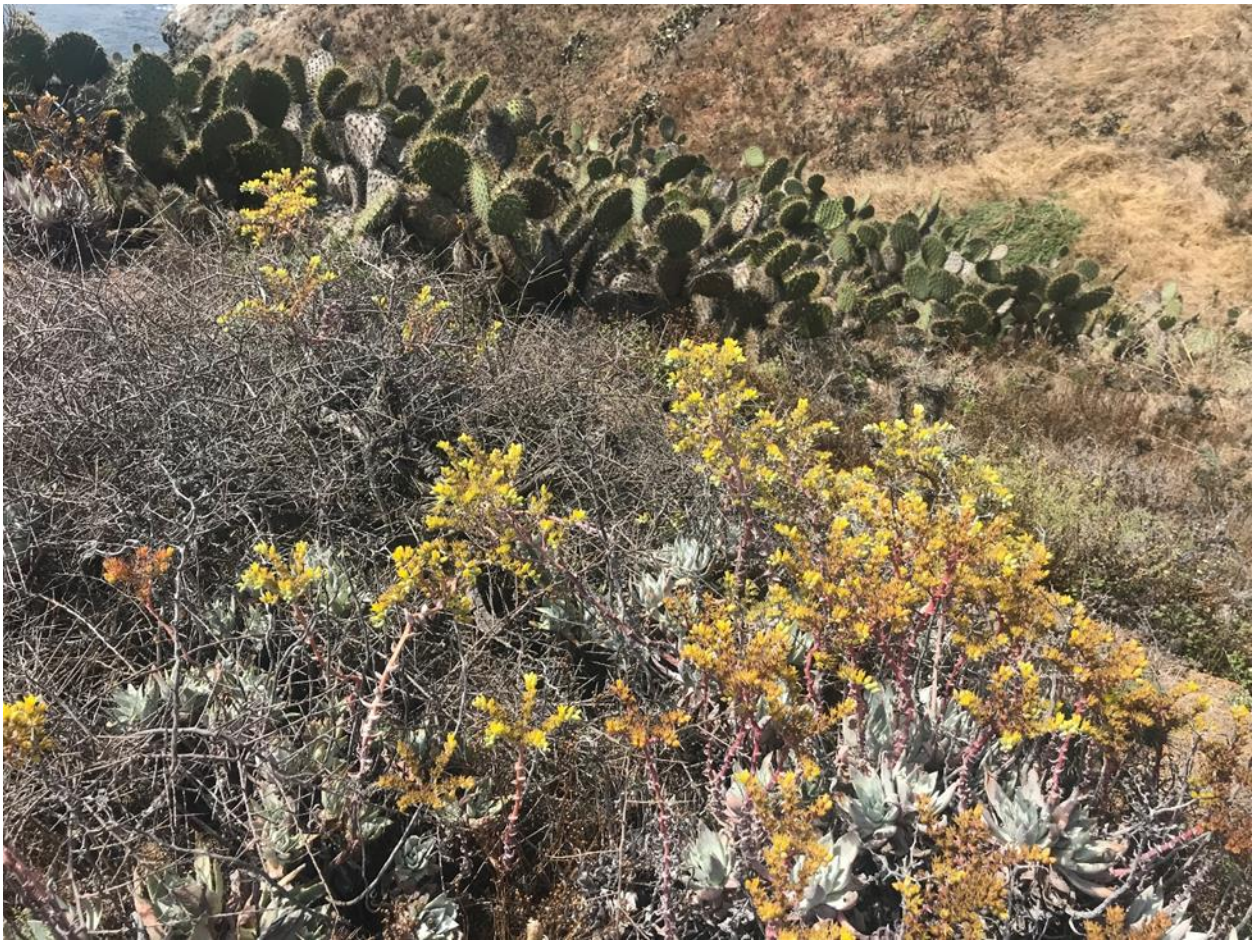
Santa Barbara Island liveforever *(Dudleya traskiae)*

5-Year Review: Evaluation and Summary



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

February 2025

5-YEAR REVIEW

Santa Barbara Island liveforever *(Dudleya traskiae)*

GENERAL INFORMATION:

Species: *Dudleya traskiae* (Rose) Moran
Date listed: April 26, 1978
Federal Register (FR) citation: 43 FR 17910
Classification: Endangered
Critical Habitat Designation:
We have not designated critical habitat for Santa Barbara Island liveforever.
State Listing: California State Endangered (CNDDB 2025, p. 16).

BACKGROUND:

Species overview:
Santa Barbara Island liveforever (*Dudleya traskiae*), is a succulent perennial herb in the stonecrop family (Crassulaceae; McCabe 2012). A single plant can have up to 50 rosettes, and each rosette is typically to 3–6 inches (8–15 centimeters) wide. Leaves on a plant may be glabrous to glaucous. The yellow-flowered inflorescences are about up to 20 inches (50 centimeters) long, and flowering is May through July.

The plant is generally found on steep rocky slopes and ridges and in other exposed areas (Spath et al. 2023 pp. 245–246). At the time of the last 5-year review (Service 2021), most plants were located on cliffs and could be not seen except through aerial surveys, and were counted by analysis of photographs taken from a helicopter.

The species occurs only on Santa Barbara Island in Santa Barbara County, California, about 38 miles (61 kilometers) from the mainland, and 24 miles (29 kilometers) from the next nearest island, Santa Catalina Island. Santa Barbara Island is the smallest of the California Channel Islands, with an area of about 1 square mile (226 hectares), and length of about 1 mile (1.6 kilometers). It is entirely owned by Channel Islands National Park (CINP), and all land is managed for natural resource conservation.

Most recent status review:
[Service] U.S. Fish and Wildlife Service. 2021. Santa Barbara Island liveforever (*Dudleya traskiae*). 5-Year Review: Evaluation and Summary. U.S. Fish and Wildlife Service, Ventura Field Office, Ventura, California. 13 pp.

In our 2021 status review, we recommended no status change from endangered for Santa Barbara Island liveforever.

FR notice citation announcing this status review:
[Service] U.S. Fish and Wildlife Service. 2024. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews for 59 Pacific Southwest Species. Federal Register 89:83510–83514.

ASSESSMENT:

Information acquired since the last status review:
The U.S. Fish and Wildlife Service's (Service) Ventura Fish and Wildlife Office (VFWO) conducted this 5-year review. We announced the review through a Federal Register notice on October 16, 2024 (Service 2024). We did not receive any information from the public in response to our Federal Register Notice announcing this 5-year review. We conducted a literature search and a review of information in our files, and also contacted botanists at Channel Islands National Park, U.S. Geological Survey, Santa Barbara Botanic Garden, California Institute of Environmental Studies (CIES), and other botanists to request any data or information we should consider in our review.

Santa Barbara Island liveforever has updated information on distribution, abundance, recovery planting, and conservation seed banking.

Distribution and abundance:
Distribution: The California Natural Diversity Database (CNDDB) defines an Element Occurrence (EO) as a group of plants separated from the next group of conspecifics by at least ¼ mile (CNDDB 2018, entire). The EOs for Santa Barbara Island liveforever in CNDDB (2025) have not been updated since before the last 5-year review (Service 2021). Table 1, adapted from the 2021 5-year review, lists current EOs as well as occurrences that are not yet recorded as EOs.

Table 1. Santa Barbara Island liveforever Element Occurrence and colony numbering on Santa Barbara Island. CIES = California Institute of Environmental Studies, CINP = Channel Islands National Park, CNDDB = California Natural Diversity Database, and EO = Element Occurrence. The question marks mean there is some uncertainty about the relative location of colonies in Middle Canyon in the CINP documents. Data are from Service 2021.

CNDDB EO #	CIES colony #	CINP colony #	Location description
2	**1**	1	Cave Canyon— mouth
2	**2**	2?	Middle Canyon— upper middle
2	**3**	3	Middle Canyon— upper
2	**4**	4?	Middle Canyon— mouth
2	**5**	5	Graveyard Canyon— terrace
1	**6**	6	Cat Canyon
1	**7**	7	Cat Canyon— west of; in flats
1	**8**	8	Cat Canyon— west of; on slopes
1	**9**	9	Signal Peak— slopes below
5	**10**	10	Cliff Canyon area
1	**11**	none	Signal Peak— North
2	**12**	11?	Middle Canyon— lower middle
none	**13**	none	North Peak— slopes
none	**14**	none	Housing Area— outplanted

Within EOs, colony numbers further refine the Santa Barbara Island liveforever distribution by distinct groups of plants. CIES established and has been using CIES colony numbers since about

2013, which superseded CINP colony numbers (Service 2021 p. 3; Table 1). From here on in this review, "colony" refers to CIES colony number. The continued use of CIES colony numbers fulfills Recommendation for Future Action 1 of the last 5-year review (Service 2021 p. 11). There are 14 colonies, and this number has not changed since the last 5-year review (Service 2021 p. 3). Figure 1 shows colony locations.

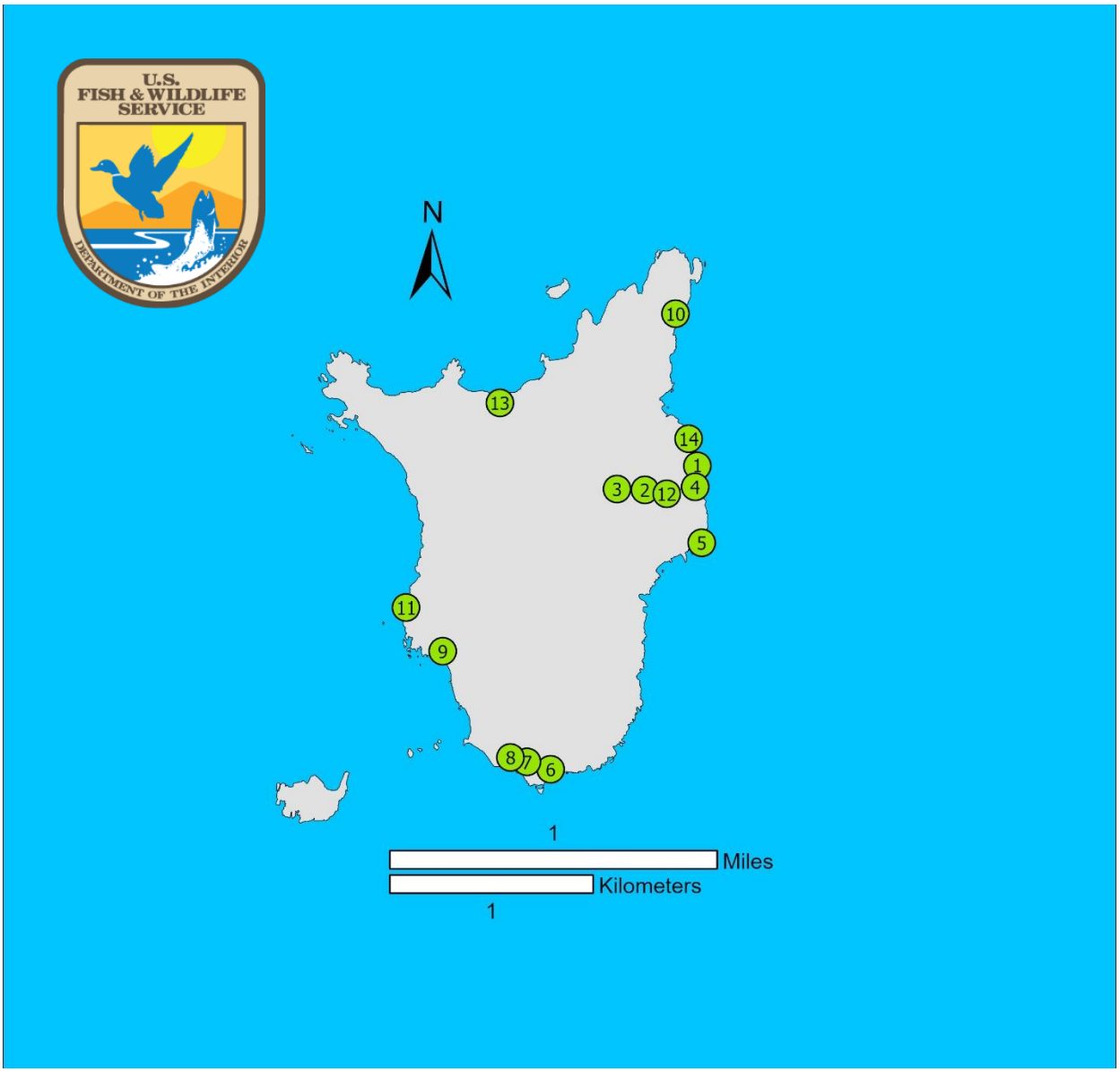

Figure 1. Distribution of Santa Barbara Island liveforever colonies on Santa Barbara Island (Parker et al. 2024). Numbers correspond to those in Table 1.

Abundance: CIES completed the most recent plant counts of Santa Barbara Island liveforever in 2024 (Parker *et al.* 2024), as a combination of ground surveys and analysis of photos taken from a helicopter (Table 2). Most colonies were surveyed using only ground surveys (colonies 1, 2, 3, 4, 12, 14) or helicopter (colonies 5, 9, 11, 13) methods, but four colonies were surveyed using both (colonies 6, 7, 8, 10), and for these four colonies the numbers of plants were similar

between the two methods. Surveys totaled 3,800 plants; of these 3,486 are natural and 314 are outplanted (see Recovery Planting section below). Almost two-thirds of the plants on the island were found with the helicopter survey of colony 11, which, before any helicopter surveys were conducted, we considered extirpated in the 2012 5-year review (Service 2012 p. 8).

Table 2 Santa Barbara Island liveforever abundance on Santa Barbara Island in 2024. For colonies with both ground and air surveys, we used the larger number of plants as the final number of plants. Data are from Parker et al. 2024.

Colony #	Location Description	Ground Survey # Plants	Aerial Survey # Plants	Final # Plants
1	Cave Canyon— mouth	35	no data	35
1	Cave Canyon— mouth outplanted	45	no data	45
2	Middle Canyon— upper middle	17	no data	17
3	Middle Canyon— upper	7	no data	7
3	Middle Canyon— upper outplanted	50	no data	50
4	Middle Canyon— mouth	46	no data	46
5	Graveyard Canyon— terrace	no data	1	1
6	Cat Canyon	34	46	46
7	Cat Canyon— west of; in flats	128	104	128
8	Cat Canyon— west of; on slopes	278	241	278
9	Signal Peak— slopes below	no data	185	185
10	Cliff Canyon area	0	0	0
11	Signal Peak— North	no data	2,240	2,240
12	Middle Canyon— lower middle	62	no data	62
13	North Peak— slopes	no data	441	441
14	Housing Area— outplanted	219	no data	219
			Total	**3,800**

Trends in abundance: Because of herbivory from non-native animals, botanists considered Santa Barbara Island liveforever to be possibly extinct in 1972 (Philbrick 1972 p. 342). However, since the eradication of these non-native animals, plant numbers have increased such that the 2024 total abundance of 3,800 plants is the highest yet recorded. Colony 11contains most of the plants of the species, 2,240; about 59% of the total. These plants can only be seen by helicopter; ground-based surveys are not possible at this colony. It is likely that this colony has been extant for many years, but just not detected.

Table 3 tracks changes in abundance at colonies over time from 1984 to 2024. We combined numbers of plants in colonies 2, 3, 4, and 12 in Middle Canyon because of uncertainty of colony identity before 2013. In general, colonies are stable or increasing in plant numbers over time, except for colony 5 in Graveyard Canyon and colony 10 in the Cliff Canyon area, which are either near extirpation or extirpated. Both of these colonies are in areas of pelican nesting (Parker et al. 2024 pp. 5–6). These trends are similar to those identified in the last 5-year review (Service 2021).

Table 3. Santa Barbara Island liveforever abundance trends on Santa Barbara Island from 1984 to 2024 by colony or group of colonies. Data from Parker et al. 2021 and 2024 and Service 2012.

Colony #	Location Description	1984	1985	2013	2020	2024	Trend
1	Cave Canyon—(mouth	5	25	15	54	80	increasing
2, 3, 4, 12	Middle Canyon	77	84	>270	91	192	stable?
5	Graveyard Canyon—terrace	1	1	1	0	1	extirpation?
6	Cat Canyon	21	28	10	17	46	stable
7	Cat Canyon—west of; in flats	1	7	2	38	128	increasing
8	Cat Canyon—west of; on slopes	27	51	100	198	278	increasing
9	Signal Peak—slopes below	no data	no data	7	150	185	stable?
10	Cliff Canyon area	7	11	2	0	0	extirpated
11	Signal Peak—North	no data	no data	no data	1,683	2,240	stable?
13	North Peak—slopes	no data	no data	no data	122	441	increasing?
14	Housing area—outplanted	no data	no data	no data	no data	219	not applicable
	Total known:	**139**	**207**	**>397**	**2,353**	**3,800**	**increasing**

While the total number of plants counted increased from 2,353 to 3,800 between 2020 to 2024, there are two factors, besides actual recruitment, that may have influenced the increased count (Parker et al. 2024 pp. 7–8). First, 2023 and 2024 were relatively high rainfall years, which may have caused rapid growth of undetected small plants present in 2020, and made them detectable in 2024. Second, there was a switch in cameras used in the aerial surveys from a 20.2 MP model in 2020 to a 32.5 MP model in 2024. This may have made plants that were not discernable in 2020 countable in 2024. However, colonies that were surveyed with both methods (colonies 6, 7, and 8) all had similar substantial increases with both ground and aerial surveys, suggesting that the increases between 2020 and 2024 are both real and from recruitment.

We also assessed change in abundance in CNDDB Element Occurrences. In Table 4, we pooled the numbers of plants in colonies by EO and compared across years. We excluded colonies 9 and 11 from EO 1 because they were not surveyed in 2013. EOs 1 and 2 have each increased in abundance over their survey histories, as has the occurrence on North Peak slopes. EO 5 remains apparently extirpated.

Table 4. Abundance of Santa Barbara Island liveforever element occurrences on Santa Barbara Island from 2013 to 2024. CNDDB = California Natural Diversity Database, EO = Element

Occurrence, CIES = California Institute of Environmental Studies. Data from CIES 2015 and CIES 2021.

CNDDB EO #	CIES colony #	EO # location description	1984 total #	1985 total #	2013 total #	2020 total #	2024 total #
1	6, 7, 8 (excluding 9, 11)	south and east slopes and cliffs	49	86	112	253	452
2	1, 2, 3, 4, 5, 12	center east canyons and slopes	83	110	>286	145	213
5	10	Cliff Canyon slopes	7	11	2	0	0
none	13	North Peak— slopes	no data	no data	no data	122	441

Recovery planting:
CIES planted 1,526 nursery-grown plants on Santa Barbara Island from 2021–2022 (Parker et al. 2024 pp. 6–8). Of these, 314 survived until the 2024 survey, for a 21% survival rate. These plants are at Cave Canyon (45, colony 1), Upper Middle Canyon (50, colony 3), and in the Housing Area (219, colony 14).

Conservation seed banking:
Conservation seed banking has increased since the 2021 5-year review when no seeds were in storage in a Center for Plant Conservation (CPC) approved facility. Currently there are three Santa Barbara Island liveforever conservation seed accessions listed in the California Plant Rescue (CaPR) online database (Table 1, CaPR 2025), with a total of 70,410 seeds.

Table 5. Santa Barbara Island liveforever seed in the California Plant Rescue online database (CaPR 2025). All are housed at the Santa Barbara Botanic Garden.

CNDDB EO #	Colony number and location	Year collected	# maternal lines	# seeds
1	6: Cat Canyon	2020	32	13,661
1	8: Cat Canyon— west of, on slopes	2020	36	33,933
2	4: Middle Canyon— mouth	2020	39	22,816

All seed accessions are stored at the Santa Barbara Botanic Garden, a facility approved by the CPC. Seed accessions represent two occurrences, EOs 1 and 2, while EO 5 and the two unnumbered occurrences are unrepresented. However, it may be that genetic representation for the species is effectively conserved. It is likely that before the introduction of non-native herbivores, the distribution of Santa Barbara Island liveforever was effectively continuous on the island, and that there was a single panmictic population (M. Guilliams pers. comm. to K. Niessen). Genetic sampling would be required to confirm this (Parker et al. 2024 p.9).

Threats:

At the time of listing (Service 1978), we described the primary threats to Santa Barbara Island liveforever as habitat alteration from the destruction of native vegetation by previous agricultural activities, and ongoing predation of the species by "European hares" (actually European rabbits at listing, McEachern *et al*. 2016 p. 759). Santa Barbara Island harbored feral goats (*Capra aegagrus hircus*) from the 1840s until before 1915 (Service 1985 p. 13–14), was used for grazing sheep (*Ovis aries*) periodically from the 1860s to the 1940s, and was farmed from about 1915–1922 (Livingston 2016 pp. 839–851), but agriculture was never successful because the island lacks reliable water. Besides goats and sheep, major non-native herbivores of native vegetation were European hares (*Lepus europaeus*, present 1918–1930s) followed by European rabbits (*Oryctolagus cuniculus*, present 1942–1981, McEachern *et al*. 2016 p. 759), which so severely impacted Santa Barbara Island liveforever that botanists considered the species extinct for several years in the mid-1970s (Moran 1978, p. 38).

The 1985 recovery plan and 2008, 2012, and 2021 5-year reviews evaluated the continued impact of these threats, and identified other threats, including competition with non-native plants, mouse and moth larva herbivory, fire, stochastic extirpation and extinction, low reproduction and recruitment, pelican effects, and effects of climate change, including increased temperatures, change in precipitation regimes, increased wildfire risk, and sea level rise. For this 2025 5-year review, the threats discussed in the 2021 5-year review remain largely unchanged. We briefly discuss these threats below.

Habitat alteration from the destruction of native vegetation by previous farming and grazing activities: The continued importance of habitat alteration was noted in the 1985 recovery plan and the 2008, 2012, and 2021 5-year reviews. While no farming or grazing has occurred on Santa Barbara Island since the 1920s, the effects on the landscape and vegetation are persistent. Since that time there has been a lack of passive recovery of native vegetation (Handley *et al.* 2013 pp. 158–179), such as is seen on Santa Cruz Island (Beltran *et al.* 2014 entire). The vegetation on Santa Barbara Island continues to be dominated by non-native annual grassland with non-native succulent iceplants (*Mesembryanthemum crystallinum* and *M. nodiflorum*,).

The recovery criteria in the 1985 recovery plan include that Santa Barbara Island liveforever distribution be expanded to encompass more potential suitable habitat. The most recent assessment of Santa Barbara Island liveforever suitable habitat was about 35 years ago (Clark 1989), and the 2008, 2012, and 2021 5-year reviews state that a better definition of suitable habitat is needed and recommend mapping potential suitable habitat.

Non-native herbivores: At the time of listing, European rabbits were still present on Santa Barbara Island. These were removed by the time of the 1985 recovery plan and are no longer a direct threat, however there are long-lasting indirect threats, such as the increase in non-native plants, that still remain.

Non-native plants: The 1985 recovery plan and 2008, 2012, and 2021 5-year reviews emphasized the possible competitive effects of non-native plants. The competitive effects of

non-native plants on the species remain unknown, but are likely to vary with local plant densities, microhabitat, and annual precipitation.

Illegal collecting: The 1985 recovery plan and the 2008, 2012, and 2021 5-year reviews all consider illegal collecting as a threat, but conclude that illegal collection was unimportant. There have been no recent reports of illegal collection of Santa Barbara Island liveforever from Santa Barbara Island, and the threat remains minor. The species is readily legally available in the horticultural trade.

Predation by native mice: Native deer mice (*Peromyscus maniculatus elusus*) eat seeds, seedlings, and mature plants of Santa Barbara Island liveforever. The 1985 recovery plan noted predation by the native mice, but did not consider it important. The 2008, 2012, and 2021 5-year reviews give more importance to mouse predation, and the 2012 5-year review linked mouse numbers to fluctuations in abundance non-native annual grasses. Given the observations by CIES of mouse damage to recent outplantings (Schneider and Carson 2022 p. 90), mouse predation remains a threat to the species, especially in dry years following high grass abundance years. With the relatively high precipitation of 2022 and 2023 water years, the expectation is that mouse predation may increase in the near future.

Seedling predation by owlet moth larvae: Predation on Santa Barbara Island liveforever seedlings by owlet moth (Noctuidae) larvae (Clark 1989 p. 46) was identified in the 2008 5-year review as a potential threat. No work has been done on this interaction, and the importance of this threat remains unknown.

Fire: The 1978 listing mentioned intentional agricultural burning as a factor in the original vegetation alteration, and the 1985 recovery plan briefly mentioned without discussion that fire remained a potential threat at that time. The 2008, 2012, and 2021 5-year reviews consider fire to be a threat to the species, and as long as non-native annual grasses that can easily carry a fire remain abundant on the island, fire will remain a potential threat to the species.

Stochastic extirpation of populations and extinction of the species: At the time of listing in 1978, we only knew of a few hundred individuals of Santa Barbara Island liveforever. The 1985 recovery plan discussed a need to augment the species with outplanted individuals to increase numbers. The 2008, 2012, and 2021 5-year reviews emphasized that the species is threatened by the stochastic extirpation of populations, leading to extinction, and considered small population size to be the largest threat to the species. Available data (Tables 3 and 4) suggest the possible extirpation of two colonies with historically few individuals, indicating that stochastic extirpation of populations with small colony size remains a threat to the species. The number of individuals has increased by an order of magnitude since listing, but there are still fewer than 4,000 plants, and the threat of stochastic events leading to extinction remains.

Low reproductive and recruitment rates: The 2008, 2012, and 2021 5-year reviews considered low reproductive and recruitment rates to be threats to the Santa Barbara Island liveforever. There have been no studies directly addressing reproduction and natural recruitment in the field since the 2012 5-year review, and the magnitudes of these threat

remain unknown. However, the number of plants is increasing over time, and low reproductive and recruitment rates may not be as great a concern if that trend continues.

Pelican nesting and roosting habitat effects and trampling: The 2008 and 2012 5-year reviews described how brown pelican (*Pelicanus occidentalis*) nesting and roosting unfavorably altered habitat for Santa Barbara Island liveforever. The soils become nutrient enriched by guano, favoring annual grasses which compete with Santa Barbara Island liveforever. The soil can become either more compacted or have increased erosion from pelican activity, and pelicans can damage plants directly by trampling. The magnitude of these effects varies yearly depending on pelican abundance, but a single season of pelican nesting can kill the impacted Santa Barbara Island liveforever plants. Colony 10 may have been extirpated by pelican activity. The threat of pelican effects on Santa Barbara Island liveforever plants remains, although the magnitude of the effects on the species a whole is unclear because the effects on the large cliff colony 11 are unexplored.

During the outplanting effort beginning in 2021, pelicans in Middle Canyon nested on or around cages meant to prevent outplantings from being eaten by mice (Parker et al. 2024 p. 8). While some cages and plants were destroyed, about 90% (50) of the plants remained alive in cages until 2024. The advantages of cages for outplantings clearly outweigh the disadvantages.

Climate change: We included the effects of climate change as a potential threat to Santa Barbara Island liveforever in the 2012 5-year review. We used the most recent San Diego area climate assessment (Kalansky et al. 2018 pp. 18–39) instead of the geographically closer Los Angeles assessment because the vegetation of Santa Barbara Island is more similar to that of southern San Diego County and northern Baja California than to that of the Los Angeles area. The general predictions for climate change on Santa Barbara Island do not differ substantially between 2012 and the most recent regional climate assessment. While magnitudes are not certain, predictions call for increased temperatures, more episodic rainfall, longer periods of drought, increased wildfire risk, and sea level rise. Drier conditions with increased rainfall-induced erosion and increased risk of fire are threats to Santa Barbara Island liveforever, as is wave-induced erosion effected by sea level rise on coastal cliffs where the species is generally found.

Summary of threats:

A major direct threat to Santa Barbara Island liveforever, herbivory from non-native herbivores, has been removed with the removal of European rabbits in the early 1980s. The threats from altered habitat, competition with non-native plants, collecting, mouse and moth larva predation, wildfire, stochastic extirpation and extinction, low reproduction and recruitment, pelican effects, and effects of climate change remain, but are generally not well understood. Some of these threats may interact. For example, historical habitat alteration has resulted in a landscape with abundant annual grasses which can compete directly with Santa Barbara Island liveforever, support a larger mouse population which eats the species, and increase the amount of relatively flammable fuel. The expectation of continued climate change is to favor non-native grasses (Sandel and Dangremond 2012 entire). Threats will be best understood and managed when addressed together.

Evaluation of Recovery Criteria:
We list recovery criteria in the Recovery Plan (Service 1985, p. 22).

Downlisting criteria for Santa Barbara Island liveforever:

1. *Secure all colonies of the species in a vigorous, self-sustaining condition.*
   Most colonies are increasing or stable, and the 2024 surveys yielded the largest recorded total number of plants to date. Therefore, the intent of this criterion has been met.
2. *Expand the distribution of the species to include 50 percent of the suitable potential habitat.*
   The recovery plan states that, "criteria for identifying suitable habitat will be determined following studies." Suitable habitat has not yet been defined and, while outplanting has occurred, known locations have not been documented to have expanded in area. Therefore, this criterion has not been met.

Delisting criterion for Santa Barbara Island liveforever:

1. *After meeting the downlisting criteria above, expand the distribution of the species to include 95 percent of the suitable potential habitat.*
   This criterion has not been met, because downlisting criteria 1a and 1b have not been met.

Conclusion:
After reviewing the best available scientific information, and the evaluation of threats affecting the species under the factors in 4(a)(1) of the Endangered Species Act, and analysis of the status of the species, we conclude that Santa Barbara Island liveforever remains an endangered species. There is a documented increased abundance of plants known from the island and the intent of one of the downlisting criteria has been met. However, at this time the threats from altered habitat, competition with non-native plants, and effects of climate change remain.

RECOMMENDATIONS FOR FUTURE ACTIONS:

The following lists carries over recommendations from the previous 5-year review (Service 2021).

1. Continue regular monitoring Santa Barbara Island liveforever so that meaningful comparisons can be made between monitoring events.

2. Continue helicopter surveys to assess colonies not easily seen with ground-based surveys.

3. Establish conservation seed banks for remaining occurrences (EO 5, and the unnumbered occurrence colony 13) at Center for Plant Conservation approved facilities.

4. Develop strategies to overcome detrimental effects of deer mice on seedlings, outplantings, and established plants.

5. Develop strategies to overcome detrimental effects of pelicans on the Santa Barbara Island liveforever.

6. Define habitat suitable habitat for Santa Barbara Island liveforever and map potential suitable habitat.

7. Continue outplanting efforts to augment existing colonies and establish new colonies to bridge gaps between existing colonies.

Supervisor, Ventura Fish and Wildlife Office

Approved CATHERINE DARST Digitally signed by CATHERINE DARST Date: 2025.03.04 11:50:14 -08'00'

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