

Arctostaphylos glandulosa subsp. *crassifolia*
(Del Mar manzanita)

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



Arctostaphylos glandulosa subsp. *crassifolia* (Del Mar manzanita).
Photo Credit Emilie Luciani (USFWS).

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

August 13, 2010

5-YEAR REVIEW
Arctostaphylos glandulosa* subsp. *crassifolia
(Del Mar 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. 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:

Arctostaphylos glandulosa subsp. *crassifolia* (Del Mar manzanita) is a perennial burl-forming shrub in the Ericaceae (heath family). This plant ranges in height from 1 to 1.2 meters (3.3 to 4 feet) tall (USFWS 1996, p. 52371). It has thick, leathery leaves that are dark grey-green and a characteristic smooth red bark. It has clusters of urn-shaped flowers (white to pink) that appear in late winter to early spring. It is associated with southern maritime chaparral and occurs on sandstone terraces and bluffs. This species is endemic to San Diego County, California and northwestern Baja California, Mexico. At listing there were 17 occurrences distributed from Carlsbad south to Torrey Pines State Reserve and east to Rancho Santa Fe, just south of the San Dieguito River, southwest of Lake Hodges. Currently, there are 50 known occurrences of *A. g.* subsp. *crassifolia* in the United States that we consider to be extant or presumed extant. *Arctostaphylos glandulosa* subsp. *crassifolia* was listed as endangered under the Act in 1996.

Methodology Used to Complete This Review:

This review was prepared by Emilie Luciani at the Carlsbad Fish and Wildlife Office (CFWO), following the Region 8 guidance issued in March 2008. Our primary sources of information used to update the species' status and threats are survey data, data for *Arctostaphylos glandulosa* subsp. *crassifolia* in the California Natural Diversity Database (CNDDDB) (CNDDDB 2009, pp. 1-53, Element Occurrences (EO) 1-59) maintained by the California Department of Fish and Game (CDFG), and personal communications with species and habitat experts. There is no final approved recovery plan for this species. We received no information from the public in response

to our Federal Register Notice initiating this 5-year review. This 5-year review contains updated information on the species' biology and threats, and an assessment of that information compared to that known at the time of listing. We focus on current threats to the species that are attributable to the Act's five listing factors. The review synthesizes all this information to evaluate the listing status of the species and provide an indication of its progress towards recovery. Finally, based on this synthesis and the threats identified in the five-factor analysis, we recommend a prioritized list of conservation actions to be completed or initiated within the next 5 years.

Contact Information:

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Federal Register (FR) Notice Citation Announcing Initiation of This Review:

A notice announcing initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the Federal Register on March 25, 2009 (USFWS 2009, pp. 12878-12883). We did not receive any information relative to this species in response to this notice.

Listing History:

Original Listing

FR Notice: 61 FR 52370-52384

Date of Final Listing Rule: October 7, 1996

Entity Listed: *Arctostaphylos glandulosa* subsp. *crassifolia* (Del Mar manzanita), a plant subspecies

Classification: Endangered

Associated Rulemakings: None

Review History: No previous reviews have been drafted for this species.

Species' Recovery Priority Number at Start of 5-Year Review:

The recovery priority number for *Arctostaphylos glandulosa* subsp. *crassifolia* is 6C according to the 2009 Recovery Data Call for the Carlsbad Fish and Wildlife Office, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (USFWS 1983, pp. 43098-43105). This number indicates that the taxon is a subspecies that faces a 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:

A recovery plan has not been prepared for *Arctostaphylos glandulosa* subsp. *crassifolia*.

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 is a plant, 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 Description

Arctostaphylos glandulosa subsp. *crassifolia* is a perennial burl-forming shrub in the Ericaceae (heath family). It has aerial stems and a smooth red bark. The twigs and young stems characteristically lack glandular hairs, but rather are either densely covered with short fine hairs or have scattered longer hairs. The leaves are thick, leathery, and dark grey-green, sometimes with a reddish margin. The flowers are small, urn-shaped, white to pink in color, and appear between late winter and early spring. Compared to other subspecies, the globose fruits are small and markedly depressed and the twigs lack glandular hairs. These are among the diagnostic features of the taxon. The fruits of *A. glandulosa* produce an average of six seeds embedded in a hard resinous endocarp surrounded by a pulpy pericarp (Keeley 1977, p. 821; Keeley 1987, p. 446).

Species Biology and Life History

Arctostaphylos glandulosa subsp. *crassifolia* plants are woody shrubs, which, when mature, can regenerate from burls (lignotubers) and from seeds. The burl at the base of the stem is covered with undeveloped branch buds. Typically, these buds will sprout after the stems are removed or damaged by fire or other means. Occasionally some of these buds will sprout in the absence of fire (Keeley 1992a, p. 1196). Fire in chaparral communities are typically crown fires that kill all above ground vegetation. Because the plant can regenerate from the burls, which are present in seedlings after the first year, they are resilient to fire and can potentially be very long lived (Keeley et al. 2007, p. 43). In addition, *A. glandulosa* is shade intolerant and can be replaced by taller stature species (Howard 1992, p. 5).

The flowers of *Arctostaphylos glandulosa* are self-incompatible and are visited by flies, bees, and bee-flies (Keeley 1977, p. 821; Moldenke 1976, pp. 318-353). There does not appear to be any specialized seed dispersal mechanism and the fruits generally fall close to the parent plant in late summer where they may be consumed by rodents (Keeley 1977, pp. 821-826). Some are

eaten by foxes or coyotes and may be transported some distance away (Keeley 1977, p. 826; J. Keeley, U.S. Geological Survey, pers. comm. 2009).

Arctostaphylos glandulosa plants can produce considerable numbers of seeds; however, they exhibit large differences in annual seed production, and in some years, produce no seeds (Keeley 1977, p. 823). In addition, they have relatively small seed populations in the soil indicating that many of the seeds produced are either transported away or destroyed in situ (Keeley 1977, p. 826). *Arctostaphylos glandulosa* seeds are dependent on fire to germinate. The seeds remain dormant in the soil until they are stimulated to germinate when chemicals produced by charred wood are present (Keeley 1991, p. 92; Keeley et al. 2007, p. 43). Typically, seedlings are only established in the first year after a fire (Keeley 1991, p. 96).

Spatial Distribution and Abundance

Historically, *Arctostaphylos glandulosa* subsp. *crassifolia* was believed to be restricted to sandstone terraces and bluffs along the immediate coast in San Diego County, California, from Carlsbad south to Torrey Pines State Reserve. In 1982, prior to listing, approximately 16,600 to 17,600 individuals were known from about 21 populations. Other populations likely existed before 1982, but their numbers were not quantified prior to their habitats being lost.

At the time of listing, 25 extant populations and one extirpated population were known in San Diego County. Their distribution was from Carlsbad south to Torrey Pines State Reserve and east to Rancho Santa Fe, just south of the San Dieguito River, southwest of Lake Hodges. According to the listing rule, a significant number of the extant populations were severely impacted since 1982, reducing the number of individuals to approximately 9,400 to 10,300 (USFWS 1996, p. 52372). Since listing, it was discovered that the extirpated site along the San Dieguito River was not completely destroyed, but rather limited in area and currently supports a population of *Arctostaphylos glandulosa* subsp. *crassifolia* (T. Oberbauer, San Diego County, pers. comm. 2010). Therefore, 26 extant populations were likely known at the time of listing.

The 26 populations known at listing are now represented as 17 occurrences in the CNDDDB (CNDDDB 2009, pp. 1-53) and an additional 29 occurrences have been detected since listing for a total of 46 occurrences. It is unlikely that new occurrences were established by seed dispersal events since listing, because *A. glandulosa* subsp. *crassifolia* seed is not known to disperse in large quantities or over great distances; therefore, these newly detected occurrences were likely extant at the time of listing. We included four additional occurrences that were known at listing, but were not included in the listing rule because their subspecies was in question (see discussion below). This brings the total number of occurrences of *A. glandulosa* subsp. *crassifolia* in the United States to 50 (Appendix 1).

We consider all 50 occurrences to be extant or presumed extant. Occurrences are considered extant if we have recent information on their location, and are considered presumed extant if we have no new information on their location, but know that the habitat where they were found remains intact. In preparing this 5-year review, we visited 12 locations to determine the status of the taxon at each site. All of the sites that we visited had extant specimens of *Arctostaphylos glandulosa* subsp. *crassifolia*, however, at many of these sites the number of standing plants was

reduced from previous estimates (E. Luciani, USFWS, pers. obs. 2009). For those sites that we did not visit, we reviewed 2009 aerial imagery to determine whether or not the habitat appeared to be present. While habitat was visible at all of the sites, the extent of the habitat present varied greatly and until the status of the taxon at each site can be definitely determined, we presume that it is extant.

At the time of listing, *Arctostaphylos glandulosa* subsp. *crassifolia* was believed to occur on sandstone terraces and bluffs, from Carlsbad, south to Torrey Pines State Reserve and east to Rancho Santa Fe in San Diego County, California. In a recent taxonomic treatment for the species *A. glandulosa*, a new, narrower distribution for *A. g.* subsp. *crassifolia* was proposed. Based on morphologic traits, researchers restricted the distribution to within 3, or possibly 6 miles (mi) (5 to 10 kilometers (km)) from the coast, from Encinitas in San Diego County, south to Baja California (Keeley et al. 2007, p. 57). Carlsbad was not included in this distribution because the research suggests that while some of the plants in Carlsbad are *A. g.* subsp. *crassifolia*, many are a different subspecies (*A. g.* subsp. *glandulosa*) and that these northern populations comprise a mixture of the two subspecies (Keeley et al. 2007, p. 57). Based on this new treatment, surveys for *A. g.* subsp. *crassifolia* by land managers at the Rancho La Costa Habitat Conservation Area in Carlsbad, yielded nine individuals in a population previously thought to be over 1000. The majority of the plants at this site are now considered *A. g.* subsp. *glandulosa* (CNLM, unpubl. data 2009).

Currently, 32 of the 50 occurrences of *Arctostaphylos glandulosa* subsp. *crassifolia* are located within 6 mi (10 km) of the coast. The remaining 18 occurrences are located between 6 and 13 mi (10 and 21 km) away from the coast and on either different soils or in different vegetation types than the typical sandstones and maritime chaparral. These occurrences can be grouped into three distinct areas – near San Marcos, near Lake Hodges, and near Marine Corps Air Station (MCAS) Miramar:

San Marcos:

Approximately 10 mi (16 km) from the coast, in and around the City of San Marcos, three occurrences (EO 10, 12 and San Marcos) of *Arctostaphylos glandulosa* subsp. *crassifolia* occur on various coarse sandy or rocky silt loams, but do not occur in southern maritime chaparral. The vegetation types associated with these occurrences are chaparral, Diegan coastal sage scrub, and southern mixed chaparral.

Lake Hodges:

Approximately 7 miles (11 km) from the coast, in Rancho Santa Fe, southwest of Lake Hodges, 2 occurrences (EO 15 and 58) can be found, both on rocky silt loams types. The occurrence in and around the golf course at Crosby Estates can be found in typical southern maritime chaparral. Field visits confirmed that the population here consists of *Arctostaphylos glandulosa* subsp. *crassifolia*, *A. g.* subsp. *glandulosa* and intermediate individuals (E. Luciani, USFWS, pers. obs. 2010). To the south, at the Lusardi Creek Preserve, the plants occur in chamise chaparral.

MCAS Miramar:

The last area where *Arctostaphylos glandulosa* subsp. *crassifolia* can be found outside of its previously known range occurs in the vicinity of MCAS Miramar. Individuals of this taxon are located approximately 9 to 13 mi (15 to 21 km) from the coast and as far south as Mission Trails Regional Park. We visited some of the eight occurrences (EO 47, 50, 51, 52, 53, 54, 55, and MCAS Miramar Training Areas) at MCAS Miramar and determined that the population consists of *A. g.* subsp. *crassifolia*, *A. g.* subsp. *glandulosa* and intermediate individuals. Because of this, and the occurrence just south of MCAS Miramar at Mission Trails Regional Park (EO 46), we decided to include in this 5-year review, four occurrences (EO 29, 30, 31, 32) located near Miramar Reservoir (just north of MCAS Miramar) that were known at the time of listing but not included in the listing rule because their subspecific identity had been questioned. Generally, the soils associated with the occurrences near MCAS Miramar are Redding cobbly loams rather than the typical eroding sandstones found near the coast. While the vegetation associated with the Miramar Reservoir occurrences appears to be southern maritime chaparral, the vegetation type associated with the occurrences on MCAS Miramar is southern mixed chaparral. This vegetation type is comprised of similar associated plant species compared to southern maritime chaparral including *Cneoridium dumosum* (bushrue), *Adenostoma fasciculatum* var. *obtusifolium* (chamise), *Malosma laurina* (laurel sumac), *Ceanothus verrucosus* (coast white ceanothus), *Lonicera subspicata* (honeysuckle), *Quercus dumosa* (Nuttall's scrub oak), and *Yucca schidigera* (Mohave yucca).

Because of the documented occurrences of *Arctostaphylos glandulosa* subsp. *crassifolia* outside of the range of the plant known at listing, we feel that the range of this taxon is expanded and currently extends from the City of Carlsbad south along the coast to Torrey Pines State Reserve, east to MCAS Miramar, and as far south as Mission Trails Regional Park (Figure 1).

Occurrences not visited in preparation for this 5-year review should be visited at the appropriate time of year to determine the subspecific identity of plants present.

Arctostaphylos glandulosa subsp. *crassifolia* also occurs at San Diego Botanical Gardens (EO 59). In 1980, 75 individuals were propagated from 35 specimens and transplanted by staff at the Gardens. These plants originated from a development project near Canteberia Road in Encinitas (USFWS 1992, p. 3). At the time of listing, information regarding these plants was not used to determine the status of *A. g.* subsp. *crassifolia* in the listing rule, nor are they used in this 5-year review.

The status of *Arctostaphylos glandulosa* subsp. *crassifolia* in Mexico is uncertain. Prior to 1982, it was reported from five localities in northwestern Baja California, Mexico, from the border just east of Tijuana, south 25 mi (40 km) to Cerro el Coronel and Mesa Descanso. These occurrences are not well documented. The listing rule states that while little is known about these occurrences, this region in Mexico was severely impacted by the same factors (urban and agricultural development) that had been affecting the United States population (USFWS 1996, p. 52372). Currently, we have no additional information about these occurrences and no new occurrences have been reported from Mexico. Additional information on these occurrences will help us to gain a better assessment of the status of *A. g.* subsp. *crassifolia* in the future.

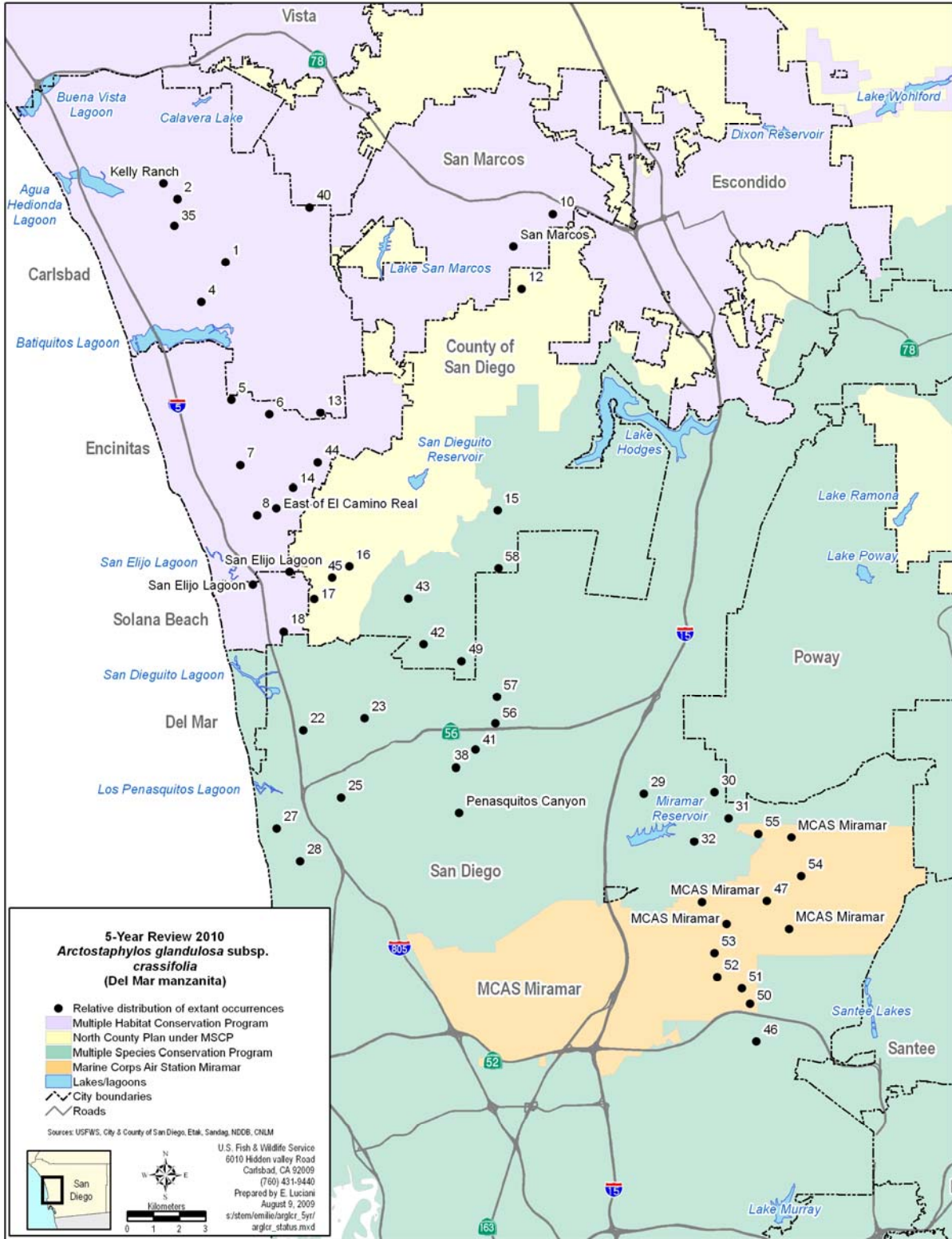


Figure 1: Distribution of known *Arctostaphylos glandulosa* subsp. *crassifolia* (Del Mar manzanita) occurrences; developed for the 5-Year Review 2010.

In summary, the geographical and ecological range of *Arctostaphylos glandulosa* subsp. *crassifolia* has changed since this species was listed. At the time of listing there were 26 known populations. Currently those 26 populations are represented as 17 occurrences by CNDDDB (CNDDDB 2009, pp. 1-53). Since listing, an additional 29 occurrences have been detected; 4 additional occurrences not included in the listing rule are included in Appendix 1 for a total of 50 occurrences. A total of 18 occurrences occur east of the range known at listing and on different substrates. However, these inland occurrences should be visited at the appropriate time of year to determine their subspecies status. The majority of occurrences have been reduced in area or there has been a decrease in the numbers of plants present. No new information is available for occurrences in Baja California, Mexico which prevents us from determining the current status of this species in Mexico.

Habitat or Ecosystem

Arctostaphylos glandulosa subsp. *crassifolia* is typically found in southern maritime chaparral. Southern maritime chaparral can be described as a chamise-black sage chaparral that includes rare species such as *A. g.* subsp. *crassifolia* and is associated with coastal fog from Carlsbad south to Point Loma. It occurs on weathered sandstone soils including the Carlsbad series, Cesterton series, and Corralitos sandy loam. It can also be found on loamy alluvium, rough broken land, and terrace escarpments. Southern maritime chaparral is typically found within 5 mi (8 km) of the coast. Plants associated with this vegetation type include *Salvia mellifera* (black sage), *Cneoridium dumosum*, *Eriogonum fasciculatum* subsp. *fasciculatum* (California buckwheat), *Adenostoma fasciculatum* var. *obtusifolium*, *Malosma laurina*, and *Yucca schidigera* (Hogan et al. 1996, p. 6).

Throughout its range, southern maritime chaparral is a severely reduced vegetation community. In San Diego County, estimates of the historical extent of southern maritime chaparral are approximately 21,000 acres (8,498 hectares) (Oberbauer and Vanderwier, 1991, p. 210 (identified as coastal mixed chaparral)). At the time of listing, the Service estimated that approximately 1,500 to 3,700 acres (607 to 1,497 hectares), or 18 percent, of southern maritime chaparral in San Diego County remained. This significant reduction in habitat was considered largely due to agricultural conversion and urbanization (USFWS 1996, p. 52371). Currently, the Service believes that the estimate of intact southern maritime chaparral in San Diego County is approximately 2,700 acres (1,093 hectares), an 87 percent reduction of the historical extent of southern maritime chaparral that likely supported *Arctostaphylos glandulosa* subsp. *crassifolia*. In Baja California, Mexico, southern maritime chaparral had also declined significantly due to agriculture and urbanization (USFWS 1996, p. 523721). Southern maritime chaparral also occurs in Orange County, but does not support *A. g.* subsp. *crassifolia*.

Since listing, *Arctostaphylos glandulosa* subsp. *crassifolia* has also been observed in limited numbers on coarse sandy or rocky silt loams or Redding cobbly loams in associations described as southern maritime chaparral, chaparral, southern mixed chaparral, or coastal sage scrub (Luciani, pers. obs. 2010).

Changes in Taxonomic Classification or Nomenclature

Neither the taxonomic classification nor the nomenclature of *Arctostaphylos glandulosa* subsp. *crassifolia* has changed since listing. However, as stated above, a recent paper studied subspecific variation in morphological traits in *A. glandulosa*. The researchers hypothesize that because of the number of shared traits between glandular tomentose (*A. glandulosa*) and non-glandular tomentose populations (*A. cushingiana*) that occur throughout the coastal ranges of California and Baja California, Mexico, both lineages may stem from a common origin. Because of this, both taxa are included in *A. glandulosa* as subspecies, one glandular (*A. g.* subsp. *glandulosa*) and one non-glandular (*A. g.* subsp. *cushingiana*). Each subspecies is further divided based on additional distinct variation and geographic constraints. According to this treatment, two glandular subspecies (*A. g.* subsp. *glandulosa* and subsp. *leucophylla*) and three non-glandular subspecies (*A. g.* subsp. *cushingiana*, subsp. *crassifolia*, and subsp. *adamsii*) can occur in San Diego County. One subspecies, *A. g.* subsp. *zacaensis*, identified in previous treatments and considered to occur in close proximity to *A. g.* subsp. *crassifolia* is now included in the more widespread *A. g.* subsp. *glandulosa* in the most recent systematic and floristic treatments (Keeley et al. 2007, p. 58; Parker et al. 2009, p. 443). In addition, intergradation of closely related subspecific taxa does occur and thus some populations reflect a mixture of traits and cannot be assigned a unique name of practical value (Keeley et al. 2007, p. 42). Traits now useful to identify *A. g.* subsp. *crassifolia* are that the young stems and leaves lack glandular hairs and that plants have small, markedly flattened fruits.

Genetics

We are unaware of any studies focused on the genetics of *Arctostaphylos glandulosa* subsp. *crassifolia* that have been conducted or proposed. Application of the new taxonomic treatment narrows the distribution of plants that may be considered to be *A. g.* subsp. *crassifolia*. We feel genetic studies would be beneficial to definitively determine which of the occurrences at the limits of its range are, in fact, *A. g.* subsp. *crassifolia*.

Species-specific Research and/or Grant-supported Activities

We are unaware of any research or grant-supported activities involving this species since the time of listing.

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

At listing, threats identified under Factor A include: urban and agricultural development, and indirect impacts from fuel modification activities and edge effects (USFWS 1996, pp. 52377-52378). Urban development was considered the most imminent threat facing *Arctostaphylos*

glandulosa subsp. *crassifolia*. In this review, we have added altered fire regime and invasive nonnatives as potential threats to the habitat. Also, we moved the discussion of trampling from Factor E, where it was discussed in the listing rule, to this section under a discussion of human access and disturbance. Threats collectively considered edge effects in the listing rule are discussed in this document under their basic component threats (e.g., fuel modification, invasive nonnative plants, and human access).

Development

According to the listing rule, the majority of extant populations had been greatly reduced and significantly fragmented due to urban and agricultural development mostly prior to listing (USFWS 1996, p. 52378). The majority of these populations were distributed in highly fragmented habitat along the margins of residential development. At listing, four of the six largest populations were threatened by proposed or approved development projects. Since listing, completion of these projects resulted in an additional 35 percent being eliminated through direct impacts and 20 percent through indirect impacts to these four populations. In addition, several of the smaller populations were impacted by development (USFWS 1996, pp. 52377-52378). Impacts of development are rangewide and are discussed among the seven major locations below: City of Carlsbad, City of Encinitas, City of San Marcos, Cities of Solana Beach and Del Mar, City of San Diego, County of San Diego, and MCAS Miramar. Agricultural development is not known to currently threaten this taxon and thus will not be discussed further.

City of Carlsbad:

There are nine occurrences located in the City of Carlsbad (EO 2, 4, 13, 35, 40, Kelly Ranch and portions of EO 1, 5, 6) (Appendix 1). Of these, seven occurrences (EO 2, 4, 5, 6, 13, 35, and Kelly Ranch) are conserved under provisions of the City of Carlsbad's Habitat Management Plan (HMP) or are part of homeowners' association (HOA) open space associated with existing residential developments, and one is proposed for conservation (EO 40). The remaining occurrence (EO 1) is partially conserved and remains threatened by development (City of Carlsbad 2004, p. A-4; City of Carlsbad 2009, p. 8). The HOA open space is governed by the HOA and maintained according to their guidelines. These areas are controlled for trash, fire, and illegal encampments and are not managed for *Arctostaphylos glandulosa* subsp. *crassifolia* or for any biological value (City of Carlsbad 2005, p. 3-7; Tierra Data 2008, p. 2). Occurrences that are either completely or partially located in HOA open space are EO 1, 2, 4, 5, 6, and 13. The HMP is described in detail below under Factor D. The conserved occurrences are either owned by the City of Carlsbad (EO 35), privately owned (EO 4, 5, 6, 13 and Kelly Ranch), or owned by both (EO 2). A portion of EO 1 (east of El Camino Real and north of Palomar Airport Rd) occurs on lands owned by the County of San Diego (McClellan-Palomar Airport). County owned lands were not considered a part of Carlsbad's subarea plan and are currently not covered by a HMP (AMEC Earth and Environmental Inc. and Conservation Biology Institute 2003, p. 2-1). Please see discussion under County of San Diego below.

Development could potentially occur on lands identified by the Carlsbad HMP as Standards Areas. Standards Areas are key properties for which a proposed hardline design for inclusion in the preserve system has not yet been submitted and where certain conservation goals and

standards will apply to future development. A portion of EO 1 is located in a Standards Area (Zone 21) and is the only location within the Carlsbad HMP potentially directly threatened by development. All the other locations of *Arctostaphylos glandulosa* subsp. *crassifolia* within the Carlsbad HMP boundary are either part of or proposed to be included in the City of Carlsbad's preserve system.

City of Encinitas:

There are seven occurrences located in the City of Encinitas (EO 7, 8, 14, 44, East of El Camino Real, and portions of EO 5 and 6) (Appendix 1). According to the Draft Encinitas Subarea Plan, three occurrences (EO 6, 14 and East of El Camino Real) are within conservation areas associated with approved development or are part of (HOA) open space associated with existing residential developments. This HOA open space is governed by the HOA and maintained according to their guidelines. These areas are controlled for trash, fire, and illegal encampments (Ogden and CBI, 2001, pp. 4-1-5-3). Occurrences that are either completely or partially located in HOA open space are EO 5, 6, 8, 14, and East of El Camino Real. One occurrence (portion of EO 14) located in the Manchester Habitat Conservation Area, is currently being managed and monitored by the Center for Natural Lands Management (CNLM). Three additional occurrences (EO 5, 7, and 8) are partially conserved and partially subject to development. The remaining occurrence (EO 44) is not conserved and development remains a threat. Currently, a development project has been proposed that would impact the northern portion of EO 8 in Lux Canyon. The City of Encinitas has a draft Subarea Plan under the Multiple Habitat Conservation Plan (MHCP); however, this plan is not finalized. Therefore, occurrences not yet assured of conservation or management remain threatened by development. The only mechanism for protecting these occurrences is under the Act.

City of San Marcos:

There are two occurrences of *Arctostaphylos glandulosa* subsp. *crassifolia*, both on private land, in the City San Marcos (EO 10 and San Marcos) (Appendix 1). The City has a draft Subarea Plan under the MHCP; however, this plan is not finalized. Therefore, these occurrences are not yet assured of conservation or management and remain threatened by development. Currently, the only mechanism for protecting these occurrences is the Act.

City of Solana Beach and City of Del Mar:

There is one occurrence on private land in the City of Solana Beach (EO 18), and one occurrence on City owned land in the City of Del Mar (portion of EO 22) (Appendix 1). These occurrences are not yet addressed under the MHCP or the Multiple Species Conservation Program (MSCP) because these cities do not have either draft or final subarea plans. *Arctostaphylos glandulosa* subsp. *crassifolia* occurrences in these cities are not yet assured of conservation or management and remain threatened by development. Currently, the only mechanism for protecting these occurrences is the Act. An additional occurrence of *A. g.* subsp. *crassifolia* (San Elijo Lagoon) in the City of Solana Beach occurs on lands owned by the County of San Diego within the San Elijo Lagoon Ecological Reserve. Please see discussion under County of San Diego below for information on this occurrence.

City of San Diego:

There are 15 occurrences located in the City of San Diego (portions of EO 22, EO 23, 25, 27, 28, 29, 30, 31, 32, 38, 41, 46, 56, 57, and Penasquitos Canyon) (Appendix 1). Of these, 7 are conserved and protected from development (EO's 27, 28, 41, 46, 56, 57 and Penasquitos Canyon), 4 are partially conserved and partially subject to development (portions of EOs 22, 25, 30, and 38), and 4 are not conserved and development remains a threat (EO's 23, 29, 31 and 32).

The City of San Diego MSCP Subarea Plan defined four major populations (EO 22, 27, 38, Penasquitos Canyon) of *Arctostaphylos glandulosa* subsp. *crassifolia* within the Multiple Habitat Planning Area (MHPA), each of which will be conserved from 75 to 100 percent, with 91 percent overall coverage (City of San Diego 1997, p. 109; USFWS and CDFG 1996, p. 21). In addition, they are required to prepare framework management plans to provide guidelines for preserve management and to develop area-specific management directives to address site-specific management issues. A plan is complete for Los Penasquitos Canyon Preserve and a draft plan for both the Carmel Mountain and Del Mar Mesa Preserves is awaiting approval. In addition, the plan for Mission Trails Regional Park is currently being written and efforts are underway to begin plans for Crest Canyon and Gonzales Canyon Preserves (B. Miller, City of San Diego, pers. comm. 2009).

County of San Diego:

There are 11 occurrences located in the County of San Diego (portions of EO 1, EO 12, 15, 16, 17, 42, 43, 45, 49, 58, and San Elijo Lagoon) (Appendix 1). Of these, four are conserved (EO 15, 17, 58 and San Elijo Lagoon). The remaining seven privately owned occurrences are not conserved. Of these, three are within the County MSCP (EO 42, 43, and 49) and are found on lands where preserve and development boundaries have not been delineated. Therefore, those lands will be subject to the terms of the County's Biological Mitigation Ordinance in order to receive take authorization for the species (County of San Diego 1998, pp. 1-17; USFWS 1998, pp. 7-56). The remaining four occurrences (portion of EO 1, EO 12, 16, and 45) are located in the North County MSCP and are not yet addressed under this plan because this plan is not yet final. *Arctostaphylos glandulosa* subsp. *crassifolia* occurrences in these areas are not yet assured of conservation or management and remain threatened by development. The only mechanism for protecting these occurrences is protection afforded under the Act. Currently, an industrial park and upgrading navigational aids are proposed projects that may impact *A. g.* subsp. *crassifolia* in EO 1 (County of San Diego 2009, Appendix E pp. 27-30).

MCAS Miramar:

There are eight occurrences located on MCAS Miramar (EO 47, 50, 51, 52, 54, 55, and MCAS Miramar training areas) (Appendix 1). The majority either occur in training areas or in the rifle and pistol range surface danger zone. Thirty plants at two occurrences (EO 50 and 51) will be impacted by the Military Family Housing project on MCAS Miramar. These impacts are proposed to be mitigated by developing and implementing a restoration plan for at least 90 plants and their associated habitats (USFWS 2008, p. 40).

In summary, 19 of the 50 *Arctostaphylos glandulosa* subsp. *crassifolia* occurrences are conserved and protected from development, 8 are partially conserved and partially subject to development, and 23 are not conserved and development remains a threat. Currently four occurrences (EO 1, 8, 50 and 51) have proposed development projects which could impact *A. g.* subsp. *crassifolia*.

Fuel Modification

In the listing rule, fuel modification was listed as a threat to *Arctostaphylos glandulosa* subsp. *crassifolia* (USFWS 1996, p. 52381). Fuel modification is the reduction of flammable vegetation along the urban/wildland interface to reduce fuel loads to contribute to fire protection and thereby public safety. Fuel modification activities can result in the damaging or removal of plants and their habitats. In addition, these activities can increase the fragmentation of habitat and increase the rate and extent of introduction of nonnative species which could in turn increase both erosion and fire frequency, all of which pose threats to *A. g.* subsp. *crassifolia* (see discussion of nonnatives and altered fire regime below) (Longcore 2003, p. 116).

Occurrences of *Arctostaphylos glandulosa* subsp. *crassifolia* occur primarily in association with mesa topography in naturally fragmented habitat. Because of the desirability of the mesa topography for development, the remaining occupied habitat is along the margins of residential development and is therefore subject to fuel modification activities (USFWS 1996, p. 52381).

Since listing, the Service entered into a Memorandum of Understanding (MOU) in 1997 with the San Diego County Fire Chiefs' Association, CDFG, Fire Districts' Association of San Diego County, and California Department of Forestry in order to establish standards for the abatement of flammable vegetation while minimizing the impacts to federally listed species including *Arctostaphylos glandulosa* subsp. *crassifolia* (USFWS 1997b, p. 1). This MOU essentially covers the entire range of the listed taxon. The Service's Biological Opinion regarding the MOU stated that potential adverse affects were not likely to jeopardize the species because landowners subject to vegetation abatement activities would be notified of the presence of listed species within 100 feet of their structures so that they may be avoided if possible (USFWS 1997c, p. 30). In 2009, the County of San Diego Department of Parks and Recreation, San Elijo Lagoon Conservancy, and City of Solana Beach Fire Department developed a vegetation management plan to reduce the risk of fire to properties adjacent to the San Elijo Lagoon Ecological Reserve. Consistent with the MOU, populations of *A. g.* subsp. *crassifolia* were identified and no vegetation was removed within 3 feet of the plant (County of San Diego Parks and Recreation Department et al. 2009, pp. 3-4). The root systems and stumps of the thinned vegetation were left intact; however, surface soil was left exposed. To control erosion in these areas, measures such as silt fencing, sterile straw wattles and sandbags were installed. In addition, as part of the overall management of the Reserve, invasive nonnative plants are being controlled. While threats to the individual plants may be alleviated by actions followed in accordance with the MOU, fuel modification activities still pose a threat to the habitat that supports *A. g.* subsp. *crassifolia* at approximately 22 occurrences (EO 1, 2, 4, 5, 6, 8, 10, 13, 14, 15, 18, 22, 47, 50, 51, 52, 53, 54, 55, MCAS Miramar, San Elijo Lagoon, and East of El Camino Real) (Appendix 1).

Altered Fire Regime

The listing rule says populations of *Arctostaphylos glandulosa* subsp. *crassifolia* were threatened by fire events that may be suppressed too long to maintain a healthy southern maritime chaparral habitat (USFWS 1996, pp. 52381-52382). However, no time interval was given for a fire cycle that would maintain a healthy population. Frequently, at the unburned sites that we visited in preparation for this review we saw plants that seemed unhealthy and crowded by taller stature native vegetation. Many of the branches of these plants were dead or dying and had evidence of slab growth. Often when leaves and new branches were present it was only at the very end of the branch (Luciani, pers. obs. 2009). At MCAS Miramar, prior to the 2003 Cedar Fire, plants that grew among dense unburned chaparral also appeared unhealthy with “many branches dead or desiccated and trunks covered with lichen” (Kellogg 2004, p. 8). Since the fire, populations of *A. g.* subsp. *crassifolia* are recovering well. They are resprouting from burls, showing signs of robust branching, and their vigor is considered strong. Overall the Cedar Fire was considered to have a positive impact on the species (MCAS Miramar 2006, p. 4-24).

Studies have shown that chaparral communities unburned for a century or more remain viable and show similar species diversity as younger stands. Sprouting shrubs were reported to have great longevity and there was little evidence of successional replacement by other vegetation types (Keeley 1992b, pp. 86-88). In addition, recovery of 100 year old chaparral fared as well as younger chaparral stands after fire (Keeley 2007, p. 18). Fire history data shows that the majority of *Arctostaphylos glandulosa* subsp. *crassifolia* occurrences (mainly located directly adjacent to residential development) have not burned in the last 100 years. Fire suppression activities may have prevented these areas from burning given their proximity to residential development, however, their proximity to residential development also puts them more at risk to be subjected to fire. Given this last assumption, we feel that fire suppression activities alone in the order of 100 years may not pose a threat to the habitat of *A. g.* subsp. *crassifolia*. However, more information is needed to determine what, if any, the impacts are of fire suppression in cycles greater than 100 years. For a discussion of additional threats to *A. g.* subsp. *crassifolia* from fire suppression activities, please see the Altered Fire Regime section under Factor E.

The listing rule also identified frequent fires to be a threat to *Arctostaphylos glandulosa* subsp. *crassifolia*. The increasing numbers and proximity of humans generally lead to increasing numbers and frequency of fires. Fires that occur too frequently may threaten the species because if resprouting plants are burned again before they are able to adequately replenish stores in the burls or sufficient seeds for their seed bank leaving the long term persistence of the plants in doubt. When fires are too frequent, nonnatives (especially grasses) can invade frequently burned areas and outcompete natives. In addition, they can modify the environment in their favor by creating a mass of highly flammable fuels which not only can extend the length of the fire season, but alter the types of fires that occur. Typically, chaparral fires are high intensity crown fires which burn all above ground vegetation. Fires where nonnative grasses and forbs are present are a combination of surface and crown fires. Surface fires are of lower intensity and tend to favor the nonnative seed bank which would otherwise be destroyed in a crown fire. This generally leads to a type conversion from native shrubs to nonnative grasslands (Keeley 2007, p. 18).

Essentially all known extant occurrences of *Arctostaphylos glandulosa* subsp. *crassifolia* are in close enough proximity to human occupation that they are affected by a general trend toward fire suppression or an increase in fire incidence related to nearby activities (e.g., military activities on MCAS Miramar). Consequently, we still consider altered fire regime a general rangewide threat to the habitat of *A. g.* subsp. *crassifolia*

Invasive Nonnatives

In the listing rule, nonnative species were noted as a threat to *Arctostaphylos glandulosa* subsp. *crassifolia*. Areas where natural vegetation and soils have been disturbed are more prone to invasion by nonnative species. Nonnative species can change plant community structure and can alter ecosystem processes, such as hydrology, fire intensity and frequency, soil process (deposition and erosion), nutrient cycling, and light availability (Cal-IPC 2006, p. 1). In addition, they can dominate the habitat, displace native species, potentially hybridize with natives, and facilitate the invasion of other nonnative species.

Reserves and protected areas are not safe from invasive nonnative species (Bossard et al. 2000, pp. 11-18) even if there is some level of specific management for control. The Habitat Management Plan for Kelly Ranch identifies nonnative species as the biggest challenge for management of the preserve currently and for many years to come (CNLM 2008a, p. 21).

Some invasive nonnative plants can become well established locally and may have profound impacts to the habitat. For example, land managers at the Rancho La Costa Habitat Conservation Area (EO 1) in the City of Carlsbad have noted a nonnative grass, *Ehrharta calycina*, as a serious problem for the reserve (Appendix 1). This grass is invasive, can cover the ground like a mat, and potentially increase the flammability of the area (J. Vinje, CNLM, pers. comm. 2009). According to the California Invasive Plant Inventory, *Ehrharta calycina* is considered to have a severe ecological impact on plant and animal communities and are considered to be severely invasive (Cal-IPC 2006, pp. 3-11). Another example is the presence of a woodland *Eucalyptus* spp. at San Dieguito County Park (EO 17). The canopy is relatively open over the *Arctostaphylos glandulosa* subsp. *crassifolia* occurrence but there is a layer of dead, high oil content leaves augmented by park personnel who spread additional leaf litter and wood chips from maintenance operations in the area (Luciani, pers. obs. 2009). If, and when a fire starts at this site, it will likely be intense enough to kill at least some of the burls. In addition, *Eucalyptus* spp. can have an allelopathic effect on other plants from the compounds found in its bark and leaf litter. These compounds have been shown to inhibit germination, seedling length, vigor, and nitrogen fixation of certain plant species (Sasikumar et al. 2001, pp. 135-137). Currently, nonnative species likely continue to be a threat to *A. g.* subsp. *crassifolia* and its habitat at most occurrences (Appendix 1).

Human Access and Disturbance

In the listing rule, trampling where trails have been cut through populations by recreationalists and farm workers was identified as a threat to *Arctostaphylos glandulosa* subsp. *crassifolia* and discussed under Factor E (USFWS 1996, p. 52381). We have included this threat into a more broadly defined threat of human access and disturbance. Most *A. g.* subsp. *crassifolia*

occurrences are directly adjacent to residential development. Use of these lands, whether or not public access is allowed, has proven to be problematic. For example, unwanted public use of lands supporting *A. g.* subsp. *crassifolia* have resulted in trail creation, disposal of green waste, dumping of trash, vandalism, and itinerant encampments on the Kelly Ranch and Rancho La Costa Preserves in the City of Carlsbad (CNLM 2008a, p. 22; CNML 2008b, p. 28). We have no evidence of direct impacts to *A. g.* subsp. *glandulosa* or its habitat; however, these activities generally lead to habitat degradation. Preserve managers continually work to stop unwanted use of the preserves through patrolling, education, signage, etc. (CNLM 2005, p. 34). Many preserves in the City of Carlsbad are owned by HOAs and managed according to pre-existing levels of management (usually management of property boundaries and trash removal). In the absence of a land manager, problems associated with human access could pose a large threat for *A. g.* subsp. *crassifolia*. Impact to the habitat from human access is considered a documented threat at a minimum of two occurrences (EO 1 and Kelly Ranch).

Summary of Factor A

At the time of listing, the direct loss of habitat to development was the primary threat to *Arctostaphylos glandulosa* subsp. *crassifolia*. Since listing, approximately 19 of the 50 extant occurrences occur in areas that are conserved and protected from development; an additional 8 occurrences are partially conserved and protected from development. The conservation of these areas has been accomplished through application of the Act, other State and Federal laws, and the regional planning efforts in San Diego. These conservation efforts have helped to reduce or eliminate the threat of direct habitat loss due to development to 19 known extant occurrences and have helped to reduce or eliminate the threat of direct habitat loss due to development to portions of an additional 8 occurrences. However, a total of 23 occurrences (and portions of 8 occurrences) are not conserved and are potentially threatened with development. Therefore, we still consider that the greatest threat to *A. g.* subsp. *crassifolia* attributable to Factor A is development. An additional serious threat to the habitat of *A. g.* subsp. *crassifolia* is from fuel modification activities, altered fire regime, invasive nonnative plants, and activities associated with human access to occupied sites. Overall, impacts from Factor A threats remain a concern across this taxon's range.

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

Overutilization was not known to be a factor in the 1996 listing rule (USFWS 1996, p. 52379). Overutilization for any purpose does not appear to be a threat at this time.

FACTOR C: Disease or Predation

Disease or predation was not known to be a factor in the 1996 listing rule (USFWS 1996, p. 52379). Disease or predation do not appear to be threats at this time.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

At the time of listing, regulatory mechanisms thought to have some potential to protect *Arctostaphylos glandulosa* subsp. *crassifolia* included: (1) the California Environmental Quality Act (CEQA); (2) regional planning efforts pursuant to the Natural Community Conservation Planning (NCCP) Program; (3) the Act, in those cases where these species occur in habitat occupied by other listed species; (4) land acquisition and management by Federal, State, or local agencies, or by private groups and organizations; (5) local laws and regulations; and (6) laws and regulations in Mexico. The listing rule (USFWS 1996, pp. 52379–52381) provides an analysis of the level of protection that was anticipated from those regulatory mechanisms. Below we have included a discussion of the laws discussed in the listing rule and added discussions on the California Endangered Species Act (CESA), Native Plant Protection Act (NPPA), California Coastal Act, Sikes Act, and National Environmental Policy Act (NEPA).

State Protections

California Endangered Species Act (CESA) and Native Plant Protection Act (NPPA)

CESA (California Fish and Game Code, section 2080 *et seq.*) prohibits the unauthorized take of State-listed threatened or endangered species. NPPA (Division 2, Chapter 10, section 1908) prohibits the unauthorized take of State-listed threatened or endangered plant species. CESA requires State agencies to consult with CDFG 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.

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 are notified by the State that a rare or endangered plant is growing on their land, the landowners are required to notify CDFG 10 days in advance of changing land use in order to allow salvage of listed plants. CESA generally requires an incidental take permit for activities that would result in take of a State-listed species. Among other requirements for a State incidental take permit, a project proponent must demonstrate that any such take will be fully mitigated. *Arctostaphylos glandulosa* subsp. *crassifolia* is not State-listed, but can co-occur with other State-listed species. Therefore, *A. g.* subsp. *crassifolia* may receive indirect protection under CESA and NPPA.

California Environmental Quality Act (CEQA)

CEQA is the principal statute mandating environmental assessment of projects in California. The purpose of CEQA is to evaluate whether a proposed project may have an adverse affect on the environment and, if so, to determine whether that effect can be reduced or eliminated by pursuing an alternative course of action or through mitigation. CEQA applies to projects proposed to be undertaken or requiring approval by State and local public agencies

(http://www.ceres.ca.gov/topic/env_law/ceqa/summary.html). CEQA requires disclosure of potential environmental impacts and a determination of “significant” if a project has the potential to reduce the number or restrict the range of a rare or endangered plant or animal; however, projects may move forward if there is a statement of overriding consideration. If significant effects are identified, the lead agency has the option of requiring mitigation through changes in the project or to decide that overriding considerations make mitigation infeasible (CEQA section 21002). Protection of listed species through CEQA is, therefore, dependent upon the discretion of the lead agency involved. *Arctostaphylos glandulosa* subsp. *crassifolia* is not State-listed, but may receive indirect protection where it co-occurs with species listed under the CESA.

Natural Community Conservation Planning (NCCP) Act

The NCCP program is a cooperative effort between the State of California and numerous private and public partners with the goal of protecting habitats and species. The NCCP identifies and provides for the regional or area-wide protection for plants, animals, and their habitats, while allowing compatible and appropriate economic activity. The program began in 1991 under the State’s NCCP Act (CFG Code 2800-2835). The primary objective of the NCCP program is to conserve natural communities at the ecosystem scale while accommodating compatible land uses (<http://www.dfg.ca.gov/nccp/>). Regional NCCPs provide protection to federally listed species by conserving native habitats upon which the species depends. The specific plans under the NCCP Act that cover *Arctostaphylos glandulosa* subsp. *crassifolia* are discussed below under the Act.

California Coastal Act

The California Coastal Commission (CCC) considers the presence of listed species when defining Environmentally Sensitive Habitat Areas (ESHA) which are subject to section 30240 of the California Coastal Act of 1976. This section of the California Coastal Act states that ESHAs shall be protected against any significant disruption of habitat values. Certain local jurisdictions have developed their own Local Coastal Programs or Land Use Plans that have been approved by the CCC. Although approximately 91 percent of California’s wetlands were lost prior to 1980 there has been relatively little loss of wetlands in coastal California over the last 30 years due to the extremely protective nature of section 30233 of the California Coastal Act (CCC 2006, p. 23). In addition to a reduction of wetland losses, there have been large and small restoration projects conducted by a variety of cooperators (CCC 2006, p. 23). Projects that occur in the Coastal Zone and potentially impact *Arctostaphylos glandulosa* subsp. *crassifolia* may receive additional protection due to this law, but not all occurrences are within the Coastal Zone. The Coastal Zone was mapped by the California legislature and can vary in width from several hundred feet up to 5 miles depending on the degree of urbanization (CCC 2009, p. 1).

Federal Protections

National Environmental Policy Act (NEPA)

NEPA (42 U.S.C. 4371 *et seq.*) provides some protection for listed species that may be affected by activities undertaken, authorized, or funded by Federal agencies. Prior to implementation of such projects with a Federal nexus, NEPA requires the agency to analyze the project for potential

impacts to the human environment, including natural resources. In cases where that analysis reveals significant environmental effects, the Federal agency must propose mitigations that could offset those effects (40 C.F.R. 1502.16). These mitigations usually provide some protection for listed species. However, NEPA does not require that adverse impacts be fully mitigated, only that impacts be assessed and the analysis disclosed to the public.

Sikes Act

The Sikes Act Improvement Act of 1997 requires Department of Defense (DoD) installations to prepare Integrated Natural Resource Management Plans (INRMPs) that provide for the conservation and rehabilitation of natural resources on military lands consistent with the use of military installations to ensure the readiness of the Armed Forces. While the Sikes Act of 1960 was in effect at the time *Arctostaphylos glandulosa* subsp. *crassifolia* was listed, it was not until the amendment of 1997 (Sikes Act Improvement Act) that DoD installations were required to prepare INRMPs. The INRMPs incorporate, to the maximum extent practicable, ecosystem management principles and provide the landscape necessary to sustain military land uses. While INRMPs are not technically a regulatory mechanism because their implementation is subject to funding availability, they can be an added conservation tool in promoting the recovery of endangered and threatened species on military lands. The only DoD installation known to support *A. g.* subsp. *crassifolia* is MCAS Miramar.

Protection and management of listed species on MCAS Miramar, is guided by an INRMP that was initially developed in 2000 and updated in 2006. As part of the 2000 INRMP, a Habitat Evaluation Model (HEM) was developed to identify and rank important biological resources and their associated habitats. The HEM was then used to help delineate five Management Areas for the Station based on the differing conservation requirements and management concerns with Level I receiving the highest conservation priority and Level V receiving the lowest priority. The majority of *Arctostaphylos glandulosa* subsp. *crassifolia* occur in Level II Management Area (MCAS Miramar 2006, pp. 4-42-5-7).

MCAS Miramar's approach for conservation and management of *Arctostaphylos glandulosa* subsp. *crassifolia* is to maintain and, when possible, enhance populations while maintaining maximum compatible use of operations requirements. Management considerations include avoiding or minimizing the effect of the planned action. For *A. g.* subsp. *crassifolia*, this means minimizing off-road activities near known populations of *A. g.* subsp. *crassifolia* during the plants active growth period and allowing vehicle operations only on roads and fuelbreaks. Efforts will be made to avoid accidental damage to *A. g.* subsp. *crassifolia* by implementing site specific measures, such as fencing. Mitigation for impacts will be targeted in Level I and II Management Areas prior to Level III, IV, or V Management Areas (MCAS Miramar 2006, pp 5-2). Currently, MCAS Miramar has conducted a population census and established permanent monitoring plots for *A. g.* subsp. *crassifolia* and has plans to develop a long-term monitoring plan as well (MCAS Miramar 2006, pp. 7-16; J. Kassebaum, MCAS Miramar, pers. comm. 2009).

Endangered Species Act of 1973, as Amended (Act)

Since listing, the Act is the primary Federal law that may provide protection for this species. The Service's responsibilities include administering the Act, including sections 7, 9, and 10. Section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that actions they fund, authorize, or carry out do not "jeopardize" a listed species or result in the "destruction or adverse modification" of habitat in areas designated by the Service to be "critical." A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its reproduction, numbers, or distribution (50 C.F.R. § 402.02). A non-jeopardy opinion may include reasonable and prudent measures that minimize the amount or extent of incidental take of listed species associated with a project. Critical habitat has not been proposed for this taxon.

Under section 9(a)(2) of the Act, it is unlawful to remove and reduce to possession (i.e., collect), and maliciously damage or destroy any listed plants from lands under Federal jurisdiction. In addition, it is unlawful to remove, cut, dig up, or damage or destroy listed plants on non-Federal lands in knowing violation of any law or regulation of any state or in the course of any violation of a state criminal trespass law.

Section 10(a) of the Act allows for exceptions to section 9 prohibitions. Under section 10(a)(1)(A) of the Act there are provisions for collection of plants or plant parts for scientific purposes or to enhance the propagation and survival of the species. Under section 10(a)(1)(B) the Service may issue "incidental take" (take is defined in section 3(18) of the Act) permits for listed animal species to non-Federal applicants. Take and therefore incidental take protections are not extended to plants. "Incidental take" refers to taking of listed species that results from, but is not the purpose of, carrying out an otherwise lawful activity by a Federal agency or applicant (50 CFR 402.02). To qualify for an incidental take permit, applicants must develop, fund, and implement a Service-approved Habitat Conservation Plan (HCP) that details measures to minimize and mitigate the project's adverse impacts to listed species including listed plants. Issuance of an incidental take permit by the Service is subject to section 7 of the Act; thus, the Service is required to ensure that the actions proposed in the HCP are not likely to jeopardize the animal or plant species or result in the destruction or adverse modification of critical habitat. Therefore, HCPs may provide an additional layer of regulatory protection to animals as well as plants. Although section 10(a)(1)(B) allows for exemptions to take prohibitions under section 9 for animals it does not allow for similar exemptions for plants. The two most important regional HCPs for *Arctostaphylos glandulosa* subsp. *crassifolia* are the San Diego Multiple Species Conservation Program/Natural Community Conservation Plan/HCP (MSCP) (City of San Diego 1997, approved by the Service in 1997) and the San Diego Multiple Habitat Conservation Program/Natural Community Conservation Plan (MHCP) (AMEC Earth and Environmental Inc. and Conservation Biology Institute, 2003; approved by the Service in 2004).

Multiple Species Conservation Plan (MSCP):

The Multiple Species Conservation Program is a comprehensive habitat conservation planning program for southwestern San Diego County. Currently, the City of San Diego and the County

of San Diego have approved subareas plans under the MSCP that address *Arctostaphylos glandulosa* subsp. *crassifolia*.

City of San Diego and County of San Diego Subarea Plans under the MSCP:

Subarea Plans under the MSCP contain framework management plans to provide guidelines for preserve management and to develop area-specific management directives to address site-specific management issues. The framework management plans and area-specific management directives are comprehensive and address a broad range of management needs at the preserve and species levels that are intended to reduce the threats to covered species, including *Arctostaphylos glandulosa* subsp. *crassifolia*. In addition, Subarea Plans are to address the specific requirements identified as conditions for take authorization for *A. g.* subsp. *crassifolia*. These plans and directives address the following: (1) fire management, (2) public access control, (3) fencing and gates, (4) ranger patrol, (5) trail maintenance, (6) visitor/interpretive and volunteer services, (7) hydrological management, (8) signage and lighting, (9) trash and litter removal, (10) access road maintenance, (11) enforcement of property and/or homeowner requirements, (12) removal of invasive species, (13) nonnative predator control, (14) species monitoring, (15) habitat restoration, (16) management for diverse age classes of covered species, (17) use of herbicides and rodenticides, (18) biological surveys, (19) research, and (20) species management conditions (City of San Diego 1997, pp. 49-56; County of San Diego 1997, pp. 1-18-1-28; County of San Diego 1998, pp. 6-7-6-13).

The City of San Diego MSCP Subarea Plan defined four major occurrences (EO 22, 27, 38, and Penasquitos Canyon) of *Arctostaphylos glandulosa* subsp. *crassifolia* within the MHPA, each of which will be conserved from 75 to 100 percent, with 91 percent overall conservation (City of San Diego 1997, p. 109; USFWS and CDFG 1996, p. 21). The MHPA delineates areas targeted for conservation that contain core biological resources and corridors (City of San Diego 1997, p. 1). The Service concluded that this, along with the specific management measures identified to reduce the impacts of development along the urban interface, would not reduce the likelihood of the survival and recovery of *A. g.* subsp. *crassifolia* (USFWS 1997a, p. 114). Under the County of San Diego's MSCP Subarea Plan, over 60 percent of the mapped occurrences of *A. g.* subsp. *crassifolia* will be conserved when the plan is fully implemented (USFWS 1998, pp. 7-56). In addition, if any occurrences of *A. g.* subsp. *crassifolia* are found on lands where preserve and development boundaries have not been delineated, those lands will be subject to the terms of the County's Biological Mitigation Ordinance in order to receive take authorization for the species. The Service concluded that these, along with the specific management measures identified to reduce the edge effects to the species, would not reduce the likelihood of the survival and recovery of *A. g.* subsp. *crassifolia* (County of San Diego 1997, pp. 1-17; USFWS 1998, pp. 7-56). Although some losses may occur to this species within the lands that are not currently preserved or otherwise designated for conservation under the MSCP, the preservation, conservation, and management, including management to address the role of fire in sustaining populations of *A. g.* subsp. *crassifolia*, provided under the City and County MSCP Subarea Plans ensures the long-term conservation of this species and its habitat within all areas addressed by the subarea plans under the MSCP.

In the listing rule we identified habitat destruction and fragmentation from urban, agricultural, or recreational development, fuel modification, trampling, and nonnative invasive plant species as primary threats to the species (USFWS 1996, pp. 52377-52382). As described above, the MSCP provides protection and appropriate management for *Arctostaphylos glandulosa* subsp. *crassifolia*, and its habitat through implementation of conservation strategies that are consistent with generally accepted principles of conservation biology. The MSCP preserves habitat that supports this species and provides for its recovery.

North County Plan under the MSCP:

The Draft North County Plan encompasses lands in northwestern San Diego County that support six occurrences (EO 12, 16, 17, 45, San Elijo Lagoon, and portions of EO 1) of *Arctostaphylos glandulosa* subsp. *crassifolia*. According to the Plan, a minimum of 80 percent of the known locations of *A. g.* subsp. *crassifolia* will be conserved (County of San Diego 2009, p. 61). Additional conservation measures may apply under the Plan's Narrow Endemic Policy which requires maximum avoidance of all locations of *A. g.* subsp. *crassifolia* within the Plan area (County of San Diego, 2009, pp. 79-80). Because the Plan is not yet finalized, no further discussion will be included here.

Multiple Habitat Conservation Plan (MHCP):

The Multiple Habitat Conservation Plan (MHCP) is a comprehensive, multi-jurisdictional planning program designed to create, manage, and monitor an ecosystem preserve in northwestern San Diego County. Of the seven cities evaluated under the MHCP, only Carlsbad, Encinitas, San Marcos, and Solana Beach have occurrences of *Arctostaphylos glandulosa* subsp. *crassifolia* (AMEC Earth and Environmental, Inc. et al. 2003, p. 4-30). No further discussion of these latter cities' subarea plans will be included here. Carlsbad is the only city that currently has an approved subarea plan (see discussion below). The other cities have draft subareas plans.

Under the MHCP, 97 percent of the locations of *Arctostaphylos glandulosa* subsp. *crassifolia* that were evaluated will be conserved (EO 2, 6, 13, 14, 35, and portions of EO 5, 7, 8, and San Marcos). The majority of the locations fall within the Focused Planning Area (FPA) and will be conserved at levels of 95 to 100 percent (AMEC Earth and Environmental, Inc. et al. 2003, pp. 4-29-4-30). However, the Narrow Endemics Policy will apply to any locations potentially threatened with development or to any new locations found in the future. For populations within the FPA, this policy requires maximum avoidance, minimization of impacts with no more than 5 percent gross cumulative loss for populations or occupied acreage, and mitigation for unavoidable impacts resulting in no net loss of narrow endemic populations, occupied acreage, or population viability. For populations outside the FPA, this policy requires avoidance, minimization of impacts with no more than 20 percent gross cumulative loss of locations, numbers or occupied acreage, and mitigation resulting in no net loss and designed to minimize adverse effects to the species viability and contribute to the species recovery. In addition, any location of *A. g.* subsp. *crassifolia* listed as a Critical Location must be totally avoided. If new locations are determined to be Critical, then those locations must be maximally avoided which means "avoidance of impacts to the degree practicable without precluding reasonable use of the property" (AMEC Earth and Environmental, Inc. et al. 2003, pp. D-1-D-2).

Carlsbad Habitat Management Plan (HMP) under the MHCP:

The City of Carlsbad HMP is a subarea plan under the northwestern San Diego County MHCP. The MHCP is a comprehensive, multi-jurisdictional planning program designed to create, manage, and monitor an ecosystem preserve in northwestern San Diego County. The incidental take permit for the City of Carlsbad HMP was issued on November 9, 2004, and the City was the first of the seven participating cities to receive a permit on their subarea plan. *Arctostaphylos glandulosa* subsp. *crassifolia* is a “conditionally covered species” under the subarea plan. Once the City of Carlsbad has adequate funding and legal access to manage and monitor the plant consistent with the requirements of the MHCP, it will become a covered species.

There are nine occurrences of *Arctostaphylos glandulosa* subsp. *crassifolia* within the City of Carlsbad. Point localities distributed among five of these (EO 2, 5, 6, 13, and portions of EO 1) were evaluated in the HMP and it was determined that, overall, 83 percent (46 of the 49 point localities) would be conserved (AMEC Earth and Environmental, Inc. et al. 2003, pp. 4-29–4-30). Sites included in the remaining four occurrences (EO’s 4, 35, 40, and Kelly Ranch) were not evaluated in the HMP; however, all four are conserved or proposed for conservation. Preservation of other occurrences (portions of EO 1) not evaluated in the HMP is required to be consistent with the MHCP’s narrow endemic policy which requires mitigation for unavoidable impacts and management practices designed to achieve no net loss of narrow endemic populations, occupied acreage, or population viability within FPAs. In addition, cities cannot permit more than 5 percent gross cumulative loss of narrow endemic populations or occupied acreage within the FPAs, and no more than 20 percent cumulative loss of narrow endemic taxon locations, population numbers, or occupied acreage outside of FPAs (AMEC Earth and Environmental, Inc. et al. 2003, pp. 2-14, D-1). All conserved populations of *A. g.* subsp. *crassifolia* will be incorporated into the preserve areas of the HMP. The HMP includes provisions to manage the populations within the preserve areas in order to provide for the long-term conservation of the species by minimizing edge effects, preventing disturbance, protecting against frequent fires, and possibly including prescribed fires (City of Carlsbad 2004, pp. D-97–D-98).

Some properties in Carlsbad’s HMP are considered Standards Areas. Standards Areas are key properties that have not submitted proposed hardline designs for inclusion in the preserve system, and where certain conservation goals and standards will apply to future development. Standards Areas are located in Local Facility Management Zones that do not have approved local facilities management plans which is a requirement of the City Council prior to processing development applications. Each plan will demonstrate how the goals and objectives of the HMP will be achieved and will ensure that viable biological open space will be planned for comprehensively. The HMP outlines specific goals and standards for each zone. Zone 21 contains a critical population of *Arctostaphylos glandulosa* subsp. *crassifolia* (a portion of EO 1). A critical population is defined as “an area that must be conserved substantially for that species to be adequately conserved by the MHCP” (City of Carlsbad 2004, p. B-2). The HMP Conservation Goals and Planning Standards for this area are to conserve Narrow Endemic plant populations by avoiding the plants. However, if impacts cannot be avoided, they must be limited to disturbed or low quality portions of the site.

Fieldstone/La Costa HCP:

The incidental take permit for the Fieldstone/La Costa Associates HCP was issued on June 6, 1995. This project, within the City of Carlsbad, directly impacted 171 of the 1,025 plants at the Rancho La Costa occurrence (portion of EO 1). All remaining *Arctostaphylos glandulosa* subsp. *crassifolia* within the occurrence were conserved for these impacts and for impacts to 1,200 plants (EO 6) from the Arroyo La Costa development (USFWS 1993, p. 9; USFWS 1995, p. 20). However, based on the new treatment of *A. g.* subsp. *crassifolia*, surveys of *A. g.* subsp. *crassifolia* here yielded nine individuals in a population previously thought to be over 1000. The majority of the plants at this site are now considered *A. g.* subsp. *glandulosa* by land managers (CNLM, unpubl. data 2009). These nine individuals are located in a section of the Rancho La Costa Habitat Conservation Area called the Greens which is owned and actively managed by CNLM. These lands will be maintained and managed in perpetuity for the benefit of *A. g.* subsp. *crassifolia*. Long-term management activities identified in the HCP include monitoring, restoration or enhancement, nonnative plant management, fire management, and access controls (City of Carlsbad/Fieldstone/La Costa Associates 1995, p. 90).

Local Laws and Regulations

In San Diego County, most jurisdictions require that prior to any grading activities a grading permit is acquired (San Diego County Code of Regulatory Ordinances, Title 8, Division 7, Chapter 1; San Diego Municipal Code, Chapter 14, Article 3, Division 1: Environmentally Sensitive Lands Regulations; San Diego Municipal Code, Chapter 14, Article 2, Division 1: Grading Regulations; Municipal Code for the City of Carlsbad, California, Chapter 15.16: Grading and Erosion Control; City of Encinitas Grading, Erosion, and Sediment Control Ordinance (Chapter 23.24); City of San Marcos Grading Ordinance, Chapter 17.32; City of Solana Beach Municipal Code, Chapter 15.40; City of Del Mar Municipal Code, Chapter 23.32). As part of the permit process, applications receive environmental review which ensures that grading projects take environmental constraints into account. The result of these and other local laws is a high rate of compliance to existing laws before grading at a project site occurs. Due to the regulations under CEQA and NEPA, project proponents attempt to reduce the impacts that their projects will have on sensitive biological resources. Without the status of being federally endangered, *Arctostaphylos glandulosa* subsp. *crassifolia* would not necessarily receive the same level of priority for avoidance as it does at this time.

Laws and Regulations in Mexico

The Service is not aware of any existing regulatory mechanisms that protect *Arctostaphylos glandulosa* subsp. *crassifolia* or its habitat where it occurs in northwestern Baja California, Mexico. *Arctostaphylos glandulosa* subsp. *crassifolia* is not listed under the Mexican equivalent of the Act (SEMARNAT 2002).

Summary of Factor D

In summary, the Act is the primary Federal law that provides protection for this species since its listing as endangered in 1996. The provisions included in regional HCPs and in MCAS Miramar's INRMP are expected to provide for conservation of *Arctostaphylos glandulosa* subsp. *crassifolia* occurrences and to provide adaptive management of the habitat to address threats to the plant. Some of the regional HCPs subarea plans do not yet have approved management plans that address *A. g.* subsp. *crassifolia* or the subarea plans are still in draft form. The Act, in conjunction with other Federal and State laws, has been beneficial to the conservation of *A. g.* subsp. *crassifolia* and its habitat. The laws, regulations, and planning efforts mentioned above have reduced the likelihood of major habitat loss and alteration. However, without the status of being federally endangered, *A. g.* subsp. *crassifolia* would not necessarily receive the same level of priority for avoidance as it does at this time. Occurrences of *A. g.* subsp. *crassifolia* that are not addressed by a completed HCP or subject to a section 7 consultation are still vulnerable to losses. Therefore, we continue to believe other laws and regulations have limited ability to protect the species in absence of the Act.

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

At listing, threats identified under Factor E included: habitat fragmentation, fuel modification, altered fire regime, and nonnatives (USFWS 1996, pp. 52381-52382). We still consider these to be threats; however, we moved the discussion of fuel modification and nonnatives under Factor A. Since listing, we also consider small population size, military training, and climate change to be threats impacting *Arctostaphylos glandulosa* subsp. *crassifolia*.

Altered Fire Regime

In the listing rule, altered fire regime, specifically fire suppression, was considered a threat to maintaining healthy southern maritime chaparral habitat (see discussion of Altered Fire Regime under Factor A) (USFWS 1996, pp. 52381-52382). Currently, we feel fire suppression activities are a potential threat to populations of *Arctostaphylos glandulosa* subsp. *crassifolia*. While existing plants can continually sprout from buds on the lignotuber, the likelihood of new plants being generated from seeds in the absence of fire is low. Seeds of *A. g.* subsp. *crassifolia* can remain dormant in the soil for years and are stimulated to germinate in the first post fire year when chemicals produced by fire are present. Therefore, in order to have the opportunity to expand their populations, *A. g.* subsp. *crassifolia* needs fire (Keeley 1992a, p. 1201). In addition, *A. g.* subsp. *crassifolia* has low seed viability and large variations in annual seed production. This can have an effect on the production of seedlings. Of the 11 unburned sites that we visited, we found only one seedling (Luciani, pers. obs. 2009). In contrast, first year post fire surveys on MCAS Miramar found either new seedlings or resprouts from burls of *A. g.* subsp. *crassifolia* (Kellogg 2004, p. 4).

In addition, because *Arctostaphylos glandulosa* subsp. *crassifolia* is shade intolerant and because of its low growing nature, fire suppression activities can allow larger stature plants to overtop them posing an additional threat to the plants (Howard 1992, p. 5; Kellogg 2004, p. 8; MCAS Miramar 2006, p. 4-16).

Essentially all known extant occurrences of *Arctostaphylos glandulosa* subsp. *crassifolia* are in close enough proximity to human occupation that they are affected by a general trend toward fire suppression. Consequently, we consider altered fire regime a general rangewide threat to populations of *A. g.* subsp. *crassifolia*.

Small Population Size

Some of the occurrences of *Arctostaphylos glandulosa* subsp. *crassifolia* are potentially threatened by having a small population size. The listing rule estimated a 50 percent decline in the number of stands and individuals since 1982. In addition, the rule stated that over 75 percent of the remaining individuals occurred at 6 of the 25 locations. Four of those populations have been further reduced by development. At one occurrence (the portion of EO 1 at the Rancho La Costa Habitat Conservation Area) there are only nine individuals of *A. g.* subsp. *crassifolia*. A commonly accepted principal in conservation biology is that small populations have higher probabilities of extinction than larger populations. Populations with small numbers of individuals are more susceptible to genetic drift, losing variation more readily making them more prone to local extinction. In addition, species whose numbers have been significantly reduced due to habitat destruction may be more susceptible to genetic stresses imposed by small population size (Barrett and Kohn 1991, p. 7). Other factors that can make small populations more susceptible to extinctions than large populations are demographic stochasticity and naturally occurring events such as wildfires, floods, droughts, and disease (Shaffer 1981, p. 131). Because the majority of *A. g.* subsp. *crassifolia* occurrences are small, it is reasonable to consider these smaller populations at risk due to these effects of small population size. Any loss or diminishment of pollinators or seed dispersal agents resulting from factors that threaten *A. g.* subsp. *crassifolia* could exacerbate those threats.

Military Training

At the time of listing, *Arctostaphylos glandulosa* subsp. *crassifolia* was not known to occur on any military lands. Since listing, populations of *A. g.* subsp. *crassifolia* have been found on MCAS Miramar (EO 47, 50, 51, 52, 54, 55, and MCAS Miramar training areas) (Appendix 1). Potential threats to the plant on MCAS Miramar range from ground training activities including foot traffic, motor vehicle operations, combat engineering support operations, temporary encampments, and fixed or rotary wing aviation operations (MCAS Miramar 2006, p. 2-6). Impacts from these training activities can result in trampling and destruction of seedlings and plants. However, threats associated with these training activities are thought to be minimal and potentially offset by management considerations described in MCAS Miramar's INRMP. Such considerations include avoiding or minimizing the effect of the planned action by minimizing off-road activities near populations of *A. g.* subsp. *crassifolia* during the plants active growth period and allowing vehicle operations only on roads and fuelbreaks. In addition, implementing site specific measures, such as fencing, to avoid accidental damage to *A. g.* subsp. *crassifolia* will further offset potential impacts to the species (MCAS Miramar 2006, p. 5-2).

Climate Change

Current 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, p. 1; Cayan et al. 2006, pp. 1, 7-8; IPCC 2007, pp. 8-9). 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. One study has predicted that 5 to 10 percent of California's native plant species would no longer find suitable habitat within the state, and thus be vulnerable to extinction, if average temperatures warmed 5 to 6° F (2.7 to 3.3° C) (Morse et al. 1995, p. 393). Whether or not this would include *Arctostaphylos glandulosa* subsp. *crassifolia* is unknown. 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 *A. g.* subsp. *crassifolia* at this time.

III. RECOVERY CRITERIA

There is no final approved recovery plan for *Arctostaphylos glandulosa* subsp. *crassifolia*.

IV. SYNTHESIS

At the time of listing, there were 26 known populations of *Arctostaphylos glandulosa* subsp. *Crassifolia* that are now represented as 17 occurrences in CNDDDB. Many new occurrences have been identified since listing and we now consider there to be 50 extant or presumed extant occurrences of *A. g.* subsp. *crassifolia* in the United States. In addition, the known range of *A. g.* subsp. *crassifolia* has expanded since it was listed. The range of this taxon currently extends from the City of Carlsbad south along the coast to Torrey Pines State Reserve, east to MCAS Miramar and as far south as Mission Trails Regional Park. However, the subspecific status of 18 peripheral occurrences should be verified to further define the range of this taxon. In the listing rule we identified habitat destruction and fragmentation from urban, agricultural, or recreational development, fuel modification, trampling, and nonnative invasive plant species as primary threats to the species. We now also consider small population size, military training, and climate change to be threats. Since listing, 19 of the 50 extant occurrences occur in areas that are protected from development mainly through regional planning efforts, and an additional 8 occurrences are partially conserved and protected from development. The conservation of these areas has helped reduce the threat of development (the most predominant threat at listing), but other threats, such as altered fire regime, nonnatives, human access and disturbance, continue to exist.

Currently, the primary threats to *Arctostaphylos glandulosa* subsp. *crassifolia* are development (at 31 occurrences), fuel modification practices (at 22 occurrences), human access (at 2 occurrences), and military training (at 8 occurrences). Additionally, altered fire regime and small population size are two overarching, rangewide threats effecting *A. g.* subsp. *crassifolia*. The taxon and all of the known extant occurrences are threatened by the lack of a natural fire regime, under which the taxon evolved to ensure generational turnover and robust vegetation. This is likely related to the threat of small population size as evidenced by the lack of seedlings

among all of the occurrences visited as part of this review process. In most locations, the plants were old with elongated stems with significant dead portions and small leaf canopies. A decrease in the number of individuals at many locations, coupled with a lack of evidence of reproduction, suggests that *A. g.* subsp. *crassifolia* still faces a high degree of threat. Therefore, we believe *A. g.* subsp. *crassifolia* still meets the definition of endangered, and recommend no status change at this time.

V. RESULTS

Recommended Listing Action:

- 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

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

- 1) Determine subspecific identity and densities of plants at occurrences peripheral to the core coastal portion of the range.
- 2) Assess the reproductive output of *Arctostaphylos glandulosa* subsp. *crassifolia* occurrences, including seed production and viability.
- 3) Determine causes and likely remedies for apparent low rate of establishment of new plants. This should include establishing the role of fire in the species biology and exploration of an acceptable alternative.
- 4) Evaluate the status of *Arctostaphylos glandulosa* subsp. *crassifolia* in Mexico.

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Appendix 1: *Arctostaphylos glandulosa* subsp. *crassifolia* (Del Mar manzanita) occurrences; prepared for 2010 5-year review.

General location	CNDDDB Element Occurrence Number (EO)	Location Description	Known at listing	Extant (2010)	Current Threats	Owner	Conserved (Yes, Partially, No)
City of San Marcos	10	South of Barham Dr., east of La Moree Rd.		PE	Factor A: development, fuel modification, altered fire regime Factor E: altered fire regime, small population size	Private	No
	-	San Marcos		PE	Factor A: development, altered fire regime Factor E: altered fire regime	City of San Marcos	No
County of San Diego	12	Mt Whitney		PE	Factor A: development, altered fire regime Factor E: altered fire regime	Private	No
	15	S of San Dieguito River, SW of Lake Hodges	Y	E	Factor A: fuel modification, altered fire regime Factor E: altered fire regime	Private	Yes
	16	Rancho Santa Fe	Y	PE	Factor A: development, altered fire regime Factor E: altered fire regime	Private	No
	17	San Dieguito County Park	Y	E	Factor A: altered fire regime, nonnatives Factor E: altered fire regime	County of San Diego	Yes
	42	Northern slopes of La Zanja Canyon		PE	Factor A: development, altered fire regime Factor E: altered fire regime	Private	No
	43	South of Rancho Santa Fe		PE	Factor A: development		No

General location	CNDDDB Element Occurrence Number (EO)	Location Description	Known at listing	Extant (2010)	Current Threats	Owner	Conserved (Yes, Partially, No)
County of San Diego	45	Rancho Santa Fe		PE	Factor A: development, altered fire regime Factor E: altered fire regime	Private	No
	49	La Zanja Canyon		E	Factor A: development, altered fire regime Factor E: altered fire regime	Private	No
	58	Canyons N of Lusardi Creek		E	Factor A: altered fire regime Factor E: altered fire regime	County of San Diego	Yes
City of Carlsbad	1	Upper Agua Hedionda drainage	Y	PE	Factor A: development, fuel modification, altered fire regime, nonnatives, human access Factor E: altered fire regime, small population size	City of Carlsbad, Private, County of San Diego	Partially
	2	Southeast of Evans Point	Y	PE	Factor A: fuel modification, altered fire regime Factor E: altered fire regime, small population size	City of Carlsbad, Private	Yes
	4	North of Batiquitos Lagoon, West of El Camino Real		PE	Factor A: fuel modification, altered fire regime Factor E: altered fire regime, small population size	Private	Yes
	13	South of Encinitas Creek, East of Rancho Santa Fe Rd		PE	Factor A: fuel modification, altered fire regime Factor E: altered fire regime, small population size	Private	Yes

General location	CNDDDB Element Occurrence Number (EO)	Location Description	Known at listing	Extant (2010)	Current Threats	Owner	Conserved (Yes, Partially, No)
City of Carlsbad	35	Carlsbad Municipal Golf Course	Y	E	Factor A: altered fire regime Factor E: altered fire regime, small population size	City of Carlsbad	Yes
	40	Carlsbad Raceway		PE	Factor A: development, altered fire regime Factor E: altered fire regime	Private	No
	-	Kelly Ranch		E	Factor A: altered fire regime, nonnatives, human access Factor E: altered fire regime, small population size	Private	Yes
Cities of Carlsbad and Encinitas	5	Hills west of Green Valley	Y	PE	Factor A: development, fuel modification, altered fire regime Factor E: altered fire regime	City of Encinitas; Private	Partially
	6	East of El Camino Real, south of La Costa Ave, north of Encinitas Blvd	Y	PE	Factor A: fuel modification, altered fire regime Factor E: altered fire regime, small population size	City of Carlsbad, Private	Yes
City of Encinitas	7	Oak Crest Park	Y	E	Factor A: development, altered fire regime, nonnatives Factor E: altered fire regime, small population size	City of Encinitas, School Districts	Partially
	8	Lux Canyon	Y	PE	Factor A: development, fuel modification, altered fire regime Factor E: altered fire regime	Private	Partially

General location	CNDDB Element Occurrence Number (EO)	Location Description	Known at listing	Extant (2010)	Current Threats	Owner	Conserved (Yes, Partially, No)
City of Encinitas	14	South of Encinitas Blvd., west of Manchester, Olivenhain	Y	E	Factor A: fuel modification, altered fire regime Factor E: altered fire regime	Private	Yes
	44	Near Whisper Wind lane		PE	Factor A: development, altered fire regime Factor E: altered fire regime		No
	-	East of El Camino Real, just south of intersection of Calle Ryan and Calle Christopher		PE	Factor A: fuel modification, altered fire regime Factor E: altered fire regime, small population size	Private	Yes
City of Solana Beach	18	Eden Gardens	Y	PE	Factor A: development, fuel modification, altered fire regime Factor E: altered fire regime, small population size	Private	No
	-	San Elijo Lagoon		PE	Factor A: fuel modification, altered fire regime Factor E: altered fire regime, small population size	County of San Diego	Yes
Cities of Del Mar and San Diego	22	South of San Dieguito River, north of Carmel Valley Rd., east and west of I-5	Y	E	Factor A: development, fuel modification, altered fire regime, nonnatives Factor E: altered fire regime, small population size	City of Del Mar, City of San Diego, California State Parks, Private	Partially

General location	CNDDB Element Occurrence Number (EO)	Location Description	Known at listing	Extant (2010)	Current Threats	Owner	Conserved (Yes, Partially, No)
City of San Diego	23	N of Del Mar Heights Rd and Carmel Canyon Rd.	Y	PE	Factor A: development, altered fire regime Factor E: altered fire regime, small population size	Private	No
	25	Carmel Mountain	Y	E	Factor A: development, altered fire regime, nonnatives Factor E: altered fire regime, small population size	City of San Diego	Partially
	27	Torrey Pines State Reserve (south)	Y	E	Factor A: altered fire regime Factor E: altered fire regime	California State Parks	Yes
	28	Mesa west of Torrey Pines Science Park		PE	Factor A: altered fire regime Factor E: altered fire regime, small population size	California State Parks	Yes
	29	North of Miramar Lake	Y*	PE	Factor A: development, altered fire regime Factor E: altered fire regime	City of San Diego	No
	30	Northeast of Miramar Lake	Y*	PE	Factor A: development, altered fire regime Factor E: altered fire regime	City of San Diego	Partially
	31	West of Pomerado Rd	Y*	PE	Factor A: development, altered fire regime Factor E: altered fire regime, small population size	City of San Diego	No

General location	CNDDB Element Occurrence Number (EO)	Location Description	Known at listing	Extant (2010)	Current Threats	Owner	Conserved (Yes, Partially, No)
City of San Diego	32	East of Miramar Lake	Y*	PE	Factor A: development, altered fire regime Factor E: altered fire regime, small population size	City of San Diego	No
	38	Los Penasquitos Canyon/Del Mar Mesa Preserves	Y	E	Factor A: development, altered fire regime, nonnatives Factor E: altered fire regime	City of San Diego, Private	Partially
	41	Del Mar Mesa Preserve		E	Factor A: altered fire regime, nonnatives Factor E: altered fire regime	City of San Diego; County of San Diego	Yes
	46	Mission Trails		E	Factor A: altered fire regime Factor E: altered fire regime	City of San Diego	Yes
	56	Deer Canyon Mitigation Preserve		E	Factor A: altered fire regime Factor E: altered fire regime	City of San Diego	Yes
	57	Deer Canyon Mitigation Preserve		E	Factor A: altered fire regime Factor E: altered fire regime	City of San Diego	Yes
	-	Penasquitos Canyon South		PE	Factor A: altered fire regime Factor E: altered fire regime	City of San Diego	Yes
MCAS Miramar	47	San Clemente Canyon		E	Factor A: development, fuel modification, altered fire regime Factor E: military training	Department of Defense	No
	50	MCAS Miramar		E	Factor A: development, fuel modification, altered fire regime Factor E: military training	Department of Defense	No

General location	CNDDB Element Occurrence Number (EO)	Location Description	Known at listing	Extant (2010)	Current Threats	Owner	Conserved (Yes, Partially, No)
MCAS Miramar	51	MCAS Miramar		E	Factor A: development, fuel modification, altered fire regime Factor E: military training	Department of Defense	No
	52	MCAS Miramar		E	Factor A: development, fuel modification, altered fire regime Factor E: military training	Department of Defense	No
	53	MCAS Miramar		E	Factor A: development, fuel modification, altered fire regime Factor E: military training	Department of Defense	No
	54	MCAS Miramar		E	Factor A: development, fuel modification, altered fire regime Factor E: military training	Department of Defense	No
	55	MCAS Miramar		E	Factor A: development, fuel modification, altered fire regime Factor E: military training	Department of Defense	No
	-	MCAS Miramar Training Areas		E	Factor A: development, fuel modification, altered fire regime Factor E: military training	Department of Defense	No

* Y - known at listing but not evaluated as part of the listing rule because their subspecific status was questioned.

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

Arctostaphylos glandulosa subsp. *crassifolia* (Del Mar manzanita)

Current Classification: Endangered

Recommendation Resulting from the 5-Year Review:

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

Review Conducted By: Carlsbad Fish and Wildlife Office

FIELD OFFICE APPROVAL:

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

ACTING

Approve _____



Date _____

AUG 13 2010

Scott A. Sobiech