Dudleya cymosa subsp. *ovatifolia*
(Santa Monica Mountains dudleya)

5-Year Review:
Summary and Evaluation

Dudleya cymosa* subsp. *ovatifolia
Photo by Stephen McCabe, UC Santa Cruz Arboretum, 2005

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

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5-YEAR REVIEW

Dudleya cymosa subsp. *ovatifolia* (Santa Monica Mountains dudleya)

I. GENERAL INFORMATION

Purpose of 5-Year Reviews:

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

Species Overview:

As summarized in the Recovery Plan for this species, Recovery Plan for Six Plants from the Mountains Surrounding the Los Angeles Basin (Service 1999), the listing of *Dudleya cymosa* subsp. *ovatifolia* (Santa Monica Mountains dudleya) was inclusive of plants now identified as *Dudleya cymosa* subsp. *agourensis* (Agoura Hills liveforever). Both subspecies are currently recognized as distinct taxa. *Dudleya cymosa* subsp. *ovatifolia* and *D. cymosa* subsp. *agourensis* are succulent, rosette-forming perennial plants with thickened, exposed stems in the Crassulaceae (stonecrop family). The ovate leaves with a maroon underside distinguish *D. cymosa* subsp. *ovatifolia* from other local *Dudleya* species, while the glaucous (chalky) leaves and lemon yellow flowers separate *D. cymosa* subsp. *agourensis* from other local *Dudleya* species. *Dudleya cymosa* subsp. *ovatifolia* is currently known to occur in two populations in the Santa Monica Mountains in Los Angeles County and one population in the Santa Ana Mountains in Orange County (California Natural Diversity Database (CNDDB) 2008a, b; S. McCabe, University of California, Santa Cruz, *in litt.* 2008a, b; S. McCabe, U.C. Santa Cruz, pers. comm. 2008c, d; T. Sagar, Santa Monica Mountains National Recreation Area, *in litt.* 2008). *Dudleya cymosa* subsp. *agourensis* is currently known to occur in approximately six closely associated occurrences that are part of one contiguous population in the Santa Monica Mountains in Los Angeles and Ventura counties (CNDDB 2008a; McCabe, pers. comm. 2008c, d). *Dudleya cymosa* subsp. *ovatifolia* generally grows in canyon bottoms and the shaded slopes of canyon walls consisting of conglomerates of sedimentary rock. *Dudleya cymosa* subsp. *agourensis* generally grows on the steep slopes comprised of volcanic base materials made up mostly of late

Pleistocene dissected gravels (Service 1999). In this 5-year review, we are evaluating the status of all the populations that were identified as *Dudleya cymosa* subsp. *ovatifolia* at the time of listing; if not otherwise indicated, reference to this taxon includes *Dudleya cymosa* subsp. *agourensis*. For certain discussions, we have also noted which of these populations are now considered to be *Dudleya cymosa* subsp. *agourensis*.

Methodology Used to Complete This 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, survey information from experts who have been monitoring *Dudleya cymosa* subsp. *ovatifolia* (Santa Monica Mountains dudleya) and *Dudleya cymosa* subsp. *agourensis*, information from herbarium specimens of these taxa deposited in herbaria that belong to the California Consortium of Herbaria (CCH), and the California Natural Diversity Database (CNDDB) maintained by the California Department of Fish and Game. 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 since the last comprehensive 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.

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Federal Register (FR) Notice Citation Announcing Initiation of This Review: A notice announcing initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the 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 cymosa* subsp. *ovatifolia*, a plant subspecies
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 cymosa* subsp. *ovatifolia* is 6 according to the Service's 2008 Recovery Data Call for the Ventura Fish and Wildlife Office, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (48 FR 43098). This number indicates that the taxon is a subspecies or variety that faces a high degree of threat and has a low potential for recovery.

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.
Dates of Previous Revisions: N/A

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 species of vertebrate fish or 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.

Information on the Species and its Status

Species Biology and Life History
The listing of *Dudleya cymosa* subsp. *ovatifolia* was inclusive of plants now identified as *D. cymosa* subsp. *agourensis.* *Dudleya cymosa* subsp. *ovatifolia* and *D. cymosa* subsp. *agourensis* are succulent, perennial herbs in the Crassulaceae (stone crop family) that have a rosette of evergreen leaves and a thickened rootstock that persists in exposed dry habitats. The floral stems are 1.6 to 6.0 inch (in) (4.1 to 15.2 centimeters (cm)) tall and the corollas (flowers) are pale yellow. Its leaves are 0.8 to 2.0 in (2.0 to 5.1 cm) long and 0.6 to 1.0 in (1.5 to 2.5 cm) wide. The ovate leaves with a maroon underside distinguish "good" (plants that exhibit a combination

of the main characters that separate it from other species and hybrid individuals) *D. cymosa* subsp. *ovatifolia* from other *Dudleya* species (McCabe *in litt.* 2008a, b; McCabe, pers. comm. 2008c, d). The flowering season is from May through June for *D. cymosa* subsp. *agourensis* and from March through May for *D. cymosa* subsp. *ovatifolia* (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., *D. cymosa* subsp. *agourensis* and *D. cymosa* subsp. *ovatifolia* often reproduce within a year after germination) and subsequently have a lower reproductive output (Aigner 2004). 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. cymosa* subsp. *agourensis* and *D. cymosa* subsp. *ovatifolia*) 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 small yellow to orange flowers that are generally pollinated by bees and flies, such as *D. cymosa* subsp. *agourensis*, tend to have a lower nectar content and exhibit a higher degree of auto-fertility. Subsequently, these plants have been found to be prone to pollinator unreliability, short and unpredictable reproductive seasons, small population size, and high population turnover (Dorsey 2007).

A study performed on *Dudleya cymosa* subsp. *ovatifolia* ex situ found that the average number of fruits produced per individual was 19 and the maximum number of seeds per fruit was 114. Likewise, the same study found that the average number of fruits produced per individual was 74 and the maximum number of seeds per fruit was 122 for *D. cymosa* subsp. *agourensis*. These findings are in the low to mid-range of the spectra for *Dudleya* taxa from the Santa Monica Mountains area. It was also discovered that *D. cymosa* subsp. *agourensis* has a slightly higher rate of seedling survival (91 percent versus 81 percent) than *D. cymosa* subsp. *ovatifolia* (Dorsey 2007).

Habitat

On a broad scale, suitable habitat for *Dudleya cymosa* subsp. *ovatifolia* is generally located on sedimentary and conglomerate rock on canyon bottoms and shaded slopes in drainages along the south-facing slope of the Santa Monica Mountains (Dorsey 2007). In the Santa Ana Mountains, it occurs on shaded sandstone cliffs (Roberts 2008). Adjacent plant communities include coastal scrub and chaparral (CNDDB 2008b). In most locations, the topographic relief has prevented deep soil formation; therefore, this species may be the only flowering plant occurring in a microhabitat that otherwise supports mosses, lichens, and clubmoss (*Selaginella* spp.) (Dorsey 2007, CNDDB 2008b). The population now considered to be *Dudleya cymosa* subsp. *agourensis* occurs on west- to northwest-facing volcanic rock outcrops on the north-facing slope of the Santa Monica Mountains adjacent to chaparral and cismontane woodland communities (oak (*Quercus agrifolia*) and juniper (*Juniperus californicus*)) (CNDDB 2008a, Dorsey 2007).

Spatial Distribution

Currently, there are four populations of what we considered to be *Dudleya cymosa* subsp. *ovatifolia* at the time of listing. This includes two in the Santa Monica Mountains and one in the

Santa Ana Mountains. The fourth population, now considered to be *Dudleya cymosa* subsp. *agourensis*, also occurs in the Santa Monica Mountains, and is discussed in the next paragraph. A population may be comprised of one or more "element occurrences" (EOs) in the CNDDB; the number of EOs reported varies depending on how survey results were reported by different individuals, by land ownership, and/or by proximity to other EOs. Both populations in the Santa Monica Mountains are in Los Angeles County, one of which occurs in Malibu Canyon and the other in Topanga Canyon.

At the time of listing, we discussed two populations in the Santa Ana Mountains in Orange County, one of which occurred in Modjeska Canyon and the other in central Santiago Canyon. The CNDDB (2008b) also includes two EOs for occurrences near Modjeska Peak (#9 and 12), 3 miles (4.8 km) east of Modjeska Canyon, that were documented by Soza and Boyd (1999). However, Roberts (2008) has determined that individuals from these EOs are a different variety of *Dudleya cymosa* (*D. c. pumila*) (Roberts 2008); although Roberts (2008) was not peer reviewed, his determination is corroborated by Stephen McCabe, author of the upcoming *Jepson Manual* revision for *Dudleya* (Jepson Flora Project 2008). Therefore, we consider there to be one population (Modjeska Canyon) in Orange County. Table 1 below summarizes information for the two Santa Monica Mountains populations and the Santa Ana Mountains population.

Table 1: Occurrence Records for *Dudleya cymosa* subsp. *ovatifolia* extracted from CNDDB 2008; Consortium of California Herbaria 2008.

Identification Number (CNDDB unless noted otherwise)	**Location Name, County**	**Current Trend**	**Last Observed/ Documented**	**Population Size (year)**	**Reference**	**Site Manager/ Owner**
Santa Ana Mountains Population						
EO 1	Modjeska Canyon; Orange	unknown	1999 (Soza & Gross)	100 (1999)	CNDDB 2008; Nakai 542 (CAS)	Modjeska County Park, CNF, private
EO 11[a]	Santiago Canyon; Orange	unknown	1988 (Roberts & Roberts)	unknown	CNDDB 2008; Roberts 4074 (RSA)	CNF
EO 9 and EO 12[b]	Modjeska Peak; Orange	unknown	1999 (Soza & Gross)	800 and 80 (1999)	CNDDB 2008	CNF
Topanga Canyon Population, Santa Monica Mountains						
EO 2	Topanga Canyon; Los Angeles	unknown	1980 (Nakai)	"locally abundant" (1980)	CNDDB 2008; Nakai 621 (CAS)	State Parks (Topanga Canyon State Park), Private
Malibu Canyon Population, Santa Monica Mountains						
EO 10	Malibu Canyon; Los Angeles	unknown	1980 (Nakai)	unknown	CNDDB 2008; Nakai 610 (CAS)	Malibu Creek State Park, Unknown

[a]Location mapped incorrectly by CNDDB according to Roberts and does not portray a separate population from EO1 (in litt. 2009)

[b]Both considered by Roberts (2008) to be *D. c. pumila* and not *D. c. ovatifolia*

CNDDB identification number = element occurrence (EO) number assigned by CNDDB (2008)

CNF = Cleveland National Forest

CAS = California Academy of Sciences Herbarium

RSA = Rancho Santa Ana Botanic Garden Herbarium

The *Dudleya* population now recognized as *Dudleya cymosa* subsp. *agourensis* occurs in one fairly contiguous population, which spans the Los Angeles and Ventura County line, and extends from the city of Agoura Hills west across the slopes of Ladyface Mountain to the vicinity of

Westlake Village, an area that is approximately 2 miles (mi) (3.2 kilometers (km)) wide by 6 mi (9.7 km) long.

Table 2: Occurrence Records for *Dudleya cymosa* subsp. *agourensis* extracted from CNDDB 2008; Consortium of California Herbaria 2008.

Identification Number (CNDDB unless noted otherwise)	Location Name, County	Current Trend	Last Observed/ Documented	Population Size (year)	Reference	Site Manager/ Owner
Agoura Hills Population						
EO 1	Lake Sherwood, Ventura	unknown	1990 (Thomas)	Ca. 100 (1990) [sum EO 1, 5, 6, 7]	CNDDB 2008; Nakai 512 (LA)	Private
EO 2 (includes EO 3	Lake Eleanor, Ventura	unknown	1986 (Burgess)	Ca. 100 (1986)	CNDDB 2008; Nakai 607 (CAS)	COSCA, unknown
EO 4 (includes EO 5)	Trifuno Canyon, Los Angeles	unknown	1992 (Wishner)	1,000 (1992) [sum EO 4 & 5]; 100 (1990) [sum EO 1, 5, 6, 7]	CNDDB 2008	Private, unknown
EO 6	Ladyface Mountain, Los Angeles	unknown	1990 (Thomas)	100 (1990) [sum EO 1, 5, 6, 7]	CNDDB 2008; Nakai 1119 (CAS, LA)	Private
EO 7	Agoura Hills, Los Angeles	unknown	2000 (Riefner)	100 (1990) [sum EO 1, 5, 6, 7]	CNDDB 2008; Nakai 436 (LA) , Nakai 606 (CAS, LA, SD)	Private
EO 8	Castle View Drive, Los Angeles	unknown	2000 (Riefner)	unknown	CNDDB 2008	unknown

CNDDB identification number = element occurrence (EO) number assigned by the California Natural Diversity Database (CNDDB 2008)
COSCA = Conejo Open Space Conservation Authority
CAS = California Academy of Sciences Herbarium
LA = University of California, Los Angeles Herbarium
SD = San Diego Museum of Natural History Herbarium

One population of *Dudleya* in Arroyo Sequit in Ventura County, as noted in the Recovery Plan, does not contain the combination of main characters (see section on Species Biology above) that differentiate *D. cymosa* subsp. *ovatifolia* from other *Dudleya* (McCabe *in litt.* 2008a, b; McCabe, pers. comm. 2008c, d; Sagar *in litt.* 2008); therefore, we do not discuss it further in this review.

Abundance

Very little information on the size of the four populations is available, and most of the observations are on the order of 20 years old. Some general information regarding numbers of individuals has been reported over the years for each species; however, these reports do not represent robust population surveys or analyses. We do not have information that enables us to determine trends for any of the populations. Population estimates, as available, are included in the tables above.

Changes in Taxonomic Classification or Nomenclature

Dudleya cymosa subsp. *ovatifolia* was first described as *D. ovatifolia* by Nathanial L. Britton in 1903. The species was subsequently recognized as *Cotyledon ovatifolia* by Fedde in 1904 and then as *Echeveria ovatifolia* by Berger in 1930 (Moran 1951). Moran published the currently recognized name of *D. cymosa* subsp. *ovatifolia* in 1957. Nakai first recognized the uniqueness of the *Dudleya cymosa* plants in Agoura Hills as a "distinct race of subsp. *ovatifolia*" in 1983 and

described D. *cymosa* subsp. *agourensis* in 1987. Bartel (in litt. 1992; 1993) concluded that *D. cymosa* subsp. *agourensis* did not warrant recognition as a distinct taxon and synonomized it under *D. cymosa* subsp. *ovatifolia*; this treatment was also followed by Thiede (2004). Both *D. cymosa* subsp. *ovatifolia* and *D. cymosa* subsp. *agourensis* have been recognized as separate taxa since November 2006 (Jepson Flora Project 2008) and both will be recognized as distinct subspecies in the upcoming version of The Jepson Manual (2nd edition) (McCabe, pers. comm. 2008c, McCabe 2008e).

Genetics

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

Five-Factor Analysis

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

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

At the time of listing *Dudleya cymosa* subsp. *ovatifolia* (inclusive of plants now identified as *D. cymosa* subsp. *agourensis*) in 1997 (Service 1997), we discussed that the species was threatened by the increase in urban development. We noted that a portion of another *Dudleya* (*D. parva*) and the Agoura Hills population of what was called *D. cymosa.* subsp. *ovatifolia* had been extirpated by development in Westlake Village, Thousand Oaks, and Agoura Hills and that because the majority of the existing distribution of the species is located on private lands with increasing development pressures, the species faced an ongoing threat of habitat loss. We also noted that roadside scraping for weed abatement had modified habitat for *D. cymosa* subsp. *ovatifolia.*

The threat of habitat encroachment from new or existing development surrounding several of the known *Dudleya cymosa* subsp. *ovatifolia* (and *D. cymosa* subsp. *agourensis*) population sites continues to be a threat. In summer 2008, an environmental impact report (EIR) was certified for a master plan for a tract of land within the city limits of Agoura Hills - the Agoura Village Specific Plan (City of Agoura Hills 2008). All portions of the tract that support *Dudleya* populations have been zoned as open space (Area G) and will not be subject to development. Individual proposals for development projects will still be subject to review and approval through the CEQA process. No project proposals are in process at the current time within the area included in the Agoura Village Specific Plan (A. Cook, City of Agoura Hills, pers. comm. 2009).

In 2007, we issued a biological opinion for the Triangle Ranch project that analyzed impacts to *D. cymosa* subsp. *agourensis* (referred to as *D. cymosa ovatifolia* in the opinion) plants in the knolls south of the city of Agoura Hills (Service 2007). Our analysis of the project included the direct removal of 0.06 acres (0.02 ha) of *Dudleya cymosa* subsp. *agourensis* and indirect effects on an additional 0.17 acres (0.07 ha). However, CEQA approval of the project included a measure to "protect 100% of . . . the Santa Monica Mountains dudleya" (Los Angeles County

Board of Supervisors 2007). Construction of this project is on hold due to the downturn in the economy.

We are not aware of any other construction projects that are being proposed at this time. Although both the Agoura Village Specific Plan and the Triangle Ranch project would avoid most direct impacts to *Dudleya* populations, it is still possible that, if and when these projects move forward, there will be indirect impacts resulting from associated human activities, such as recreation, in the vicinity. Along with such impacts as habitat alteration due to landscaping, associated changes in watering regimes, and the introduction of Argentine ants, fuel modification activities can negatively impact the species both immediately and over the long term. In the case of the Triangle Ranch project, the approved proposal contains a Fuel Modification Plan that includes preservation and avoidance of all *Dudleya* individuals (Service 2007). While fuel modification can be planned for in advance of wildfires, fire suppression activities must be responsive to the immediate danger of loss of human life and property. Due to an increase in residential and commercial development in the surrounding and adjacent areas (City of Agoura Hills 2009), such fire suppression activities may be an increasing threat to both *D. cymosa* subsp. *ovatifolia* and *D. cymosa* subsp. *agourensis* (see Appendix 1 and 2) (Halsey 2006, Service 2007, Halsey in litt. 2008). However, because most occurrences are on rocky outcrops with little vegetative cover, we believe the threat is low at this time.

At the time of listing, we noted that roadside scraping for weed abatement had also modified habitat for *Dudleya cymosa* subsp. *ovatifolia*. We have no new information on the current extent of this threat. However, since most individuals occur on rocky substrates, we believe this threat would be confined to the margins of the populations that are along existing road edges.

Recreational activities such as rock climbing and hiking were not discussed at the time of listing as a threat to the species. We consider this to be a new threat at certain locations. In Orange County, the Modjeska Peak occurrences (EOs #9 and 12) are located near a dirt road that is used by the public to access the peak, and Soza and Boyd (1999) noted the vulnerability of these occurrences and the presence of trash and footprints at EO #12; however, these occurrences are now thought to be a different *Dudleya* taxon (Roberts 2008). The Modjeska Canyon occurrence (EO #1) is inaccessible, and no visible signs of disturbance were seen in 1999 (Soza and Boyd 1999). Disturbance from recreational activities is also noted in CNDDB (2009) as a potential threat for the two populations in the Santa Monica Mountains, Los Angeles County. A site visit in 2009 confirmed that the Malibu Canyon population (EO #10) is being impacted by rock climbing activity (Marek in litt. 2009); the extent of recreational impacts on the Topanga Canyon population is unknown at this time.

In summary, the potential threats to the habitat for *Dudleya cymosa* subsp. *ovatifolia* (inclusive of plants now identified as *D. cymosa* subsp. *agourensis*) remain similar to what they were at listing. While development was perceived to be one of the primary threats at the time of listing, the two projects that have been approved since then have included measures to avoid impacts to *Dudleya* individuals. Even so, due to population growth along the north side of the Santa Monica Mountains, direct and indirect impacts from future development still remain a concern. Recreational activities were not noted to be a threat at the time of listing. Recreational impacts from rock climbing were confirmed for the Malibu population in 2009; we believe the threat

from recreational use is possible in the future, but no additional threats of this kind have been confirmed at other locations.

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

Dudleya species were included in the Smithsonian's list of Commercially Exploited Endangered and Threatened Species in the Continental United States, citing private collectors as a threat; although no specific reference to *D. cymosa* subsp. *ovatifolia* was made, *D. cymosa* subsp. *marcescens* was considered endangered by the authors and thus included (Ayensu and DeFillips 1978). Collection for horticultural purposes by professional horticulturists and amateur collectors and gardeners was identified as a threat to all of the *Dudleya* taxa including *D. cymosa* subsp. *ovatifolia* (inclusive of plants now identified as *D. cymosa* subsp. *agourensis*) in the 1997 final listing rule (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 *D. pulverulenta* (chalk dudleya) 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 for *D. cymosa* subsp. *ovatifolia* or *D. cymosa* subsp. *agourensis*, we believe that collection still constitutes a threat to the species.

FACTOR C: Disease or Predation

Disease or predation was not identified as a threat for *Dudleya cymosa* subsp. *ovatifolia* (inclusive of plants now identified as *D. cymosa* subsp. *agourensis*) at the time of listing in 1997 and is not currently considered to be a threat.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

At the time of listing, regulatory mechanisms thought to have some potential to protect *Dudleya cymosa* subsp. *ovatifolia* (inclusive of *D. cymosa* subsp. *agourensis*) included: (1) the California Environmental Quality Act (CEQA); (2) listing in the California Native Plant Society's (CNPS) Inventory of Rare and Endangered Plants, 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 in those cases where *D. cymosa* subsp. *ovatifolia* or *D. cymosa* subsp. *agourensis* occur and/or are incidentally protected in habitat occupied by a listed wildlife species. The listing rule (Service 1997) provides an analysis of the level of protection that was anticipated from those regulatory mechanisms. This analysis appears to remain currently valid. We have added a paragraph ((3) below) regarding regulatory mechanisms that apply to State Park lands.

(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. At the time of listing, we noted that local lead agencies that are in charge of enforcing the regulations of CEQA have made determinations that have or will negatively impact *Dudleya cymosa* subsp. *ovatifolia* or *D. cymosa* subsp. *agourensis* (Service 1997).

(2) California Native Plant Society's Inventory, List 1B: California endemic, rare, threatened, or endangered in California: *Dudleya cymosa* subsp. *ovatifolia* and *D. cymosa* subsp. *agourensis* are listed in the CNPS Inventory, under List 1B: California endemic, rare, threatened, or endangered in California (Skinner and Pavlik 1994; CNPS 2008a, b). Inclusion of these taxa under this listing indicates that, in accordance with chapter 10 section 1901 of the California Department of Fish and Game Code, *D. cymosa* subsp. *ovatifolia* and *D. cymosa* subsp. *agourensis* are eligible for State listing; however, these taxa are not currently State listed and are therefore not protected by the California Endangered Species Act (CESA).

(3) The goal of the resource management program within California State Parks is to protect, restore, and maintain the natural resources in the State Park System (California Department of Parks and Recreation 2007). The resource management plan for Malibu Creek State Park was finalized in 2005. The goals include the long term protection and enhancement of sensitive ecosystems and plant species. A specific management guideline supporting this goal is to prepare a conservation and recovery plan for *Dudleya cymosa* subsp. *ovatifolia*, and which may include establishment of rare plant preserves, monitoring surveys, ongoing research, and seed banking activities (California Department of Parks and Recreation 2005). A management plan for Topanga State Park does not currently exist; the planning process has started as of September, 2009 (California Department of Parks and Recreation 2009).

(4) Local land use laws, regulations, and policies:
Los Angeles County: The County of Los Angeles does not have any regulations specific to *Dudleya cymosa* subsp. *ovatifolia* or *D. cymosa* subsp. *agourensis*; however, there are some provisions for threatened and endangered species within the county's general plan. "Today, the primary mechanism used by the County to conserve biological diversity is a planning overlay called Significant Ecological Areas (SEAs). SEAs are ecologically important land and water systems that are valuable as plant and/or animal communities, often integral to the preservation of threatened or endangered species and the conservation of biological diversity in the County...SEAs are not preserves, but instead, are areas where the County deems it important to facilitate a balance between new development and resource conservation" (County of Los Angeles 2000). There are specific guidelines for developments proposed for SEAs, including:

> "1. Cluster structures and infrastructure within 25 percent or less of the parcel (including fire management requirements) and maintain the remaining portions of the site in a natural undisturbed state. Avoid development on slopes greater than 25 percent.
> 2. Retain a contiguous area of undisturbed open space over the most sensitive natural resources to maintain regional connectivity within the undeveloped area." (County of Los Angeles 2008)

Likewise, there are some provisions for the Santa Monica Mountains area listed in the Santa Monica Mountains North Area portion of the Los Angeles County General Plan which are specific to the preservation of special status plant species, such as:

> "a. Require buffers or other measures adequate to protect such areas.
> b. Within designated habitat areas of rare, threatened or endangered species, prohibit disturbance of protected biotic resources."
> ..."d. Where plants listed as 'special' or 'of concern' by the California Natural Diversity Database (California Department of Fish and Game) are present, require that new development not result in a net reduction in the number of these plants. Maintenance of the number of plants may be accomplished by replacement in another part of the site or off-site in the appropriate habitat, with a monitoring program approved through the Conditional Use Permit process--which includes a requirement for at least one season of successful reproduction (i.e., producing seed that germinates the following year, assuming the weather cooperates) before any disturbance of the existing habitat is permitted--to ensure the survival of the species in the replacement habitat." (County of Los Angeles 2000)

Orange County: Orange County has a resources element within their general plan, but it does not include any specific conservation measures that would protect *Dudleya cymosa* subsp. *ovatifolia* or suitable habitat for these species (County of Orange 2005).

Ventura County: Although the County of Ventura does not have any specific laws or regulations that protect *Dudleya cymosa* subsp. *agourensis*, 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 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)

Conejo Open Space Conservation Authority (COSCA): *Dudleya cymosa* subsp. *agourensis* occurs on lands managed by the Conservation Authority, 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, the Conservation

Authority 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 (1,538 hectares (ha)) of the lands they manage within the Conejo Canyon area (Harris 2008); however, there is currently no plan being proposed for the Lake Eleanor COSCA site within which *D. cymosa* subsp. *agourensis* is known to occur.

(5) Endangered Species Act of 1973, as amended (Act): The Act is the primary Federal law providing protection for this species. Since listing in 1997, 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.: The provisions of the Act helped to secure partial protections for one occurrence of *Dudleya cymosa* subsp. *agourensis* on private property that were proposed for development. In order to obtain authorization from the U.S. Army Corps of Engineers' (Corps), under the authority of section 404 of the Clean Water Act, this proposed development project was subject to section 7 consultation requirements under the Act (Service 2007). As a result, some of the lands where this population occurs (referred to as *D. cymosa ovatifolia* in the consultation) will be protected in perpetuity, although the plants on these lands may be subject to indirect effects from the nearby housing development.

In 2005, non-jeopardy biological and conference opinions were issued that addressed the Revised Land Management Plans for the four southern California national forests (Service 2005). These plans included strategic direction in the form of land use zoning and standards. The land use zoning and standards indicated that for projects under the plans, new activities will be neutral or beneficial to *D. cymosa* subsp. *ovatifolia* and expansion of existing facilities or new facilities will focus recreational use away from *D. cymosa* subsp. *ovatifolia*. Exceptions were included in the plans for fuel treatments in wildland-urban interface areas and to allow for projects with short-term effects and long-term benefits (Service 2005). In addition, the Revised Land Management Plans are only strategic, so projects can occur outside the parameters of these documents.

In summary, the Endangered Species Act is the primary Federal law that provides protection for these species since their 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 these species absent their 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

Fire suppression and fuel modification: In the listing rule (Service 1997), we discussed general threats to the various *Dudleya* species, including the effects of grazing, which has resulted in habitat type conversion, and thus increased potential resource and space competition, from native grass species to non-native, invasive annual grass species; and fire suppression management policies for the last 200 years. The 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. Despite efforts to suppress fires in

coastal southern California, the present fire frequency of every 15 years or less is substantially higher than it was historically, which, for coastal scrub (including coastal sage scrub and chaparral), is thought to be every 50 to 100 years (Keeley 2006). Over a period of 60 years, most of the area in the Santa Monica Mountains has burned an average of three to five times, with an average interval of every 12.4 to 20.7 years (Radtke et al. 1982). An increase in fire frequency can result in type-conversion of chaparral and coastal sage scrub communities to annual invasive grasses which aggressively compete with native species for resources. However, because the specific sites where *Dudleya cymosa* subsp. *ovatifolia* and *D. cymosa* subsp. *agourensis* grow are on rocky outcrops and would not support dense stands of chaparral or coastal sage scrub (Christy Brigham, Santa Monica Mountains National Recreation Area, pers. comm. 2009; CNDDB 2008a, b; Marek in litt. 2009), we believe that impacts from wildfires on the *Dudleya* taxa would likely be less severe than on the surrounding native plant communities. In 2007, a wildfire (named the "Santiago Fire") burned over an area of approximately 28,000 acres (11,494 ha) in the Santa Ana Mountains. Although vegetation surrounding the *D. cymosa* subsp. *ovatifolia* population was burned, the *Dudleya* was apparently unharmed (Roberts in litt. 2009).

The practice of discing for fire prevention and suppression is unlikely to directly affect *D. cymosa* subsp. *ovatifolia* because it inhabits rocky outcrops. The spraying of fire retardant has been demonstrated to affect native species in grassland habitats outside California because they facilitate the growth of annual grasses (Larson and Newton 1996, Bell 2003). The impacts from their use on sites where *D. cymosa* subsp. *ovatifolia* occurs are unknown at this point in time.

Competition with non-native species: We discussed the effects of grazing, habitat type conversion, and the increase in non-native species on a landscape scale in the listing rule. However, because *Dudleya cymosa* subsp. *ovatifolia* occurs on rocky outcrops where there is little other vegetation, it is less subject to these threats. In recent site visits, competition with non-native grasses has not been noted as a concern at any of the sites (Marek in litt. 2009, Roberts in litt. 2009, Soza and Boyd 1999). Jade plant (*Crassula argentea*), a non-native species from South Africa, was observed growing in Topanga Canyon within EO #2 by McCabe (Sagar in litt. 2008); its impacts on the *Dudleya cymosa* subsp. *ovatifolia* population are unknown.

Stochastic extinction: Although stochastic events were not specifically mentioned in the final listing rule as a threat to *Dudleya cymosa* subsp. *ovatifolia* (inclusive of plants now identified as *D. cymosa* subsp. *agourensis*) (Service 1997), we now consider the species to be threatened by stochastic events due to the small size and isolation of the populations. Conservation biology literature commonly notes the vulnerability of taxa known from small populations (Shaffer 1981, 1987; Meffe and Carroll 1997; Primack 1998). It is generally accepted that small populations have higher probabilities of extinction than larger populations because their low numbers make them susceptible to inbreeding, loss of genetic variation, high variability in age and sex ratios, demographic stochasticity, and random naturally occurring events such as wildfires, floods, droughts, or disease epidemics (Menges 1991, Ellstrand and Elam 1993, Shaffer 1981, 1987; Soulé 1987; Meffe and Carroll 1997; Primack 1998).

Another factor commonly understood to make populations vulnerable to stochastic events is isolation. Isolation often acts in concert with small population size to increase the probability of extinction. Isolated populations are more susceptible to long-term/permanent extirpation by

accidental or natural catastrophes because the likelihood of recolonization following such events is negatively correlated with the extent of isolation (i.e., colonization is less likely as isolation increases) (Wilcox and Murphy 1985, Meffe and Carroll 1997). Human development exacerbates the risk of stochastic extinction because it further isolates and fragments remaining populations as time goes on.

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, Hayhoe et al. 2004, 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; whereby the species will "move" or disperse to higher elevations and northward, depending on the ability of each species to do so. Species diversity will also shift in response to these changes, showing a general trend of increasing diversity in the coastal and northern areas; with these areas becoming de facto future refugia. These increases in species diversity in the refugia, due to climate change, have the potential to result "…in new species mixes, with consequent novel patterns of competition and other biotic interactions…" to the species present (Loarie et al. 2008) with unknown consequences to the species present. Due to the elevation and coastal location of the Santa Monica Mountains, this area is expected to become one of these potential future refugia and greatly increase in diversity (Loarie et al. 2008). We recognize that climate change is an important issue with potential effects to listed species and their habitats. 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 small-ranged species that are restricted to soils of limited distribution, such as *Dudleya cymosa* subsp. *ovatifolia* and *D. cymosa* subsp. *agourensis*, we acknowledge that they are more vulnerable to extinction due to these changing conditions (Pimm and Raven 2000, Loarie et al. 2008).

In summary, we believe that Factor E threats pose a greater risk to the species than was discussed at the time of listing. With respect to the threat posed from wildfires, we believe that suppression activities (particularly the use of fire retardants) may pose the most threat, while wildfires themselves and fuel modification activities may be less of a threat than thought at the time of listing. Competition from non-native plants is less of a threat that thought at the time of listing. Stochastic extinction is likely a greater threat than we discussed at the time of listing because of the small numbers of populations and individuals, and because stochastic threats are exacerbated by other threats, particularly habitat alteration and destruction. Climate change is a new threat that was not discussed at the time of listing, and is also exacerbated by the small number of populations and individuals of this species.

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 for *Dudleya cymosa* subsp. *ovatifolia* (inclusive of plants now identified as *D. cymosa* subsp. *agourensis*) contains the following delisting criteria (Service 1999):

1. All current sites 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. Portions of the three populations of *Dudleya cymosa* subsp. *ovatifolia* occur on preserved lands (Orange County Parks; and city, State, county, or regional parks/open space) and are currently safe from direct effects from new development. However, none of the existing populations are currently known to be managed specifically for the benefit of *D. cymosa* subsp. *ovatifolia*. One portion of the *Dudleya* population now recognized as *D. cymosa* subsp. *agourensis* occurs on preserved lands, owned by the Conejo Open Space Conservation Agency, but none of the habitat is currently known to be being managed for the benefit of *D. cymosa* subsp. *agourensis*. Another portion of this *Dudleya* population is now zoned as open space and will not receive direct impacts from development. However, other portions of the *Dudleya* populations that occur on private land are not protected from development or other impacts to the taxon. Therefore, this criterion for delisting has been partially, but not sufficiently met.

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

This criterion is relevant and appropriate. We have reports or estimates of plant numbers for a few of the occurrences of each taxon. Although no occurrences of either *Dudleya cymosa* subsp. *ovatifolia* or *D. cymosa* subsp. *agourensis* have been extirpated since the time of listing, we do not know if the populations are self-sustaining because no demographic studies or population surveys (per se) have been conducted. As such, we cannot clearly determine densities or the population trends for the *Dudleya* populations. Therefore, this criterion for delisting has not been met. While we believe the intent of this criterion is relevant and appropriate, we think that, due to the potential threat from global warming, it should be modified to demonstrate long-term persistence of the populations over a longer period of time.

IV. SYNTHESIS

The status of *Dudleya cymosa* subsp. *ovatifolia* (inclusive of plants now identified as *D. cymosa* subsp. *agourensis*) has changed somewhat since the time of listing. Populations recognized as *Dudleya cymosa* subsp. *ovatifolia* at the time of listing include two distinct taxa: *D. cymosa* subsp. *agourensis* and *D. cymosa* subsp. *ovatifolia*. At the time of listing in 1997, we discussed that there were "less than 10 occurrences" reported for *D. cymosa* subsp. *ovatifolia*. Because of the problems inherent in discussing "occurrences," we believe it is more meaningful to discuss "populations" in this review. The occurrences discussed at the time of listing comprised four populations, and these four populations are all still extant. The Malibu Canyon population is on State Parks lands and has been impacted by recreational activities (primarily rock climbing) since the time of listing. The status of the Topanga Canyon population, also on State Parks lands, is unknown. The range of the Santa Ana Mountains population is smaller than what we thought it was at the time of listing; this was due to a recent determination that higher elevation populations are a different taxon. What we understand to be the population now, on County Parks land, was within a larger area burned in the 2007 Santiago Fire; the population appears to be healthy. The Agoura Hills population is now recognized as a separate taxon, *D. cymosa* subsp. *agourensis.* This population is the most widely scattered of the four, with six occurrences scattered along a 6-mi (9.7-km) band along the north-facing slopes of the Santa Monica Mountains. A portion of the population occurs on regional parks lands; the rest occurs on private lands and with a portion of this designated as open space. While no development has directly impacted this population to date, its location along the urban-wildlands interface renders it vulnerable to human impacts as time goes on.

We believe the threats to the species have slightly increased since the time of listing. The greatest immediate threats to *Dudleya cymosa* subsp. *ovatifolia* (inclusive of those populations now recognized as *D. cymosa* subsp. *agourensis*) are those associated with the alteration and destruction of habitat from development and associated human activities, including recreational activities, and potentially fire suppression activities. We believe that the threat of extinction from stochastic events is a threat due to the small number of populations and individuals; this threat was not previously recognized. In addition, climate change is a potentially significant threat that was not discussed at the time of listing. Because of the continuation of previously recognized threats as well as newly-identified threats, combined with the small numbers of populations and individuals, we conclude that this taxon continues to be in danger of continued loss of individuals and populations in the foreseeable future and still meets the definition of threatened; therefore, no status change is recommended at this time.

V. RESULTS

Recommended Listing Action:

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

New Recovery Priority Number and Brief Rationale: N/A

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

1. Develop and implement monitoring and adaptive management plans for known existing occurrences of *Dudleya cymosa* subsp. *ovatifolia* and *D. cymosa* subsp. *agourensis* populations. Monitoring should occur at intervals of 3 years and include population abundance surveys, habitat condition assessment, and documentation of existing and potential threats.

2. Work with private landowners and local agencies to protect and manage *Dudleya cymosa* subsp. *ovatifolia* and *D. cymosa* subsp. *agourensis* on private property. If development is proposed or planned near *D. cymosa* subsp. *ovatifolia* and *D. cymosa* subsp. *agourensis*, recommend measures to protect the species such as creating large buffer zones between development and plants and invasive plant prevention and control.

3. Work with local fire departments to: a) develop or modify fire management plans for when fires occur in or near the habitat of each species and b) prevent or limit discing of soil in fire management zones near *Dudleya cymosa* subsp. *ovatifolia* and *D. cymosa* subsp. *agourensis* habitat to prevent the spread of invasive, nonnative plants.

4. Once additional information concerning the status of populations and current threats is obtained, consider whether: a) a change in status for *Dudleya cymosa* subsp. *ovatifolia* may be warranted and, b) candidate status may be warranted for *D. cymosa* subsp. *agourensis.*

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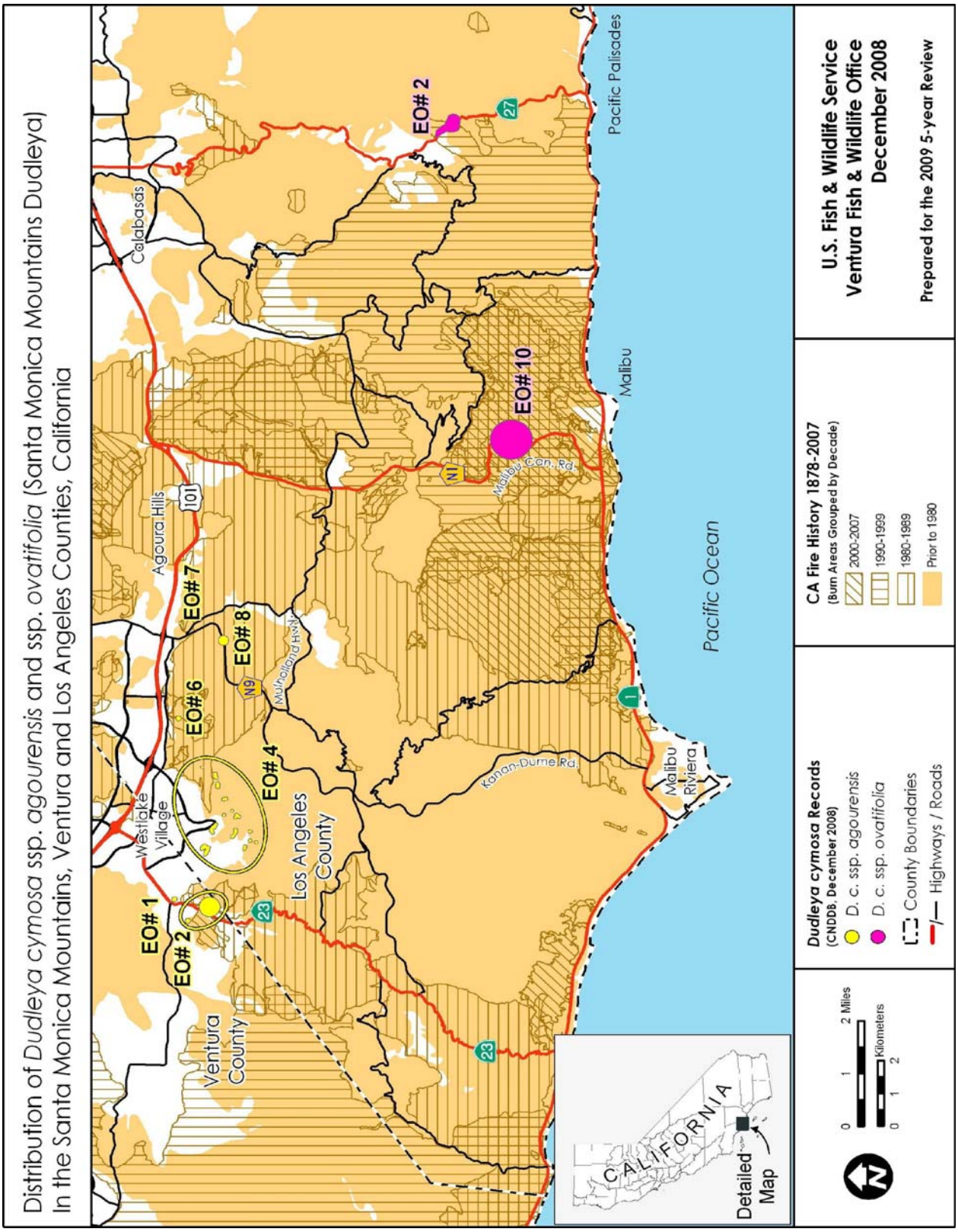
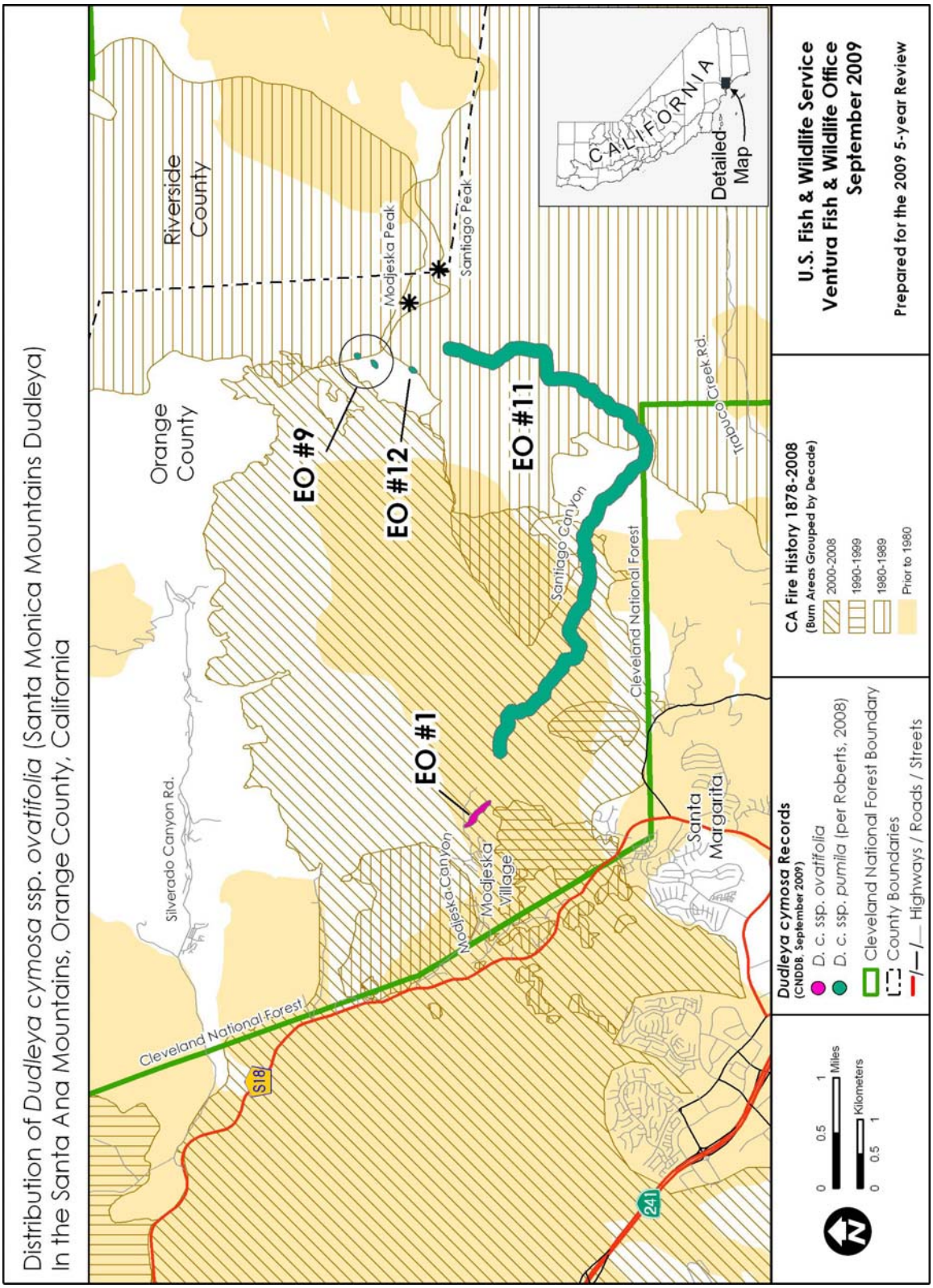
Appendix 1. Distribution of *Dudleya cymosa* subsp. *agourensis* and *Dudleya cymosa* subsp. *ovatifolia* in the Santa Monica Mountains, Ventura and Los Angeles Counties, California.



Appendix 2. Distribution of *Dudleya cymosa* subsp. *ovatifolia* in the Santa Ana Mountains, Orange County, California.



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

Dudleya cymosa subsp. *ovatifolia* (Santa Monica Mountains dudleya, and inclusive of Agoura Hills dudleya (*D. cymosa* subsp. *agourensis*))

Current Classification: *Dudleya cymosa* subsp. *ovatifolia* (inclusive of *D. cymosa* subsp. *agourensis*) - Threatened

Recommendation Resulting from the 5-Year Review:

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

Appropriate Listing/Reclassification Priority Number: no change

Review Conducted By: Mark Elvin and Connie Rutherford

FIELD OFFICE APPROVAL:

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

Approve _____ Date 11/13/09

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

Approve _____ Date 11-13-2009