

FINAL REPORT

STATUS OF THE ENDANGERED AND RARE PLANTS
ON SANTA BARBARA ISLAND
CHANNEL ISLANDS NATIONAL PARK

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ABSTRACT

The populations of four endangered and rare plant taxa were monitored during 1985-1989 on Santa Barbara Island, Channel Islands National Park, California. Data collected included the number and location of sites supporting each taxon, numbers of plants at each site, numbers of mature and immature plants at each site, and the physical features of the habitat supporting these taxa.

The populations underwent dynamic changes in numbers of individuals during the study period, with a net loss of individuals in the Astragalus traskiae population, a relatively stable Dudleya traskiae population, and population increases for Eriogonum giganteum ssp. compactum and Platystemon californicus var. ciliatus.

The data from this five-year study indicate the need to continue to monitor each of these taxa to determine natural population fluctuations. The lack of consistent directional change in population numbers precludes the prediction of future population trends. If populations stabilize or continue to expand in numbers and geographic range, future management may simply require continued protection and monitoring. However, if populations show a decrease in numbers and/or range, as was observed for Astragalus traskiae, active manipulation may be necessary to preserve viable populations.

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INTRODUCTION

Santa Barbara Island is one of the eight Channel Islands off the coast of Southern California (Figure 1), and one of five islands managed by the National Park Service (NPS) as Channel Islands National Park. It is the smallest of the Channel Islands at 2.6 square kilometers (km). Santa Barbara Island supports 116 vascular plant taxa, 14 (12%) of these are insular endemics (Anon. 1987).

In accordance with NPS management guidelines, (U.S. National Park Service Management Policies, 3-88 (draft) ed. p. 5.3) a study of the rare plants on Santa Barbara Island was undertaken to clarify the status of four insular endemic plant taxa. Three of these taxa, Dudleya traskiae (Santa Barbara Island live-forever), Astragalus traskiae (Trask's locoweed) and Eriogonum giganteum ssp. compactum (Santa Barbara Island buckwheat) are listed as endangered or rare by the state and federal governments (CDFG 1989, USFWS 1989). The fourth taxon, Platystemon californicus var. ciliatus (Santa Barbara Island cream cups), is under consideration for listing by the federal government (USFWS 1985). All four taxa are considered endangered or rare by the California Native Plant Society (CNPS) (Smith and Berg 1988). The listing status of these plants is given in Table 1. This research, in addition to increasing our understanding of the population dynamics of these endangered and rare endemic plants, was designed to provide pertinent information for the management of viable populations of these taxa on Santa Barbara Island.

In a discussion of rarity in plants, Harper (1981) suggested that the concept of time as well as that of space is important in interpreting the rarity of a taxon. This concept of time is often overlooked in investigations of rare taxa where population numbers and geographic distribution at a single point in time are the primary considerations in describing rarity. A knowledge of the changes in the abundance and geographic distribution of a species through time is essential in interpreting its status and in planning management actions. For endemic plants, changes in geographic distribution are especially of interest, particularly when the present distribution of a taxon is extremely narrow.

There are many causes of both endemism and rarity in plants (Drury 1980, Raven and Axelrod 1978, Stebbins 1980). The rarity of a taxon may be interpreted in terms of abundance (numbers of individuals) and/or geographic range. Stebbins (1942) recognized three general categories of

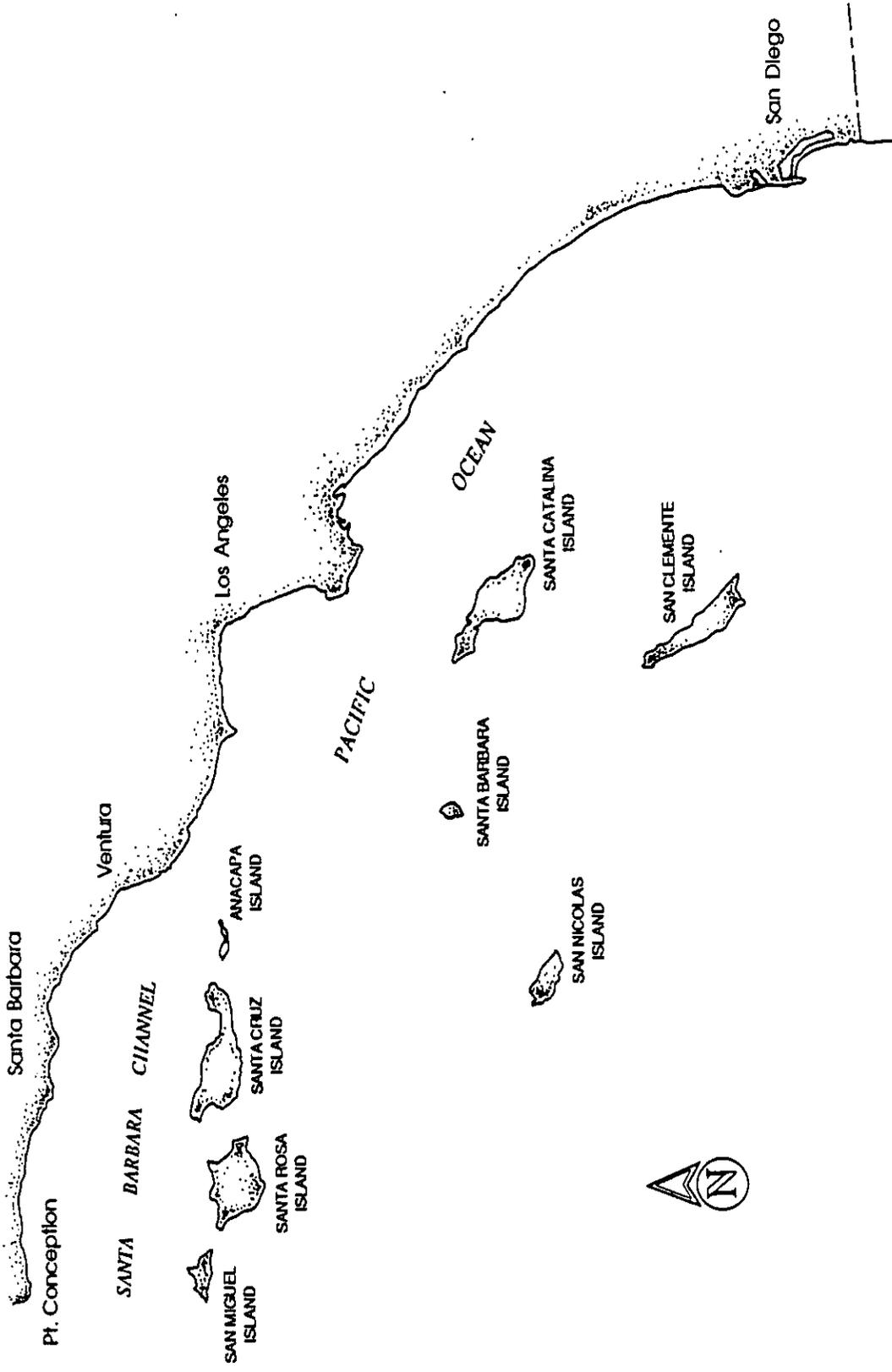


Figure 1. Santa Barbara Island and vicinity. The eight islands of the California Channel Islands are represented as well as the adjacent mainland area.

Table 1. Listing status of the endangered and rare plants of Santa Barbara Island, California. The definition for each listing category is provided in Appendix A.

	Federal	State	CNPS
<u>Astragalus traskiae</u> Trask's locoweed	C-2	R	1B
<u>Dudleya traskiae</u> Santa Barbara Island live-forever	E	E	1B
<u>Eriogonum giganteum</u> s. <u>compactum</u> Santa Barbara Island buckwheat	C-2	R	1B
<u>Platystemon californicus</u> v. <u>ciliatus</u> Santa Barbara Island cream cups	C-2	none	1B

Legend

- C-2: Category 2 candidate for listing as threatened or endangered
 E : Endangered
 R : Rare
 1B : Rare or Endangered in California and elsewhere

rarity that encompass 1) widespread taxa that are found as small isolated populations or scattered individuals throughout their range, 2) extremely localized taxa that are abundant where they are found and 3) narrow endemics that are found in only one or two locations worldwide, often in low numbers.

California is rich in endemic taxa (Kruckberg and Rabinowitz 1985) with nearly one-third of the 7000 native taxa endemic to a particular habitat type or locality. Further, approximately 23% of the native plants are considered endangered, threatened or rare, including approximately 45% of the endemic taxa (Smith and Berg 1988). Like the flora of the entire state, the flora of the California Channel Islands is rich in endemic plants with approximately 16% of the taxa endemic to one or more of the islands (Wallace 1985). The causes of rarity throughout California are varied and include anthropogenic as well as natural causes. Some taxa appear to have always been rare, while others, that are rare today, were apparently once more widespread (Smith and Berg 1988).

It appears that the narrow endemism of the taxa considered in this research is the result of isolation and subsequent speciation, for there is no evidence that the geographic range of these taxa was ever greater than it is today. Whether these plants were historically more widespread on Santa Barbara Island is not clearly documented by collections, but it is likely that anthropogenic influence has contributed to the extreme rarity of these plants.

This research was designed to describe the current demographic status and ecological habitat of the following endangered and rare taxa: Dudleya traskiae, Astragalus traskiae, Eriogonum giganteum ssp. compactum and Platystemon californicum var. ciliatus on Santa Barbara Island. This research provides baseline data that will allow future evaluations of population trends, and changes in geographic distribution and habitat affinities through time. The two specific questions addressed in this research are:

1. What is the ecological status of the endangered and rare plants on Santa Barbara Island, including:
 - a. geographic distribution
 - b. population size and structure
 - c. reproduction
2. What factors appear to be limiting population growth?

This report summarizes the population and habitat data for each of the rare plants, and discusses an overall trend of vegetation change observed on Santa Barbara Island in recent years. A separate report that provides a detailed action plan for the management of these plants will be provided to Channel Islands National Park staff. This report meets the requirements of the Memorandum of Agreement (MOA) with the California Department of Fish and Game (CDFG), Contract No. FG-7478, and United States Fish and Wildlife Service (USFWS) Contract No. EP85 III-1.

HISTORICAL ASPECTS OF THE STUDY SITE

The vegetation of Santa Barbara Island has been influenced by more than 100 years of anthropogenic disturbance including herbivore introductions, farming, burning and intensive use of the island by the U.S. Navy following World War II. The botanical history of the island is not well-documented. The bulk of the collections have been made since the 1930's, well after the effects of man and introduced herbivores began. Therefore, there is little first-hand information from which a description of the pristine vegetation of the island might be reconstructed. The literature does suggest, however, that some profound changes in plant community diversity and species diversity have occurred. Much of the island is now dominated by herbaceous alien plants (Figure 2) (Halvorson 1988). The eastern terrace, which once supported dense stands of native shrubs, including giant coreopsis (Coreopsis gigantea) and boxthorn (Lycium californicum) (Dunkle 1950), is now a well-developed grassland. Of the 116 vascular plant taxa found on Santa Barbara Island, 36 (31%) are considered alien to the island flora (Anon. 1987). These alien taxa account for approximately 60% of the total vegetation cover on the island (Halvorson 1988).

As is true for the pre-disturbance vegetation on Santa Barbara Island, the historic distribution of the rare taxa is not well-documented. Many of the sites supporting these plants today are on the steep sea cliffs of the island. The relictual nature of this distribution is probably the result of habitat degradation and browsing by alien herbivores at more accessible sites.

Santa Barbara Island is now managed as a preserve, with the goal of restoring the native vegetation, and limiting disturbance by man. All alien herbivores have been removed from the island and visitor use is restricted to a designated trail system. Vegetation data collected on the island in recent years, as well as general observations, have shown that a recovery of the native plants is occurring. Some of the native shrubs that were formerly confined to the sea slopes are expanding their range to occupy more inland sites on the island. Similar habitat expansion has occurred for some of the endangered and rare taxa (hereafter, to simplify the text, referred to as rare taxa) considered here.

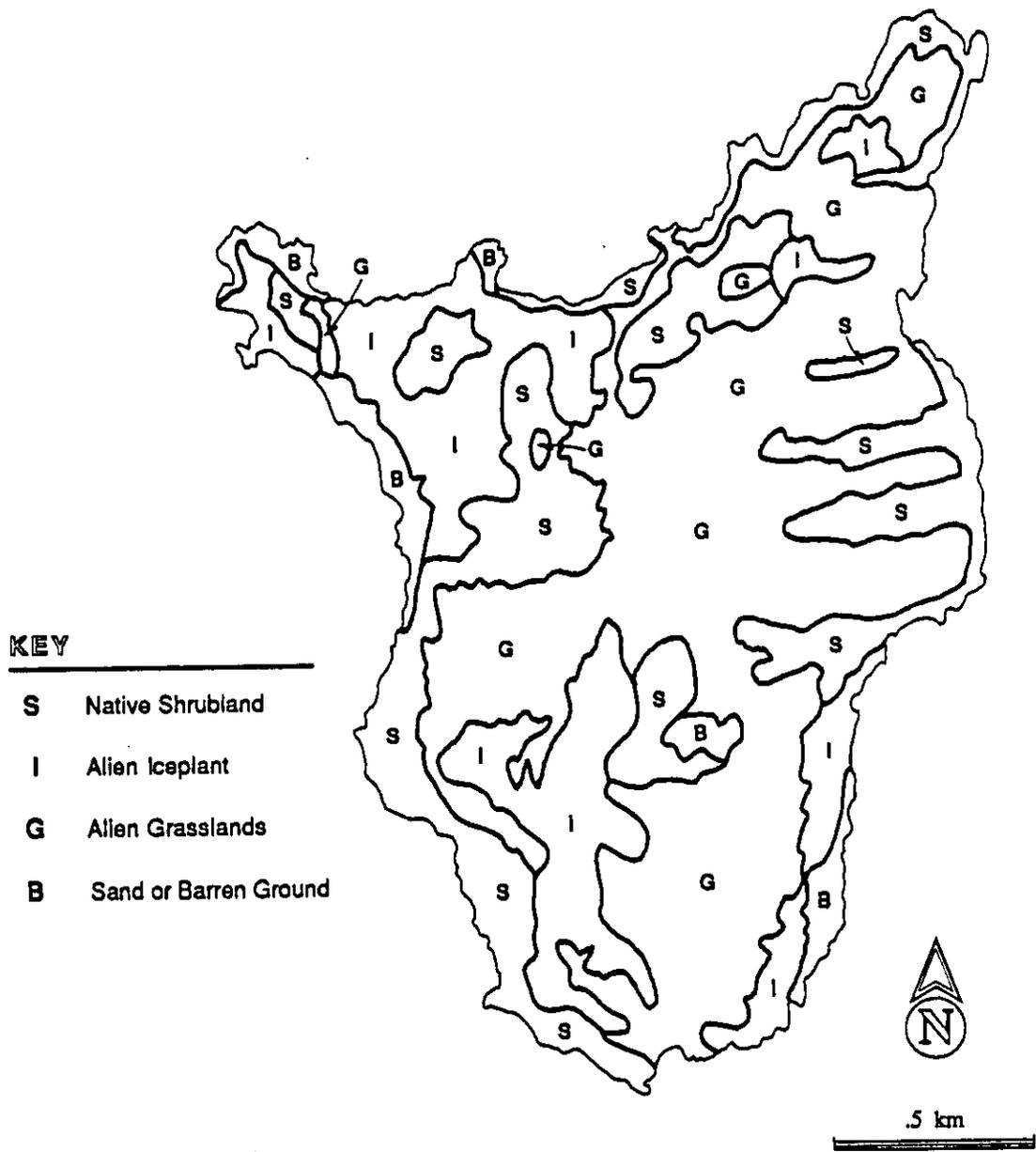


Figure 2. The vegetation of Santa Barbara Island, California. From Halvorson, et al. 1988.

METHODS

Prior to conducting field investigations, a review of the pertinent literature, and herbarium specimens, as well as consultations with botanists familiar with the Santa Barbara Island flora, was conducted to determine the known distribution of each of the rare plants. Maps showing the distributions of these plants was available from a preliminary investigation of the botanical resources of the island, conducted by the Santa Barbara Botanic Garden (Hochberg et al. 1979). Historic collection sites were determined by visits to local herbaria. The expertise of NPS personnel stationed on Santa Barbara Island, and information contained in NPS files provided data on population distribution and numbers of individuals of these plants in recent years.

Field surveys were conducted during spring and summer of 1985, 1986, 1988, and 1989. Known populations were visited and sampled using parallel and meandering transects (Goff et al. 1982). Habitat similar to, but outside that where each plant taxon is presently found was sampled in the same manner. The transect interval varied with: 1) the visibility afforded by the habitat (visibility can be restricted by vegetation, rock crevices and cliff slopes), and 2) the accessibility of the habitat. The minimum distance between transects was approximately 0.5 meters (m), the maximum was 2.5 m. Because of the small size of Santa Barbara Island, most of the island was sampled during these investigations.

Surveys were timed to coincide with the period of flowering and/or peak vegetative growth to maximize the visibility of the plants, and the period of fruit development in order to evaluate reproductive output. At each site, population and habitat data were collected on a standardized field survey form provided by the California Department of Fish and Game (CDFG), an example of which is shown on Figure 3. The location of each site was recorded on maps of the island generated by NPS staff rather than on standard USGS maps due to the small scale of the USGS maps. Photographs were taken of each taxon and its habitats. Field notes and photographs are on file at Channel Islands National Park.

Population data included counts of the numbers of individuals that were: 1) mature and flowering plants, 2) immature and/or non-flowering, 3) the present year's seedlings (where possible), to accurately identify recruitment, and 4) plants with developing fruits. Habitat

MAIL TO: CALIFORNIA NATURAL DIVERSITY DATA BASE, c/o DEPARTMENT OF FISH AND GAME, 1416 NINTH ST., SACRAMENTO, CA 95814

OFFICE USE ONLY

CALIFORNIA NATIVE SPECIES FIELD SURVEY FORM

Diagnosis Code _____	Quasi Code _____
Index Code _____	Occurrence # _____

PLEASE COMPLETE ALL ENTRIES IN THE BASIC DATA SECTION ABOVE THE HEAVY LINE. PLEASE ENTER ALL INFORMATION AVAILABLE TO YOU WITHIN THE DETAILED SECTION BELOW THE HEAVY LINE. YOU DO NOT HAVE TO COMPLETE ALL ENTRIES IN THE DETAILED SECTION. USE THE BACK FOR COMMENTS. PLEASE ATTACH OR DRAW A MAP.

BASIC DATA

Scientific Name (no codes): _____

Date of Field Work: _____ 19____ County: _____ Collection: Yes _____ No (# _____ Mus./ Herb _____)

Location: _____

Reporter: _____ Phone: () _____

Address: _____

1. LOCATION

A. Is this a new location record? Yes _____ No _____ Unknown _____ Is this a subsequent visit? Yes _____ No _____

B. Species found? Yes _____ No _____ If not, reason: _____

C. Quad Name: _____ T _____ R _____ 1/4 of _____ 1/4 Sec _____
 _____ 7/8 _____ 15' T _____ R _____ 1/4 of _____ 1/4 Sec _____

D. Owner (Name/Address/Phone): _____

2. SPECIES BIOLOGY

A. Number of Individuals	B. Population Area	C. Phenology	D. Age Class
_____ 1-10	_____ < 1m ² = yd ²	_____ In leaf	_____ % Seedlings
_____ 11-50	_____ 1-5 m ²	_____ In bud	_____ % Immature
_____ 51-100	_____ 5-10 m ²	_____ In flower	_____ % 1st yr
_____ 101-1000	_____ 10-100 m ²	_____ In fruit	_____ % Mature
_____ 1001-10,000	_____ 100 m ² - 1 ha	_____ Fall regreen	_____ % Senescent
_____ 10,001 +	_____ 1 ha + (+ 2 1/4 ac)	_____ Dormant	_____ % _____

E. Compared to your last visit to this site: Number of Individuals _____ more _____ same _____ fewer Population Area _____ Jarger _____ Age Classes _____ same _____ different

F. Give reasons for changes: _____

3. HABITAT

A. Description: _____

B. Overall Site Quality: Excellent _____ Good _____ Fair _____ Poor _____ Comments: _____

C. Aspect	D. Slope	E. Topographic Position	F. Light	G. Moisture
_____ N	_____ Slight, 0°-20°	_____ Crest	_____ Open	_____ Inundated
_____ E	_____ Moderate, 20°-45°	_____ Upper Slope	_____ Filtered	_____ Saturated
_____ S	_____ Extreme, 45°+	_____ Mid-Slope	_____ Shade	_____ Moist
_____ W	_____ Vertical	_____ Lower Slope		_____ Dry
_____ Flat		_____ Bottom		

H. Elevation: _____ ft(m) to _____ ft(m) I. Microhabitat Relief: _____

DETAILED INFORMATION

J. Substrate/Soils: _____

K. Plant Communities: _____

L. Dominant, Associated & Other Rare Species: _____

M. Disturbances/Viable Threats/Current Land Use: _____

N. Site Function for Species (animals): _____

4. DETERMINATION (Check one or more, fill in blanks)

_____ Keyed in a manual (Title _____) _____

_____ Compared with Specimen _____

_____ Compared with Photo/Drawing (Source _____) _____

_____ By another person (Name _____) _____

_____ Other (_____) _____

5. PHOTOGRAPHS (Check one or more)

A. Subject	B. Type
_____ Plant/Animal	_____ Slide
_____ Habitat	_____ Print
_____ Diagnostic Feature	
_____ Other	

C. May we obtain duplicates of our cast? _____ Yes _____ No

6. OTHER KNOWLEDGEABLE INDIVIDUALS (Name/Address/Phone) _____

98379-000 10-81 50 O 08P

FSF-2

Figure 3. Standardized field survey data form. Made available through the California Department of Fish and Game (CDFG), California Natural Diversity Data Base (CNDDB).

data, including elevation, slope and aspect, were collected at each site.

A thorough investigation of the ecology of Dudleya traskiae was conducted during the period 1985-1987. Some of the findings of that study are reported herein. For a complete discussion of the findings and the methods employed see Clark (1989).

The high numbers of individual Platystemon californicus var. ciliatus, and time limitations of NPS staff, precluded an exact population count during 1989; therefore, a subsample of the population was measured and an estimate of numbers for the entire population was made. A belt transect was established through areas of differing densities of Platystemon californicus var. ciliatus. Forty, randomly selected, 1 m² plots were sampled along this transect, and the numbers of Platystemon plants occurring in each plot were counted. From these data, the mean number of plants per square meter was calculated. This mean was extrapolated to a mean number of Platystemon californicus var. ciliatus per km². The areal extent of the population on the island was calculated (in km²) and used with the density data to determine the population estimate.

RESULTS

Astragalus traskiae Eastw.
Trask's locoweed

Fabaceae
Pea family

Listing status:

Federal: Candidate, Category 2
State: Rare
CNPS: List 1B

Description:

Astragalus traskiae is a perennial herb with spreading branches (Figure 4). The plant is evergreen or may be drought-deciduous. The leaves are pinnately divided, 5-10 cm long, with 21-29 ovate-elliptic leaflets. The leaves and stems have a soft pubescence that imparts a grey-green color to the plant. Flowering stems are axillary and flowering is indeterminate in loosely 12-30 flowered racemes. The five-parted calyx is fused to form a tube 5-6 mm long, and is deeply campanulate. The corolla is papilionaceous, with the banner petal 14-17.5 mm long; flower color is yellowish-white. The fruit is 2 locular, and pendulous with a stipe 4-8.5 mm long. The body of the fruit is obliquely oval-oblong in outline, gently incurved and abruptly acuminate into a narrow beak 8-16 mm long. Munz (1974) states that flowering occurs from March-July; on Santa Barbara Island, flowering may begin as early as February and usually ends before June (pers. obs.).

Distribution:

The genus Astragalus is widespread throughout the northern hemisphere with nearly 2000 species recognized. Four hundred species of Astragalus occur in North America, and seven species occur on the Channel Islands. Astragalus traskiae is known from two of the California Channel Islands: Santa Barbara and San Nicolas Islands.

Habitat:

Astragalus traskiae occurs on the northern and southwestern portions of Santa Barbara Island (Figure 5), on shallow, often rocky (caliche or basalt) substrate. The habitats occupied range in slope from nearly level to an almost vertical cliff. The more extensive populations occur



Figure 4. Astragalus traskiae.

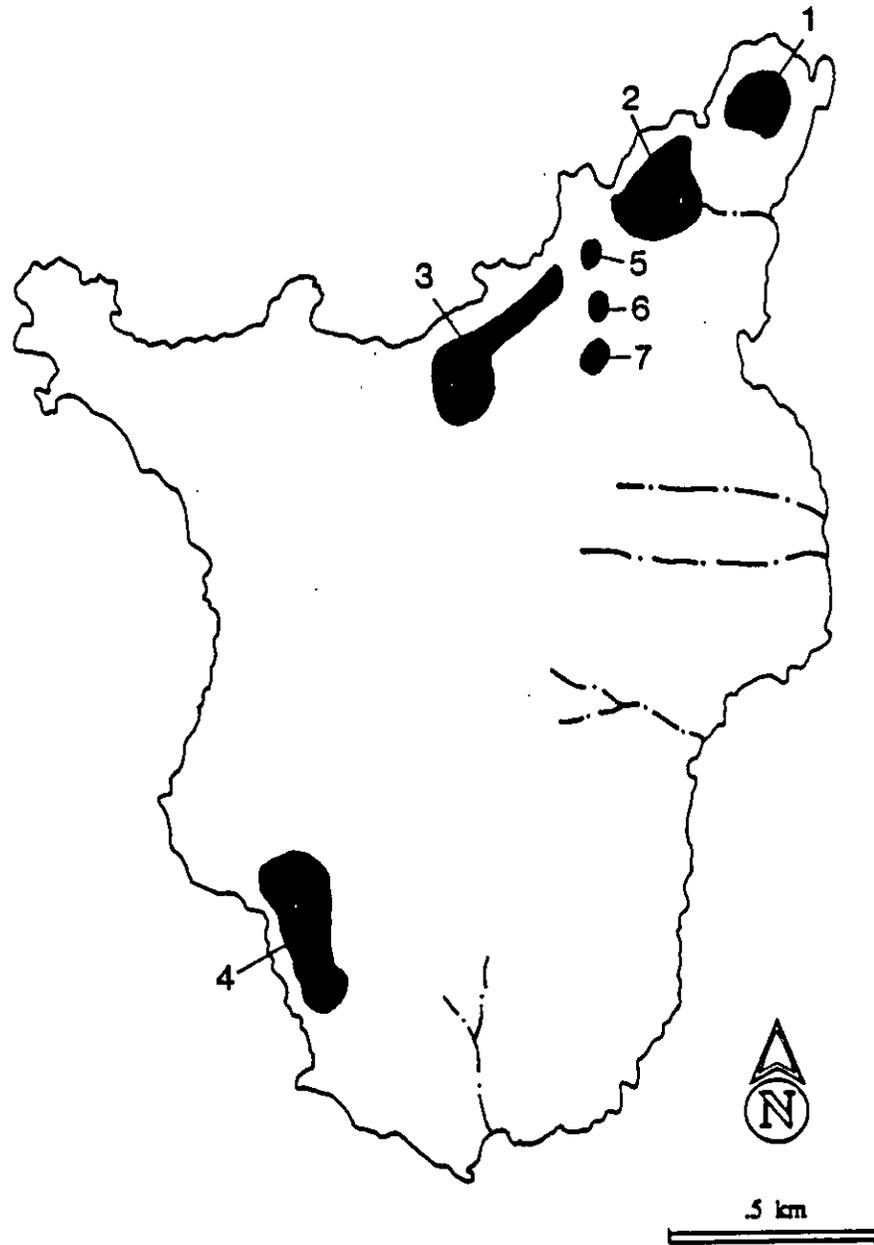


Figure 5. Distribution of *Astragalus traskiae* on Santa Barbara Island, California 1985-1989.

on the steep sea slopes of the perimeter of the island. At the majority of sites supporting this species, the associated vegetation is low-growing and irregularly distributed, and there is much bare soil and rock. The habitats of Astragalus traskiae have been described by various authors (Hochberg et al. 1979, Holland 1986, Halvorson and D'Antonio 1987)) as being a part of a number of island plant communities, including: the island grassland, southern coastal bluff scrub, cactus scrub, sea blite phase, crystalline iceplant phase, herbaceous and tarweed communities. Common associates of A. traskiae in these plant communities include: Atriplex californica, Malacothrix philbrickii (Davis ined.), Platystemon californicus var. ciliatus, Mesembryanthemum crystallinum, Hordeum murinum ssp. glaucum, Eriogonum giganteum ssp. compactum, Lasthenia californica, Lotus argophyllus ssp. ornithopus, Hemizonia clementina and Coreopsis gigantea.

On San Nicolas Island, Astragalus traskiae is widespread, and especially abundant at exposed sites on the southern and western portion of the island. It occurs in sandy to heavier clay-type soils in open areas where the vegetation is sparse and/or low-growing (R. Dow pers. comm. 1989, Junak and Vanderwier 1989).

Current population status:

Seven sites support Astragalus traskiae on Santa Barbara Island (Figure 5); each site was censused during this research. The total number of plants present on the island declined from 3,323 in 1986 to 1,236 in 1989 (Table 2).

Four of the seven sites were severely affected by a mid-January storm in 1988 that resulted in the loss of nearly two-thirds of the total island population. High winds and salt spray appear to be the cause of mortality. Fragments of kelp were found throughout much of the north and northeastern portion of the island, including sites supporting A. traskiae. Leaf loss and mortality of individual plants was observed for many plant taxa in these areas including, Astragalus traskiae, Coreopsis gigantea, Atriplex californica, Eriophyllum nevinii, and Eriogonum giganteum ssp. compactum.

To date, two of the sites (1,5) that supported A. traskiae prior to the 1988 storm, no longer support an extant population. A third site (2), has shown minimal recovery with some new growth initiated on wind-damaged A. traskiae plants, and recruitment of six new individuals.

Table 2. Astragalus traskiae population size, 1985, 1986, 1988 and 1989. Data from 1985 are population estimates and all others are actual counts of the total number of individual plants.

Site	1985	1986	1988	1989
1	100-200	347	*	0
2	1100	1743	*	19
3	250	876	624	792
4	150-200	274	298	337
5	----	5	*	0
6	----	74	80	82
7	----	4	6	6

* Due to a severe storm (18 Jan 1988) the plants at these sites are completely lacking leaves, but do not appear to be dead. These sites were sampled immediately after the storm and monthly through May 1988 - throughout this time few plants initiated new growth.

The fourth site (3), showed an initial decline of approximately 29% (876 plants were present in 1986 and 624 in 1988), as a result of this storm, followed by a 27% increase in numbers during 1988-1989 (from 624 plants to 792). Through time, the net loss at this site was approximately 10% (876 to 792). The three sites not affected by the storm (4,6,7) have shown an increase in numbers during this research, with a range in the percent increase of 11-50%, although total numbers are low.

Data on the numbers of mature and immature plants in each population for 1986 and 1989 (Table 3, Figure 6) demonstrate the relatively low percentage of immature plants in Astragalus traskiae populations. During 1986 the proportion of immature and seedling stage plants was greater than that of the mature plants at only two sites (2,6). Although the plants flower profusely, little fruit development occurs. Data collected during 1985 for sites 2 and 3, indicate that only one percent of the plants that flowered developed fruits. The factors responsible for this low production of fruits are unknown, and may be very important to the long-term survival of this species on Santa Barbara Island. The lack of a viable seed bank may be responsible for the inability of A. traskiae to recover from the natural catastrophe of 1988, and to reestablish populations at sites 1 and 5, where extant populations existed prior to the storm.

These population data suggest that if current trends continue, recruitment may not be sufficient to maintain the populations. Continued monitoring of the Astragalus traskiae populations on Santa Barbara Island is necessary to determine long-term population trends, and may be critical to assure the survival of this species on the island.

Table 3. Numbers of mature and immature plants at each site supporting Astragalus traskiae on Santa Barbara Island, 1986 and 1989. Data are actual counts of numbers of individual plants.

Site	1986		1989	
	mature/immature		mature/immature	
1	228	/ 119	0	/ 0
2	758	/ 985	13	/ 6
3	864	/ 12	594	/ 198
4	164	/ 110	286	/ 51
5	1	/ 4	0	/ 0
6	14	/ 60	80	/ 2
7	0	/ 4	0	/ 6

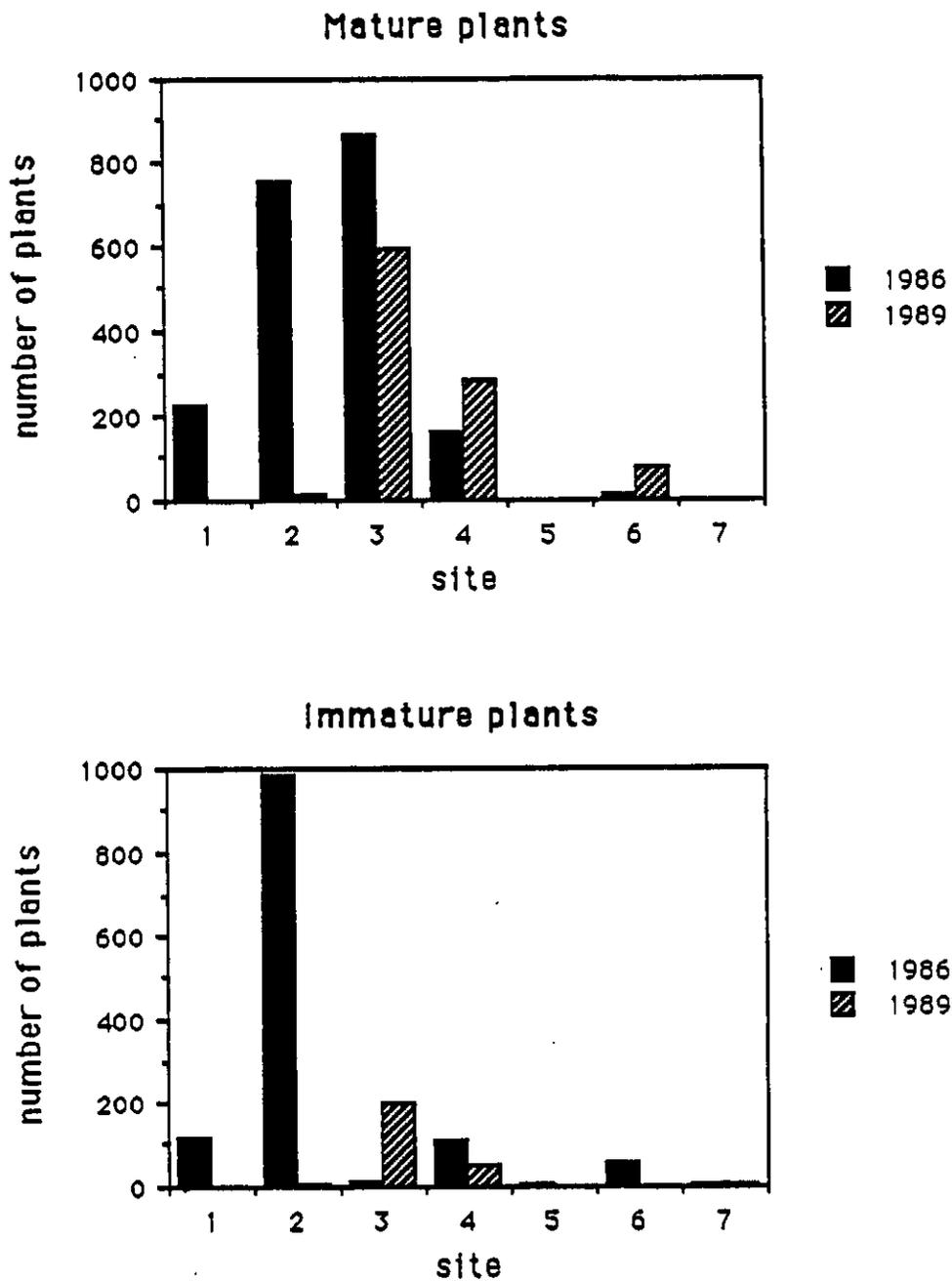


Figure 6. Numbers of mature and immature plants at each site supporting Astragalus traskiae on Santa Barbara Island, 1986 and 1989.

Dudleya traskiae (Rose) Moran
Santa Barbara Island live-forever

Crassulaceae
Stonecrop family

Listing status:

Federal: Endangered
State: Endangered
CNPS: List 1B

Description:

Dudleya traskiae is a perennial succulent herb with foliage leaves in a basal rosette (Figure 7). The plants are evergreen, with a branched primary stem (caudex) and are composed of one to several hundred rosettes. The branching of the stem is dichotomous. The rosette leaves number 25-35, are strap-shaped - oblanceolate to subacuminate and are 4-15 cm long and 1-4 cm wide. Leaves may be green or glaucous with a waxy covering. The flowering stems are axillary and flowering is indeterminate in paniculate or cymose clusters. The petals (5) are bright yellow, often with red veins, fused below and curving outward in the upper half. Stamens (10) are borne on the corolla tube. The fruit is composed of 5 carpels that are spreading in age, 7-8 mm long. Seeds are many and minute, narrow and pointed. Dudleya traskiae is tetraploid with a chromosome number of 34 (Moran 1951). Flowering most commonly occurs from May-July (Moran 1951), although flowering may begin as early as mid-February (pers. obs.)

Distribution:

The genus Dudleya is primarily Californian, though it also extends north into southern Oregon, west to central Arizona and southern Nevada, and south to the tip of Baja California, Mexico. Dudleya taxa occur on each of the eight Channel Islands. Dudleya traskiae is known only from Santa Barbara Island, California.

Habitat:

All of the known sites supporting Dudleya traskiae are in rocky areas on the steep slopes of the island's perimeter or on outcrops within shallow canyons where vegetation is low growing. With the exception of a small population on the far-western portion of the island (Dunkle 1950), all locations, historic as well as present day occur on the eastern, southeastern and southwestern slopes of the island, as shown on Figure 8. No Dudleya traskiae plants presently occur on the northern and north-western sides of the island

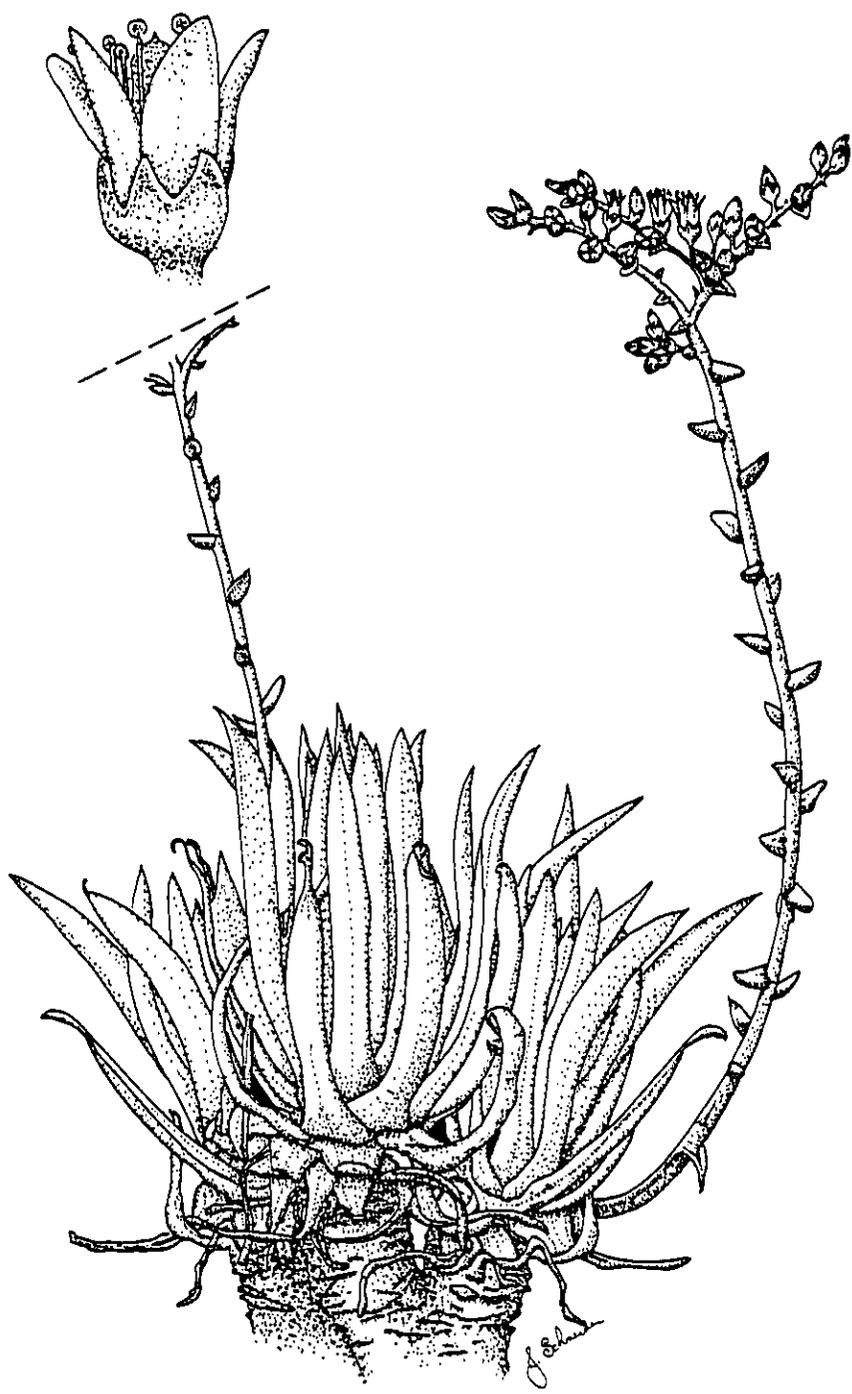


Figure 7. Dudleya traskiae.

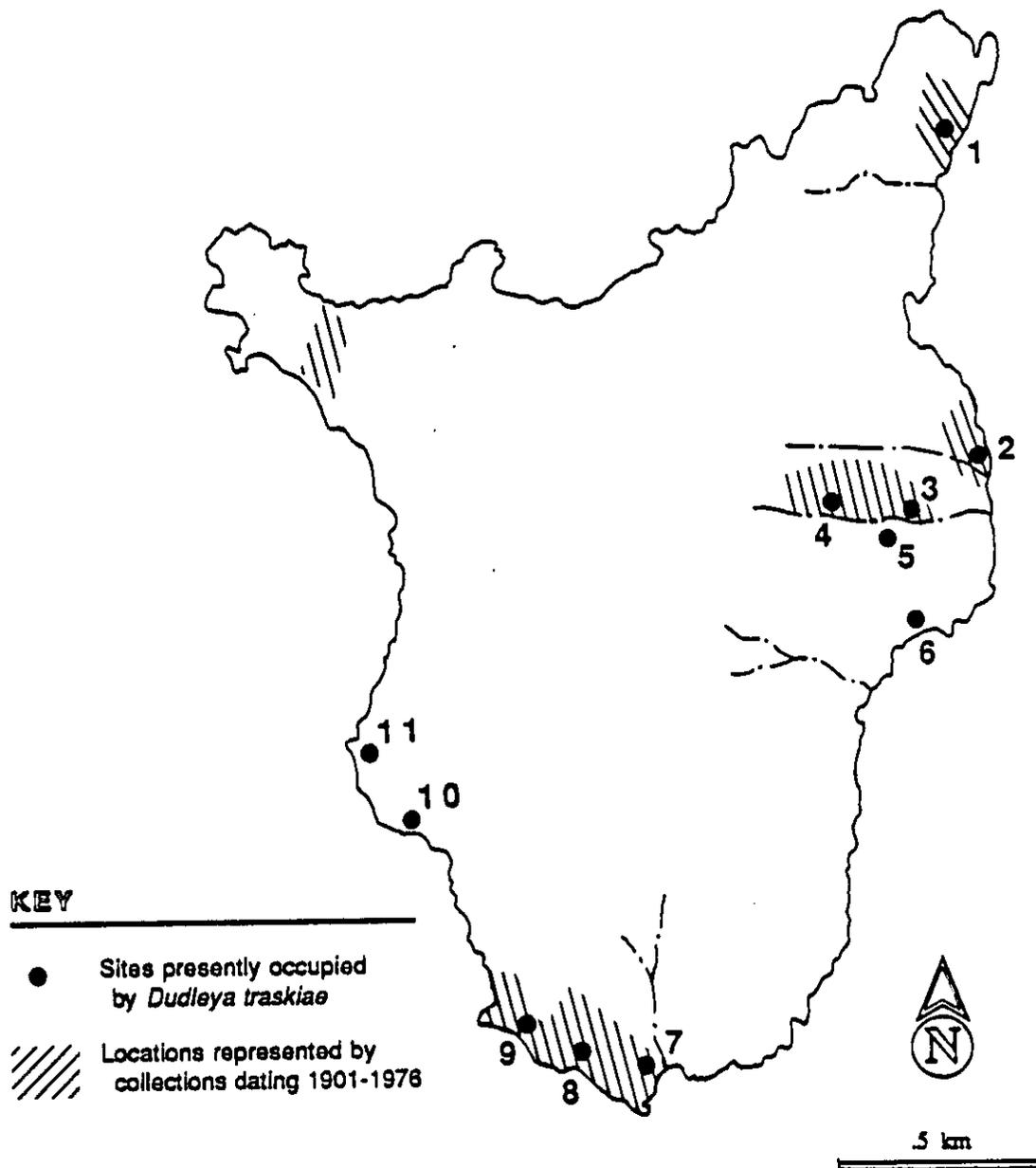


Figure 8. The present distribution of *Dudleya traskiae* on Santa Barbara Island and locations represented by collections dating 1901-1976.

although they do occur elsewhere on north-facing slopes. The habitat of Dudleya traskiae has been described as a maritime cactus scrub (Hochberg, et al. 1979, Halvorson and D'Antonio 1987), and by Holland (1986) as southern coastal bluff scrub. This assemblage of plants, characterized by cholla (Opuntia prolifera), prickly pear (O. oricola and O. littoralis), boxthorn (Lycium californicum), Santa Barbara Island buckwheat (Eriogonum giganteum ssp. compactum) and annual forbs and grasses, is restricted to the perimeter of the island and south-facing slopes of the canyons.

Current population status:

Census data resulting from both the general census and the mapping of Dudleya microhabitat during 1985-1987 (Clark 1989) show little change in the number of Dudleya traskiae individuals during this three year study period (Table 4). Total numbers of individuals are provided from 1984 (NPS files), as well as data gathered during the present research. Data for Site 4 are missing for 1986-1989 because it was difficult to accurately define Dudleya traskiae individuals at this site due to the dense growth of cholla (Opuntia prolifera) adjacent to Dudleya plants. Since individuals could not be determined precisely, total rosette numbers rather than the number of individuals were recorded at this site for comparison over time. During 1985-1986 there was an increase, due to recruitment, in the total number of individuals of Dudleya traskiae on the island followed by a decline in 1986-1987 such that the net increase in individual plants over these three years was only three individuals.

The population was much more dynamic during this time period than the change in total numbers suggests. During 1985-1986 four sites (1,5,6,8) showed no net change, two showed a net decrease (2,3) and three sites (7,9,10) showed a net increase. Overall, during 1985-1986 there were 14 new recruits (resulting from seed germination), ten 'new' plants found outside the mapped grids (these cannot positively be identified as new recruits) and 12 plants lost to mortality. Three sites (2,9,10) accounted for all the recruitment (recruitment at site 2 is masked by mortality) and three sites (2,3,10) accounted for all the mortality observed. The period of decline, 1986-1987, is marked by five sites (5,6,7,8,9) that showed no net change, three sites (2,3,10) with a net decrease and only one site (1) with a net increase. Overall, in 1986-1987, there was 1 new recruit (site 1), three 'new' plants (site 3) and 13 plants lost to mortality.

Table 4. Dudleya traskiae population size, 1984-1989. Data are total numbers of individuals at censused sites. 1984 data, not generated from this research, are included here for a comparison of total numbers of known individuals through time.

Site	1984	1985	1986	1987	1988	1989
1	7	13	13	14	15	14
2	5	26	23	22	21	23
3	7	23	21	17	20	20
4	67*	70*	--	--	--	--
5	3	3	3	3	3	4
6	1	1	1	1	--	--
7	21	28	34	34	37	37
8	1	1	1	1	5	6
9	27	43	48	48	47	51
10	<u>114</u>	<u>181</u>	<u>187</u>	<u>182</u>	--	--
TOTALS	186	319	331	322		

* these data are not reflected in the totals since data are not available for 1986-1989. Sites 6 and 10 were not censused during 1988 and 1989 due to nesting of the endangered California Brown Pelican, therefore total population estimates are not provided for these two years.

The number of Dudleya plants present in the mapped plots (only) during 1985-1987 (Table 5) shows a slightly different population trend with a net decline in numbers. Once again the 1985-1986 period is one of an increase in numbers and 1986-1987 a period of decline, with mortality exceeding recruitment over time. The only sites showing any recruitment in the mapped plots were sites 9 and 10.

Data on rosette numbers in the mapped plots during 1985-1987 (Table 6) show an increase in the total number of rosettes at seven of the ten sites. A comparison of these data and those of Table 5 demonstrates that a loss of rosettes is not necessarily correlated with a decline in the number of individual plants. Similarly, an increase in rosette numbers is not necessarily correlated with an upward trend in numbers within the population. Sites 6 and 8, each showing a decline in rosette numbers, support only one Dudleya traskiae plant. The loss of rosettes by these individuals was substantial, yet these plants are alive. Site 1 also showed a decline in rosette numbers, but there was an increase in the number of individuals due to recruitment. The loss of rosettes at this site is the result of a decrease in rosette numbers by one plant within the population. Recruitment of Dudleya seedlings occurred at three of the seven sites that showed an increase in rosette numbers. These gains in Dudleya plants due to recruitment account for only a small part of the rosette gain observed; recruitment of rosettes by branching of the caudex accounts for most of the increase.

The structure of Dudleya populations through time (1985-1987) was measured by counting the number of individual plants in each of 13 size classes that were based upon the number of rosettes per individual plant. The first size class is composed of plants of one rosette, and size classes increase in increments of ten rosettes. Size class one included all new recruits into the population, and this size class accounted for all of the death of Dudleya plants observed. There was a great deal of variation in the size class distributions within the Dudleya populations and in the changes in these distributions through time. The distribution of plants within the size classes is shown on Figure 9 for the island population as a whole (see Clark 1989 for distributions of each population).

The overriding trend of the population was toward a composition of larger, more mature individuals. The decrease in the number of plants in size class 1 through time suggests that there may be peak periods of recruitment of Dudleya individuals with little or no recruitment in intervening years. The change in the number of rosettes that comprise a plant may be bidirectional; that is, a plant

Table 5. Dudleya traskiae population size within the mapped plots, 1985-1987. Data are numbers of individuals present.

Site	1985	1986	1987
1	12	12	12
2	25	21	17
3	13	11	9
4	70*	--	--
5	1	1	1
6	1	1	1
7	5	5	5
8	1	1	1
9	42	43	43
10	<u>50</u>	<u>62</u>	<u>57</u>
TOTALS	150	157	146

* these data are not reflected in the totals since data are not avail for 1986 and 1987.

Table 6. Dudleya traskiae rosette numbers within the mapped plots, 1985-1987. Data are total numbers of rosettes within the plots.

Site	1985	1986	1987
1	257	239	234
2	182	200	213
3	116	147	153
4	270	317	325
5	16	30	45
6	30	34	25
7	12	17	19
8	50	37	25
9	162	251	262
10	<u>74</u>	<u>125</u>	<u>126</u>
TOTALS	1,169	1,397	1,427

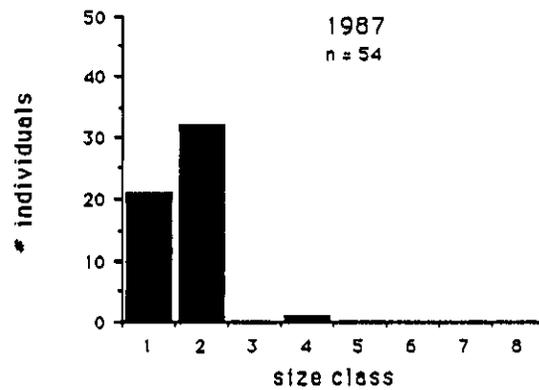
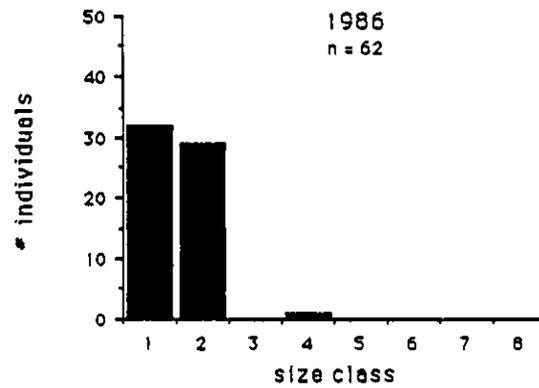
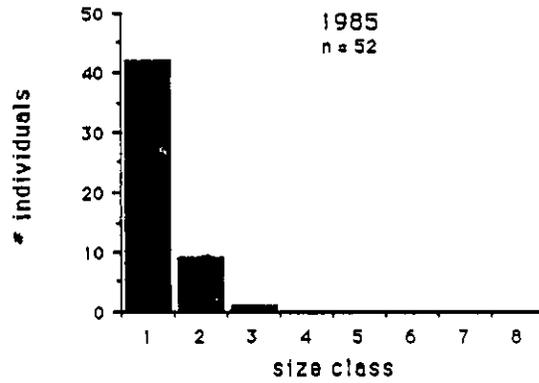


Figure 9. Size class distribution of Dudleya traskiae for the island population, 1985, 1986 and 1987. Data represent the sum of the distribution data for each Dudleya site monitored. Sample sizes are shown. Size class breakdown is by rosette number as indicated on page 34 of the text.

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may gain or lose rosettes. The loss of rosettes by individual plants is apparent in Figure 9 by the loss of individuals in some of the larger size classes and the subsequent increase in the number of plants in smaller size classes.

During the 1988-1989 time period, all monitored sites except site 1 showed a net increase in numbers of Dudleya individuals. As during the 1985-1987 research period, the change in numbers at each site was dynamic with losses and gains of individual plants. Two of the sites monitored during 1985-1987 (6,10) were not censused during 1988-1989 due to nesting of the endangered California Brown Pelican. Consequently, data for these sites are not available.

Data from Clark (1989) suggest that rainfall is correlated with Dudleya traskiae seedling establishment and growth. Yearly rainfall is highly variable on Santa Barbara Island (Table 7), and the conditions necessary for germination and growth of Dudleya traskiae seeds may be infrequently met. Changes in the number of plants and rosettes in individual populations correlated with high and low rainfall years on Santa Barbara Island. Ninety-three percent of the recruitment observed during 1985-1987 (14 of the 15 plants) occurred during the wettest rainfall year (1985-1986). Of the 19 plants lost to mortality, eight (42%) died in 1986 and 11 (58%) died in the drier year of 1987. The effects of low precipitation appear to be more important to individual recruitment and mortality than to the increase or decrease of rosettes by an individual plant (Figure 10). These results suggest that individual plants may maintain reserves that allow for continued branching and the development of new rosettes even in periods of low rainfall.

Table 7. Santa Barbara Island rainfall, by rainfall year (1 July-30 June), 1982-1989. Numbers are the total recorded precipitation in millimeters. Mean rainfall for this eight year period is indicated.

Year	Rainfall (mm)
1981-1982	230.6
1982-1983	412.8
1983-1984	200.2
1984-1985	149.4
1985-1986	276.6
1986-1987	115.8
1987-1988	223.0
1988-1989	87.0
8 year mean	211.9

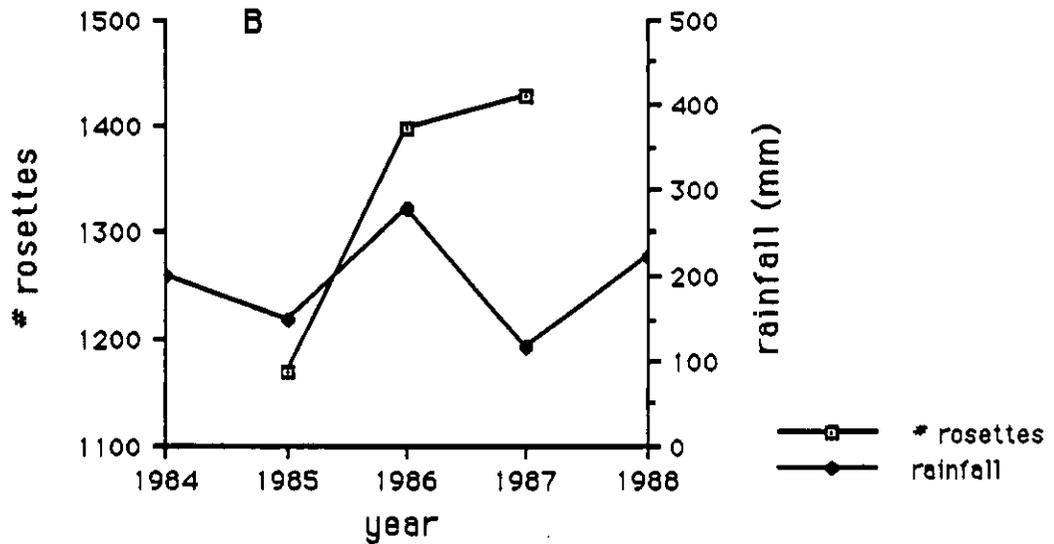
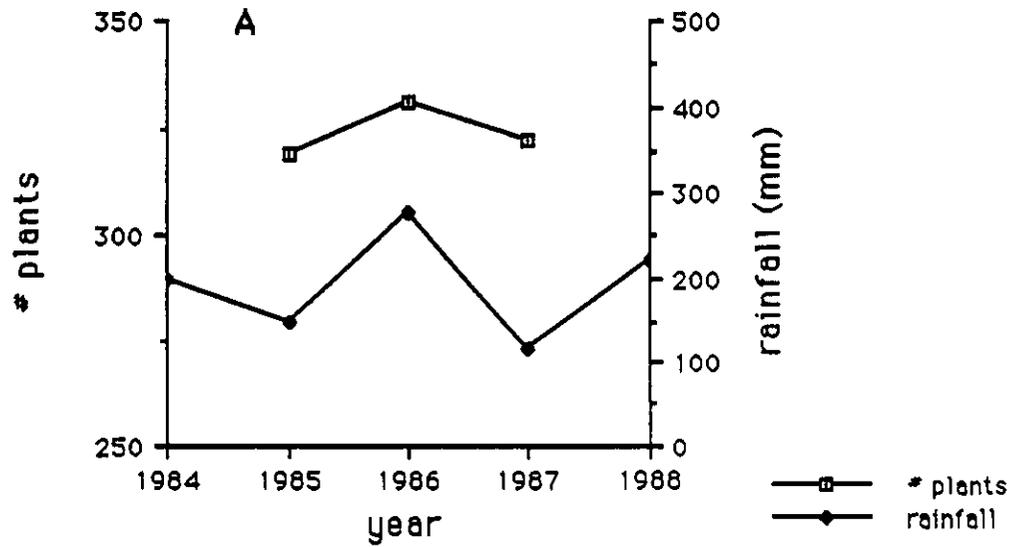


Figure 10. Changes in the number of Dudleya plants and rosette numbers with rainfall, 1985-1987. Data are the total number of Dudleya plants within the monitored sites (A) and the total number of rosettes (B) comprising those plants.

Eriogonum giganteum Wats. ssp. compactum (Dunkle) Munz
Santa Barbara Island buckwheat

Polygonaceae
Buckwheat family

Listing status:

Federal: Candidate, Category 2
State: Rare
CNPS: List 1B

Description:

Eriogonum giganteum ssp. compactum is a perennial shrub, rounded and branched from near the base with a height of 4-6 decimeters (dm) (Figure 11). The younger branches are tomentose, and become dark with age. Leaves are present towards the tips of the branches only. Leaves are alternate on the stem, and the leaf blades are leathery, ash-colored and somewhat glabrate above, white-wooly tomentose beneath, and oblong in shape (3-10 cm long). The peduncles supporting the inflorescences are stout, 1-3 dm long, tomentose early and later glabrate. The peduncle is first 3-branched, then 2-branched with the ultimate branches very short (0.2-2.5 cm long). The involucre are crowded, campanulate, 3-4 mm long with short obtuse teeth. The flowers are held on stout pedicels; petals are lacking, and the petal-like calyx (5 parted) is light pink in color. The obovate segments of the calyx have fine white hairs. Achenes are brown and shiny, about 2 mm in length. Flowering occurs during July-Aug. (Dunkle 1950, Philbrick 1972, Munz 1974).

Distribution:

The genus Eriogonum is a North American plant with over 200 species. The species Eriogonum giganteum is endemic to the Channel Islands with 3 subspecies recognized. Each is endemic to only one of the eight islands:

Eriogonum giganteum ssp. compactum - Santa Barbara Isl.
Eriogonum g. ssp. giganteum - Santa Catalina Island
Eriogonum g. ssp. formosum - San Clemente Island

Habitat:

Eriogonum giganteum ssp. compactum occurs primarily on the steep sea slopes of the perimeter of the northern, eastern, southern and southwestern portions of the island, and on the northeastern portion of Sutil Island (Figure 12). Two additional populations and scattered individuals occur on more inland sites, away from the steep slopes, where soil

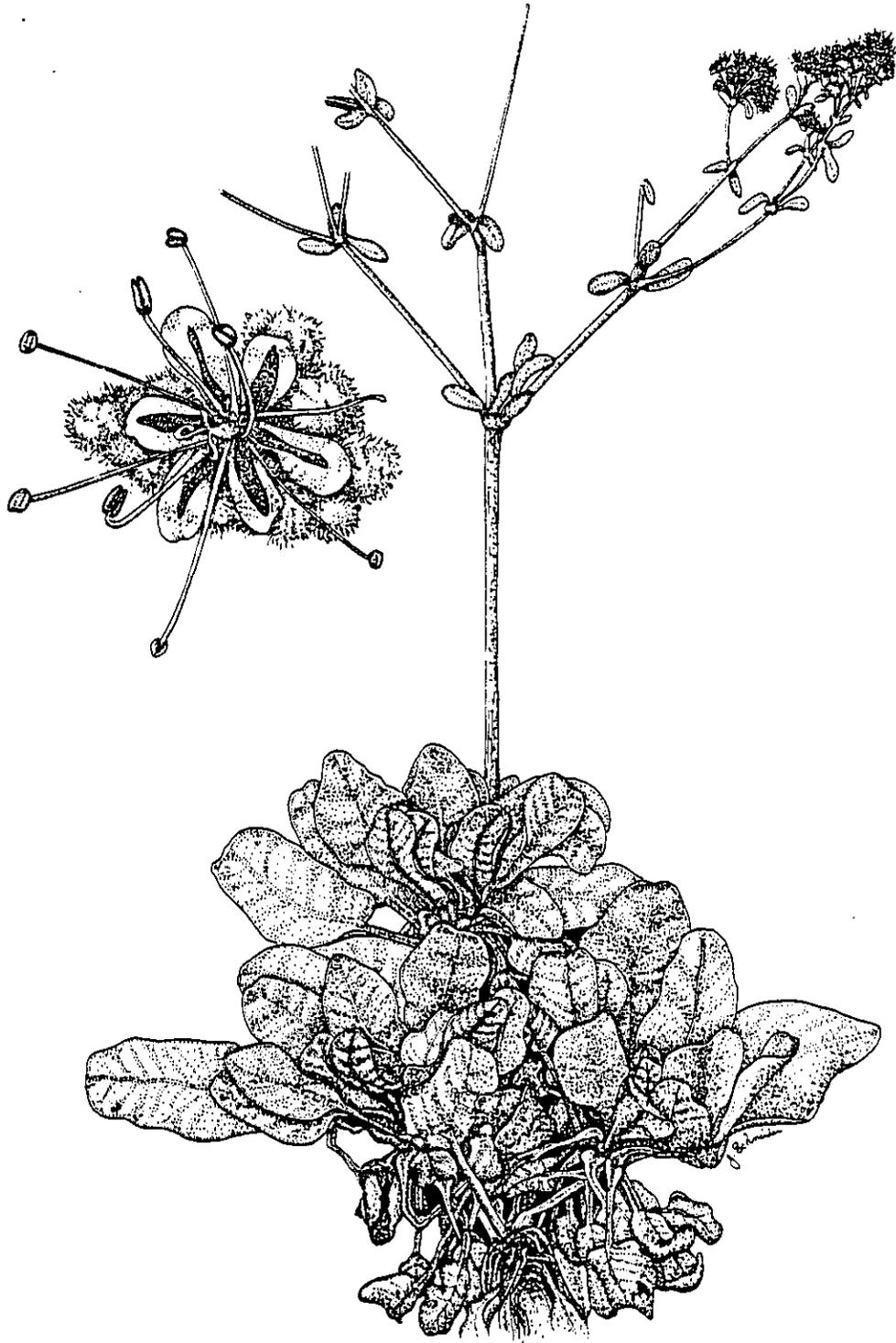


Figure 11. Eriogonum giganteum ssp. compactum

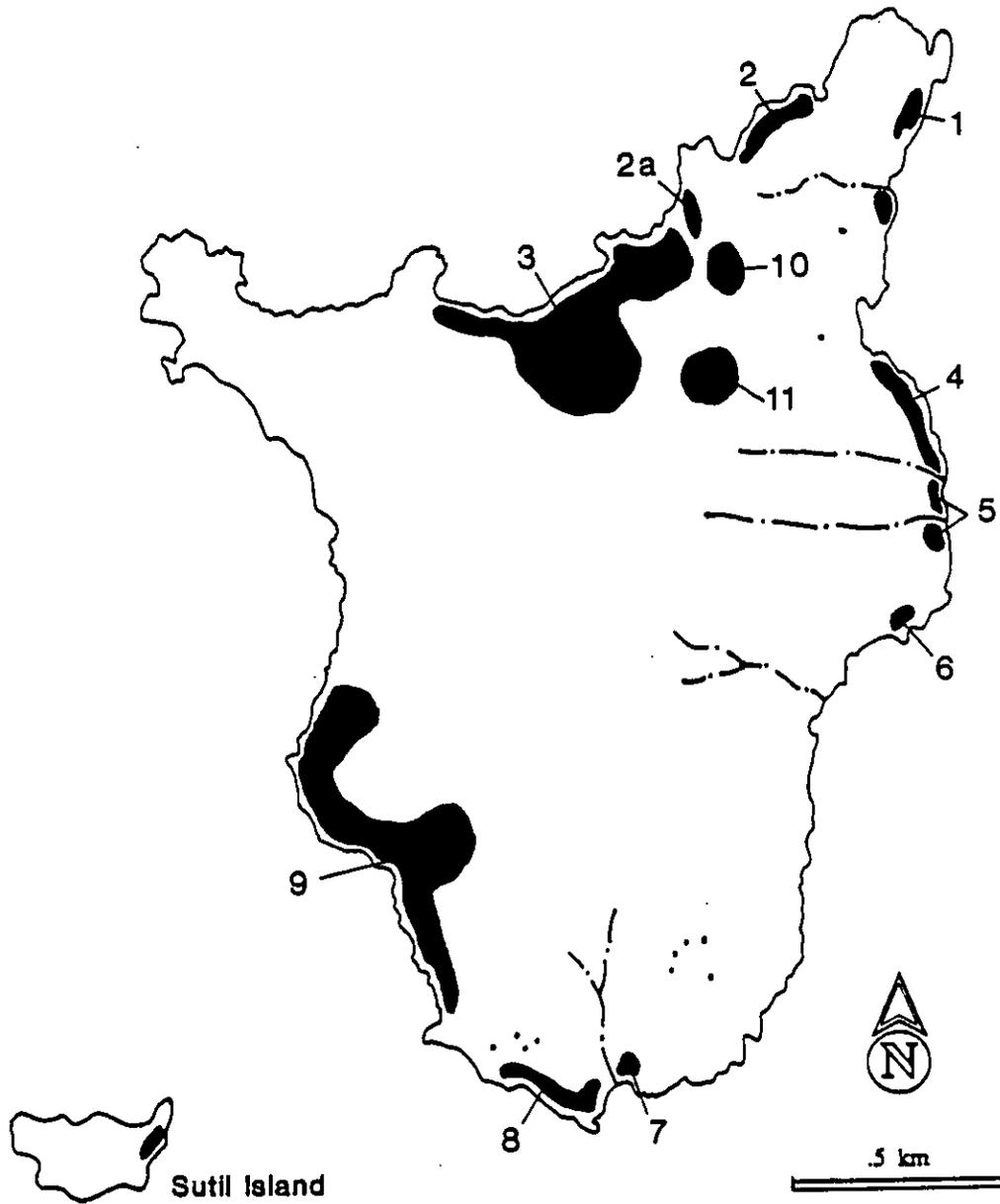


Figure 12. Distribution of *Eriogonum giganteum* ssp. *compactum* on Santa Barbara Island, 1985-1989.

is deeper and the vegetation more dense. The habitat of Eriogonum giganteum ssp. compactum has been described by various authors (Hochberg et al. 1979, Holland 1986, Halvorson and D'Antonio 1987) as being a part of a number of plant island communities, including: maritime cactus scrub, southern coastal bluff scrub, island grassland, crystalline iceplant phase, buckwheat phase, and the 'moonscape' area. The plant assemblage characterizing the habitat type includes Eriophyllum nevinii, Dudleya traskiae, Opuntia spp., Coreopsis gigantea, Lycium californicum, Atriplex californica, Mesembryanthemum crystallinum, Hemizonia clementina, Astragalus traskiae, Artemisia californica var. insularis, Bromus rubens, and Lotus argophyllus ssp. ornithopus.

Current population status:

The population of Eriogonum giganteum ssp. compactum on Santa Barbara Island is represented by 11 sites that support rather large aggregations of plants and, separate from these, scattered small groups of plants or solitary individuals. Nine of the eleven sites were sampled during 1985-1989; sampling at sites 6 and 9 was discontinued due to nesting activity of the endangered California Brown Pelican.

It is difficult to assess the population trend for this taxon simply by looking at the total numbers of individual plants present through time. Seven of the nine sites monitored throughout this research showed an increase in the number of plants present (Table 8). At site 2, although a sharp decrease in numbers was observed from 1986-1989, this decrease was the result of an extremely high rate of recruitment during the relatively high rainfall year of 1985-1986, and the subsequent death of young plants through time. In the spring of 1986, 4,628 seedlings and 81 mature and flowering plants were observed at this site. No new recruitment has occurred at this site since that time and the population now contains 419 immature, non-flowering individuals and 139 mature and flowering plants. This decrease in numbers resulted from mortality of young plants - a phenomenon that can reasonably be expected when such a dramatic level of recruitment occurs. The number of plants at site 5 also decreased during this study. The habitat at this site is of poorer quality than others that support Eriogonum giganteum ssp. compactum. This site is low on a rocky cliff slope on the east side of the island, and is subject to wave action during winter storms; there is little soil development and many of the plants occur on bare rock. No recruitment was documented at this site and mortality of mature as well as immature plants occurred.

Table 8. Eriogonum giganteum ssp. compactum population size, 1985, 1986, 1988 and 1989. The data from 1985 that are marked with an * are population estimates, all other data are actual counts of the number of individual plants.

Site	1985	1986	1988	1989
1	150*	108	127	156
2	50*	4709	784	558
3	400*	625	631	652
4	159	409	512	581
5	108	136	102	87
6	5	---	---	---
7	17	21	29	36
8	51-100*	66	74	75
9	200*	1566	---	---
10	100*	904	981	1143
11	25	76	78	84

- Sites 6 and 9 were not monitored 1986-1989 due to nesting of the endangered California Brown Pelican. In addition, site 9 is steep and difficult to access - 1986 numbers are from transect sampling and a census done using binoculars on inaccessible portions of the slope. Continued systematic sampling of this slope is not recommended due to unsafe conditions.

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The distribution of Eriogonum giganteum ssp. compactum on Santa Barbara Island has increased during this study period. Most of the recruitment within populations has occurred at more inland sites away from the steep cliff slopes. In addition, entirely new populations are becoming established on inland sites on the island (10,11, and scattered locations). Eriogonum giganteum ssp. compactum was not found at any of these sites during a 1979 survey of the island (Hochberg et al. 1979); rather they were recorded as supporting the alien grassland that is common to much of the island.

The numbers of mature and immature plants in the Eriogonum giganteum ssp. compactum populations for 1986 and 1989 are presented in Table 9, and shown on Figure 13. In 1986, the number of immature plants exceeded that of mature plants at four of the ten sites (2,3,7,10) censused; numbers of mature and immature plants were equivalent at site 11, and at five sites (1,4,5,8,9) the number of mature plants exceeded the number of immature. In 1989, the number of immature plants exceeded that of mature plants at three sites (2,7,10), and at six of the nine sites the number of mature plants exceeded that of immature ones.

The proportion data alone suggest that at six sites (1,3,4,5,8,11) recruitment may not be sufficient to maintain populations in the long-term. However, the data also suggest that recruitment in Eriogonum giganteum ssp. compactum may be sporadic, and closely correlated with climatic conditions. A similar pattern of recruitment was suggested for Dudleya traskiae, with recruitment periods correlated with higher rainfall years. We argued that a sporadic pattern of recruitment may be sufficient to maintain a long-lived species through time. Data regarding the longevity of individual E. giganteum ssp. compactum plants are not available, however, if individuals are long-lived, recruitment levels such as those observed during this research may be adequate to maintain the population, and sufficient to allow for population growth. Continued monitoring of Eriogonum giganteum ssp. compactum is essential to answer these questions and to determine long-term population trends.

Table 9. Numbers of mature and immature plants at each site supporting Eriogonum giganteum ssp. compactum on Santa Barbara Island, 1986 and 1989. Data are not available for site 9 during 1989 due to nesting of the endangered California Brown Pelican.

Site	1986 mature/immature	1989 mature/immature
1	77 / 31	138 / 18
2	81 / 4628	139 / 419
3	302 / 323	587 / 65
4	322 / 87	no data
5	125 / 11	71 / 16
7	4 / 17	10 / 26
8	66 / 0	66 / 8
9	1408 / 158	no data
10	65 / 839	120 / 1023
11	28 / 48	73 / 11

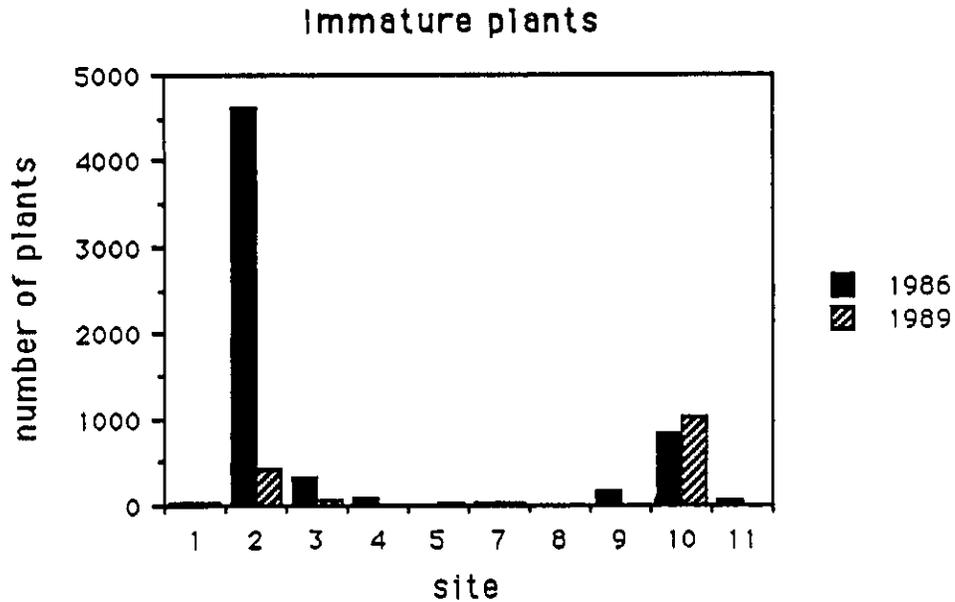
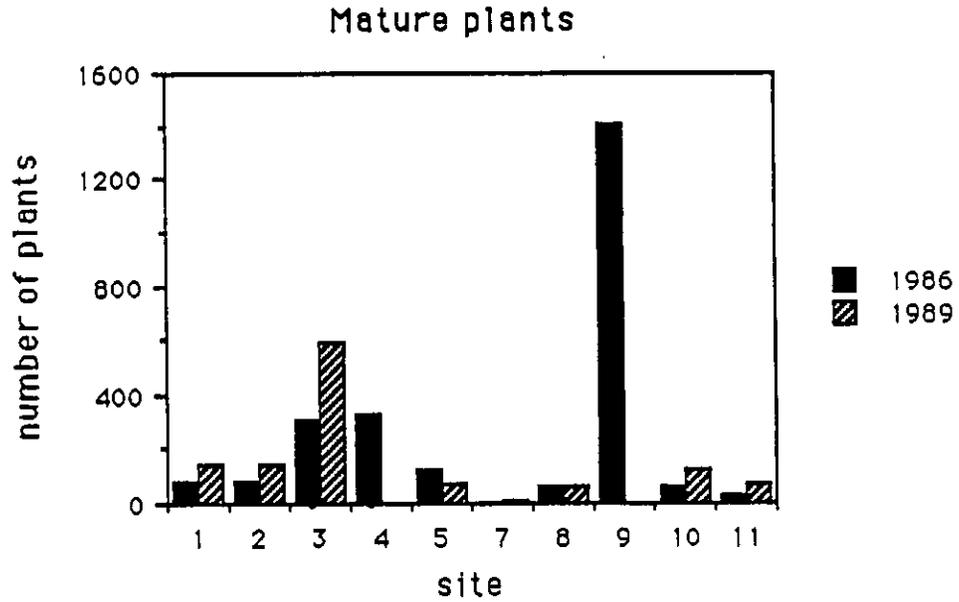


Figure 13. Numbers of mature and immature plants at each site supporting Eriogonum giganteum ssp. compactum on Santa Barbara Island, 1986 and 1989. Data are not available for site 9 during 1989 due to nesting of the endangered California Brown Pelican.

Platystemon californicus var. ciliatus (Benth.) Dunkle
Santa Barbara Island cream cups

Papaveraceae
Poppy family

Listing status:

Federal: Candidate, Category 2
State: none
CNPS: List 1B

Description:

Platystemon californicus var. ciliatus is a low-growing annual herb to 1 dm in height, with decumbent branches from the base (Figure 14). Leaves are opposite, entire, and largely on the lower portion of the plant. The leaves are lance-linear, sessile, and 2-5 (-8) cm long. Both the leaves and stem have a pubescence of short stiff hairs. Flowers are subsessile, and solitary on peduncles 0.1-1 dm long. The sepals (3) have long, soft hairs, are ovate in shape and deciduous at anthesis. The petals (6 [or 7]) are cream colored, and 8-16 (-20) mm long. The fruit consists of many carpels that are erect at maturity and beaked by the persistent styles. The seeds are many and small (1 mm long). Phenological development is dependent upon climatic conditions; Munz (1974) states that flowering occurs from March-May, but on the island, flowering may begin as early as February, and end before April (pers. obs.).

Distribution:

The genus Platystemon occurs in California and adjacent areas, with only one extremely variable species. Nearly 60 segregates of the species have been proposed. Platystemon californicus var. ciliatus occurs only on Santa Barbara Island.

Habitat:

Platystemon californicus var. ciliatus occurs on the northern portion of Santa Barbara Island (Figure 15). Plants are most abundant in areas of shallow soil with sparsely distributed vegetation. The habitat occupied by Platystemon californicus var. ciliatus has been described as island grassland, bare zones, southern coastal bluff scrub, and as a part of the 'moonscape' and herbaceous plant communities (Hochberg et al. 1979, Holland 1986, Halvorson and D'Antonio 1987). The species assemblage characterizing the habitat includes Atriplex californica, Mesembryanthemum crystallinum, Malacothrix philbrickii (Davis ined.), Hordeum murinum ssp. glaucum, Lasthenia californica, and Astragalus



Figure 14. Platystemon californicus var. ciliatus

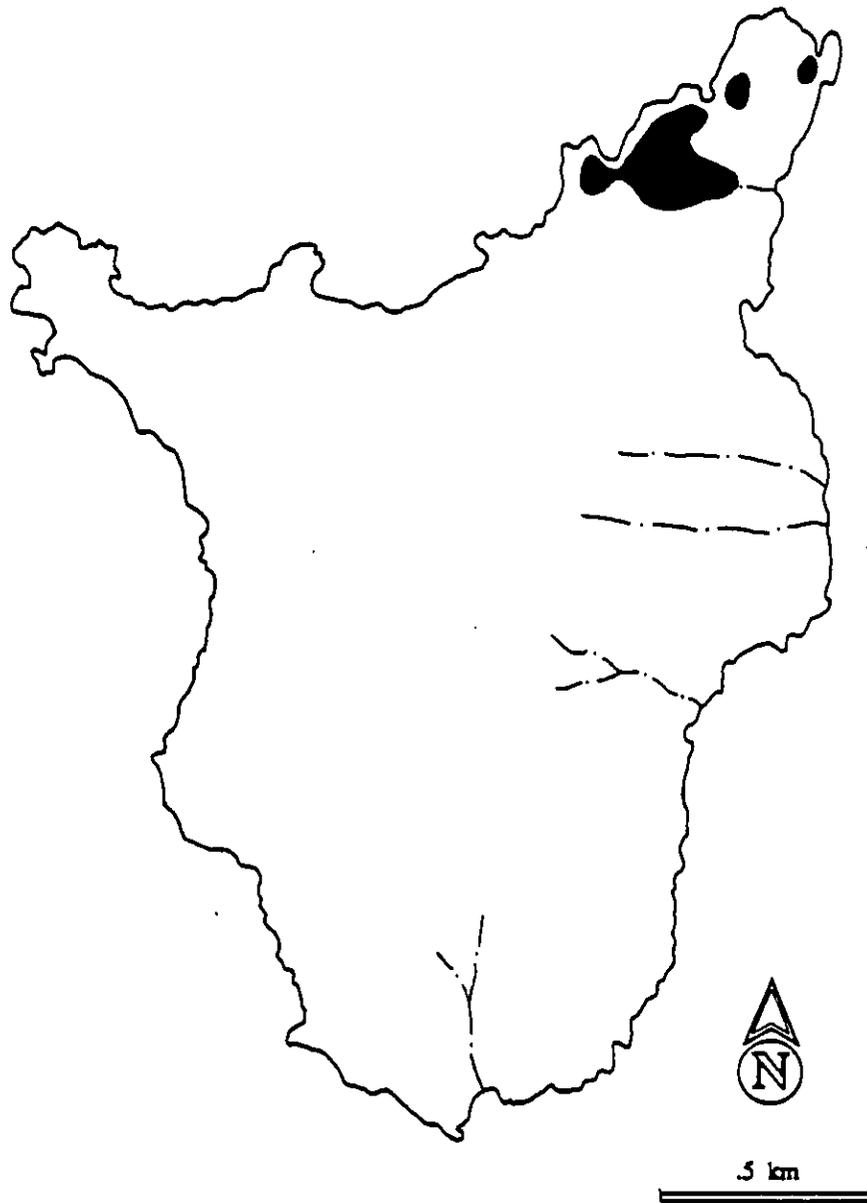


Figure 15. Distribution of Platystemon californicus var. ciliatus on Santa Barbara Island 1984-1989.

traskiae. The population has expanded in recent years to areas of deeper soil where the associated vegetation is a dense cover of the alien annual grass, Hordeum murinum ssp. glaucum.

Current population status:

Due to the annual nature of Platystemon californicus var. ciliatus, the extent of the total range that is occupied by plants is highly variable from year to year. Data on population numbers for 1988 and 1989 suggest the population is expanding. During 1988, 2,033 individuals were counted. The population estimate for 1989 was 6,137 (s.e. = 4.0, n = 40) plants. The numbers of individuals observed in 1988 may have been low as a result of the severe January storm that caused a dramatic decrease in numbers of Astragalus traskiae observed. However, data demonstrating the loss of Platystemon plants as a result of this storm are not available. Qualitative observations from 1984-1989 support the data that indicate a population expansion, with the areal distribution of Platystemon californicus var. ciliatus increasing through time. Further, observations show not only a geographic expansion but also an expansion of habitat, with plants occupying sites with a dense cover of alien annual grasses in addition to sites more typical of the habitat occupied in the recent past - areas of low, sparse vegetation.

DISCUSSION

The National Park Service has been effective at minimizing present-day disturbance on Santa Barbara Island, and the native vegetation on the island appears to be recovering from reductions in abundance and distribution caused by past land use. However, the long-term status of four endangered and rare plants on this tiny island remains unclear. Three of the taxa considered in this research, Dudleya traskiae, Eriogonum giganteum ssp. compactum, and Platystemon californicus var. ciliatus are endemic to Santa Barbara Island, therefore maintenance of a viable population here is essential to the survival of each taxon. Astragalus traskiae, though not endemic to Santa Barbara Island is an insular endemic, occurring on Santa Barbara and San Nicolas Islands. Although San Nicolas Island is protected by the U.S. Navy, the status of Astragalus traskiae there is unknown since no systematic studies of populations on San Nicolas have been conducted.

Populations of the four taxa underwent dynamic changes in numbers of individuals during the period 1985-1989. The data from Clark (1989) suggested five factors that may limit population growth in Dudleya traskiae: 1) the production of viable seeds, 2) seed herbivory, 3) seed dispersal, 4) herbivory of seedlings, and 5) seedling death from drought. Although the present study did not fully explore the reproductive output of each of the taxa considered, it is likely that these same factors are important in limiting population growth in other rare plants. Qualitative observations indicate that seed dispersal is sufficient to allow a geographic range expansion for two of the taxa under study: Eriogonum giganteum var. compactum and Platystemon californicus var. ciliatus. Seedling herbivory and seedling death from drought were responsible for all the seedling mortality observed for Dudleya traskiae. Seedling herbivory was not observed for any of the other taxa considered here, and it is likely that drought-induced mortality is a more important limiting factor for these taxa. Climatic factors including variable rainfall, the length of summer drought and winds associated with winter storms contribute to the effect of desiccation upon seedling survival. Recruitment was correlated with higher rainfall years while mortality was correlated with lower rainfall and high winds.

The actual changes in numbers for each taxon were significantly different, with Dudleya traskiae populations varying by plus-or-minus six plants, and Eriogonum giganteum s. compactum varying by thousands of individuals. A tremendous amount of variation in recruitment levels and mortality, and substantial changes in geographic

distribution have been documented for other native perennial plants on Santa Barbara Island, including Hemizonia clementina, Eriophyllum nevinii, Artemisia californica var. insularis, and Coreopsis gigantea (NPS files). These taxa have undergone dynamic fluctuations in numbers in the past ten years, with a net increase in numbers and geographic range in the recent past.

These data suggest that the native vegetation of Santa Barbara Island is still in a dynamic phase of recovery following the destructive land use practices of the past 100 years. Because data are lacking to adequately reconstruct a description of the predisturbance vegetation for the island, we are unable to determine the reduction in geographic range which the native taxa may have suffered. However, the available data clearly illustrate the need for further monitoring of the endangered and rare taxa in particular, to determine normal population fluctuations and long-term population trends.

Under the provisions of the Endangered Species Act (1973), Channel Islands National Park is obligated to monitor these endangered and rare plants, and where necessary, to manipulate populations or habitat to ensure their survival. Specific guidelines for management are provided to the park under separate cover (Clark and Halvorson in prep.). However, the authors recommend that yearly monitoring of each taxon be continued until normal fluctuations in populations can be determined. Table 10 indicates the time period during which these plants flower on the island, and the recommended time periods for monitoring each taxon. This recommended schedule includes periods for monitoring vegetative, flowering and fruiting stages of development. Numbers of individuals, reproductive output (flower and fruit production), and recruitment and mortality of individuals must be documented through this monitoring effort. A continued decline in numbers of any of these endangered or rare taxa would indicate the need for active manipulation to ensure the survival of a viable population.

Table 10. Flowering times and recommended time periods for monitoring the endangered and rare plants of Santa Barbara Island, California. Solid lines indicate the flowering range for each taxon.* Dashed lines reflect the period during which monitoring should take place.

Plant taxon	J	F	M	A	M	J	J	A	S	O	N	D
<u>Astragalus traskiae</u>							_____					

<u>Dudleya traskiae</u>								_____				

<u>Eriogonum giganteum</u> ssp. <u>compactum</u>									_____			

<u>Platystemon californicus</u> var. <u>ciliatus</u>							_____					

* flowering is highly correlated with climatic conditions, therefore may vary substantially on an annual basis.

ACKNOWLEDGEMENTS

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APPENDIX A

Definitions of Endangered, Threatened and Rare Species

Federal - Endangered Species Act (1973)

Endangered (E) - any species which is in danger of extinction throughout all or a significant portion of its range.

Threatened (T) - any species which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Category 1 (C-1) - taxa for which the Service presently has sufficient information on hand to support the biological appropriateness of their being listed as an Endangered or Threatened species. Because of the large number of such species, and because of the necessity of gathering data concerning the environmental and economic impacts of listings and designations of Critical habitats, it is anticipated that the development and publication of proposed and final rules concerning such species will require several years.

Category 2 (C-2) - taxa for which information now in the possession of the Service indicates the probable appropriateness of listing as Endangered or Threatened, but for which sufficient information is not presently available to biologically support a proposed rule. Further biological research and field study will usually be necessary to determine the status of the taxa included in this category.

State - California Endangered Species Act (1984)

Endangered (E) - a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition or disease.

Threatened (T) - a native species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with extinction, is likely to become endangered in the foreseeable future in the absence of the special protection and management efforts required by state law.

Rare (R) - a native plant that although not presently threatened with extinction, is in such small numbers throughout its range that it may become endangered if its present environment worsens.

Candidate species - a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant for which the California Fish and Game Commission has made formal notice as being under review by the California Department of Fish and Game for addition to either the list of endangered species or the list of threatened species, or a species for which the Commission has published a notice of proposed regulation to add the species to either list.

California Native Plant Society - Smith and Berg 1988.

List 1A - Presumed extinct in California

List 1B - Rare or endangered in California and elsewhere

List 2 - Rare or endangered in California, but more common elsewhere

List 3 - Plants for which more information is needed to properly assess their status

List 4 - Plants of limited distribution

APPENDIX B

Herbarium specimens examined

Astragalus traskiae

- 1922 dry situations Santa Barbara Island, CA, Dr. & Mrs. W.A. Bryan, 14 July (RSA)
- 1939 summit of bare slope, Santa Barbara Island, locally common, M.B. Dunkle 28 May (RSA)
- 1939 west side cliff summits, Santa Barbara Island, L.A. County, (Santa Barbara County), frequent, M.B. Dunkle, 29 May (RSA, SBBG)
- 1940 common, gravelly soil, north ridge, Santa Barbara Island, L.A. County (Santa Barbara County), M.B. Dunkle, 17 March (RSA, SBBG)
- 1940 exposed sea bluffs in tuff, abundant where exposed to wind, Signal Hill (Peak), Santa Barbara Island, L.A. County (Santa Barbara County), M.B. Dunkle, 19 March (RSA, SBBG)
- 1963 perennial, scattered on bare, very wind-swept rocky area, top of Signal Peak, elev. ca. 600 ft., Santa Barbara Island, Santa Barbara County, E.R. Blakley, 4 May (SBBG)
- 1963 perennial, forming tufts on bare rocky area, elev. ca. 150 ft. Arch Pt., Santa Barbara Island, CA, E.R. Blakley, 4 May (RSA, SBBG)

- 1963 prostrate shrub; noted only at the head of Cliff Canyon at the base of Arch Point, elev. ca. 250 ft., Santa Barbara Island, Santa Barbara County, M.A. Piehl, 4 May (SBBG)
- 1966 bluff due west of the mouth of Cliff Canyon, elev. ca. 200 ft., Santa Barbara Island, Santa Barbara County, R.N. Philbrick and M.R. Benedict, 21 May (RSA, SBBG)
- 1968 windy, pebbly terrace just north of Cliff Canyon, elev. ca 200 ft., Santa Barbara Island, Santa Barbara County, R.N. Philbrick, 18 March (SBBG)
- 1968 Northeast slope of North Peak, elev. ca. 250 ft., prostrate perennial, with Mesembryanthemum crystallinum, Hemizonia clementina, etc. R.F. Thorne, 27 April (RSA)
- 1969 Summit area, North Peak, elev. ca. 550 ft., with Eriogonum, Achillea, Amblyopappus, Bromus rubens, B. arizonicus, Erodium cicutarium, Hemizonia clementina, Medicago, Trifolium palmeri, Malacothrix, Lasthenia, Atriplex semibaccata, and Mesembryanthemum crystallinum, Santa Barbara Island, Santa Barbara County, R.N. Philbrick, 29 April (SBBG)

Dudleya traskiae

- 1901 Santa Barbara Island, Blanche Trask, May (USNH, NY) *this specimen was not seen by the authors - information from Philbrick (1972)

- 1939 infrequent, rocky sea bluffs,
south end, M.B. Dunkle, 28 May
(RSA)
- 1941 west side, R. Moran, 26-27
April (DS, SD)
- 1941 west slope of Santa Barbara
Island, CA, elev. 100 m, 27
April (POM, RSA)
- 1949 south slope (of Signal Peak),
R. Moran, 10 February (SD)
- 1961 local and rare, with Opuntia,
side of Middle Canyon, W.
Blakley, 22 October (SBBG)
- 1966 west-facing slope west of Cat
Canyon (southeast of Signal
Peak), R. Philbrick and M.
Benedict, 22 May (SBBG)
- 1968 south-facing slope lower 1/3
Middle Canyon, elev. ca. 100
ft., R. Philbrick and J.K.
McPherson, 27 April (SBBG)
- 1968 sea bluff at the mouth of Cave
Canyon, east side of island,
elev. ca. 25 ft., with
Eriophyllum nevinii,
Mesembryanthemum crystallinum,
Cryptantha maritima, Artemisia
nestiotica (A. californica
var. insularis), 27 April
(RSA)
- 1976 west face of Signal Peak
facing Sutil Island, within
sight of Webster Point, dozens
and dozens of clumps along 30
yds of rock cliff, elev. ca.
250 ft., R. Philbrick and M.J.
Cummings, 17 September (SBBG)

Eriogonum giganteum var. compactum

- 1922 dry open slopes, Santa Barbara
Island, CA, Dr. & Mrs. W.A.
Bryan, 14 July (RSA)

- 1938 dry hillside, Santa Barbara Island, F.H. Elmore, 12 August (RSA)
- 1939 Santa Barbara Island, Santa Barbara County, R. Bond (SBBG)
- 1939 rocky sea bluff, south end Santa Barbara Island, CA, rare, M.B. Dunkle, 28 May (POM, RSA, SBBG)
- 1941 shallow soil on bluff, Landing cove, Santa Barbara Island, Santa Barbara County, E.R. Blakley, 27 September (SBBG)
- 1961 shrub, 3 ft. tall, few on a bluff above the ocean, on a north slope, in clay soil with Coreopsis, elev. 10 ft. Boat landing cove, E.R. Blakley (SBBG)
- 1961 perennial to 1 ft tall, with Coreopsis on a shady beach bluff in clay soil, elev. 100 ft., Landing cove, east side of the island (specimen in flower), Santa Barbara Island, Santa Barbara County, E.R. Blakley, 22 October (SBBG)
- 1963 shrub ca. 7 ft. tall, in bud only; at base of south side of Wester Pt., elev. ca. 75 ft., Santa Barbara Island, Santa Barbara County, M.A. Piehl, 4 May (SBBG)
- 1966 north-facing slope just above landing platform, Landing cove, elev. ca. 100 ft., Santa Barbara Island, Santa Barbara County, R.N. Philbrick and M.R. Benedict, 21 May (RSA, SBBG)
- 1968 south-facing slope lower Middle Canyon, elev. ca 100 ft., Santa Barbara Island,

- Santa Barbara County, R.N.
Philbrick (SBBG)
- 1968 south-facing slope, half way up to west ridge, Sutil Island off Santa Barbara Island, Santa Barbara County, R.N. Philbrick (SBBG)
- 1968 east-facing sea bluff north of Cliff Canyon, north end of the island, elev. ca. 100 ft; low, compact shrub ca. 1/3 to 1/2 m high, with Cryptantha maritima, Atriplex californica, A. semibaccata, Oligomeris linifolia, 27 April (RSA)
- 1969 voucher for photographs, south-facing slope lower Middle Canyon, Santa Barbara Island, Santa Barbara County, R.N. Philbrick and D.W. Richer, 15 March (SBBG)
- 1970 regenerating plant with only small new leaves, with few normal individuals nearby, upper northwestern slope of North Peak, Santa Barbara Island, Santa Barbara County, R.N. Philbrick, 13 February (SBBG)
- 1975 loose, unattached piece (of infl.) that may have been brought by a bird, Shag Rock, off Santa Barbara Island, Santa Barbara County, M.S. Astone, 14 August (SBBG)

Platystemon californicus var. ciliatus

Specimens were unavailable for review - they are on loan by the various herbaria that house the specimens to another scientist.