VEGETATION AND FLORA OF ISLAS LOS CORONADOS BAJA CALIFORNIA, MEXICO

Thomas A. Oberbauer

Department of Planning and Land Use, County of San Diego
5201 Ruffin Road, Suite B-5, San Diego, CA 92123
(619) 694-3700, FAX (619) 694-2555, E-mail:TOBERBPL@co.san-diego.ca.us

ABSTRACT

Islas Los Coronados are a group of four small islands in Mexico, near the International Border with the United States. Together, they comprise approximately 2.5 km^2 and lie 13 km from the mainland (See Figures 1 and 2). Vegetation is Maritime Succulent Scrub dominated by *Encelia californica*, *Euphorbia misera*, *Hazardia berberidis*, *Atriplex canescens*, *Bergerocactus emoryi*, *Opuntia littoralis,* and *Lycium californicum*. Middle Rock and Middle Island also have barren areas covered with bird guano. On South Island, the north facing slope supports Coastal Sage Scrub. Botanically, the South Island is the most diverse, containing a number of insular endemics including *Eschscholzia ramosa, Malva occidentalis,* and *Malacothrix foliosa*. The *Malva* is noteworthy since it is also found on Isla Guadalupe about 350 km to the south. Islas Los Coronados support three endemics, *Galium coronadoense* and *Malacothrix insularis*, which have only been found on the South Island, and *Dudleya candida,* which has been found on all four of the islands. Unfortunately, the South Island has a small herd of goats that has had an effect in reducing the areas of shrubs, including the *Malva.*

Keywords: Coronado Islands, Islas Los Coronados, North Coronado Island, South Coronado Island, Middle Coronado Island, California Islands, Baja California, Mexico, flora, vegetation, botany, feral animals.

INTRODUCTION

The vegetation of Islas Los Coronados falls within Thorne's (1976) classification of Maritime Sage Scrub and Holland's (1986) Maritime Succulent Scrub (Oberbauer 1992). The flora reflects this vegetation. However, each of the islands in the four-island group has different vegetation and floral characteristics due to differences in size, topography, soils, and disturbance, both natural and the result of human influence.

Two historical accounts exist of the vegetation of Islas Los Coronados. Bartlett (1854) described the South Island as "entirely destitute of trees. A few small shrubs are seen; and wherever there is soil, it is covered with grass and a great abundance of wildflowers...like patches of orange, purple and yellow when seen from the water." Greene (1885) made a number of collections of plants on the north end of the island and discussed the dry condition of the season in which he landed on the island.

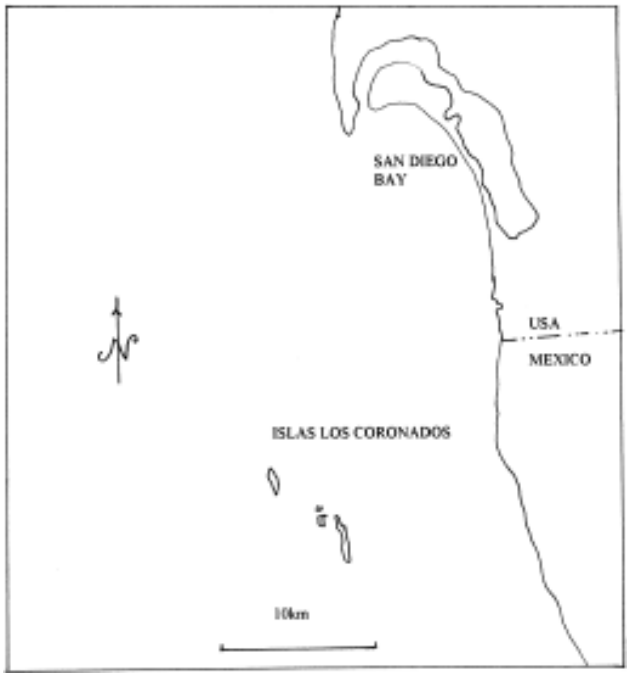

Figure 1. Relative location of Islas Los Coronados to the shoreline.

Islas Los Coronados have been visited by a number of collectors dating back to Bartlett (1854), but also Greene (1885). Others who made plant collections include Pond in 1889, Wiggins in 1949, Blakely, who made several visits during the 1960s, Philbrick who made collections during the 1960s and 1970s with Ricker and Benedict, and especially Reid Moran who made collections from the 1950s, 1960s, and 1970s. There have also been a number of incidental collectors including Frank Stephens, Charles Shaw, Frank Gander and A. J. Stover. With the exception of Reid Moran, most of the collectors landed on the South Island and spent only short visits there. Greene's and Pond's collections are housed in the Greene Herbarium at the University of Notre Dame. Blakely, Philbrick and Ricker, and Philbrick and Benedict collections are at the Santa Barbara Botanic Garden. Most Reid Moran collections, the author's collections, and collections by the remainder of those

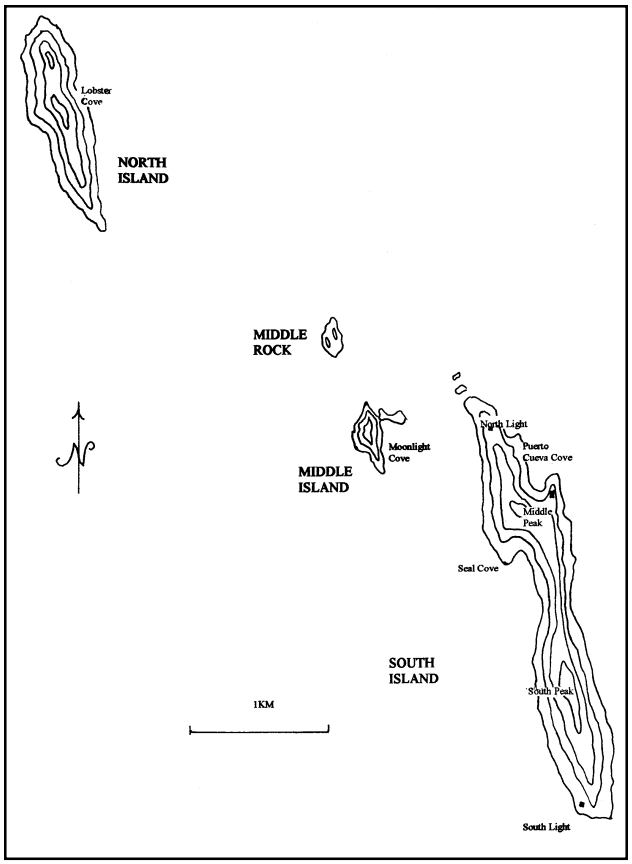

Figure 2. Landmarks on Islas Los Coronados.

mentioned above are at the San Diego Museum of Natural History.

MATERIALS AND METHODS

Field surveys were conducted on the islands from boats as well as land. The islands were surveyed and circumnavigated by boat in November 1978 and 1979, and May and July of 1990, August 1992 and June 1993. Landing occurred on the South Island, including a traverse down the west side on foot, in November of 1978 and 1979. In May of 1989 and June of 1993, the area north of Middle Peak was explored. In April of 1991, the entire reachable portion of the island was surveyed on foot following exceptional February and March rains. Landing occurred on the North Island in May and June of 1989 with an overnight stay and thorough survey in March 1990. Middle Rock was visited in May of 1989, May and July of 1990, and spring of 1991, with two overnight stays. Middle island was visited on land and thoroughly explored in August 1990. All plant species were noted during each of these visits and an emphasis was placed on collecting specimens of the native species. Examinations were made of the plant collections at the San Diego Museum of Natural History and the Santa Barbara Botanic Garden. In addition, written inquiries were made to the University of Notre Dame and the National Museum of Natural History at the Smithsonian Institution. Furthermore, information on collections from the genus *Malacothrix* was provided by William S. Davis of the University of Louisville. Collected specimens were identified using Munz (1974), Wiggins (1980), and Hickman (1993). The vegetation analysis is comprised mostly of descriptive evaluations with notations of the distribution and relative abundance of the dominant species that comprise the vegetation.

RESULTS

Vegetation Description

North Coronado Island

The vegetation on Islas Los Coronados reflects the relatively dry maritime climate, similar to the southern end of Point Loma where the average rainfall has been measured between 6 and 7 inches on the lower slopes (Lynch 1931). North Coronado Island is large enough to contain various microhabitats for plants. The southeastern slopes and northern end of the island are a series of rocky cliffs of durable red sandstone. The vegetation of the rocky cliffs is composed of *Coreopsis maritima, Perityle emoryi, Stephanomeria diegensis, Dudleya candida, Lycium californicum, Mirabilis californica*, and *Opuntia littoralis*. In some locations, the *Dudleya* forms mats up to a few meters across. Populations of *Mammillaria dioica* and *Bergerocactus emoryi* occur on the island, but they are rare.

An amphitheater-shaped talus slope exists on the northeastern portion of North Coronado Island. This slope supports a combination of introduced and native disturbance oriented plants including *Sonchus* sp., *Malva parviflora, Stellaria media, Bromus carinatus, Hordeum* sp., *Lamarckia aurea* and *Mesembryanthemum crystallinum. Coreopsis maritima* occurs in a few large patches here.

The basic vegetation on the central ridge of the island, where soil development has occurred, consists of *Atriplex canescens, Hazardia berberidus, Encelia californica, Opuntia prolifera, Opuntia littoralis, Marah macrocarpus*, and *Lycium californicum*. In addition, there are significant portions of the upper ridge of the island that are covered with solid patches of *Atriplex canescens*. In the southern third of the island, a terrace is nearly barren except for *Mesembryanthemum crystallinum*.

The upper portions of the northern end and the terrace area of the North Island are major nesting colony sites for the western gull. Large areas of the southeastern slopes of the island were until recently major nesting sites for the California brown pelican. The combination of heavy concentrations of guano and physical disturbance for nest locations has prevented much vegetation growth with the exception of disturbance-and salt-tolerant plants such as *Mesembryanthemum* and *Hordeum.*

Middle Rock

Physically, the island consists of a guano-washed rock hill on the south side, and a smaller ridge on the north side

with a small amphitheater-like depression between them. The island is composed of relatively infertile sandstone and mudstone. The vegetation on Middle Rock is generally very sparse, with the majority of the island nearly barren. On the western side of the rock hill, a few patches of the rocky slope vegetation similar to that on the North Island include *Coreopsis, Dudleya, Opuntia prolifera, O. littoralis,* and *Stephanomeria diegensis*. A few individuals of *Lycium californicum* also occur in these areas. These patches occur where a veneer of soil has accumulated over the solid rock base. In some locations, the lower edges of the soil are sloughing down slope, gradually reducing the area habitable by vegetation.

The inner basin area of the island contains deeper soil materials, dominated by a sparse growth of *Suaeda californica*. The introduced *Chenopodium murale* is one of the most common plants on this island, but it does not form continuous cover. *Malva parviflora* and *Hordeum leporinum* are common in the soft soils in the inner basin and a few specimens of *Salsola iberica* occur there. It is noteworthy that a moderate sized *Rhus integrifolia* occurred on the island until 1987 or 1988, its skeleton remaining in the upper part of the inner basin.

Middle Island

The Middle Island is topographically a steep hill with a peninsular-like structure on the northeast side which forms a protected cove referred to as Moonlight Cove. The island is constructed of extensively weathered and unstable material that gives way in handfuls or slope-sized masses.

The barren nature of this island is probably a combination of the unstable substrates and heavy use by breeding and roosting sea birds. The east side is a heavily eroding and slumping area that supports a very sparse vegetation with scattered *Atriplex canescens, Suaeda californica, Chenopodium murale, Salsola iberica*, and *Atriplex californica.* The majority of plants occur as isolated individuals in a hard packed guano surface. This is particularly true of the *Hazardia berberidus* shrubs on the northern edge of the ridge-like spine, and small clusters of *Suaeda californica* and *Encelia californica* high on the west slope of the island. In contrast to these sparsely growing species, *Mesembryanthemum crystallinum* grows in large patches on the steep north slope following favorable rains.

The only area of vegetation growth in the form of a community occurs on the southwest, windward slope of the island. There grows a patch of *Lycium californicum, Mammillaria dioica, Euphorbia misera, Mirabilis californica, Dudleya candida, Bergerocactus emoryi*, and *Opuntia prolifera*. Since the North Island pelican colony relocated to Middle Island in the late 1980s, this area, which is on the outer edge of the colony, has become disturbed.

Eriogonum fasculatum and *Encelia californica* occur as very sparse individuals on some short, east facing cliffs near the top of the southern portion of the island. The extreme southern tip of the island is a rocky ridge with both *Opuntia littoralis* and *O. prolifera*, and *Stephanomeria diegensis* on the predominantly rock slopes. *Marah macrocarpus* also occurs here.

South Island

The South Island is the largest and highest of the Los Coronados group and it has a greater number of plant species than the others. The major topographic factors that exist there are Puerto Cueva Cove located about one quarter the way down on the east side, Middle Peak with an elevation of approximately 180 m located about one third the way down the island, Seal Cove on the west side, and South Peak with an elevation of approximately 160 m.

Major factors of disturbance on South Island have been the military outpost consisting of a half dozen structures above Puerto Cueva Cove and an old casino. The old casino was built during the U. S. Prohibition era for gambling and consumption of alcoholic beverages. However it was destroyed in heavy winds and storms of January of 1988. Several trails cross the northern end of the island and extend to the southern end serving the navigational light.

In Puerto Cueva Cove, a few burros have been traditionally kept to carry materials to the navigational lights at the northern and southern ends of the island, however since the mid 1980s these animals have been augmented by several dozen goats. The goats have caused a noticeable adverse effect on the vegetation. As on the other islands, breeding colonies of birds have affected the vegetation on the southern end. Natural erosion of steep, unstable surfaces has left barren the nearly vertical slopes around Puerto Cueva Cove and Seal Cove and portions of the southern end of the island. There are also large sandstone outcrops that in one place on the eastern side form a “chute” that extends from the upper slopes of the island to near sea level.

On the upper slopes of the island, particularly in the northern end, the scrub community is dominated by *Encelia californica, Euphorbia misera, Hazardia berberidus, Rhus integrifolia, Bergerocactus emoryi, Opuntia littoralis*, and *Lycium californicum*. On the extreme northern end near the lighthouse, the vegetation takes on the aspect of Coastal Sage Scrub with dominants of *Artemisia californica, Rhus integrifolia, Eriogonum fasciculatum*, and a patch of *Heteromeles arbutifolia*. This is the only location on the island where the *Erigonium fasciculatum*, *Heteromeles arbutifolia*, and *Baccharis sarothroides* grow. The endemic *Galium coronadoense* and *Galium angustifolium* also occur near the north end, on the east facing slope, west of Puerto Cueva Cove.

As one moves southward on the island, the diversity of shrubs decreases somewhat. The *Encelia, Euphorbia misera, Lycium, Opuntia littoralis,* and *O. prolifera* extend the entire length of the island, but with a lower density on the southern end than in the more northerly locations. In the more southerly locations, *Suaeda californica, Atriplex canescens, Chenopodium californicum, C. murale, Cleome isomeris* and *Oligomeris linifolia* are major components of the vegetative cover. *Mesembryanthemum crystallinum* is common in the vegetation over the entire island, especially

in disturbed areas such as along trails. It is of interest that it provides shelter for the commonly occurring endemic rattlesnake, *Crotalus viridus caliginus. Erodium cicutarium* and *Lamarckia aurea* are also widespread on the island, though most prevalent in areas that are disturbed by trails.

In partially shaded, rocky areas, such as the east facing slopes south of the military buildings, *Marah macrocarpus, Antirrhinum nutallianum, Eucrypta chrysanthemifolia* and *Pholistoma racemosum* grow in a lush cover. The sandstone outcrops that occur down the east side of the island have large patches and clusters of *Dudleyas,* particularly *D. candida* and *D. anomala.* The cobblestone cliffs around the cove are covered with *Cleome* and *Dudleya candida.*

The slopes of Middle Peak support a vegetative cover of low growing perrennials and annuals. Dominants here include *Mammillaria dioica, Lepidium oblongum insulare, Calandrinia maritima, Lycium californicum, Eschscholzia ramosa*, *Cryptantha intermedia* and *C. maritima.*

About two thirds of the way down the island grows the *Malva occidentalis* which is elsewhere found only on the outer islet of Isla Guadalupe. It formed dense thickets in the late 1970s with shrubs up to a meter in height. In 1991 after years of drought and probable impacts from goats, the only *Malvas* found were small seedlings or resprouting plants no more than a few inches high.

In some areas, the *Hazardia berberidus* forms nearly pure stands, particularly the slope above Puerto Cueva Cove on the north portion of the island. However, in the late 1980s and early 1990s, the drought and goat herd reduced the importance of this shrub. During the heavy rains of March 1991, this area was revegetated by a carpet of native wildflowers including extensive areas of *Collinsia heterophylla, Linaria canadensis, Lasthenia coronaria, Claytonia perfoliata, Astragalus trichopodus* ssp. *leucopsis, Delphinium parryi*, and *Eschscholzia californica*. From the water, the views of this area were identical to those described by Bartlett (1854) nearly 145 years ago.

Floristics

The islands support three endemics, *Dudleya candida*, *Malacothrix insularis*, and *Galium coronadoense*, and three insular endemics, *Eschscholtzia ramosa*, *Malva occidentalis*, and *Malacothrix foliosa*. There are a total of 96 native species including 11 monocots and 18 members of the Asteraceae. An additional 30 introduced species are present. Since the earliest explorers documented the vegetation on South Coronado Island, there have been subtle changes. Greene, in 1885, listed two species, *Gilia capitata* and *Lotus scoparius* that have not been found for many years, though they were considered common during his times. The collection of the *Aesculus parryi* by Pond is of special note since it has not been found this far north on the adjacent mainland and can apparently no longer be found on these islands. It is also noteworthy that new weedy species have been introduced, some by humans and some — such as the *Myoporum* and *Lycopersicon* on the North Island — by western gulls that have ingested fruits and seeds from restaurants and ornamental plants on the mainland.

DISCUSSION

Over the years, there have been numerous proposals for development on these islands. They have also been traditionally visited by egg collectors and fishermen. Furthermore, the presence of goats on the south island is particularly disturbing as they devour the vegetation and cause the reduction of native species. However, as was illustrated by comparison of the appearance of the south island in 1854 by Bartlett to that of the spring of 1991, there is still a relatively intact flora that must be protected. For a complete catalogue of the vascular flora, see the Attachment.

ACKNOWLEDGMENTS

The author gratefully acknowledges William T. Everett, for arranging transportation to the islands on a number of private boats, the owners of the boats, and the San Diego Association of Geologists who provided access on several occasions. People who have assisted in the research on the islands include Reid Moran, who made the greatest number of collections; R. Mitchel Beauchamp; Jon Rebman; Geoffrey Levin; and Steve Junak who provided access to collections and data at the Santa Barbara Botanic Garden and in his own files.

LITERATURE CITED

Bartlett, J. 1854. Personal Narrative of exploration and incidents in Texas, New Mexico, California. Appleton, NY.

Greene, E. 1885. Botany of the Coronado Islands. Western American Scientist 1(10):69-71.

Hickman, J. C. (ed.) 1993. The Jepson Manual: Higher plants of California. University of California Press, Berkeley, CA.

Holland, R. F. 1986. Preliminary description of the terrestrial natural communities of California. State of California Department of Fish and Game. 156 p.

Lynch, H. B. 1931. Rainfall and stream runoff in Southern California since 1769. Metropolitan Water District of Southern California. 17 pp plus appendices.

Munz, P. A. 1974. A Flora of Southern California. University California Press, Los Angeles, CA.

Oberbauer, T. A. 1992. Vegetation of Islas Los Coronados. Pages 16-22 *in* Perry, L. (ed.), Natural History of the Coronado Islands, Baja California (revised 1992). San Diego Association of Geologists.

Thorne, R. F. 1976. The vascular plant communities of California. Pages 1-31 *in* Latting, J. (ed.), Plant Communities of Southern California. California Native Plant Society Special Publication No. 2.

Wiggins, I. L. 1980. Flora of Baja California. Stanford University Press, Stanford, CA.

ATTACHMENT

Vascular Plants of Islas Los Coronados

Non-Flowering Plants

Polypodiaceae

Pellaea andromedaefolia (Kaulf.) Fee S North facing slope above PC Cove and NE slope of South Island, 6-21-60, *RM 8301* (SD); 4-21-91 *T0 SLC91-09* (SD).

Polypodium californicum Kaulf. Reported by Greene, 1885. **S** North end of island, 3-14-64, *Blakley 6445*; 3-19-66, *Blakley 6616*; 3-19-66 *Philbrick B66-262*; center of island, 5-7-76 *RM 23101*. All at SBBG.

Angiosperms

Aizoaceae

Carpobrotus chilensis* (Molina) N.E.Br. Reported by Greene, 1885. **N Southeast of lighthouse, 3-20-66 and 3-15-64, *Blakley 6743, 6481*. **S** Near shore on northeast side, 3-14-70 *Philbrick & Ricker B70-25* (All at SBBG).

Mesembryanthemum crystallinum* (L.) Rothm. **N Forms extensive cover of steep slopes, 6-10-89 TO obs. **MR** In small patches in basin area, 6-12-90, *TO MRLC90-02* (SD). **MI** In a few large patches on the north slope 8-26-90. **S** Forms a major part of the cover, especially in the disturbed areas, 4-21-91, TO obs.

Mesembryanthemum nodiflorum* (L.) Rothm. **S In drier and more disturbed areas than *G. crystallinum*, 4-21-91, TO obs.

Anacardiaceae

Rhus integrifolia (Nutt.) Brew. & Wats. **S** Scattered on the N third of the island on NE, 4-21-91, TO obs. **MR** One dead snag, 6-12-90, TO obs. **MI** Southern ridge, 8-26-1990, *TO MRLC90-10* (SD).

Apiaceae

Apiastrum angustifolium Nutt. **S** Central portion of the island on the west side trail, 4-21-1991, *TO SLC91-24* (SD).

Daucus pusillus Michx. Reported by Greene, 1885. **S** Southwest part of island, 3-14-70, *Philbrick & Ricker B70-16* (SBBG).

Asteraceae

Amblyopappus pusillus H. & A. **S** Open disturbed areas along trails over the island, 5-7-76, *RM 23132*; 4-21-1991, *TO SLC91-23* (both at SD).

Artemisia californica Less. **S** Scattered over N 2/3 of island, pruned by goats and drought, 4-21-1991, *TO SLC91-30* (SD).

Baccharis sarothroides Gray **S** N end one plant observed in midst of impenetrable cactus patch, 4-21-91, TO obs.

Coreopsis maritima (Nutt.) Hook. F. **N** In colorful patches over the island, 3-24-90, *TO NLC90-07*. **MR** Upper ridge and in rock crevices, 6-12-1990, *TO MRLC90-03*. **S** Central portion, 5-7-76, *RM 23144*; 4-21-1991, *TO SLC91-13* (All at SD). *Encelia californica* Nutt. Very common on both N and S islands. **N** 3-25-90, *TO NLC90-06*; **S** 5-7-76, *RM 23108*. **MI** Top of ridge on barren west side, 8-26-90, *TO MILC90-04* (All at SD).

Eriophyllum confertiflorum (DC.) A. Gray **S** N slope above PC cove, 5-7-76, *RM 23116* ; 4-21-1991, *TO SLC91-02* (Both at SD).

Gnaphalium microcephalum Nutt. **S** 6-14-37 *Stover*.

Gnaphalium ramosissimum Nutt. **S** On northern end, 4-21-91, obs. TO.

Hazardia berberidus (A. Gray) E. Greene **N** Over major portion of island, 3-24-90, *TO NLC90-04* (SD). **S** In stands over island, large patch on north slope above PC cove, 6-4-1889, *Pond* (Greene Herbarium). **MI** Scattered individuals on barren north slope, 8-26-1990, *TO MILC90-09* (SD).

Lasthenia chrysostoma (F. & M.) **S** 5-16-1885, *Greene* (Greene Herbarium) and observed 4-21-91 near highest part of island, TO.

Lasthenia coronaria (Nutt.) Ornduff **S** Extensive patches on north slope above PC cove and scattered to S peak, 3-19-66, *Blakley 6624* (SBBG); 3-14-70, *Philbrick & Ricker B70-15* (SBBG); 5-7-76, *RM 23125* (SD); 4-21-91, *TO SLC91-37* (SD).

Malacothrix foliosa A. Gray **S** Central portion of the island, 5-12-1895 *A.W. Anthony* (UC); 5-30-26 *W.M. Pierce 98743* (POM); 6-10-26 *M.E. Jones* (POM); 4-21-91, *TO SLC91-33* (SD).

Malacothrix insularis Greene. Endemic. **S** Abundant, 5-16-1885, *Greene*, including type (CAS, UC, DS, US). Also 5-30-26, *W.M. Pierce 98743* (POM); and from one colony of ca. 100 on steep west slope in southern part of island, not seen elsewhere, 5-8-76, *RM 23158* (SD).

Malacothrix similis W. Davis & Raven. **S** Ridge north of PC cove, northern portion of island, 3-19-66, *Philbrick B66-280* (SBBG).

Perityle emoryi Torrey **N** Over entire island, 3-15-64, *Blakley 6490* (SBBG); 3-25-90, *TO NLC90-05*. **S** Lower dry slopes over whole island, 3-20-66, *Philbrick B66-243* (SBBG); 5-7-76, *RM 23135* (SD).

Rafinesquia californica Nutt. **S** NE slope on north end, 6-1-63, *RM 21056* (SD); on NE slope on north end in locations along west side of island, 4-21-91, *TO SLC91-16, SLC91-14* (SD).

Sonchus oleraceus* L. **MR In basin area, 3-3-70, *RM 16786.* **N** Scattered locations, 4-25-77, *RM 23977* (SD). **S** Mostly near military camp, 5-7-76, *RM 23112* (SD).

**Sonchus tenerrimus* L. 5-8-76, *RM 23162* (SD).

Stephanomeria diegensis Gottlieb **N** Grew in extensive stands over island July 1990, 3-15-64, Blakley 6488; 3-19-66, *Philbrick* B66-222 (SBBG); 6-10-89, *TO NLC89-07* (SD). **MI** Obs. 8-26-90, TO on S end. **MR** 6-12-90, *TO MRLC90-04* (SD).

Uropappus lindleyi (DC.) Nutt. [*Microseris linearifolia* (DC.) Sch.-Bip.] Reported by Greene 1885 .

Boraginaceae

Cryptantha intermedia (A. Gray) Greene **S**, Scattered in openings over N 2/3 of island, 5-16-1885, *Greene* (GREENE); 5-7-76, *RM 23129* (SD); 4-21-91, *TO SLC91-26* (SD).

Cryptantha maritima Greene **S** SW slope of middle peak, 3-19-66, *Blakley 6675* (SBBG); 4-21-91 *TO SLC91-19* (SD).

Brassicaceae

Descurainia pinnata (Walt.) Britt. ssp. *glabra* (Woot.& Stand.) Detling **S** Around south peak, 4-21-91, *TO SLC91-39* (SD).
Lepidium oblongum Small var. *insulare* C.L. Hitchc. **S** On SW slope of middle peak and along trail near south peak, 3-19-66 *Blakley 6649* (SBBG); island ridge, 4-21-91, *TO SLC91-39, SLC91-22*

Sisimbrium irio* L. **S A few scattered along trail to S light house, 4-21-91, *TO SLC91-43* (SD).

Cactaceae

Bergerocactus emoryi (Engelm.) Britton & Rose **N** In patches, 2-20-58, *RM 6557* (SD). **S** Over island, mostly west side, 5-7-1976, *RM 23137* (SD). **MI** One patch on SW side, 8-26-90, TO obs.

Mammillaria dioica K. Brandegee **N** A few locations on upper ridge, 3-20-66, *Blakley 6732* (SBBG). **S** Scattered length of island, mostly on spine, 3-14-64, 3-19-66, *Blakley 6644* and *6476* (SBBG). **MI** Southwest slope, 8-26-90, *TO obs.*

Opuntia littoralis (Engelm.) Ckll. var. *littoralis* **N** Dominant member of vegetation, 6-10-89, TO obs. **MR** on SW ridge, 6-12-90, *TO MRLC 90-05* (SD). **S** Dominant form of vegetation, 10-19-13, *SB Parish 8834*; 5-26-47, *George Lindsay* (SD). **MI** SW side, 8-26-90, TO obs.

Opuntia oricola Philbrick **S** Reported by Beauchamp.

Opuntia prolifera Engelm. **N** Above Fish camp, 3-20-66, Blakeley 6741 (SBBG). **S** Common, 4-21-91, TO obs. **MI** SW slope, 8-26-90, TO obs. **MR** 6-12-90, *TO obs.*

Capparaceae

Cleome isomeris Greene **S** On cliff slopes within PC cove and lower slopes on S end, 3-19-66, *Blakely 6706* (SBBG); 2-8-69, *Philbrick and Benedict B69-13* (SBBG); 5-7-76 *RM 23143* (SD).

Caryophyllaceae

Silene gallica* L. **S N slope above PC cove, 5-7-76, *RM 23100* (SD).

Silene laciniata Cav. ssp. *major* Hitchc. & Maguire **S** N slope above PC cove, 6-21-60, *RM 8308* et al. (SD); 6-2-71 *RM 18460* (SD).

Spergularia villosa* (Pers.) Camb. **S Along trail to landing below military camp, 6-10-89, *TO NLC 89-02*; 3-24-90 *NLC 90-03* (SD).

Stellaria* media (L.) Vill. **N E slope above landing , 6-10-89, TO obs. **S** A patch above military camp near flat pad, 4-21-91, *TO SLC91-21* (SD).

Chenopodiaceae

Aphanisma blitoides Nutt. **S** One quarter mile north of southern light, 3-14-64, *Blakley 6464* (SBBG).

Atriplex californica Moq. **N** In scattered patches, 4-23-16, *Stephens* (SD), **MR** Dominant vegetation in basin, 3-3-70, *RM 16788* (SD). **S** Lower slopes around island, 5-7-76, *RM 23145* (SD); 4-21-91, *TO SLC 91-29* (SD).

Atriplex canescens (Pursh) Nutt. ssp. *canescens* **N** Dominant vegetation on southern 2/3 of island, 5-20-58, *RM 6558* (SD). **S** Most common on southern ridge and slopes, 2-20-66, *Blakley 6716*; 2-8-69 *Philbrick & Benedict B69-9*; 5-8-76, *RM 23159* (SD).

Atriplex semibaccata* R. Br. **S Along trails, 3-19-66, *Blakley 6656* (SBBG). **MI** East slope, 7-9-58, *RM 6811*(SD).

Atriplex serenana var. *davidsonii* (Standl.) Munz **S** Middle of island, 3-14-64, Blakley 6447 (SBBG).

Atriplex pacifica Nelson **S** Southwest slope of island, 5-7-76, *RM 23133*.
Chenopodium californicum (S. Wats.) S. Wats. **S** Very common, 5-7-76, *RM 23108* (SD). **N** Very common, 5-3-70, *RM et al. 16798* (SD); 6-10-89, *TO NLC89-05* (SD).

Chenopodium murale* L. **N 6-10-89, *TO NLC89-06* (SD). **MR** Obs. 6-12-90 TO, **S** Very common, 5-7-76, *RM 23111* (SD).

Salsola iberica* Sennen & Pau **N Mostly on ridge top and paths, 3-25-90, *TO NLC90-08* (SD). **MR** Mostly in basin, 6-12-90, TO obs, **S** In a few locations along trails, 5-7-76, *RM 23134* (SD). **MI** In trough area on upper island, 8-26-90, TO obs.
Suaeda californica S. Wats. **MR** Dominant in basin, 3-3-70, RM 16785; 6-12-90, TO NLC90-08 (SD). **MI** E slope 7-9-58, *RM 6807*; 8-26-90, *TO MILC90-03* (SD). **S** Along southern, lower slopes, 6-14-37 *Stover*.

Convolvulaceae

Calystegia macrostegia ssp. *longiloba* Brummit **S** Western side of island, 3-14-64, *Blakley 6446* (SBBG); 5-7-76, *RM 23115* (SD).

Dichondra occidentalis House **S** South to south peak, 2-8-69 *Philbrick and Benedict B66-281* (SBBG).

Crassulaceae

Crassula connata (Ruiz & Pav.) A.Berger **S** Above PC cove , 3-19-66, *Blakley 6620* (SBBG); 3-19-66, *Philbrick B66-284*; 3-14-70, *Philbrick & Ricker B70-21* (SBBG); 4-21-91, *TO SLC91-25* (SD).

Dudleya anomala (Davidson) Moran **S** Common on E slope of island, 7-10-73, *Philbrick B69-12* (SBBG); 6-21-60, *RM 8307* (SD).

Dudleya attenuata ssp. *orcuttii* (Rose) Moran **S** North end ridge, 6-20-59, *RM 7504*; 6-21-60, *RM 8308* (SD).

Dudleya candida Britton Endemic. **N** Green and chalky, 3-25-90, *TO NLC90-10* (SD). **S** 7-28-28, *Kessler "Isotype"*; 6-14-37, *A. J. Stover* (SD). **MR** 6-12-90, *TO MRLC90-09* (SD). **MI** 8-26-90, *TO MILC90-06* (SD).

Dudleya lanceolata (Nutt.) Britton & Rose **S** Slope above cove, 6-20-59, RM 7505 (SD).

Dudleya x *semiteres* (Rose) Moran **S** RM field notes 6-20-59.

Cucurbitaceae

Marah macrocarpus (Greene) Greene **N** Relatively common, 3-25-90, obs. TO. **S** Very common over island, 1-4-1889, *Greene* (GREENE); 5-7-76, *RM 23118* (SD). **MI** One at S end, 8-26-90, *TO MILC90-08* (SD).

Euphorbiaceae

Euphorbia misera Benth. **S** Dominant, 5-7-76, *RM 23114* (SD). **MI** On SW slope, 8-26-90, *TO MILC90-11* (SD).

Fabaceae

Astragalus trichopodus ssp. *leucopsis* (T. & G.) Thorne **S** Patches above PC cove, 7-26-1948, *Charles Shaw* (SD); 6-30-68, *RM*; 5-7-76, *RM 23104* (SD).

Lotus scoparius (Nutt.) Ottley Reported by Greene, 1885.

Lupinus succulentus Dougl. **S** Along E side trail past middle peak and west side of middle portion, 4-21-91, *TO SLC91-34* (SD).

Medicago polymorpha* L. **N 3-25-90, TO obs. **S** 4-21-91, *TO SLC91-34* (SD).

Trifolium tridentatum Lindl. **S** On slope above PC cove, 4-21-91, *TO SLC91-36* (SD).

Geraniaceae

Erodium cicutarium* (L.) L'Her. **S Very common over island, 5-7-76, *RM 23110* (SD).

Erodium botrys* (Cav.)Bertol **S Above Puerto Cueva cove, 4-21-91, obs. TO.

Erodium moschatum* (L.)L'Her. **S North slope, 5-7-76, *RM 23113* (SD).

Hipocastanaceae

Aesculus parryi A.Gray **S** Collected 6-4-1889 by *Pond HG#06931#25927* (GREENE). Apparently no longer extant.

Hydrophyllaceae

Eucrypta chrysanthemifolia (Benth.) Greene **S** Shaded areas NE and SW side, 3-19-66, *Blakley 6650* (SBBG), 3-19-66 (SBBG); *Philbrick B66-310* (SBBG); 5-7-76, *RM 23128*, 4-21-91, *TO SLC91-42* (SD).

Phacelia distans Benth. **S** SW side along trail, 5-8-76*, RM 23154* (SBBG); 3-14-64, 3-19-66, *Blakley 6451, 6641* (SBBG); 4-21-91, *TO SLC91-40* (DS).

Phacelia ixodes Kellogg **S** North of Hotel cove, N end and along SW side trail, 5-7-76, *RM 23142* (SD).

Pholistoma auritum (Lindl.) Lilga Reported by Greene, 1885.

Pholistoma racemosum (Nutt.) Constance **S** SE side above PC cove, 5-7-76, *RM 23150*; 4-21-91, *TO SLC91-07* (SD).

Malvaceae

Malva occidentalis (S. Wats) M.F. Ray **S** Much reduced in 1991 along SW side of island and top of south peak, 5-16-1885, *Greene* (GREENE), 4-22-70, RM 17481; 5-8-76 RM 23156,23157 (SD) others.

Malva parviflora* L. **N 3-25-90 obs. TO common along trails and open places. **MR** In basin, 6-12-90, *TO MRLC90-10* (SD). **S** common along trails, 5-7-76, *RM 23109* (SD).

Myoporum laetum* Forst. f. Ngaio. **N Top of N ridge, carried by gulls, 3-25-90, obs. TO. **S** Planted near military camp, 5-7-76, *RM 23149* (SD). .

Nyctaginaceae

Mirabilis californica A. Gray **N** Common in shrubs and rocks, 3-25-90, *TO NLC90-11* (SD). **MI** On southwestern slope, 8-26-90, *TO MILC90-05* (SD). **S** Common length of island, 5-7-76, *RM 23120* (SD).

Papaveraceae

Eschscholzia californica Cham. var. *peninsularis* (Greene) Munz **S** Growing in colorful patches on slopes around PC cove, 3-14-64, *Blakley 6417* and 3-19-66, *6680* (SBBG); 4-21-91, *TO SLC91-04* (SD) .

Eschscholzia ramosa Greene **S** Very common middle 1/3 of island, 2-26-49, *Wiggins 11989* ; 6-21-60, *RM 8303*; 5-7-76, *23136, 23147* et al.; 4-21-91, *TO SLC91-28* (all SD).

Stylomecon heterophylla (Benth.) G. Taylor **S** On NE side of middle peak, 3-19-66, Blakley 6627 (SBBG); 4-21-91, *TO SLC91-44* (SD).

Polemoniaceae

Gilia capitata ssp. *abrotanifolia* (Nutt.) V. Grant. Reported by Greene, 1885.
Linanthus dianthiflorus (Benth.) Greene **S** Slope above PC cove and saddle at middle of island, 3-19-66, *Blakley 6621* (SBBG); 5-7-76, *RM 23130* (SD); 4-21-91, *TO SLC91-17* (SD).

Polygonaceae

Eriogonum fasciculatum Benth. **S** On north end only, 5-7-76, *RM 23148* (SD). **MI** A few clusters on E slopes of upper central portion, 8-26-90, *TO MILC90-01* (SD).

Pterostegia drymarioides F.&M. **S** On shaded SW side, 4-21-91*, TO SLC91-15* (SD).

Portulacaceae

Calandrinia maritima Nutt. **S** On slopes of middle peak to central saddle, 4-21-91, *TO SLC91-39* (SD).

Claytonia perfoliata Willd. ssp. mexicana (Rydb.) J.M.Miller & K.L.Chambers. **S** On north slope above PC cove, 3-19-66, *Blakley 6679* (SBBG); 2-8-69, *Philbrick & Benedict B69-19* (SBBG); 4-21-91, *TO SLC91-03* (SD).

Ranunculaceae

Clematis pauciflora Nutt. Reported by Greene, 1885. **S** Occasional over island, 3-19-66, *Blakley 6665* (SBBG); 5-7-76, *RM 23119* (SD).

Delphinium parryi A. Gray. **S** Slope above PC cove, 3-19-66, *Blakley 6683* (SBBG); 5-7-76, *RM et al.23124* (SD);, 4-21-91, *TO SLC91-08* (SD).

Resedaceae

Oligomeris linifolia (Vah.) J.F. Macbr. **S** Common south of middle peak on open slopes, 3-19-66, *Blakley 6670*; 5-7-76, *RM 23161* (SD); 4-21-91, *TO SLC91-31* (SD). **MI** 7-9-58*, RM 6808* (SBBG).

Rosaceae

Heteromeles arbutifolia (Lindl.) Roem. **S** SE slope NW of PC cove, 6-2-71, *RM 8464* (SD).

Rubiaceae

Galium angustifolium Nutt. **S** NE slope above PC cove; dioeceous, 3-14-64, *Blakley 6432* (SBBG); 5-9-76, *RM 23151* (SD).

Galium coronadoense Dempster Endemic. **S** NE slope above PC cove, polygamous, 6-21-60*, RM* 8317 (SD); 6-2-71, *RM 18454, 18455, 18456, 18463* (SD); 5-7-76, *RM 23123* (SD).

Saxifragaceae

Jepsonia parryi (Torr.) Small. **S** Rare on rocky clay N slope, south of N light house, 3-14-64, *Blakley 6437* (SBBG).

Scrophulariaceae

Antirrhinum nuttallianum forma *pusillum* (Brandegee) Munz. **S** Common over island, 6-14-37, *F. Gander*; 5-7-76, *RM 23141*; 4-21-91, *TO SLC91-20* (SD). **N** In steep drainage NE side, 6-10-89, *TO NLC89-03* (SD).

Collinsia heterophylla Buist. **S** N slope above PC cove in 1991, 4-21-91, *TO SLC91-10* (SD).

Linaria texana Scheele **S** In large patches on slopes above PC cove in 1991, 5-7-76, *RM 23140*; 4-21-91, *TO SLC91-41* (SD).

Solanaceae

Lycium californicum Nutt. **N** Over lower slopes of island, 3-25-90, *TO NLC90-09.* **MR** 6-12-90, *TO MRLC90-01*. **MI** 8-26-90, *TO MILC90-02*. **S** Mostly over W and lower slopes of island , 5-8-76, *RM 23160*; 4-21-91, *TO SLC91-27* (all SD).

Nicotiana clevelandii A. Gray. **N** 5-20-58*, RM 6543* (SD).

Solanum nodiflorum* Jacq. **N In rocks near N end, 3-20-58 *RM 6544*; 6-10-89, *TO NLC89-01*.

Lycopersicon esculentum* Mill. **N On upper ridges, seeds carried by gulls, 6-10-89, *TO NLC89-04* (SD).

Urticaceae

Parietaria floridana Nutt. **S** On NE slope S of PC cove, 4-21-91, *TO SLC91-06* (SD).
Urtica urens* L. **N Above landing area, 3-25-90, *TO NLC90-12* (SD).

Monocots

Amaryllidaceae

Dichelostemma pulchellum (Salisb.) Heller **N** One patch seen, 5-20-58, *RM 6547* (SD). **S** Very common much of upper part of island, 2-26-49, *Wiggins 11994* (SD); 5-8-76*, RM 23153* (SD); 4-21-91, *TO SLC91-11* (SD).

Liliaceae

Calochortus splendens Dougl. **S** Occasional northern third of island, 5-7-76, *RM 23105*; 4-21-91, *TO SLC91-35* (both SD).

Orchidaceae

Piperia cooperi (S. Watson) Rydb. **S** Only one in burned area, 6-21-60*, RM 8311* (SD).

Poaceae

Agrostis pallens Trin. [*diegoensis* Vasey] **S** 1-21-60*, RM 8312* (SD).

Avena barbata* Brot. **S NW of PC cove, 5-7-76, *RM 23098* (SD).

Avena fatua* L. **S Much of island, 4-21-91, obs. TO.

Bromus carinatus H. & A. **N** Common above landing, 3-20-58, *RM 6551*, 3-3-70, *RM 16795*; 4-25-77, *RM 23976*; 3-24-90, *TO NLC90-13* (all SD).

Bromus mollis* L. **S NW of PC cove, 4-21-91 obs. TO.

Bromus rubens* L. **S Above PC cove, 5-7-76, RM 23106 (SD).

Cynodon dactylon* (L.) Pers. **S 6-14-37, *Stover* (SD)

Distichlis spicata (L.) Greene. **S** Above PC cove, 4-21-91, obs. TO.

Hordeum murinum* ssp. *glaucum* (Steud.) Tzvelev. **N Common in gull disturbed areas, 3-25-90*, TO NLC90-02* (SD). **MR** In basin, 6-12-90, obs. TO. **S** On slopes above PC cove, 5-8-76, *RM 23146* (SD).

Hordeum murinum* ssp. *leporinum* (Link) Arcang. **S Near military structures, 3-25-90, *TO NLC90-01* (SD).

Lamarckia aurea* (L.) Moench. **N Above landing, 6-10-89 obs. TO. **S** Very common and widespread, especially along trails, 5-7-76, RM 23102 (SD).

Leymus condensatus (Presl.) Love. Reported by Greene, 1885. **S** top of narrow isthmus between N. and S. points of island and near north light, 3-19-66, *Blakley 6632, 6686* (SBBG); on north east slope, 5-8-76, *RM 23131* (SD).

Melica imperfecta Trin. **N** 4-1-34, *Alderson.* **S** On NE side and middle saddle, 3-14-64, Blakley 6428 (SBBG).

Muhlenbergia microsperma (DC.) Kunth. **S** S slope of middle peak and south peak, 3-14-64, *Blakley 6438* (SBBG); 4-21-91, *TO SLC91-12, SLC91-18* (SD).

Stipa pulchra Hitchc. **S** NW of PC cove, 3-14-64*, Blakley 6471* (SBBG); 3-19-66, *Philbrick B66-267, B66-310* (SBBG); 5-7-76, *RM 23122* (SD).

Vulpia myuros* var. *hirsuta* Hack. Reported by Greene, 1885. **S NW slope, 5-8-76, RM 23121 (SD).

Zosteraceae

Phyllospadix scouleri Hook. **MR** Near east side of island, 3-3-70, *RM 16793* (SD).

Abbreviations: N = North Island, **MR** = Middle Rock and **MI** = Middle Island, **S** = South Island; RM = Reid Moran, TO = Thomas Oberbauer, obs.=observed, PC cove = Puerto Cueva cove.

Species Included in Other Draft Lists but not Verified: *Chaenactis glabriuscula, Hazardia orcuttii, Isocoma venetus, Malacothrix coulteri, Opuntia hybrid occidentalis,* and *Trifolium palmeri.*