Santa Barbara Island Liveforever
(Dudleya traskiae)

5-Year Review:
Summary and Evaluation

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U.S. Fish and Wildlife Service
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Ventura, California

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5-YEAR REVIEW
Dudleya traskiae (Santa Barbara Island liveforever)

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1. GENERAL INFORMATION

1.1. Reviewers

Lead Region: Region 8 (California and Nevada): Jenness McBride, Fish and Wildlife Biologist, 916- 414-6464; and Diane Elam, Division Chief for Listing, Recovery, and Habitat Conservation Planning, 916-414-6464

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1.2. Methodology used to complete the review:

This review was completed by staff in the Ventura Fish and Wildlife Office. Information was gathered from a variety of sources (Internet, literature review, and extensive coordination with staff at Channel Islands National Park). The most important sources of new information consist of the following: 1) ecological and population studies carried out by Ms. Ronilee Clark (1989) over a 3-year period for her master's thesis; 2) propagation and outplanting efforts carried out by Channel Islands National Park staff (CINP 2006); and 3) follow-up surveys carried out by Clark and Channel Islands National Park staff to check on the status of populations in 2003, 2004, and 2006 (Chaney *in litt.* 2006, Chaney 2007). Because the entire species is on lands managed by the Park, we requested that Park staff review the draft document and have incorporated their comments.

1.3. Background:

1.3.1. FR Notice citation announcing initiation of this review:

The FR notice initiating this review was published on July 7, 2005 (70 FR 39327). This notice opened a 60-day request for information period, which closed on September 6, 2005. A second FR notice was published on November 3, 2005 (70 FR 66842), which extended the request for information period for an additional 60 days until January 3, 2006. No new information was received as a result of this request.

1.3.2. Listing history

Original Listing
FR notice: 43 FR 17916
Date listed: April 26, 1978
Entity listed: species (*Dudleya traskiae*)
Classification: endangered

1.3.3. Associated actions

1983: Listed by Convention on the International Trade of Endangered Species (CITES) as an Appendix 1 species (those species threatened with extinction which are or may be affected by trade. Permits for international commercial trade are rarely issued).

2003: Moved to CITES Appendix II list (those species which although not necessarily now threatened with extinction may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization incompatible with their survival).

Listed by the State of California as endangered in 1979.

1.3.4. Review History

The status of *Dudleya traskiae* was reviewed during preparation of the recovery plan for this species, but a complete 5-factor analysis was not done.

1.3.5. Species' Recovery Priority Number at start of 5-year review : 8C. This denotes a full species facing a moderate degree of threat and a high recovery potential. The "C" indicates a potential conflict with economic activities.

1.3.6. Recovery Plan or Outline

Name of plan or outline: Santa Barbara Island Liveforever Recovery Plan

Date issued: June 27, 1985

Dates of previous revisions, if applicable: None

2. REVIEW ANALYSIS

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

The Endangered Species Act (Act) defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listings as distinct population segments (DPS) only 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.

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

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

The recovery criteria do not take into consideration new information about recruitment limitations and expanding pelican (*Pelicanus occidentalis californicus*) nesting and roosting.

2.2.2.2. 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)?

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

At the time of listing, the two factors that were considered were: Factor A) alteration and destruction of habitat due to historical use of the island for ranching and farming, and associated impacts such as invasion of nonnative species and fires; and Factor C) predation by rabbits. Stochastic extinction (Factor E) was mentioned at the time of listing, and is still considered a threat. Factors B and D were not considered threats at the time of listing and are not considered threats now.

As discussed in the Five Factor analysis below, a number of threats exist today that were not addressed at the time of listing: alteration and destruction of habitat resulting from pelican nesting and roosting, and predation by deer mice and owlet moth larvae. Predation by deer mice was considered when the recovery plan was developed, but was not considered a great enough threat to warrant its own recovery criterion.

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):

Downlisting and delisting criteria are presented in the recovery plan (Service 1985) in a narrative format and essentially consist of the following:

Downlisting criteria:

1. Secure all 10 colonies of the species in a vigorous, self-sustaining condition (addresses Factors A and C). This criterion has not been met. We consider this criterion to be appropriate with respect to the recovery of the species.

2. Expand the distribution of the plant to include 50 percent of the suitable potential habitat. The recovery plan notes that, "criteria for identifying suitable habitat will be determined following studies." Figure 3 of the recovery plan shows a theorized historical distribution based on soils, slope, and aspect (addresses Factors A, C, and E). This criterion has not been met: only 2 out of 10 populations have had a notable increase in distribution. We believe this criterion is appropriate; however, what is considered suitable habitat needs to be better defined.

Delisting criteria:

1. Secure all 10 colonies of the species in a vigorous, self-sustaining condition (addresses Factors A and C). This criterion has not been met. We consider this criterion to be appropriate with respect to the recovery of the species.

2. Expand the distribution of the plant to include 95 percent of the suitable potential habitat (addresses Factors A, C, and E). This criterion has not been met; only 2 out of 10 populations have had a notable increase in distribution. We believe this criterion is appropriate, but that what is considered suitable habitat needs to be better defined.

These criteria focus on the desired outcome of recovery actions and are measurable, but do not specifically address threats to the species (i.e., are not "threats-based"). In the Background section of the recovery plan, the Service acknowledges that predation by rabbits had already been removed as a primary threat to the species by the Park since the time of listing. In addition to a generalized discussion of other threats in the Background section of the recovery plan, the Recovery Objectives section specifically mentions the following threats: low population numbers (Factor E), nonnative vegetation (Factor E), collection (Factor B), and wildfire (Factor E). Of these, we believe that low population numbers is the largest threat, followed by nonnative vegetation and wildfire.

2.3. Updated Information and Current Species Status

2.3.1. Biology and Habitat

Distribution

Dudleya traskiae has always been restricted to Santa Barbara Island, located 38 miles (61 kilometers) from the mainland. The island comprises only 652 acres (264 hectares) and is bounded by rugged, precipitous cliffs. The prominent topographic feature of the island is Signal Peak, which rises to 635 feet (193 meters) in elevation on the southwest margin of the island. A low, north-south oriented saddle runs between Signal Peak and North Peak, which is on the north rim of the island. Much of the island consists of marine terraces that slope gently down to the edge of the coastal cliffs to the east and west. Due to the influence of nonnative herbivores, it is believed that the species was more abundant and probably occupied much more of the island prior to the time herbivores were introduced (see Habitat Trends below), and that the sea bluff and interior cliffs and slopes acted as refuges for native vegetation (Philbrick and Haller 1988). However, this cannot be confirmed for *Dudleya traskiae* because no observations on the plant were made prior to the era of farming and feral animal introductions (Clark and Halvorson 1987).

At the time of listing in 1978, only two occurrences were known. By 1985, approximately 10 occurrences of *Dudleya traskiae* had been located; these occurrences were concentrated in four portions of the island: along the southwestern margin in the Signal Peak area, the southern tip near Cat Canyon, in the northeast in Arch Canyon, and along the eastern margin in Cave, Middle, and Graveyard Canyons (Service 1985).

The "number" of biological populations is uncertain because we now believe that what were initially documented to be separate occurrences are most likely remnant portions of what was once a more continuous population. For instance, three separately marked populations in Middle Canyon are within 500 feet (150 meters) of each other and likely were once part of a continuous population. In 2003, a fourth population was located in Middle Canyon midway between two known populations, further supporting the ideas that: 1) the entire canyon may have supported a more continuous population historically, and 2) reestablishment of populations has the best chance of succeeding in areas adjacent to existing populations where habitat characteristics are similar.

Based on outplanting experiments carried out by Clark (1989), she suggested that some areas outside of the habitat known at the time might also be suitable for *Dudleya traskiae*. However, in the intervening 18 years (1987 to 2005), no new populations have been found outside the known distribution of the species. Moreover, the boundaries of most of the populations have not undergone natural expansion to any great degree. Exceptions are two of the populations near Cat Canyon, which have significantly expanded in area (Chaney 2007). In Middle Canyon, two other populations in Middle Canyon have increased in density, and new individuals have been observed between existing populations (Chaney in litt. 2006, Chaney 2007).

Habitat Trends

The vegetation on Santa Barbara Island had a long history of being altered by human activities. While Native Americans inhabited or at least visited Santa Barbara Island, their impact on the vegetation is unknown and the subject of speculation (Service 1985). The most likely impacts were either from burning of the vegetation or from consumption. Impacts associated with colonization by settlers, however, were much more severe. By 1850, the island was already "densely populated" with goats (Philbrick 1972). Other introductions included: cats in the 1880s, sheep in the early 1900s, New Zealand red rabbits in 1915, and Belgian hares in 1942 (McEachern 2004). Each of these species inflicted damage to the natural vegetation. The island was also farmed for oats, barley, and potatoes over nearly one-half of the island in the first half of the 1900s, and was used as an aircraft early warning outpost from 1942 to 1947 (McEachern 2004, Service 1985).

In 1984, Channel Islands National Park instituted long-term plant community monitoring programs on all the islands within the Park including Santa Barbara Island. Transects are located in the following communities: boxthorn scrub, cactus scrub, coastal sage scrub, coreopsis (*Coreopsis gigantea*) scrub, grassland, seablite scrub, and seacliff scrub (Johnson 1998, Johnson and Rodriguez 2001). Early results from this study suggest that there is a trend of native species recovery on the island. An analysis of long-term trends is forthcoming in 2006 (Corry in press).

Clark (1989) analyzed site characteristics for habitat occupied by *Dudleya traskiae* at the time (1985-1987). She found that the biotic and abiotic habitat components – specifically associated plant species, slope, aspect, and elevation – were homogeneous throughout the habitat type, with sites occupied by *Dudleya traskiae* being indistinct. This suggested that the availability of suitable habitat is not limiting population growth.

Abundance

The Smithsonian report (1975 in Service 1978) noted that *Dudleya traskiae* had not been collected since 1968 and that it was possibly extinct. In that same year, several plants were discovered regenerating from stubs that had been gnawed to the ground by hares (Service 1978). This regeneration was attributed to the efforts of the National Park Service to eradicate the hares and rabbits. The National Park Service continued hare eradication efforts until 1981, at which time they were eliminated from the island. The Park surveyed the island for *Dudleya traskiae* in 1982, 1983, and 1984; these surveys resulted in the location of additional populations, while at the same time revealing the precarious status and rarity of the species (Service 1985). Of the ten populations located by 1983, 3 comprised less than 10 individuals each, 6 comprised less than 100 individuals each, and only the Signal Peak population comprised over 100 individuals (approximately 120) (Drost *in litt.* 1983). In 1984, additional plants were found farther north on the cliff below Signal Peak, bringing the total estimated number of individuals in the Signal Peak area to 534 (Drost in litt. 1984).

An effort to census populations (excluding Signal Peak cliff) from 1985 through 1987 was done by tracking the abundance of individuals at 10 plots over the range of the species (Clark 1989). Over the 3-year period, the study found the following:

- The number of plants in censused plots was essentially stable over the 3-year period. However, this included a recruitment event in the 2nd year (due to higher than average rainfall), followed by a decrease in seedlings the 3rd year (due to a drought).

- The structure of the entire island population, measured on the basis of distribution of the number of individuals in rosette number classes, changed dynamically during this study, with a trend towards larger, more mature individuals. The total number of censused rosettes increased by 22 percent from 1985 to 1987.

In 2003, Clark and Park staff successfully located all the populations, some of which had not been observed in 15 years; these populations were subsequently censused in 2004. They found three populations had increased in size, three populations were small but stable, and four populations had decreased in size and were at serious risk of extirpation (Chaney 2007). Data on size classes and productivity were also gathered to compare to Clark's data set; however, analysis is not complete (Chaney 2007). The total number of individuals in the eight populations that were censused (excludes the Signal Peak populations and one Cat Canyon population) in 2004 was approximately 138 individuals. By assuming that the Signal Peak populations and the Cat Canyon populations were the same size as when they were last censused, we conservatively estimate the total number of individuals to be 852 for this year (Chaney 2007).

In November 2006, Park staff censused all accessible populations (excluding the Signal Peak populations) and also noted the extent of damage from pelican nesting and roosting activity, which had greatly expanded in the previous two years. Park staff reviewed Signal Peak population survey data and postulate that, based on a comparison of the accessible portion of this population and the Cat Canyon population (which is similar in topographic position along the south side of the island), the Signal Peak cliff population may have increased in size over the last 20 years (Chaney 2007). Even if the population is stable and has not increased in size from the 534 individuals estimated in 1984, this one population is larger than all the other populations combined. By assuming that the Signal Peak populations were the same size as when they were last censused, we conservatively estimate the total number of individuals to be 928 for this year (Chaney 2007). Note that a true increase in numbers of individuals between 2004 and 2006 cannot be documented; this is an artifact of the assumptions that were made regarding populations for which data were missing.

An additional 80 individuals have become established through outplanting efforts of Park staff; these are located adjacent to the Cave Canyon and Cat Canyon populations (see Recruitment below) (Chaney in litt. 2006, Chaney 2007).

Recruitment

Very little natural recruitment of new seedlings has been observed since Clark's (1989) 3 years of observations. In 2003, a population of 18 individuals was located in Middle Canyon; due to the size of the individuals, Park staff deduced that their establishment occurred some time after Clark's observations were completed. In addition, near Cat Canyon, one population (#8) increased from 27 plants in 1984 to 210 plants in 2006 (Chaney 2007). However, in 18 intervening years, these are the only significant natural recruitment events that have been observed; all other observed recruitment has been comprised of fewer individuals, and has occurred within or adjacent to previously known populations. Clark's demographic studies (Clark 1989) suggest that new population growth in *Dudleya traskiae* may be limited by the following five factors:

1. Viable seed production: The production of viable seeds (as measured by the number of filled seeds produced per fruit and total viable seed production) varied significantly among individuals within populations and among sites. Viability of seed ranged from 40 to 80 percent at different sites. Seed production also varied, with increased seed production correlated with larger population size. Since the variation was due exclusively to an increase in the number of filled seeds per fruit, Clark hypothesized that pollination may be limiting in the smaller populations (Clark 1989).

2. Seed herbivory: Seed herbivory was inferred from observations of *Dudleya* fruit and fruit debris in cases at the openings of deer mouse burrows (Clark 1989). Similar observations have been made by Park staff in subsequent years (Chaney *in litt.* 2006).

3. Seed dispersal: Seed dispersal may be naturally limited in this species of *Dudleya* as it is for others in the genus (Moran in Clark 1989), and may be a factor in maintaining the small, localized populations that give rise to the high degree of endemism displayed by the genus. Seed caching by deer mice may result in herbivory of some seed, but aid in dispersal of the unconsumed portion of seed (Sieg 1987).

4. Seedling herbivory: Herbivory of seedlings was documented by Clark (1989) in a series of experiments in which outplanted seedlings were placed in one of three treatments (exclosure, roof treatment, and open). Herbivory was more extensive in the open and roof treatments than in the exclosures. Herbivory was more extensive in grassland and cactus-dominated habitats than in tarplant (*Hemizonia* sp.) or coreopsis-dominated habitats. In addition to deer mice, owlet moth larvae are suspected of being a primary herbivore of *Dudleya* seedlings (Clark 1989). Evidence of herbivory by deer mice and possibly birds has also been observed by Park staff (Chaney in litt. 2006, Chaney 2007) and others while censusing *Dudleya* populations and monitoring outplanted populations.

5. Seedling death from drought: In Clark's (1989) outplanted seedling experiments, many of the seedlings that did not die from herbivory ultimately died from

desiccation. Chaney (2006) also reported that of 800 seedlings outplanted in April 2005, only 15 percent survived to January 2006, due to the late timing of the outplanting, the lack of spring rains in 2005, and the subsequent desiccation of individuals.

Clark (1989) concluded that the findings of her studies indicated that *Dudleya traskia*e was capable of maintaining itself without active manipulation. She cautioned, however, 3 years of study was insufficient to predict long-term population trends.

The few seedlings that survived Clark's outplanting experiments were subsequently removed from the island. Since then, assisted recruitment has been attempted by Park staff on two occasions over the past 10 years:

- In 1996-1997, outplantings of seedlings greenhouse-grown from seed of two populations were outplanted near their source populations. Both plantings have persisted and have been flowering and producing seed since 1999 (Chaney *in litt.*, 2006).

- In 2005, about 800 seedlings were outplanted from seed collected from seven populations. Due to drought conditions, however, only 15 percent had survived after the first 9 months (Chaney 2007).

Conservation Efforts

Management: The Park has undertaken numerous management actions designed to restore natural processes and remove external sources of disturbance on Santa Barbara Island, including: all visitors are restricted to a designated trail system, camp area, and landing cove, with no off-trail exploration allowed; trails have been removed from Cave and Middle Canyons; hare eradication was completed in 1981; seasonal restrictions are applied as needed. For instance, in 2006, access to the island was restricted to the public during pelican nesting season (National Park Service 2006). Restoration trials that focused on the removal of crystalline iceplant from the island were also undertaken in the mid- to late-80s (Halvorson 1993), though to what extent this occurred in areas of potentially suitable habitat for *Dudleya traskiae* is uncertain.

Research: The Park supported the research carried out by Clark (1989), which contributed greatly to our understanding of the demographics of *Dudleya*. The research was funded by the Service through a section 6 grant to the California Department of Fish and Game.

Outplanting experiments: Park staff has conducted three outplanting trials of *Dudleya* seedlings; these efforts are discussed in the previous section on Recruitment. Because successful seedling establishment appears to be one of the limiting factors in the continued expansion of existing populations and the reestablishment of populations within what appears to be suitable habitat, these efforts are critical to the eventual recovery of the species.

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

In the final rule to list *Dudleya traskiae* as endangered in 1978, only Factors A and C were discussed, and then only briefly. Although not presented within a "Five Factor" format, additional information about historic threats was gleaned from the Recovery Plan (Service 1985).

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

At the time *Dudleya traskiae* was listed (Service 1978), habitat alteration was discussed on the landscape level scale because by then only two populations had been located: one consisting of three individuals that were regenerating from "stubs that had been gnawed to the ground" by the hares; and one population of several hundred individuals that were found clinging to the face of a sea cliff, which presumably had been out of reach of the hares. Much of the rest of the island had been subject to burning, farming, livestock grazing, and subsequent increase in the cover of nonnative species such as iceplant, which can cover large patches of ground precluding the re-establishment of native species. All nonnative herbivores have been removed from the island; the last rabbits were removed in 1981.

Though habitat alteration on a landscape scale has ceased with the establishment of the Park (originally designated a National Monument in 1938), residual impacts remain. Specifically, nonnative plant taxa whose spread was favored by the previous disturbances are still present. In areas with steep slopes, another residual impact is soil erosion caused by previous disturbances; restoring slope stability may take decades, if not longer (McEachern 2004).

In 2004 during surveys, Park staff observed that federally endangered brown pelicans had expanded their roosting habitat onto Santa Barbara Island. By early 2006, pelican roosting activity had expanded greatly, and the Park closed access to the eastern portion of the island (National Park Service 2006). Nesting and roosting activity results in trampling of rosettes, breakage of floral stems, destabilization of slopes which cause plants to become dislodged, and loss of substrate which precludes new seedlings from becoming established. In 2006, an assessment of pelican impacts on *Dudleya traskiae* populations was conducted. Seven of the 11 populations of *Dudleya traskiae* were characterized as having sustained impacts or were immediately vulnerable to impacts from pelican activities (Chaney 2007). Of these, five populations were characterized as being at extreme or high risk of extirpation from these impacts (Chaney 2007). Most of these populations are located along the east margin of the island in the stretch between Arch Canyon and Middle Canyon, and one is located at Cat Canyon on the southern tip of the island.

In 1983, Drost noted that 2 large *Dudleya traskiae* individuals were "stripped from the rocks by exceptionally large waves from a severe winter storm" (Drost *in litt.* 1983). During the 2006 assessment (Chaney 2007), Park staff also noted that erosion,

caused either by pelican activity or natural sloughing, was affecting 7 of the 11 *Dudleya traskiae* populations (Chaney 2007).

2.3.2.2. Overutilization for commercial, recreational, scientific, or educational purposes:

Overcollection was not considered a threat in the final rule to list *Dudleya traskiae* as endangered in 1978. However, the species was placed on the CITES Appendix I List in 1983 due to concern that it could be sought after for international trade. The concern most likely was based on the interest that dudleyas in general generate within the commercial nursery trade. Collection was also mentioned as a concern in the 1985 recovery plan, though at that time there was no evidence that collection had occurred.

In 2003, the species was moved from the CITES Appendix I List to the CITES Appendix II List. This move was based on the lack of evidence that the species was subject to collecting pressure or that it was coveted within the commercial nursery trade (CITES 2003). In general, it does not appear that overutilization constitutes a threat to this species (S. Chaney, Channel Islands National Park, pers. comm. 2006). However, Park staff noted that one incident of collection occurred from one plot that was being monitored by Clark between 1985 and 1987.

In 2004, a special issue of the Cactus and Succulent Journal was devoted to dudleyas; several articles specifically mention *Dudleya traskiae* (McCabe 2004). Whether this publicity has elicited additional interest among collectors to seek out the species is unknown at this time.

2.3.2.3. Disease or predation:

At the time *Dudleya traskiae* was listed, predation by rabbits was considered one of two primary threats to the persistence of the species. The "New Zealand red" rabbits were introduced in 1942, peaked in 1955, and were finally eliminated by the Park in 1981 (McEachern 2004). There is no reason to believe that the sheep and goats that also populated the island between the 1850s and 1915 did not consume those individuals that were accessible (Hochberg et al. 1979). In the same year the species was listed (1978) the largest population was located on the cliffs west of Signal Peak on the southwestern margin of the island. The remote and rocky location protected *D. traskiae* from being consumed by these mammal herbivores. By 1984, after 3 years of intensive surveys, Park staff located a total of 10 populations, ranging in size from 1 to more than 420 individuals (Halvorson et al.1992 in: Junak et al. 1993). Because nonnative herbivores have been eliminated from the island, predation from these animals is no longer considered a threat.

At least by 1979, biologists from the Santa Barbara Museum of Natural History observed that the native deer mice (*Peromyscus maniculatus* ssp. *exilis*) were feeding on *Dudleya traskiae* (Collins et al. 1979). Park staff also observed deer mice feeding on *D. traskiae*, and noted that 30 to 40 percent of their fruiting stalks were gnawed through and broken (Drost 1983 in: Service 1985). Moreover, caches of *D. traskiae*

fruits and fruit debris were observed at the openings of deer mouse burrows (Clark 1989). Herbivory thus could reduce the vigor of individuals through reduction in leaf tissue, and also reduce the amount of seed available to contribute to the seed bank. However, seed caching associated with herbivory may also serve to disperse seed to potentially suitable habitat.

2.3.2.4. Inadequacy of existing regulatory mechanisms:
Inadequacy of existing regulatory mechanisms was not considered a threat to *Dudleya traskiae* at the time of listing and is not considered a threat at this time. Because all populations occur on one island that is managed by Channel Islands National Park, the Park has and continues to have the ability to impose restrictions on access to and use of the island.

2.3.2.5. Other natural or manmade factors affecting its continued existence:
At the time *Dudleya traskiae* was listed, fires were mentioned in the context of agricultural practices that had occurred on the island in the first half of the 1900s. In the Service's recovery plan (1985), we briefly mention that "fire and exotic vegetation remain as potential threats to the species." While intentional fires were previously used to help clear the more level portions of the island for agriculture, any current threat of fire is based more on the presence of nonnative species (such as grasses) that would carry an accidental fire more readily than native vegetation.

Recruitment rates may not keep pace with rates of mortality. Although good recruitment rates under greenhouse conditions have been achieved, recruitment rates observed in the wild appear to be extremely low and episodic. Small populations may be even more vulnerable to reduced viability because the seed they produce have lower germination rates than that produced by larger populations (Clark 1989, Chaney 2007).

Stochastic extirpation of populations and extinction of the species also pose a potential threat to the species and are exacerbated by low recruitment rates. Those populations with low numbers of individuals are particularly vulnerable to extirpation from stochastic events because, due to their tendency to be clumped into colonies, the stochastic event is likely to affect the entire population (Meffe and Carroll 1997). The most likely causes of extirpation are pelican nesting, pelican roosting, and slope erosion. The largest population at Signal Peak, which is located on the face of a sea cliff, is vulnerable to cliff failure.

2.4. Synthesis

At the time of listing, only two populations comprising "a few hundred" individuals were known from Santa Barbara Island. Both of these populations appeared to be remnants of a more widespread distribution on the island which had been browsed by rabbits and hares. One population was comprised of several plants "regenerating from stubs that had been gnawed to the ground by the hares," and the other comprised a few hundred individuals on the face of a sea cliff where the hares could not reach them (Service 1978). By the time the species was listed, the Park had already initiated an aggressive campaign to eliminate the hares; this task was completed 3 years later in 1981.

As of 2006, all nonnative animal species have been removed; however, residual effects in the form of soil compaction, soil erosion, and slow rates of recovery by natural vegetation cover, may be affecting the ability of *Dudleya traskiae* to recover more quickly than it has over the last 20 years.

The Park has undertaken many of the recovery tasks included in the Service's recovery plan (1985). Park management for this species has included landscape-level protective measures; additional surveys that increased the known number of individuals and populations; research that has contributed to our understanding of the life history of the species; and efforts to expand existing and establish new populations. All of these measures have contributed to stabilizing and improving the status of the species.

The primary concerns for the current status of this species are: 1) alteration of habitat through pelican nesting and roosting, and 2) low recruitment rates. At the time of listing, most of the discussion of threats focused on historical alteration of habitat due to the presence of nonnative animal species; low recruitment rates were acknowledged as a potential concern, but little was known at the time to substantiate the level of concern.

Pelican nesting, roosting, and flight activity has emerged as a potential threat to *Dudleya traskiae* and its habitat only within the past 2 years. The extent of this potential threat to the species needs to be assessed over the next few years, and measures taken to ensure that *Dudleya traskiae* populations are protected. After an initial assessment in November 2006 of the magnitude of the threat from pelicans, it appears that most of the populations (and all of them small populations between 1 and 100 individuals each) are being affected by pelican activities. Not only are the current populations being affected, but habitat is being altered such that future recruitment is being compromised.

Along with the new threat of pelican activities, recovery of *Dudleya traskiae* appears to be hampered by the lack of natural recruitment. Bottlenecks to recruitment appear to include both intrinsic as well as extrinsic factors. While the Park has undertaken efforts to expand populations and is committed to continuing these efforts, it is uncertain at this time to what extent this will contribute to recovery of the species.

We believe that *Dudleya traskiae* continues to be threatened with extinction due to its low level of abundance and its threats from pelican roosting and low recruitment. Therefore, we recommend that no change in species listing status occur at this time.

3. RESULTS

3.1. Recommended Classification

___ Downlist to Threatened

___ Uplist to Endangered

___ Delist (indicate reason 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: 8

Although overcollection for commercial trade was a concern at the time of listing, there is no evidence to indicate this is a concern. Therefore, we recommend removing the "C" designation from the priority number.

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

Over the years, the Park, USGS, and the Service have coordinated on prioritizing needed recovery tasks for a large suite of species that are endemic to the northern Channel Islands. The Service should continue to coordinate with the Park and USGS to support needed recovery tasks for *Dudleya traskiae* including:

1. Expand assessment of the threat to *Dudleya traskiae* populations from pelican nesting, roosting, and flight activity. Undertake actions to protect those populations found to be at-risk, as appropriate.

2. Continue efforts to expand existing populations and establish new populations of *Dudleya traskiae*. These efforts should include sufficient logistical support to maximize the success of the efforts (e.g., sufficient staff and logistical support to carry out and monitor the program).

3. Bank seed from any populations that are not yet represented in seedbank collections. In addition to maintaining collections at the Park, a portion of the seed banks should be maintained by a facility within the Center for Plant Conservation network (likely Santa Barbara Botanic Garden or Rancho Santa Ana Botanic Garden).

REFERENCES

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of
Santa Barbara Island Liveforever (*Dudleya traskiae)*

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

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

Appropriate Listing/Reclassification Priority Number, if applicable: N/A

Review Conducted By: Connie Rutherford

FIELD OFFICE APPROVAL:

Field Supervisor, Fish and Wildlife Service

Approve Diane K Noda Date 12/31/07

REGIONAL OFFICE APPROVAL:

Regional Director, Fish and Wildlife Service

Approve Paul Henson Date 1/10/08