Dudleya setchellii
(Santa Clara Valley Dudleya)

Streptanthus albidus ssp. albidus
(Metcalf Canyon Jewelflower)

5-Year Review:
Summary and Evaluation

Metcalf Canyon Jewelflower
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Sacramento Fish and Wildlife Field Office
U.S. Fish and Wildlife Service
Sacramento, California
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5-YEAR REVIEW
Dudleya setchellii (Santa Clara Valley Dudleya)
and
Streptanthus albidus ssp. albidus (Metacalf Canyon Jewelflower)

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional or Headquarters Office – Larry Rabin, Deputy Division Chief for Listing, Recovery, Environmental Contaminants, Pacific Southwest Region, 916-414-6464

Lead Field Office – Josh Hull, Recovery Division Chief, Sacramento Fish and Wildlife Office, 916-414-6600

1.2 Methodology used to complete the review:

This review was prepared by the Sacramento Fish and Wildlife Office (SFWO) of the U.S. Fish and Wildlife Service (Service) using information from the *Santa Clara Valley Habitat Plan* (August 2012), 1998 *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (Recovery Plan) (Service 1998), California Natural Diversity Database (CNDDB) and survey information from experts who have been monitoring various localities of these species.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review:

74 FR 12878, March 25, 2009. We received no information from the public in response to this notice.

1.3.2 Listing history

Original Listing
FR notice: 60 FR 6671
Date listed: February 3, 1995
Entity listed: *Dudleya setchellii* (Santa Clara Valley dudleya) and *Streptanthus albidus* ssp. *albidus* (Metcalf Canyon jewelflower), two plant species
Classification: Endangered

1.3.3 Associated rulemakings

No associated rule makings have been made for these two species.

1.3.4 Review History

No formal status reviews have been conducted for these species. However, since the original listing in 1995, updated information on their status and threats were included in the Recovery Plan.

1.3.5 Species' Recovery Priority Number at start of 5-year review

Dudleya setchellii is ranked as 2C. This species is considered to be confronted with a high degree of threats and to have a high potential for recovery.

Streptanthus albidus ssp. *albidus* is ranked as 3C.

Recovery priority numbers are determined based on a 1 to 18 ranking system where 1 represents the highest ranked recovery priority and 18 represents the lowest ranked recovery priority. The "C" indicates there is a conflict with construction or other development projects or other forms of economic activity.

1.3.6 Recovery Plan or Outline

Name of plan or outline: *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*
Date issued: September 30, 1998

2.0 REVIEW ANALYSIS

Species Overview

Dudleya setchellii

Dudleya setchellii is a low-growing perennial of the stonecrop family (Crassulaceae) with fleshy, glabrous (hairless) leaves. The oblong to triangular, slightly glaucous (covered with a whitish or bluish waxy or powdery film) leaves are 3 to 8 centimeters (1 to 3 inches) long and 7 to 15 millimeters (0.3 to 0.6 inch) wide. Two or three flowering stems ascend to heights of 5 to 20 centimeters (2 to 8 inches) in mid to late spring. The pale yellow petals are 8 to 13 millimeters (0.3 to 0.5 inch) long (Hickman 1993). *Dudleya setchellii* is restricted to rocky outcrops within serpentine grasslands between 120 and 300 meters (390 to 990 feet) in Santa Clara County (Hickman 1993). The roots of *Dudleya setchellii* are at least 15 centimeters (6 inches) long and often extend into rock crevices of the serpentine outcrops (McCarten 1993). *Dudleya setchellii* flowers from May to June (Munz and Keck 1959) and producing wind dispersed seeds (McCarten 1993). The species can also reproduce vegetatively by forming rosettes that can separate from the parent plant or remain attached.

There are two related species in the area. *Dudleya cymosa* ssp. *cymosa* (canyon liveforever) has bright yellow to red petals rather than pale yellow, and is, therefore,

easily distinguished from *Dudleya setchellii* with its pale yellow flowers. *Dudleya cymosa* ssp. *paniculata* (canyon liveforever) can be distinguished from *Dudleya setchellii* by its oblong to oblanceolate (narrowly elongate and widest at the tip) leaves (in contrast to the oblong-triangular leaves of *Dudleya setchellii*), its greater degree of rebranching of the inflorescence branches, and its longer pedicels (Hickman 1993).

Dudleya setchellii is found only in the Coyote Valley area, from San Jose south about 30 kilometers (25 miles) to Gilroy (CNDDB 2012) in Santa Clara County (Skinner and Pavlik 1994). Two hundred and eight occurrences have been documented within the study area between 1989 and 2012, and all of these are presumed to be extant (H.T. Harvey and Associates 2000; California Natural Diversity Database 2012; T. Marker pers. comm.). The estimated number of individuals known for the species varies greatly due in part to the variation in the methodology of counting the rosettes which are formed as individual plants spread vegetatively (Jones & Stokes 1998). Fifty occurrences were reported in the California Natural Diversity Database (2012), 109 occurrences from the United Technologies Corporation (T. Marker pers. comm.), 48 occurrences from Santa Clara County Parks, and one from the Santa Clara Valley Water District (ICF 2012)

<u>*Streptanthus albidus ssp. albidus*</u>

Streptanthus albidus ssp. *albidus* is an annual herb of the mustard family (Brassicaceae) that reaches up to 1 meter (3 feet) in height. It has bristly hairs at the base and pale green, strongly glaucous stems and leaves. The flowers are borne in leafless terminal racemes (unbranched clusters or inflorescences of stalked flowers that open from bottom to top). The upper three of the white to yellow to whitish-green sepals are fused (united), with the lower (fourth) sepal free and spreading. The four petals, 8 to 11 millimeters (0.3 to 0.4 inch) long, are whitish with light purple veins. The erect flattened pods (dry fruits that open upon ripening to release the seeds) are 3 to 8 centimeters (1 to 3 inches) long (Kruckeberg 1977). *Streptanthus albidus* ssp. *albidus* flowers April to June (Kruckeberg 1977). Its close relative *Streptanthus albidus ssp. peramoenus* (most beautiful jewelflower) co-occurs with *Streptanthus albidus* ssp. *albidus*. *Streptanthus albidus* ssp. *peramoenus* is distinguished by its lilac-lavender sepals (Kruckeberg 1958).

Streptanthus albidus ssp. *albidus* always has been rare. It can be locally abundant, but its range is limited, extending less than 30 kilometers (20 miles) from San Jose south to Anderson Lake, which lies northeast of Morgan Hill in Santa Clara County. Furthermore, the serpentine outcrops on which *Streptanthus albidus* ssp. *albidus* occurs are patchily distributed and comprise only a small percentage of the area within its range (McCarten 1992). There are four historic reports of *Streptanthus albidus* ssp. *albidus* (CNDDB 2012). One occurrence (CNDDB occurrence #6) from 1895 may actually be a different species of *Streptanthus*. The second historic occurrence (#5) documented in 1937 has likely been extirpated because it is located in an area now covered by Anderson Lake. A third occurrence (#11) first documented in 1980 at Tulare Hill was extirpated when the plants were covered by fill during construction of a housing development. A fourth occurrence was documented in Gilroy along Llagas Avenue in 1957 and has not

been reported since (former CNDDB element occurrence #16). There is some taxonomic uncertainty about this occurrence (CDFG 1997, Whittal 2011).

Eleven occurrences of *Streptanthus albidus* ssp. *albidus* are presumed extant (CNDDB 2012). Most of the occurrences are on the east side of Santa Clara Valley along U.S. highway 101.

There are four occurrences on the west side of U.S. highway 101: CNDDB occurrence numbers 6, 17, 19, and 21 (includes former CNDDB #16). CNDDB occurrence 6 is located near Lexington Reservoir, on Santa Clara County Parks land. Occurrence 17 is located on private land in San Jose and is assumed extant by the CNDDB. Occurrence 19 is on Communication Hill in San Jose and is adjacent to an active quarry. Occurrence 21 is a non-specific reference from 1992 and is located on private property. Numbers 6 and 21 are thought to have been misidentifications since *Streptanthus albidus ssp. peramoenus* was observed at these locations during recent surveys (Whittall 2011).

The remaining seven occurrences are found on the eastern side of U.S. 101. CNDDB occurrence numbers 18 and 20 are located on Type I open space (as defined by the Santa Clara Valley Habitat Plan). Occurrence numbers 15 and 18 are located near the Silver Creek Valley Country Club golf course within designated plant conservation areas (WRA 2010). Occurrence numbers 8 and 4 are located in the Coyote Ridge area and are the two occurrences most likely to be impacted by Santa Clara Valley Water District along the Coyote Canal and Coyote Canal extension. Occurrence number 8 is located on Type 3 open space and occurrence 4 is located on private property. Occurrences 2 and 12 are also located on private property in the Coyote Ridge area.

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

_____Yes
__X__No

The Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA) defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species if vertebrate wildlife. This definition limits listing as distinct population segments (DPS) 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.

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

__X__ ***Yes***,

___ ***No***

2.2.2 Adequacy of recovery criteria.

2.2.2.a. Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?

__X_ ***Yes***
____ ***No***

2.2.2.b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?

_X_ ***Yes***
____***No***

2.2.3. List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information. For threats-related recovery criteria, please note which of the 5 listing factors are addressed by that criterion. If any of the 5-listing factors are not relevant to this species, please note that here.

The Recovery Plan (Service 1998) uses a community-level approach because many of the listed species and species of concern co-occur in the same natural community and share the same threats. The over-arching recovery strategy for *Dudleya setchellii and Streptanthus albidus* ssp. *albidus* is habitat protection and management. The key elements that comprise this ecosystem-level recovery and conservation strategy are: (1) habitat protection; (2) habitat management and restoration, including removal of invasive non-native species; (3) surveying and monitoring; (4) ex-situ conservation measures such as artificial rearing and seed banking; (5) research; and (6) public participation, education, and outreach.

The recovery criteria in the Recovery Plan (Service 1998) follow Cypher's (1998) guidelines to the greatest extent possible. The criteria chosen were based upon the known current and historic distribution and number of occurrences of the species as well as on any data pertaining to likelihood of successful repatriations and introductions to the species. As suggested by Cypher (1998), in the absence of sufficient ecological information, the appropriate interim goal is to maintain all existing sites and stabilize

known populations and to support ecological research that will aid development of appropriate recovery criteria. The criteria in the Recovery Plan should be considered preliminary and should be reevaluated as soon as further data become available (Service 1998). A recovery team has not been established and likewise there has not been any development of new data to suggest a different approach other than Cypher's (1998) guidelines (pers. comm., J. Hull and B. Warne)

The Recovery Plan (Service 1998) provides recovery criteria that either directly or implicitly address the five listing factors noted in the final rule to list the species: destruction, modification, or curtailment of habitat or range (Factor A), overutilization for commercial, recreational, scientific, or educational purposes (Factor B), disease or predation (Factor C), inadequacy of existing regulatory mechanisms (Factor D), and other man-made or natural factors affecting its continued existence (Factor E).

Downlisting/delisting criteria for *Dudleya setchellii and Streptanthus albidus* ssp. *albidus* are summarized in Table 1 and include:

A. Secure and protect specified recovery areas from incompatible uses

This criterion addresses Factor A.

Dudleya setchellii

The Recovery Plan describes that the recovery of *Dudleya setchellii* must first focus on protecting and managing extant populations. Populations on private land should be protected by land acquisition, conservation easements or other means. Protection of populations on public land will involve working with Santa Clara County Parks Department to ensure the long-term survival of the species on their lands. In general, the largest possible block of serpentine habitat should be protected at each site. Protection should, at least, involve securing the populations themselves as well as a 150-meter (500-foot) buffer around each population, where possible, to reduce external influences and allow expansion of populations. In addition, other unoccupied habitat at the sites that might provide space for expansion of the populations and habitat for pollinators and seed dispersers must be protected.

If 20 populations of *Dudleya setchellii* within and representing its entire range are (1) fully protected and managed with the primary intention of preserving the populations in perpetuity and (2) shown to be stable or increasing over a minimum of 20 years that include the normal precipitation cycle (or longer if suggested by the results of demographic monitoring), the species should be evaluated for downlisting. Until research shows otherwise, recovery should target securing populations containing a minimum of 2,000 plants each (but preferably more). The probability of population persistence over the long-term is expected to be higher for larger populations because large size decreases the likelihood of reduced viability or population extirpations due to random demographic or

genetic events (Barrett and Kohn 1991, Ellstrand and Elam 1993). Protected populations should be distributed throughout the range of the species.

North:
At least three populations should be located in the northern portion of the species range approximately north of the Santa Teresa Hills (on the San Jose East U.S. Geological Survey 7.5 minute quadrangle map).

South:
At least one population should be located in the southern portion of the species range in the San Martin area (on the Gilroy U.S. Geological Survey 7.5 minute quadrangle map)

South Status: Two occurrences are in the southernmost known range of Dudleya setchellii, one within the Mount Madonna County Park and another in private ownership approximate 3.5 and 5 miles from the southernmost known records at the time of the 1998 Recovery Plan. Neither of these occurrences are currently protected or managed with the primary purpose of conservation for this species.

The 548-acre Santa Clara Valley Transportation Authority (VTA)-Coyote Ridge property was purchased from Castle and Cooke as compensation for known and predicted impacts to serpentine communities for several projects including VTA's U.S. 101 Widening, Route 85/U.S. 101 South Interchange, and Consolidated Biological Mitigation Riparian and Wetland projects, the City of San Jose's Bailey Avenue and U.S. 101 Interchange, and the privately developed Coyote Valley Research Park (H.T. Harvey & Associates 2005 and Service 2001) and also includes 98 acres preserved by Castle and Cooke as mitigation for impacts to the California red-legged frog (*Rana draytonii*) from expansion of the Coyote Creek golf Course. VTA and the City of San Jose were required to also provide a funding mechanism for long-term management of the land and prepare a long term resource management plan for review and approval from the Service (H.T. Harvey & Associates 2005 and Service 2001).

Center:
At least 14 populations should be in the center of the species range including the areas in and around Almaden Quicksilver County Park, the Santa Teresa Hills, Calero Reservoir, Kirby, Morgan Hill, and Anderson Reservoir (Los Gatos, Santa Teresa Hills, Morgan Hill, Mt. Madonna, and Mt. Sizer U.S. Geological Survey 7.5 minute quadrangle maps).

Of the populations in the center of the range, at least one must represent the westernmost extent of the range (e.g., Almaden Quicksilver County Park on the Los Gatos U.S. Geological Survey 7.5 minute quadrangle map) and one the most easternmost extent of the range (e.g., around Anderson Reservoir and eastward on the Mt. Sizer U.S. Geological Survey 7.5 minute quadrangle map).

The remaining populations in the center of the range must be distributed with at least half of the total population residing east of Highway 101 and west of Anderson Lake and the other half of the population residing west of Highway 101 and east of Guadalupe Reservoir (i.e., half on the Morgan Hill U.S. Geological Survey 7.5 minute quadrangle map and half on the Santa Teresa Hills U.S. Geological Survey 7.5 minute quadrangle map).

If additional surveys indicated that the actual distribution of populations is different (e.g., a greater proportion of populations is found in the southern part of the range), targets for protection should be changed so that they are consistent with the new information. Conserving the target 20 populations may involve a combination of protection of known locations and newly discovered populations.

Dudleya setchellii should not be considered for delisting unless 30 populations distributed throughout its entire range (as specified above) are shown to meet the criteria above. Meeting this goal would require locating, restoring and/or successfully introducing 10 additional populations. Because (1) insufficient data are available to recommend translocation for this species (N. McCarten, *in litt*., 1998) and (2) repatriation and introduction of populations is expensive and experimental (Falk *et al*. 1996), surveying potential habitat within the species' range to locate currently unknown populations is the preferred strategy. At this time, creation of serpentine rock and soil habitat for *Dudleya setchellii* as a conservation strategy is also discouraged. Studies have shown created substrate is not a reliable source of habitat although *Dudleya setchellii* seedlings germinated in low numbers in two years in created habitat (Jones and Stokes 1998).

Streptanthus albidus* ssp. *albidus

Recovery of *Streptanthus albidus* ssp. *albidus* must first focus on protecting and managing the remaining populations by working with Santa Clara County Parks and private landowners to ensure the long-term survival of the species on their lands. Populations on private land should be protected through land acquisition, conservation easements or other means. Protection of *Streptanthus albidus* ssp. *albidus* should involve the largest possible block of serpentine habitat at each site and securing the populations themselves as well as a 150-meter (500-foot) buffer around each population, where possible, to reduce external influences and allow expansion of populations. In addition, other unoccupied habitat at the sites that might provide space for expansion of the populations and habitat for pollinators and seed dispersers must be protected.

If nine natural populations of *Streptanthus albidus* ssp. *albidus* are: (1) fully protected and managed with the primary intention of preserving the populations in perpetuity; (2) shown to be stable or increasing over a minimum of 20 years that contain the normal precipitation cycle (or longer if suggested by the results of demographic monitoring); (3) seed collected from the remaining natural populations is stored at a minimum of two Center for Plant Conservation certified

botanic gardens; and (4) reliable seed germination and propagation techniques for the species are understood, the species should be evaluated for downlisting to threatened. Until research shows otherwise, recovery should target securing populations containing a minimum of 2,000 plants each (but preferably more). The protected populations should be distributed throughout the range of the species including at least 25 percent west of Highway 101 and 75 percent in the Metcalf Canyon area east of Highway 101. If additional surveys indicate that the actual distribution of populations is different (e.g., a greater proportion of populations is found west of Highway 101), targets for protection should be changed so that they are consistent with the new information. *Streptanthus albidus* ssp. *albidus* should not be considered for delisting unless 18 populations within its historic range and representing its entire historic range are shown to meet the criteria above. Meeting this goal would require locating, restoring and/or successfully introducing nine new populations. Because repatriation and introduction of populations is expensive and experimental (Falk *et al*. 1996), surveying historic sites and potential habitat within the historic range to locate currently unknown populations is the preferred strategy. The status of these four criteria follows:

1. Nine natural populations have not yet been fully protected or managed with the primary intent of preserving the populations in perpetuity.
2. Nine natural populations have not been monitored to the extent to understand if the populations have been stable or increasing over a minimum of 20 years with the normal precipitation cycle.
3. Seed has been collected from 5 populations and stored at the Rancho Santa Ana Botanical Garden and at the University of California Botanical Garden at Berkeley. Whittall (2011) is planning a reintroduction project involving the collection of seeds from all accessible populations and excess seeds generated from the project will include contributing seeds to the two storage facilities listed above.
4. Reliable seed germination and propagation techniques for the species are understood as described by Whittall (2011).

B. Management plan approved and implemented for recovery areas, including survival of the species as an objective

This criterion implicitly addresses Factors A, D, and E

Dudleya setchellii

Management plans emphasizing *Dudleya setchellii* and other special status species for all populations and any occupied or unoccupied habitat identified as essential to survival must be developed and implemented. The plans should include provisions for standardized monitoring of *Dudleya setchellii* populations every 3 years to determine demographic trends. The plans should also include strategies to minimize known threats at the sites as well as to identify new threats

as they may appear. If new threats are identified or other new information becomes available, management plans need to be reevaluated and revised.

Although there are management plans for some sites, this criterion has generally not been met. Table 2 summarizes the Preserves and acreages that have management plans and funding to implement them.

Streptanthus albidus* ssp. *albidus

Management plans emphasizing *Streptanthus albidus* ssp. *albidus* and other special status species for all populations and any occupied or unoccupied habitat identified as essential to survival must be developed and implemented. The plans should include provisions for standardized annual monitoring of *Streptanthus albidus* ssp. *albidus* populations to determine demographic trends. The plans should also include strategies to minimize known threats at the sites as well as to identify new threats as they may appear. In particular, threats from road maintenance and construction, off-road vehicle use, dumping, and grazing must be eliminated. If new threats are identified or other new information becomes available, management plans need to be reevaluated and revised.

Although there are management plans for some sites, this criterion has generally not been met. Table 2 summarizes the Preserves and acreages that have management plans and funding to implement them.

C. Population monitoring in specified recovery areas

This criterion implicitly addresses Factors A, D, and E

Dudleya setchelli

To satisfy this criterion, population monitoring in specified recovery areas must show stable or increasing for a period of 20 years that include the normal precipitation cycle (or longer if suggested by the results of demographic monitoring). Once downlisted, there must not be a decline after downlisting to consider delisting for this criteria; if declining, determine cause and reverse trend prior to considering delisting.

Although some surveys have been performed at some of the known occurrences since the time of listing, monitoring of populations has not been performed at a sufficient level to satisfy this criterion.

Streptanthus albidus* ssp. *albidus

To satisfy this criterion, population monitoring in specified recovery areas must show stable or increasing for a period of 20 years that include the normal precipitation cycle (or longer if suggested by the results of demographic monitoring). Once downlisted, there must not be a decline after downlisting to consider delisting for this criteria; if declining, determine cause and reverse trend prior to considering delisting.

Although some surveys have been performed at most or all of the known occurrences since the time of listing and most recently from 2007 through 2011 (Whittall 2011), monitoring of populations has not been performed at a sufficient level to meet satisfy this criterion.

D. Other Actions

This criterion implicitly addresses Factors A, B, and E.

Dudleya setchelli

There no other actions identified for Dudleya setchelli for this recovery criterion.

Streptanthus albidus* ssp. *albidus

The recovery plan described the importance of seed banking for this species. Seed banking is prudent to guard against extinction of the species from chance catastrophic events and to provide potential material for enhancement efforts in existing populations, repatriations, and/or introductions to new sites. Care should be taken to ensure that seed collection does not adversely affect the donor populations. For this recovery criterion, seeds must be stored in at least two Center for Plant conservation certified facilities and seed germination and propagation techniques must be understood prior to downlisting.

This criterion has been met. Seed has been stored at two facilities including Rancho Santa Ana Botanic Garden (Wall 2012) and UC Berkeley Botanical Garden (Forbes 2012). Germination and propagation techniques have been developed and tested in greenhouse and lath house environments and are well understood (Whittall 2011). Further germination, propagation, and reintroduction are planned for four years including 2012 – 2015 (Whittall 2012).

TABLE 1: Recovery Plan Recovery Criteria

Species	Recovery Step	Secure and protect specified recovery areas from incompatible uses	Management plan approved and implemented for recovery areas, including survival of the species as an objective	Population monitoring in specified recovery areas shows:	Other actions	Status of Criterion Being Met
Santa Clara Valley dudleya (*Dudleya setchelli*)	Downlist	Occupied habitat or 20 populations representing the range of the species along with adjacent unoccupied habitat and a 150-meter (500-foot) buffer	For all populations and any occupied or unoccupied habitat identified as essential to survival	Stable or increasing for a period of 20 years that include the normal precipitation cycle (or longer if suggested by the results of demographic monitoring)		These criteria have not been met. At least 5 sites have been protected, managed, and monitored with an unknown number of populations.
	Delist	30 populations representing the range of the species	For all populations and any adjacent areas identified as essential to continued survival	No decline after downlisting; if declining, determine cause and reverse trend		These criteria have not been met
Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*)	Downlist	Occupied habitat along with adjacent unoccupied habitat and a 150-meter (500-foot) buffer at nine known sites	For all populations and any occupied or unoccupied habitat identified as essential to survival	Stable or increasing for a period of 20 years that include the normal precipitation cycle (or longer if suggested by the results of demographic monitoring)	Seeds stored in at least two Center for Plant conservation certified facilities; Seed germination and propagation techniques understood	Nine sites have not been protected, managed, or monitored. Seeds have been stored at two facilities. Propagation techniques are understood.
	Delist	18 populations representing entire historic range of the species	For all populations and any adjacent areas identified as essential to continued survival	No decline after downlisting; if declining, determine cause and reverse trend		These criteria have not been met

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 Abundance, population trends (e.g., increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

The trend for most of the occurrences for *Dudleya setchelli* and *Streptanthus albidus* ssp. *albidus* are identified as unknown (CNDDB 2012).

Dudleya setchelli

Dudleya setchelli is found only in the Coyote Valley area, from San Jose south about 30 kilometers (20 miles) to San Martin (McCarten 1993; Service 1998). At the time of listing in 1995, *Dudleya setchelli* was known from fourteen sites and a total of approximately 33,000 plants were known to exist. At the time of the Recovery Plan, there were 20 known occurrences with three additions from the Almaden Quicksilver County Park (Service 1998, CNDDB 1996)). There are currently 207 known occurrences in the entire range (ICF 2012; CNDDB 2009). The estimated number of individuals known for the species varies greatly due in part to the variation in the methodology of counting the rosettes which are formed as individual plants spread vegetatively (Jones & Stokes 1998). There is one unconfirmed occurrence near highway 152 approximately 2 miles east of Casa de Fruta and is further south than any other known occurrence (ICF 2012).

Available demographic information for this species is limited, however, as described in the Recovery Plan (Service 1998); individual plants may live for approximately 10 years. They are susceptible to heavy frosts but can survive for up to two years in inhospitable conditions and still exhibit minimal stress (J. Bartel, pers. comm. as cited in McCarten 1993, Service 1998). Rock outcrops in a *Dudleya setchellii* site usually number from 1 to 100 with 30 to 60 plants on each (McCarten 1993). McCarten studied demography of *Dudleya setchellii* at Kirby Canyon Landfill. He found seedling germination was high in wet years (e.g., 1995-1997), but seedling survivorship was often very low in both natural and created habitats. Seedling survival was generally less than 5 percent and may be less than 1 percent after the first year. The highest survival rates observed were on east- and north-facing slopes (Jones and Stokes 1998, N. McCarten, *in litt*., 1998). McCarten (*in litt*., 1998) suggests the primary cause of low survival is the limited number of rock crevices with enough soil to provide the necessary nutrient and moisture conditions.

Streptanthus albidus ssp. *albidus*

Streptanthus albidus ssp. albidus has always been rare. The current known range is the same as at the time of listing in 1995, extending from San Jose south to Anderson Lake, which lies northeast of Morgan Hill (approximately 20 miles) (Service 1995, Service 1998). At the time of listing in 1995, nine populations and a total of 20,000 to 25,000 plants were recorded (McCarten 1992, Service 1995). There are currently 11 known extant populations within the entire range (Draft Santa Clara Valley Habitat Conservation Plan 2009; CNDDB 2012). Population estimates are available for four of the known occurrences; three of the estimates date from 1989 and one from 2006. They are 27, 40, 1,000, and 4,000 for a total of 6,067 individuals (Draft Santa Clara Valley Habitat Conservation Plan 2009; CNDDB 2009).

Recent surveys between 2006 -2011 found large fluctuations in plant numbers in known populations including those with the largest and densest populations such as along Metcalf Road. Four of the six years had substantially lower numbers than two of the more productive years (2007-2008). The cause of periodic declines is unknown but may fluctuate with invertebrate herbivores, pathogens, and / or climate (Whittall 2011). A limited survey of herbivory on 14 individuals was performed at Metcalf Motorcycle County Park where approximately half of the leaves within a plant being affected. Invertebrate herbivores such as aphids and Pierid caterpillars have been observed previously (Whittall 2011).

Flower color examination was performed using UV-Vis spectral analysis to determine the distinctiveness of the flower color of *Streptanthus albidus ssp. albidus* compared to its closest relatives. There are consistent differences in sepal reflectance among pigmented (*S. albidus* ssp. *peramoenus* and *S. glandulosus*) and non-pigmented (*S. albidus* ssp. *albidus*). Whittall (2011) believes the constancy of the flower color differences is a key component to justifying the taxonomic recognition of ssp. *albidus* as distinct from ssp. *peramoenus*.

The most common pollinators were surveyed at the Motorcycle County Park in July 2010 and nearly all pollinators observed were *Bombus vosnesenkii*. A few honeybees (*Apis mellifera*) and flies (Diptera) were also observed pollinating *Streptanthus albidus ssp. albidus.* Whittall (2007) observed and quantified a high frequency of *Bombus vosnesenkii* visits to individual flowers suggesting the frequency of visitation may account for the high fruit set in *Streptanthus albidus ssp. albidus* in the wild.

Soil chemical analysis was performed by Whittall (2011) to determine if the serpentine soils of *Streptanthus albidus ssp. albidus* are unique compared to serpentine soils of its relatives. Few differences in soil chemistry were found, including at potential reintroduction sites at Tulare Hill.

Germination and propagation techniques were implemented in normal greenhouse conditions and in a lath-house environment with much higher levels of air flow, cooler/drier temperatures, and restricted water availability. There was significantly less fruit production in the greenhouse and the UC Davis Lath-House compared to wild plants suggesting that these environments are not an efficient approach to generating seeds for reintroduction. This is likely due to genetic self-incompatibility since greenhouse grown plants were prevented from cross-fertilization because no pollinators were allowed in the greenhouse. Whittall (2011) suggested that specific testing with a pollinator exclusion experiment in the field should be done to confirm *Streptanthus albidus ssp. albidus* is self-incompatible.

2.3.1.2 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

Streptanthus albidus ssp. *albidus*

Population genetic research indicates that, because of genetic differences among populations, all populations of *Streptanthus albidus* ssp. *albidus* are valuable genetic resources (Mayer *et al*. 1994, M. Mayer, pers. comm., 1998).

A study was performed by Whittall (2011) to determining the optimal conditions for propogation and reproduction of *Streptanthus albidus* ssp. *albidus* and a genetic assessment of its taxonomic status. The main components evaluated are described as follows.

1. Amplified Fragment Length Polymorphism (AFLP) Assessment of Taxanomic Status

   Streptanthus albidus ssp. *albidus* is distinguished from its more widespread relatives, *S. albidus* ssp. *peramoenus* and *S. glandulosus*, primarily by its flower color. Whittall (2011) assessed its evolutionary distinctiveness at the molecular level and extracted DNA from the three relatives. A nearly complete clade of S. albidus ssp. albidus was found and suggests the taxon may be a unique evolutionary lineage. However, this branch in the phylogeny is very weakly supported (i.e., less than 50% in a bootstrap analysis). Whittall (2011) believes the result suggests either a relatively recent evolutionary split among the closely related taxa or occasional introgression/hybridization between the populations via gene flow from seeds and/or pollinators. Whittall plans to conduct a Bayesian analysis on the AFLP data to further assess the distinctiveness of the lineage composed nearly entirely of Streptanthus albidus ssp. albidus.

2. Floral Anthocyanin Gene Survey

Streptanthus albidus ssp. *albidus* is distinguished from its closest relatives nearly entirely by its white flower color (Whittall 2011). Because only weak genomic distinctiveness of the lineage was found, molecular basis for the color trait was studied. Although many DNA differences were found, there was no consistent difference between plants with purple vs. white sepals. Whittall (2011) suggested that the results may be due to gene(s) that have not been sequenced or due to loss of expression of the genes rather than structural mutation in the gene itself.

3. Surveys

Surveys performed in 2007 and 2008 along the Metcalf Road and Motorcycle Park populations found the presence of pink flowered individuals which could represent introgression from *S. albidus ssp. peramoenus* alleles from the adjacent Kirby Canyon via pollinator exchange or seed dispersal (Whittall 2011).

2.3.1.3 Spatial distribution, trends in spatial distribution (e.g., increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g., corrections to the historical range, change in distribution of the species' within its historic range, etc.):

Dudleya setchelli
Two CNDDB occurrences (Numbers 43 and 49) are located approximately 5 miles southwest of the previously known southernmost extent of the historic range. One of which (CNDDB 43) is located within the Mount Madonna Santa Clara County Park.

Streptanthus albidus ssp. *albidus*

Recent surveys performed at Lower Soda Springs (CNDDB 6) found *S. glandulosus*. No *Streptanthus albidus ssp. albidus* were located. Whittall (2011) believes previous reports of *Streptanthus albidus ssp. albidus* were misidentifications based on the recent surveys. If the original 1895 report of *Streptanthus albidus ssp. albidus* was a misidentification, then it would suggest the historical range at the most westerly historic and current range would be significantly reduced. Similarly, the *Streptanthus albidus ssp. albidus* occurrence reported along Llagas Road (CNDDB 21) are believed by Whittall (2011) to be *S. glandulosus* and the original report to be a misidentification of *Streptanthus albidus ssp. albidus* based on the recent surveys. If the original 1957 report of *Streptanthus albidus ssp. albidus* at this location is not accurate, then it would suggest the historical range at the most southerly historic and current range would be reduced.

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Factor A, Present or threatened destruction, modification or curtailment of its habitat or range:

The destruction of habitat due to residential or recreational development are listed as the greatest threats to these species in the 1995 listing rule. The pressure to build more houses, roads, and other facilities for humans was great in Santa Clara County at the time of listing in 1995 and 20 percent of serpentine outcrops had already been eliminated (McCarten 1987b). At that time, the estimated percent population growth by year 2000 was 12.0 percent in Santa Clara County (Calif. Dept. of Finance 1992). Additionally, habitat fragmentation increases the risks of extinction due to chance events such as fire, flood, landslide, pest or disease outbreaks, severe drought, or other natural or human-caused disaster (Service 1995).

Current threats include development, nitrogen deposition, quarry expansion, landfill activity, heavy grazing, off highway vehicles, livestock trampling, canal maintenance, non-native competition, road widening and maintenance, small population size, and feral pigs (CNDDB 2012).

Dudleya setchellii

At the time of listing, 11 of the 14 populations were on private land and were subject to various levels of threat due to development. Three in the northernmost portion of its range were threatened by development. One population was threatened by the proposed Cerro Plata Project, consisting of 550 dwelling units and a 164 acre golf course on a 575 acre site. This population contained approximately 20,000 plants, 61 percent of all known plants, of which approximately 2,380 would be directly eliminated by planned construction activities (City of San Jose 1993). All remaining plants would be exposed to human activities during and after construction that could result in significant impacts to the population. These impacts included potentially harmful runoff from and upslope golf course, introduction of weed species during construction, and uncontrolled foot traffic.

The second of the northern sites was threatened by the proposed construction of the Valley Christian School and South Valley Christian Church. The construction was thought to eliminate 74 percent of the approximately 1,900 plants found on the site (City of San Jose 1992).

The third of the northernmost populations was also in an area developing rapidly and had been proposed for development at one time or another.

In the central part of its range, 2 of the 3 central populations were also threatened

with residential development and road construction. The 3rd central population was threatened by off-road motorcycle traffic and unauthorized dumping due to its proximity to an off-road motorcycle park.

In the southernmost portion of its range, around Morgan Hill, 3 populations were in an area developing rapidly and had been proposed for development.

The remaining 2 of the 11 populations on private land were on the grounds of the IBM Bailey Avenue laboratory and the company had plans to preserve the habitat (McCarten 1992) and therefore no threats were identified at the time of listing.

Three of the 14 populations occurred on land owned by Santa Clara County (2 occur in county parks) and no threats were identified at the time of listing.

Consistent with the 1995 rule, the largest continuing threats to these species are residential, facility, and recreational development.

Development:

The Kirby Canyon Recycling and Disposal Facility (KCRDF) has been an active operating landfill since 1986, and developed in phases. As of 2003, approximately 200 acres of the 827 acre project site had been impacted by landfill operations. The KCRDF will impact 284 acres of Santa Clara Valley Dudleya habitat (Service File Number 1-1-03-F-0213) over a period of 50 years. Landfill activities within the site of the proposed KCRDF expansion project could result in direct mortality or injury to individual Santa Clara Valley Dudleya. Mortality or injury to plants can occur from being crushed by earth moving equipment, landfill debris, and worker foot traffic. After closure of the KCRDF, between 300 to 350 acres of the completed, restored landfill will be protected with a permanent conservation easement and be subject to vegetation management and monitoring. According to the biological opinion (Service File Number 1-1-03-F-0213), after closure of the KCRDF, the project proponent (Waste Management of California Incorporated) must endow a Service-approved fund for monitoring and perpetual management and maintenance of the 300 to 350 acres of the completed, restored landfill.

Streptanthus setchellii

At the time of listing, there were 13 documented sites, 9 of which still harbored plants. Two occurrences were known from herbarium records only. One of the historical records was visited in 1990, but no plants were found. *Strepanthus albidus* ssp. *albidus* was last observed at the other historical site in 1895. One population consisting of approximately 9,000 plants, approximately 45 percent of all known plants, occurred on the proposed site of the Cerro Plata residential and golf course project (also known as Ranch on Silver Creek Development). Although no direct destruction of any plants were planned at the time of listing, it

was thought that construction activities, human disturbance, and habitat fragementation would result in significant impacts to the population. There was a proposed Valley Christian School and South Valley Christian Church that would destroy 61 percent of the 2,700 plants occurring on the site. The remaining 7 populations were also threatened by impending or potential development.

The Ranch on Silver Creek Development (Cerro Plata) has been constructed since the time of listing. Although all direct impacts to *Strepanthus albidus* ssp. *albidus* were avoided as described in the biological opinion (Service 2000), the populations within the 580 acre parcel are intermixed with residential homes, golf course, and facilities. Ten years of monitoring (2001-2010) of the preserved populations within the on-site Hassler Ranch Preserve show that the Plant Conservation Areas are still occupied by *Strepanthus albidus* ssp. *albidus*. The total area occupied within the Plant Conservation Areas has increased slightly by 3.65 acres. The numbers of plants have drastically reduced from 75,000 plants in 1998 to an average of 11,266 plants over 10 years (2001-2010). This is a reduction of 85% percent of the baseline prior to construction of the Silver Creek Development.

One location at Tulare Hill was covered by fill during construction of a housing development (CNDDB 2012). Three sites within the Metcalf Energy Center Ecological Preserve are proposed for reintroduction (Whittall 2011). The reintroduction plan includes monitoring and preparation of a management plan.

Draft Santa Clara Valley Habitat Conservation Plan (HCP):

A habitat conservation plan was developed for the Santa Clara Valley in Santa Clara County August 2012 and is proposed to cover a fifty year term. Twenty four species are proposed to be covered including the known range of *Dudleya setchellii* and *Streptanthus albidus* ssp. *albidus* except one *Streptanthus albidus* ssp. *albidus* occurrence located on a Santa Clara County Park. Covered activities would include urban development, in-stream capital projects, in-stream operation and maintenance, rural capital projects, rural development, rural operation and maintenance, and conservation strategy implementation. Conservation strategy implementation includes avoidance, minimization and protection of existing and created occurrences of *Dudleya setchellii* and *Streptanthus albidus* ssp. *albidus* within four serpentine soil land cover types including serpentine bunchgrass grassland, serpentine rock outcrops, serpentine seeps, and serpentine chaparral.

Urban development is one of the primary impact mechanisms considered in the HCP, accounting for approximately 60% of all impacts assessed in the HCP. Urban development is assumed to result in permanent direct impacts because it is assumed that complete conversion of natural land cover types would occur at project sites in urban areas. The HCP would allow direct impacts to eleven occurrences of *Dudleya setchellii* and two occurrences of *Streptanthus albidus*

ssp. *albidus.* If new occurrences of *Dudleya setchellii* are found and protected, then three additional occurrences may be directly impacted. The protected occurrences must be of higher conservation value than impacted occurrences and must be protected before impacts occur. The HCP defines impact as a permanent loss of an entire occurrence or a partial loss that results in a loss of population viability. The HCP developed habitat distribution models and identified 7,987 acres of *Streptanthus albidus* ssp. *albidus* primary habitat of serpentine bunchgrass grassland within the Study Area. The HCP would allow a maximum of 550 acres (4%) of permanent and 92 acres (<1%) of temporary impacts to *Streptanthus albidus* ssp. *albidus* primary habitat. Urban development will have indirect effects on biological resources in protected open space within and outside the planning limits of urban growth, including the Reserve System. One significant indirect impact is nitrogen deposition on the local serpentine grassland community resulting from increased traffic associated with new home development.

Conservation Efforts:

1. Salvage/Transplant

According to the *Formal Endangered Species Consultation on the Proposed Kirby Canyon Recycling and Disposal Facility, Santa Clara County, California (Corps File #27837S)* (Service File Number 1-1-03-F-0213), since 1996, the applicant has contracted with biologists to move Santa Clara Valley Dudleya from areas affected by landfill operations. The salvage/transplant program has been relatively successful with an overall survival rate of 74 percent. The Santa Clara Valley Dudleya are moved into protected areas of the landfill. As landfill cells are closed and final cover is achieved, landfill cells will be revegetated with serpentine grassland habitat as described in the Kirby Canyon Landfill Revegetation Plan. Completed cells will be used as sites to transplant Santa Clara Valley Dudleya plants that are salvaged from the future landfill areas. The applicant (Waste Management of California Incorporated) intends to salvage plants from the 284 acres landfill expansion area immediately prior to disturbance, and then replant the salvaged plants elsewhere on the 827 acre KCRDF site.

2. Preserves

The threats identified in the 1995 listing rule continue to threaten these species (ICF 2012). There have been a few Preserves protected in perpetuity from incompatible land uses to offset some of the impacts imposed by various projects and changes of land use. Table 2 summarizes a subset of these Preserves that support or may in the future support *Dudleya setchellii* and *Streptanthus albidus* ssp. *albidus*.

Table 2. Preserves: The following Preserves support *Dudleya setchellii* and/or *Streptanthus albidus* ssp. *albidus*.

Preserve Name	***Dudleya setchellii*** Individuals (year)	***Streptanthus albidus* ssp. *albidus***	**Serpentine Habitat Acres**	**Protection and Management**	**Manager**
VTA Coyote Ridge Conservation Bank	X		425		
Ranch on Silver Creek Plant Conservation Areas	X	X			
Metcalf Energy Center Ecological Preserve, Tulare Hill	6,000 (2004)	Reintroduction proposed	116	CE, Mgmt Plan, Endowment	Silicon Valley Land Conservancy
Metcalf Energy Center Ecological Preserve, Coyote Ridge	104 (2003)		15	CE, Mgmt Plan, Endowment	Silicon Valley Land Conservancy
Lost Esteros Critical Energy Facility Parcel on Coyote Ridge	191(2005) ? (2006) ? (2007)		40	CE, Mgmt Plan, Endowment	Silicon Valley Land Conservancy

3. Management Plans

Below is a summary of the CH2MHILL 2009 Annual Monitoring Report for the Metcalf Energy Center Ecological Preserve and Los Esteros Critical Energy Facility:

Elimination of grazing on portions of Tulare Hill lead to increased annual grass invasion and reduction of Bay checkerspot host and nectar plants. The Silicon Land Conservancy has been deeply involved in sorting out the management issues on Tulare Hill. The flexibility of ranchers to move their animals to other pastures has created a rich mosaic of habitat conditions across Coyote Ridge. Multiple, flexible grazing regimes across paddocks allow the ranchers to maximize the removal of grass biomass, which creates disturbance regimes, lack of competition, and bare soil for annual forbs to thrive. The results are illustrated by the diversity and mass of wildlflowers across the range of serpentine grasslands being properly managed, including conservation areas referred to as MEC-TH and MEC-CR, Lost Esteros Critical Energy Facility, and adjacent Silicon Valley Power. Also well managed are adjacent Valley Transportation Authority and United Technology Corporation properties.

4. Draft Santa Clara Valley Habitat Conservation Plan (HCP)

Dudleya setchellii

The draft HCP proposes to acquire through acquisition or conservation easement lands that support 55 extant occurrences of *Dudleya setchellii*. Incorporation of portions of Santa Teresa, Calero, Anderson Lake, and Almaden Quicksilver County Parks will protect 11 of the 55 occurrences and provide opportunities for

improved management and monitoring. The sites will be protected on both sides of Coyote Valley to ensure geographic diversity in protected occurrences.

Streptanthus albidus ssp. *albidus*

The draft HCP proposes to acquire primary modeled habitat, extant occurrences, and newly created occurrences for *Streptanthus albidus* ssp. *albidus.* A minimum of 3,800 acres will be acquired and added to the Reserve System. An additional 1,000 acres of modeled habitat from existing open space will be added to the Reserve System. Regardless of the level of impact, three extant occurrences will be acquired and protected prior to the first impact and by year 45.

2.3.2.2 Factor B, Overutilization for commercial, recreational, scientific, or educational purposes:

The 1995 final rule stated that overutilization was not known to be a factor for *Dudleya setchellii or Streptanthus albidus ssp. albidus,* but unrestricted collecting for scientific or horticultural purposes or excessive visits by individuals interested in seeing rare plants could result from increased publicity as a result of the final rule to list as endangered. *Dudleya setchellii* was also thought to be vulnerable because of the horticultural appeal of succulents and the slow growing of the plants. They may also appeal to collectors because of their rarity. We are not aware of any information that would suggest that these activities have become a threat as a result of the 1995 final rule that listed these species as endangered.

2.3.2.3 Factor C, Disease or predation:

The 1995 final rule did not identify any disease or predation threats to *Dudleya setchellii*. After construction of the Ranch on Silver Creek housing development and golf course project, reduction of coyotes occurred on the property. As a result, the ground squirrel population increased to the extent that the squirrels began devouring *Dudleya setchellii.* This new threat is an indirect effect of the housing and golf course development. At the same site, an expansion of native sagebrush led to an increased rabbit population that in turn reduced *Dudleya setchellii (*WRA 2010).

The 1995 final rule stated that grazing threatened one population of *Streptanthus albidus ssp. albidus* in southeast San Jose and three populations in the Metcalf Canyon/south Coyote area (McCarten 1992b).

Herbivory was observed on approximately 8 individuals of *Streptanthus albidus ssp. albidus* at the Metcalf Motorcycle County Park. The herbivory was likely due to invertebrate herbivores since aphids and Pierid caterpillars have been observed in the populations there previously (Whittall, 2011).

2.3.2.4 Factor D, Inadequacy of existing regulatory mechanisms:

In the final rule, the Service (1995) found that existing regulatory mechanisms were not sufficient to protect plants including section 404 of the Clean Water Act, California Endangered Species Act, and the California Environmental Quality Act. *Dudleya setchellii* and *Streptanthus albidus* ssp. *albidus* were not state listed as threatened or endangered and therefore were not protected by the California Endangered Species Act (CESA) or California Environmental Protection Act. *Dudleya setchellii* and *Streptanthus albidus* ssp. *albidus* still are not listed as threatened or endangered under CESA.

State Protections in California

The State's authority to conserve rare wildlife and plants is comprised of four major pieces of legislation: the California Endangered Species Act, the Native Plant Protection Act, the California Environmental Quality Act, and the Natural Community Conservation Planning Act.

California Endangered Species Act (CESA) and Native Plant Protection Act (NPPA): The CESA (California Fish and Game Code, section 2080 *et seq*.) prohibits the unauthorized take of State-listed threatened or endangered species. The NPPA (Division 2, Chapter 10, section 1908) prohibits the unauthorized take of State-listed threatened or endangered plant species. The CESA requires State agencies to consult with the California Department of Fish and Game on activities that may affect a State-listed species and mitigate for any adverse impacts to the species or its habitat. Pursuant to CESA, it is unlawful to import or export, take, possess, purchase, or sell any species or part or product of any species listed as endangered or threatened. The State may authorize permits for scientific, educational, or management purposes, and to allow take that is incidental to otherwise lawful activities. There is no protection to *Dudleya setchellii* and *Streptanthus albidus* ssp. *albidus* under CESA because they are not listed as threatened or endangered at this time.

With regard to prohibitions of unauthorized take under NPPA, landowners are exempt from this prohibition for plants to be taken in the process of habitat modification. Where landowners have been notified by the State that a rare or endangered plant is growing on their land, the landowners are required to notify the California Department of Fish and Game 10 days in advance of changing land use in order to allow salvage of listed plants. There is no protection to *Dudleya setchellii* and *Streptanthus albidus* ssp. *albidus* under CESA or NPPA because they are not listed as threatened or endangered at this time.

California Environmental Quality Act: The 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.

California Coastal Act: The California Coastal Commission considers the presence of listed species in determining environmentally sensitive habitat lands subject to section 30240 of the California Coastal Act of 1976, which requires their protection. Certain local jurisdictions have developed their own Local Coastal Programs or Land Use Plans that have been approved by the Coastal Commission. Some of the major accomplishments of this act include reduction in overall development, the acquisition of prime habitat along the coast, restoration of coastal streams and rivers, and a reduction in the rate of wetland loss. The geographic range of *Dudleya setchellii* and *Streptanthus albidus* ssp. *albidus* are not in the area where the California Coastal Act provides protection.

Federal Protections

National Environmental Policy Act: NEPA (42 U.S.C. 4371 *et seq*.) provides some protection for listed species that may be affected by activities undertaken, authorized, or funded by Federal agencies. Prior to implementation of such projects with a Federal nexus, NEPA requires the agency to analyze the project for potential impacts to the human environment, including natural resources. In cases where that analysis reveals significant environmental effects, the Federal agency must propose mitigation alternatives that would offset those effects (40 CFR 1502.16). These mitigations usually provide some protection for listed species. However, NEPA does not require that adverse impacts be fully mitigated, only that impacts be assessed and the analysis disclosed to the public.

Endangered Species Act of 1973, as amended: 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. A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its reproduction, numbers, or distribution (50 CFR 402.02). A non-jeopardy opinion may include reasonable and prudent measures that minimize the amount or extent of incidental take of listed species associated with a project.

Section 9 prohibits the taking of any federally listed endangered or threatened species. Section 3(18) defines "take" to mean "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Service regulations (50 CFR 17.3) define "harm" to include significant habitat modification or degradation which actually kills or injures wildlife by

significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. Harassment is defined by the Service as an intentional or negligent action that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. The Act provides for civil and criminal penalties for the unlawful taking of listed species. Incidental take refers to taking of listed species that results from, but is not the purpose of, carrying out an otherwise lawful activity by a Federal agency or applicant (50 CFR 402.02). For projects without a Federal nexus that would likely result in incidental take of listed species, the Service may issue incidental take permits to non-Federal applicants pursuant to section 10(a)(1)(B). To qualify for an incidental take permit, applicants must develop, fund, and implement a Service-approved Habitat Conservation Plan (HCP) that details measures to minimize and mitigate the project's adverse impacts to listed species. Regional HCPs in some areas now provide an additional layer of regulatory protection for covered species, and most of these HCPs are coordinated with California's related Natural Community Conservation Planning program or other permits through the California Department of Fish and Game.

With regard to federally listed plant species, section 7(a)(2) requires Federal agencies to consult with the Service to ensure any project they fund, authorize, or carry out does not jeopardize a listed plant species. Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the "take" of federally endangered wildlife; however, the take prohibition does not apply to plants. Instead, plants are protected from harm in two particular circumstances. Section 9 prohibits (1) the removal and reduction to possession (i.e., collection) of endangered plants from lands under Federal jurisdiction, and (2) the removal, cutting, digging, damage, or destruction of endangered plants on any other area in knowing violation of a state law or regulation or in the course of any violation of a state criminal trespass law. Federally listed plants may be incidentally protected if they co-occur with federally listed wildlife species.

Summary of Regulatory Mechanisms

In summary, the Endangered Species Act is the primary Federal law that provides protection for these species since their listing as endangered in 1995. 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.

2.3.2.5 Factor E, Other natural or manmade factors affecting its continued existence:

Other manmade threats stated in the 1995 final rule include the large and still increasing numbers of people in the San Francisco Bay area place a great strain on

undeveloped wildlands through activities such as pedestrian and off-road vehicle traffic, hiking, and bicycle trails, and unauthorized garbage dumping. Disturbance may directly impact plants; it can increase erosion and allow the invasion of alien species such as the many introduced annual grasses common in California. Competition with introduced species is a serious threat to serpentine natives (McCarten 1987b). Edaphic specialists (plants restricted to a certain soil type) with small populations such as the serpentine, species may have low genetic variability (Menges 1991). As a result, populations that become subdivided by alterations in habitat from road construction and urbanization or from natural catastrophes such as disease, fire, or drought, may be at a high risk of genetic changes that decrease the ability of the populations to survive (Menges 1991). *Streptanthus albidus* ssp. *albidus* was threatened by dumping and off-road motorcycle use. Road maintenance or construction threaten populations that occur on roadcuts. This analysis appears to remain currently valid.

Nitrogen deposition

A relatively recently identified threat is nitrogen deposition into grasslands from air pollution sources and the resultant increase in productivity of the soils has facilitated increased invasion of nonnative species (ICF 2012). The main effect for Santa Clara Valley dudleya and Metcalf Canyon jewelflower is their vulnerability to annual grass overgrowth. Nonnative annuals are much less dominant in serpentine areas, although increasing nitrogen deposition from air pollution has increased the productivity of serpentine soils and allowed a greater number of nonnatives to invade (Evens and San 2004; Harrison et al. 2003; Weiss 1999).

Santa Clara Valley dudleya (Dudleya setchellii) lives on rock outcrops and is relatively immune from grass invasions except when extremely tall grasses smother small rock outcrops. The species persists on medium to large rock outcrops in ungrazed areas. Metcalf Canyon jewelflower can be a poor competitor against dense annual grasses, and some degree of grazing appears necessary to maintain populations (ICF 2012). Livestock grazing is an important management tool to combat increased invasive nonnative plants in serpentine grasslands due to atmospheric nitrogen deposition (Weiss 1999).

Climate Change

ICF (2012) summarized the potential effects of climate change to serpentine plant species and its relationship to the proposed permitted activities during the Santa Clara Valley Habitat Plan's proposed 50 year permit span. Serpentine plant distribution is restricted to highly specialized and localized habitat requirements that include species-specific microclimate conditions coincident with serpentine soil occurrence. Restriction to serpentine soils limits species range and distribution to this soil type. Climate change could change microclimate conditions so that species can no longer persist within their current range. Increase in favorable microclimate conditions could lead to an expansion of

distribution and increase in abundance, both in terms of number of populations and number of plants within each population. Change in timing or intensity of seasonal events could have an effect on pollinator reproductive and plant flowering periods leading to phonological mismatches.

The Santa Clara Habitat Plan (ICF 2012) includes a conservation strategy reserve design to reduce species vulnerability and provides opportunities for species and natural communities to adapt in response to climate changes.

2.4 Synthesis

The threats to *Dudleya setchellii* and *Streptanthus albidus* ssp. *albidus* that led to the listing of these species as endangered in 1995 are summarized in section 2.3.2.6. The primary threats to these species continue to be the modification and destruction of suitable habitat and fragmentation. New threats include nitrogen deposition, climate change, and change of land management due to urban development.

Increased nitrogen deposition from air pollution sources may increase non-native plant completion in serpentine grasslands and outcompete or smother *Dudleya setchellii* and *Streptanthus albidus* ssp. *albidus*. *Streptanthus albidus* ssp. *albidus* may be more vulnerable to this threat.

Climate change may have negative or positive effects; however the Santa Clara Valley Habitat Plan reserve design may reduce serpentine plant vulnerability of this threat. Specific monitoring of *Dudleya setchellii* and *Streptanthus albidus* ssp. *albidus* populations may be necessary to evaluate the effects of climate change.

There have been observed adverse effects due to changes of management related to urban development. For example, as a result of coyote control adjacent to a housing development and golf course resulted in an increase in the ground squirrel population. The ground squirrels in turn began consuming large amounts of *Dudleya setchellii*.

Dudleya setchelii and Streptanthus albidus ssp. *albidus* should not be considered for downlisting at this time because not all of the downlisting criteria have been met.

Therefore, based on continuing threats related to habitat loss, habitat degradation, fragmentation, and. competition by non-native plants, we conclude that *Dudleya setchellii* and *Streptanthus albidus* ssp. *albidus* still meet the Act's definition of endangered, and are in danger of extinction throughout their range.

3.0 RESULTS

3.1 Recommended Classification: *Dudleya setchellii*

____ 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 is needed

Recommended Classification: ***Streptanthus ablbidus ssp. albidus***

____ 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 is needed

3.2. New Recovery Priority Number:

Dudleya setchellii : 2C (no change)

Streptanthus albidus ssp. albidus: 3C (no change)

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

1. Preserve, protect, manage, and monitor *Dudleya setchellii* CNDDB occurrence number 43. Occurrence number 43 was found in the year 2005, subsequent to listing of the species and the Recovery Plan. The occurrence represents the most southwesterly extent of its current known range.

2. Confirm if the historic and current westernmost and southernmost occurrences for *Streptanthus albidus* ssp. *albidus* are valid. Perform additional surveys in suitable habitat around CNDDB number 6 and 21 to confirm if the range of the species is smaller than previously understood.

3. Conservation measures should include focus on preserving, monitoring, and managing pollinator fauna as it appears to be essential for any significant fruit set in *Streptanthus albidus* ssp. *albidus*.

4. *Streptanthus albidus* ssp. *albidus* plant numbers can fluctuate drastically from year to year (Whittall 2011). Reliable methods should be developed to evaluate when a population should be considered as stable and viable. The methods should include ways to measure and evaluate natural and human influenced variables.

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

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

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

Review Conducted By: Vincent Griego, Sacramento Fish and Wildlife Office

Date Submitted to Region 8: _____

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve _____ Date 5 Feb 2013

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Streptanthus albidus* ssp. *albidus*

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

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

Review Conducted By: Vincent Griego, Sacramento Fish and Wildlife Office

Date Submitted to Region 8: _____

FIELD OFFICE APPROVAL:

Acting **Lead Field Supervisor, Fish and Wildlife Service**

Approve _____ Date 5 Feb 2013