Dudleya verityi
(Verity's Dudleya)

5-Year Review:
Summary and Evaluation

Dudleya verityi growing in cushion lichen (*Niebla ceruchoides)* Photo: Santa Monica Mountains National Recreation Area

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

August 17, 2009

5-YEAR REVIEW

Dudleya verityi (Verity's 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), *Dudleya verityi* is a succulent, multiple rosette-forming perennial plant in the stonecrop family (Crassulaceae). *Dudleya verityi* is restricted to a discontinuous 6.4-kilometer (km) (4-mile (mi)) narrow band of land following the lower northern slope of Conejo Mountain and on north-facing volcanic outcrops in the vicinity of the California State University Channel Islands (CSUCI) campus in Ventura County, California, where it is threatened by a quarrying operation, fire, development activities, and potential collection. At the time of listing, poor air quality was also considered a threat. However, air quality has improved in Ventura County (California Environmental Protection Agency Air Resources Board (CEPAARB 2008)) since delisting. Therefore, until studies have been performed to determine the levels of smog that would impair the ability for *D. verityi* to persist, air quality may continue to be a threat to *D. verityi*. *Dudleya verityi* grows on north-facing volcanic rock outcrops in coastal sage scrub habitat in association with Conejo buckwheat (*Eriogonum crocatum*), Blochman's liveforever (*Dudleya blochmaniae ssp. blochmaniae*), and the coastal cactus wren (*Campylorhnchus bruneicapillus couesi*), all of which are species of concern (i.e., rare populations in decline) (Service 1999, California Natural Diversity Database (CNDDB) 2008). A substantial portion of the plant's habitat is on privately owned lands, while only a small portion is owned by a public agency (Ventura County Flood Control District).

Methodology Used to Complete the Review:

This review was prepared by the Ventura Fish and Wildlife Office (VFWO), following the Region 8 guidance issued in March 2008. We used information from the recovery plan, the CNDDB maintained by the California Department of Fish and Game, the Consortium of California Herbaria (CCH), and personal communications with experts. 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.

Contact Information:

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Lead Field Office: Robert McMorran, Fish and Wildlife Biologist, (805) 644-1766 extension 232; and Connie Rutherford, Listing and Recovery Program Coordinator for Plants; Ventura Fish and Wildlife Office, (805) 644-1766 extension 306.

Federal Register 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 (FR) on March 5, 2008 (73 FR 11945). The Service received one response collectively regarding all 58 species covered in the notice, which we have considered in preparing this 5-year review.

Listing History:

Original Listing
FR Notice: 62 FR 4172
Date of Final Listing Rule: January 29, 1997
Entity Listed: *Dudleya verityi* (species)
Classification: Threatened

Associated Rulemakings: N/A

Review History: N/A

Species' Recovery Priority Number at Start of 5-Year Review: The recovery priority number for *Dudleya verityi* is 2C according to the Service's 1999 recovery plan for this species, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest

(Endangered and Threatened Species Listing and Recovery Priority Guidelines, 48 FR 43098, September 21, 1983). This number indicates that the taxon is a species that faces a high degree of threat and has a high potential for recovery. The "C" indicates conflict with construction or other development projects or other forms of economic activity.

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

As summarized from the recovery plan for this species (Service 1999), *Dudleya verityi* is a succulent, rosette-forming perennial plant in the stonecrop family (Crassulaceae). In California, there are 39 different species and subspecies of *Dudleya*, which fall under 3 subgenera (*Dudleya*, *Hasseanthus,* and *Stylophyllum*), with *D. verityi* 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), sepals that are erect to slightly spreading at the tips, and erect fruit (follicles). *Dudleya verityi* forms multiple rosettes, with as many as 100 per plant. *Dudleya verityi* blooms in late spring (May-June) (California Native Plant Society (CNPS) 2008) and has floral stalks 5 to 15 centimeters (cm) (2.0 to 5.9 inches (in)) tall with lemon-yellow corollas and petal tips recurved to 90 degrees (Service 1999). Field observations of 30 *D. verityi* plants in 2005 found that, on average, *D. verityi* produces 39 fruits with a maximum of 112 seeds per fruit (Dorsey 2007).

Pollination and reproductive strategies vary within the *Dudleya* taxa. In general, the *Dudleya* species that are more rare tend to reproduce earlier (e.g., often in the first year after germination) and subsequently have a lower reproductive output. *Dudleya verityi* 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 snails and slugs (Riefner and Bowler 1995, Riefner et al. 2003). The cushion lichen, *Niebla ceruchoides*, appears to provide a nursery habitat for seed capture and germination for *D. verityi* (Riefner 1992) (see cover photo).

Pollination within the *Dudleya* taxa depends on characteristics such as corolla size, color, and petal fusion (Aigner 2004). The *Dudleya* species which have small yellow to orange flowers (including *D. verityi*) are pollinated by bees and flies, while species with larger red flowers are pollinated mostly by hummingbirds (Levin and Mulroy 1985, Aigner 2004). 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 (Dorsey 2007). *Dudleya verityi* is known to hybridize with some of the other *Dudleya* species (e.g., *D. blochmaniae* and potentially *D. lanceolata*), which is typical of the *Dudleya* genus (Nakai 1983, McCabe 2008a).

Historic and Current Distribution

Dudleya verityi was originally collected in 1944 by Reid Moran, who treated it as part of *Dudleya caespitosa* (Nakai 1983). In their 1966 Flora of the Santa Monica Mountains, Peter Raven and Henry Thompson treated it as part of *Dudleya farinosa*. In 1983, it was described as *D. verityi* by Kei Nakai based on a collection he made in 1978 in Long Grade Canyon, Santa Monica Mountains (CNDDB element occurrence 1), Ventura County, California (Nakai 1983). According to records available through the CNDDB (2008), the CCH (2008), Tarja Sagar of the National Park Service (Sagar 2008), Steven McCabe of the University of California Santa Cruz, Brittany Sahatjian of California State University Channel Islands, and other recently published reports (Dorsey 2007), all known occurrences are within eastern Ventura County, California, along north-facing volcanic rock outcrops on the lower slopes of the west end of the Santa Monica Mountains in coastal sage scrub. The entire distribution of the species is scattered over a 6.4-km (4-mi) stretch of land along the northern slope of Conejo Mountain and on north-facing volcanic outcrops in the vicinity of the California State University Channel Islands campus.

At the time of listing, *Dudleya verityi* was reported to have three occurrences in southern California (CNDDB 2008). According to results from a 2003 survey, *D. verityi* is now known from several additional locations not yet entered into CNDDB. For this reason, and to aid in organization of the multiple locations where *D. verityi* are now known, locations are either grouped with historic occurrences or, if a distance of separation between locations exceeded 0.4 km (0.25 mi) (distance used by CNDDB to track separate element occurrences), those locations were identified separately. Using this method to identify the different occurrences, there are currently a total of nine occurrences (see Table 1).

Of the nine currently known occurrences, three historic occurrences (numbers 1, 2, and 3) are known from surveys prior to listing and six (numbers 4, 5, 6, 7, 8, and 9) are new as a result of the 2003 surveys. The 2003 surveys included eight occurrences; two historic (numbers 1 and 2) and six new (numbers 4, 5, 6, 7, 8, and 9). Occurrence number 3 was not surveyed in 2003. Although there has been an increase in the recorded number of occurrences, they all fall within the same continuous band of Conejo volcanics; therefore, there has been no significant change in the geographic range of the species since its listing in 1997.

According to McCabe (2008a), thousands of plants, most belonging to *Dudleya lanceolata* and *Dudleya verityi* (and suspected hybrids), are growing and reproducing on clay tile roofs at the California State University Channel Islands campus near occurrence number 5. Further investigations are necessary to provide the data to determine whether these plants are in fact *D.*

verityi, and not hybrids. Therefore, this information is not included in the occurrence data below and will not be discussed further in this document.

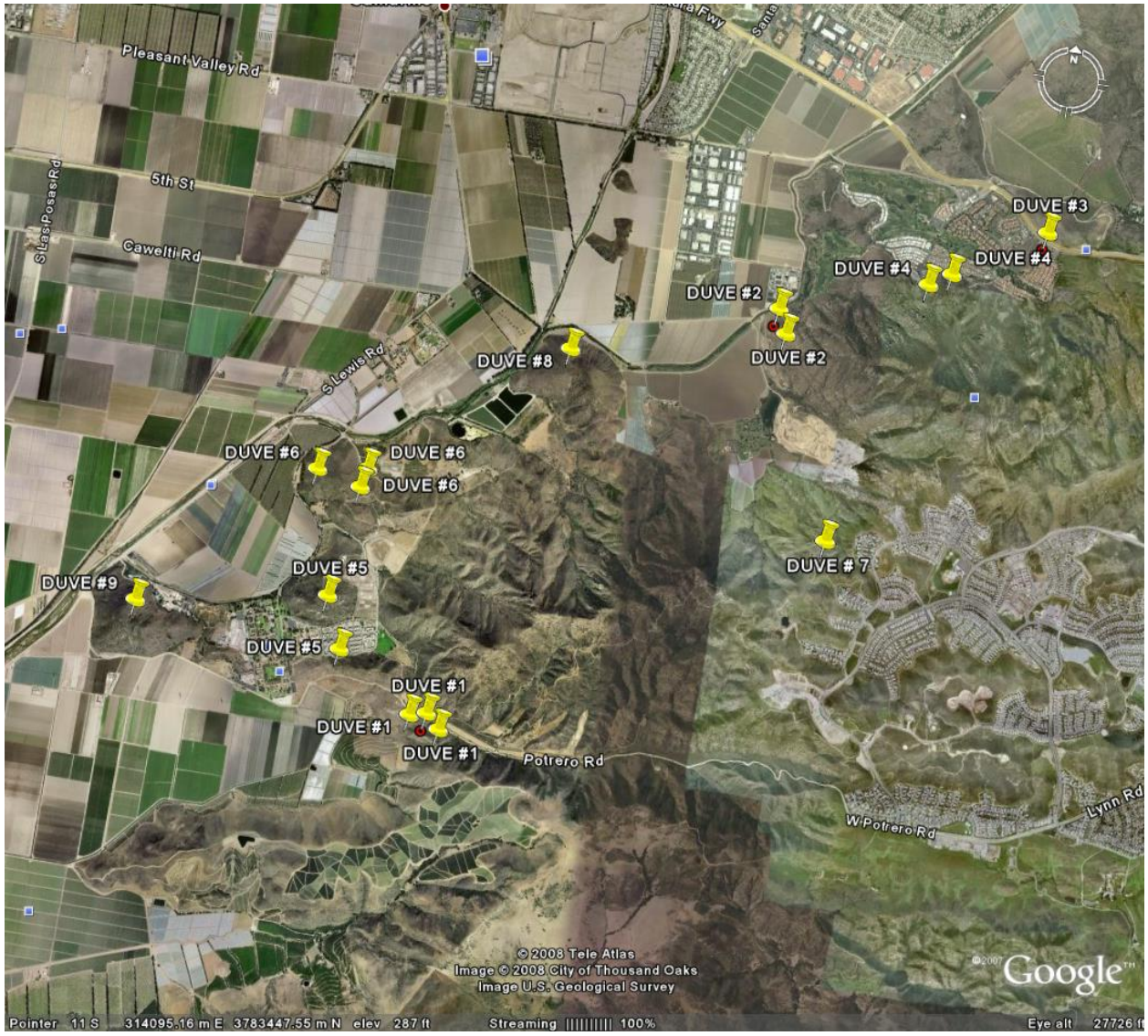


Figure 1: Map of updated occurrences
*Element Occurrences 1-3. CNDDB records
*Occurrences 4-9. Sagar 2008

Abundance, Population Trends

The population boundaries and numbers for *Dudleya verityi* have generally remained in the same suitable habitat areas as noted at the time of listing in 1997. Six additional occurrences were identified during surveys for *D. verityi* in 2003 (Sagar 2008). However, it is most likely that the more recently documented occurrences were not recently established, but instead represent occurrences of the species that had not previously been detected due to ruggedness of terrain or the level of survey effort previously expended. Information gathered from the more recent population surveys seems to indicate that overall the species' numbers have increased or remained at relatively constant levels since the time of listing (Sagar 2008).

At the time of listing in 1997, there were three known occurrences of *Dudleya verityi* (Service 1997). As a result of 2003 surveys (Sagar 2008) which reported an additional six occurrences, the number of occurrences is now currently at nine (CNDDB 2008, Sagar 2008). The additional six occurrences are not currently recorded in the CNDDB (CNDDB 2008) (see Historic and Current Distribution section above). At the time of listing, the largest reported number of plants occurred on the west and north slopes of Conejo Mountain (occurrences number 2 and 3 respectively). The number of individuals comprised by these two occurrences were combined in the recovery plan (Service 1999) for a total of more than 10,000 plants, while in 2003, 10,000 plants were reported for occurrence number 2 alone (Sagar 2008). Occurrence number 3 was not surveyed in 2003 (Sagar 2008). Occurrence number 1 at the time of listing was reported to have more than 1000 plants (Service 1999). Compared to surveys from 2003, occurrence number 1 continues to have more than 1,000 plants. In fact, the 2003 surveys report an estimated 1,100 plants at this site. Again, it is difficult to determine whether this occurrence has shown an increase in the number of plants or if an increased level of survey effort allowed for more accurate estimates. No other comparison can be made for the remaining occurrences as they were not known at the time of listing and limited survey information is available.

Table 1: Population Records for *Dudleya verityi* extracted from CNDDB 2008, Sagar 2003

Identification #	**Location**	**Current Trend**	**Year Collected/ Observed**	**Year Surveyed**	**Population Size**	**Reference**	**Site Manager/ Owner**
Ventura County Occurrences							
CNDDB Element Occurrence (EO) 1	California State University Channel Islands - Long Grade Canyon	stable	1989	1983 (Cochran) 1983 (McCabe) 1984 (Thomas) 1987 (Bittman) 1989 (Burgess) 2003 (Sagar)	>1000 1100	CNDDB 2008, Sagar 2003	Private
CNDDB EO 2	West Slope of Conejo Mountain	stable	1980	1983 (McCabe) 1983 (Nakai) 2003 (Sagar)	10,000 (includes EO 3 at time of listing) 10,000 as of 2003 surveys	CNDDB 2008, Sagar 2003	Private
CNDDB EO 3	North Slope of Conejo Mountain	unknown	1980	1980 unknown 1983 (McCabe) 1983 (Nakai)	10,000 (includes EO 2 at time of listing)	CNDDB 2008	Private
No CNDDB # (Sagar 04)	Sagar # 4	unknown	2003	Sagar 2003	unknown	Sagar 2003	Private
No CNDDB # (Sagar 05)	California State University Channel Islands	unknown	2003	2003 (Sagar)	1600	Sagar 2003	State of California /Public
No CNDDB # (Sagar 06)	Camarillo Regional Park / California State University Channel Islands	unknown	2003	2003 (Sagar)	750	Sagar 2003	Ventura County Parks District / State of California /Public
No CNDDB # (Sagar 07)	Dos Vientos Ranch	unknown	2003	2003 (Sagar)	1500	Sagar 2003	Private /Public
No CNDDB # (Sagar 08)	Sagar #8	unknown	2003	2003 (Sagar)	unknown	Sagar 2003	Private
No CNDDB # (Sagar 09)	Round Mountain	unknown	2003	2003 (Sagar)	50	Sagar 2003	State of California /Public

CNDDB element occurrence = EO number assigned by the California Natural Diversity Database (CNDDB 2008).
Sagar identification # = occurrence number assigned by the Service

Since very little is known about the current status as compared to the historical status of *Dudleya verityi*, Sahatjian developed in 2008 a "Method for Creating a Systematic Monitoring Program for *D. verityi* in the Foothills Surrounding the CSUCI Campus" (Sahatjian 2008). The intention of the study is to determine the current status of *D. verityi* in order to determine the necessary steps towards recovery (Sahatjian 2008). Since its listing in 1997, no studies or recovery efforts have taken place to determine the current status of this species. Through the implementation of this newly designed methodology, we can begin to document the status of *D. verityi*, which will enable the Service to better understand the current status of this species and identify recovery efforts.

Habitat or Ecosystem Conditions

In general, *Dudleya* taxa typically inhabit ocean bluffs, sheer cliffs, and rock outcrops including open habitat soils that have nutrient poor substrates and little vegetation (Riefner et al. 2003). The Santa Monica Mountains harbor these diverse habitat types and are the home of five narrowly endemic *Dudleya* species (Dorsey 2007), including *Dudleya verityi*. Based on an inventory of the north slope of Conejo Mountain, more than 240 species of vascular flora were reported along with more than 70 species of lichen flora (Service 1999). This constitutes an unusually high botanical richness when compared with areas that have greater microclimate variation and substrate diversity (Wishner 1992). The diverse lichen community associated with *D. verityi* contains species that are considered rare and disappearing from southern California, through habitat loss and air pollution (Riefner 1992). The cushion lichen, *Niebla ceruchoides*, appears to provide a nursery habitat for seed capture and germination for *D. verityi* (Riefner 1992). The dense, intricately-branched cushion captures and consolidates moisture derived from soil and fog on the sheer rock outcrops, providing suitable habitat for germination and establishment of *D. verityi* (Riefner and Bowler 1995).

These lichen communities are limited in Ventura County because the coastal side of the Santa Monica Mountains and the rest of the county have a generally southern exposure. Despite the strong influence of fog, the arid aspect of the coastline combined with the Mediterranean climate and regular strong winds off the Pacific Ocean limits the extent of lichens. However, relics of the habitat are found in Ventura County as far inland as Conejo Mountain on north slopes along the edge of the Oxnard Plain. These local sites harbor high lichen diversity and species richness, and contain rare lichen species such as soot lichen (*Cyphelium brunneum*) as well as abundant *Niebla* populations (Dorsey 2007).

Based on CNDDB (2008) records and recently mapped coordinates onto Google Earth (2008), known occurrences of *Dudleya verityi* prefer elevations ranging from 60 to 350 meters (200 to 1150 feet). *Dudleya verityi* prefers slopes ranging from 20 to 90 degrees, and most commonly with north-facing exposures (CNDDB 2008, Sagar 2008). This species is highly localized in its distribution, occurring exclusively in thin-soiled substrate over rocky outcrops derived from the Miocene Conejo volcanics (Service 1999).

Most of the coastal sage scrub where *Dudleya verityi* occurs is dominated by coastal sagebrush (*Artemisia californica*), wild buckwheat (*Eriogonum fasciculatum*), purple sage (*Salvia leucophylla*), and occasionally giant coreopsis (*Coreopsis gigantea*) (Service 1997, CNDDB 2008)). Additional flora associated with *D. verityi* includes, but is not limited to, Conejo

buckwheat, Blochman's liveforever, species of cacti, and non-native annuals and grasses (Sagar 2008, CNDDB 2008).

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

Five-Factor Analysis

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

When *Dudleya verityi* was listed (Service 1997), we discussed that the species was threatened by quarrying operations, urban development, air quality, and fire. Furthermore, we mentioned that, because a substantial 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). Air quality and fire regimes are discussed under Factor E.

Historically, the lower slopes of Conejo Mountain near occurrence number 2 have been the site for quarrying of construction-grade rock. This land is zoned by the County of Ventura for mineral extraction and there are abandoned, active, and proposed quarry operations within the distribution of *Dudleya verityi* (Service 1997, 1999). However, the quarrying near occurrence number 2 remains as the only current quarry operation within the distribution of *D. verityi*, and even though we are not aware of any individuals of *D. verityi* that have been affected by these actions, the current quarry operation has violated some of their county permit requirements and has mined beyond the permit boundaries (C. Danko, Ventura County Planning Division, pers. comm. 2009). In addition, the quarry operation, once back in compliance with county requirements, may request to expand its operation. Therefore, the activities and the affects of this quarry to *D. verityi* or its habitat remain unclear and therefore continue to be a threat.

At the current time, habitat encroachment from new or existing development activities surrounding several of the known *Dudleya verityi* occurrences continues to be a threat to the species and its habitat. For the most part, *D. verityi* and associated habitat is located in areas where impacts from development itself may not directly affect the species or its habitat. However, the associated human impacts to the land (e.g., hiking, mountain biking) in these areas adjacent to new or existing developments could result in *D. verityi* and associated lichen communities to be trampled and/or dislodged. Additionally, erosion from such activities may cause changes in the substrate which may change the microhabitat necessary for the lichen communities to persist.

In summary, threats to the habitat for *Dudleya verityi* remain similar to what they were at the time of listing, but the intensity of these threats have decreased since listing. However, over the last several years the amount of *D. verityi* habitat identified on public open space or parklands has increased. Additionally, at the time of listing, quarry operations were threatening *D. verityi* throughout its range. However, as mentioned above, there is currently only one quarry in operation. Of the nine recorded occurrences of *D. verityi*, four are located on public lands (two on State of California land, one on County of Ventura land, and one on both State and county land) and are not subject to large-scale, land-use conversion. The remaining five occurrences are

located on private lands where potential development remains a concern. We are currently unaware of any future development projects that would reduce habitat within the distribution of *D. verityi*.

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

At the time of listing (Service 1997), we discussed that species of *Dudleya* are collected by professional horticulturalists as well as amateur collectors and gardeners. 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 vandalism of chalk dudleya (*Dudleya pulverulenta*) occurred near a public access location in Topanga Canyon, California in 1999, illustrating that collection of *Dudleya* species continues to be a threat to members of this genus (Farris 1999). Even though we are unaware of any collection of *Dudleya verityi*, occurrence number 1, 5, and 7 are especially prone to collection given the ease of accessibility and proximity to existing development and roads.

FACTOR C: Disease or Predation

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

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

At the time of listing, regulatory mechanisms thought to have some potential to protect *Dudleya verityi* included: (1) the California Environmental Quality Act (CEQA); (2) listing in the California Native Plant Society's (CNPS) 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. verityi* 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 currently 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 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. 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 complying with CEQA requirements have made determinations that have or could negatively impact *Dudleya verityi*.

(2) California Native Plant Society's Inventory, List 1B: California endemic, rare, threatened, or endangered in California: *Dudleya verityi* is listed in the California Native Plant Society's Inventory, under List 1B: California endemic, rare, threatened, or endangered in California (CNPS 2008). Inclusion of this species on this list indicates that, in accordance with chapter 10 sec. 1901 of the California Department of Fish and Game Code, *D. verityi* 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 verityi*, 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'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 decision making 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)."

(4) Endangered Species Act of 1973, as amended (Act): The Act is the primary Federal law providing protection for this species. The Service's responsibilities include administering the Act, including sections 7, 9, and 10 that address take. Since listing, the Service has analyzed the potential effects of Federal projects under section 7(a)(2), which requires Federal agencies to consult with the Service prior to authorizing, funding, or carrying out activities that may affect listed species.

In summary, the Endangered Species Act is the primary Federal law that provides some protection for this species 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 absence of the Endangered Species Act.

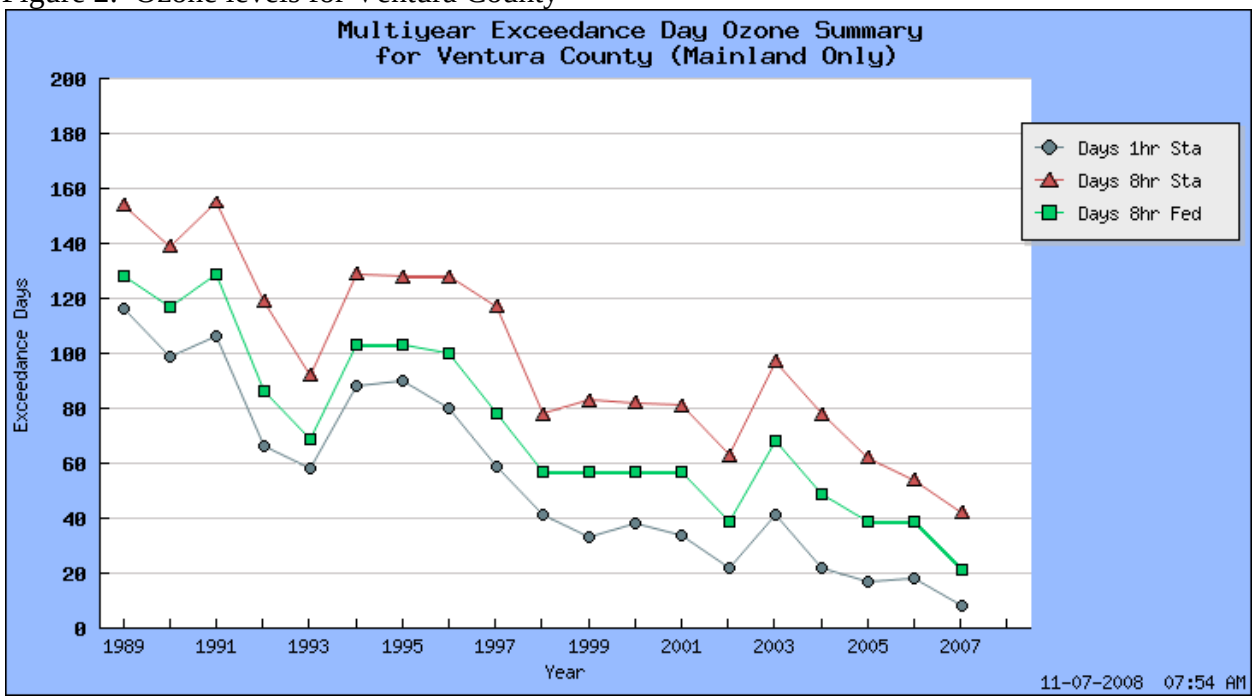
FACTOR E: Other Natural or Manmade Factors Affecting Its Continued Existence

Air Quality

At the time of listing, we discussed general threats to the *Dudleya* genus, including the effects of air quality. Air pollution impacts to coastal sage scrub have been documented in the Santa Monica Mountains as a threat to the viability and functioning of the habitat (O'Leary 1990). The diverse lichen flora associated with *D. verityi* contains species that are considered rare and disappearing from southern California (Riefner 1992). The cushion lichen (*Niebla ceruchoides*) appears to provide a nursery habitat for seed capture and germination for *D. verityi* (Riefner 1992). The population of *Niebla* on Conejo Mountain is the largest on the mainland (it is also known from the California Channel Islands). Lichens are sensitive to air pollutants and have been eliminated from many areas during the past century (Hale 1983). Studies in California have shown a strong correlation between the increases in smog and the loss of the regional lichen flora (Sigal and Nash 1982). Since the time of listing in 1997, air pollution in Ventura County has decreased. Due to efforts to reduce emissions of smog-producing chemicals, Ventura County has seen a steady decline in smog levels that exceed the Federal standards as indicated in the California Environmental Protection Agency Air Resources Board (CEPAARB) Figure 2 below (CEPAARB 2008). According to CEPAARB (2008), the year 2007 was the cleanest air ever in its recorded history in Ventura County. Despite continued increases in population, the number of days in which air quality in Ventura County as a whole exceeded the Federal standards for ozone continues to decrease compared to the late 1980's and mid 1990's. In fact, during the past 10 years, with the exception of 2003, Ventura County has exceeded Federal standards fewer than 100 days annually, with approximately 80 days being the highest and approximately 40 days being the lowest, whereas in the late 1980's and mid 1990's, the number of days exceeding Federal standards far surpassed 100 days and at times approached 160 days (CEPAARB 2008).

With Ventura County's improvements in air quality, air pollution is not the threat it was at the time of listing. However, until studies have been performed to determine the levels of smog that would impair the ability for the cushion lichen, *Niebla ceruchoides*, to persist, air quality may continue to be a threat to *D. verityi*.

Figure 2: Ozone levels for Ventura County



California Environmental Protection Agency Air Resources Board 2008.

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

At the time of listing in 1997, we discussed general threats to several species within the *Dudleya* genus, including the effects of fire (Service 1997). Natural fire regimes of these areas have been affected, consequently having drastic effects on the grassland, coastal sage scrub, chaparral, and oak woodland ecosystems and the species that reside there (Keeley et al. 1999). In some cases, *D. verityi* is threatened by direct removal during fuel modification and fire-break efforts that occur in the vicinity of the habitat for this species due to the large number of residences and buildings that exist in close proximity to the existing distribution of this species (Service 1997, 1999; Sagar 2008). Additionally, fire that reduces or eliminates the lichen community could dramatically reduce the extent and number of populations of *D. verityi*. Lichens grow very slowly and persist for long periods of time (Hale 1983). The population structure of *D. verityi* depends on mature lichen individuals (Service 1999). Therefore, an extremely hot fire could remove the necessary substrate for the species to germinate and would modify *D. verityi* habitat for an uncertain period of time.

Although the plants probably have the ability to survive small, low-intensity fire, there is a high probability that the plants may not survive a larger, high intensity fire. Increased fire suppression over the last century in a large portion of southern California increases the chance of having these larger, more intense fires (Keeley et al. 1999) and thus high intensity fires may pose a threat to the species.

Stochastic extinction

At the time of listing, we noted that due to the limited number of individuals and the restricted range of *Dudleya verityi*, this species is under threat of extinction from naturally occurring events, such as fire, drought, disease, or rock slides (Service 1997). As a result of the number of

individuals and range of *D. verityi*, 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).

Climate Change

We did not discuss climate change at the time of listing. However, 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, Intergovernmental Panel on Climate Change 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 low numbers of individuals, will affect *Dudleya verityi*, small ranged species such as *D. verityi* are more vulnerable to extinction due to these changing conditions (Loarie et al. 2008).

In summary, the combination of threats associated with urban development and quarry activities (discussed in Factor A), potential collection for horticultural, botanical interests, and educational purposes (Factor B), unknown effects of air pollution and fire on lichens and associated habitat (Factor E), and the low numbers of individuals and limited range of *Dudleya verityi* 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. For the purpose of this 5-year review, "current sites" as mentioned below include only those occurrences (numbers 1, 2, and 3) known at the time of listing and discussed in the recovery plan.

The recovery plan indicates that delisting for *Dudleya verityi* 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 the *Dudleya verityi* sites occur are currently safe from new development threats, the existing occurrences are currently not being managed specifically for the benefit of *D. verityi* to meet this criterion; therefore, this criterion has been partially, but not sufficiently 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 the historical occurrences where the numbers of individuals were documented for *Dudleya verityi* seem to indicate that the numbers of individuals have increased or remain at similar levels as those at the time of listing and the species has not been extirpated from any historically known locations. However, it should be noted that presence/absence was used to document the majority of occurrences rather than documenting the actual number of individuals. In addition, surveys to date have not recorded demographic data that would assist in determining whether recruitment is occurring and that populations are self-sustaining. Therefore, it is difficult to say with certainty whether the numbers of plants within known occurrences remain at similar levels to those at the time of listing and whether populations are self-sustaining. There is limited information available to establish any trend at this time; therefore, this criterion has been partially met.

IV. SYNTHESIS

The status of *Dudleya verityi* has not changed substantially since the time of listing in 1997. At the time of listing, a total of three occurrences of *D. verityi* were known to exist. Currently, there are nine known occurrences of the species, two of which (historical occurrences 1 and 2) seem to be relatively stable and extant with a possible increase in the number of individuals. Although more populations have been located since listing, we do not have enough data to determine a trend in the population. However, given existing data, there does not appear to be any substantial increase in the overall species' population size or range (CNDDB 2008, Sagar 2008). Although a portion of the *D. verityi* habitat is somewhat protected through public ownership, these lands are managed for a variety of activities, and not specifically for the preservation of this species.

Overall, the majority of *Dudleya verityi* occurrences known to exist are located on private lands and continue to be subject to development threats (CNDDB 2008, Sagar 2008). There is a lack of current information about the status of the species and the existing occurrences, as well as the

extent or quality of potential habitat for the species. The species remains threatened due to the low numbers of individuals (based on limited data), limited range, and ongoing threats to the species, such as quarrying which has been reduced to a single operation, fire and fire suppression activities, potential collection by humans, development, and to a lesser extent, air pollution. Therefore, we believe *D. verityi* still meets the definition of threatened, and recommend no status change at this time.

V. RESULTS

Recommended Classification:

_____ Downlist to Threatened
_____ Uplist to Endangered
_____ Delist (*indicate reasons for delisting per 50 CFR 424.11*):
__X__ No Change

New Recovery Priority Number and Brief Rationale: 8C. The recovery priority of 8C is the correct number for a species that faces a moderate degree of threat and with a high potential for recovery.

VI. RECOMMENDATIONS FOR FUTURE ACTIONS

1. Conduct new, up-to-date extensive population survey of existing and potential habitat sites. Potential partners include the National Park Service (Santa Monica Mountains Recreation Area), California State Parks, and California State University, Channel Islands.

2. Develop and implement monitoring and adaptive management plans for known existing occurrences. Monitoring should follow Sahatjian's (2008) monitoring methodology. Update and expand knowledge of species life history and specific habitat requirements.

3. Work on public outreach and education with 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. Cooperative agreements and coordinated planning and management efforts could assist in conservation efforts.

4. Work closely with agencies 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 potential habitat for the species.

5. Work with county planning departments to develop a species conservation plan; if development does occur, onsite protection should be required.

6. Investigate air quality impacts on cushion lichen, *Niebla ceruchoides*.

7. Investigate *Dudleya verityi* (and suspected hybrids) growing and reproducing on the clay tile roofs at California State University Channel Islands campus near occurrence number 5 to determine whether these plants are in fact *D. verityi*, and not hybrids.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Dudleya verityi* (Verity's Dudleya)

Current Classification: Threatened

Recommendation Resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__X__ No change needed

Review Conducted By: Robert McMorran

FIELD OFFICE APPROVAL:

Field Supervisor, U.S. Fish and Wildlife Service

Approve _____ Date 8/17/09