THE LOS ANGELES COASTAL PRAIRIE, A VANISHED COMMUNITY

RUDI MATTONI and TRAVIS R. LONGCORE

UCLA Department of Geography
Box 951524
Los Angeles, California 90095-1524

Reprinted from
CROSSOSOMA 23(2), Autumn–Winter 1997, pp. 71–102.

Southern California Botanists, Inc.
— Founded 1927 —

Enquiries regarding membership in The Southern California Botanists Inc., subscriptions to *CROSSOSOMA*, availability and cost of *CROSSOSOMA* back issues, and/or availability and cost of SCB Special Publications, should be sent to: Alan Romspert, Treasurer, Southern California Botanists, Department of Biology, California State University, Fullerton, California 92834, U.S.A.

THE LOS ANGELES COASTAL PRAIRIE, A VANISHED COMMUNITY

RUDI MATTONI and TRAVIS R. LONGCORE
UCLA Department of Geography
Box 951524
Los Angeles, California 90095-1524
(310) 825-1071

ABSTRACT: The Los Angeles coastal prairie was an herbaceous plant community with high concentrations of annual forbs, similar to coastal prairie described for northern California, interspersed with a network of vernal pools with their associated specialized flora. Unfortunately, the unique community was lost before it could be studied in detail. The prairie covered about 95 km^2 of coastal Los Angeles County, extending north-south from the crest of the Ballona Bluffs to the Palos Verdes peninsula and inland for 3–7 km from the lee of the El Segundo sand dunes. We present (1) historical accounts and photographs of the prairie, (2) a description of the vegetation, including a list of plants native to the prairie assembled from herbarium accessions, botanical literature, and recent surveys of a highly degraded 12-ha fragment, and (3) a review of the mammals, birds, reptiles, and amphibians that were once found on the prairie. The description of the Los Angeles coastal prairie and its vernal pools should inform restoration efforts in the area, and aid in the potential identification of previously overlooked fragments of these habitats in the urban mosaic.

KEY WORDS. California, coastal prairie, Los Angeles, restoration, vegetation, vernal pools.

Introduction

The Los Angeles coastal prairie was a predominantly herbaceous plant community with extensive vernal pool habitat that covered about 95 km^2. The last significant remnant, a 120-ha site at the west end of the Los Angeles International Airport (LAX), was obliterated in the late 1960s. Today a few scattered open patches remain, but these are so degraded and overgrown with exotic weeds as to be unrecognizable as coastal prairie. One remnant, 12 ha at LAX, was the site of an attempt to restore a portion of this unique community. Our purpose in this paper is to reconstruct this ecological community from historical information, including voucher specimens, biological field notes, photographs, and anecdotal material. This description should allow those attempting ecological restoration within the former extent of the prairie to use appropriate native plants in their efforts. This objective is timely because restoration projects across the Los Angeles basin often attempt restoration using plants never found in an area or neglect to restore the diversity of plants that were present. Such well-meaning but inappropriate plant choices create insidiously harmful effects on animal communities (Longcore et al. 1997), and may confuse future analysts who will be required to reconcile alien species and ecotypes.

The extent of the Los Angeles coastal prairie (Figure 1) was congruent with the Pleistocene dune system delineated by Cooper (1967) during his comprehensive review of the coastal sand dunes of California (Mattoni 1993). The Pleistocene dune system coincides almost exactly with the Oakley Sand formation depicted by the U. S. Bureau of Soils survey (Nelson 1919). The prairie was underlain by this edaphic formation, characterized by the consolidated sands of the Pleistocene sand dunes at El Segundo. The older system was formed during the 80,000 years before the last glaciation while the newer dunes were formed

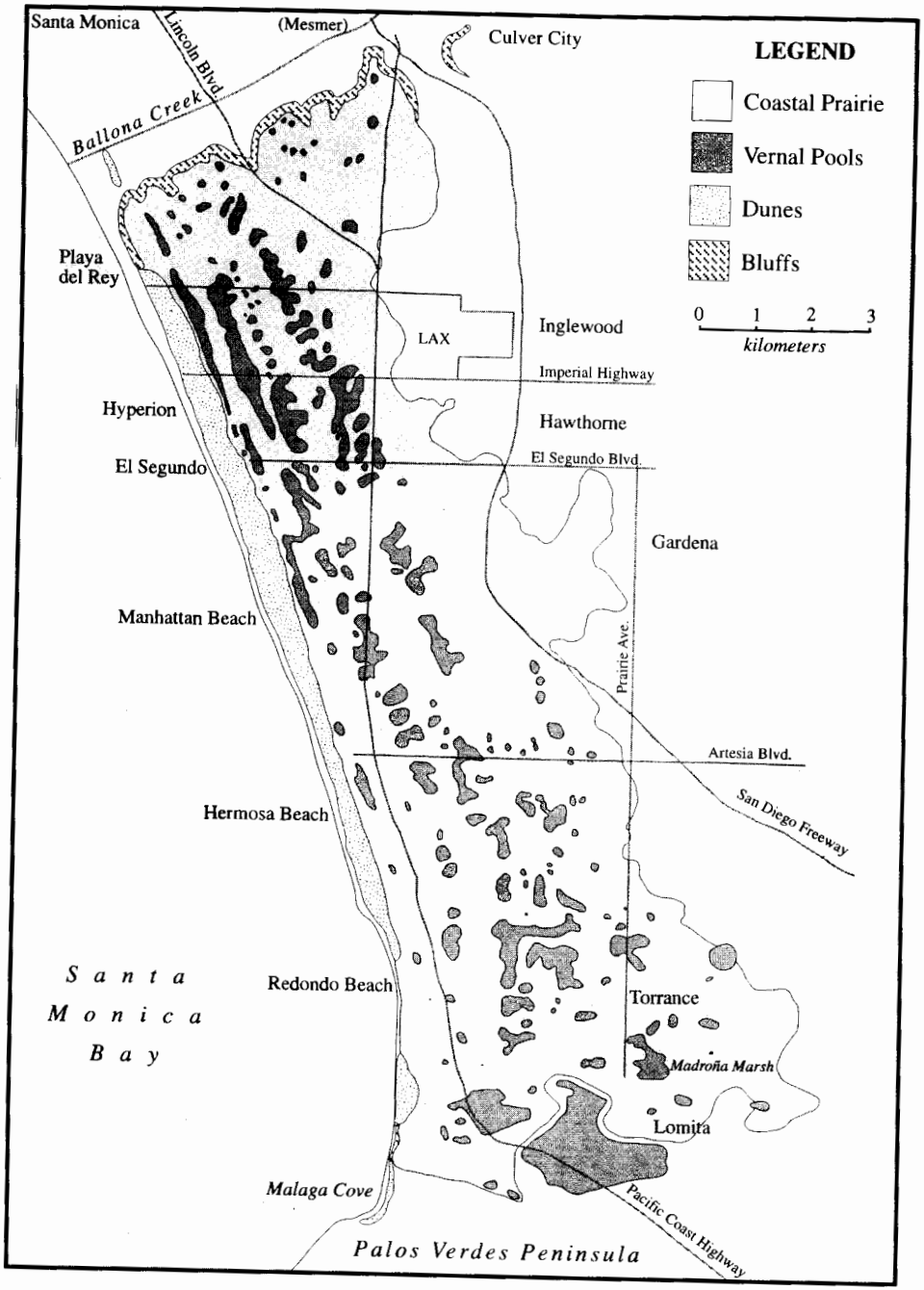


Figure 1 (opposite). Map of the extent of the Los Angeles coastal prairie and its vernal pools. Modern infrastructure is overlain on the historic features. Historic collection localities are given, names not in current usage are given in parentheses. After Cooper (1967).

over the past 6,000–8,000 years. The enormous amounts of sand that form both dune systems were provided by alluvium transported by Ballona Creek, which was fed by the Los Angeles River until the 1800s.

The Los Angeles coastal prairie was surrounded by vegetation types associated with different edaphic, hydrologic, and topographic features. The western edge of the Los Angeles coastal prairie was formed by the active El Segundo sand dunes along the immediate coast, which were covered with dune scrub. The eastern and southern boundaries are hypothetical as no remaining vestiges of the native biota exist. Soil types along the south border, at the Palos Verdes uplift, are sedimentary sandstones vegetated by a typical coastal sage scrubland of *Artemisia californica* and admixtures of other shrubs. Portions of these scrub communities still exist on the Palos Verdes peninsula, but not in the border areas of the prairie. The southern and eastern borders included extensive wetlands including Bixby Slough and "Nigger Slough."[1] The highly degraded Madroña Marsh is a small extant remnant of these wetlands. The remaining border of the prairie was probably entirely coastal sage scrub and coastal bluff scrub, extending north from the marshes in the Torrance area to the Ballona Gap and west to the Pacific across the top of the Ballona Bluffs.

Historical Description: "Where once grew wild flowers with abandon"

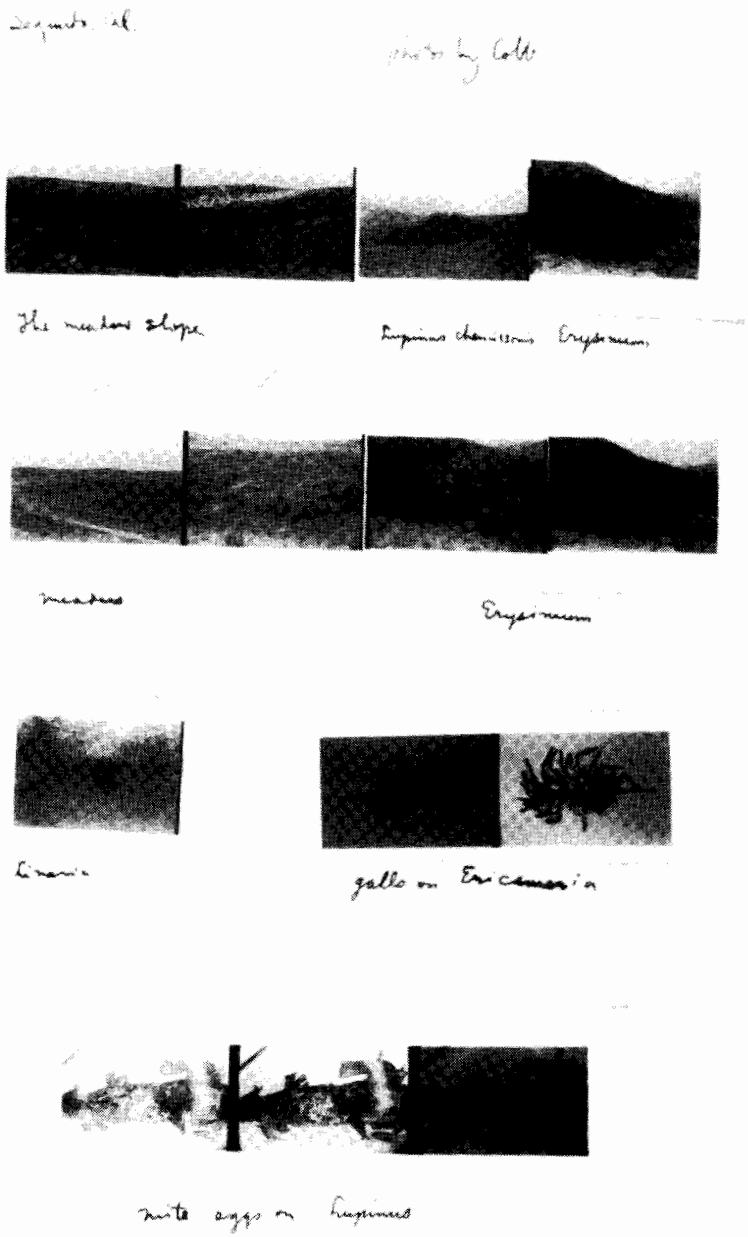
Although the Los Angeles Coastal Prairie has been overlooked as a distinct association in recent years except by Mattoni (1993), lay people have recognized the unique character of this area. The "plains" rolling to the sea are described in many travelers' accounts of early Los Angeles (*e.g.*, Brewer 1930). Historian Roy Rosenberg (1938) writes that the prairie was converted from ranching to dry farming in the 1800s by the founder of Inglewood, California, Daniel Freeman. Rosenberg reports characteristics of the prairie at that time;

> [I]t is recorded that the Freeman children rode over the rancho through fields of wildflowers that extended to the Pacific. The sight of these great fields, suddenly confronting a person as he neared the top of Baldwin Hills, brought as enthusiastic exclamations of surprise and wonder from his lips as does the present panorama which greets the traveler as he speeds over ribbons of concrete enroute from the metropolitan district to Inglewood. Where once grew wild flowers with abandon — poppies, lupin, mustard, horseradish and verbena — there now appears a sea of lights which that great raconteur, Alexander Wolcott, has aptly likened to "the babel of a million tungstens" (Rosenberg 1938:12–13).

A Manhattan Beach resident wrote as follows of his childhood in the 1920s;

> While living at 3116 Alma, we almost always walked to school. We walked over the sanddunes, through the area where Grandview School is located, across the fields, over the railroad tracks, past the Catholic Church property.

[1]We use this offensive place name with regret and have abbreviated it to "N. Slough" throughout the remainder of the paper. Most local botanists are aware of this locality between Gardena and Torrance because of its frequent occurrence on herbarium labels on specimens from the early 1900s. It has no modern place name because it has long since been drained and filled. The wetland was reportedly named after the freemen who farmed near it and the name appears on historic maps of the area (Nelson 1919). We hope that the reader understands our decision to identify the locale by its only name.



Quite often we would pick wild flowers like Lupins, Indian Paint Brush, and mustard flower, which grew everywhere, to take to our teachers (Dow 1976:27).

Although some of the flowers listed by Dow and Rosenberg are exotic weeds (*e.g.*, horseradish, probably *Raphanus sativus*, and mustard, probably *Brassica nigra*), it is apparent that the area was not coastal sage scrub as it is often described. Additional historical information is provided by Dorothy Lyndes, who lived in Inglewood in the 1930s and still recalls from that time yearly wildflower trips by the Girl Scouts to admire the poppies and lupines in fields to the west (Lyndes *pers. comm.* 1996). And, although the prairie is now largely gone, a namesake, Prairie Avenue, remains.

Botanists and biologists also have described the Los Angeles coastal prairie as a distinct region in various ways. The U. S. Bureau of Soils (Nelson 1919:29) described the native vegetation of the Oakley series as "Some grass and small scrubby brush." Pierce (1938), in his extensive studies of the flora and fauna of the El Segundo dunes, distinguished the "meadow" from the dunes. In his field notes and publications, he delineated specifically between plants of the meadow and plants of the dunes (Figure 2, Pierce 1938; Pierce 1938–1939). In later articles, von Bloeker (1942; 1943a; 1943b) also described the meadow. He wrote, "A large part of the meadow is covered throughout the year by low-growth vegetation, such as grass, weeds, and non-native plants. ... Another section is heavily over-grown with native shrubs. ... In the grassland (including the areas of native and non-native grasses and weeds, and the grain-fields)..." (von Bloeker 1943a:12). These descriptions evoke a landscape that is different from the surrounding dominant coastal sage scrub. Burcham (1957) mapped the whole Los Angles basin as California Prairie. Küchler (1977) created confusion with his map of the potential natural vegetation of California by identifying the active dunes and the area underlain by consolidated dunes as "Southern Seashore Communities," which included "Southern beach community" and "Southern dune scrub." The observation that the area of the prairie is different from its surroundings is correct, but the prairie is also distinct from dune scrub. The previous misclassification has caused some difficulties in attempting to restore the appropriate plant community in the area.

Vegetation Description

We have compiled a list of all native vascular plant species known to have occurred on the Los Angeles coastal prairie (Table 1, pp. 77–85). The list was created by inspecting accessions in the UCLA Herbarium and the Rancho Santa Ana Herbarium of all species that could possibly have been found on the prairie. The list of possible species was developed by reviewing historical records, habitat descriptions in Floras of southern California (Abrams 1904; Davidson and Moxley 1923; Munz 1935; Munz 1974), relevant literature (e.g., Beetle 1947; Biswell 1956; Holland and Keil 1995; Keeler-Wolf et al. 1995; Keeley 1989; Munz and Keck 1949; Munz and Keck 1950; Orndduff 1974; Sawyer and Keeler-Wolf 1995; Thorne 1976; Zedler 1987) and through consultation with botanists with a knowledge of the area. Many records are from collections made incidental to surveys of the El Segundo sand dunes by W. Dwight Pierce, O. H. Kappler, and others. Other records are from casual collections by amateur botanists. Because there was no systematic effort to document the flora of this area, it is possible that species not on the list simply were not collected. Nevertheless, from the records documented here, we conclude that the plant species present in this area indicate

Figure 2 (opposite). Page from W.D. Pierce's notes, with contact strips of photos. The first photograph on the second row is the only picture that shows the "meadow" looking inland from the El Segundo dunes.

the presence of a coastal prairie with two characteristic features: (1) an herbaceous plant community with high concentrations of annual forbs, similar to coastal prairie described for northern California, and (2) a network of vernal pools with their associated specialized flora.

Evidence for a coastal prairie

The plant list for the Los Angeles coastal prairie shares 19 of the 34 native plants listed by Magney (1992) as characteristic of southern coastal needlegrass grassland, 15 of the 23 native plant genera and species listed by Holland and Keil (1995) as characteristic of southern coastal grassland, and 31 of the 61 native species and genera listed as components of pristine California grassland presented by Keeley (1989). The components of the prairie differ by the presence of numerous species associated with vernal pools (discussed below), lower cover by perennial grasses, and more cover by flowering herbs (*e.g., Gnaphalium, Corethrogyne, Erysimum, Linanthus, Limnanthes*). Because of the differences and similarities with other grassland descriptions, the Los Angeles coastal prairie is properly identified as a type of grassland, sufficiently distinct to warrant identification by the word "prairie."

The term "prairie" seems the most appropriate appellation because of the preponderance of wildflowers and the occurrence of vernal pools. The topography is prairie-like, "consisting of low, rounded hills and ridges, and numerous undrained depressions" (Cooper 1967:97). In the Midwest, these undrained depressions would be called "prairie potholes." Unfortunately, analysis of the plant community is hindered because few quantitative data exist that would allow for a comparison with northern California coastal prairie as described by Munz and Keck (1950) and Thorne (1976). The most extensive description of the coastal prairie is by Hektner and Foin (1977). After collecting extensive plot data at Sea Ranch in Sonoma County, they describe five vegetation types in the coastal prairie (*i.e.*, headlands, *Lupinus* dominated, mixed grassland, perennial grassland, and *Calamagrostis* dominated).

We used the only available source for quantitative data, a photograph of the "meadow floor" taken by W. D. Pierce in March 1938 to compare the study area to these descriptions (Figure 3, p. 86). We used a dissecting microscope and measured species frequency and percent cover across three transects of the photograph (Table 2, p. 87). Other probable species in the photograph, but not on transects scored, were *Plantago erecta* and *Stebbinsoseris heterocarpa*. These species had not yet formed flowerheads, and *P. erecta* is particularly difficult to discriminate when a small seedling. Because the photograph was taken before the peak of floral development, ultimate cover could approach 100%. The area photographed by Pierce and the lupine sub-association described by Hektner and Foin (1977; Table 3, p. 88) indicate dominance by species of *Lupinus* and representation of *Lotus* and grasses. The Los Angeles sample has considerably more cover by a spring wildflower (*Phacelia stellaris*), which may be related to the timing of the photograph in early spring.

The question of the proportion of bunch grasses (*Stipa* spp.) to other herbaceous cover in all California grasslands has been a topic of extended debate. The conventional view, which arose from the successionist theory of Clements, is that native grasslands were dominated by perennial species (Clements 1934; Clements and Shelford 1939; Küchler 1977; Munz and Keck 1949; Ornduff 1974). Wester (1981) challenged this notion and used historical sources to assert that much of the valley grasslands were dominated by annual herbs rather than perennial grasses. The mistranslation of the Spanish "*pasto*," meaning "pasture," as "grassland" has further complicated historical accounts of the region (*i.e.*, Crespi in Bolton 1927; Parish 1920). *Pastos* were not necessarily grasslands, but simply areas that were good for cows to graze, which also could be dominated by broad-leaved annuals (R. Minnich, *personal communication*). Our research indicates a greater predominance of broad-leaved annual and perennial species, rather than perennial bunch

[text continued p. 87]

Table 1. Native plants of the Los Angeles Coastal Prairie and its vernal pools.

Habitats: **D**, dunes *and* prairie; **P**, prairie (*not* dunes); **V**, vernal pools.

[1]Southern California vernal pool indicator species.

[2]Vernal pool associates, found also in aquatic, marsh, or seepage areas.

[3]Found in vernal pool basins, but common in other habitats (Zedler 1987).

*Species or examples of genera listed by Keeley (1989) as composing pristine native California grasslands.

Lifeforms: **A**, annual, **B**, biennial, **P**, perennial, **S**, shrub.

Nomenclature generally follows *The Jepson Manual* (Hickman 1993); synonomies are given for deviations and to aid in interpretation of historical sources. Relevant text from herbarium labels and literature or references that suggest presence on the prairie are presented.

Scientific Nomenclature	Common Name	Habitat	Form	Authority
DICOTYLEDONES				
AIZOACEAE				
Sesuvium verrucosum Raf. [*S. sessile* auth., not Pers.]	WESTERN SEA-PURSLANE	V	P	Occasional on the borders of brackish pools from Gardena to Wilmington (Davidson and Moxley 1923). "N. Slough," A. Davidson, June 14, 1891, I. Johnston, April 11, 1917 (RSA).
APIACEAE				
Apiastrum angustifolium Nutt.		P	A	Manhattan Beach, Hills, Effie S. Spaulding, May 3, 1924 (RSA).
Eryngium aristulatum var. *parishii* (J. Coulter & Rose) Jepson	SAN DIEGO BUTTON-CELERY	V[1]	B	Sandy ground, Redondo (Davidson and Moxley 1923).
ASTERACEAE				
Achyrachaena mollis Schauer	BLOW-WIVES	P[3]	A	Cultivated ground west of Los Angeles, A. Davidson, 1930 (RSA).
Ambrosia acanthicarpa Hook.	ANNUAL BUR-SAGE	P	A	Drier slopes (Pierce 1938–1939).
Ambrosia psilostachya DC.	WESTERN RAGWEED	P	P	(Pierce 1938–1939). To edge of dune but not on sandy slopes (Pierce 1938).
Artemisia californica Less.	CALIFORNIA SAGEBRUSH	D	S	Occasional on prairie (Mattoni 1990).
Aster subulatus Michaux var. *parviflorus*	ASTER	V	A	"N. Slough," I. Johnston, April 11, 1917. Moist ground, near Mesmer, LeRoy Abrams, August 24, 1902 (RSA).
Baccharis emoryi A. Gray		V	S	Gardena, "N. Slough," dry bottom of slough, F.R. Fosberg, October 18, 1930 (RSA).
Blennosperma nanum (Hook.) S.F. Blake [*B. californicum*]		V[1]	A	In moist places; not common in southern California. Wilmington, Los Angeles County; Gardena, *McClatchie* (Davidson and Moxley 1923).
Chaenactis glabriuscula DC.	YELLOW PINCUSHION	D*	A	(Pierce 1938–1939). Generally distributed over the dunes and on the meadow (Pierce 1938). Sand Hills and flats, between Del Rey and El Segundo, O.H. Kappler, April 30, 1940 (LA).
Corethrogyne filaginifolia (Hook. & Arn.) Nutt. var. *virgata* (Benth.) A. Gray [*Lessingia f.* (Hook. & Arn.) M.A. Lane var. *f.*, *C. virgata*]	CALIFORNIA-ASTER	D	P	(Pierce 1938–1939). Sparingly distributed over the dunes, common on meadow (Pierce 1938). Waste land, Culver City, Fay A. MacFadden, November 18, 1934 (RSA). El Segundo, A. Davidson, 1930 (RSA). Los Angeles near Soldier's Home, Playa del Rey, Ballona Harbor (Canby 1927).

Encelia californica Nutt.	CALIFORNIA SUNFLOWER	D	S	Occasional on prairie (Mattoni 1990).
Filago californica Nutt.	HERBA IMPIA	D[3]	A	Ballona Harbor, LeRoy Abrams, April 1, 1901 (RSA).
Gnaphalium bicolor Bioletti		D	P	(Mattoni 1990).
Gnaphalium californicum DC. [*G. decurrens*]		D	A/B	Meadow and dunes (Pierce 1938).
Gnaphalium canescens DC. ssp. *microcephalum* (Nutt.) Stebb. & Keil [*G. m.*]		P	B	(Pierce 1938–1939). (Mattoni 1990). To edge of dune but not on sandy slopes (Pierce 1938).
Gnaphalium palustre Nutt.		V[1]	A	Inglewood, L.R. Abrams, April 2, 1901 (RSA). Sink at Inglewood, F.W. Peirson, 1951 (RSA).
Grindelia camporum E. Greene var. *bracteosum* (J. Howell) M.A. Lane	GUMPLANT	P[3]	P	Wiseburn, LeRoy Abrams, June, 1901 (RSA). Los Angeles, mesas and open ground west of city, E. Kline, June 9, 1924 (RSA).
Hemizonia fasciculata (DC.) Torrey & A. Gray [*Deinandra f.*]	TARWEED	P*3	A	Hills near Playa del Rey, LeRoy Abrams, 1902 (RSA). Del Rey between sand dunes and salt marsh, just above supralittoral, F.R. Fosberg, June 23, 1930 (RSA). Playa del Rey, F.W. Peirson, 1951 (RSA).
Heterotheca grandiflora Nutt.	TELEGRAPH WEED	D	A/P	(Pierce 1938–1939). In stabilized areas, ravines, at both slope bases, and sparingly on the dunes (Pierce 1938).
Heterotheca villosa (Pursh) Shinn. [*Chrysopsis fastigiata* Greene]		D	P	Santa Monica, *Hasse*, Los Angeles, *Davidson* (McClatchie 1899).
Isocoma menziesii (Hook. & Arn.) G. Nesom var. *vernonioides* (Nutt.) G. Nesom [*Haplopappus venetus* (Kunth) S.F. Blake ssp. *vernonioides* (Nutt.) H.M. Hall]	GOLDENBUSH	P	S	Redondo Beach, Palos Verdes cliffs, July 1943 (RSA). Growing as weed in open field, Compton, F.W. Gould, October 26, 1943 (RSA).
Lasthenia californica Lindley	GOLDFIELDS	P*	A	Vermont and Western, hills north between, Helen Oster, April 27, 1924 (RSA). Playa del Rey, G.B. Grant, May 14, 1904 (RSA).
Lasthenia glabrata Lindley ssp. *coulteri* (A. Gray) Ornd.	COULTER GOLDFIELDS	V*	A	Salt marsh, Del Rey Hills. In dense patches in old ploughed ground now overgrown, A.M. Johnson, 1934 (LA). Common in saline marshes, especially along the coast (Abrams 1904).
Layia platyglossa (Fischer & C. Meyer) A. Gray	TIDY-TIPS	P*	A	Frequent in sandy soil, especially along the coast (Abrams 1904). Near "N. Slough," field, I. Johnston, April 11, 1917 (RSA).
Malacothrix saxatilis (Nutt.) Torrey & A. Gray		D	P	Playa del Rey, I. Johnston, June 10, 1910 (RSA).
Micropus californicus Fischer & C. Meyer	SLENDER COTTONWEED	P	A	Santa Monica, F.W. Peirson, April 11, 1951 (RSA). Low hills, Los Angeles, G.L. Moxley, May 9, 1915 (RSA).
Psilocarphus brevissimus Nutt.	WOOLLY-HEADS	V[1]	A	Frequent on the plains and hills, especially in exsiccated places (Abrams 1904; Davidson and Moxley 1923). Not uncommon in desiccated pools in the coastal district of Los Angeles County (Parish 1917). Sink at Inglewood, F.W. Peirson, 1951 (RSA). Hills and dry grounds, Los Angeles, H.E. Hasse, July 1890 (RSA).
Psilocarphus tenellus Nutt.		V[1]	A	In the coastal subregion, probably not uncommon. Glendale, near Los Angeles, *Braunton* (Davidson and Moxley 1923; Parish 1904)
Rafinesquia californica Nutt.	CALIFORNIA CHICORY	D	A	(Pierce 1938–1939).

Senecio californicus DC.	GROUNDSEL, RAGWORT, BUTTERWEED	D	A	(Pierce 1938–1939). Meadow slope of sand dunes, Playa del Rey to El Segundo, B.C. Templeton, April 10, 1939 (RSA). Culver City, sandy hillside, Frances M. Morey, April 14, 1922 (RSA). Foothills near end of Vermont Ave., Helen M. Aster, April 27, 1924 (RSA). Common in sandy soil in dry places in our interior valleys and foothills, and on the sand-dunes along the seashore (Abrams 1904).
Senecio flaccidus Less. var. *douglasii* (DC.) B. Turner & T. Barkley		D	P	(Pierce 1938–1939).
Stebbinsoseris heterocarpa (Nutt.) Chambers [*Microseris h.* (Nutt.) Chambers]		P	A	Photograph (Pierce 1938–1939).
Stephanomeria exigua Nutt. ssp. *coronaria* (E. Greene) Gottlieb		D	A	On meadow, stabilized areas of foredune, and in dune ravines (Pierce 1938). Swale behind sand dunes, El Segundo, F.R. Fosberg, August 30, 1931 (RSA). On dry mesas, Inglewood, L. Abrams, August 25, 1902 (RSA).
Stephanomeria virgata Benth. [*Ptiloria v.*]		D	A	From meadow onto the dune, only in stabilized areas, especially on seaward side (Pierce 1938). (Pierce 1938–1939). Common on dry ground, especially toward the coast (Abrams 1904).
BORAGINACEAE				
Amsinckia spectabilis Fischer & C. Meyer	FIDDLENECK	D*	A	(Pierce 1938–1939). Common in sandy soil near the coast (Abrams 1904). Redondo Beach, Emily M. Bradford, March 17, 1904 (RSA).
Cryptantha clevelandii E. Greene var. *florosa* I.M. Johnston		D*	A	Hills between Del Rey and El Segundo, open fields, F.R. Fosberg, March 28, 1932 (RSA).
Cryptantha intermedia (A. Gray) E. Greene		P*	A	(Pierce 1938–1939). Open field, Sand Hills and flats, between Del Rey and El Segundo, O.H. Kappler, April 30, 1949 (LA).
Cryptantha muricata (Hook. & Arn.) Nelson & J.F. Macbr.		D*	A	Hills between Del Rey and El Segundo, open fields, F.R. Fosberg, March 28, 1932 (RSA). El Segundo, sand dunes, Robert M. Perkins, April 16, 1936 (RSA).
Heliotropium curassavicum L. var. *oculatum* (A.A. Heller) I.M. Johnston	HELIOTROPE	D	P	Palisades along railroad at foot of bluff, Hollenberg, July 24, 1928 (RSA). Redondo Beach, sandy fields south end of town around sea level, Tom Burch, June, 1940 (RSA).
Pectocarya linearis (Ruiz Lopez & Pavon) DC. ssp. *ferocula* (I.M. Johnston) Thorne		P	A	Inglewood, LeRoy Abrams, April, 1899 (RSA).
Plagiobothrys canescens Benth.	POPCORNFLOWER	P*	A	Frequent on grassy foothills and mesas (Davidson and Moxley 1923).
Plagiobothrys nothofulvus (A. Gray) A. Gray	POPCORNFLOWER	P*	A	Frequent on rather moist grassy hillsides about Los Angeles and on mesas in the coast region (Abrams 1904). Frequent on grassy foothills and mesas (Davidson and Moxley 1923).
Plagiobothrys trachycarpus (A. Gray) I.M. Johnston [*Allocarya t.* Greene]	POPCORNFLOWER	V*	A	In moist ground near Inglewood (Abrams 1903).
BRASSICACEAE				
Descurainia pinnata (Walter) Britton	TANSY MUSTARD	D	A	(Mattoni 1990).
Erysimum insulare E. Greene ssp. *suffrutescens* (Abrams) R.A. Price [*E. angustata* auth. unknown, *E. s.* Abrams]	SUFFRUTESCENT WALLFLOWER	D	P	(Mattoni 1990). Sand Hills and flats, between Del Rey and El Segundo, O.H. Kappler, April 30, 1949 (LA).
Hymenolobus procumbens [*Hutchinsia p.* (L.) Desv.]		V	A	Redondo, A. Davidson, March, 1894 (RSA).

Lepidium dictyotum A. Gray [*L. acutidens Howell*]	PEPPERGRASS	V	A	In saline places toward the coast. Cienega; Santa Monica (Abrams 1904). Occasional in alkaline soils on the coastal plains (Davidson and Moxley 1923).
Lepidium lasiocarpum Torrey & A. Gray	PEPPERGRASS	D	A	Occasional on prairie (Mattoni 1990).
Lepidium latipes Hook.	PEPPERGRASS	V[3]	A	In saline places near the coast; not common (Davidson and Moxley 1923).
Lepidium nitidum Torrey & A. Gray	PEPPERGRASS	P[3]	A	Common on grassy slopes (Davidson and Moxley 1923). Very common on grassy plains and hills (Abrams 1904). Ballona Hills, March, 1927 (RSA).
Sibara virginica (L.) Rollins [*Arabis v.*]		V[1]	A, B	Inglewood in low ground (Abrams 1904).
CACTACEAE				
Opuntia littoralis (Engelm.) Cockerell	PRICKLY-PEAR	D	P	Occasional on prairie (Mattoni 1990).
CALLITRICHACEAE				
Callitriche marginata Torrey	WATER-STARWORT	V[1]	A	Soldier's Home, *Hasse* (Abrams 1904). In pools near Santa Monica, *Hasse* (Parish 1917).
CAPPARACEAE				
Isomeris arborea Nutt.	BLADDERPOD	D	S	Occasional on prairie (Mattoni 1990).
CARYOPHYLLACEAE				
Cardionema ramosissimum (J.A. Wienm.) Nelson & J.F. Macbr.		P	P	Santa Monica, fields near city, Crawford & Hiatt, March 30, 1916 (RSA). Near Mesmer, dry sandy cliffs, I. Johnston, June 10, 1917 (RSA). Manhattan Beach, Effie S. Spaulding, May 9, 1924 (RSA).
Loeflingia squarrosa Nutt.		D	A	Near Redondo (McClatchie 1894).
Polycarpon depressum Nutt.	POLYCARP	V	A	Redondo Beach, in sandy fields near sea level, Tom Burch, March 9, 1940 (RSA).
Spergularia marina (L.) Griseb.	SAND-SPURREY	D[3]	A	(Mattoni 1990). Ballona wetlands, R. Gustafson, March 26, 1981 (RSA). Del Rey, dried mud flats, F.R. Fosberg, June 23, 1930 (RSA).
CHENOPODIACEAE				
Atriplex lentiformis (Torrey) S. Watson [*A. breweri* Wats.]	BIG SALTBUSH	P	P	Del Rey, bluffs at Palisades, Hollenberg, July 24, 1928 (RSA). On bluffs of the seashore. San Juan, *Anderson*, Santa Monica, *Hasse*, *Parish* (McClatchie 1899).
CONVOLVULACEAE				
Calystegia macrostegia (E. Greene) Brummitt [*Convolvulus m.* Greene]	MORNING-GLORY	D	P	(Pierce 1938–1939).
Cressa truxillensis Kunth	ALKALI WEED	V[2]	P	Culver City, waste land, F.A. MacFadden, September 10, 1934 (RSA). Common in hard subsaline soils along the coast and on the deserts (Davidson and Moxley 1923). Frequent in saline places throughout our range (Abrams 1904).
CRASSULACEAE				
Crassula connata (Ruiz Lopez & Pavon) A. Berger [*C. erecta* Hook. & Arn., *Tillaea minima* Hook. & Arn.]	PYGMY-WEED	D	A	(Pierce 1938–1939). (Mattoni 1990). Manhattan Beach, Mrs. E.S. Spaulding, May 3, 1924 (RSA).
CUCURBITACEAE				
Cucurbita foetidissima Kunth	CALABAZILLA	D	A	(Pierce 1938–1939). (Mattoni 1990). Frequent on dry sandy soil throughout our range (Abrams 1904).
Marah macrocarpus (E. Greene) E. Greene	WILD CUCUMBER	D	P	(Mattoni 1990).

CUSCUTACEAE				
Cuscuta californica Hook. & Arn.	DODDER	D	A	From meadow onto dune. Parasitic on various plants on the dune, but especially on *Croton* and *Camissonia* (Pierce 1938). (Pierce 1938–1939). Occasional along the coast and in the interior, growing on various low shrubs.
ELATINACEAE				
Elatine brachysperma A. Gray	WATERWORT	V[1]	A	Inglewood, L. Abrams, April 1, 1899 (RSA). On the borders of pools near the coast in Los Angeles and San Diego Counties (Davidson and Moxley 1923). Occasional along borders of ponds toward the coast (Abrams 1904).
EUPHORBIACEAE				
Chamaesyce albomarginata (Torrey & A. Gray) Small [*Euphorbia a.* Torrey & A. Gray]	RATTLESNAKE WEED	D	P	Railroad embankment, Inglewood, LeRoy Abrams, May 31, 1902 (RSA).
Croton californicus Muell. Arg.		D	P	(Pierce 1938–1939). Common on dry ground throughout our range (Abrams 1904).
Eremocarpus setiger (Hook.) Benth.	TURKEY MULLEIN	P*[3]	A	(Pierce 1938–1939). To edge of dune but not on to sandy slopes (Pierce 1938).
FABACEAE				
Astragalus didymocarpus Hook. & Arn.	TWO-SEEDED MILKVETCH	P*	A	Playa del Rey, A. Davidson, 1920 (RSA).
Astragalus tener A. Gray var. *titi* (Eastw.) Barneby	COASTAL DUNES MILKVETCH	P*	A	Moist, sandy depressions of bluffs or dunes along and near the Pacific Ocean, 50 feet or lower, rare and seldom collected. Coast of Los Angeles plain (Santa Monica; Hyde Park) — probably extinct (Barneby 1964:1048).
Astragalus trichopodus (Nutt.) A. Gray var. *lonchus* (M.E. Jones) Barneby [*A. leucopsis* (Torrey) Torrey & A. Gray]		D*	P	(Pierce 1938–1939). (Mattoni 1990). Very common along the coast (Davidson and Moxley 1923).
Lotus purshianus (Benth.) Clements & E.G. Clements [*L. unifoliolatus*, *L. americanus*]		P*	A	To edge of dune but not on sandy slopes (Pierce 1938).
Lotus salsuginosus E. Greene [*L. maritima* Nutt.]		P*	A	Widely distributed on coast and interior (Davidson and Moxley 1923).
Lotus scoparius (Nutt.) Ottley	DEERWEED	D*	P	All over dune and meadow (Pierce 1938). (Pierce 1938–1939). (Mattoni 1990).
Lotus strigosus (Nutt.) E. Greene		D*	A	(Pierce 1938–1939). (Mattoni 1990). Common on sandy soils in plain and mountains (Davidson and Moxley 1923).
Lupinus bicolor Lindley	MINIATURE LUPINE	D*	A	(Pierce 1938–1939). (Mattoni 1990).
Lupinus chamissonis Eschsch		D*	S	(Pierce 1938–1939). (Mattoni 1990).
Lupinus truncatus Hook. & Arn.		D*	A	(Pierce 1938–1939). (Mattoni 1990).
Trifolium gracilentum Torrey & A. Gray		P*	A	Inglewood, L. Abrams, April 1, 1899 (RSA). Grassy hills near Inglewood, L. Abrams, April 10, 1903 (RSA).
FRANKENIACEAE				
Frankenia salina (Molina) I.M. Johnston [*F. grandifolia* Cham. & Schldl.]	ALKALI HEATH	V[2]	P	Common in saline marshes (Abrams 1904). Common on alkaline flats near the coast (Davidson and Moxley 1923).
HYDROPHYLLACEAE				
Phacelia distans Benth.		P*	A	(Pierce 1938–1939). Very common in the plains and foothills (Abrams 1904).
Phacelia ramosissima Lehm.		D	P	Rare on meadow (Mattoni 1990).

Phacelia stellaris Brand [*P. douglasii* Torr. var. *cryptantha* Brand]	BRAND'S PHACELIA	P*	A	(Pierce 1938–1939). Frequent near the coast along the borders of the sand-dunes (Abrams 1904). On a few subalkaline places on the plains; Los Angeles and San Bernardino Counties (Davidson and Moxley 1923).
LAMIACEAE				
Salvia carduacea Benth.	THISTLE SAGE	D	A	El Segundo, established portion of the lee slope, Jack Rempel, May 16, 1932 (RSA). Occasional in sandy soil in all the valleys and in the foothills (Abrams 1904).
Salvia columbariae Benth.	CHIA	P	A	
Stachys ajugoides Benth.	HEDGE NETTLE	V²	A, P	Playa del Rey (Davidson and Moxley 1923).
LIMNANTHACEAE				
Limnanthus douglasii R.Br.	MEADOWFOAM	V	A	(Pierce 1938–1939). Growing in wet places. Reported from Los Angeles and San Bernardino (Abrams 1904).
LOASACEAE				
Mentzelia affinis E. Greene	BLAZING STAR	D	A	Redondo Beach, sandy fields, elevation near sea level, Tom Burch, March 9, 1940 (RSA). El Segundo, sand dunes near strand, Jack Rempel, April 10, 1932 (RSA). Likely more on dunes (Mattoni 1990).
MALVACEAE				
Malvella leprosa (Ortega) Krapov. [*Sida hederacea* Torr.]	ALKALI-MALLOW	V²	P	Common in subsaline places (Abrams 1904). West Los Angeles, O.H. Kappler, June 13, 1944 (notes, LA). On compact ground in subalkaline soils (Davidson and Moxley 1923).
Sidalcea malviflora (DC.) Benth. ssp. *malviflora*	CHECKER MALLOW	P*	P	(Pierce 1938–1939). To edge of dune but not on to sandy slopes (Pierce 1938). Frequent on the grassy hills and mesas (Abrams 1904).
Sidalcea neomexicana A. Gray [*S. parviflora* Greene]		V	P	Between West Adams and Culver City, Hillside, Frances M. Morey, May, 1922 (RSA). In low subsaline places throughout our range (Abrams 1904). In subalkaline meadows from Los Angeles to San Bernardino (Davidson and Moxley 1923).
NYCTAGINACEAE				
Abronia umbellata Lam.	SAND VERBENA	D	A	Very rare on prairie (Mattoni 1990).
ONAGRACEAE				
Camissonia bistorta (Torrey & A. Gray) Raven [*Oenothera b.* Nutt. ex T. & G.; *Sphaerostigma b.* Walp.]	CALIFORNIA SUN CUP	P*	A	(Pierce 1938–1939). (Mattoni 1990). To edge of dune but not on sandy slopes (Pierce 1938). Very common in sand-washes about San Diego; extending north to Santa Barbara (Abrams 1904).
Camissonia cheiranthifolia (Sprengel) Raimann	BEACH EVENING PRIMROSE	D*	P	(Pierce 1938–1939). (Mattoni 1990).
Camissonia lewisii Raven	LEWIS' EVENING PRIMROSE	D*	A	(Pierce 1938–1939). (Mattoni 1990). Bordering sand dunes at Ballona Harbor, Abrams, 1901 (RSA); Inglewood, Abrams, 1903 (RSA).
Camissonia micrantha (Sprengel) Raven		D*	A	(Pierce 1938–1939). Frequent on the sand dunes along the seashore, but not strictly maritime as reported by some, for it is also frequent in sandy soil in all our valleys (Abrams 1904).
Epilobium pygmaeum (Speg.) P. Hoch & Raven [*Boisduvalia glabella* (Nutt.) Walp.]	FIREWEED	V¹	A	Sink near Inglewood, F.W. Peirson, July 19, 1906 (RSA). Low ground. Santa Monica; Mesmer; San Diego (Abrams 1904). Low ground, Santa Monica to San Diego (Davidson and Moxley 1923).
Oenothera elata Kunth ssp. *hirsutissima* (S. Watson) W. Dietr.	EVENING PRIMROSE	P	B	Ballona wetlands, R. Gustafson, July 15, 1981 (RSA).
PAPAVERACEAE				
Eschscholzia californica Cham.	CALIFORNIA POPPY	D*	A	Rosenberg (1938).

Platystemon californicus Benth.	CREAM CUPS	P*	A	Common in sandy soil throughout our range below 3,000 feet altitude (Abrams 1904).
PLANTAGINACEAE				
Plantago elongata Pursh [*P. bigelovii* A. Gray]	PLANTAIN	P*³	A	Inglewood (Davidson and Moxley 1923). In moist ground near Inglewood (Abrams 1903).
Plantago erecta E. Morris [*P. hookeriana* Fisher & C. Meyer]	DWARF PLANTAIN	P*³	A	(Pierce 1938–1939). Very common on dry plains and in the foothills throughout our range (Abrams 1904).
POLEMONIACEAE				
Gilia capitata Sims ssp. *abrotanifolia* (E. Greene) V. Grant		P	A	Playa del Rey, A. Davidson, 1930 (RSA). Common and generally distributed on sandy plains (Davidson and Moxley 1923).
Linanthus dianthiflorus (Benth.) E. Greene		P*	A	(Pierce 1938–1939). (Mattoni 1990). Common in sandy soil in the coast and interior valleys (Abrams 1904). Common and general on sandy soils, more abundant towards the coast (Davidson and Moxley 1923).
Navarretia prostrata (A. Gray) E. Greene		V¹	A	Sink near Inglewood, F.W. Peirson, July 19, 1906 (RSA). On margin of vernal pool; near junction of Sepulveda Blvd. and W. Railroad, Manhattan Beach vicinity, Frank W. Gould, April 15, 1944 (RSA). In low adobe places on the mesas of the coast valley, Inglewood. (Abrams 1904). Not uncommon in desiccated pools in the coastal district of Los Angeles county (Parish 1917). Abundant in restricted localities, near Downey; Bixby; Inglewood (Davidson and Moxley 1923).
POLYGONACEAE				
Eriogonum gracile Benth.		P*	A	(Pierce 1938–1939). Sparse on dune, common at meadow base (Pierce 1938). (Mattoni 1990).
Mucronea californica Benth. [*Chorizanthe c.* (Benth.) A. Gray var. *suksdorfii* J.F. Macbr.]	CALIFORNIA SPINEFLOWER	D*	A	(Pierce 1938–1939). Persists on dunes (Mattoni 1990).
Rumex hymenosepalus Torrey	WILD-RHUBARB	D	P	Del Rey Hills, marshy ground, O.H. Kappler, March 19, 1944 (notes, LA). Frequent in dry sandy soil (Abrams 1904). Common on sandy plains in the counties of San Bernardino, Los Angeles, and Orange (Davidson and Moxley 1923).
PORTULACACEAE				
Calandrinia ciliata (Ruiz Lopez & Pavon) DC. [*C. caulescens* var. *menziesii* Gray; *C. menziesii* Torrey & Gray]	RED MAIDS	P*	A	(Pierce 1938–1939). (Mattoni 1990). Common on grassy mesas especially near the coast (Davidson and Moxley 1923). Common on the mesas, especially in the coast region (Abrams 1904).
Calyptridium monandrum Nutt.	PUSSYPAWS	D	A	(Mattoni 1990). On dunes, likely inland.
RANUNCULACEAE				
Ranunculus californicus Benth.	BUTTERCUP	P*³	P	Grassy hills, Inglewood, L. Abrams, March 8, 1903 (RSA). Del Rey Hills, moist hillside, O.H. Kappler, March 19, 1944 (LA).
ROSACEAE				
Horkelia cuneata Lindley		D	P	(Pierce 1938–1939). At the very edge of the dune only, we find a thin line (Pierce 1938).
RUBIACEAE				
Galium angustifolium Nutt.	NARROW-LEAVED BEDSTRAW	D	P	Very rare on prairie (Mattoni 1990).
SCROPHULARIACEAE				
Antirrhinum nuttallianum Benth.	SNAPDRAGON	P	A, B	Venice, Hollenberry, July 10, 1928 (RSA). Ballona Harbor, LeRoy Abrams, June 6, 1901 (RSA). Playa del Rey, LeRoy Abrams, June 8, 1902 (RSA).

Castilleja exserta (A.A. Heller) Chuang & Heckard [*Orthocarpus purpurascens* Benth.]	PURPLE OWL'S CLOVER	P*	A	To edge of dune but not onto sandy slopes (Pierce 1938).
Linaria canadensis (L.) Dum.-Cours. var. *texana* (Scheele) Pennell	BLUE TOADFLAX	D	A	(Pierce 1938–1939). (Mattoni 1990).
Veronica peregrina L.	PURSLANE SPEEDWELL	P[2]	A	Occasional along the margins of streams and in the dry beds of winter pools (Abrams 1904).
SOLANACEAE				
Datura wrightii Regel [*D. meteloides* A.DC.]	JIMSON WEED	D	P	(Pierce 1938–1939). On meadow and in established zones (Pierce 1938).
Petunia parviflora A.L. Juss		V[1]	A, P	Occasional on margins of ponds and along streams, especially in subsaline places (Abrams 1904). Extant, Ballona wetlands.
VERBENACEAE				
Verbena bracteata Lagasca & J.D. Rodriguez		V	A, B	Inglewood, LeRoy Abrams, June 6, 1901 (RSA). Gardena, "N. Slough," slough edge among grass, prostrate on ground, I. Johnston, April 11, 1917 (RSA).
MONOCOTYLEDONES				
CYPERACEAE				
Cyperus eragrostis Lam.	NUTSEDGE	V	P	El Segundo dunes, scarce in wet soil. A.C. Sanders, September 18, 1987 (RSA).
Eleocharis acicularis (L.) Roemer & Schultes	SPIKERUSH	V[2]	P	Inglewood, L. Abrams, April, 1901 (RSA). Frequent in moist places along streams and on borders of ponds (Abrams 1904).
Eleocharis macrostachya Britton	SPIKERUSH	V[2]	P	"N. Slough," marshy ground, I. Johnston, April 11, 1917 (RSA). Santa Monica, swamp near road, P.A Munz, R.D. Harwood, May 15, 1920 (RSA).
IRIDACEAE				
Sisyrinchium bellum S. Watson	BLUE-EYED GRASS	P	P	In grassy field dominated by *Phalaris lemmoni*, Sepulveda Boulevard northwest of Los Angeles Airport. Flowers white. F.W. Gould, April 15, 1944 (RSA).
JUNCACEAE				
Juncus balticus Willd.	RUSH	V	P	Frequent along streams and in low ground generally throughout range (Abrams 1904). Brackish marsh, Los Angeles Co., H.E. Hasse, May, 1892 (RSA).
Juncus bufonius L.	TOAD RUSH	V[2]	A	"N. Slough." Occasional on slough edge. I.M. Johnston, April 17, 1917 (RSA).
Juncus mexicanus Willd.	RUSH	V[2]	P	Frequent along streams and in low ground generally throughout range (Abrams 1904). Wilmington, sand dunes. I. Johnston, April 11, 1917 (RSA). Extant, Ballona wetlands.
Juncus phaeocephalus Engelm.	RUSH	V[2]	P	Frequent along streams and in low brackish places (Abrams 1904). Baldwin Hills, lowlands, Mr. and Miss Dayton, April 15, 1925 (RSA).
LEMNACEAE				
Lemna gibba L.	DUCKWEED	V[2]	P	Abundant at Compton, and near San Pedro. "In a ditch at Compton I found it fruiting abundantly on September 2nd" (McClatchie 1896).
LILIACEAE				
Bloomeria crocea (Torrey) Cov. [*B. aurea* Kell.]	COMMON GOLDENSTAR	P*	P	Frequent in the foothills and on the plains (Abrams 1904).
Calochortus catalinae S. Watson	CATALINA MARIPOSA LILY	P	P	

Dichelostemma capitatum (Benth.) A.W. Wood [*Brodiaea pulchella* (Salisb.) E. Greene]	BLUE DICKS	D*	P	(Pierce 1938–1939). (Mattoni 1990)..
POACEAE				
Alopecurus saccatus Vasey [*A. howellii* Vasey, *A. californicus* Vasey]	FOXTAIL	V[1]	A	Meadows and wet places along the coast to San Diego (Davidson and Moxley 1923). Inglewood (Munz 1935).
Bromus carinatus Hook. & Arn.	CALIFORNIA BROME	D	P	Santa Monica roadside, Crawford & Hiatt, March 28, 1918 (RSA). El Segundo dunes, A.C. Sanders February 18, 1988 (RSA).
Deschampsia danthonioides (Trin.) Munro	ANNUAL HAIRGRASS	V[1]	A	"N. Slough," damp pasture, I. Johnston, April 11, 1917 (RSA).
Distichlis spicata (L.) E. Greene	SALTGRASS	P[2]	P	Very common in low subsaline places along the coast and our interior valleys (Abrams 1904). Common in subalkaline places especially near the coast (Davidson and Moxley 1923).
Elymus triticoides Buckley [*Leymus t.* (Buckley) Pilger]		D	P	(Pierce 1938–1939). (Mattoni 1990). Common in low ground, especially in the coast valleys (Abrams 1904).
Festuca megalura Nutt. [*Vulpia microstachys* (Nutt.) Munro var. *hirsuta* (Hack.) Asch. & Graebner]	FESCUE	D[3]	A	(Pierce 1938–1939). (Mattoni 1990).
Hordeum intercedens Nevski [*H. pusillum* Nutt. in part]	BARLEY	V	A	In subsaline soils near the coast from Los Angeles to San Diego (Davidson and Moxley 1923).
Koeleria macrantha (Ledeb.) J.A. Schultes [*K. cristata* (L.) Pers.]	JUNE GRASS	P*	P	Baldwin Hills, Mr. and Miss Dayton, April 15, 1925 (RSA). Beetle (1947).
Leptochloa uninervia (C. Presl) A. Hitchc. & Chase	MEXICAN SPRANGLETOP	V	A	Ballona wetlands, R. Gustafson, May 15, 1981 (RSA). Also W. Adams Street (RSA).
Stipa cernua Stebb. & Love [*Nassella c.* (Stebb. & Love) Barkworth]	NODDING NEEDLEGRASS	P*	P	Bunch grass (Pierce 1938–1939). (Mattoni 1990).
Orcuttia californica Vasey	CALIFORNIA ORCUTT GRASS	V[1]	A	In dry ditches assimilating vernal pools, around airport at corner of South Western Avenue and Rosecrans Avenue, A.A. Beetle, June 11, 1946 (LA). Old Municipal Airport, Rosecrans Avenue, Bellue and Henson, October 1944 (RSA).
Phalaris lemmonii Vasey		V[1]	A	Abundant in meadow near corner of Western Ave. and 131st Street, Frank W. Gould, April 12, 1944 (LA). In exsiccated places; Inglewood, LeRoy Abrams, April 9, 1903 (LA). Meadow lands from South Los Angeles to Inglewood (Davidson and Moxley 1923).

Figure 3 (opposite). Photograph of the "meadow floor" at El Segundo taken by W. D. Pierce in March 1938. Identifiable species include *Lupinus bicolor*, *Camissonia bistorta*, *Phacelia stellaris*, *Lotus strigosus*, *Festuca megalura*, *Cryptantha intermedia*, *Plantago erecta*, and *Stebbinsoseris heterocarpa*.

grasses, in the area of the Los Angeles coastal prairie. Other historical references indicate a greater presence of forbs in coastal grasslands in southern California and into Baja California. For example, on an expedition to Baja California in 1886, C. R. Orcutt described a coastal prairie similar to the Los Angeles coastal prairie:

> The 9th of April we pass through Encenada, and along the shores of All Saints bay, by magnificent fields of the golden California poppy, phacelias, layia elegans, orthocarpus, baerias, larkspurs, platystemon and other delicate annuals and perennials which lent an added charm to the beautiful view of land and sea that was spread out before us on every hand. And thus for mile after mile we alternately contemplate the rich garden of flowers and the beautiful scenery (Orcutt 1886:54).

Although available evidence for the Los Angeles coastal prairie indicates primarily a forb and grassland, the historical descriptions show the presence of patches of native shrubs within the prairie, probably on small sandy rises (Nelson 1919; von Bloeker 1942). Also, like most natural boundaries, the transition from prairie to dune scrub or coastal sage scrub along its edges was likely diffuse, with species extending patchily from one vegetation type into another as topoclimatic and edaphic factors allowed.

The plant species of the Los Angeles coastal prairie do not match any of the vegetation series described by Sawyer and Keeler-Wolf (Sawyer and Keeler-Wolf 1995). The closest approximation would be the California annual grassland series without the introduced species. Were *A Manual of California Vegetation* to include historic vegetation series, the Los Angeles coastal prairie would likely be one of several series added to describe native annual vegetation prior to the introduction of the annual forbs and grasses that have so thoroughly transformed California landscapes.

Evidence for vernal pools

Vernal pools are ephemeral spring wetlands that occupy depressions in grasslands and woodlands (Holland and Keil 1995; Zedler 1987). Only a fraction of the historically extant vernal pools in southern California persist because many have been destroyed by human land

Table 2. Species frequency and percent cover measured across three transects from a photograph of the meadow floor taken by Pierce in March, 1938 (Figure 3).

SPECIES	% COVER	# OF PLANTS
Lupinus bicolor	39	12
Camissonia bistorta	18	17
Phacelia stellaris	14	15
Lotus strigosus	8	15
Festuca megalura	4	6
Cryptantha intermedia	1	3
open	16	na

uses. Recent reviews of vernal pools in southern California (Keeler-Wolf, Elam, and Flint 1995; Zedler 1987) do not indicate the historical or current presence of vernal pools in the Los Angeles coastal prairie. The historical references compiled herein, however, suggest that the area contained extensive vernal pools. Four types of evidence confirm the presence of vernal pools: (1) historical topography, (2) records of plant species restricted to vernal pools, (3) historical descriptions, including photographs and place names, and (4) physical remnants of degraded and recently destroyed pools.

As described earlier, the topography of the Los Angeles coastal prairie was of undulating hills with numerous undrained depressions. Cooper (1967) describes "the presence of degraded but perfectly distinct ridges in the seaward part of the dune sheet, parallel to the coastal ridge and the shore, with elongated undrained depressions or series of depressions in line between them. Parallelism is nearly perfect in the north; south of Manhattan Beach it is less so" (Cooper 1967:97). Cooper presents two hypotheses for the creation of the ridges: that they were formed as offshore bars during a period of higher sea level, or that they were coastal ridges, degraded and flattened over time (Cooper 1967:98). Both of these theories are consistent with descriptions of the creation of vernal pool landscapes (Norwick 1991:11–12).

Zedler (1987), in his community description of southern California vernal pools, lists plants that are indicators of vernal pools. The plants are those "whose distribution in coastal California is completely or substantially restricted to vernal pool basins." Further, "if a number of plants of this group occur together in a particular place, it is virtually certain that the habitat is a vernal pool" (Zedler 1987:41). Our research indicates that 14 of these species were found on the Los Angeles coastal prairie (Table 1). These included *Orcuttia californica*, *Phalaris lemmonii*, and *Elatine brachysperma*. The indicator species certainly were found together in pools. For example, on July 6, 1906, F. W. Peirson collected *Epilobium pygmaeum*, *Psilocarphus brevissimus*, and *Navarretia prostrata* from a "sink near Inglewood" (RSA).

Descriptions associated with plant records in herbaria and texts also indicate the presence of extensive vernal pools in the coastal Los Angeles region. Parish (Parish 1917:52) refers to the "desiccated pools in the coastal district of Los Angeles County." Accounts of *Elatine brachysperma* describe its range as "On the borders of pools near the coast in Los Angeles and San Diego Counties" (Abrams 1904; Davidson and Moxley 1923). LeRoy Abrams describes "exsiccated places" in Inglewood as the locality for a specimen of *Phalaris lemmonii* (April 9, 1903, LA). Frank W. Gould records the location of his collection of *Navarretia prostrata* as "On margin of vernal pool; near junction of Sepulveda Blvd. and W. Railroad, Manhattan Beach vicinity" (April 15, 1944, RSA).

Other historical evidence of the extent of the prairie's vernal pool landscape is provided by anecdotal accounts and photographs. One such account is of "Pollywog Park" in Manhattan Beach (Dow 1976:14–15). This public park earned its name from the yearly hatch of western spadefoot toads (*Scaphiopus hammondii*), a species associated with ephemeral wetlands. The drainage has long since been "improved" and the toads are no longer found, but the name remains. An aerial photograph taken in August of 1931 from a view looking inland from the El Segundo dunes shows the many vernal pool basins, as well as fragments of relatively undisturbed prairie (Figure 4).

Table 3. Cover value of species with greatest cover in Coastal Prairie Lupine Vegetation Type (Hektner and Foin 1977).

SPECIES	% COVER
Lupinus arboreus	28.4
Anthoxanthum odoratum	16.9
Holcus lanatus	16.3
Lotus angustissimus	3.0
Juncus effusus	2.2
Rubus ursinus	2.1
open	21.5

Mattoni discovered a remnant vernal pool when conducting a plant survey for an industrial development in 1995. A vacant lot in Lomita, although highly disturbed, still harbored a population of fairy shrimp (*Brachinecta* spp.) and western spadefoot toads in 1998, both of which are restricted to vernal pools. In 1997, U.S. Fish and Wildlife Service staff located remnant vernal pools at the Los Angeles International Airport as part of a site visit to discuss environmental documentation for the proposed airport expansion. These pools contain at least two fairy shrimp species (*Streptocephalus wootoni* and *Branchinecta* spp.) (Rogers 1998). The airport site also sustains a western spadefoot toad population that is likely to be destroyed by the expansion.

The species documented from the vernal pools of the Los Angeles coastal prairie most closely match the vegetation series of the San Diego mesa vernal pools as described by Sawyer and Keeler-Wolf (Sawyer and Keeler-Wolf 1995).

Climate and Phenology

The climatic regime is typical Mediterranean coastal southern California with hot dry summers and cool wet winters with limited rainfall. These generalities apply to the coastal prairie, but in addition, coastal fogs are commonplace from late summer through autumn, providing significant moisture. The phenology of the prairie is quantitatively undescribed, but the growth and reproductive periods of most annuals and herbaceous perennials occur during early spring immediately following late winter rains. Exceptions to this pattern include *Eriogonum gracile*, *Corethrogyne filaginifolia*, *Gnaphalium microcephalum*, *Ambrosia acanthicarpa*, *Heterotheca grandiflora*, and *Eremocarpus setigerus*, all of which commence vegetative growth in late spring and flower during August and September. Additional photographs by Pierce document some of the yearly cycle of the prairie annuals. A verdant display of wildflowers characterized the prairie in the spring, especially in the vernal pools. Figure 5 shows a small vernal depression in the early spring carpeted with *Linanthus dianthiflorus*. Later-growing components of the community are shown in Figure 6, where *Heterotheca grandiflora*, *Corethrogyne filaginifolia*, and *Gnaphalium microcephalum* are visible. None of the pictures left from Pierce's surveys shows that bunch grasses were predominant.

Fauna

The coastal prairie was used by early Los Angeles residents for hunting birds and small game. The diversity of mammals was increased by the vernal pools, as described in an historical account:

> Between the beach and Inglewood, herds of cattle and sheep grazed. In low-lying areas, water congregated and drew birds and small animals which were rich game for hunters coming from inland (City of Manhattan Beach Historical Committee 1977:4).

A list of mammals for the prairie was never published, but Jack von Bloeker's notes, found with Pierce's notes, reveal a high diversity of small mammals (Appendix A). Two subspecies of small rodents, the endangered pacific pocket mouse (*Perognathus longimembrus pacificus*) and the western harvest mouse (*Reithrodontomys megalotis limicola*), were described from locations on the prairie. Recent research on vernal pools indicates that rabbits (*Lepus* spp.) are important dispersal vectors of many vernal pool plants

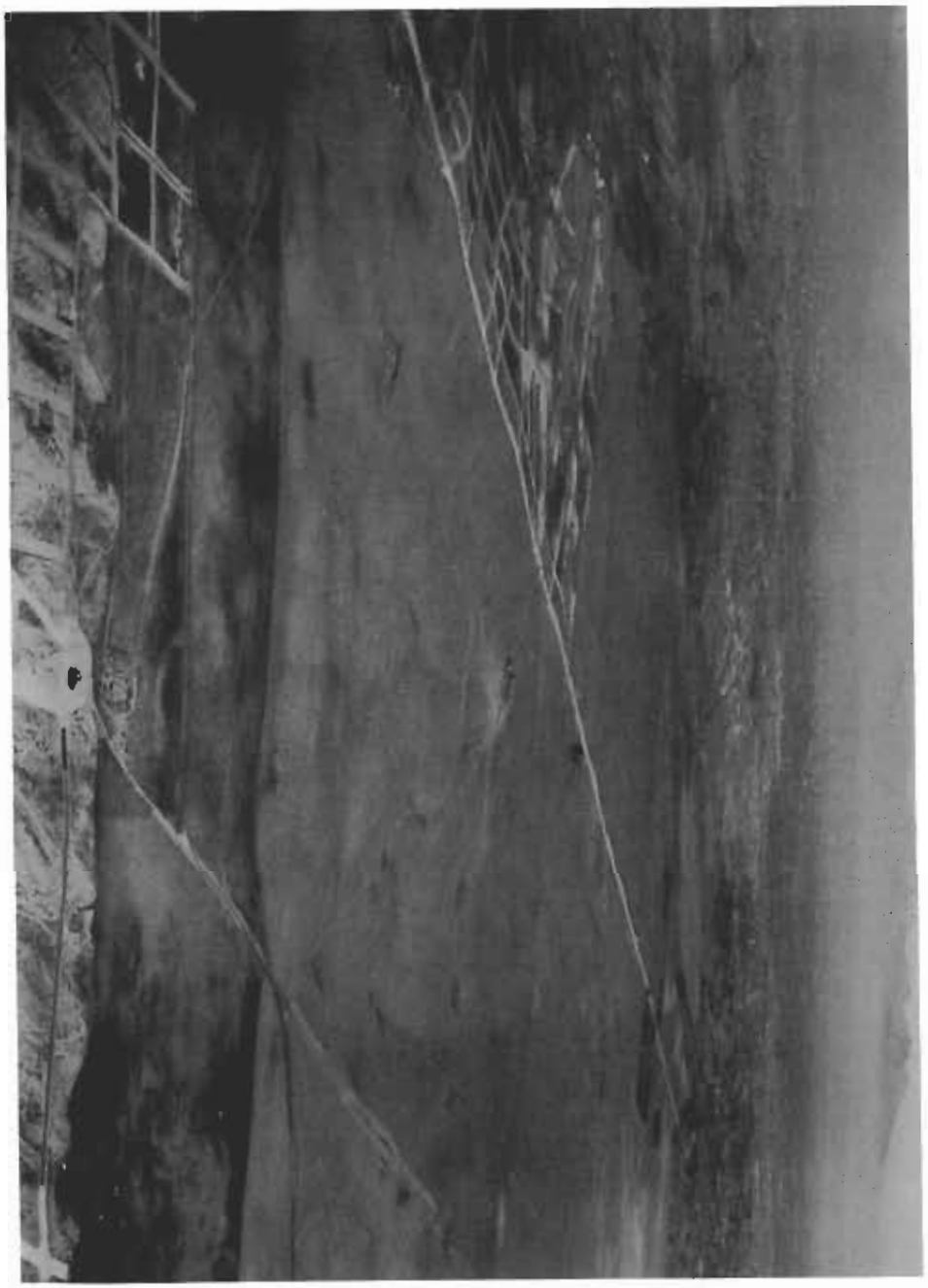


Figure 4 (opposite). Aerial photograph of site of Los Angeles International Airport showing vernal pool depressions, September 6, 1931 (UCLA Department of Geography Air Photo Archives, Spence Air Photo Collection, Negative #E-3181).

(Zedler and Black 1992). Their presence on the prairie strengthens the assumption that herbarium records of vernal pool plants recorded from one part of the prairie probably were found in other pools across the prairie.

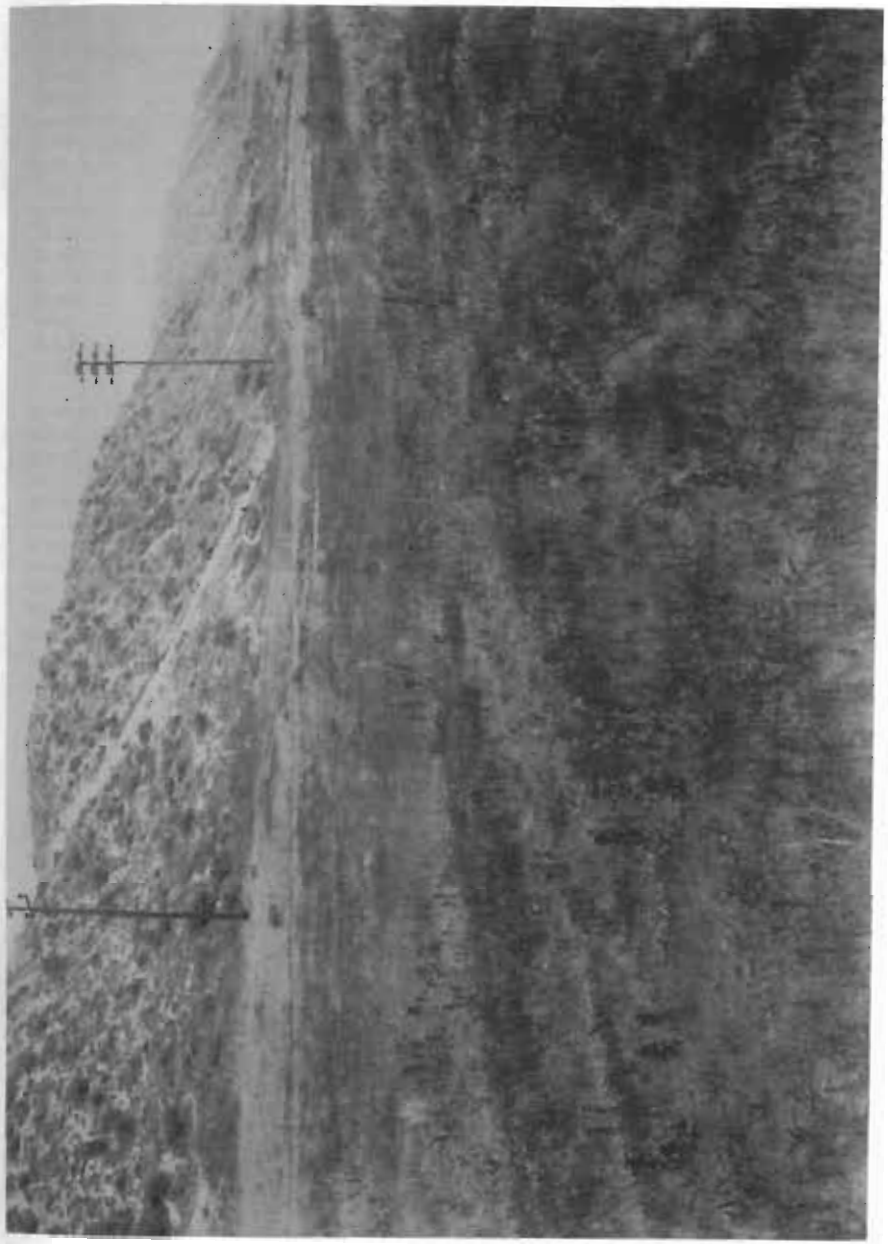
Fossorial mammals played an important role in maintaining the prairie vegetation, especially pocket gophers and ground squirrels. The role of animal disturbance in influencing vegetation type has been largely overlooked and is only now being considered seriously for California grass and forblands (Schiffman 1997). High levels of burrowing mammal disturbance were likely present on the Los Angeles coastal prairie as in other California grasslands (*e.g.*, Hobbs and Mooney 1985; Hobbs and Mooney 1991; Peart 1989; Schiffman 1997). Such disturbance has been shown to increase annual species cover, soil humus content, mineral availability, moisture, and friability (Dalquest and Schaffer 1942; Ellison and Aldous 1952; Hansen and Morris 1968; Martinsen et al. 1990; McGinnes 1960; Mielke 1977; Ross et al. 1968).

In his survey of the reptiles and amphibians of the El Segundo dunes, von Bloeker (1942) recorded five lizard species from the meadow, including the southern California horned lizard, and nine snake species (for full list and scientific names see Appendix B). In addition, the prairie was home to slender salamander, California toad, and Pacific treefrog. Not recorded by von Bloeker, but found in a remnant vernal pool in Lomita, and formerly at "Pollywog Park," was the western spadefoot toad.

Von Bloeker also documented the birds of the Los Angeles coastal prairie (von Bloeker 1943a; von Bloeker 1943b; see Appendix C). The abundant small mammal populations made the prairie a good hunting ground for raptors (sharp-shinned hawk, Cooper's hawk, northern harrier, American kestrel, barn owl, and burrowing owl). The complement of breeding birds shows those typical of open grassland communities (California quail, killdeer, mourning dove, roadrunner, red-shafted flicker, Anna's hummingbird, western kingbird, black phoebe, horned lark, northern mockingbird, loggerhead shrike, western meadowlark, brewer's blackbird, and house finch). Furthermore, the prairie provided wintering grounds for a number of migratory passerines (orange-crowned warbler, yellow-rumped warbler, Townsend's warbler, common yellowthroat, western tanager, savannah sparrow, Lincoln's sparrow, song sparrow, and others). In addition, the seasonal water resource of the vernal pools attracted a few water-associated birds (red-winged blackbird, great blue heron), as well as enhanced the habitat for grassland passerines, as has been shown for other vernal pool systems (Baker et al. 1992).

Figure 5 (overleaf, p. 92). Early spring vernal pool on the Los Angeles coastal prairie showing cover of *Linanthus dianthiflorus* with *Lotus scoparius* and *Lupinus bicolor*. Photograph from W. D. Pierce's notes.

Figure 6 (overleaf, p. 93). Photograph of Los Angeles coastal prairie in July 1939 showing later-growing components of coastal prairie community. Distinguishable species include *Mucronea californica*, *Corethrogyne filaginifolia* var. *virgata*, and *Heterotheca californica*. Photograph from W. D. Pierce's notes.



Restoration Efforts

The most significant remaining remnant of the prairie is 12 ha, located in the lee of the El Segundo dunes at LAX. Mattoni described this fragment previously, and preliminary restoration efforts, sponsored by a grant from the California Department of Transportation, were undertaken by Mattoni during 1988–1994 for the least disturbed areas (Mattoni 1990; Mattoni 1992; Mattoni 1993). Non-native plants were cleared from the site by hand, and *Eriogonum fasciculatum* (planted inappropriately by LAX) was removed by trimming and applying a herbicide. Three prairie floor annuals were successfully reintroduced: *Phacelia distans*, *Castilleja exserta*, and *Plantago erecta*. No restoration attempts were made for a more disturbed area of prairie, formerly used as agricultural land, because it was outside of the area set aside by LAX as a nature reserve. This degraded area might allow for investigation of the importance of mycorrhizal fungi in nutrient mobilization. Such fungal associations with *Stipa* spp. are widespread and correlated with host adaptation to xeric environments (St. John 1993). Active restoration efforts were ended in 1994 when LAX hired a consultant to explore expansion of the airport rather than continue the habitat restoration program.

The historical composition of the coastal prairie is important to future restoration efforts on the LAX fragment and other smaller fragments. Because of misinformation in the literature about the historical extent of the El Segundo dunes (Arnold 1983; Arnold 1990; see Mattoni 1992 for details), restorationists may be misled into attempts to reestablish dune scrub in areas that were formerly coastal prairie. The description of the Los Angeles coastal prairie and its vernal pools given here should inform future restoration efforts in the area and provide a model for documentation of historical conditions. Complete restoration projects must first properly characterize the historic composition of a habitat, or risk inadvertently converting the vegetation into an inappropriate type (*e.g.*, Jordan and Packard 1987). The description of the Los Angeles coastal prairie and its vernal pools should also aid in the potential identification of previously overlooked fragments of these habitats in the urban mosaic.

Acknowledgments

We thank Tim Ross for thoughtful suggestions that substantially improved the manuscript. Andrew Sanders provided the impetus for this paper by creating the initial list of possible prairie plants. We appreciate the advice and encouragement from Dorothy Lyndes, Richard Minnich, Chris Nagano, Barry Prigge, Allan Schoenherr, and Gary Wallace. Catherine Rich and Jerry Longcore improved the paper with thoughtful editorial comments and attention to detail. We thank the two reviewers, who made constructive comments that improved the organization, clarity, and accuracy of the paper. All remaining errors are the sole responsibility of the authors.

The herbaria at the University of California, Los Angeles and the Rancho Santa Ana Botanical Garden graciously provided access to collections and primary documents. The UCLA Department of Geography Air Photo Archives waived fees for research in its extensive collection. The research for this paper was supported by a National Science Foundation Graduate Research Fellowship to Travis Longcore. Support for the restoration project and plant surveys was provided by California Department of Transportation through the City of Los Angeles, Department of Airports.

Figure 7 (opposite). July 1939 photograph of prairie and backdune with large *Lupinus chamissonis* from W. D. Pierce's notes.

LITERATURE CITED

Abrams, LeRoy. 1903. Additions to the flora of Los Angeles County, II. *Bulletin of the Southern California Academy of Sciences* 2(1): 157–158.

———. 1904. *Flora of Los Angeles and vicinity.* Stanford University Press, Stanford, CA.

Arnold, Richard A. 1983. Ecological studies of six endangered butterflies (Lepidoptera, Lycaenidae): island biogeography, patch dynamics, and the design of habitat preserves. *University of California Publications in Entomology* 99: 1–161.

———. 1990. Ecology and conservation of two endangered southern California butterflies. In *Endangered wildlife and habitats in southern California*, edited by P. J. Bryant and J. Remington. Natural History Foundation of Orange County, Newport Beach, CA.

Baker, William S., Floyd E. Hayes, and Earl W. Lathrop. 1992. Avian use of vernal pools at the Santa Rosa Plateau Preserve, Santa Ana Mountains, California. *The Southwestern Naturalist* 37(4): 392–403.

Barneby, Rupert C. 1964. *Atlas of North American Astragalus, Part II.* Vol. 13, *Memoirs of the New York Botanical Garden.* New York Botanical Garden, New York.

Beetle, Alan A. 1947. Distribution of the native grasses of California. *Hilgardia* 17(9): 309–357.

Biswell, H. H. 1956. Ecology of California grasslands. *Journal of Range Management* 9: 19–24.

Bolton, Herbert Eugene. 1927. *Fray Juan Crespi: Missionary explorer on the Pacific coast 1769–1774.* University of California Press, Berkeley, CA.

Brewer, William Henry. 1930. *Up and down California in 1860–1864; the journal of William H. Brewer.* Yale University Press, New Haven.

Burcham, L. T. 1957. *California range land: an historico-ecological study of the range resource of California.* Division of Forestry, Department of Natural Resources, State of California, Sacramento.

Canby, Margaret L. 1927. The genus *Corethrogyne* in Southern California. *Bulletin of the Southern California Academy of Sciences* 26: 8–16.

City of Manhattan Beach Historical Committee. 1977. *The streets of Manhattan.* Vol. 5, *Manhattan Beach Historical Series Publication.* Manhattan Beach Historical Committee, Manhattan Beach.

Clements, Frederic E. 1934. The relict method in dynamic ecology. *Journal of Ecology* 22: 39–68.

———, and Victor W. Shelford. 1939. *Bio-ecology.* John Wiley & Sons, New York.

Cooper, William Skinner. 1967. *Coastal dunes of California.* Vol. 104, *Geological Society of America Memoir.* Geological Society of America, Boulder, CO.

Dalquest, W. W., and V. B. Schaffer. 1942. Origin of mima mounds in western Washington. *Journal of Geology* 50: 68–84.

Davidson, Anstruther, and George L. Moxley. 1923. *Flora of southern California.* Times-Mirror Press, Los Angeles.

Dow, Frances. 1976. *Manhattan Beach yesterdays: personal recollections.* Vol. 4, *Manhattan Beach Historical Series Publication.* Manhattan Beach Historical Committee, Manhattan Beach.

Ellison, L., and C. M. Aldous. 1952. Influence of pocket gophers on vegetation of subalpine grassland in central Utah. *Ecology* 33: 177–186.

Hansen, R. M., and M. J. Morris. 1968. Movement of rocks by northern pocket gophers. *Journal of Mammalogy* 49: 391–399.

Hektner, M. M., and T. C. Foin. 1977. Vegetation analysis of a northern California coastal prairie: Sea Ranch, Sonoma County, California. *Madroño* 24(2): 83–103.

Hickman, James C., ed. 1993. *The Jepson manual: higher plants of California.* University of California Press, Berkeley, CA.

Hobbs, Richard J., and Harold A. Mooney. 1985. Community and population dynamics of serpentine grassland annuals in relation to gopher disturbance. *Oecologia* 67: 342–351.

———, and ———. 1991. Effects of rainfall variability and gopher disturbance on serpentine annual grassland dynamics. *Ecology* 72(1): 59–68.

Holland, V. L., and David J. Keil. 1995. *California vegetation.* Kendall/Hunt, Dubuque, IA.

Jordan, William R., III, and Steven Packard. 1987. Just a few oddball species: restoration practice and ecological theory. In *Biological Habitat Reconstruction*, edited by G. P. Buckley. Belhaven Press, New York.

Keeler-Wolf, Todd, Diane R. Elam, and Scott A. Flint. 1995. California vernal pool assessment: preliminary report. State of California, The Resources Agency, Department of Fish and Game, Sacramento, CA.

Keeley, Jon E. 1989. The California valley grassland. In *Endangered plant communities of southern California, 15th Annual Symposium, Southern California Botanists, Special Publication No. 3*, edited by A. A. Schoenherr. Southern California Botanists.

Küchler, A. W. 1977. The map of the natural vegetation of California. Department of Geography, University of Kansas, Lawrence, KS.

Longcore, Travis, Rudi Mattoni, Gordon Pratt, and Catherine Rich. 1997. On the perils of ecological restoration: lessons from the El Segundo blue butterfly. Paper read at 2nd Interface Between Ecology and Land Development in California, April 18–19, at Occidental College, Los Angeles.

Lyndes, Dorothy. pers. comm. 1996. Letter to Travis Longcore, 22 October.

Magney, David L. 1992. Descriptions of three new southern California vegetation types: southern cactus scrub, southern coastal needlegrass grassland, and scalebroom scrub. *Crossosoma* 18(1): 1–9.

Martinsen, Gregory D., J. Hall Cushman, and Thomas G. Whitham. 1990. Impact of pocket gopher disturbance on plant species diversity in a shortgrass prairie community. *Oecologia* 83: 132–138.

Mattoni, Rudi. 1990. Species diversity and habitat evaluation across the El Segundo sand dunes at LAX. Los Angeles Department of Airports, Los Angeles.

———. 1992. The endangered El Segundo blue butterfly. *Journal of Research on the Lepidoptera* 29(4): 277-304.

———. 1993. Natural and restorable fragments of the former El Segundo sand dunes ecosystem. In *Interface Between Ecology and Land Development in California*, edited by J. Keeley. Southern California Academy of Sciences, Los Angeles.

McClatchie, Alfred James. 1894. Additions to the flora of Los Angeles County, I. *Erythea* 2: 76–80.

———. 1896. *Lemna gibba* in southern California. *Erythea* 4: 195.

———. 1899. New or little-known plants of southern California, II. *Erythea* 7(10): 89–104.

McGinnes, W. J. 1960. Effect of mima-type microrelief on herbage production of five seeded grasses in western Colorado. *Journal of Range Management* 13: 231–239.

Mielke, Howard W. 1977. Mound building by pocket gophers (Geomyidae): Their impact on soils and vegetation in North America. *Journal of Biogeography* 4: 171–180.

Munz, Philip A. 1935. *A manual of Southern California botany*. Scripps Publishing Fund, Claremont, CA.

———. 1974. *A flora of Southern California*. University of California Press, Berkeley, CA.

———, and D. D. Keck. 1949. California plant communities. *El Aliso* 2(1): 87–105.

———, and D. D. Keck. 1950. California plant communities — supplement. *El Aliso* 2(3): 199–202.

Nelson, J. W. 1919. *Soil survey of the Los Angeles area, California*. U.S. Department of Agriculture, Bureau of Soils, Washington, DC.

Norwick, Stephen A. 1991. Vernal pools and other seasonal bodies of standing water. *Fremontia* 19(3): 8–19.

Orcutt, Charles R. 1886. A botanical trip. *The West American Scientist* 2(17): 53–58.

Ornduff, Robert. 1974. *An introduction to California plant life*. University of California Press, Berkeley, CA.

Parish, Samuel B. 1904. New or unreported plants from southern California. *Botanical Gazette* 38: 459–462.

———. 1917. The Red Hill pools. *Bulletin of the Southern California Academy of Sciences* 16: 51–52.

———. 1920. The immigrant plants of southern California. *Bulletin of the Southern California Academy of Sciences* 19(4): 3–30.

Peart, D. R. 1989. Species interactions in a successional grassland. III. Effects of canopy gaps, gopher mounds, and grazing on colonization. *Journal of Ecology* 77: 267–289.

Pierce, W. Dwight. 1938. The fauna and flora of the El Segundo sand dunes: 1. General ecology of the dunes. *Bulletin of the Southern California Academy of Sciences* 37(3): 93–97.

———. 1938–1939. Unpublished field notes. Los Angeles County Museum of Natural History, Los Angeles.

Rogers, D. Christopher. 1998. Analysis of vernal pool soils from LAX to determine the potential presence of special-status shrimp species. Jones & Stokes Associates, Inc, Sacramento, CA.

Rosenberg, Roy. 1938. *History of Inglewood*. Arthur H. Cawston, Inglewood, CA.

Ross, B. A., J. R. Tester, and W. J. Breckenridge. 1968. Ecology of mima-type mounds in northwestern Minnesota. *Ecology* 49(1): 172–177.

Sawyer, John O., and Todd Keeler-Wolf. 1995. *A manual of California vegetation*. California Native Plant Society, Sacramento, CA.

Schiffman, Paula M. 1997. Erratic rainfall, mammal burrowing, and annual lifestyle in southern California grasslands: Is it time for a paradigm shift? Paper read at 2nd Interface Between Ecology and Land Development in California, April 18–19, at Occidental College, Los Angeles.

St. John, T. V. 1993. Benefits of mycorrhizae in revegetation and restoration. In *Interface Between Ecology and Land Development in California*, edited by J. E. Keeley. Southern California Academy of Sciences, Los Angeles.

Thorne, Robert F. 1976. The vascular plant communities of California. In *Plant communities of southern California: symposium proceedings. California Native Plant Society Special Publication No. 2*, edited by J. Latting. California Native Plant Society, Berkeley.

von Bloeker, Jack C., Jr. 1942. The fauna and flora of the El Segundo sand dunes: 13. Amphibians and reptiles of the dunes. *Bulletin of the Southern California Academy of Sciences* 41(1): 29–38.

von Bloeker, Jack C., Jr. 1943a. The fauna and flora of the El Segundo sand dunes: 14. Birds of El Segundo and Playa del Rey. *Bulletin of the Southern California Academy of Sciences* 42(1): 1–30.

———. 1943b. The fauna and flora of the El Segundo sand dunes: 15. Birds of El Segundo and Playa del Rey. *Bulletin of the Southern California Academy of Sciences* 42(2): 90–103.

Wester, Lyndon. 1981. Composition of native grasslands in the San Joaquin Valley, California. *Madroño* 28(4): 231–241.

Zedler, Paul H. 1987. The ecology of southern California vernal pools: A community profile. *U.S. Fish and Wildlife Service Biological Report* 85(7.11): 1–136.

———, and Charles Black. 1992. Seed dispersal by a generalized herbivore: Rabbits as dispersal vectors in a semiarid California vernal pool landscape. *The American Midland Naturalist* 128(1): 1–10.

Appendix A. Mammals of the Los Angeles coastal prairie (Mattoni 1990).

Scientific Name	Common Name	Notes
Sorex ornatus californicus	Ornate shrew	B
Scapanus latimanus occultus	Broad-footed mole	B
Macrotus californicus californicus	California leaf-nosed bat	F
Myotis californicus californicus	California bat	F
Eptesicus fuscus bernardinus	Big brown bat	F
Lasiurus borealis teliotis	Red bat	F
Lasiurus cinereus cinereus	Hoary bat	F
Antrozous pallidus pacificus	Pallid bat	F
Tadarida brasiliensis mexicana	Mexican free-tailed bat	F
Eumops perotis californicus	Western mastiff bat	F
Sylvilagus audubonii sanctidiegi	Desert cottontail	B
Lepus californicus bennetti	Black-tailed jackrabbit	B
Spermophilus beecheyi beecheyi	California ground squirrel	B
Thomomys bottae bottae	Botta's pocket gopher	B
Perognathus longimembrus pacificus	Pacific pocket mouse	B; type Palisades del Rey
Dipodomys agilis agilis	Pacific kangaroo rat	B
Reithrodontomys megalotis limicola	Western harvest mouse	B; type Hyperion
Peromyscus maniculatus gambelli	Deer mouse	B
Onychomys torridus ramona	Southern grasshopper mouse	B
Neotoma fuscipes	Dusky-footed woodrat	B
Microtus californicus stephensi	California meadow vole	B
Canis latrans ochropus	Coyote	B?
Urocyon cinereoargenteus californicus	Gray fox	B
Vulpes macrotis macrotis	Kit fox	?
Mustela frenata latirostra	Long-tailed weasel	B
Taxidea taxus jeffersonii	Badger	F?
Spilogale putorius phenax	Western spotted skunk	F
Mephitis mephitis holzneri	Striped skunk	B?
Lynx rufus californicus	Bobcat	F
Ursus arctos californicus	California grizzly bear	F?
Odocoileus hemionus californicus	Mule deer	F

Notes: **B**, breeding and foraging; **F**, foraging only. Partial list from J. von Bloeker's field notes.

Appendix B. Reptiles and Amphibians of the Los Angeles coastal prairie (after von Bloeker 1942).

Scientific Name	Common Name	Notes
Batrachoseps attenuatus attenuatus	Slender salamander	Meadow proper, hides in rodent burrows
Bufo boreas halophilus	California toad	dunes and meadow
Scaphiopus hammondii	Western spadefoot toad	
Hyla regilla	Pacific treefrog	meadow in wet winters
Uta stansburiana hesperis	California brown-shouldered lizard	occasional in meadow
Sceloporus occidentalis biseriatus	Western fence lizard	abundant
Phrynosoma blainvillii blainvillii	Southern California horned lizard	dunes through meadow; most common reptile
Gerrhonotus multicarinatus webbii	San Diegan alligator lizard	grassy areas
Anniella pulchra	Silvery footless lizard	dunes
Eumeces skiltonianus	Western skink	rare in meadow proper
Lichanura roseofusca	California rosy boa	one recorded from meadow
Diadophis amabilis modestus	Southern ring-necked snake	dunes
Coluber constrictor mormon	Western yellow-bellied racer	uncommon, meadow slope
Masticophis flagellum frenatus	Red racer	maybe in brushy meadow
Pituophis catenifer annectens	San Diegan gopher snake	common
Lampropeltis getulus boylii	Boyle king snake	foredune to meadow
Thamnophis sirtalis infernalis	Pacific garter snake	occasional on meadow
Thamnophis hammondii	California garter snake	occasional on meadow in winter and spring
Crotalus viridis oreganus	Pacific rattlesnake	meadow
Clemmys marmorata	Pacific mud turtle	wanders up from Ballona

Appendix C. Birds of the Los Angeles coastal prairie (after von Bloeker 1943).

Scientific name	Common Name	Notes
Ardea herodias hyperonca	Great blue heron	min., non-breeding resident
Cathartes aura septentrionalis	Turkey vulture	min., non-breeding resident
Accipiter striatus	Sharp-shinned hawk	excl., winter
Accipiter cooperii	Cooper's hawk	excl., non-breeding resident
Buteo jamaicensis	Red-tailed hawk	min., resident
Circus cyaneus	Northern harrier	min., non-breeding resident
Falco sparverius sparverius	American kestrel	max., resident
Callipepla californica californica	California quail	max., resident
Charadrius vociferus	Northern killdeer	min., resident
Larus californicus	California gull	min., non-breeding resident
Larus delawarensis	Ring-billed gull	min., non-breeding resident
Zenaida macroura	Mourning dove	max., resident
Geococcyx californianus	Greater roadrunner	max., resident
Tyto alba pratincola	Barn owl	max., resident
Athene cunicularia	Burrowing owl	min., resident
Aeronautes saxatalis saxatalis	White-throated swift	min., winter
Archilochus alexandri	Black-chinned hummingbird	max., transient
Calypte anna	Anna's hummingbird	min., resident
Selasphorus rufus	Rufous hummingbird	min., transient
Selasphorus sasin sasin	Allen's hummingbird	min., transient
Colaptes auratus collaris	Northern flicker	max., resident
Tyrannus verticalis	Western kingbird	max., summer resident-breeds

Sayornis nigricans	Black phoebe	min., resident
Sayornis saya saya	Say's phoebe	max., winter
Eremophila alpestris actia	Horned lark	max., resident
Hirundo rustica	Barn swallow	min., transient
Hirundo pyrrhonota	Cliff swallow	min., summer visitor
Corvus corax sinatus	Common raven	min., non-breeding resident
Corvus brachyrhynchos	American crow	excl., non-breeding resident
Chamaea fasciata	Wrentit	min., resident, possibly breeds
Troglodytes aedon parkmani	House wren	min., non-breeding resident
Thryomanes bewickii	Bewick's wren	min., winter
Cistothorus palustris	Marsh wren	min., winter
Mimus polyglottos	Northern mockingbird	min., resident
Turdus migratorius	American robin	min., winter
Catharus guttatus	Hermit thrush	min., winter
Sialia mexicana	Western bluebird	max., irregular winter
Polioptila caerulea	Blue-gray gnatcatcher	min., winter
Regulus calendula cinerasceus	Ruby-crowned kinglet	min., winter
Anthus rubescens	American pipit	max., winter
Lanius ludovicianus	Loggerhead shrike	max., resident
Vermivora celata sordida	Orange-crowned warbler	min., winter
Dendroica audubonii	Audubon's warbler	min., winter
Dendroica townsendi	Townsend's warbler	min., winter
Geothlypis trichas scirpicola	Common yellowthroat	min., winter
Passer domesticus	House sparrow	max., resident
Sturnella neglecta	Western meadowlark	max., resident
Agelaius phoeniceus	Red-winged blackbird	min., non-breeding resident
Icterus cucullatus nelsoni	Hooded oriole	min., transient
Icterus bullockii	Bullock's oriole	min., spring visitor
Euphagus cyanocephalus	Brewer's blackbird	max., resident
Piranga ludoviciana	Western tanager	min., transient
Pheucticus melanocephalus	Black-headed grosbeak	min., transient
Carpodacus mexicanus frontalis	House finch	min., resident
Carduelis tristis salicamans	American goldfinch	min., non-breeding resident
Carduelis psaltria hesperophilus	Lesser goldfinch	min., winter
Pipilo fuscus crissalis	Brown towhee	min., non-breeding resident
Passerculus sandwichensis alaudinus	Savannah sparrow	max., winter
Zonotrichia leucophrys gambelii	White-crowned sparrow	max., winter
Zonotrichia atricapilla	Golden-crowned sparrow	min., winter
Melospiza lincolnii	Lincoln's sparrow	min., winter
Melospiza melodia cooperi	Song sparrow	min., non-breeding resident

Notes: **Min.**, minimum usage of prairie, **max.**, maximum, **excl.**, prairie and not adjoining dunes or wetlands.