

Dudleya abramsii ssp. *parva* (= *Dudleya parva*)
(Conejo Dudleya)

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



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

March 2015

5-YEAR REVIEW

Dudleya abramsii ssp. *parva* (= *Dudleya parva*)
(Conejo Dudleya)

I. GENERAL INFORMATION

Purpose of 5-Year Review:

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

Species Overview:

As summarized in the recovery plan for this species, Recovery Plan for Six Plants from the Mountains Surrounding the Los Angeles Basin (Service 1999), Conejo dudleya (*Dudleya abramsii* ssp. *parva*) is a succulent, rosette-forming perennial plant in the stonecrop family (Crassulaceae). *Dudleya abramsii* ssp. *parva* is currently restricted to a narrow band of recorded occurrences along a 16-kilometer (km) (10-mile (mi)) stretch of land from the western portion of the Simi Hills, through Mountclef Ridge, to the Conejo Grade in Ventura County, California, where it is threatened by development and recreational activities. *Dudleya abramsii* ssp. *parva* grows at the base of scattered rock outcrops of the Conejo volcanics in grassland and cactus dominated coastal sage scrub habitat, which also provides nesting habitat for the Bell's sage sparrow (*Amphispiza belli belli*) and the southern California rufous-crowned sparrow (*Amophila ruficeps canescens*), both of which are designated by the State of California as species of special concern. A significant portion of the plant's habitat occurs on lands designated as "open space" by the Conejo Open Space Conservation Agency (COSCA), or on parklands managed by the Ventura County Department of Parks and Recreation; the remaining habitat is owned and managed by the Cities of Thousand Oaks and Simi Valley, or is privately owned.

Methodology Used to Complete the Review:

The 2009 review was prepared by the Ventura Fish and Wildlife Office (VFWO), following guidance issued by Region 8 in March 2008. For the 2009 review, we used the currently recognized name for the taxon, *Dudleya parva*, rather than use the name under which the species was listed, *Dudleya abramsii* ssp. *parva*. We used information from the recovery plan, survey information from experts who have been monitoring various localities of this species, and the California Natural Diversity Database (CNDDDB) maintained by the California Department of Fish and Wildlife. The recovery plan and personal communications with experts were our primary sources of information used to update the species' status and threats. 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 or the last 5-year review. 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.

For the 2014 review, we contacted species experts and other knowledgeable individuals to determine whether there was any information that was new since the 2009 5-year review was published. We particularly relied on information gathered from the 2013 report entitled "Census of Federally Listed Threatened *Dudleya* Taxa in the Santa Monica Mountains and Vicinity" (Dorsey et al. 2013). We used the 2009 5-year review as the template for this review. If there was substantive new information to add to the previous review, we added this information to the end of the appropriate section or subsection, and clearly marked it as New Information as of 2014. In addition, the Synthesis section includes an Updated Synthesis as of 2014. Other minor edits may have been made to the text of the previous 5-year review to correct minor errors or omissions, or to bring the format and organization of the document up to current Service standards.

Contact Information:

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Federal Register Notice Citation Announcing Initiation of This Review: On April 21, 2013, the U.S. Fish and Wildlife Service announced in the Federal Register (FR) initiation of the 5-year review for *Dudleya abramsii* ssp. *parva* and asked for information from the public regarding the subspecies' status (78 FR 19510). No information was received as a result of this request.

Listing History:

Original Listing

FR Notice: 62 FR 4172

Date of Final Listing Rule: January 29, 1997

Entity Listed: *Dudleya abramsii* ssp. *parva* (subspecies)

Classification: Threatened

Associated Rulemakings: N/A

Review History: The status of *Dudleya parva* [*Dudleya abramsii* ssp. *parva*] was reviewed during the previous 5-year review, which was published in March 2009. The 5-year review did not recommend a change to the listing classification of threatened.

Species' Recovery Priority Number at Start of 5-Year Review: The previous 5-year review (2009) resulted in a recommendation for the species' recovery priority number to change from 3 to 2C, where 1 is the highest-ranked recovery priority and 18 is the lowest (Service 1983). The number 2 indicates that the taxon is a full species that faces a high degree of threat and has a high potential for recovery. We note here, however, that because the taxon was, and still is, listed under the Act as a subspecies, the number 3 should have been retained at that time. The "C" indicated that recovery of the species may be in conflict with development.

Recovery Plan or Outline

Name of Plan or Outline: Recovery Plan for Six Plants from the Mountains Surrounding the Los Angeles Basin

Date Issued: September 30, 1999

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy:

The 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 limits listing as distinct population segments to vertebrate species of fish and wildlife. Because the species under review is a plant and the DPS policy is not applicable, the application of the DPS policy to the species' listing is not addressed further in this review.

Updated Information on Current Species Status, Biology, and Habitat:

Species Biology and Life History

Dudleya parva is a long-lived, succulent dicot, rosette-forming perennial herb in the stonecrop family (Crassulaceae) that is native to California (CNPS 2008). In California there are 39

different species and subspecies within the *Dudleya* genus, which fall under 3 subgenera (*Dudleya*, *Hasseanthus*, and *Stylophyllum*), with *D. parva* belonging to the subgenus of *Dudleya* (Bartel 1993). Species that fall under the subgenus *Dudleya* are unique from the other two subgenera in that they have above-ground stems (caudices), five sepals that are erect to slightly spreading at the tips, and erect fruit (follicles). Under this subgenus, *D. parva* (Conejo dudleya), *D. abramsii* ssp. *bettinae* (San Luis Obispo serpentine dudleya), and *D. cymosa* ssp. *marcescens* (marcescent dudleya) are the only three species with vernal leaves (summer deciduous) (McCabe in litt. 2008a). *Dudleya parva* blooms in late spring (May-June) and has an inflorescence stem 5 to 18 centimeters (cm) (2.0 to 7.1 inches (in)) long with pale yellow-green flowers that often exhibit flecks of red on the keel (Bartel 1993, McCabe in litt. 2008a).

Dudleya parva does not always resprout with the same number of rosettes or in the same locations as rosettes from the previous year. This species forms roots that are narrowed and swollen at irregular intervals, and has rhizome-like branches that extend out from the roots of the plant. During most of the year, the rhizomes resemble shriveled roots and are very fragile, leading to breakage when plants are removed from hard, rocky substrate. As a result, these rhizomes are generally not a good field identification character for this species and have not been previously noted (McCabe in litt. 2008a). *Dudleya parva* is similar to *D. blochmaniae*, in that the above-ground parts of the plant die back after flowering, but the plant can persist for some time as underground rootstock, perhaps up to several years (Sagar in litt. 2008b, McCabe in litt. 2008b).

Pollination and reproductive strategies vary within the *Dudleya* taxa. In general, the *Dudleya* species that are more rare tend to reproduce earlier (e.g., *D. parva* often reproduces within one year after germination) and subsequently have a lower reproductive output (*D. parva* and *D. blochmaniae* ssp. *blochmaniae* have the lowest output among the *Dudleya* taxa that occur in the vicinity of the Santa Monica Mountains). Pollination within the *Dudleya* taxa depends on characteristics such as corolla size, color, and petal fusion (Aigner 2004). The *Dudleya* species that have small yellow to orange flowers (including *D. parva*) are pollinated by bees and flies, while species with larger red flowers are pollinated mostly by hummingbirds. Furthermore, flowers pollinated by hummingbirds tend to produce more nectar than those pollinated by bees and flies, which is a characteristic directly related to the degree of auto-fertility (the proportion of flowers that will set fruit, without mechanical aid, in an insect-proof greenhouse). Plants with a lower nectar content, such as *D. parva*, tend to exhibit a higher degree of auto-fertility and subsequently have been found to be prone to pollinator unreliability, short and unpredictable reproductive seasons, small population size, and high population turnover (Dorsey 2007). *Dudleya parva* will hybridize with some of the other *Dudleya* species (e.g., *D. pulverulenta*), which is typical of the *Dudleya* genus (McCabe in litt. 2008b). *Dudleya parva* seeds sprout in the winter when there is ample precipitation and continue to grow throughout the rainy season (Dorsey 2007). There is evidence that mosses and lichens aid in seed recruitment and germination by providing nutrients, moisture, substrate, and protection against herbivory by snails and slugs (Riefner and Bowler 1995).

In a study conducted in 2006 (Fraga and Wall in litt.), seeds were collected from 80 *Dudleya parva* plants at one of the Wildwood Park occurrences (See Table 1, DUPA 3). This study found

that out of the 80 plants surveyed, seed production ranged from 10 to 686 seeds per individual, with an average of 180 seeds per individual. Another study performed on *D. parva* ex situ found that the average number of fruits produced per individual was 24 and the maximum number of seeds per fruit was 79; both findings are in the low range of the spectra for *Dudleya* taxa from the Santa Monica Mountains area (Dorsey 2007).

In cultivation, some *Dudleya parva* will bloom within the first year after germination; however, in a dry year in the wild, very few of the plants within a population may bloom (McCabe in litt. 2008b). Although many of the plants may begin to form flowering stems in the spring, they will abandon reproduction if there is not enough moisture (Burgess in litt. 2008b). While many of the *Dudleya* species can self-pollinate, it is uncertain whether *D. parva* is capable of this. Because it is such a long-lived species, not much is known about the exact life span of *D. parva*, but one plant in cultivation is reported to be 24 years old (McCabe in litt. 2008b). In cultivation, favorable soil moisture conditions are required for the seedlings of this species to become established; the same is perceived to be true of seedling establishment in the wild, but more information is needed to make this determination. The plants may spread slowly underground by roots or stems, and any stem within 2 to 3 cm (0.8 to 1.2 in) of a centrally established individual may be a clone of that individual (McCabe in litt. 2008b). In a recent greenhouse study, conducted in Santa Cruz, California, by Stephen McCabe and Rachel Ormes, *D. parva* was rooted from the leaves of the plant, making it the only known species in the *Dudleya* subgenus to exhibit this behavior (McCabe in litt. 2008a). This phenomenon leads to some speculation of a taxonomic relationship between *D. parva* and the vernal members of the subgenus *Hasseanthus*, which can also be rooted from leaf cuttings (McCabe in litt. 2008a).

New Species Biology and Life History Information as of 2014:

Dorsey et al. (2013) provided some additional information related to the species population demographics based on surveys conducted in 2010 and is summarized here: During these 2010 surveys, 94 percent of the individuals were observed for reproductive condition. Of these, 26 percent of the plants had inflorescences from the current year, and 1 percent had inflorescences only from the previous year(s). Seventy-three percent of the plants observed had no inflorescences and less than 1 percent of the plants were dead. Of those plants that had inflorescences, most plants had only 1 inflorescence, but 2 to 5 inflorescences per plant was commonly seen, and individuals with up to 21 inflorescences were also found. The inflorescence stalks tend to break easily and may, in part, account for the large number of plants without inflorescences observed during the surveys. Such breakage may reduce the amount of seed that mature fully and contribute to the seed bank

Historic and Current Distribution

Dudleya parva was first described in 1923 as *D. parva* by Joseph Rose and Anstruther Davidson, based on a collection by Mrs. J. Bullard that was made the year before at Conejo Grade near Newbury Park (Moran 1948). According to records available through the California Natural Diversity Database (Bittman in litt. 2008, CNDDDB 2008a, in litt. 2008b), the California Consortium of Herbaria (Consortium)(Consortium 2008), Stephen McCabe of the UC Santa Cruz Arboretum (McCabe in litt. 2008b), Rick Burgess of the City Planning Office of Thousand Oaks (Burgess in litt. 2008b), Tarja Sagar of the National Park Service (Sagar in litt. 2008a), and

several other recently published reports (Fraga and Wall in litt. 2006, Dorsey 2007), all known occurrences of *D. parva* are within eastern Ventura County, California, along an east-west trending ridgeline formed of Conejo volcanics. The entire distribution of the species is scattered over a 16 km (10 mi) stretch of land in the western end of the Simi Hills, along Mountclef Ridge, terminating near Conejo Grade, and covering a total of several hundred acres (CNDDDB 2008a, in litt. 2008b; Sagar in litt. 2008a).

There are 18 reported occurrences of *Dudleya parva* in southern California (Fraga and Wall in litt. 2006; CNDDDB 2008a, in litt. 2008b,c; Consortium 2008; Sagar in litt. 2008a), most of which are part of a large meta-population that extends along the northern slope of Mountclef Ridge from the Reagan Library in the east to Camarillo Springs Road in the west (Burgess in litt. 2008a, CNDDDB in litt. 2008c, McCabe in litt. 2008b). Since the time of listing, seven new occurrences have been recorded, two of which were surveyed before the time of listing, but not yet recorded (Fraga and Wall in litt. 2006; CNDDDB in litt. 2008b; Consortium 2008; Sagar in litt. 2008a, pers. comm. 2008c). These new occurrences are within the same band of Conejo volcanics; four occur among other known populations near Thousand Oaks and the other three occur just northeast of the previously recorded species distribution, on the eastern side of Highway 23 in the vicinity of Simi Valley. Although there has been an increase in the documented number of occurrences, they all fall within the same continuous band of Conejo volcanics; therefore, there has been no significant change in the known geographic range of the species since the species' listing in 1997.

A large portion of the plant's habitat is on lands designated as "open space" by the Conejo Open Space Conservation Agency (COSCA), which jointly manages parklands with the Conejo Parks and Recreation Department. The remaining occurrences of the species are on "open space" or park lands managed by the Ventura County Department of Parks and Recreation and the Cities of Thousand Oaks or Simi Valley; a small portion of the habitat is privately owned.

New Information as of 2014:

In general, the distribution is the same as it was 5 years ago. Please see Abundance Information as of 2014 below and Table 2, where we report several minor changes to how localized distributions are described (Sagar 2014).

Abundance and Population Trends

The population boundaries and numbers for *Dudleya parva* exhibit some annual fluctuations; however, the species has generally remained in the same suitable habitat areas noted at the time of listing in 1997 (CNDDDB 2008a, in litt. 2008b,c; McCabe in litt. 2008b; Sagar in litt. 2008a). Since the time of listing, the number of documented individuals within the noted occurrences of the species has increased in some cases, while decreasing somewhat in others; however, the information gathered from the more recent population surveys seems to show that overall the species has remained at relatively constant levels since the time of listing (Fraga and Wall in litt. 2006; CNDDDB 2008a, in litt. 2008b; McCabe in litt. 2008b; Sagar in litt. 2008a). Most likely, the more recently documented occurrences do not represent new populations, but rather occurrences of the species that had not previously been detected due to ruggedness of terrain or the level of survey effort expended. It is difficult to accurately track annual fluctuations in the

number of individuals of *D. parva* due to the fact that the species is summer deciduous, making it hard to find for 5 to 7 months of the year, and may even remain dormant as underground rootstock in some very dry years (Burgess in litt. 2008b, McCabe in litt. 2008b, Sagar in litt. 2008b).

At the time of listing in 1997, there were approximately 11 known occurrences of *Dudleya parva* (Service 1997). Element occurrence (EO) number 6 (CNDDDB 1997) was accidentally deleted from CNDDDB within the last few years, but will be re-entered into the system (CNDDDB in litt. 2008c). Including EO 6, there are currently 18 known occurrences of the species (Fraga and Wall in litt. 2006; CNDDDB 2008a, in litt. 2008b,c; Consortium 2008; McCabe in litt. 2008b; Sagar in litt. 2008a). The largest reported populations occur in Wildwood Regional Park (several thousand individuals), the Joel McCrea Wildlife Preserve (Burgess in litt. 2008b), and at two sites near California Lutheran University, the latter of which had a reported combined population (DUAB 101 and EO 10) of approximately 2,000 plants in 2003 (CNDDDB 2008a, Sagar in litt. 2008a).

The Conejo Grade occurrence (EO 5) was reported to have greater than 600 individuals as of 1983. A fire on the Conejo Grade in August of 1984 killed some of the *Dudleya pulverulenta* within 20 meters (m) (66 feet (ft)) of the *D. parva* site, but the effects on the *D. parva* in the area are uncertain. Stephen McCabe and Tarja Sagar revisited the area in 2006 and although the *D. pulverulenta* had recovered in the same location as before, the *D. parva* population had declined from what it was in the early 1980s, even in the absence of major human recreational threats (McCabe in litt. 2008b). The occurrence north of U.S. Highway 101, just north of Peak 915 (EO 8) ranged between approximately 250 and 300 individuals from 1991 to 1993. A new occurrence of the species (documented since the time of listing) was reported near the western portion of California Lutheran University (DUAB 101), consisting of approximately 1,000 individuals as of 2003 (Sagar in litt. 2008a). Additionally, the population near the western portion of California Lutheran University (EO 10) that was known to exist before the time of listing was reported to have only 50 individuals in 1991, but was reported to contain approximately 1,000 individuals in 2003 (Sagar in litt. 2008a).

The McCrea Wildlife Preserve occurrence (EO 3) ranged from approximately 2,000 to 10,000 individuals between 1983 to 1987 (CNDDDB 2008a) and was most recently reported as comprising approximately 160 individuals in 2003 (Sagar in litt. 2008a); however, the most recent survey in 2003 was likely conducted over only a portion of the suitable habitat within this occurrence and does not necessarily indicate a drastic decline of the species in this area. Stephen McCabe visited this site in 1990 (the third unusually dry year in a row) and noted that, although *D. parva* seemed relatively abundant for such a dry year, there were many hollow casts in the clay soil where roots of the individuals had previously been, perhaps indicating decline. He visited the site again in 2001 and noted that, although the population was still in existence, there was an increase in the number of informal hiking trails since the early 1980s, some evidence of trampling by hikers, and an increase in the numbers of invasive species in the area (McCabe in litt. 2008b).

Since the time of listing, a new occurrence has been recorded near the Reagan Library in Thousand Oaks (DUAB 103), containing approximately 200 individuals as of 2003 (Sagar in litt. 2008a). Another occurrence not previously reported at the time of listing, north of Olsen Road and east of Highway 23 (DUPA 2), had greater than 250 individuals in 1998 (CNDDDB in litt. 2008b).

Table 1. Population Records for *Dudleya parva* extracted from Fraga and Wall in litt. 2006; Burgess in litt. 2008b; CNDDDB 2008a, in litt. 2008b; Consortium 2008; McCabe in litt. 2008b; and Sagar in litt. 2008a.

Identification Number	Name	Current Trend	Year Collected/ Observed	Year Surveyed	Population Size	Reference	Site Manager/ Owner
CNDDDB EO 3	Head of Arroyo Santa Rosa, within McCrema Wildlife Preserve	Unknown	1987 1990	1980 (Nakai) 1983 (Verity) 1987 (Burgess) 1990 (McCabe) 2001 (McCabe) 2003 (Sagar)	-- <10,000 2,000-3,000 -- -- 160	CNDDDB 2008a, Consortium 2008, McCabe 2008b	McCrema Wildlife Preserve – COSCA
CNDDDB EO 5	Conejo Grade	Unknown	1922 (Bullard) 1983	1983 (Cochrane & McCabe) 2006 (McCabe & Sagar)	>600 --	CNDDDB 2008a, McCabe 2008b	Private
CNDDDB EO 6	0.5 air miles S of HWY 101, 1.1 air miles SW of Camarillo Oak Grove County Park	Unknown	1980 1987	1980 (McLeod)	--	CNDDDB 1994	Private
CNDDDB EO 7	1.7 air miles NNE of Camarillo Oak Grove Co. Park	Unknown	1960	1974 (Verity) 1991 (Burgess)	-- --	CNDDDB 2008a	Private/ May be designated as open space.
CNDDDB EO 8	N of HWY 101, just N of peak 915 on Topo	Unknown	1993	1991 (Bowland) 1993 (Bowland)	250 300	CNDDDB 2008a	CTO/ May go to COSCA
CNDDDB EO 9	South of Mountclef Ridge, N fork of Arroyo Conejo, Wildwood County Park	Unknown	1984	1983 (Cochrane) 1984 (Thomas) 2003 (Sagar)	-- -- 850	CNDDDB 2008a	Ventura County Parks and Recreation
CNDDDB EO 10	W portion of California Lutheran University land	Unknown	1991	1983 (Verity) 1991 (Bowland) 2003 (Sagar)	-- 50 1000	CNDDDB 2008a	CLU Open Space
CNDDDB EO 12	W end of Mountclef Ridge, Wildwood County Park	Unknown	1984	1983 (Cochrane) 1984 (Thomas) 2003 (Sagar)	-- -- 500	CNDDDB 2008a	Ventura County Parks and Recreation
CNDDDB EO 13	Upper end of N fork Arroyo Conejo	Unknown	1980	1983 (Cochrane)	--	CNDDDB 2008a	COSCA/ CRPD
CNDDDB EO 15	Mountclef Ridge, N of Norwegian Grade Summit	Unknown	1991	1991 (Wishner) 1997 (Gale, Parikh, and Tierney)	<100 75-200	CNDDDB 2008a	YMCA
CNDDDB EO 16	0.3 Mi due E of Mountclef Peak on Topo	Unknown	1991	1991 (Bowland)	25	CNDDDB 2008a	COSCA/ CRPD
DUAB 101	SW of Cal Lutheran Campus, just off Morningstar Ct.	Unknown	2003	2003 (Sagar)	1,000	Sagar 2008a- recorded as DUAB 101	Will become open space COSCA
DUAB 102	300 meters N of Wood Ranch Reservoir	Unknown	--	unknown	--	Sagar 2008a- recorded as DUAB 102	Simi Valley

DUAB 103	200 ft from wooden gate of Reagan Library	Unknown	2003	2003 (Sagar)	200	Sagar 2008a-recorded as DUAB 103	Simi Valley
DUPA 1	0.2 mi S of Hill Canyon Sewage Treatment Facility	Unknown	1996	1996 (Harrison)	--	Consortium 2008	COSCA or CTO
DUPA 2	East of HWY 23, N of Olsen Rd.	Unknown	1998	1998 (VanderPluym)	>250	VanderPluym 1998 (CNDDDB 2008b)	Simi Valley?
DUPA 3	Wildwood Canyon Park, NE portion of Santa Rosa Trail	Unknown	2006	2006 (Fraga, Thibault, Bair)	>2,000	Fraga and Wall 2006	COSCA/CRPD
DUPA 4	Wildwood Canyon Park, SW portion of Santa Rosa Trail	Unknown	2006	2008 (Sagar)	--	Sagar 2008	COSCA/CRPD

CNDDDB identification # = occurrence number assigned by the California Natural Diversity Database (CNDDDB 2008a).

COSCA = Conejo Open Space Conservation Agency

CRPD = Conejo Recreation and Parks Department

CTO = City of Thousand Oaks

New Information as of 2014:

In 2010, the Service partnered with the National Park Service to fund surveys and a census of three sensitive *Dudleya* taxa that occur in Santa Monica Mountains, including *D. parva*. Table 2, below, highlights the results of the 2010 census conducted by Dorsey et al. (2013). Minor changes, such as consolidating or eliminating EOs, are reflected here. For example, EO15 has been placed into EO3, EO7 is no longer recognized as a valid site, and DUPA 1 has been incorporated into EO9. Other changes are noted in the Ownership; Trend/Notes column of the table.

While many of the sites occur on private lands and could not be adequately surveyed, the numbers of plants that were seen on public lands have substantially increased in a few areas. In the 2009 5-year status review, there were an estimated 20,050 plants recorded. During the 2010 surveys, a total of 14 EOs with approximately 153,500 plants were counted (Dorsey et al. 2013), mostly on public lands protected from development. This observed increase, however, does not represent an actual increase in the number of plants, but rather is likely a result of the more thorough surveys that were conducted during 2010 in comparison to surveys in previous years. Although earlier reports estimated the amount of suitable habitat surrounding the EOs (CNDDDB 2008a) as comprising several hundred acres, Dorsey et al. (2013) attempted to measure the precise footprint of each EO; they estimated 6.3 acres (2.55 hectares) of habitat are currently covered with individuals.

Table 2. Findings of 2010 census of *Dudleya parva* (Dorsey et al. 2013). Identification numbers follow those used in the Service's previous 5-Year Status Review (2009). Surveys were conducted June 26 to October 1, 2010.

CNDDB Identification #	Estimated Population Size (2010)	Ownership; Trend/Notes
CNDDB EO3		COSCA and Private (former EO15); Trend unknown. In 2010 there were ~ 58,400 plants observed compared to previous estimate of <10,000 (in 1983), 2,000-3,000 (in 1987), and 160

(EO15 now included in EO3)	58,400	(in 2003). 210 dislodged plants found in survey area (see Factor C discussion).
CNDDDB EO5	0	Previously private, new owner the City of Thousand Oaks; Trend unknown. Viewed from a distance late in season in 2010. 25 plants were counted in 2006, while in 1983, > 600 plants were counted. It is possible these plants are still present.
CNDDDB EO6	No data	Private; Trend unknown. ID of <i>D. parva</i> on-site uncertain; though in 1980 it was mapped as occurring on-site and would have represented the western-most extent of the species. However, the site was developed shortly after it was mapped. Another species (<i>D. verity</i>) does occur in the area, and Dorsey et al. (2013) believe that <i>D. parva</i> does not occur in this area.
CNDDDB EO7 (no longer recognized)	No data	Private; Trend unknown. This EO was eliminated in the 2012 CNDDDB update.
CNDDDB EO8	No data	Private; Trend unknown. In 1991, estimated 250 plants; in 1993, about 300 plants.
CNDDDB EO9 (now includes DUPA 1)	6,150	COSCA and Conejo Recreation and Park District; Trend unknown. Two outcrops where <i>D. parva</i> occurs - Paradise Falls and along the Stagecoach Bluff Trail.
Former DUPA 1 (now EO9)	500 No data	41 dislodged plants were observed. The DUPA 1 site could not be located. The 2012 CNDDDB update incorporates DUPA 1 into EO9.
CNDDDB EO10	56,850	COSCA and Conejo Recreation and Park District; The two stands found were mostly outside, but within 0.25 mile of the CNDDDB polygon. In 2012 CNDDDB update, these stands were designated as the location for EO10. A portion of the northern stand was not surveyed due to lateness in the season. <i>North of Lower Butte Trail</i> – 148 dislodged plants observed. <i>South of Lower Butte Trail</i> – 1614 dislodged plants observed. Area was surveyed late in October w/ evidence of browsing, with many rosettes almost entirely eaten. Browsing may have dislodged many of the plants.
CNDDDB EO12	800	COSCA; Trend unknown. Lizard Rock is a popular hiking destination and most plants are found off the trail in areas people are unlikely to go. 15 dislodged plants observed.
CNDDDB EO13 (DUAB 101 now placed in EO13)	0 500 (partial survey)	COSCA; Trend unknown. In the 2012 CNDDDB update, DUAB101 is designated as the location for EO13. Private; <i>D. parva</i> is visible on private property adjacent to COSCA land. Only the public portion of the population was surveyed.
CNDDDB EO16	No data	COSCA; Trend unknown. No recent surveys conducted. Inaccessible due to poison oak, dense vegetation, and steep terrain. In 1991, estimated 25 plants.
DUAB 102 (rejected by CNDDDB)	No data	Private; No trend data. CNDDDB determined that this is an invalid report in the 2012 CNDDDB update.
DUAB 103 (now CNDDDB EO 20)	No Data	Private; No trend data. Designated EO20 in 2012 CNDDDB update. In 2003, ~ 200 plants.
DUPA 2 (now CNDDDB EO 19)		Private; No trend data. Designated EO19 in 2012 CNDDDB update. In 1998, ~ 250 plants.
CNDDDB EO17 (includes both DUPA 3 and DUPA 4)	600 4300 100	COSCA and Conejo Recreation and Park District; No trend data. Non-native perennial herbs and erosion concerns. DUPA 3 and DUPA 4 are combined into EO17 in the 2012 CNDDDB update. The three subpopulations are reported separately because of distinct breaks between colonies and large differences in the number and density of plants at each location. 40 dislodged plants found in stands along the Santa Rosa Trail, and 63 in stands along the connector trail.

CNDDDB E0 18 (not listed in 2009 5-year status review)	100	COSCA; No trend data. Designated EO18 in 2012 CNDDDB update. Plants occur in a few isolated patches growing on the sides of small, shallow drainages with bedrock outcroppings. 9 dislodged plants observed.
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Habitat or Ecosystem Conditions

On a broad scale, suitable habitat for *Dudleya parva* is comprised of coastal sage scrub and valley and foothill grassland with clay or volcanic soils, at elevations ranging from 60 to 450 meters (180 to 1350 ft) (CNPS 2008), and on slopes ranging from 0 to 90 degrees, but most commonly on north-facing slopes of approximately 10 degrees (Dorsey 2007). This species is highly localized in its distribution, occurring exclusively in thin-soiled substrate over rocky outcrops derived from the Miocene Conejo volcanics (Burgess in litt. 2008b).

The plants associated with *Dudleya parva*, include but are not limited to spikemoss (*Selaginella bigelovii*), California buckwheat (*Eriogonum fasciculatum*), Conejo buckwheat (*E. crocatum*), chalk dudleya (*Dudleya pulverulenta*), Blochman's dudleya (*D. blochmaniae*), Blochman's larkspur (*Delphinium parryi* ssp. *blochmaniae*), black sage (*Salvia mellifera*), dwarf plantain (*Plantago erecta*), California sagebrush (*Artemisia californica*), lemonadeberry (*Rhus integrifolia*), foothill needlegrass (*Stipa lepida*), oat grass (*Avena* spp.), goldfields (*Lasthenia chrysostoma*), California broom (*Lotus scoparius*), mountain mahogany (*Cercocarpus betuloides*), species of cacti, and non-native annuals. Additionally, *D. parva* is often found growing in association with the federally listed endangered plant Lyon's pentachaeta (*Pentachaeta lyonii*) (CNDDDB 2008a).

New Information as of 2014:

No new information is available.

Changes in Taxonomic Classification or Nomenclature

Dudleya parva was recognized as a distinct species by Munz and Keck in 1959 and 1968, Nakai in 1983, and Moran in 1980 (McCabe in litt. 2008a). In 1991, Bartel published a revision treating *D. parva* as a subspecies of *D. abramsii* (Bartel 1991) based on similarities between the flowers of *D. abramsii* and *D. parva* noted by Reid Moran (1948). However, *D. parva* and *D. abramsii* have differing micromorphological leaf surface characters, caudex diameters, and wound responses that appear to clearly separate the two (McCabe in litt. 2008a). The name of this species has been returned to *Dudleya parva* (from *Dudleya abramsii* ssp. *parva*) as of November 2006 (Jepson eFlora 2013 at http://ucjeps.berkeley.edu/cgi-bin/search_IJM.pl.)

New Information as of 2014:

No new information is available.

Genetics

No new studies concerning the genetics of this taxon have been conducted since the time of listing.

New Information as of 2014:

No new information is available.

Five-Factor Analysis

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

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

When *Dudleya parva* was listed in 1997, we discussed that the species was threatened by urban development, equestrian facilities and activities, recreational activity (mountain biking, off-road vehicles, hiking, and rock climbing), and fire suppression activities (mostly due to disruption of habitat from fuel modification and the creation of fire breaks around buildings) (Service 1997). We also noted that portions of the *D. parva* population had been extirpated by development, including a segment of one occurrence near the Ronald Reagan Library (McClelland Consultants 1989). The species' listing rule and recovery plan both noted that because a significant portion of the existing distribution of the species was located on private lands with increasing development pressures, the species faced an ongoing threat of habitat loss (Service 1997, 1999).

At present, habitat encroachment from new or existing development and fire suppression activities surrounding several of the known *Dudleya parva* occurrences continues to be a threat (Burgess in litt. 2008b, Wishner pers. comm. 2008). Within the City of Thousand Oaks, city regulations require a fire clearance zone of 30.5 m (100 ft) from the building pad. Fuel modification is a less substantial threat to the *D. parva* occurrences that are within Thousand Oaks city limits compared to occurrences outside city limits, because in most cases the city requires a buffer zone around new development, ensuring that sensitive plants do not fall within the fuel modification zone (Burgess in litt. 2008b,c). Ventura County requires a fire clearance of 30.5 meter (100 ft) from the building itself (Burgess in litt. 2008c). In general, the occurrences that are within the "open space" managed by COSCA are not threatened by fuel modification activities, as these activities are carefully controlled and managed within COSCA boundaries to prevent undue ground disturbance (Burgess in litt. 2008b). Outside COSCA boundaries, the most common method of fuel reduction is with a "weed whacker" (Burgess in litt. 2008c), which could have adverse impacts on *D. parva* in sensitive habitat areas.

Currently (as of 2009), an environmental impact report (EIR) is being prepared for a housing development (Wildwood Preserves; Assessor's Parcel Number 520-0-180-23), which is proposed for the north slope of Mountclef Ridge in the Simi Hills. In addition to the direct impacts the construction of this project would have on *D. parva* habitat (EO 12), this housing development would include equestrian facilities and extensive fuel modification activities that would also directly negatively impact the species both immediately and over the long term (Wishner pers. comm. 2008). Additionally, one other area of suitable habitat is proposed for development in the near future, potentially directly affecting a portion of the population (DUAB 101 from Table 1) (Sagar pers. comm. 2008c).

Human recreational activities, such as hiking, rock climbing, biking, and horseback riding continue to threaten the species (Burgess in litt. 2008b, McCabe in litt. 2008b, Sagar in litt.

2008b). The plants occur low to the ground in rocky outcrops and often near trails, where they could be easily trampled. Mountain bikers and hikers often leave established trails and thus some of the plants are at risk of being trampled (Burgess in litt. 2008b, McCabe in litt. 2008b). A few crushed plants have been observed in Wildwood Park and in the McCrea Wildlife Preserve in the last few years, but many of the habitat sites are slightly less accessible (McCabe in litt. 2008b, Sagar in litt. 2008b). It appears that there has been little change in how occurrences of *D. parva* within public access areas have been managed over the years.

In summary, threats to *Dudleya parva* and its habitat remain similar to what they were at the time of listing, but the intensity of these threats may have decreased slightly since listing, because over the last few years the amount of *D. parva* habitat that has been identified on public open space or parklands has increased. Of the 18 recorded occurrences of *D. parva*, at least 60 to 75 percent (based on land-area) are located on public lands that are not subject to large-scale, land-use conversion; the remaining portion are located on private lands where potential development is not precluded (see Appendix 1).

New Information as of 2014:

Based on surveys conducted in 2010, threats to *Dudleya parva* and its habitat remain and are similar to what they were at the time of listing and in the previous 5-year review (Dorsey et al. 2013, Sagar in litt. 2014). However, efforts are being made to protect habitat containing *D. parva* by local municipalities and COSCA. For example, the population within EO5 (Conejo Grade) was previously in private ownership and is now owned by the City of Thousand Oaks. While access to the EO5 site was not possible, approximately 25 plants were observed in 2006 and may still be present (Dorsey et al. 2013). In addition, two development projects that were previously pending (Wildwood Preserves, and development near DUAB 101, see above) have not gone forward, and we are not aware of other proposals for development.

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

In the listing rule for the species, we discussed that species of *Dudleya* are collected by professional horticulturalists as well as amateur collectors and gardeners (Service 1997). A special issue of the Cactus and Succulent Journal was published by the Cactus and Succulent Society of America (CSSA) that focused on *Dudleya* in 2004 (CSSA 2004). An incident of removal of chalk dudleya (*D. pulverulenta*) occurred near a public access location in Topanga Canyon in 1999, illustrating that collection of *Dudleya* species continues to be a threat to members of this genus (Farris in litt. 1999). Although we do not have specific reports of unauthorized collection of *D. parva*, we believe that due to the accessibility of some of the habitat sites to the public and the appeal of *Dudleya* species to horticulturalists, collection still constitutes a threat to the species (Burgess in litt. 2008b). However, due to the vernal nature of this species (leaves wither and fall off in the summer), it may be slightly less attractive to collectors than non-vernal species.

New Information as of 2014:

No new information regarding this factor has been identified since the last review in 2009 (Fraga in litt. 2014).

FACTOR C: Disease or Predation

Disease or predation was not considered a threat to the species at the time of listing (Service 1997), and is not necessarily considered a threat at this time. However, some damage from caterpillars (species unknown) eating out the inside of the stems of plants within the *Dudleya* taxa (including *D. parva*) has been reported in many locations. These hollow roots and stems were first noticed in some other *Dudleya* species individuals as early as 1990 and have been reported as far south as the considerably isolated Isla Zapato in Mexico, leading to speculation that a native caterpillar is responsible for the damage (McCabe in litt. 2008b).

New Information as of 2014:

While no new information regarding this factor has been identified since the last review in 2009, Dorsey et al. (2013) did find that there were an increasing number of dislodged *Dudleya parva* individuals in some of the EOs as the surveys progressed into the late season. However, the cause could not be determined, and given the relative inaccessibility and distance from hiking and equestrian trails of most *D. parva* sites, it seemed unlikely to the surveyors that the dislodged plants were caused by recreational activities (Dorsey et al. 2013). There were signs of wildlife feeding on the rosettes indicating the possibility of low-level predation. Table 2 identifies the various EOs where dislodged plants were observed.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

At the time of listing, regulatory mechanisms thought to have some potential to protect *Dudleya parva* included: (1) the California Environmental Quality Act (CEQA); (2) listing in the California Native Plant Society's Inventory, List 1B (California endemic, rare, threatened, or endangered in California); (3) local land use laws, regulations, and policies; and (4) the Federal Endangered Species Act (Act) in those cases where *D. parva* occurs and is incidentally protected in habitat occupied by a listed wildlife species. The listing rule (62 FR 4172) provides an analysis of the level of protection that was anticipated from those regulatory mechanisms. This analysis appears to remain valid.

(1) California Environmental Quality Act (CEQA): CEQA requires review of any project that is undertaken, funded, or permitted by the State or a local governmental agency. If significant impacts 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. However, if there are no feasible mitigation measures, and if the lead agency believes the benefits of the project outweigh the environmental risks, it may approve a project by making a statement of overriding considerations. If the lead agency is interested in having the project proceed, it is likely to approve the report or make the statement of overriding considerations even if listed species are affected. We noted in the listing rule that local lead

agencies responsible for enforcing the regulations of CEQA have made determinations that have or could negatively impact *Dudleya parva* (Service 1997).

(2) California Native Plant Society's Inventory, List 1B: *Dudleya parva* is listed in the California Native Plant Society's Inventory, under List 1B: California endemic, rare, threatened, or endangered in California (CNPS 2008). In accordance with chapter 10 sec. 1901 of the California Department of Fish and Game Code, inclusion of this species on List 1B indicates that *D. parva* is eligible for State listing; however, this species is not currently State listed and is therefore not protected by the California Endangered Species Act (CESA).

(3) Local land use laws, regulations, and policies

County of Ventura: Although the County of Ventura does not have any specific laws or regulations that protect *Dudleya parva*, the Biological Resources Element from the general plan for the County of Ventura (2008) states that they aim to "Preserve and protect significant biological resources in Ventura County from incompatible land uses and development." Significant biological resources include "endangered, threatened, or rare species" and their habitats, "wetland habitats, coastal habitats, wildlife migration corridors" and "locally important species/communities." The County of Ventura's policies relevant to endangered species conservation include:

"1. Discretionary development which could potentially impact biological resources shall be evaluated by a qualified biologist to assess impacts and, if necessary, develop mitigation measures.

2. Discretionary development shall be sited and designed to incorporate all feasible measures to mitigate any significant impacts to biological resources. If the impacts cannot be reduced to a less than significant level, findings of overriding considerations must be made by the decisionmaking body. ...

5. The California Department of Fish and Game, the U.S. Fish and Wildlife Service, National Audubon Society and the California Native Plant Society shall be consulted when discretionary development may affect significant biological resources. The National Park Service shall also be consulted regarding discretionary development within the Santa Monica Mountains or Oak Park Area." (County of Ventura 2008).

City of Thousand Oaks: Although the City of Thousand Oaks does not have any specific laws or regulations that protect *Dudleya parva*, the Conservation Element from the general plan for the City of Thousand Oaks states that the City "shall encourage and promote the preservation of all rare, threatened, endangered, or sensitive species listed by State and Federal agencies, the California Native Plant Society, and the City of Thousand Oaks" (City of Thousand Oaks 1996). However, this simply states that the city recognizes the need for preservation of rare or listed species and does not afford any specific implemented forms of protective regulations or actions by the city.

Conejo Open Space Conservation Agency (COSCA): *Dudleya parva* occurs on lands managed by COSCA, which is a joint powers authority agency established between the City of Thousand Oaks and the Conejo Parks and Recreation District. While the Conejo Parks and Recreation District manages the smaller, more developed park units in and around the City of Thousand

Oaks in Ventura County, COSCA acquires and manages the larger and undeveloped park units as open space. As of October 2008, COSCA has initiated a public planning process for 3,800 acres of the lands they manage; we are not able to determine at this time whether proposed changes to management of these lands will affect *D. parva* (Harris 2008).

In summary, the Endangered Species Act is the primary Federal law that has provided some level of protection for *Dudleya parva* since its listing as threatened in 1997. Other Federal and State regulatory mechanisms provide discretionary protections for the species based on current management direction, but do not guarantee protection for the species absent its status under the Act. Therefore, we continue to believe other laws and regulations have limited ability to protect the species in the absence of the Endangered Species Act.

New Information as of 2014:

In June 2013, COSCA released their *Strategic Plan: Beyond 2013*. The primary focus of the plan is to manage open space so as to preserve its natural characteristics while providing opportunities for passive recreational enjoyment of the diverse vegetation, wildlife, and cultural resources it contains (Burgess in litt. 2014). COSCA identified a goal to administer the lands in a cooperative manner to augment on-going conservation efforts including, but not limited to, “plant and animal communities, habitats or species which are considered to be unique, rare, endangered or threatened in any manner.” However, while the plan offers a number of actions to enhance and maintain open space, no objectives or actions have been specifically described to protect and conserve *Dudleya parva*. Therefore, we are not able to determine at this time how the proposed management of these lands will affect *D. parva*.

The 2009 5-year review inadvertently left out discussion of protections that have accrued for *Dudleya parva* under the federal Act. To date, we have provided technical assistance and entered into consultation with several other federal agencies under section 7 of the Act regarding proposed restoration and planning projects. It is also likely that its status as a federally listed species has been taken into consideration during project permitting by local and county agencies (see discussion above under County of Ventura, City of Thousand Oaks, and COSCA), but the extent of this cannot be quantified. In addition, the Act’s requirement for 5-year reviews provided the impetus for us to provide cost-share funding for the surveys that were carried out in 2010 (Dorsey et al. 2013) which has provided us with the most comprehensive understanding of the distribution, abundance, and demography of the species to date.

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

Fire suppression, fuel modification, wildfire survivability, and invasive species

At the time of listing, we discussed general threats to the *Dudleya* genus, including the effects of grazing, often resulting in habitat type conversion from native grass species to non-native, invasive annual grass species; fire suppression activities for the last 200 years; and increased incidence of fire ignition near the wildland-urban interface, leading to more frequent fires (Service 1997). Competition from non-native annuals is a threat to *D. parva* because such species tend to take over habitat for the species and compete for the same limited resources (Sagar in litt. 2008b). Fuel modification activities (e.g., the creation of fuel breaks, etc.) have led to an increase in the number of invasive species in the southern California shrubland and

grassland ecosystems (Keeley 2006), creating an indirect threat to *D. parva*. The natural fire regimes of some of these areas have been affected due to increased human-caused fire ignitions, often leading to more frequent fires despite fire suppression activities, which subsequently can have drastic effects on the grassland, coastal sage scrub, chaparral, and oak woodland ecosystems and the native species that reside there (Syphard et al. 2007). In some cases, *D. parva* is directly threatened by fuel modification efforts, due to the extent of development in close proximity to suitable habitat for the species (Service 1997, 1999, Burgess in litt. 2008b, Wishner pers. comm. 2008).

New Information as of 2014:

In this review, we clarify our discussion about fire-related threats as follows. *Dudleya parva* is potentially threatened by: (1) pre-fire fuel-reduction activities, such as removal of native vegetation and disturbance of soils that can reduce habitat quality; (2) the wildfire itself, in which the intense heat can kill or set back the growth of individuals; and (3) fire suppression activities, including the disturbance of native vegetation and soils during the grubbing of fire lines and the dropping of fire retardants, the latter of which increases soil nitrogen and stimulates the growth of non-native grasses that could compete with *D. parva*. To date, *D. parva* has not been extensively impacted by fire and related activities. However, we consider the threat of fire to *D. parva* to be high because fire ignition events tend to be more frequent in urban-wildland interface zones (as is characteristic of *D. parva* occurrences), and because fire has severely damaged another *Dudleya* species in the same geographic region. In 2013, the Springs Fire burned 24,000 acres just south of Highway 1 in the western Santa Monica Mountains in Ventura County. While no individuals of *D. parva* were affected by this fire, individuals of *D. verityi* (another federally listed species) were burned throughout most of the species' range.

Stochastic extinction

At the time of listing, we noted that due to the limited number of individuals and existing range of *Dudleya parva*, this species was at risk of extinction from naturally occurring events, such as fire, drought, disease, or rock slides (Service 1997). Although the plants have the ability to survive as underground rootstock during the dormant period and probably would not be significantly affected during a small, low-intensity fire, there is a high probability that even the dormant rootstock of the plants may not survive a larger, high-intensity fire (Sagar in litt. 2008b). The shrublands of southern California (including areas within the distribution of *D. parva*) are often subject to large, high-intensity fires (Keeley et al. 1999), which may pose a threat to the species. As a result of the small population size and range of *D. parva*, the genetic viability and thus resilience of the species to human-caused or natural disasters may be greatly reduced (Menges 1991, Ellstrand and Elam 1993).

New Information as of 2014:

As noted previously, several of the EOs have been combined in the most recent reporting in an effort to more accurately reflect the grouping of individuals on the ground. Despite these small shifts in how the groupings are described, there is one other notable observation about the abundance and distribution of individuals: two of the EOs (EO3 and EO10) each comprise on the order of 50,000 individuals, and together comprise approximately 66 percent of the total number of individuals. Both the small number of acres that currently support *Dudleya parva*

individuals, as well as the fact that many of those individuals are concentrated in just a few EOs, contributes to the vulnerability of the species to stochastic events.

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, Cayan et al. 2005, IPCC 2007). Recently, the potential impacts of climate change on the flora of California were discussed by Loarie et al. (2008). Based on modeling, they predicted that species' distributions will shift in response to climate change and that the species will "move" to higher elevations and northward, depending on the ability of each species to do so. The Santa Monica Mountains and Simi Hills are expected to increase in diversity, becoming potential future refugia for some species (Loarie et al. 2008). Increases in species diversity in these higher elevations and northern locations due to climate change have the potential to result "...in new species mixes, with consequent novel patterns of competition and other biotic interactions..." with unknown consequences to the species which currently exist there (Loarie et al. 2008). While we lack adequate information to make specific and accurate predictions regarding how climate change, in combination with other factors such as small population size, will affect *Dudleya parva*, small-ranged species such as *D. parva* are more vulnerable to extinction due to these changing conditions (Loarie et al. 2008).

New Information as of 2014:

There is no new information specific to *Dudleya parva* regarding the potential effects of climate change on the species. In a recent study by Anacker et al. (2013), the authors assessed the vulnerability of 156 rare plant species in California due to climate change. In their study, two-thirds of the species evaluated were considered to be highly vulnerable to climate change. Additionally, for 99 of the 156 species, their assessment indicated that the ability for these plants to migrate due to shifting climate will likely be impeded by anthropogenic barriers such as existing residential and other types of developments, which have eliminated potential habitat in areas such as the Los Angeles Basin and San Francisco Bay area.

In short, while the vulnerability assessment by Anacker et al. (2013) did not specifically make a vulnerability projection for *Dudleya parva*, this species resembles the profile of other rare plants species that may be most vulnerable; the entire known range of *D. parva* is located on a restricted habitat type (Conejo volcanic outcroppings along the Mountclef Ridge) and is surrounded by human development on all sides. In their discussion, Anacker et al. (2013) indicate that soil endemics (e.g., *D. parva*) are scored as more vulnerable to climate change than plants considered to be soil generalists. However, the authors did indicate that additional research is needed to better understand such plant/soil relationships.

Finally, the authors believe that soil specificity in plants should be assessed as a natural barrier issue in light of climate change, and not just a consideration in discussing the species life history.

Summary

In summary, the combination of threats associated with urban development, recreational activities, and fire suppression (discussed in Factor A); collection for horticultural, botanical interests, and educational purposes (Factor B); and the low numbers of individuals and limited range of *Dudleya parva* make it particularly vulnerable to extinction from random human-caused or natural events.

III. RECOVERY CRITERIA

Recovery plans provide guidance to the Service, States, and other partners and interested parties on ways to minimize threats to listed species, and on criteria that may be used to determine when recovery goals are achieved. There are many paths to accomplishing the recovery of a species and recovery may be achieved without fully meeting all recovery plan criteria. For example, one or more criteria may have been exceeded while other criteria may not have been accomplished. In that instance, we may determine that, over all, the threats have been minimized sufficiently, and the species is robust enough, to downlist or delist the species. In other cases, new recovery approaches and/or opportunities unknown at the time the recovery plan was finalized may be more appropriate ways to achieve recovery. Likewise, new information may change the extent that criteria need to be met for recognizing recovery of the species. Overall, recovery is a dynamic process requiring adaptive management, and assessing a species' degree of recovery is likewise an adaptive process that may, or may not, fully follow the guidance provided in a recovery plan. We focus our evaluation of species status in this 5-year review on progress that has been made toward recovery since the species was listed (or since the most recent 5-year review) by eliminating or reducing the threats discussed in the five-factor analysis. In that context, progress towards fulfilling recovery criteria serves to indicate the extent to which threat factors have been reduced or eliminated.

The recovery plan indicates that delisting for *Dudleya parva* can be considered when the following criteria have been achieved:

1. All the current sites (including seedbanks) are fully protected and managed with the primary intention of preserving the populations in perpetuity (addresses Listing Factors A and E).

This criterion is relevant and up-to-date. Although a portion of the *Dudleya parva* sites occur on park lands (either city, county, or regional) and are currently safe from new development threats, very few, if any, of the existing occurrences are currently being managed specifically in the interest of *D. parva* to meet this criterion; therefore, this criterion has been partially, but not fully met.

New Information as of 2014:

Two EOs (EO3 and EO5) have changed ownership from private to public since the 2009 5-year status review was completed (Burgess in litt. 2014). With regards to EO3, the portion that was in private ownership during the surveys in 2010 is now managed by COSCA, a change that should result in additional protections for the plants. With regard to EO5, while the site was inaccessible during the 2010 surveys, a small population of at least 25 plants (last observed in 2006) may still exist and would receive consideration for conservation since the City of Thousand Oaks is the new land owner of that portion of Conejo Grade (Burgess in litt. 2014). In light of these land transfers, additional progress has been made toward meeting this criterion since the last 5-year review, but it is not fully met.

2. All the current sites (including seedbanks) are shown to be self-sustaining over a minimum of 10 years (addresses Listing Factors A and E).

This criterion is relevant and up-to-date. The most current observations for several of the *Dudleya parva* sites seem to show that the number of individuals are remaining at similar levels to the time of listing and the species is extant, while some of them seem to be decreasing (Burgess in litt. 2008; CNDDDB 2008a, in litt. 2008b; McCabe in litt. 2008b; Sagar in litt. 2008a); therefore, this criterion has been partially, but not fully, met.

New Information as of 2014:

Dorsey et al. (2013) report an increase in the number of plants observed between the 2009 5-year status review and 2013. Up to 2009, there had been an estimated 20,050 plants reported, whereas in 2010, approximately 153,500 plants were observed in total, with EO3, EO9, and EO10 comprising the majority of the plants. All three of these EOs are protected from development, as they occur on public lands managed by COSCA and the Conejo Recreation and Park District (see also Table 2). While the total number of individuals reported from 2010 surveys represents better survey data rather than any trend over time, the increase in reported numbers provides a qualitative measure that at least some of the populations are self-sustaining. However, the surveys to date have been designed to capture baseline abundance and distribution information throughout the range of the species, rather than to detect population stability (i.e., whether a population self-sustaining). Therefore, this criterion has been partially, but not fully, met.

IV. SYNTHESIS

The status of *Dudleya parva* has not changed substantially since the time of listing in 1997. At the time of listing, a total of 11 occurrences of *D. parva* were known to exist. As of 2009, there are 18 known occurrences of the species, some of which are extant and seem to be relatively stable; however, there has not been a significant increase in the overall species' population size or range (Burgess in litt. 2008b; CNDDDB 2008a, in litt. 2008b; McCabe in litt. 2008b; Sagar in litt. 2008a). Although a portion of the *D. parva* habitat is somewhat protected through parks, preserves, and "open space" designations, these lands are managed for a variety of recreational and open space values, and not specifically for the preservation of this species.

Overall, the number of *Dudleya parva* occurrences that are known to exist on public lands has increased since the time of listing, but there is still a portion of the species' habitat that occurs on private lands and continues to be subject to development threats (Burgess in litt. 2008b; CNDDDB 2008a, in litt. 2008b,c; Sagar pers. comm. 2008c; Wishner pers. comm. 2008). There is a lack of current information about the species and the existing occurrences, as well as potential habitat for the species. The species remains threatened due to the low numbers of individuals, limited range, and ongoing threats to the species, such as fire suppression, collection by humans, impending development, and human recreational activities. Therefore, we believe *D. parva* still meets the definition of threatened, and recommend no status change at this time.

Updated Synthesis as of 2014:

Since the time of listing in 1997, new survey information appears to indicate that *Dudleya parva* occurs in much greater abundance. This is likely due, in part, to more efficient survey efforts. At the time the species was listed, there were a total of 11 element occurrences (EOs) of the species, and in the 2009 5-year status review, approximately 20,050 plants had been reported up to that time. During the 2010 surveys, there were a total of 14 EOs with approximately 153,500 plants documented. In addition, although individuals are scattered over an area of several hundred acres, the combined footprint of the individuals is only 6.3 acres (2.55 hectares). As previously noted, the larger number of individuals does not represent an increase in the population size over time, but rather improved survey methods. Currently, the majority of the plants occur on public lands that are protected from development (e.g., COSCA) or receive consideration for conservation during planning processes (e.g. City of Thousand Oaks). The threat from additional development has eased.

Despite the fact that a greater number of individuals have been observed than were known before, threats to the species remain. These include impacts from recreational activities such as rock climbing and hiking, fire suppression activities that clear vegetation, and the introduction and spread of invasive non-native plants related to the above-mentioned activities. Moreover, we believe that wildfires and climate change may be even greater threats than initially thought. As noted previously, an assessment by Anacker et al. (2013) on climate change and rare plant species in southern California suggests that certain species may be more vulnerable to climate change than others, including those that are soil endemics and substrate endemics (such as *D. parva*). Also, because this species occurs in a unique geologic substrate and within the urban-wildland interface, it heightens the possibility of this species being subject to stochastic events. Given these factors, the species remains vulnerable due to its limited range and ongoing threats, such as fire and fire-related activities suppression, collection by humans, and human recreational activities. Therefore, we believe *D. parva* still meets the definition of threatened, and recommend no status change at this time.

V. RESULTS for 2014

Recommended Classification:

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

Recovery Priority Number and Brief Rationale: 3.

The previous recovery number was 2, which denotes a species that faces a high degree of threat and has a high potential for recovery (as noted previously, although the taxon is taxonomically recognized as a full species, it is still listed under the Act as a subspecies; thus, the number 3 should have been retained at that time). We therefore return the species to a recovery priority of 3 given that it is still listed under the Act as a subspecies, still faces a high degree of threat (threat from development has eased but other threats remain or have increased), and has a high potential for recovery (some conservation plans are in place to be improved upon to meet recovery criteria, improved survey methods have detected more individuals, and further research and monitoring can inform conservation efforts). We have also removed the “C” from the Recovery Priority Number in this 2014 review because conflict with development is no longer viewed as a major concern for this species.

VI. RECOMMENDATIONS FOR FUTURE ACTIONS

1. Conduct new, up-to-date, extensive population surveys of known occurrences and areas of suitable habitat.
2. Develop and implement monitoring and adaptive management plans for known existing occurrences. Monitoring should occur at intervals of 3 years and include population abundance surveys, habitat condition assessment, and documentation of existing and potential threats.
 - 2a. Work closely with agencies such as COSCA and the Ventura County Parks and Recreation Department to implement a species monitoring and public outreach program, in addition to implementing new conservation measures for the species (e.g., fencing off certain areas, etc.) and preserving additional suitable habitat for the species.
 - 2b. Enhance public outreach and education of private land owners in the area; develop incentives aimed at conservation of the species. Seek input from public and other stakeholders on the management and preservation of the species.

- 2c. Work with county and city planning departments to develop a species conservation plan; if development does occur, onsite protection should be required.
3. Update and expand knowledge of the species' life history and specific habitat requirements.

Changes in Recommendations as of 2014:

No changes to the list of recommendations are suggested at this time. We note, however, that Recommendations #1, #2a, and #2c have been partially implemented, and have resulted in a better understanding of the species abundance and distribution. Additionally, lands with *Dudleya parva* previously held in private ownership have been acquired and are being managed by the City of Thousand Oaks. We encourage the city to continue monitoring human activities in the vicinity of known plant populations and utilize adaptive management strategies to anticipate and prevent adverse impacts to the species and its habitat. The public outreach and education component described in Recommendation #2b above could be an integral part of this adaptive management approach.

Although we would prefer to conduct conservation efforts in the habitats where a species has evolved, we believe that additional research may be necessary (as indicated under Recommendation #3) to better understand the response of *Dudleya parva* to climate change. Anacker et al. (2013) have provided some information regarding the vulnerability of numerous southern California plant species in light of climate change. Because the entire range and distribution of *D. parva* is limited to the unique Conejo volcanic geologic substrate, research may help in our understanding of the species needs and identifying opportunities to further protect and conserve the species. Opportunities such as translocating plants into other suitable habitats within the Conejo volcanics could be examined as a possible tool for conservation, if necessary.

VII. REFERENCES

As of 2014, new references have been incorporated into the lists below.

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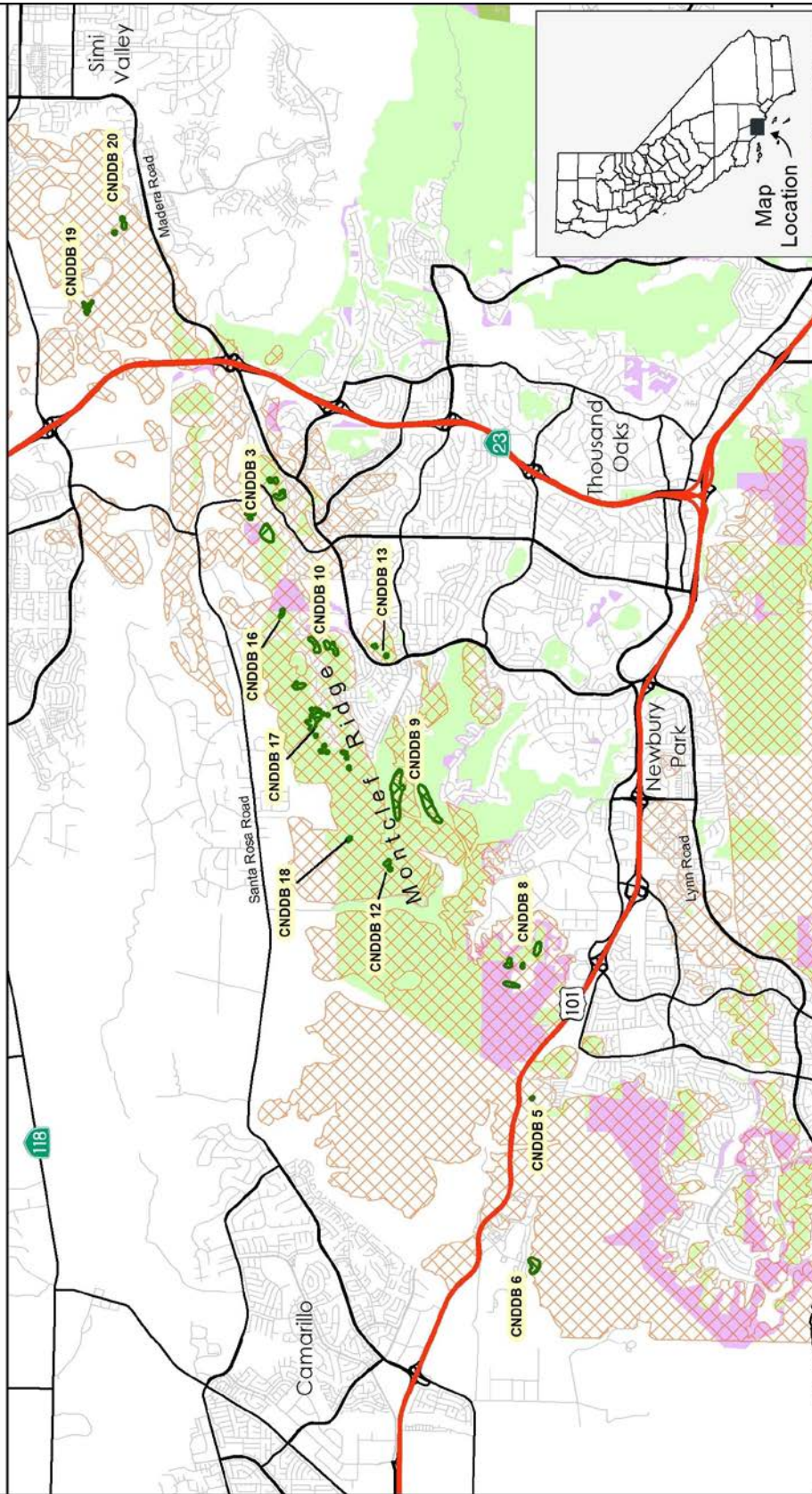
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Figure 1. Distribution of *Dudleya abramsii* ssp. *parva* (Conejo Dudleya)



Geology

- CONEJO VOLCANICS

Conservation Land Ownership

- CITY / COUNTY / LOCAL AGENCY
- LAND TRUST / CONSERVANCY/PRIVATE

**U.S. Fish & Wildlife Service
Ventura Fish & Wildlife Office
September, 2014**

Prepared for the 2014 5-year status review

**Conejo Dudleya Records
in CNDDB, September 2014**

- Highways / Roads / Streets

0 0.5 1 2 Miles

0 1 2 Kilometers

Map Location

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

Dudleya abramsii ssp. *parva* (*Dudleya parva*)
(Conejo Dudleya)

Current Classification: Threatened

Recommendation Resulting from the 5-Year Review:

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

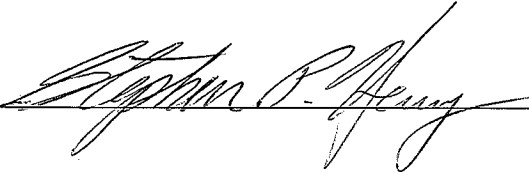
Appropriate Listing/Reclassification Priority Number: N/A

Review Conducted By: Ray Vizgirdas

FIELD OFFICE APPROVAL:

Field Supervisor, U.S. Fish and Wildlife Service

Approve



Date

3/4/15