolf 1995, p. 167).

*Eriogonum apricum* var. *apricum* and *E. apricum* var. *prostratum*, are perennial herbs in the buckwheat family (Polygonaceae). *Eriogonum apricum* var. *apricum* is glabrous (smooth, without hairs or glands) and grows upright to 8 to 20 cm (3 to 8 in.) in height. *Eriogonum apricum* var. *prostratum* is similar but is more prostrate. Both *E. apricum* var. *apricum* and *E. apricum* var. *prostratum* produce a new circle of basal leaves from the rootstock each year. Leaves are dark green and smooth on their upper surface, and white-woolly beneath (Service 1999, p. 28404). *Eriogonum apricum* var. *apricum* leaves are basal, round to oval, and 3 to 10 mm (0.1 to 0.4 in.) wide. *Eriogonum apricum* var. *prostratum* generally has smaller leaves.

In *Eriogonum apricum* var. *apricum* the inflorescence is from 8 to 25 cm (3 to 10 in.) in height, dwarfing the circle of leaves at its base. The branching points of the inflorescence have a circling set of small bracts, woolly on their inner surfaces. The flowers are borne in clusters and are white with red midribs and very small. Flowering occurs chiefly from May to October, though flowers may be found on individual plants at any season of the year (Myatt 1970, pp. 320–321). The flowers of *E. apricum* var. *prostratum* are very similar; however, there is a distinct prostrate growth pattern and flowering typically occurs in June and July.

In their natural environment, the two varieties of *Eriogonum apricum* generally do not co-occur. Both varieties of *E. apricum* are prolific seeders. Since the fruit of *E. apricum* drops from the plant along with the dried calyx, the calyx allows for limited seed dispersion via floatation on surface runoff (Myatt 1987, p. 574).

*Arctostaphylos myrtifolia* is a small, woody perennial shrub in the heath family (Ericaceae). Plants reach up to 1.2 m (3.9 ft) in height, but are more commonly about 0.6 m (2 ft) tall. Its bark is reddish, waxy, and smooth. The leaves are small, 6 to 15 mm (0.25 to 0.50 in.) long, and 3 to 8 mm (0.10 to 0.25 in.) wide, bright green and shiny, erect, narrowly elliptic, with a wedge-shaped base and entire margin (smooth edge). Flowers are white to pinkish, urn-shaped and small 4 mm (0.12 in.) across. Its small, rounded, greenish fruits are about 3 millimeters (0.10 in.) long and a little less wide (Wells 1993, p. 554). Flowering occurs from mid-January to early March and fruits are fully developed by late spring or early summer (Gankin and Major 1964, p. 796). *Arctostaphylos myrtifolia* is an obligate seeder that can be killed by fire and therefore depends entirely on seeds stored in the soil or dispersed to the site for stand regeneration (Gankin and Major 1964, p. 795).

### Spatial Distribution

*Eriogonum apricum* var. *apricum* and *E. apricum* var. *prostratum* are known only from an approximate 16-kilometer (km) (10-mile (mi)) stretch along the Ione Formation in western Amador County. Although little information is available to determine the historical extent of either *E. apricum* variety, and there has been a loss of natural occurrences within the range, the species still persists throughout its estimated historical range. All of the historical and current occurrences are between the village of Buena Vista in the south and Highway 16 in the north

(CNDDDB 2008). At the time of listing, it was suggested that the range of *E. apricum* var. *apricum* may extend to cover portions of Sacramento County (Service 1999, p. 28406); however, surveys conducted in 2001 have placed all of the *E. apricum* var. *apricum* plants in Amador County (Service 2005, p. 15).

*Arctostaphylos myrtifolia* is restricted to the Ione Formation in Amador and Calaveras Counties, along an approximate 31.4-km (19.5-mi) stretch, with the central distribution being the large exposure of the Ione Formation in western Amador County around the City of Ione (Figure 1). Historically about 2,430 hectares (ha) (6,002 acres (ac)) of Ione chaparral vegetation existed (Service 1999, p. 28403), with the most common plant in this vegetation type being *A. myrtifolia*. A recent mapping effort to detect the extent of *A. myrtifolia* from high-resolution aerial photographs and field verification was conducted by researchers from California State University San Francisco (Holzman and Meyer 2004, pp. 1–40; Meyer 2005, pp. 1–106). This mapping effort resulted in the identification of 484 ha (1,196 ac) of *A. myrtifolia* in Amador and Calaveras Counties. Of the original 2,430 ha (6,002 ac) of Ione chaparral vegetation, what proportion of this was *A. myrtifolia* is unknown.

*Arctostaphylos myrtifolia* occurs throughout all of its presumed historical range in Amador County, though many populations have been reduced in size due to mining, road construction, development, and diseases. At the time of listing, the range of *A. myrtifolia* extended from approximately Highway 16 southward to the Amador County line, with a few disjunct populations in Calaveras County. The distribution of *A. myrtifolia* was believed to extend as far east as the Town of San Andreas in Calaveras County. However, efforts to locate and identify the San Andreas populations of *A. myrtifolia* have not been successful (Holzman and Meyer 2004, p. 17; Meyer 2005, pp. 46–47). Because of the discontinuous nature of the Ione Formation to which it is confined, *A. myrtifolia* was always patchily distributed with other chaparral and oak forest types.

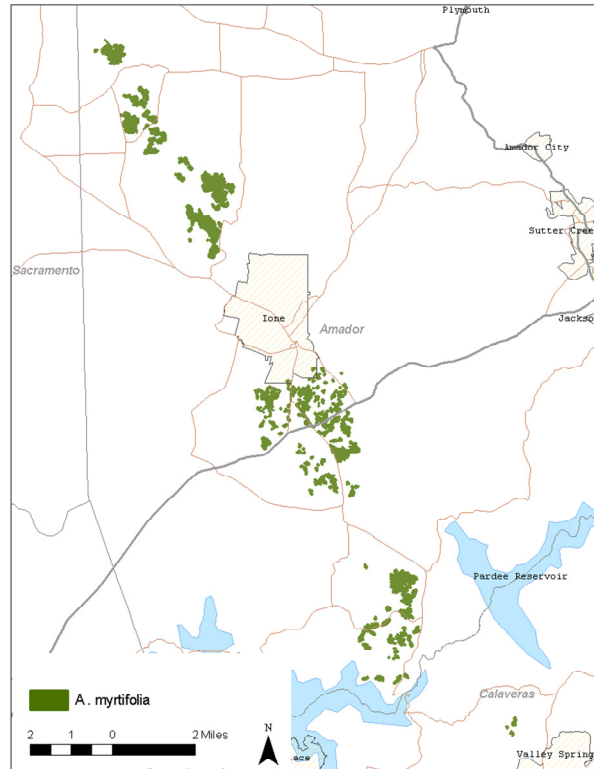


Figure 1. Current distribution of *A. myrtifolia* in Amador and Calaveras counties, California.

### Abundance

At the time of listing there were nine known extant occurrences of *Eriogonum apricum* var. *apricum* occupying a total of approximately 4 ha (10 ac) and two occurrences of *E. apricum* var. *prostratum* occupying a total of approximately 0.4 ha (1 ac) (Service 1999, p. 28404). Currently all of these occurrences are still believed to remain (CNDDDB 2008) and together represent seven distinct population centers, five of *E. apricum* var. *apricum* and two *E. apricum* var. *prostratum* (Holzman and Meyer 2004, p. 33; Meyer 2005, p. 85). Due to the variation in stands, ranging from a few individual plants to hundreds, and the patchy distribution within an area, a more recent mapping effort did not calculate acreage, as this information would not provide an accurate representation. *E. apricum* var. *prostratum* is currently believed to have a patchy distribution in an area of about 4 ha (10 ac) at Irish Hill, and, more extensively, on possibly 10 ha (25 ac), north of Irish Hill in the area known as the Pacific Clay Property; however, the status of these occurrences is largely unknown (G. Hartwell, botanist, pers. comm. 2008).

At the time of listing *Arctostaphylos myrtifolia* was known from 17 occurrences covering approximately 404.7 ha (1,000 ac); however, it was unknown how many distinct stands were represented by the 17 occurrences, but was believed to be approximately 100 (Service 1999, p. 24804). Currently, the CalFlora Occurrence Database (CalFlora 2008, p. 1) contains 39 records for *Arctostaphylos myrtifolia* from Amador and Calaveras Counties and the CNDDDB (2008, pp. 1–21) recognizes 15 occurrences for this species. Comparison of the number of occurrences listed in the CNDDDB between time of listing and the present does not provide an accurate representation of the status for this species because some of the original occurrences have been

combined. However, of the original 17 known occurrences, three occurrences from Calaveras County north of San Andreas were not able to be located during efforts in mapping the lone plant community (Holzman and Meyer 2004, p. 17; Meyer 2005, pp. 46–47).

Holzman and Meyer (2004, pp. 34–35) detected 484 ha (1,196 ac) of *Arctostaphylos myrtifolia* in Amador and Calaveras Counties, comprising five larger distinct populations and a few small isolated populations (Holzman and Meyer 2004, p. iv). While the area occupied by *A. myrtifolia* appears to have increased since the time of listing, the change in area is actually due to better mapping of the *A. myrtifolia* plant community. Due to loss of habitat and individual plants, the total area occupied by *A. myrtifolia* has actually been reduced. There is no accurate representation of the exact decline in area of *A. myrtifolia* since the time of listing due to a lack of specific data on population size, area, and health when listed.

Currently, disease (discussed in more detail under Factor C below) appears to be a major factor in the declining abundance and health of *Arctostaphylos myrtifolia*. It is estimated that over 120 hectares (300 acres) of *A. myrtifolia* have been lost since 1980 to diseases which are responsible for dieback and mortality of this species (Service 2005, p. 28). Of the major population centers, populations occurring near Buena Vista show over 50 percent mortality; those near Carbondale Road, less than 50 percent; and visible populations near Comanche Reservoir as well as both north and south of the Carbondale area appear to be healthy. The most robust population at the time of listing occurred in an area along Lambert Road. Currently the plants in the area between Lambert and Carbondale Roads are extremely unhealthy, but it is uncertain if it is due to disease or herbicide use associated with adjacent development (Swiecki *et al.* 2005, p. 10). Areas north of Lambert Road were consumed in a series of fires, including the “Pony Fire”, which consumed large portions of *A. myrtifolia*. Although there is some regeneration visible, it is uncertain as to whether the stands will successfully regrow.

As of 2004, an assessment of stand health throughout the range of *Arctostaphylos myrtifolia* indicated that at least 30 percent of *A. myrtifolia* stands are unhealthy (Holzman and Meyer 2004, p. 30; Meyer 2005, pp. 71–72). Holzman and Meyer (2004, p. 30) determined that based on the percentage of live vegetation, approximately 220 ha (544 ac) contained 76-100 percent live vegetation, 118 ha (291 ac) contained 51-75 percent live vegetation, 32 ha (80 ac) contained 26-50 percent live vegetation, and 114 ha (282 ac) contained 0-25 percent live vegetation. Differing criteria are presented to define a healthy stand of *A. myrtifolia*. Criterion one suggests that greater than 50 percent live vegetation is considered healthy (Holzman and Meyer 2004, p. 5; T. Meyer, pers. comm. 2008), which would result in a total population health of 70 percent, while criterion two indicates that greater than 75 percent live vegetation is required for a healthy stand (A. Franklin, BLM, pers. comm. 2008), resulting in an overall population health of 45 percent.



### Habitat or Ecosystem

The Ione Manzanita Series (inclusive of *Eriogonum apricum* and *Arctostaphylos myrtifolia*) occurs primarily on Ione soils, which have developed along a 65-km (40-mi) stretch of the Ione Formation. The Ione Formation exists as a discontinuous belt from near Fresno, in central California, north to near Lincoln, California. The Ione Formation is a geologic formation consisting of a unique Tertiary oxisol (a highly weathered tropical soil type) comprising fluvial (stream or river produced), estuarine, and shallow marine deposits that were developed under a subtropical or tropical climate during the Eocene (35 to 57 million years ago). These soils and the sedimentary deposits with which they are associated also contain large amounts of commercially valuable minerals including quartz sands, kaolinitic (containing a hydrous silicate of aluminum) clays, lignite (low-grade coal), and heavy-mineral-bearing gravels (Force and Creely 2000, pp. 20–23; Creely and Force 2007, pp. 20–24).

*Eriogonum apricum* can be found in barren surfaces of the Ione Formation. The plants sometimes colonize disturbed sites, such as clay pits, spoil piles, clay stockpiles, and abandoned roads, at times growing on near-vertical walls of almost pure clay. Often little, if any, other vegetation is present within the *E. apricum* occurrences (Myatt 1970, p. 320). *Arctostaphylos myrtifolia* is an associate, but where dense stands of *A. myrtifolia* or other manzanitas occur, *E. apricum* var. *apricum* and *E. apricum* var. *prostratum* are usually absent.

### Changes in Taxonomic Classification or Nomenclature

The Service is not aware of any changes in taxonomic classification or nomenclature for either *Eriogonum apricum* or *Arctostaphylos myrtifolia* since the time of listing.

### Genetics

In an analysis of *Eriogonum apricum* var. *apricum* and *E. apricum* var. *prostratum*, Crawford *et al.* (2001, pp. 1–4) utilized a technique in which DNA regions called intersimple sequence repeats are amplified in order to assess genetic differences between the two varieties. The genetic analysis found only minor genetic marker differences between the two varieties. However, the unpublished data was created using a small sample size (n=30), and if the genetic divergence of these varieties occurred in more-recent history, genetic difference would be hard to detect.

### Species-specific Research and/or Grant-supported Activities

Holzman and Meyer (2004, pp. 1–40) utilized IKONOS satellite imagery, soil and geologic information, CNDDDB data, digital ortho quadrangles, digital raster grids, and surveys in order to map the Ione plant community, including *Eriogonum apricum* and *Arctostaphylos myrtifolia*. The effort resulted in mapping and calculating the area of the identifiable stands of *A. myrtifolia*, identifying the percentage of live foliage, and classifying the associated vegetation communities. Additionally, the locations of *E. apricum* were mapped as single points based on field observation. Due to the variability in numbers of individual plants within a population and

patchy distribution, the area occupied by *E. apricum* was not calculated, as this would not provide an accurate assessment.

Swiecki and Bernhardt (2003, pp. 3–49) conducted a study to examine the symptoms and progression of disease and identify the disease believed to be responsible for large amounts of die-off of *Arctostaphylos myrtifolia*. Based on lab work, using *A. viscida* (whiteleaf manzanita) as a surrogate, and field surveys and sampling, researchers concluded that at least two diseases were affecting the health of *A. myrtifolia* and *A. viscida* in the Ione study area. Swiecki and Bernhardt (2003 pp. 3–49) assessed the effects of a previously identified branch canker disease caused by *Fusicoccum* spp. and identified and documented a root disease *Phytophthora cinnamomi*.

In 2004, Tedmund Swiecki, Elizabeth Bernhardt, and Matteo Garbelotto assessed the distribution and spread of *Phytophthora cinnamomi* within the range of *Arctostaphylos myrtifolia*. As a result of their effort, it was determined that *P. cinnamomi* is relatively widespread in the area between Ione and Buena Vista, but did not appear to be present in the southern part of the range.

Currently, California Department of Fish and Game is utilizing Section 6 funding for a project titled “Protection of Ione manzanita stands (*Arctostaphylos myrtifolia*) from *Phytophthora* root rot”. Tedmund Swiecki and Matteo Garbelotto are conducting greenhouse trials to assess whether spraying *A. myrtifolia* with a surfactant prevents the plant from becoming infected, or reduces progress of the disease. Since the research is currently underway, and preliminary results are inconclusive (Garbelotto 2008, pp. 1–8) no additional information is available.

### **Five-Factor Analysis**

The following five-factor analysis describes and evaluates the threats attributable to one or more of the five listing factors outlined in section 4(a)(1) of the Act.

#### **FACTOR A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range**

The destruction and modification of habitat resulting from mining activities continues to be a major threat to *Eriogonum apricum* and *Arctostaphylos myrtifolia*. Residential and commercial development, and clearing for agriculture and fire protection also continue to pose a threat but to a much lesser degree. For *E. apricum* var. *apricum*, of the nine records present in the CNDDDB (2008), two are located on Federal and State lands. Neither of the two known occurrences of *E. apricum* var. *prostratum* are protected. Of the 484 ha (1,196 ac) of *A. myrtifolia*, approximately five percent is located on Federal and State public lands that are not subject to land conversion that will result in loss of habitat. Specifically, the State of California owns and manages a 15 ha (37 ac) preserve for the protection of Ione plants, and the Bureau of Land Management (BLM) has designated 105 ha (260 ac) of their property in Amador County as Areas of Critical Environmental Concern, 97 ha (240 ac) for the conservation of *A. myrtifolia*, and 8 ha (20 ac) for *E. apricum* var. *apricum* (BLM 2008, pp. 39–40; Franklin, *in litt.* 2009, p. 1). Aside from the

small portion located on Federal and State lands, both *E. apricum* and *A. myrtifolia* are located on private and county lands where habitat modification is not precluded.

When *Eriogonum apricum* and *Arctostaphylos myrtifolia* were federally listed in 1999 (Service 1999, pp. 28403–24813), we identified mining for silica sand, clay, lignite, common sand and gravel as the primary threat to these species. We also identified commercial or residential development, clearing for agriculture and fire protection, and continued erosion due to previous fireline construction and driver training for California Department of Forestry and Fire Protection employees as lesser threats. Since the listing, the threat posed by erosion appears to have been removed, in part due to the efforts of BLM and natural revegetation, while the other threats remain. Due to the proprietary nature of mining operations, and scarcity of information available on mining operations, no specific information is available to assess the future effects that mining may have on *E. apricum* or *A. myrtifolia*. However, since most occurrences of these plants occur on private property, including the largest population of *E. apricum* var. *prostratum* located on Pacific Clay property (G. Hartwell, pers. comm. 2008), mining still poses a large threat to these plants.

Development for residential and commercial purposes is an ongoing threat to both *Eriogonum apricum* and *Arctostaphylos myrtifolia*. Numerous development projects have taken place since the time of listing that have altered or removed habitat for these plant species. One such project involved the construction of a single-family housing development southeast of the city of Ione, California. This project resulted in the loss of approximately 35 ha (86 ac) of habitat and the direct loss of 885 individual *A. myrtifolia* plants covering 5 ha (13 ac). Additionally, residential development in the Carbondale area, has resulted in the loss of an unknown number of *A. myrtifolia* due to herbicide spraying (Hartwell, *in litt.* 2008, p. 1), and subsequent loss of habitat from residential construction.

Based on information presented by the Sacramento Area Council of Governments (2008, pp. 1–111), the Sacramento Region is projected to experience an approximately 18 percent increase in housing need from 2006 through 2013. As such, development pressure in Amador County is likely to increase in the foreseeable future. While there are no currently-proposed development projects in Amador County, this appears to be due to the updating of the Amador County General Plan which started in 2006 and is expected to be completed in 2011 (H. Anderson, Amador County, *in litt.* 2009, p. 1; Amador County, pers. comm. 2010).

Recently 16,100 acres of property in Amador County, known as Rancho Arroyo Seco, were purchased by Amador Ranch Associates. Of the 16,100 acres, approximately 343 acres are currently occupied by *Arctostaphylos myrtifolia*. The current Amador County General Plan (Amador County 2008, p. 1) designates this area as a mineral resource zone and agricultural use; however, the General Plan is currently being updated (Anderson, *in litt.* 2009, p. 1). As part of the updating of the General Plan, Amador County has identified as an alternative, designating all, or a portion of, the Rancho Arroyo Seco property as a special planning area (Amador County 2008, pp. 4–7). Designation as a special planning area is intended to allow a more site-specific planning area to help guide and facilitate land use and development within an area. While the owners of the property intend to continue the existing uses such as agriculture, cattle grazing, and mining, they also propose possible future uses such as habitat conservation, development,

and recreation (Amador Ranch Associates 2007, pp. 1–4). There are currently no specific plans to develop the Rancho Arroyo Seco property; however, given that it is owned by a development company (Shaw 2006, pp. 1–2) that may construct 8,000 homes over the next 20 years (Forster pers. com. 2006, as cited in Hartwell 2006, p. 21) and Amador County is updating the General Plan, it is reasonable to believe that development will occur within this area in the foreseeable future.

### **FACTOR B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes**

Overutilization for commercial purposes was not known to be a factor in the 1999 final listing rule (Service 1999, p. 28408). Overutilization for any purpose does not appear to be a threat at this time.

### **FACTOR C: Disease or Predation**

At the time of listing, an unidentified fungal pathogen was known to cause dieback of partial or entire stands of *Arctostaphylos myrtifolia*. This pathogen was believed to be due to senescence of older individuals and pathogen loads attributed to crowding and accumulation of organic debris (Service 1999, p. 28408). Wood and Parker (1989, p. 50) expressed concern for this threat in their report on the plant found at the Apricum Hill Ecological Reserve. At that time, little was known about the direct cause, and disease had still not inflicted heavy losses on the Reserve. Hartwell (2001, pp. 43–61) referred to this disease and cited a study by plant pathologist Tim Tidwell (Stephenson and Tidwell, pers. comm. 2000–2001, as cited by Hartwell 2001, p. 58) that identified madrone canker as the possible cause of the extensive die-back.

Recent studies by Swiecki and Bernhardt (2003, pp. 1–49) and Swiecki *et al.* (2005, pp. 1–38) determined that at least three different diseases are affecting the health of *Arctostaphylos myrtifolia* in the Ione area. First, a branch canker disease caused by a species of *Fusicoccum* that had previously been identified, and two newly identified pathogens, *Phytophthora cinnamomi* and *P. cambivora*. Progressive dieback associated with *Fusicoccum* spp. cankers likely contributes to and may sometimes cause the death of *A. myrtifolia* plants. *Phytophthora* spp. were found to cause contiguous patches of mortality in stands of *A. myrtifolia* due to root and crown rot (Swiecki and Bernhardt 2003, p. 4; Swiecki *et al.* 2005, p. 22). While mortality associated with *Phytophthora* spp. appears to have been noted since the 1980's, Swiecki and Bernhardt (2003, p. 41) believe it was at least partially confused with the branch canker disease because both diseases can occur together in the same area. However, mortality associated with *Fusicoccum* spp. tends to be patchily distributed within a stand and mortality caused by *Phytophthora* spp. is continuous.

Swiecki and Bernhardt (2003, pp. 41–43) determined that two species of *Fusicoccum* affect *Arctostaphylos myrtifolia* plants by killing off branch tips or infecting larger diameter stems where the infection may expand and girdle the stem. The girdling of the stem may result in the death of large portions of the plant or the plant in its entirety. Swiecki and Bernhardt (2003, p. 41) observed that stem cankers associated with *Fusicoccum* spp. may expand slowly during the months from March to October; however, if the die-back associated with *Fusicoccum* spp.

exceeds new growth, individual plants may eventually be killed. Although advancement of the disease appears to be reduced during the drier months, stem canker severity, and subsequent dieback, appears to be related to plant water stress (Swiecki and Bernhardt 2003, p. 43).

*Arctostaphylos myrtifolia* is highly susceptible to the pathogen *Phytophthora cinnamomi*. The *P. cinnamomi* pathogen was first identified as affecting *A. myrtifolia* by Swiecki and Bernhardt (2003, p. 5). *Phytophthora cinnamomi* is considered to be a serious pathogen of agricultural crops and native plant communities. In California, it is known to infect avocado trees, orchard trees, ornamental plants and Christmas tree farms (Swiecki and Bernhardt 2003, p. 44). More recently *P. cinnamomi* was identified to be partially responsible for mortality in *Quercus agrifolia* (coast live oak) (Garbelotto *et al.* 2006, p. 1). *Phytophthora cinnamomi* is a disease that causes root and crown rot and is responsible for killing off large patches of *A. myrtifolia* in the Ione area. Once infected by this pathogen, the root system of the plant begins to decay until the loss of roots and/or water-conducting tissues causes the plant to desiccate (Swiecki and Bernhardt 2003, p. 43). Additionally, *P. cinnamomi* can also infect the leaves and stems of the plant, providing the same symptoms as *Fusicoccum* infections, making it difficult to determine which disease is affecting a particular plant (Swiecki and Bernhardt 2003, p. 45).

Introduction of *Phytophthora cinnamomi* into *Arctostaphylos myrtifolia* habitat represents long-term, if not permanent, destruction of habitat due to its long persistence in the soil (Swiecki and Bernhardt 2003, p. 43). *Phytophthora cinnamomi* can persist in the environment in the absence of susceptible hosts. This pathogen survives in the soil in infected roots, or as long-lived resident spores (Swiecki and Bernhardt 2003, p. 44). There is no known cure or prevention for this *A. myrtifolia* disease (Swiecki and Bernhardt 2003, pp. 45–47). Swiecki and Bernhardt (2003, pp. 26–27) found that *A. myrtifolia* regeneration within an older portion of a mortality center was killed off by *P. cinnamomi*, while Swiecki *et al.* (2005, p. 25) discovered healthy *A. myrtifolia* regeneration in other older portions of mortality centers. However, subsequent investigation in 2009 discovered regeneration in these mortality centers displayed extreme dieback, or complete mortality (Karuzas, *in litt.* 2009, p. 1). Swiecki *et al.* (2005, p. 330) further noted that although reductions in pathogen populations may occur over time, it is unclear what period of time is needed to allow successful reestablishment of *A. myrtifolia*.

The pathogenic activity of *Phytophthora cinnamomi* is favored by free moisture and under wet conditions, multiple infection cycles are likely to occur. *Phytophthora cinnamomi* is primarily spread to new areas through the movement of infested soil by humans, particularly through the use of vehicles (Swiecki and Bernhardt 2003, p. 45). Once the disease has been introduced into an area, the movement of the pathogen is facilitated by water flow. Swiecki *et al.* (2005, p. 33) noted that the local spread of *P. cinnamomi* occurs during the wet season at a cross slope and upslope rate of approximately 0.25 m (0.8 ft) per year. Down slope spread has been calculated at 2 m (6.5 ft) per year, presumably due to transport via flowing water, and under stagnant stream conditions *P. cinnamomi* has been located 10 m (33 ft) from disease-associated mortality centers (Swiecki *et al.* 2005, p. 34). While it is more likely for *P. cinnamomi* infected soil to be spread over larger distances during the wet season, movement of infected soils can readily occur during dry months as the result of mining operations and excavation (Swiecki *et al.* 2005, p. 35).

An investigation of the distribution of the *Phytophthora cinnamomi* pathogen throughout the range of *Arctostaphylos myrtifolia* found that *P. cinnamomi* infection is widespread throughout the Ione and Buena Vista area, with a second disease center in the Carbondale area (Swiecki *et al.* 2005, pp. 1–38). Of the populations located in and around Ione and Buena Vista, over 50 percent have been killed by disease or are at risk of being infected (Swiecki, *in litt.* 2008, p. 1). DNA microsatellite analysis of *P. cinnamomi* isolates from Apricum Hill Preserve identified four genetically distinct variants, suggesting multiple introductions of the pathogen at this location. Additionally, two of the four genotypes have been identified elsewhere in California (Swiecki *et al.* 2005, pp. 28–29). Investigation of the *A. myrtifolia* mortality on BLM land in the Carbondale area resulted in the discovery of a second soil-borne *Phytophthora* species, *P. cambivora* (Swiecki *et al.* 2005, p. 36). While it is not known what effect *P. cambivora* has on *A. myrtifolia*, *P. cambivora* is closely related to *P. cinnamomi* and is also an aggressive root pathogen (Swiecki *et al.* 2005, p. 36).

*Phytophthora cinnamomi* is currently considered to be the greatest threat to *Arctostaphylos myrtifolia*. As of 2005, *P. cinnamomi* was documented as occurring in two of the five large *A. myrtifolia* populations (Figure 2). However, because *P. cinnamomi* is causing mortality in a number of native forests and chaparral communities in northern California (Swiecki, *in litt.* 2008, p. 2), and contaminated soil is readily transported on vehicles and in nursery stock, it is likely that *P. cinnamomi* will spread throughout the range of *A. myrtifolia* in the foreseeable future.

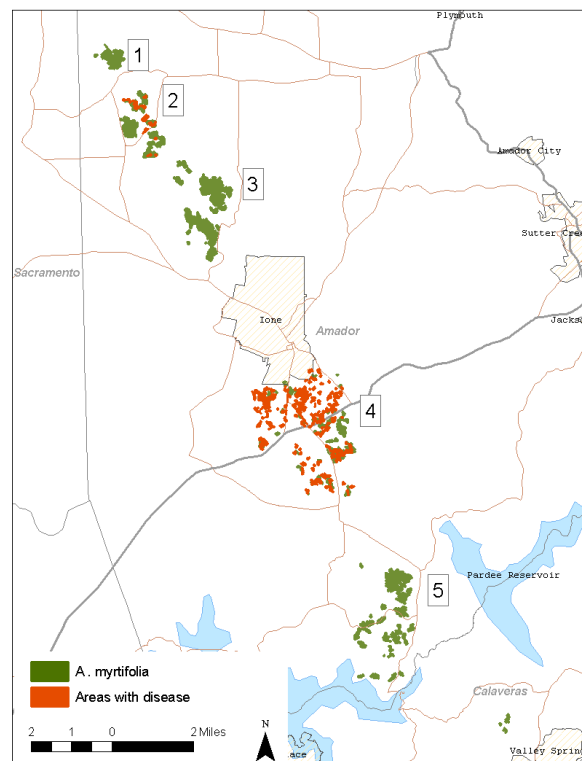


Figure 2. Areas of confirmed *P. cinnamomi* within the range of *A. myrtifolia*. Of the five numbered populations, limited testing of population 1 (one sample) did not result in detection of this disease. Populations 2 and 4 contain the disease, while populations 3 and 5 do not appear to be infected. However, assessment of populations 3 and 5 was limited to visual inspection from publically accessible areas.

## **FACTOR D: Inadequacy of Existing Regulatory Mechanisms**

At the time of listing, regulatory mechanisms thought to be inadequate to protect *Eriogonum apricum* included: (1) listing under the California Endangered Species Act (CESA) and the Native Plant Protection Act (NPPA); (2) the California Environmental Quality Act (CEQA); (3) the California Surface and Mining Reclamation Act (SMARA) of 1975; and (4) local regulations. Regulatory mechanisms thought to be inadequate to protect *Arctostaphylos myrtifolia* included: (1) the CEQA; (2) the SMARA; and (3) local regulations. The final listing rule (Service 1999, pp. 28403–28413) provides an analysis of the level of protection that was anticipated from those regulatory mechanisms. While this analysis appears to remain valid, a brief summary is provided below.

California Endangered Species Act and Native Plant Protection Act: The CESA (California Fish and Game Code, section 2080 *et seq.*) prohibits the unauthorized take of State-listed threatened or endangered species. The NPPA (Division 2, chapter 10, section 1908) prohibits the unauthorized take of State-listed threatened or endangered plant species. The CESA requires State agencies to consult with the California Department of Fish and Game on activities that may affect a State-listed species and mitigate for any adverse impacts to the species or its habitat. Pursuant to CESA, it is unlawful to import or export, take, possess, purchase, or sell any species or part or product of any species listed as endangered or threatened. The State may authorize permits for scientific, educational, or management purposes, and to allow take that is incidental to otherwise lawful activities. However, since *Arctostaphylos myrtifolia* is not state-listed, these protections only apply to *Eriogonum apricum* (vars. *apricum* and *prostratum*).

Furthermore, with regard to prohibitions of unauthorized take under NPPA, landowners are exempt from this prohibition for plants to be taken in the process of habitat modification. Where landowners have been notified by the State that a rare or endangered plant is growing on their land, the landowners are required to notify the California Department of Fish and Game 10 days in advance of changing land use in order to allow salvage of listed plants. Thus far, there is no indication that transplanting *E. apricum* is successful.

California Environmental Quality Act: The CEQA requires full public disclosure of the potential environmental impact of proposed projects. The public agency with primary authority or jurisdiction over the project is designated as the lead agency and is responsible for conducting a review of the project and consulting with other agencies concerned with resources affected by the project. Section 15065 of CEQA guidelines requires a finding of significance if a project has the potential to “reduce the number or restrict the range of a rare or endangered plant or animal”. Species that are eligible for listing as rare, threatened, or endangered but are not so listed are given the same protection as those species that are officially listed with the State. Once significant impacts are identified, the lead agency has the option to require mitigation for effects through changes in the project or to decide that overriding considerations make mitigation infeasible. In the later case, projects may be approved that cause significant environmental damage, such as destruction of endangered species. Protection of listed species through CEQA is, therefore, at the discretion of the lead agency. CEQA provides that, when overriding social and economic considerations can be demonstrated, project proposals may go forward, even in

cases where the continued existence of the species may be jeopardized, or where adverse impacts are not mitigated to the point of insignificance.

#### California Surface and Mining Reclamation Act of 1975:

The SMARA (California Public Resources Code chapter 9 sec. 2710 et seq.) requires reclaiming mined lands to a useable condition that is readily adaptable for alternative land uses, not necessarily natural conditions. Although SMARA requires reclamation for mining activities, the standards for reclamation and the success of any revegetation is judged on the approved end use of the land. SMARA does not require replacement of the same vegetation type, species, or percentage of vegetation cover as the habitat that is lost. Additionally, mining operations are not required to submit a reclamation plan for operations conducted prior to January 1, 1976.

#### Local Regulations

Although the City of Ione General Plan includes the protection of *Arctostaphylos myrtifolia* and *Eriogonum apricum* as a goal, the City has no regulatory mechanism to stop land clearing and/or preserve natural habitat.

### **FACTOR E: Other Natural or Manmade Factors Affecting Its Continued Existence**

At the time of listing, the change in fire frequency resulting from fire suppression was identified as a potential threat to *Arctostaphylos myrtifolia* (Service 1999, pp. 28409–28410). At the time of listing little was known about the effects that a change in the natural fire regime has on *A. myrtifolia*. Since this shrub is an obligate seeder that requires open areas in order to grow, it was speculated that fire is necessary for stand regeneration (Service 1999, p. 28410). Since its listing no further research has been conducted to determine whether fire is necessary to ensure healthy stands of *A. myrtifolia*; however, Keeley (2007, p. 18) stated that the risk of senescence does not represent a significant threat to the persistence of chaparral in California, and that studies show stands where fires have been excluded for over 100 years recover after fire as well as younger stands (Keeley *et al.* 2005, p. 264). Therefore, the threat posed by a change in fire frequency is poorly understood for *A. myrtifolia*.

When *Arctostaphylos myrtifolia* was listed, the inability of *A. myrtifolia* to become reestablished on mined areas was discussed as a potential threat due to a lack of the required specialized substrate and an absence of proven propagation methods (Service 1999, p. 28410). Since its listing, Hartwell (2001, pp. 59–60) was able to demonstrate that *A. myrtifolia* could be successfully propagated using tip cuttings from the plant. Planting the cuttings on BLM's Ione Manzanita ACEC resulted in the survival of 60 percent of the propagated *A. myrtifolia* (Hartwell 2001, p. 60). Although Hartwell (2001, pp. 59–60) demonstrated successful propagation of *A. myrtifolia*, there is no new information on the ability of *A. myrtifolia* to become reestablished on mined areas.

At the time of listing, competition with other native vegetation, specifically *Arctostaphylos viscida* was considered to be a potential threat to *A. myrtifolia* (Service 1999, p. 28410). No new information is available on the threat posed by *A. viscida*.

Chance events were considered a threat to *Eriogonum apricum* var. *prostratum* when it was



listed (Service 1999, p28410). Events such as disease outbreaks, reproductive failure, extended drought, landslides, or a combination of several such events, could destroy part of a single population or entire populations. A local catastrophe could also decrease a population to so few individuals that the risk of extirpation due to genetic and demographic problems inherent to small populations would increase. Because no additional populations of *E. apricum* var. *prostratum* have been located, the populations remain small in size, and no measures have been taken to lessen the threat, chance events are still considered a threat.

Since the 1999 listing of *Eriogonum apricum* and *Arctostaphylos myrtifolia*, climate change 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, pp. 1–3; Cayan *et al.* 2005, pp. 3–6; IPCC 2007, pp. 1–18). However, predictions of climatic conditions for smaller sub-regions such as California remain uncertain. It is unknown at this time if climate change in California will result in a warmer trend with localized drying, higher precipitation events, or other effects. While we recognize that climate change is an important issue with potential effects to listed species and their habitats, we lack adequate information to make accurate predictions regarding its effects to these particular species at this time.

### III. RECOVERY CRITERIA

We focus our evaluation of species status in this 5-year review on progress that has been made toward recovery since the species were listed (or since the most recent 5-year review) by eliminating or reducing the threats discussed in the five-factor analysis. However, there is currently no approved final or draft recovery plan for *Eriogonum apricum* (inclusive of vars. *apricum* and *prostratum*) or *Arctostaphylos myrtifolia*; the Service is currently in the process of preparing one.

### IV. SYNTHESIS

The status of *Eriogonum apricum* (inclusive of vars. *apricum* and *prostratum*) has not changed since their listing in 1999. *Eriogonum apricum* var. *apricum* continues to consist of five distinct populations and *E. apricum* var. *prostratum* consists of two. No new populations have been discovered, and the exact demographics of individual *E. apricum* populations remains largely unknown. However, loss of habitat continues to be a great threat to the continued existence of *E. apricum* through mining and human development. Because of the limited distribution, few known populations, and the threat of habitat loss, *E. apricum* continues to be in danger of extinction in the foreseeable future throughout its range. Therefore we believe *E. apricum* (inclusive of vars. *apricum* and *prostratum*) still meets the definition of endangered, and recommend no status change at this time.

At the time of listing *Arctostaphylos myrtifolia* was believed to occur in Amador and Calaveras Counties, extending as far east as San Andreas, California. However, current information indicates that the range of *A. myrtifolia* does not extend as far east in Calaveras County as San Andreas. Since listing, residential development, mining, disease, herbicide spraying, and fire have resulted in the loss of an unknown amount of *A. myrtifolia* plants and habitat. As of 2004, between 30 and 55 percent of all *A. myrtifolia* stands were considered unhealthy. Mining and

development continue to pose a large threat to *A. myrtifolia*, and while there are no proposals currently in place, development associated with Rancho Arroyo Seco may further reduce habitat for this plant by as much as 29 percent. Currently, the greatest existing threat to *A. myrtifolia* is a disease that has been identified since the time of listing, *Phytophthora cinnamomi*, and, potentially, a newly identified pathogen *P. cambivora* which also causes root and crown rot. While the exact amount of *A. myrtifolia* that has been lost as a result of disease since listing is unknown, *P. cinnamomi* currently occurs throughout a large portion of the range of the plant. There is no known cure or prevention for this disease affecting *A. myrtifolia* and the pathogen results in the degradation of suitable habitat. Due to a variety of infection sources in northern California and how readily *P. cinnamomi* is transported, it is likely that this deadly pathogen will occupy the entire range of *A. myrtifolia* in the foreseeable future. Due to the limited distribution, current health, and the threats to this the plant, we believe that *A. myrtifolia* is in danger of extinction in the foreseeable future and should be reclassified from threatened to endangered.

## V. RESULTS

### Recommended Listing Action:

*Eriogonum apricum* (inclusive of vars. *apricum* and *prostratum*)

- Downlist to Threatened
- Uplist to Endangered
- Delist (indicate reason for delisting according to 50 CFR 424.11):
  - Extinction*
  - Recovery*
  - Original data for classification in error*
- No Change

*Arctostaphylos myrtifolia*

- Downlist to Threatened
- Uplist to Endangered
- Delist (indicate reason for delisting according to 50 CFR 424.11):
  - Extinction*
  - Recovery*
  - Original data for classification in error*
- No Change

### New Recovery Priority Number and Brief Rationale:

At the time of initiating this five-year review, the recovery priority number for *Eriogonum apricum* (inclusive of vars. *apricum* and *prostratum*) was 2C and for *Arctostaphylos myrtifolia* was 5C. We are not recommending a change for either recovery priority number.

**Listing and Reclassification Priority Number and Brief Rationale:** The recommendation of uplisting *Arctostaphylos myrtifolia* to endangered is given a reclassification number of “2” indicating it is a species with a high magnitude and imminent threat (Service 1983).

## **VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS**

Currently there is no approved final or draft recovery plan for *Eriogonum apricum* (inclusive of vars. *apricum* and *prostratum*) or *Arctostaphylos myrtifolia*, therefore a high priority action should be finalizing a recovery plan for these species. Disease is currently the greatest threat to *A. myrtifolia*, and as such, a high priority should be placed on identification of the current extent of this pathogen within the range of *A. myrtifolia* and implementing measures to restrict the movement of infested soil and plant materials from areas affected by *Phytophthora cinnamomi*. Additional emphasis should be placed on conducting research into how to eliminate this disease from the ecosystem and identify other methods to prevent disease transmission. As part of this effort, the symptomatology, etiology, and impact of *P. cambivora* on *A. myrtifolia* and other species should be studied. Additionally, priority should be placed on identifying the status of *E. apricum* populations and obtaining an accurate representation of the area occupied by this species and the availability of habitat for restoration purposes. These tasks would aid us in better understanding the threats facing these species and to develop methods to help reduce the threats.

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**U.S. FISH AND WILDLIFE SERVICE  
5-YEAR REVIEW**

*Eriogonum apricum* (inclusive of vars. *apricum* and *prostratum*) (lone buckwheat)

**Current Classification:** Endangered

**Recommendation Resulting from the 5-Year Review:**

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

**Review Conducted By:** Jeremiah Karuzas

**Date Submitted to Region 8:** \_\_\_\_\_

**FIELD OFFICE APPROVAL:**

**Lead Field Supervisor, U.S. Fish and Wildlife Service**

Approve Susan C. D. Norton Date 8/4/10

**U.S. FISH AND WILDLIFE SERVICE  
5-YEAR REVIEW**

*Arctostaphylos myrtifolia* (lone manzanita)

**Current Classification:** Threatened

**Recommendation Resulting from the 5-Year Review:**

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

**Appropriate Listing/Reclassification Priority Number:** 2

**Review Conducted By:** Jeremiah Karuzas

**Date Submitted to Region 8:** \_\_\_\_\_

**FIELD OFFICE APPROVAL:**

**Lead Field Supervisor, U.S. Fish and Wildlife Service**

Approve Susan C. Doran Date 8/4/10

**REGIONAL OFFICE APPROVAL:**

**Lead Assistant Regional Director, Ecological Services, U.S. Fish and Wildlife Service,  
Region 8**

Approve M. P. [Signature] Date 8/6/10