THE VEGETATION OF BALLONA

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INTRODUCTION AND METHODOLOGY

The vegetation of the Ballona wetlands has been carefully mapped and discussed in previous reports (Envicom, Army Corps of Engineers, and UCLA). Apart from the plant species list prepared by Envicom and a partial list by Judith Clark for the UCLA report, an actual plant inventory had not been thoroughly undertaken with voucher specimens deposited into a credited institution. The present investigator is a taxonomist, not an ecologist, and it has been his primary purpose to collate a list of plant species over a one-year period beginning in July 1980 through August 1981. About 75 to 100 hours were spent walking over the study units on approximately 15 separate field trips. All the plants collected are deposited in the herbarium of the Natural History Museum, Los Angeles County. In addition, each herbarium sheet has a map of the study areas with an indication of the proximate locality where the plant was collected. No rare and endangered species were recorded from the sites, but some plants not previously found in Southern California either as escapes or adventives were discovered. In cases of uncertainty in identification, plants were sent to Tom Fuller and Doug Barbe at the Department of Food & Agriculture, Sacramento, who specialize in introduced weeds. No mapping or transects were undertaken by this investigator, although distribution of plant

species in the various parcels was carefully noted.

WETLANDS DEFINITIONS

The U. S. Fish and Wildlife Service defines wetlands as follows: "...land where the water table is at, near or above the land surface long enough to promote the formation of hydric soils or to support the growth of hydrophytes. In certain types of wetlands, vegetation is lacking and soils are poorly developed or absent as a result of frequent and drastic fluctuations of surface-water levels, wave action, water flow, turbidity or high concentration of salts or other substances in the water or substrate. Such wetlands can be recognized by the presence of surface water or saturated substrate at some time during each year and their location within adjacent to vegetated wetlands or deep-water habitats."

Three parcels of land (designated as Units 1, 2 & 3, see maps) were carefully surveyed by the museum team for over a one-year period. As a result, the breakdown of wetlands within each of these parcels is defined as follows. Unit 1: approximately 72 acres bounded by the Ballona Channel on the west, Culver Boulevard on the east, the dune community on the south and the Gas Co. entrance on the north. Unit 2: west of the Gas Co. road, approximately 55 acres bounded by the bluffs to the south, Culver Boulevard to the west; east of the Gas Co. road on property which is bounded by the bluffs on the south, Jefferson Boulevard on the north and Lincoln Boulevard on the east are a freshwater marsh 2-3 acres in size just east of the Gas Co. facility, and a riparian community about 4 feet on each side of the Centinela Creek drainage ditch along its entire length. In the western part of the occasionally-flooded agricultural area degraded Salicornia is found. Unit 3 is the dredge spoils from the construction of the Marina in 1961-62. This 139-acre parcel contains approximately 62 acres of dry pickleweed (transitional)

habitat. The presence of Salicornia has been used as an indicator of wetlands, but the existence of Salicornia, by itself, does not indicate conclusively that this area is a wetland biologically. Salicornia on this site is poor in quality, especially by comparison to that found in Units 1 and 2 which are subject to tidal flow. The pickleweed community of the spoils area is more or less confined to the central, lower portions of the fill which contain the salt pans. Whether or not hydric soils are present here seems to be a debatable point: the Shapiro report for the Corps maintaining there are, while the Fruit Growers Laboratory, Inc., findings indicate the exact opposite. Only further analyses will resolve the issue. Other factors that may play a part in the presence of Salicornia on this site are its hydrophytic as well as halophytic nature, the presence of sea water intrusion and capillary action which could provide sufficient moisture to maintain the community, or a perched water table. It would appear that the successional scrub community that is forming on the higher portions of the spoils is slowly advancing, probably because the winter rainfall has been leaching out the salts and washing them into the central depressions over the past 20 years. That the Salicornia persists is certainly an indication of its halophytic nature, although it has never been proved to be an obligate halophyte. Salt flats may be an important aspect of a salt marsh ecosystem, but this is not the case here because the spoils do not contain a salt marsh habitat, and there is no tidal influx. However, the land has value as open space and the opportunity to watch the development of an upland scrub community.

OCCASIONALLY FLOODED ARGICULTURAL AREA

In addition to the wetlands areas, there are 15 to 20 acres of occasionally flooded agricultural lands located east of the Gas Co. road in Unit 2 (see map).

VEGETATION TYPES

Three designated areas have been extensively surveyed over a one-year period and the results have been plotted on three maps (see Figures Bo-1-3 respectively). Because the boundaries between the plant communities are, or have been subject to topography, urban disturbance or soil type, one does not necessarily find a nice gradational pattern between them. The maps (legend adapted from Envicom report) indicate the major grouping of plants within each of the study areas. These maps correspond closely to the overall findings of the Shapiro report.

Estuarine Habitats

1. Pickleweed Saltmarsh (Fig. 4)

Pickleweed (Salicornia) is the dominant plant of this community. Two species occur at Ballona with S. virginica being the most abundant and found in all three units. S. subterminalis is locally common only in Unit 1. Salicornia is the most widespread halophyte in California saltmarshes. It forms a low-growing, dense stand south of the Ballona Channel in Unit 1, while in Unit 2 it is most prevalent west of the Gas Co. road. East of the road in the Agricultural area, Salicornia is present in limited areas where winter ponding occurs. Agricultural practices in previous years have resulted in the area being disced during the early summer months. The plants on the dredge spoils of Unit 3 are centrally located bordering the salt pans.

Within the pickleweed marsh proper are areas that are or have been invaded by aggressive weedy species. Iceplant (Carpobrotus edulis) has invaded the marsh in the southern part of Units 1 & 2 where it forms an almost impenetrable ground cover. Saltgrass (Distichlis spicata) is common in these transitional areas, especially in the southwestern section of Unit 1 where the marsh abuts against the sand dune community. It is frequent in Unit 2 throughout the pickleweed community and also is present in some upland areas, especially highly disturbed situations.

Sicklegrass (Parapholis incurva), an introduced European species naturalized in California saltmarshes, is relatively common in the central section of Unit 1 (also in the eastern half of Unit 2), especially along the drying edges of the pickleweed community. Other aggressive weeds such as Melilotus, Conyza, Rumex, Beta, Picris and Atriplex can also be found here. Introduced weedy species comprise approx. 15% of the total plant cover of the pickleweed communities and are most abundant on the berms or along paths through the marsh.

Since the Ballona saltmarsh lacks a low and middle marsh flora, the pickleweed occurrence is topographically lower than in other Southern California saltmarshes which have been subject to less disturbance. Many saltmarsh species are not found at Ballona, due perhaps to the restricted water-flow between the marsh proper and the channel. Although the pickleweed marsh at Ballona is considered a high marsh, several species (Monanthochloe littoralis, Limonium californicum, etc.) usually characteristic of this situation are absent. Before the advent of the flood control channel during the 1930's, it is possible that a natural barrier could have developed periodically which restricted the flow of water to the marsh. As it now stands, several factors such as stagnation, salinity, temperature fluctuations, etc., have kept the marsh at a low-level species density.

2. Mudflats and Saltflats (Fig. 5)

- The vegetation of these areas is practically non-existent except for the presence of green algae which become abundant during the spring-summer months. Since these areas are slightly lower than the pickleweed communities, the salt crusts associated with them undoubtedly have a strong influence in limiting the vegetation. A thin layer of water often persists on these flats depending on the rainfall from the previous winter-spring months.

Freshwater Habitats

1. Willow Community (Fig. 6)

A unique community of willows (Salix lasiolepis, S. laevigata), Populus fremontii, Juncus, Carex and Eleocharis occurs in the southwestern section of Unit 1, just west of the sand dune community and immediately south of the Distichlis-Salicornia marsh, a curious association and juxtaposition of plant communities not known elsewhere in the county. Around the periphery of this community are several plants of an introduced Australian shrub, Myoporum laetum, which appears to be naturalizing.

Another type of willow community occurs in Unit 2 along the base of the bluffs above or south of Centinela Creek. Here the willows, Salix lasiolepis, grow in close association with castorbean, Ricinus communis, forming rather dense stands. The water is supplied to this area largely from urban runoff.

2. Freshwater Marsh (Fig. 7)

Along the drainage ditch of Centinela Creek, west of Lincoln Blvd., a freshwater habitat prevails for most of its length to the Gas Co. facility. Here the water becomes increasingly brackish with Salicornia prevailing along the ditch. In addition to introduced weeds like Paspalum, Polygonum, Chenopodium, etc., which comprise about 15% of the freshwater marsh flora, there are several native aquatics (Scirpus robustus, S. californicus, S. olneyi, Eleocharis, Sagittaria, Typha, etc.). Ruppia maritima, a submerged aquatic, is relatively common in the more western part of the creek. A large stand of Scirpus olneyi occurs close to the Gas Co. facility about 10 yards south of the ditch proper. Typha latifolia, Urtica holosericea, Eleocharis, Cyperus and Salix are also to be found here.

Terrestrial Habitats

1. Coastal Dune (Fig. 8)

Three areas of coastal dune community are found on the study sites. The most extensive is along the southwest boundary of Unit 1 where the dominants include Lupinus chamissonis, Erysimum suffrutescens, Camissonia cheiranthifolia, Phacelia ramosissima and Abronia umbellata. Parts of this area are being invaded by Carpobrotus. A small slip of land near the southeastern corner of Unit 3 also supports a coastal dune vegetation with Croton californicus, Camissonia cheiranthifolia and Eriogonum parvifolium as the most conspicuous elements. Invading this community are Erodium botrys, Bromus rubens and Chrysanthemum coronarium. This community probably arose subsequent to the building of the flood control channel during the 1930's or it could be a vestige of what was once a more extensive system. Remnants of a coastal dune community occur on the bluffs above Centinela Creek in Unit 2, now largely colonized by Salix and Ricinus.

2. Coastal Scrub (Figs. 9a & b)

The scrub commuity is present along the bluffs in the southern part of Unit 2 with Haplopappus species, Corethrogyne filaginifolia, Elymus condensatus, Galium angustifolium and Lotus scoparius as examples of typical plants found here. A successional coastal scrub community appears to be developing on the dredge spoils of Unit 3 characterized by the presence of Rhus laurina, Rhus integrifolia, Artemisia californica, Gnaphalium microcephalum and Ricinis communis. Many weedy annuals are also present, but Chrysanthemum coronarium becomes dominant in the late spring months. This community occupies less than 20% of Unit 3 and occurs along the southern boundary of the site just north of the channel.

3. Transitional Pickleweed and Salt Pan (Fig. 10)

During the construction of Marina del Rey in the early 1960's, the dredged earth was dumped into Unit 3 considerably altering the composition of the previous vegetation. The central section is salt pans and flats surrounded by Salicornia. Because the pans and flats are lower than the surrounding areas, rainwater is leaching out the salts in elevated portions of the spoils and concentrating them into this central depression. This dry pickleweed habitat is for the most part monotypic, but Frankenia, Gasoul and Polypogon are sometimes associated with it; Salicornia covers approx. 62 acres of the site.

3. Coyote Brush and Pampas Grass (Fig. 11)

On the higher elevations in the eastern part of Unit 3, a brushy scrub comprised of Baccharis pilularis ssp. consanguinea and Cortaderia atacamensis has become established. Neither of the plants mix to form a single plant community. Baccharis is also dominant in the northwestern section. Smaller herbaceous perennials are also found associated with them, such as Gnaphalium chilense, Malephora crocea, Carpobrotus edulis, Sida leprosa, Centaurea repens and Verbascum virgatum.

4. Agricultural Areas and Weedy Fields (Fig. 12)

Because of the extensive urban activity and filling and diking of the Ballona wetlands, several areas have become colonized by mostly introduced species, largely weedy in nature, wind-pollinated and annual in growth form. Several grasses (Avena, Hordeum, Bromus, Festuca, Paspalum, etc.), mustards (Brassica and Raphanus), composites (Chrysanthemum, Picris) form the basis of this category. Many members of the Chenopodiaceae are also associated with these fields (Bassia, Salsola and Chenopodium).

A few ornamentals (such as Phoenix, Eucalyptus, Ceratonia, Acacia) occur scattered throughout the parcels. Some were undoubtedly planted at some time in the past while others are probably adventives.

COMMENTS ON PLANT SPECIES AT BALLONA

There were a total of 235 plant species recorded from the primary study sites representing 50 plant families. Of these 235 species, 130 are introduced or naturalized, and 105 indigenous to California. Because of the continued disturbance at Ballona over the years, the weedy components cover approx. 40% of the total land under investigation. Approx. 15% of this figure can be attributed to the spread of Carpobrotus alone which if unchecked will continue to encroach not only on the salt marsh community but in the upland habitats where it is becoming established as well. The dredge spoils, Unit 3, contain a high percentage of introduced weeds (by volume), although a coastal scrub community comprised of primarily native shrubs has established itself. Even though this unit is comparatively new vegetatively speaking, at least 50% of the plant cover represents indigenous species (including the 62 acres of Salicornia). The weedy cover includes primarily annual grasses, composites, mustards and patches of iceplant (Carpobrotus and Melephora).

Unit 1 is covered by approx. 70% of native plants (mostly Salicornia, Frankenia, Distichlis and Atriplex). The weedy elements are confined to disturbed areas, berms, bridal paths; at least 15% of this parcel is covered by iceplant. Unit 2 west of the Gas Co. road is largely Salicornia, although weedier than in Unit 1, and covers about 65% of the property. The rest is largely iceplant and eucalyptus. East of the Gas Co. facility the land has largely been given over to agriculture and

less than 20% of the parcel contains native plants (including the occasionally flooded areas where Salicornia and Cressa are growing). By comparison the Point Mugu salt marsh which was surveyed in 1977 contained 222 species of which 101 were introduced or naturalized. Since the Mugu lagoon contains one of the best preserved salt marshes in Southern California, the weedy elements in this instance contribute little in overall plant cover. Such is not the case of Ballona.

Unit 1

Lycium ferocissimum (Fig. 13, erroneously identified as L. halmifolium in some previous reports) is one of the great curiosities at Ballona in Unit 1. This South African saltmarsh shrub (identified by Fuller) consists of perhaps a half dozen plants, some of them apparently quite old. Whether it was planted deliberately or appeared as an adventive from cultivation at some time in the past is not known. The plant does not seem to be currently in cultivation in Southern California, which makes its appearance in the marsh even more surprising. Although it is said to form dense thickets in its native habitat, the plants at Ballona do not appear to be spreading. During the rainy season the shrubs were covered by a dense flush of new leaves but by mid-summer they appeared to be half-dead.

Several cultivated plants are present here, which include Agave attenuata, Crassula argentea, Schinus molle, Ceratonia siliqua and Chasmanthe aethiopica. Ordinarily, the Schinus and the Ceratonia are trees but in the marsh they appear as stunted shrubs. Myoporum laetum, which is reasonably common along the southwestern boundary of the site, appears to be naturalizing and thriving near the borders of the salt marsh. Suaeda californica has been reported from nearly every list of plants at Ballona no matter how incomplete. Interestingly enough, this saltmarsh

native is sparingly represented at Ballona and is by no means common, confined primarily to the berm below the channel. Bassia hyssopifolia, one of the most abundant weeds, closely resembles Suaeda in its juvenile stages. This plant has either been overlooked or misidentified by past reviewers. In the same vicinity are located shrubs of Malacothamnus fasciculatus and Eriogonum fasciculatum, usually associated with a coastal sage scrub or chaparral community. A small population of hemlock, Conium maculatum, grows in a depression near the base of the berm. Close by milk thistle, Silybum marianum, and Bassia are the dominant weeds. Jaumea carnosa, a common saltmarsh composite prevalent in other California marshes, is represented by only a few centrally located populations, mostly along the sloughs. Monanthochloe littoralis and Juncus acutus, reported by the Army Corps of Engineers as occurring at Ballona, were not found by this investigator. Potentilla egedei and Limonium californicum might be anticipated but were not found. Of the five Atriplex species present on the site, only A. patula ssp. hastata is abundant, becoming a subdominant in the Salicornia marsh. Only a few specimens of A. californica are centrally located. Of the five Lupinus species, four are present in Unit 1. The annuals, L. truncatus and L. bicolor microphyllus, are fairly abundant in the early spring in the southern part of this site growing among the Carpobrotus or on disturbed grassy areas. L. succulentus was found sparingly along Culver Blvd. L. chamissonis, a silvery shrub to 3', is common in the sand dune area where it is a dominant along with Phacelia, Erysimum and Abronia. The willow woodland west of the sand dune area contains a variable population of Salix lasiolepis and some S. laevigata as well. Eleocharis macrostachya, Carex praegracilis and Juncus balticus, vegetatively similar,

grow in close proximity to one another beneath the willows. One tree of Populus fremontii is associated with this habitat. In the Clark report from UCLA, Adenostoma fasciculatum was reported from the sand dune community. I believe this was mistakenly identified for Haplopappus ericoides, which it somewhat resembles. Three species of Camissonia occur on the sand dunes, C. cheiranthifolia, a perennial, is the most abundant along with two annual species, C. micrantha and C. bistorta. Because of the bridle paths throughout this area, at least three different mushroom genera were collected during the rainy season: Volvariella, Agaricus and Collybia. The best preserved Salicornia salt marsh occurs throughout Unit 1 with S. virginica more abundant than its counterpart S. subterminalis. The two species are quite distinct and easily to tell apart even when growing in proximity to one another. Frankenia grandifolia and Atriplex patula hastata are subdominants. Distichlis is frequent and common along sloughs and transition areas within the marsh. St. Augustine grass, Stenotaphrum secundatum, is becoming naturalized along some of the sloughs, especially in the western section of the site. Spergularia macrotheca is rather uncommon and confined more or less to the central area while Spergularia marina and Gasoul nodiflorum are abundant throughout. Gasoul crystallinum has been reported from Unit 1, but it did not turn up during this survey.

Unit 2

Unit 2 is divided into two sectors by the Gas Company road, the smaller, western section contains viable Salicornia saltmarsh, although generally weedier than that west of Culver Blvd. Weedy annuals have invaded the marsh along berms on the higher, drier, less saline areas. Only S. virginica is found here and not S. subterminalis, which is locally

common throughout Unit 1. The planted Eucalyptus grove consists of two or three species which are apparently naturalizing. A single specimen of Albizia distachya was found in this grove, an interesting find, since the plant is not common in cultivation. Tetragonia tetragonioides was also collected here, although it might possibly occur in other parts of the study area, since it is weedy in nature and naturalizes easily in salt marshes. A large population of Anemopsis californica (Fig. 14) is found just south of the Eucalyptus grove growing intermixed with Carpobrotus. East of the Gas Co. road the land has largely been given over to agricultural use. During the rainy season, occasional flooding occurs throughout the western part of this section (in addition, some ponding occurs near Lincoln Blvd.) with Cotula coronopifolia, Lythrum hyssopifolia and Spergularia marina becoming dominants (Figs. 15 & 16). Some Salicornia, Cressa truxillensis, Atriplex patula hastata and Sida leprosa and Juncus bufonius are also prevalent. The freshwater marsh just east of the Gas Co. plant is largely dominated by Scirpus olneyi, which reaches 6' or more in height. Cyperus alternifolius, Cyperus eragrostis, Typha latifolia, Urtica holosericea, Polygonum lapthifolium, Juncus balticus, Eleocharis macrostachya and Salix lasiolepis are also to be found here. The drainage ditch of the old Centinela Creek becomes increasingly brackish as one travels west from Lincoln Blvd. Ruppia maritima, a submerged aquatic, is relatively common along the creek in somewhat brackish water, while Sagittaria calycina, a partially submerged aquatic, is frequent in the more eastern part of the ditch. Along the banks of this ditch occur several weedy and some native plants. Grasses such as Agrostis stolonifera, Leptochloa uninervia and Echinochloa crus-galli, associated with wet places, are present, the latter two common during the summer months. Native plants like Heliotropium

curassavicum, Scirpus californicus, Scirpus robustus, Aster exilis, Typha domingensis, etc., are frequent along the ditch. In the southeastern section of Unit 2 just west of Lincoln Blvd. are several Canary Island palms, Phoenix canariensis. Near the palms, a dense stand of willows persists intermixed with Oenthera hookeri grisea and Conium maculatum. The size and vigor of the willow community would seem to indicate the presence of subsurface water. Gnaphalium, Digitaria, Amaranthus and Ricinus are the more common weedy elements. Several acres of wheat, Triticum vulgare, were planted in the agricultural areas in the spring. During the summer this land has been largely given over to lima bean culture (Phaseolus limensis). Sporadic plants of watermelon, Citrullus lanatus, were found throughout the agricultural fields indicating that perhaps this has been grown as a crop plant at some time in the past.

Unit 3

The dredge spoils of Unit 3 present a curious amalgam of plant species occupying a variety of habitats. The fill ranges from 10-16' above mean high tide. The most interesting assemblage of native plants in this area occur along the small strip of sand dune toward the southeast corner of the property. Two plants of Lupinus excubitus hallii are found here and associated with Croton californicus, Camissonia cheiranthifolia and a few plants of Eriogonum parvifolium. Weeds such as Erodium botrys, E. cicutarium, Chrysanthemum coronarium, Bromus rubens, etc., are abundant during the spring months on these dunes. Wandmullein, Verbascum virgatum, is relatively common along the southern boundary of the property, some plants often more than 5' tall. However, one does not find it elsewhere. A few cultivated plants also appear just north of the channel, like

Ceratonia siliqua, Acacia decurrens and Washingtonia sp., probably as adventives. Other cultivated plants (Narcissus tazetta, Iris pseudacorus, Gazania longiscapa) are scattered about the site but by no means common. Cichorium intybus is found to be locally abundant only in the extreme west part of Unit 3, while Centaurea repens is localized toward the southeastern end. Hemizonia ramosissima and Gnaphalium chilense are common in disturbed areas throughout. A single plant of Ribes malvaceum was found. Since it grows fairly close to a small population of Rhus laurina and R. integrifolia which are colonizing the site, it seems to indicate perhaps an early successional stage of coastal scrub or chaparral. Lotus scoparius, Artemisia californica and Gnaphalium microcephalum are other native plants closely associated with the above-mentioned shrubs. A pernicious thistle, Cirsium vulgare, seems to be confined to a few acres below the coyote brush scrub, but as more salts are leached from the soil, it can be expected to increase its range. Although Carpobrotus edulis is not as prevalent as in other sites at Ballona, it nonetheless is present and rapidly spreading. Another iceplant, Malephora crocea, with orange-red petals above, violet-magenta beneath, has probably been misdetermined as Carpobrotus aequilaterus in past reports. A large colony of this plant, up to 10' in diameter, is found in close proximity to the Carpobrotus. Its blue-green glaucous foliage and red flowers make it easily identifiable. A few small colonies of this same plant also occur in Unit 1. The Carpobrotus complex at Ballona seems to be a mixture of good edulis (yellow flowers) and edulis x aequilaterus (purple flowers). Both color forms grow together (Ferren, UC Santa Barbara). Many plants such as Picris echioides, Melilotus indica, Raphanus sativa, Brassica geniculata, Lactuca serriola, Stephanomeria virgata and Rumex crispus

occupy a wide variety of habitats and as such are the most abundant dicots at Ballona. The weedy grasses, Bromus rubens, B. diandrus, Hordeum leporinum, Paspalum dilatatum, Festuca myuros, F. megalura and Bromus mollis constitute the greatest percentage of monocots. Sorghum halepense tends to be more concentrated in the agricultural areas, especially at the edge of plowed fields or along roadsides. Along the drainage ditch immediately south of Fiji Way, Salicornia virginica occurs along with several weeds.

PLANT SPECIES LIST

CODE DESIGNATION

I - Introduced plants, not indigenous to California.

N - Plants indigenous to California.

SM - Plants found growing in the salt marsh proper.

FM - Plants found growing in freshwater marsh situations.

CD - Plants found growing on coastal dunes.

WF - Plants found in weedy situations, agricultural land, along berms or elevated areas in the salt marsh, along roadsides bordering the area, open fields, etc. (This category refers to Units 1 and 2 only.)

DS - Plants found in the dredge spoils area north of the Channel only (Unit 3).

B - Plants found growing near the base of the bluffs along the southern boundaries of Unit 2 (the bluffs proper were not surveyed for this report).

	I	N	SM	FM	CD	WF	DS	B
AGAVACEAE								
Agave attenuata	x					x		
AIZOACEAE								
Aptenia cordifolia	x					x		
Carpobrotus edulis	x		x		x		x	x
Carpobrotus edulis x aequilaterus	x		x		x		x	x
Delosperma cf. *litorale*	x						x	
Gasoul nodiflorum	x		x				x	
Malephora crocea	x		x				x	
Tetragonia tetragonioides	x					x		
ALISMACEAE								
Sagittaria calycina		x		x				
AMARANTHACEAE								
Amaranthus albus	x					x	x	
Amaranthus californicus		x				x		
Amaranthus deflexus	x					x		
AMARYLLIDACEAE								
Narcissus tazetta	x						x	
ANACARDIACEAE								
Rhus integrifolia		x					x	
Rhus laurina		x					x	x
Schinus molle	x					x		
APIACEAE								
Apium graveolens	x		x					
Apium leptophyllum	x					x		
Conium maculatum	x			x		x		
Foeniculum vulgare	x		x			x	x	x
ARECACEAE								
Phoenix canariensis	x					x		
Washingtonia sp.	x						x	

ASTERACEAE	I	N	SM	FM	CD	WF	DS	B
Ambrosia acanthicarpa		x			x	x	x	
Ambrosia chamissonis		x			x		x	
Ambrosia psilostachya		x			x	x	x	
Artemisia californica		x					x	
Artemisia douglasiana		x	x	x			x	
Artemisia dracunculus		x				x		
Aster exilis		x		x				
Baccharis glutinosa		x		x			x	
Baccharis pilularis ssp. *consanguinea*		x				x	x	
Centaurea melitensis	x					x	x	x
Centaurea repens	x						x	
Chaenactis glabriuscula var. *tenuifolia*		x			x			
Chondrella juncea	x				x			
Chrysanthemum coronarium	x					x	x	
Cichlorium intybus	x						x	
Cirsium vulgare	x						x	
Conyza bonariensis	x					x	x	x
Conyza canadensis	x					x	x	
Conyza coulteri	x					x	x	
Corethrogyne filaginifolia var. *virgata*		x				x		x
Cotula australis	x					x		
Cotula coronopifolia	x		x	x		x	x	
Gazania scaposa	x						x	
Gnaphalium beneolens		x				x		
Gnaphalium bicolor		x			x			
Gnaphalium californicum		x			x			
Gnaphalium chilense	x					x	x	x
Ghaphalium microcephalum		x					x	x
Gnaphalium ramosissimum		x				x		x
Grindelia robusta		x				x		
Haplopappus ericoides		x			x			
Hedypnois cretica	x				x	x		
Helianthus annus ssp. *lenticularis*		x				x	x	
Hemizonia ramosissima		x				x	x	
Heterotheca grandiflora		x			x	x	x	x
Jaumea carnosa		x	x					
Lactuca serriola	x					x	x	x
Malacothrix saxatilis var. *tenuifolia*		x				x	x	x
Matricaria matricarioides	x					x	x	
Osteospermum fruticosum	x						x	
Picris echioides	x					x	x	x
Senecio vulgaris	x					x	x	
Silybum marianum	x					x		
Solidago occidentalis		x	x					
Sonchus asper	x					x	x	
Sonchus oleraceus	x					x	x	
Stephanomeria exigua		x			x	x	x	
Stephanomeria virgata		x				x	x	x
Xanthium spinosum	x					x		
Xanthium strumarium var. *canadense*	x			x			x	

BORAGINACEAE	I	N	SM	FM	CD	WF	DS	B
Cryptantha intermedia		x			x			
Heliotropium curassavicum var. *oculatum*		x	x	x		x	x	
BRASSICACEAE								
Brassica geniculata	x					x	x	x
Brassica cf. *hirta*	x						x	
Brassica nigra	x					x	x	
Brassica rapa ssp. *sylvestris*	x					x	x	
Cakile maritima	x				x			
Coronopus didymus	x					x		
Erysimum suffrutescens		x			x			
Lepidium virginicum var. *pubescens*		x				x		
Lobularia maritima	x						x	
Raphanus sativus	x		x		x	x	x	x
Sisymbrium irio	x					x	x	x
CARYOPHYLLACEAE								
Polycarpon tetraphyllum	x					x		
Silene gallica	x					x		
Spergula arvensis	x					x		
Spergularia macrotheca		x	x					
Spergularia marina		x	x	x		x		
CHENOPODIACEAE								
Atriplex californica		x	x					
Atriplex lentiformis ssp. *breweri*		x	x					
Atriplex patula ssp. *hastata*		x	x			x		
Atriplex rosea	x					x	x	
Atriplex semibaccata	x		x			x	x	
Atriplex triangularis	x		x					
Bassia hyssopifolia	x		x			x	x	
Beta vulgaris	x		x			x	x	
Chenopodium album	x					x		
Chenopodium ambrosioides	x					x		
Chenopodium berlandieri var. *sinatum*	x					x		
Chenopodium murale	x					x	x	
Salicornia subterminalis		x	x					
Salicornia virginica		x	x				x	
Salsola iberica	x					x	x	
Suaeda californica		x	x					
Suaeda depressa var. *erecta*		x	x					

	I	N	SM	FM	CD	WF	DS	B
CONVOLVULACEAE								
Calystegia macrostegia var. *cyclostegia*		x					x	
Convolvulus arvensis	x					x	x	
Cressa truxillensis ssp *vallicola*		x	x			x	x	
Cuscuta californica		x			x			
Cuscuta campestris		x				x		
CRASSULACEAE								
Crassula argentea	x					x		
Crassula erecta		x	x			x	x	
CUCURBITACEAE								
Citrullus lanatus	x					x		
Cucurbita foetidissima		x				x	x	
CYPERACEAE								
Carex praegracilis		x		x				
Cyperus alternifolius	x			x				
Cyperus eragrostis		x		x				
Cyperus esculentus	x			x				
Eleocharis macrostachya		x		x				
Eleocharis montevidensis		x		x				
Scirpus californicus		x		x				
Scirpus olneyi		x		x				
Scirpus robustus		x		x				
EUPHORBIACEAE								
Croton californicus		x			x		x	
Euphorbia albomarginata		x					x	
Euphorbia peplus	x					x		
Euphorbia polycarpa		x				x		
Euphorbia serpens		x				x	x	
Euphorbia supina	x					x		
Ricinus communis	x				x	x	x	x
FABACEAE								
Albizia distachya	x					x		
Acacia decurrens var. *dealbata*	x						x	
Ceratonia siliqua	x					x	x	
Lotus purshianus		x			x			
Lotus scoparius		x			x	x	x	x
Lotus strigosus		x				x		

FABACEAE (contd.)	I	N	SM	FM	CD	WF	DS	B
Lupinus bicolor ssp. *microphyllus*		x				x		
Lupinus chamissonis		x			x			
Lupinus excubitus ssp. *hallii*		x					x	x
Lupinus succulentus		x				x		
Lupinus truncatus		x				x		
Medicago polymorpha	x					x	x	x
Melilotus albus	x		x			x	x	x
Melilotus indicus	x					x	x	
Phaseolus limensis	x					x		
FRANKENIACEAE								
Frankenia grandifolia		x	x				x	
GERANIACEAE								
Erodium botrys	x				x		x	
Erodium cicutarium	x				x	x	x	x
HYDROPHYLLACEAE								
Phacelia ramosissima var. *austrolitoralis*		x			x			
IRIDACEAE								
Crasmanthe aethiopica	x					x	x	
Iris pseudacorus "alba"	x						x	
JUNCACEAE								
Juncus balticus		x		x				
Juncus bufonius		x		x		x		
LAMIACEAE								
Marrubium vulgare	x					x	x	
LYTHRACEAE								
Lythrum hyssopifolia	x			x		x		

	I	N	SM	FM	CD	WF	DS	B
MALVACEAE								
Malacothamnus fasciculatus var. ?		x				x		
Malva nicaeensis	x					x	x	
Malva parviflora	x					x	x	
Sida leprosa var. *hederacea*		x				x	x	
MYRTACEAE								
Eucalyptus camaldulensis	x					x		
Eucalyptus tereticornis	x					x		
Eucalyptus viminalis	x					x		
MYOPORACEAE								
Myoporum laetum	x		x		x	x		
NYCTAGINACEAE								
Abronia umbellata		x			x			
OLEACEAE								
Fraxinus velutina		x				x		
ONAGRACEAE								
Camissonia bistorta		x			x			x
Camissonia cheiranthifolia ssp. *suffrutescens*		x			x		x	
Camissonia micrantha		x			x	x		
Oenothera hookeri ssp. *grisea*		x				x		x
OXALIDACEAE								
Oxalis pes-caprae	x					x	x	
PLANTAGINACEAE								
Plantago lanceolata	x					x	x	
Plantago major	x					x	x	
POACEAE								
Agrostis stolonifera ssp. *major*	x			x				
Arundo donax	x						x	

	I	N	SM	FM	CD	WF	DS	B
POACEAE (contd.)								
Avena fatua	x					x	x	x
Bromus diandrus	x					x	x	x
Bromus marginatus		x				x		
Bromus mollis	x					x	x	
Bromus rubens	x				x	x	x	x
Bromus wildenovii	x					x		
Cortaderia atacamensis	x					x	x	
Cynodon dactylon	x			x	x	x	x	x
Digitaria sanguinalis	x			x		x		
Distichlis spicata		x	x					
Echinochloa crusgallii	x			x				
Festuca megalura		x				x	x	
Festuca myuros	x					x	x	
Hordeum leporinum	x					x	x	x
Hordeum vulgare	x					x		
Leptochloa uninervia		x		x				
Lolium perenne ssp. *multiflorum*	x					x	x	x
Melica imperfecta		x				x		
Oryzopsis miliacea	x						x	
Parapholis incurva	x		x					
Paspalum dilatatum	x			x		x	x	
Phalaris paradoxa	x					x		
Poa annua	x					x		
Polypogon monspeliensis	x		x	x		x	x	
Schismus barbatus	x					x		
Setaria geniculata	x						x	
Sorghum halepense	x					x		
Stenotaphrum secundatum	x		x			x	x	
POLYGONACEAE								
Eriogonum fasciculatum		x				x		
Eriogonum gracile		x						x
Eriogonum parvifolium		x			x		x	x
Polygonum aviculare	x					x	x	
Polygonum lapathifolium		x		x				
Polygonum persicaria	x			x				
Rumex crispus	x		x			x	x	
Rumex fueginus		x				x		
Rumex salicifolius		x	x	x		x		x
PRIMULACEAE								
Anagallis arvensis	x			x		x	x	
RANUNCULACEAE								
Clematis ligusticifolia		x						x

	I	N	SM	FM	CD	WF	DS	B
RUBIACEAE								
Galium angustifolium		x						x
RUPPIACEAE								
Ruppia maritima		x	x					
SALICACEAE								
Populus fremontii		x		x				
Salix laevigata		x		x				
Salix lasiolepis		x		x			x	x
SAURURACEAE								
Anemopsis californica		x				x		
SAXIFRAGACEAE								
Ribes malvaceum		x					x	
SCROPHULARIACEAE								
Verbascum virgatum	x						x	
SOLANACEAE								
Datura meteloides		x				x	x	x
Lycium ferocissimum	x		x					
Lycopersicum esculentum	x							x
Nicotiana glauca	x					x	x	
Solanum douglasii		x				x	x	x
Solanum nigrum complex	x					x		
Solanum sarrachoides	x				x			
TYPHACEAE								
Typha domingensis		x		x				
Typha latifolia		x		x				
URTICACEAE								
Urtica holosericea		x		x				
Urtica urens	x				x	x		

	I	N	SM	FM	CD	WF	DS	B
VERBENACEAE								
Verbena lasiostachys		x					x	x
ZYGOPHYLLACEAE								
Tribulus terrestris	x					x		

Plants previously recorded as occurring at Ballona by the Envicom report for Summa but not collected during the LACM survey of the study sites during the 1980-81 season are listed below. Since the Envicom report covered a much larger area than the three study sites undertaken by the museum, it is quite possible that several of these plants occur on parts of the property not within the purview of this report. Unfortunately no plant material was kept as voucher specimens by the Envicom people.

Avena barbata (undoubtedly present on the study sites)

Carpobrotus aequilaterus (believed to be a misdetermined for Malephora crocea)

Chenopodium rubrum

Cyperus rotundus

Gasoul crystallinum

Gnaphalium luteo-album

Haplopappus squarrosus (present on the bluffs, but not in Units 1, 2 or 3)

Haplopappus venetus (present on the bluffs, but not in Units 1, 2 or 3)

Hoffmanseggia densiflora

Lippia nodiflora

Lotus corniculatus

Lycium halmifolium (a misdetermination for L. ferocissimum)

Salix hindsiana

Sesuvium verrucosum

Plants collected at Ballona prior to 1905 (old herbarium records) no longer occuring on the site.

Amsinckia spectabilis

Chenopodium macrospermum v. farinosum

Cuscuta salina

Lasthenia glabrata v. coulteri

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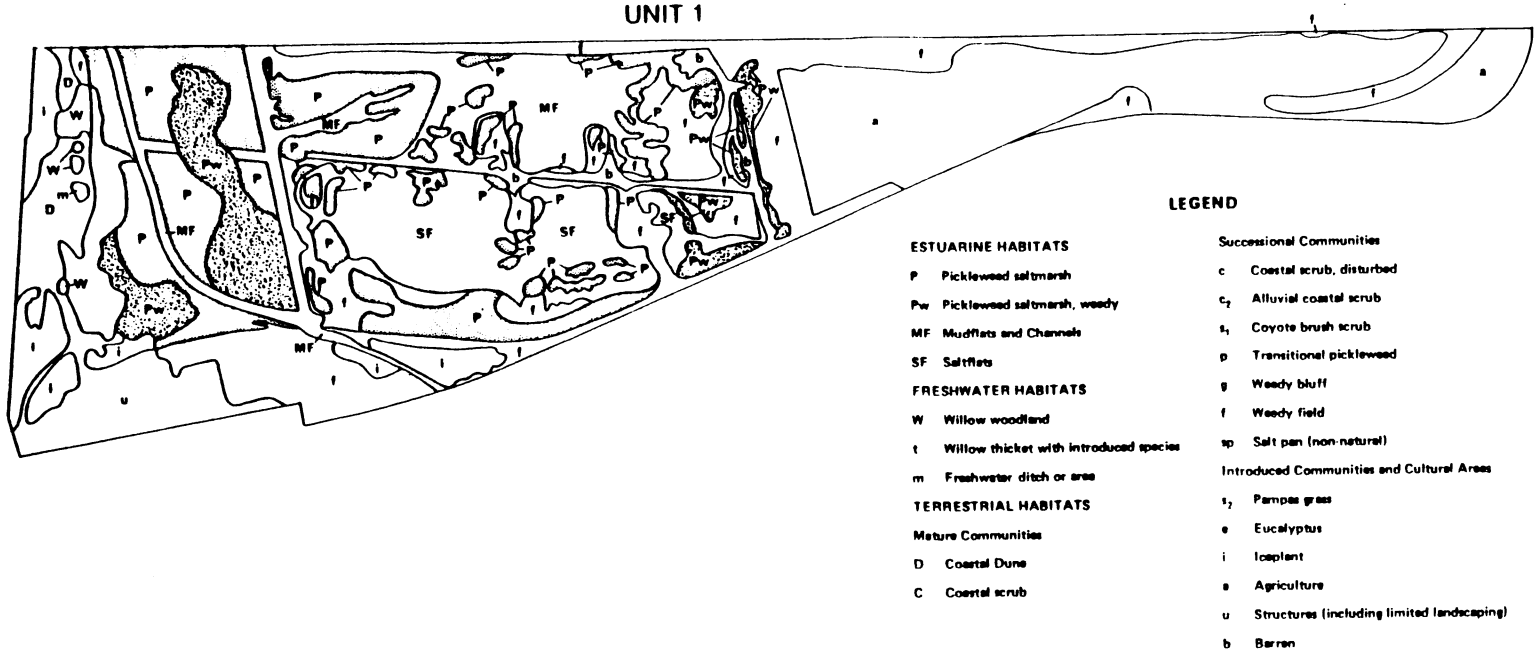
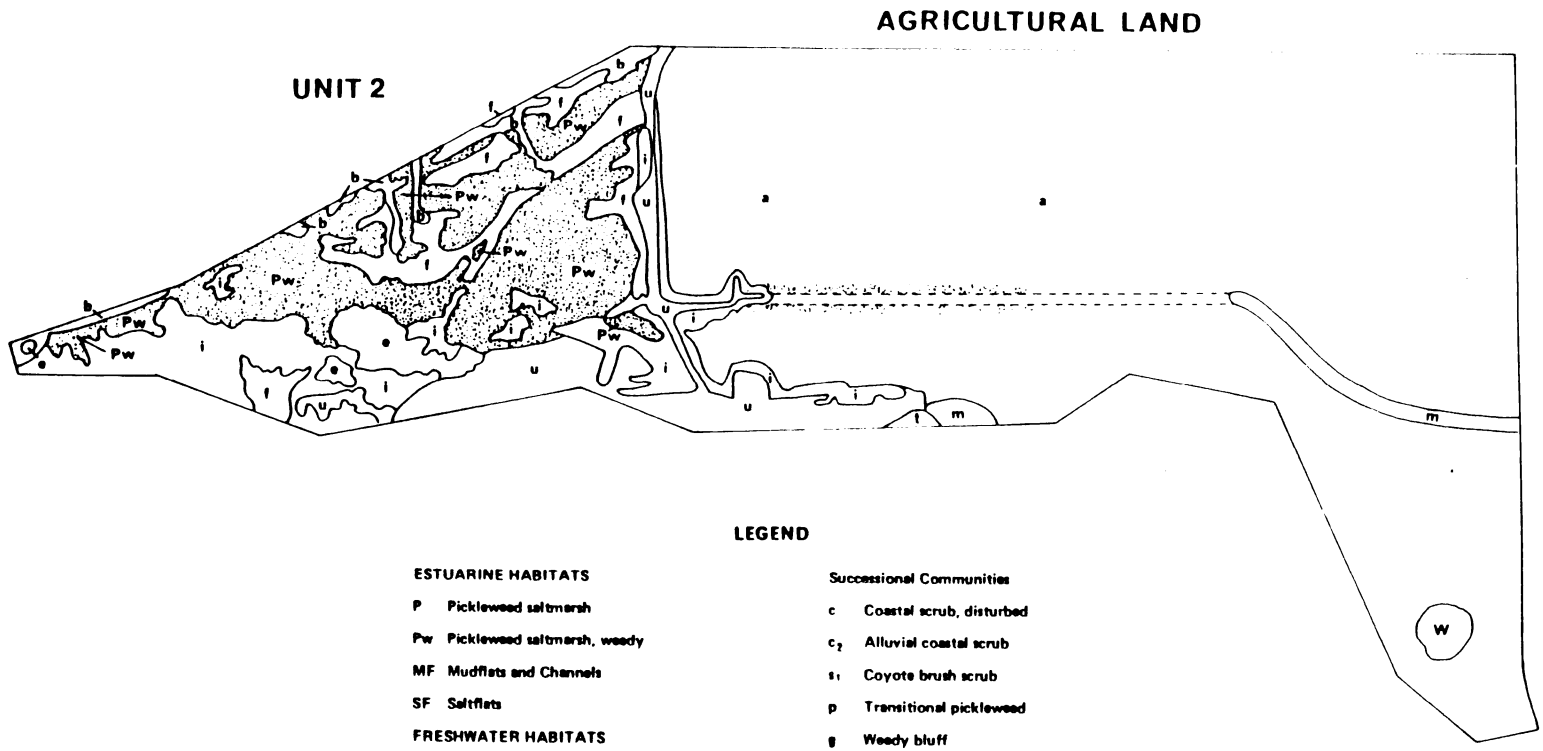


Bo- Figure 1

Unit 1 and Agricultural Lands -
Vegetation map with pickleweed community
indicated by shading
(redrawn from Envicom)



LEGEND

ESTUARINE HABITATS

- P Pickleweed saltmarsh
- Pw Pickleweed saltmarsh, weedy
- MF Mudflats and Channels
- SF Saltflats

FRESHWATER HABITATS

- W Willow woodland
- t Willow thicket with introduced species
- m Freshwater ditch or area

TERRESTRIAL HABITATS

Mature Communities

- D Coastal Dune
- C Coastal scrub

Successional Communities

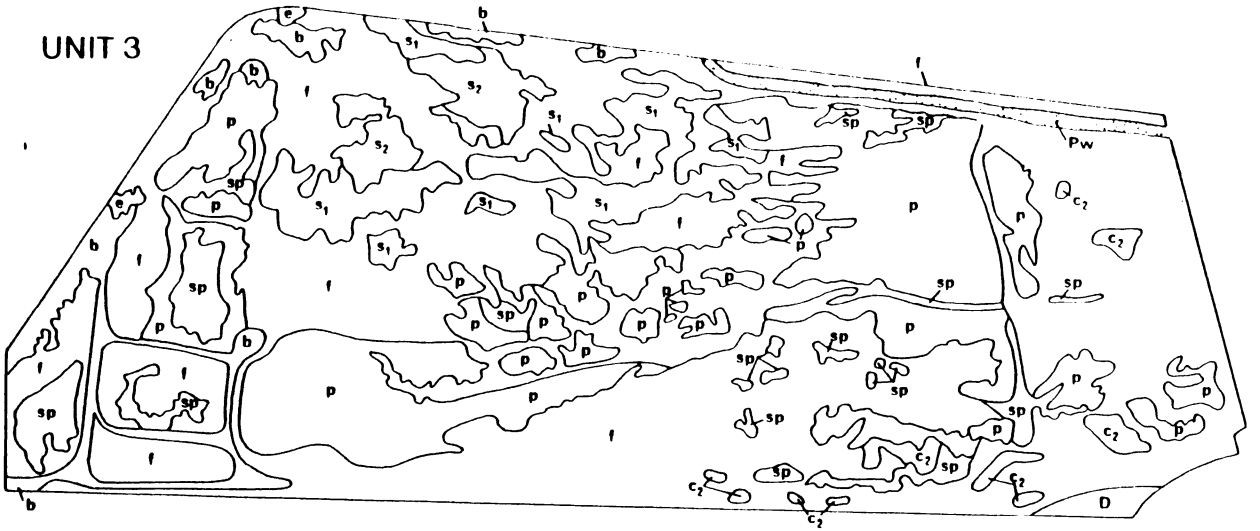
- c Coastal scrub, disturbed
- c_2 Alluvial coastal scrub
- s_1 Coyote brush scrub
- p Transitional pickleweed
- g Weedy bluff
- f Weedy field
- sp Salt pan (non-natural)

Introduced Communities and Cultural Areas

- s_2 Pampas grass
- e Eucalyptus
- i Iceplant
- a Agriculture
- u Structures (including limited landscaping)
- b Barren

Bo- Figure 2

Unit 2 and Agricultural Lands -
Vegetation map with pickleweed community
indicated by shading
(redrawn from Envicom)



LEGEND

ESTUARINE HABITATS

- P Pickleweed saltmarsh
- Pw Pickleweed saltmarsh, weedy
- MF Mudflats and Channels
- SF Saltflats

FRESHWATER HABITATS

- W Willow woodland
- t Willow thicket with introduced species
- m Freshwater ditch or area

TERRESTRIAL HABITATS

Mature Communities

- D Coastal Dune
- C Coastal scrub

Successional Communities

- c Coastal scrub, disturbed
- c_2 Alluvial coastal scrub
- s_1 Coyote brush scrub
- p Transitional pickleweed
- g Weedy bluff
- f Weedy field
- sp Salt pan (non-natural)

Introduced Communities and Cultural Areas

- s_2 Pampas grass
- e Eucalyptus
- i Iceplant
- a Agriculture
- u Structures (including limited landscaping)
- b Barren

Bo - Figure 3

Unit 3 - Dredge spoils vegetation map with dry pickleweed habitat indicated by small p (redrawn from Envicom)

Fig. 4 & 5 on next page

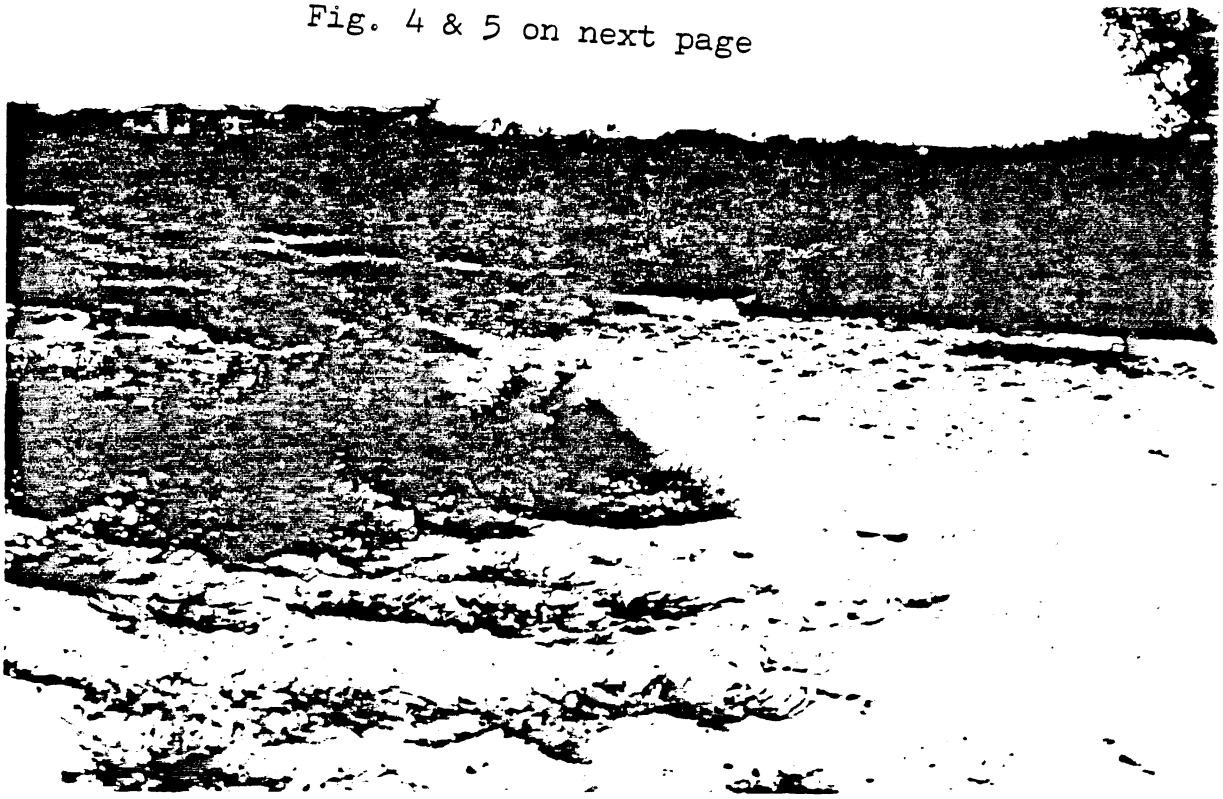


Fig. 6 & 8 - Unit 1, looking west. Coastal Dune in foreground, willow community in rear.

Fig. 7 - Unit 2, looking south. Freshwater marsh.

Fig. 4 - Unit 1, looking west. Pickleweed Saltmarsh.

Fig. 5 - Unit 1, looking east. Saltflats & Mudflats

Fig. 9a - Unit 2, looking northwest. Coastal scrub, base of bluffs, with Salix & Ricinus predominating.

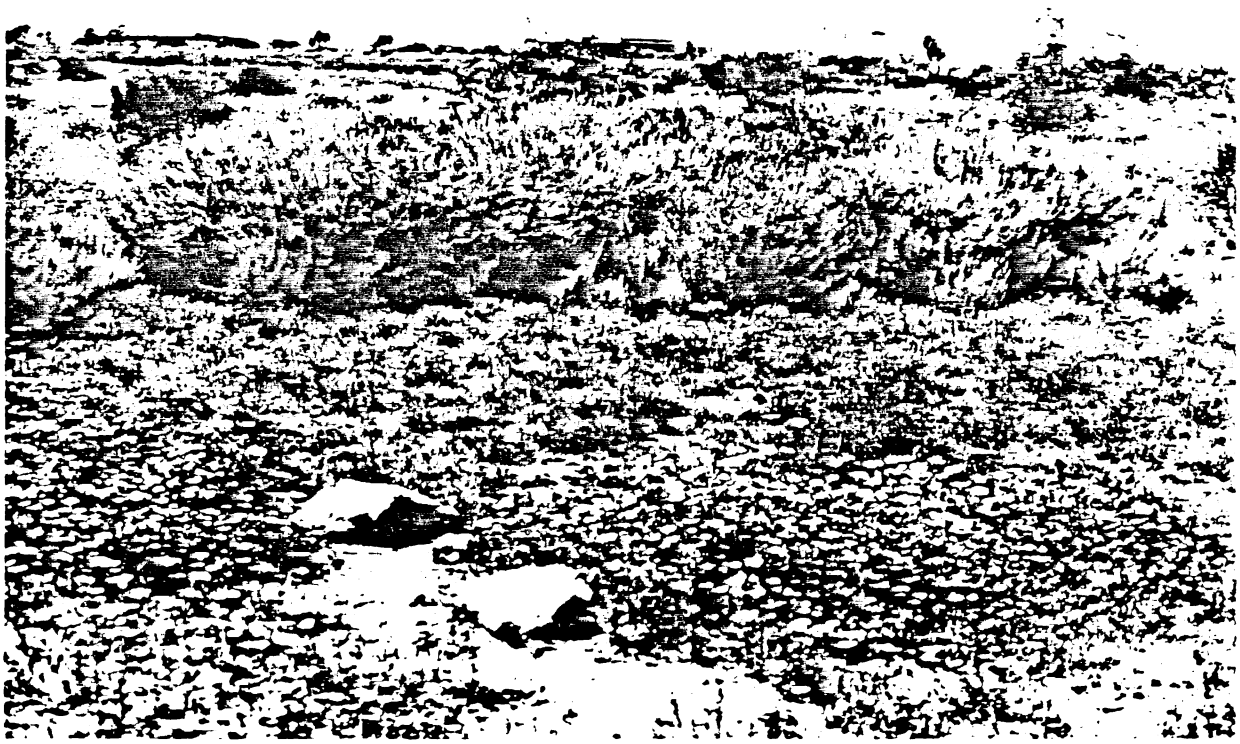


Fig. 9b - Unit 3, looking northwest. Scrub community.

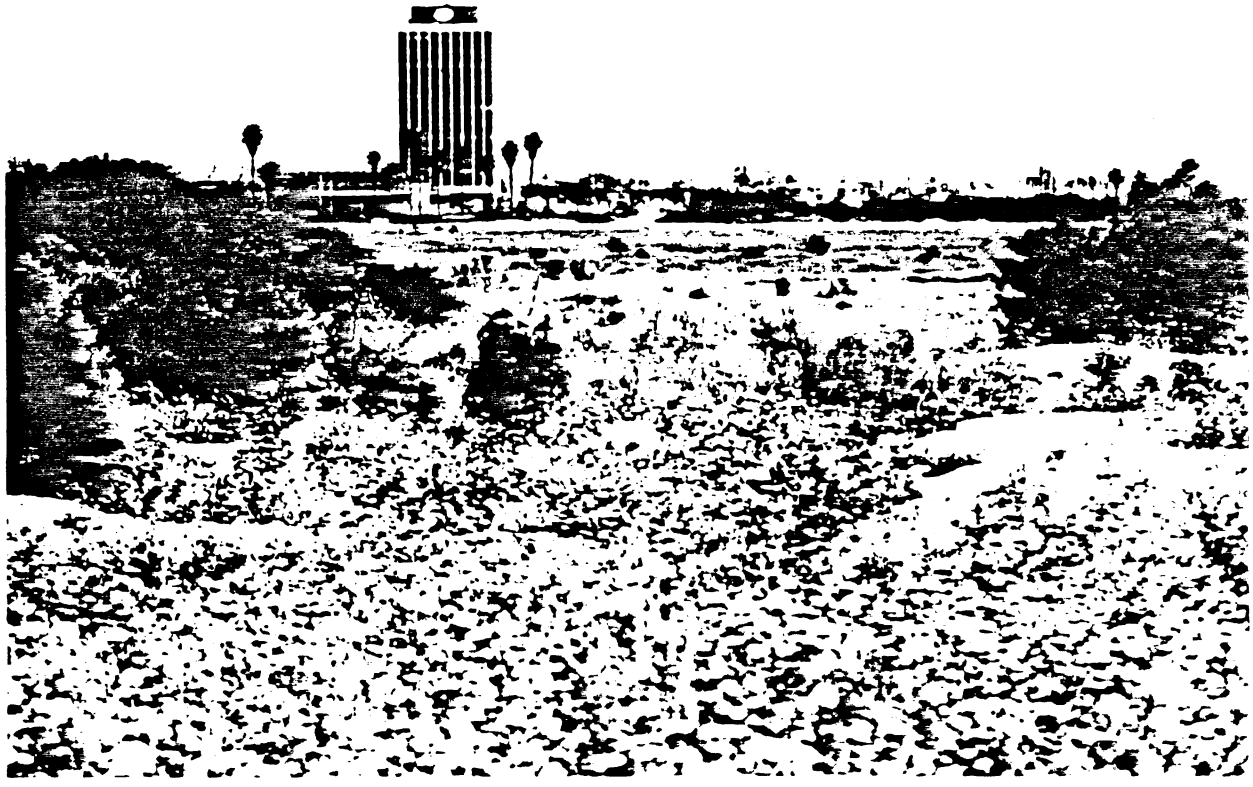


Fig. 10 - Unit 3, looking north. Dry pickleweed habitat in rear, scrub community in foreground.

Fig. 11 - Unit 3, looking west. Coyote Bush scrub intermixed with Pampas Grass.

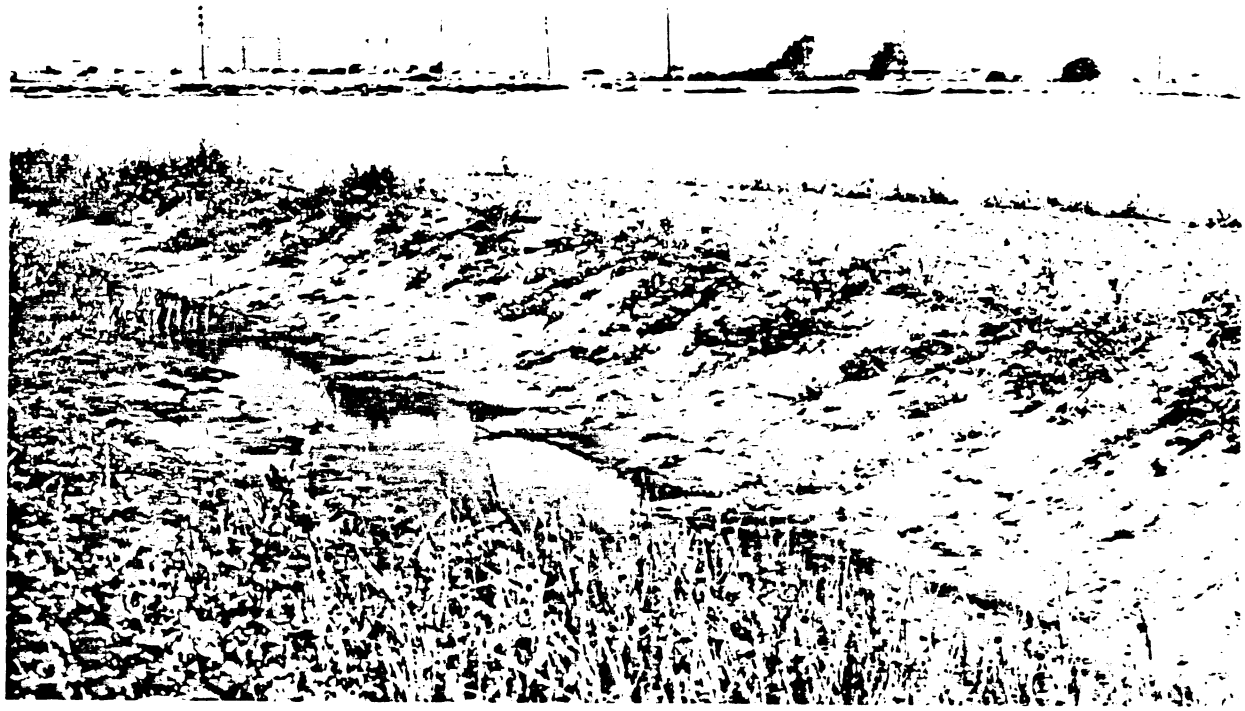


Fig. 12 - Unit 2, looking northwest. Agricultural land (Centinella Creek drainage ditch in foreground).

Fig. 13 - Unit 1, looking west. Lycium ferocissimum.

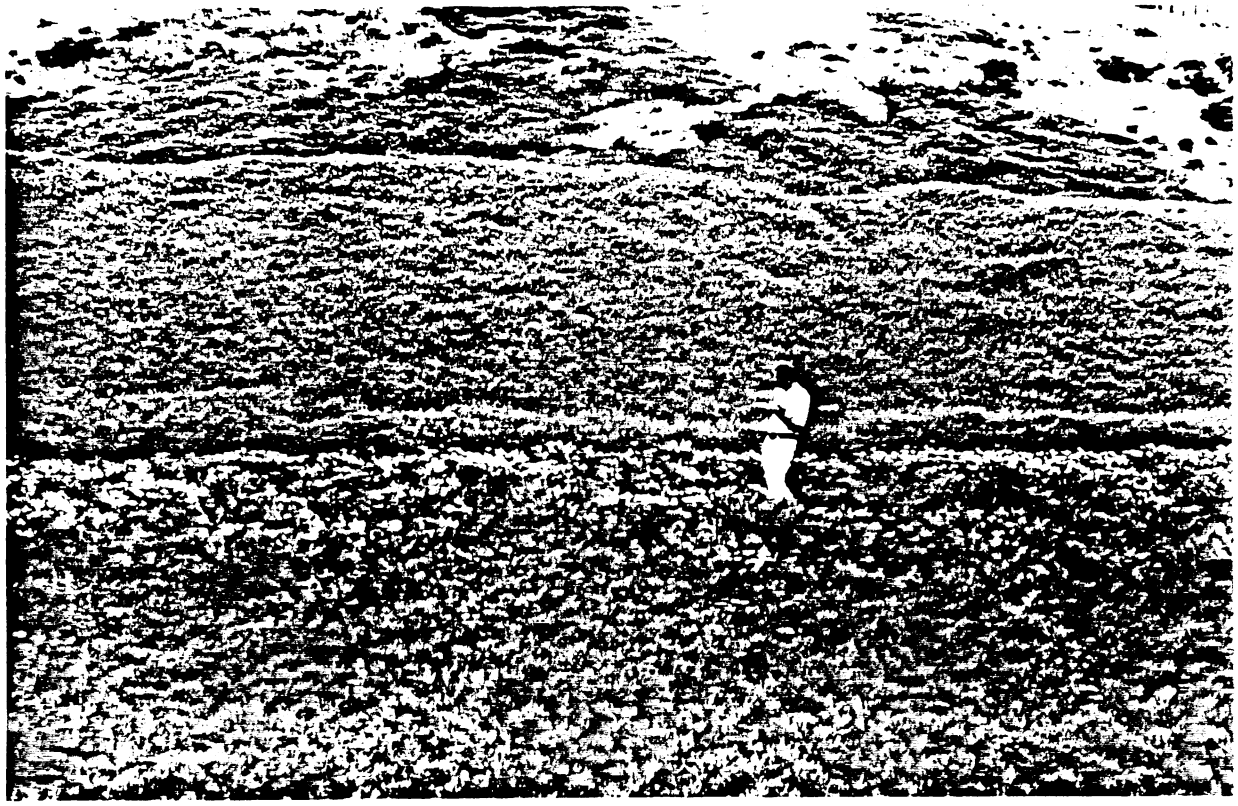


Fig. 14 - Unit 2, western section, looking east toward bluffs. Anemopsis californica & Carpobrotus edulis

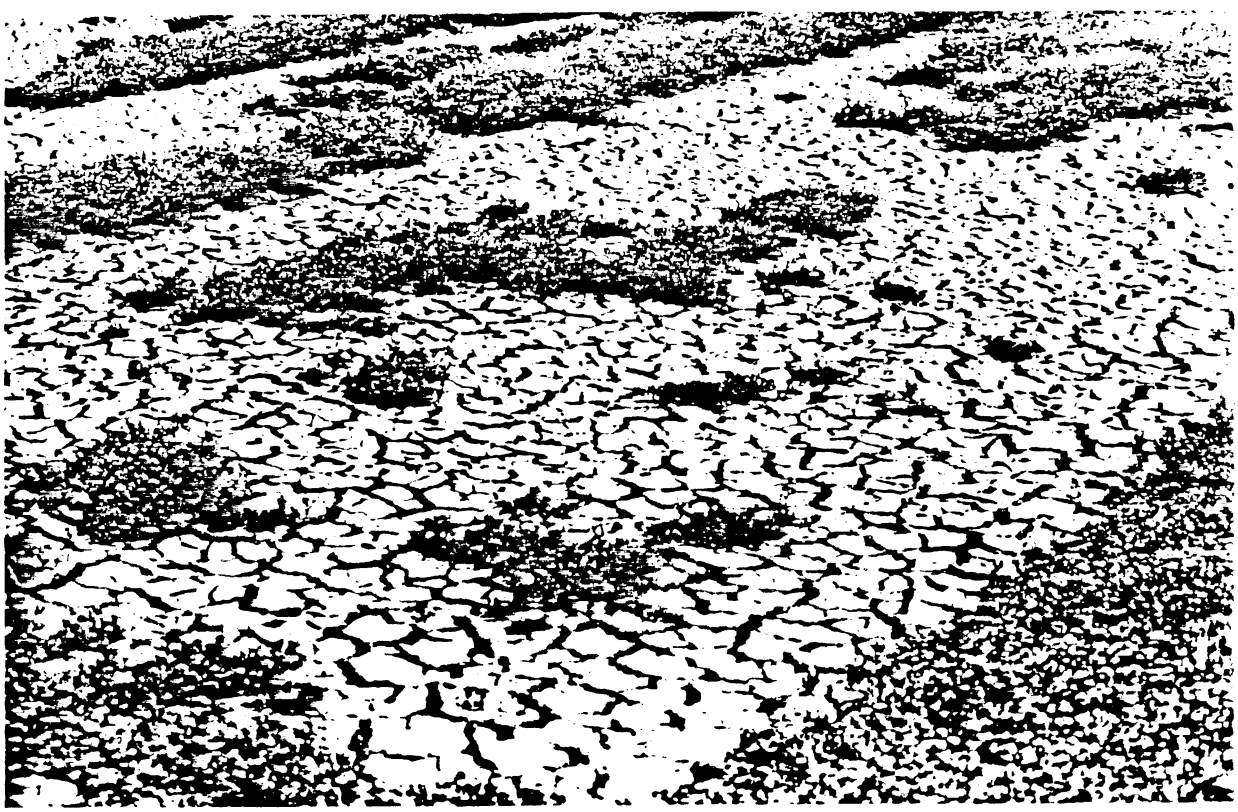


Fig. 15 - Unit 2, occasionally flooded agricultural area with Cotula coronopifolia.

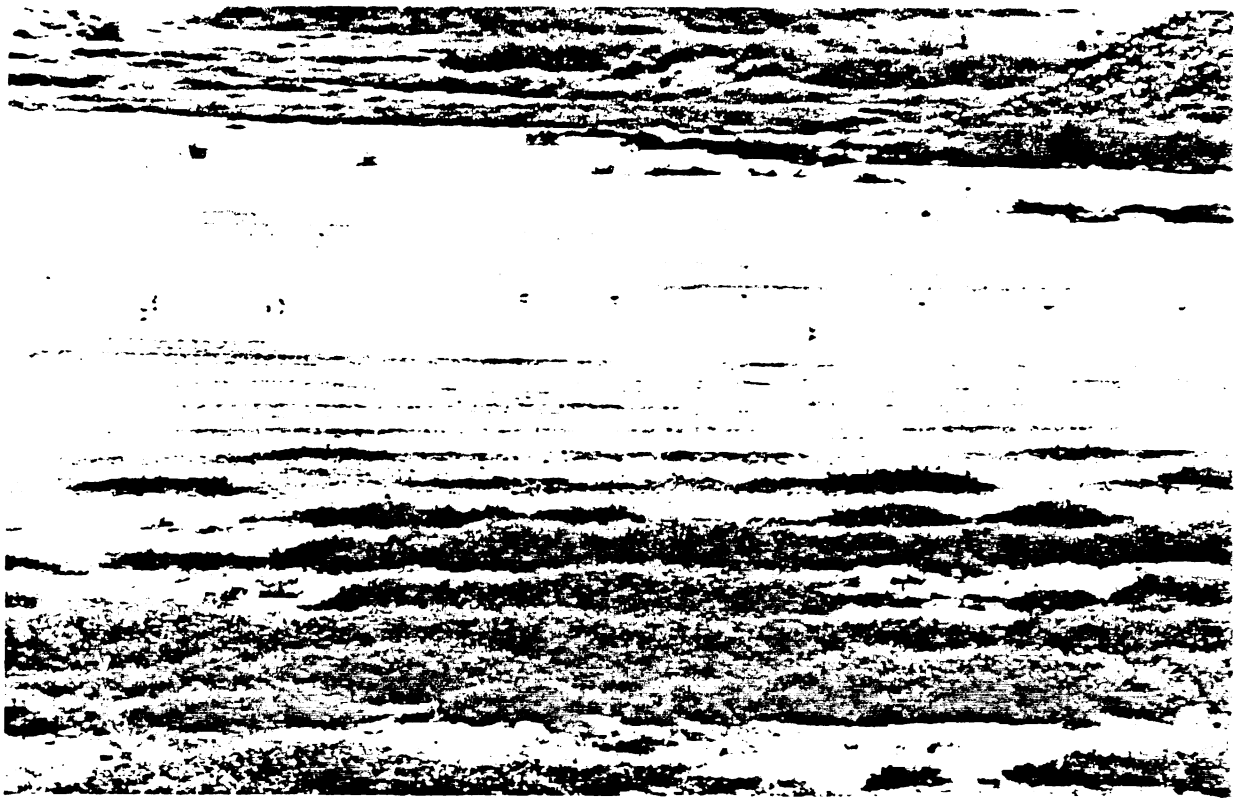


Fig. 16 - Unit 2, eastern section, looking east. Occasionally flooded agricultural land.

Photography by David Minor