A Flora of the Sacramento National Wildlife Refuge
A FLORA OF THE SACRAMENTO NATIONAL WILDLIFE REFUGE

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Joseph G. Silveira

U.S. Department of the Interior
Fish and Wildlife Service

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THE COVER: The plant on the cover is vernal-pool saltbush, *Atriplex persistens*. This rare plant was described in 1993 from specimens collected at the Sacramento National Wildlife Refuge. Drawing by Robert Gamette.
FIGURE 1. Location of the Sacramento National Wildlife Refuge in Northern California.
A Flora of the Sacramento National Wildlife Refuge

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The Sacramento National Wildlife Refuge (SNWR) is a parcel of 10,783 acres located on the west side of the Sacramento Valley between Willows and Maxwell (Figure 1). The refuge was established in 1937 and is the first in a series of land acquisitions that now make up the Sacramento National Wildlife Refuge Complex. Other units of the complex include Delevan NWR, Colusa NWR, Sutter NWR, Butte Sink NWR, and Sacramento River NWR. This flora is concerned only with the SNWR. The SNWR occupies all of the sections of land in the east half of T18N R3W, with the exception of the south halves of sections 34 and 36 (Figure 2). Most of the land lies in Glenn County, with the southern tip of the refuge extending into Colusa County. The land is an essentially flat plain, sloping from an elevation of slightly over 100 ft in the northwest corner to somewhat less than 70 ft in the southeast corner of the refuge. Natural drainage is provided by Logan Creek, which flows from the northwest to the southeast corners of the refuge, and Hunters Creek, which flows from west to east near the south boundary.

The refuge lies in the northwestern part of the Colusa Plains in an area of poorly drained Riz silt loam, Riz silty clay loam, and Willows clay, all of which are slightly to strongly saline/alkaline with a pH range of 8.5–9.7. The climate of the area is “Mediterranean, warm summer,” which applies to all of the Sacramento Valley. Dry warm to hot summers are followed by a cool, wet winters. Rainfall averages eighteen inches per year, the rainy season usually running from October to April.

History

There is no record of any explorers or trappers crossing the northwest portion of the Colusa Plains before 1850. It was not until the start of construction of the westside railroad to Oregon in 1871 that settlement of the Colusa Plains north of the town of Colusa took place. Early travelers described the Colusa Plains as “a swamp,” or “a vast, treeless prairie”, or “worthless alkali” (Hall, 1975). In his history of Colusa County published in 1880, William S. Green described the land lying a little east and then south of Willows, which would include the SNWR, as poor land “so flat that the water does not run off it readily, and it is alkali.” The term “goose lands” was widely applied to this area because of the large numbers of geese that wintered on these alkaline plains.

Norman D. Rideout bought the land now occupied by the refuge in 1877. He attempted to grow summer-fallow wheat, a successful crop on some parts of the Colusa Plains. Because of the poor soil, lack of summer water, and predation by geese, Rideout’s ventures in wheat farming ended in failure. Cattle grazing on the Rideout Ranch also proved to be unsuccessful, at least in part due to competition by geese for forage.

Z.L. Spalding acquired the Rideout Ranch in 1900. The Spalding Ranch was more successful and became the largest agricultural operation in Glenn and Colusa counties between 1920 and 1935. Cattle, horses, mules, sheep, pigs, and turkeys were all pastured on the ranch at one time or another. After a series of artesian wells was developed, alfalfa was grown in the northwest portion of the ranch between 1910 and 1915. The first

1 Prepared under the volunteer program of the Sacramento National Wildlife Refuge Complex. I wish to thank Gary W. Kramer, Kim A. Forrest, Kim D. Hanson, John G. Mensik, Denise A. Dachner, and all of the other refuge personnel who made my work at the refuge an enjoyable and rewarding experience. Special thanks to my co-author, Joseph Silveira, who was responsible for arranging this project and to Robert Gamette for preparing the drawing of Atriplex persistens.

2 Historical information is primarily from Hall (1975).
FIGURE 2. The Sacramento National Wildlife Refuge in relation to certain topographic features.
rice was also grown during this time. With the development of a private irrigation system in 1916, rice culture became the dominant agricultural activity on the Spalding Ranch. However, irrigation water, which was responsible for the success of the ranch, also eventually led to the financial collapse of the operation. In 1919, landowners of the area established the Glenn-Colusa Irrigation District and a new drainage district, the 2047 Reclamation District. The cost of irrigation water from the former and annual assessments of the latter eventually produced the collapse of the Spalding agricultural enterprise.

Ownership of the Spalding Ranch was transferred to the federal government in January, 1937. Changes occurred rapidly on the new Sacramento Migratory Waterfowl Refuge (now the SNWR). Since the country was still in the grips of the Great Depression, manpower was readily available. Camp Sacramento, a unit of 150 men of the Civilian Conservation Corps, was established at Spalding Ranch headquarters on May 15, 1937. In a relatively short period of time, roads, water control structures, levees, dikes, and jetties were constructed; channels were cleared and cleaned; lakes and ponds were developed; and other projects involving dwellings, fencing, signs, and monuments were carried out. In 1938, 80 acres of rice and 115 acres of millet (Echinochloa crus-galli) were planted expressly for waterfowl with amazing success—over one-half million ducks consumed every seed and blade of vegetation in these fields during three consecutive nights in October! Farming for waterfowl continued for many years on the refuge. Wheat and barley were the primary crops grown in upland fields, and millet and rice become the dominant aquatic crops. Upland farming was largely phased out of the management program in the 1950’s, and the last rice was grown in 1988. However, certain tracts are still managed for millet, a weedy aquatic grass that readily volunteers and is highly attractive to waterfowl.

The Flora

The agricultural activities on the Rideout and Spalding ranches, followed by the extensive land leveling, impounding, farming, and other wildlife management activities on the SNWR, has resulted in major changes in the natural communities and native vegetation at the refuge. Hall (1975) could only speculate on the original nature of the northwestern Colusa Plains. The area would probably have been a low dry plain periodically inundated by major flooding of the Sacramento River and its feeder streams. Plant communities may have included Valley Grassland, Freshwater Marsh, and Alkali Sink. Four old photographs of goose hunting on the Spalding Ranch are reproduced in Hall’s thesis (1975). These pictures, taken about 1918, show a flat landscape without a single tree or shrub from the foreground to the distant horizon. Tufts of grasses and low herbs are scattered over mostly barren, probably alkaline soil. Today only small areas of up to several hundred square meters of vegetation resembling these original “gooselands” are scattered on the upland tracts of the refuge.

The refuge land is now divided into separate “tracts” and “pools,” most of which are subdivided into “cells” (Figures 2 and 3). Most of these units can be independently managed for water levels and food plants, resulting in seasonally-flooded marsh, watergrass (millet) impoundments, permanent ponds, and uplands (Mensik and O’Halloran, 1990). Riparian strips and borders occur along streams and waterways throughout the complex. Small stands of cottonwood-type riparian woodland occur in the northeast corner of Tract 31 and along the north border of Tract 37. The latter serves as an egret and heron rookery. Lower depressions in some of the upland units regularly develop into shallow vernal pools during the winter rainy season. Only the north portion of Tract G remains as an unplowed and relatively unmodified piece of the original Alkali Sink community that covered most of the refuge lands in presettlement times. Even here, drainage from surrounding fields and invasion of alien species has clouded the picture of the pristine vegetation.

One of the first botanists to collect on the northwestern Colusa Plains was Joseph Burtt-Davy, an English forester and taxonomist who served as an agrostologist (grass specialist) at The University of California from 1892 to 1902. In May 1898, he collected African pricklegrass (Crypsis vaginiflora = C. niliaca) near Norman, the first record of this grass in North America. On the same trip Burtt-Davy collected a grass, which he named Stapfia colusana (= Neostephia colusana), “near Princeton...bordering rain pools on hard uncultivated alkali ‘goose-lands,’ beside the stage road to Norman.” Hall (1975) speculates that the type specimen of Colusa grass was collected near the Norman-Princeton Road in what is now Tract G of the refuge, but it was probably collected further to the east in habitat now obliterated by rice culture. Additional plants collected by Burtt-Davy in the Norman-Willows area include the spineless variety of bur-clover (Medicago polymorpha) and coyote-thistle (Eryngium vasesyi). Willis Lynn Jepson also collected in the Willows area (e.g., Trifolium alboburpuraeum var. olivaceum, Jepson 13, 657). In his Manual of the Flowering Plants of California (1925), Jep-
FIGURE 3. Plot map of the Sacramento National Wildlife Refuge.
son lists Atriplex fruticulosa as occurring on the “goose lands” of Glenn Co.—whether this record is based upon his own collections or that of some other collector, e.g., Burtt-Davy, is not known.

The first attempt to survey the plants on the SNWR was conducted by Harry Anderson from June 1937 into May 1938. Mr. Anderson was a member of the newly-established “Camp Sacramento.” In the preface to a hand-written list of plants (SNWR files), Anderson remarks that “This being my first experience at plant collecting, my first plants were taken without roots; too few of a species were taken; certain plants molded. During the first part of the work, I had to walk half a day, often carrying the plants nearly the whole time. Such plants were almost invariably dried and withered when I returned and were useless.” However, a series of 110 numbered specimens, with accompanying notes on abundance and distribution, was eventually prepared. Unfortunately, Anderson’s collections have either been misplaced or destroyed and could not be examined for this study. In 1988, Anderson’s handwritten notes were transcribed and organized into a typewritten list entitled “Sacramento Refuge Herbarium” (SNWR files).

Since Anderson’s survey, additional collections have been made by Ross C. Hanson (1949–53), David B. Marshall (1951–1962 but mostly 1954), Eugene Kridler (1956 & 1960), Edward J. O’Neill (1961), S.R. Wilbur (1961–62), and Marguerite Hills (1982). These specimens, which were stored in the refuge herbarium, were examined and are incorporated into this study. Annotations indicate that Herbert L. Mason examined at least some, if not all, of the Marshall collections while he was preparing his Flora of the Marshes of California. Collections made at some of the other units of the Sacramento National Wildlife Refuge Complex and stored in the refuge herbarium are not been included in this study.

The survey forming the basis for this flora was conducted between April 23, 1993 and September 6, 1994 (30 visits). During this interval, 323 species, subspecies, and varieties of vascular plants were documented. An additional 14 species represented by vouchers in the SNWR herbarium have been studied and are included in the annotated plant list. Anderson’s collections from 1937–38 present a problem—twenty-five of the plants in his list have not been found during this study. Some of his plants are probably misidentified, but most were surely collected on the refuge. Our best judgment has been used in including or excluding these unvouchedered records in the annotated plant list.

The total flora since the establishment of the SNWR in 1937, as treated in the annotated plant list, includes 351 species and subspecific taxa in 207 genera distributed among 68 families (Table 1). No study of this type is ever complete—additional plants are still to be documented on the refuge!

### TABLE 1. Numerical analysis of the vascular flora of the Sacramento National Wildlife Refuge.

<table>
<thead>
<tr>
<th>FAMILIES</th>
<th>GENERA</th>
<th>SPECIES</th>
<th>ADDITIONAL VARIETIES</th>
<th>TOTAL TAXA</th>
<th>NON-NATIVE</th>
<th>CNPS LISTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>68</td>
<td>207</td>
<td>345</td>
<td>6</td>
<td>351</td>
<td>147 (42%)</td>
<td>13</td>
</tr>
</tbody>
</table>

1 Includes both varieties and subspecies.

Non-native species comprise 42 percent of the refuge flora. This number does not include certain plants that have been deliberately introduced on the refuge, e.g., Monterey cypress (Cupressus macrocarpa) and big saltbush (Atriplex lentiformis), which are native to other places in California. The large proportion of non-native plants is correlated to the highly disturbed nature of the refuge and is typical of similar areas in the northern Sacramento Valley. Forty-two percent of the plants at Harter’s Cherokee Ranch in central Butte County were also found to be aliens (Oswald, 1988), and 48 percent of the flora of The Butte Sink Unit of Gray Lodge Wildlife Area in Butte County consists of non-native species (Oswald, 1989). Of interest is the relatively short period of time in which alien plants can colonize a disturbed area. Anderson’s plant list indicates that at least 34 alien species (33% of the plants he collected) were already growing on the newly established refuge in 1937.

Thirteen of the refuge plants are listed in the CNPS Inventory of Rare and Endangered Vascular Plants of California (Skinner & Pavlik 1994). All except two of these are in List 1B, plants that are rare, threatened, or endangered in California and elsewhere (see Appendix I). The only significant populations of Ferris’ milk-vetch (Astragalus tener var. ferrisiae) remaining in California grow on SNWR in the northwest corner of Tract AB. Before being discovered on SNWR in 1994, only two populations of Heckard’s peppergrass (Lepidium latipes var. heckardii) were known from Yolo County. When Stutz and Chu described Atriplex
**PRINCIPAL REFERENCES**


### ANNOTATED PLANT LIST

**KEY TO THE MAJOR PLANT GROUPS**

<table>
<thead>
<tr>
<th>1 Plants without seeds or flowers, reproducing by 1-celled spores borne in sporangia</th>
<th>2 Plants with seeds produced in cones or by flowers</th>
<th>3 Plants without flowers; seeds borne on the surface of a cone scale or berry-like structures.</th>
<th>2 Plants producing flowers; seeds borne inside a fruit developing from the ovary of the flower.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 Leaves net-veined; flowers usually on a plan of 4 or 5, embryonic leaves 2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 Leaves mostly parallel-veined; flowers mostly on a plan of 3, embryonic leaf 1.</td>
</tr>
</tbody>
</table>

**FERN ALLIES**

1 Plants floating on quiet water of ponds and streams or growing on wet soil at dry-down; leaves small, sessile, with overlapping blades. | 2 Plants rooted in mud of shallow ponds or becoming terrestrial as the pond dries; leaves either resembling a 4-leaved clover or thread-like and lacking a blade. |

**AZOLLACEAE – MOSQUITO FERN FAMILY**

*Azolla filiculoides* Lam. – LARGE MOSQUITO FERN. Common and widespread small, floating plant in quiet waters of ponds and ditches, often forming a solid greenish-red mass (*Anderson 51, Hanson 11-51*). Plants reproduce vegetatively during most of the year.

**MARISLACEAE – MARSILEA FAMILY**

1 Leaves with a slender petiole and 4-leaved clover-like blade. | 2 Leaves thread-like, without an expanded blade. |

**GYMNOSPERMS**

1 Leaves scale-like, thickly covering the branches. | 2 Leaves needle-like, in bundles of 2-5. |

**CUPRESSACEAE – CYRESS FAMILY**

1 Foliage gray, outer leaf surface with a conspicuous gland, bark smooth, thin, peeling in thin strips or plates, cherry red. | 2 Foliage green, outer leaf surface without a conspicuous gland, bark bluish, rich brown aging ash-gray. |

**DICOT FLOWERING PLANTS**

**KEY TO FAMILIES**

1 petals lacking or not evident (calyx sometimes petal-like). | 2 Woody trees, shrubs, or vines. |
|  | 3 Leaves compound. |
| 4 Leaves alternate, fruit a nut. | 4 Leaves opposite; fruit winged, indehiscent. |
| 5 Leaves simple. | 5 Juice more or less milky (break petals of young leaf), stones in a highly modified multiple fruit (fig, mulberry, orange). |
| 6 Flowers, at least the male, in outline or catkin-like inflorescences. | 6 Flowers not in catkins. |
| 7 Leaves of mature branches opposite. | 7 Leaves of mature branches alternate. |
| 8 Herbaceous plants, sometimes slightly woody at the base only. | 8 Aquatic plants, growing more or less submerged or on wet mud as water level drops. |
| 9 Leaves dissected, whorled. | 9 Leaves entire, opposite (the terminal ones sometimes crowded into rosettes). |
| 10 Woody plants, sometimes growing in wet places. | 10 Both sepals and petals absent; flowers staminate or pistillate, borne in clusters surrounded by an involucre resembling a perianth; capsule 3-lobed, sap milky. |
| 11 Style and stigmas simple. | 11 Style and stigmas more than 1. |
| 12 Calyx 5–6 parted, stamens 6–7. | 12 Calyx mostly 4-parted; stamens 4. |
| 13 Leaves palmately compound. | 13 Leaves simple. |
| 14 Ovary more than 1-chambered. | 14 Ovary 1-chambered. |
| 15 Ovules or seeds more than 1, fruit a capsule; leaves opposite. | 15 Ovule or seed solitary; fruit mostly an achen or achene. |
| 16 Leaves with evident stipular sheath above each node. | 16 Leaves without stipular sheath. |
| 17 Calyx 6-cleft. | 17 Calyx lobes or sepals 1, 4, or 5. |
| 18 Bracts subtending the flowers not scabious; plants mostly, glandular-pubescent, or glandular-resinous. | 18 Bracts subtending the flowers scabious; plants not mostly, glandular-pubescent, or glandular-resinous. |

**Cupressus arizonica** Greene ssp. *arizonica* – ARIZONA CYPRESS. A gray-foliaged shrubby tree with the bark peeling in small plates is planted in several locations at the headquarters complex (*Oswald 5812*). This tree is native to Arizona, northern and central Mexico, and northern Baja California. It is a rare native in the Cuyamaca Mtns. of southern California, but is widely planted in California as a windbreak.

**Cupressus macrocarpa** Gordon – MONTEREY CYPRESS. A shrubby tree with green foliage and fibrous bark grows on the margin of the woodlot in the northeast corner of Tract 31, where it was planted (*Oswald 5810*). Native to the coast of California, Monterey Cypress is widely planted elsewhere.

**Pinus halepensis** Mill. – ALEppo PINE. Several 2-needle pines, native to the Mediterranean region, have been planted at the headquarters complex (*Oswald & Silveira 5801*).
Aizoaceae – Fig-Marigold Family

Mesembryanthemum nodiflorum L. –
Slender-Leaved Iceplant. Represented by a single
waif growing in gravel on the edge of Parking Lot D
on Norman Rd. at Logan Creek (Oswald 6215).
This annual is a native of southern Africa. In
California it is typically found on coastal bluffs
and margins of saline wetlands from San Francisco Bay
southwards. Spring.

Amaranthaceae – Amaranth Family

Amaranthus albus L. – Tumbleweed. Common
and often locally abundant weedy annual along roads
and on the dry beds of vernally wet pools and depressions
(Marshall in 1954; Oswald 5494, NW corner of
T16S). Late spring and summer.

Amaranthus retroflexus L. – Red-Rooted
Amaranth. Uncommon weed around headquarters and
on road beds in 1937 (Anderson 66). No plants
were found during the 1993–94 survey. Native to
tropical America. Late summer.

Anacardiaceae – Sumac Family

Taxodium diversum L. – Pacific Poison-Oak. Known only
from the woodlot in the northeast corner of Tract 31
south of Norman Rd. (Oswald in 1993). Spring. [Rhus diversi-
loba Torr. & A.Gray]

Apliaceae – Carrot Family

[Umbelliferae]

Carrot Family

1 Inflorescence head-like, not umbellate; leaves spiny

2 Inflorescence a distinct umbel although the secondary umbels
   may be head-like; leaves not spiny

3 Ovary and fruit bearing podium or beak

4 Fruit lacking a beak

5 Rays 1–12, involucre more or less linear

6 Rays numerous; involucre bracts papillate (at SNWR?)

7 Masonia carota L.

8 Ovary and fruit glabrous

9 Fruit circular in cross section or flattened somewhat laterally; larval ribs not conspicuously
   winged
Anthracisca caulis M.Bieb. – BUR-CHEVIRL. Locally abundant weedy annual along the banks of ponds, dikes, and other disturbed places, often growing in the shade of shrubs or tall weeds (Oswald 6027, NE corner T3). Native to Eurasia. Spring. [A. neglecta Boiss. & Reut. var. scandix (Scop.) Hyl.; A. scandica (Weber) Mansf.; A. vulgaris (L.) Pers.]

Conium maculatum L. – POISON-HEMLOCK. Common and widespread European biennial along roads, ditches, and ponds (Oswald 6111, NW corner TAB). The juice of the fresh leaves and green fruits contains highly toxic alkaloids. Spring.

Eryngium vasyi J.M.Cout. & Rose – COYOTE-THISTLE. Common and widespread herbaceous perennial of vernal pools, marsh edges, and vernal wet, grassy fields (Oswald 5404, TAB; Oswald 5492, T13). Late spring to early summer.

Foeniculum vulgare Mill. – FENNEL. Occasional to locally abundant herbaceous perennial along creeks and ponds (Oswald 5694, Logan Creek bordering P1A; Oswald, S edge of T23; Oswald, along Hunters Creek). Native to southern Europe. Late spring and summer.

Lomatium carifolium (Hook. & Arn.) J.M.Cout. & Rose var. denticulatum Jeps. – ALKALI-PARSNIP. A few plants were reported as scattered along the west boundary in 1938 (Anderson 73). The plant is inconspicuous and, if still survives, was overlooked during the 1993-94 survey. Early spring. [L. humile (J.M. Cout. & Rose) Hoover ex Mathias & Constance]

Turtlehead (L.) Gaertn. – KNOTTED HEDGE-PARSELEY. Common weedy annual in disturbed soil along ditches, roads, and levees (Oswald 5368, ditch along E side of TAB). Spring.

Asclepiadaceae – Milkweed Family

1. Flowers white or yellowish; stems not purple-dotted; herbage with a strong odor of milk.... Asclepiadaceae
2. Flowers white, stem purple-dotted; herbage with an unpleasant odor (CAUTION! DEADLY IF INGESTED).... Asclepiadaceae

Asclepias fascicularis Decne. – NARROW-LEAVED MILKWEED. Herbaceous perennial forming colonies along creeks and in vernal wet, grassy depressions (Anderson 51, rare along Logan Creek E of headquarters, Oswald 5573, NE corner of T41). Summer. [A. mexicana Cav., misapplied]

Asclepias speciosa Torr. – SHOXY MILKWEED. Reported as rare in the NE/4 of the NE/4 of section 12 (in or near present-day Cell 1 of Tract E) in 1937 (Anderson 40). Attempts to relocate this species during the 1993-94 survey were unsuccessful. Summer.

Asteraceae – SUNFLOWER FAMILY

[Compositae]
34 Spring flowering plants: leaves between dark flowers sharp pointed at tip. 

35 Summer and Fall flowering plants: leaves between dark flowers foxtail at tip. Not sharp pointed. 

33 Pappus present on some or all of the female achenes. 

37 Achenes with a pappus of scales or of stiff awns (distinctive in Helianthus). 

Receptacle yellowish throughout or with a center of chaffy bracts surrounding the dark flowers. 

38 Involucre of several overlapping series of phyllaries. 

39 Involucre of 1 series of phyllaries. 

40 Rays conspicuous, base yellow with a white outer half; pappus not of conspicuous silvery scales. 

41 Rays conspicuous, yellow turning crimson; pappus of conspicuous silvery scales. 

42 Receptacle not chaffly. 

43 Perennial, often woody at the base; leaves alternate, broad, heads pyramid, the tip of the phyllaries sharply reflexed or loopy. 

44 Heads pyramidal; leaves less than 1.5 mm long; plant forming bright yellow bands along vertical stems and with waxy soft leaves. 

45 Leaves linear, the undulated portion 2-11 mm broad; leaves more than 2 mm long; plants growing in ditches and on moist alluvial flats. 

46 Ray pappus of a kind, plants often on better drained uplands. 

47 Yellow all essentially entire; corolla turning red in silage (colored of Naur 1, e.g. Darnob or CKF). 

48 Corolla, especially the middle ones, usually purple to black; corolla not turning red in silage. 

49 Leaves, especially the middle ones, usually purple to black; corolla not turning red in silage. 

50 Achyrochaena mulll Scauer - BLOW-WIVES. Occasional to locally abundant annual in grassy places along roads and in upland fields (Anderson 94, abundant almost everywhere in 1938; Hanson in 1950, without a location; Oswald 5351, NE corner T42). Spring. 

Ambrosia psilostachya DC. - WESTERN RAGWEED. Common perennial forming colonies along the edges of roads, ponds, and fields, especially in the southern part of the refuge (Anderson 10, SE corner Sect. 35 in 1937; Oswald & Silvera 5404, T44). Late summer and fall. [Includes var. californica (Ryd.) S.F. Blake] 

Anthemis cotula L. - MAYWEED. Occasional to locally abundant weedy annual along roads, in parking lots, and in grassy fields (Wilbur in 1961; Oswald 5465, Parking Lot B, NW corner T32). Native to Europe. Late spring and early summer. 

Artemisia douglasiana Besser - MUQUORT. Herbaceous perennial forming colonies along creeks and drainageways (Oswald 5809, edge of Parking Lot C, NE corner T41). It is not common on the refuge. Late summer and fall. 

Aster subulatus Michx. var. ligulatus Shinnies - ANNUAL SALTMARSH ASTER. Common in dry to moist fields, marsh edges, and depressions (Marshall in 1954; Oswald 5940, Wetlands Hiking Trail in T111). Late summer and fall. [A. exilis Elliott] 

Bidens frondosa L. - STICKTIGHT. Common annual on the edge of marshes and pools and on the banks of sloughs and other waterways (Wilbur in 1961; Oswald 5769, T42). Late summer and fall. 

Centaura solstitialis L. - YELLOW STAR-THISTLE. This annual weed was already common over most of the area in 1937 (Anderson 52). It remains widespread, and locally abundant along roads, ditches, and in dry fields (Hanson in 1951). Native to southern Europe. Spring into late autumn. 

Chamomilla occidentalis (Greene) Rydb. - VALLEY PINEAPPLE-WEED. Widespread and locally abundant weedy annual in dry soil on levees, along roads, and in other disturbed places (Oswald 5366, levee road bordering TC1). Not listed from the Sacramento Valley in The Jepson Manual. Spring. [Matricaria occidentalis Greene] 

Chamomilla suaveolens (Pursh) Rydb. - COMMON PINEAPPLE-WEED. Apparently uncommon annual on the refuge and known only from a single wail in gravel of Parking Lot B at the northwest corner of Tract 32 (Oswald 5466). There is some question as to whether pineapple-weed is native to California (it is listed as an alien in The Jepson Manual). Spring. [Matricaria suaveolens (Pursh) Buch.; M. matricaroides (Less.) Porter] 

Cichorium intybus L. - CHICORY. Perennial weed with attractive blue flowers that is found in localized infestations along some of the roads on the refuge (Oswald, near the woodlot S of the Checking Station; Oswald, N side of P1). Native to Europe. Summer. 

Cirsium vulgare (Sav.) Tenore - BULL THISTLE. Common annual weed in moist places along marshes and waterways (O'Neill in 1961). Summer and fall. [C. lanceolatum (L.) Scop.] 

Conyza bonariensis (L.) Cronquist - SOUTH AMERICAN HORSEWEED. Uncommon annual weed in roadside gravel along Norman Rd. (Oswald & Ahart 5421). Native to South America. Late spring. [Erigeron linifolius Willd.] 

Conyza canadensis (L.) Cronquist var. glabrata (A. Gray) Cronquist - CANADIAN HORSEWEED. Common annual of dry fields, margins of ponds, and roadsides (Anderson 38, sparse near the entrance gate in 1937; Oswald 5773, N edge of T21; Marshall in 1962). Although weedy in habit, Cronquist (Vasc. Plants of the Pac. NW, 5:145, 1955) considers our western plants with nearly glabrous stems to be native. The eastern phase of the species with spreading stiff-hairy stems sometimes occurs in California as an introduction. Late summer and fall. [Varieties not recognized in The Jepson Manual.] 

Conyza floribunda Humb., Bonpl., & Kunth - MANY-FLOWERED HORSEWEED. Common tall annual along trails, roads, and levees (Oswald 5867, Wetland Hiking Trail in T111). Native to S. America. Late summer and fall. 

Cotula coronopifolia - COMMON BRASS-BUTTONS. Common and widespread weedy annual in
tread clay soils along ponds, in shallow ditches, and in other vernally wet places (Marsh in 1955, without a location; Oswald 5306, T2)3. Not listed from the Sacramento Valley in The Jepson Manual. Native to South Africa. Spring.

*Euthamia occidentalis* Nutt. - Western goldenrod. Locally common along creeks and in low fields (Oswald 5889, T44 on the N side of Hunters Creek). Late summer and fall. [Sohledago occidentalis (Nutt.) Torr. & A.Gray]

*Gnaphalium californicum* DC. - California cudweed. Uncommon biennial along the branch of Logan Creek running through Refuge Headquarters (Oswald 5467, T113). Late spring.

*Gnaphalium luteo-album* L. - Weedy cudweed. Locally common annual in wet soil along ditches and ponds (Oswald 5468, ditch on the west edge of T11 near Refuge Headquarters; in TC1 near the Gravel Pit). Spring into fall.

*Gnaphalium palustre* Nutt. - Lowland cudweed. Annual forb forming large localized populations in vernal pools, on the dry bed of marshes, and along the edge of flooded fields (Wilbur in 1961; Oswald 5304, T23). Spring.

*Gnaphalium stramineum* Humb., Bonpl. & Kunth - Cotton-battling plant. Known only from an old collection (Wilbur in 1961) from the edge of a flooded millet (watergrass) field. [G. chilense Bogen.]

*Grindelia camporum* Greene var. camporum - Great Valley gumplant. Common and widespread perennial in dry fields, dry margins of vernal pools, and similar vernal wet but summer dry places (Anderson 53, over most of the area; Hanson 10-51 without a location; Oswald 4408, NE side T18). Plants are often woody at the base, sometimes becoming well-developed shrubs. Summer into late fall.

*Helianthus annuus* L. - Common sunflower. Uncommon in grassy fields bordering drying ponds (Oswald 5642, TD2). Summer. [Includes ssp. jaegeri (Heiser) Heiser; ssp. lenticularis (Douglas) Cockerell; var. macrocarpus (DC.) Cockerell]

*Hemizonia congesta* DC. ssp. luzulifolia (DC.) Babc. & H.M.Hall - Hayfield tarweed. Locally abundant annual of dry grassy fields, especially in the southern part of the refuge (Anderson 26, NE quarter Sect. 13; Oswald 5808, NE corner of T41; Marshall in 1954, dike along P1B). The plant has a strong balsamic odor. Late summer and fall.

*Hemizonia parryi* Greene ssp. radis (Greene) D.D. Keck - Papoose spikeweed. Common and widespread annual along roads, on marsh edges, and in upland fields (Hanson 21-51; Oswald 5689, T113 near the viewing pond at the entrance to the refuge). This is probably the spikeweed referred to *H. fitchii* [= Centromadia fitchii] by Anderson in 1937. Late spring into fall. [H. radis Greene; Centromadia pungens (Torr. & A.Gray) Greene var. parryi (H.M.Hall) Jeps.]

*Hemizonia pungens* (Hook. & Arn.) Torr. & A.Gray ssp. septentrionalis Keck - Common spikeweed. Locally abundant on the margins of drying vernal flat flats and drainages (Oswald 5369, NE corner of TAB3). Spring. [Centromadia pungens (Torr. & A.Gray) Greene]

*Hypochaeris glabra* L. - Smooth cat's-ear. Uncommon annual in grassy fields and in disturbed soil of roadways (Oswald 6096, N side of Norman Rd.; Oswald 6102, NW corner of P7A). Native to Europe. Spring.

*Lactuca saligna* L. - Willow-leaved lettuce. Occasional to locally abundant annual in dry, grassy places (Oswald 5631, northwest corner T102). Native to Europe. Late spring and summer.

*Lactuca serriola* L. - prickly lettuce. Locally abundant weedy European annual in grassy fields (e.g., TG). Leaves vary from deeply pinnately-lobed to strap-shaped. Late spring to fall. [Includes var. integrata Gren. & Godr. = forma integrifolia Bogen., the form with strap-shaped rather than pinnately-lobed leaves; L. scariola L.]

*Lasthenia californica* Lindl. - California goldfields. Widespread and locally abundant in grassy uplands and on vernal moist alkaline flats (Oswald 5331, TG). Early Spring. [Baeria chrysostoma Fisch. & C.A. Mey., including ssp. gracilis (DC.) Ferris]

*Lasthenia fremontii* (Torr. ex A.Gray) Greene - Fremont's goldfields. Common and widespread annual, forming bright yellow rings around vernal pools and turning more shallow depressions and drainages into solid masses of yellow in late spring (Hanson in 1952; Marshall in 1954; Oswald 5289, NE corner T16). Spring. [Baeria fremontii (Torr. & A.Gray) A.Gray]

*Lasthenia minor* (DC.) Orndoff - Woolly goldfields. Uncommon annual growing in moist roadside ditches (Oswald 6029, NE corner T15). Spring. [Baeria minor (DC.) Ferris]

*Lasthenia platycarpa* (A.Gray) Greene - Alkali goldfields. Often growing with *Lasthenia californica*, the latter forming large patches of yellow on vernal moist, alkaline flats (Oswald 6003, TAB5). Early spring. [Baeria platycarpa (A.Gray) A.Gray]

*Layia chrysanthemoides* (DC.) A.Gray - Smooth tidytips. Apparently rare annual of grassy fields (Hanson in 1953; Oswald 6103, E side of P102)5. Spring. [Includes ssp. maritima Keck]

*Microseris acuminata* Greene - Sierra foothills microseris. Inconspicuous annual in grassy fields (Oswald & Silveira 6025, NW corner of TAB5). Early spring.

*Microseris douglasii* (DC.) Sch.Bip. ssp. douglasii - Douglas' microseris. Scattered to locally abundant annual in grassy fields (Oswald 5986, S side of T18; Os-
walt 6032, W edge of T1§; Oswald 6038, TG; Oswald 6094, old rice fields on S side of T17). Early spring.

*Microseris elegans* Greene ex A. Gray – ELEGANT MICROSERIS. Inconspicuous annual growing in grassy upland (Oswald 6030, W edge of T1§; Oswald 6037, TG). Early spring.

*Pisicis echoides* L. – BRISTLY ONTONGUE. Common and widespread annual or biennial weedy forb in moist soil along marshes and ditches (Wilbur in 1962; Hills in 1982). Native to Europe. Late spring into autumn.

*Psilocarphus brevissimus* Nutt. var. brevissimus – DWARF WOOLYHEADS. Common and often locally abundant woolly annual on the drying bottoms of shallow vernal pools, seasonally flooded marshes, and drainage depressions (Oswald 5311, P1; Oswald 5364, NW corner TAB2). Spring.

*Psilocarphus oregonus* Nutt. – OREGON WOOLYHEADS. Occasional annual forming large populations along the edge of seasonally flooded marshes, in shallow vernal pools, and along vernal wet drainages (Oswald 5336, TG). Spring.

*Senecio vulgaris* L. – OLD-MAN-OF-SPRING. Common weedy annual along roads and in other disturbed places (Anderson 74, common on the N part of the refuge in 1938; Oswald 5970, NW edge TG). Native to Eurasia. Early spring.

*Silybum marianum* (L.) Gaertn. – MILK-THISTLE. Common and widespread noxious annual or biennial weed along roads and on dikes bordering ponds and canals (Hanson in 1952). Native to the Mediterranean region. Spring.

*Sonchus asper* (L.) Hill – SPINY-LEAVED SOW-THISTLE. Common Eurasian annual weed along roads, edges of seasonally flooded marshes, and on high spots in other marshy places (Anderson 29, E of gravel pit and along roads in 1937; Wilbur in 1962; Oswald & Ahart 5422, ditch along Norman Rd.). Spring and summer.

*Sonchus oleraceus* L. – COMMON SOW-THISTLE. European weed reported as sparse from around the gravel pit and a pond in the NW¼ of section 13 (near present-day Cell 6 of Tract E) in 1937 (Anderson 41). Summer.

*Tragopogon porrifolius* L. – SALSIY. Uncommon biennial on dikes and along roads and creeks (Oswald 6162, Norman Rd. near Logan Creek). Native to Europe. Spring.

*Xanthium spinosum* L. – SPINY COCKLEBUR. In Anderson's 1937 collections, spiny cocklebur is listed as a rare plant about old straw stacks and in other scattered areas (Anderson 27). No populations were found during the current study. Summer.

*Xanthium strumarium* L. – ROUGH COCKLEBUR. Widespread and locally abundant weedy annual along the edge and on dry beds of ponds and ditches (Oswald 5498, T18). Late spring and summer. [Includes *X. pumilum*, *X. spinosum var. micranthus*, but it has a more prostrate habit and the nutlets are bristly-hairy. Spring.

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**BIGNONIACEAE – BIGNONIA FAMILY**

*Campsis radicans* Scem. – TRUMPET-CREEPER. Woody vine with large orange-red flowers planted at the headquarters complex (Oswald 6211). It decorates the old arch that early on marked the entrance to the refuge. Native to the eastern U.S. Summer.

**BORAGINACEAE – BORAGE FAMILY**

1. Flowers white (sometimes with colored veins or central areas or centers).
2. Flowers smaller than 3 mm broad.
3. Flowers present near base of stem, the pedicels recurved in fruit.
4. Flowers usually not present near base of stem, the pedicels not stout.
5. Flowers usually not present near base of stem, the pedicels not stout. Spring.
6. Flowers usually not present near base of stem, the pedicels not stout.
7. Flowers usually not present near base of stem, the pedicels not stout.
8. Flowers usually not present near base of stem, the pedicels not stout.
9. Flowers usually not present near base of stem, the pedicels not stout.
10. Flowers usually not present near base of stem, the pedicels not stout.

**Amsinckia lycopsisoides** Lehm. – BUGLOSS RIDGEHEADS. Locally abundant annual in disturbed places at Refuge Headquarters, in grassy fields, and along levee roads (Marshall in 1954; Hanson in 1954; Oswald 5307, T2). Spring. [In older plant lists, usually referred to either A. douglasiana DC., A. douglasiana var. campes­tris (Greene) Jeps., or misidentified as A. intermedia Fisch. & C.A. Mey.]

**Amsinckia menziesii** Lehm. – *A. menziesii* var. intermedia (Fisch. & C.A. Mey.) F.R.Ganders – COMMON FIDDLENECK. Uncommon at the refuge and known only from along trails and roads near the headquarters complex (Oswald 6041, W boundary at the main entrance). Early spring. [A. intermedia Fisch. & C.A. Mey.]

**Heliotropium curassavicum** L. – WILD HELIOTROPE. Uncommon perennial forming localized populations on alkaline soil of vernal wet depressions in grassy fields, on the beds of vernal pools, and along roads (Anderson 49, rare at Grimes Lake (approximately by present-day Pool 2) in 1937; Oswald 5494, center of T18; Oswald 5950, TAB2). Late spring and summer. [Includes var. *oculatum* (A. Heller) I.M. Johnst.]

**Plagiobothrys leptocladus** (Greene) I.M. Johnst. – SMOOTH-STEMMED POPCORN-FLOWER. Occasional annual in vernal wet depressions and drainages in upland grasslands and on drying mud of shallowly flooded fields (Oswald 5330, TG; Oswald 5341, T2). It is superficially similar to the more common *P. stipitatus* var. *micranthus*, but it has a more prostrate habit and the nutlets are bristly-hairy. Spring.
**Plagiobothrys stipitatus** (Greene) I.M. Johnst. – LARGE-FLOWERED STIPITATE POPCORN-FLOWER. Common annual forb forming white bands and patches in vernal pools and in vernal wet fields (Hanson in 1950; Marshall in 1954). This large-flowered variety often grows with the smaller-flowered var. *michranthus*. Anderson reports stipitate popcorn-flower as very common in all sections of the refuge in early 1938. Spring. [Allocoryza stipitata Greene]

**Erysimum cheiranthoides** L. – WORMSEED-MUSTARD. Known from a single waif growing in the gravel of Parking Lot B (Oswald 6213). Native to Eurasia. Spring.

**Erysimum chiranthum** var. *acutidens* (Hanson in 1950; Marshall in 1954, Oswald 6001, TAB); Oswald, NW corner T5; Oswald, NW corner T5; Oswald, NW corner TAB. Early spring.

**Lepidium dictyotum** var. *diclytum* – ALKALI PEPPER-GRASS. Locally abundant annual on moist alkaline flats and in grassy fields, often growing near *L. dictyotum* var. *acutiden* (Hanson in 1950; Marshall in 1954, Oswald 6032, Oswald 5994, Oswald 6028, Oswald 6035, Oswald 6028, W edge of T2). Late winter to early spring. **Lepidium dictyotum** var. *acutiden* A.Gray – SHARP-TOOTHED PEPPER-GRASS. Uncommon to locally abundant annual on vernal wet grassy flats and near vernal pools and depressions in grassy fields (Oswald 5324, Oswald 5395, Oswald 6032, Oswald 5995, Oswald 6035, Oswald 6028, W edge of T2). Early spring.

**Lepidium latifolium** L. – BROAD-LEAVED PEPPER-GRASS. Tall, weedy Eurasian perennial forming spreading colonies along ditches (northern leg of Tour Route) and parking lots (Oswald 5463, Checking Station S of Norman Rd.). Spring.

**Lepidium latipes** Hook. var. *latipes* – DWARF PEPPER-GRASS. Occasional to locally abundant prostrate annual on vernal wet grassy flats and near shallow vernal pools in grassy fields (Oswald 5323, TG; Oswald 5996, E side of P10). Early spring.
but sometimes locally abundant in alkaline soil of vertically moist, grassy fields (Oswald 5985, Oswald & Silveira 6006, S side T18; Oswald 6031, W edge of T15; Oswald 6036, TG; Oswald, on N side of P4). Early spring. CNPS Inventory 1B.

Lepidium perfoliatum L. - CLASPING PEPPERGRASS. Common and sometimes locally abundant annual forb along the edges of levees and roads (Krider in 1960; Oswald 5314, between TAB & P12). Native to Eurasia. Spring.

Sisymbrium orientale L. - ORIENTAL HEDGE-MUSTARD. Occasional annual along roads and trails (Oswald 5452, T115, Wetlands Hiking Trail; Oswald 6090, Tour Route along N edge T16). Native to Europe. Spring and summer.

Tropidocarpum gracile Hook. - SLENDER TROPIDOCARPUM. Reported as sparse along the west boundary near the railroad tracks in 1938 (Anderson 82). It was not found during the 1993-94 survey. Spring.

CALLITRICHACEAE - WATER-STARWORT FAMILY

Callitriche marginata Tott. - WINGED WATER-STARWORT. Common in vernal pools and in flooded fields, the aquatic phase with floating rosettes of leaves. As the ponds dry down in late spring, the plant becomes terrestrial, forming green cushions on wet mud (Oswald 5316, TD1). Winter and spring. [Includes C. longipetulculata Morong, the aquatic phase]

CAMPANULACEAE - BELLFLOWER FAMILY

1. Anther tubes strongly bent downward so as to be almost vertical to the filaments - Downingia insignis 2. Anther tube almost in line with the filaments, not strongly bent.

Downingia bella Hoover - HOOVER'S DOWNINGIA. Annual forb, uncommon but sometimes locally abundant and covering the entire beds of smaller vernal pools and "hog wallows" (Oswald 6158, T11); Oswald 5325, TG; Oswald 6049, SW corner of TAB1). It frequently grows with D. insignis. Spring.

Downingia insignis Greene - HARLEQUIN DOWNINGIA. Common and widespread annual forb in drying mud of vernal pools and vernal wet depressions, often forming blue rings around deeper pools or turning shallow pools into a solid mass of blue (Anderson 106 [as D. elegans(Lindl.) Tott., misapplied], abundant in almost any wet place and low spot in 1938; Marshall in 1955, without a specific location; Oswald 5296, NE corner T16). Spring.

Downingia ornatissima Greene - FOLDED DOWNINGIA. Uncommon at the refuge but sometimes locally abundant on drying mud of vernal pools and depressions in grasslands, often growing with D. insignis (Oswald 6093, old rice fields on S side of T17, Oswald & Silveira 6110, SW side of TH). Spring.

CARYOPHYLLACEAE - PINK FAMILY


CARYOPHYLLACEAE - PINK FAMILY

1. Fruit a fleshy indehiscent ovary; petals absent - Hernia 2. Fruit a several to many seeded capsule; petals usually present.

Hernia hirsuta L. ssp. hirsuta - HAIRY HERNIA. Occasional weed in roadside gravel along the Tour Route (Oswald 5455, near the viewing platform), probably introduced into the stream gravel hauled into the area. Native to southern Europe, northern Africa, and southwestern Asia. Spring.

Sagina decumbens (Elliott) Torr. & A.Gray ssp. occidentalis (S. Watson) G.E.Crow - WESTERN PEARLWORT. Inconspicuous but locally abundant annual on grassy and gravelly flats (Oswald 5998, field W of checking station). Early spring.

Spergularia macrantha (Hornem.) Heynh. var. leucantha (Greene) B.L.Robb. - WHITE-FLOWERING SANDSPURRY. Scattered to locally abundant herbaceous perennial in alkaline soils of grassy fields (Anderson 93, common E of Logan Creek; Hanson in 1950, without a location; Oswald 5321, TG; Oswald in NE corner of TAB3). Spring.

Spergularia marina (L.) Griseb. - SALT-MARSH SANDSPURRY. Common and locally abundant in alkaline soils of vernal wet places in grassy fields, and on mud of drying vernal pools and drying ponds (Oswald 5312, P12). The plant has small but attractive pinkish flowers that open around mid-day on sunny days. A more robust form of this plant is locally common in gravel in the parking lot at the Checking Station (Oswald 5462). Spring. [Includes var. tenuis (Greene) R.Rossbach]

Spergularia rubra (L.) J.Presl & C.Presl - RUBY SANDSPURRY. Occasional weedy annual in parking lots and other disturbed places (Oswald 6160, parking area at viewing platform). Native to Europe. Spring.

Stellaria media (L.) Vill. - COMMON CHICKWEED. Uncommon annual weed of road sides and disturbed places (Anderson 90, along a drain near headquarters in
1938; Oswald 5991, between T41 & T38). Native to southwest Europe. Spring.

**Ceratophyllaceae – Hornwort Family**

*Ceratophyllum demersum* L. – Hornwort. Submersed aquatic represented by an old collection in the SNWR herbarium (Hanson in 1951), without a specific location. It was not found during the 1993–94 survey. Collected in Sept.

**Chenopodiaceae – Goosefoot Family**

1 Leaves not or scarcely flattened, either finely and finely or sparsely to
2 Leaves scaly, the stems and branches hairy
3 Branches and flower clusters opposite
4 Leaves not scaly, either finely and nearly linear or spine-tipped
5 Flowers with a spine
6 Leaves tipped with a spine
7 Flowers not tipped with a spine
8 Flowers clustered at the branch tips
9 Flowers not clustered at the branch tips
10 Flowers with a spine
11 Flowers without a spine
12 Flowers clustered at the branch tips
13 Flowers not clustered at the branch tips
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201 Flowers not clustered at the branch tips
202 Flowers with a spine
203 Flowers without a spine
204 Flowers clustered at the branch tips
205 Flowers not clustered at the branch tips

**Atriplex argentea** Nutt. var. *mohavensis* M.E. Jones. – Silverscale. Common and widespread annual of roadsides, levees, dry beds of seasonally flooded pools, and grassy fields (Oswald 5773, T15; Oswald 5957, Wetlands Hiking Trail between T4 & T38). Late summer and fall.

**Atriplex cordulata** Jeps. – Heartscale. Locally abundant in alkaline soils of seasonally wet flats, in hard dry soil of old rice fields which have reverted to upland, and along levee roads built up with alkaline soil (Oswald 5461, NE end of TG; Silveira & Oswald, E side of T21 & W side of T22, Oswald 5641, south corner of TCl, Oswald 5771, T15). CNPS Inventory List IB. Late spring and summer.

**Atriplex depressa** Jeps. – Brittle Scale. Occasional locally common annual along the margins of perennial pools and in the adjacent seasonally wet upland (Oswald 5778, NE corner of TAB, Oswald & Silveira, W side P7a). CNPS Inventory List IB. Late summer and fall. *[A. parishii S.Watson in part (Munz Calif. Flora)]

**Atriplex fruticulosa** Jeps. – Shrub. Common herbaceous perennial from a branching, woody caudex. It is found in seasonally wet grassy fields, along the dry margins of perennial pools, and on roads (Oswald 5365 & 5370, NE corner TAb, Oswald 5413, NW edge of TAb, Oswald & Silveira, TH). Although Jepson (Flora Calif. 1:435. 1914) lists this plant as occurring on “alkali flats of the Great Valley from the ‘gooselands’ of Glenn County south to the San Joaquin,” there have apparently been no recent collections from this area since The Jepson Manual lists it only as far north as the southern Sacramento Valley. Spring.

**Atriplex heterosperma** Bunge – Variable-seeded Saltbush. Common annual in dry fields and along roads and levees (Oswald 5938, Wetlands Hiking Trail). Native to Eurasia. Late summer and fall.

**Atriplex joaquiniana** A.Nelson – San Joaquin Spearscale. Locally common annual in grassy fields, along levee roads, and near perennial pools (Marshall in 1954; Oswald 5412, N edge TAB, Silveira, W edge of P104). CNPS Inventory List IB. Although this plant was collected near Willows by Jepson (Flora of Calif. 1:438. 1914), The Jepson Manual lists it as occurring only from the southern Sacramento Valley southward into the San Joaquin Valley and along the east slope of the Inner Coast Ranges. Late spring. *[A. spicata S.Watson, A. patula L. spp. spicata (S.Watson) H.M.Hall & Clements]*

**Atriplex lenticiformis** (Torr.) S.Watson sp. *lenticiformis* – Big Saltbush. Locally common shrub in dry upland (Oswald 5774, T21). Although big saltbush is not native this far north in the Great Valley, seedlings and young plants indicate that the plant can spread in the areas where it was planted long ago. Late summer and fall.

**Atriplex persistens** Stutz & G.L. Chu – Vernal-pool Saltbush. A small, annual *Atriplex* with the male flowers clustered at the branch tips is locally common in
alkaline soil on the dry beds of vernal pools at several locations on the refuge (Oswald & Silveira 5230, P11; Oswald 3640, TC1; Oswald, TAB1). Under favorable growing conditions, it sometimes forms large, green mats. Although this species and *A. depressa* are probably the Glenn County material referred to *A. parishii* in Munz, it has recently been recognized as new (Madroño 40:209. 1993). Although described too late to be included in the 5th edition of the CNPS Inventory, it qualifies as a List 1B plant. Late summer and fall.

*Artemisia polycarpa* (Torr.) S. Watson — MANY-FRUITED SALTBUSH. A dioecious shrub native to the San Joaquin Valley and Southern California (Oswald & Silveira 5802, Oswald 5943, headquarters complex, T12). The plants show no indication of having spread in the area where they were planted. Late summer and fall.

*Artemisia rosea* L. — TUMBLING ORACLE. Uncommon annual in weedy upland fields (Oswald 5773, T16). Native to Eurasia. Late summer. *Artemisia semibaccata* R. Br. — AUSTRALIAN SALT-BUSH. Common perennial forming low mounds along roads and levees (Marshall in 1954; Oswald 4028, SE corner P1A4; Oswald 5944, SW corner T51). Native to Australia. Spring and summer.

*Artemisia triangularis* Willd. — SPEARSCALE. Common annual in dry ditches and along the edge of ponds (Marshall in 1954; Oswald 5939, Wetlands Hiking Trail). According to Anderson’s list, this plant (as *A. patula* var. hastata) was uncommon along the border of dirt roads and fence rows in 1937. There is some question as to Anderson’s identification since the roadside and fence-row habitats are more characteristic of the vegetatively similar *A. heterosperma*. Late summer and fall. [A. hastata L., misapplied; *A. patula* L. ssp. hastata (L.) H.M.Hall & Clem., misapplied]

*Bassia hyssopifolia* (Pallas) Kunze — HYSSOP-LEAVED BASIL. Common and widespread annual in alkaline soils along levee roads, on the dry margins of vernal pools, and in vernally wet fields (Anderson 32, roads, borders of dry alkali pools; Anon. in 1951; Oswald 5410, NE quarter of TAB3). Native to Eurasia. Late spring. [Echinocephalon hyssopifolium (Pall.) Moq.]

*Chenopodium album* L. — LAMB’S-QUARTERS. Annual weed that is locally common along roads (Anderson 25 & 58, dry lake beds and roadsides; Oswald 5491, near the beginning of the Tour Route). Probably native to Europe. Late spring and summer. *Chenopodium ambrosioides* L. — MEXICAN-TEA. Annual native of tropical America that is found along the edge of marshes (Oswald 5937, Wetlands Hiking Trail; Oswald, E leg of the Tour Route). Summer and fall. [Includes var. *anthesminthum* (L.) A. Gray and vagans (Standl.) J.T. Howell]

*Chenopodium murale* L. — NETTLE-LEAVED GOOSEFOOT. This European weed was found around old ranch buildings in 1937 (Anderson 37), a typical habitat for the species. It was not found during the 1993–94 survey. Summer.

*Salicornia subterminalis* Parish — PICKLEWEED. A single clump of this perennial of salt marshes and alkali flats was found along the west side of a summer-dry flat in Cell 2, Pool 11 (Oswald 5572). Summer.

*Salsola tragus* L. — RUSSIAN-THISTLE. Common weedy roadside annual in the North Valley but fairly uncommon at the refuge (Oswald 5695, edge of Norman Rd.; Oswald, Tour Route between the parking lot and Pole Line Rd.). Native to Eurasia. Summer into fall. [S. australis R. Br.; S. iberica Sennen & Pau; S. kail L. var. tenuifolia Tausch, all misapplied; the correct name may be *S. pestiferum* A. Nelson (see Munz Suppl., p. 75)]

*Suaeda calciformis* (Hook.) Moq. — HORNY SEA-BLITE. Common and locally abundant succulent annual on the margins of drying alkaline pools and on alkali scalds (Oswald 5329, TG; Oswald 5945, NW corner T53). Spring and summer. [S. depressa (Pursh) S. Watson var. erecta S. Watson; S. depressa var. depressa misapplied]

*Suaeda moquinii* (Torr.) Greene — BUSH SEEWEED. Locally common subshrub in the southwest corner of Cell 3, Pool 7A (Oswald & Silveira 5643) and in the middle of the W side of the same pool (Silveira), the only known locations on the refuge. The plant has a foul odor. Spring and summer. [S. torreyana S. Watson including var. *ramosissima* (Standl.) Munz, *S. fruticosa* (L.) Forssk., misapplied]

**Convolvulaceae — Morning-glory Family**

*Convolvulus arvensis* L. — BINDWEED. Common weedy perennial vine of roadsides and marsh edges (Anderson 50, W of headquarters and in section 22; Hanson in 1950, without a location; Oswald 5353, NE corner T41). Native to Europe. Late spring into fall.

*Cressa truxillensis* Kunth — ALKALI-WEED. Common and widespread herbaceous perennial in alkaline soils of vernally wet upland fields, on the drying beds of vernal pools and seasonally flooded marshes, and along roads (Anderson 20, common in dry alkali beds in 1937; Oswald 5405, TAB3). At the refuge, alkali-weed is commonly infected with a rust pathogen, causing the plants to develop enlarged, yellow-green leaves. Pustules are scattered on the lower epidermis of the leaves from which orange-colored spores are released. Late spring. [Includes var. *vagina* (A. Heller) Munz, *C. cretica* L.]

**Crassulaceae — Stonecrop Family**

1. *Crepis* (12-seeded; plants of mist or dry places).
2. *Leaves and sepals blunt or gradually narrowed to a slender tip; flowers 3–5 mm across

*Crassula cornetti*

3. *Leaves and sepals obviously bar-tipped; the plant mossy-looking; flowers 5–8 mm across

*Crassula aquatic*

4. *Seed surface smooth, shiny (at SWWR?)

*Crassula salvi (Gay) F. Maigre*
**Crassula aquatica** (L.) Scheen. – WATER PIGMY-WEEED. Common but inconspicuous annual forb, often forming large populations in shallow water and later on drying mud of vernal pools and seasonally flooded marshes (Oswald 5344, NW corner T31). Spring. [Tillaea aquatica L.]

**Crassula connata** (Ruiz & Pav.) A. Berger – PYGMY-WEEED. Inconspicuous annual forming localized populations along roads, in parking areas, and on dry, barren spots in grassy fields (Anderson 81, near the Gravel Pit in 1938; Oswald 5537, TG; Oswald 6091, road along N edge of T16). Spring. [Tillaea erecta Hook & Arn.]

**Crassula tiliae** Lest.-Carl. – MOSSY PIGMY-WEEED. Locally common annual on hard-packed soil of parking lots and roadsides, and in dry openings in fields (Oswald 5993, parking lot in NE corner T41; Oswald 6092, road along N edge of T16). Often growing near the previous species. Native to the Mediterranean region. Spring. [Tillaea muscosa L.]

**CUCURRURACEAE – DODDER FAMILY**

1. Corolla with obvious fringed, scale-like appendages attached to the tube below the stamens. Cuscuta salina
2. Corolla without fringed, scale-like appendages at the base of the filament. Cuscuta californica

**Cuscuta californica** Hook. & Arn. var. californica – CALIFORNIA DODDER. A common parasite of *Hemizonia parryi* (Oswald 5588, parking lot at the Checking Station S of Norman Rd.; Oswald 5772, T16). Summer.

**Cuscuta salina** Engl. var. *papillata* Yunck. – ALKALINE DODDER. Locally abundant parasite of *Frankenia* (Oswald 5496, NE 3/4 T18; Oswald 5777, NE 3/4 TAB3) and less often of *Suaeda* and *Bassia* on alkaline soils of vernal wet flats and margins of vernal pools. Late spring and summer.

**DIPSACACEAE – TEASEL FAMILY**

1. Bracts of head ending in a straight spine. *Dipsacus sylvestris*
2. Bracts of head ending in a recurved spine; the spines stiff. *Dipsacus siliquosus* (L.) Humb.

**Dipsacus fullonum** L. – WILD TEASEL. Weedy perennial forming colonies along ponds and ditches (Wilbur in 1962, without a location; Oswald 5692, Tour Route near the viewing platform). Late spring and summer, some plants blooming again in the fall on new growth on old stems. [D. sylvestris Huds.]

**Dipsacus sativus** (L.) Honck. – FULLER’S TEASEL. Weedy perennial forming colonies along ponds and ditches (Oswald 5457, E edge of P1A3). This is the species that was used to raise the nap on woolen cloth. Late spring and summer. [D. fullonum L. & D. sylvestris Huds., misapplied]

**ELATINACEAE – WATERWORT FAMILY**

1. Plant glabrous-pubescent; flower parts in 5’s; sepals pointed, with a thickened midrib; dry bottoms of vernal wet places. *Erigeria*
2. Plants glabrous; flower parts in 3’s, 3’s, or 4’s; sepals blunt, without a midrib; aquatic or semi-aquatic. *Elatine*

**Elatine ambigua** Wight – RICEFIELD WATERWORT. Delicate annual forming localized populations on mud on the bottom of drying ponds and marshes (Oswald 5451, T11; S edge of T14). Native to the Mediterranean region. Spring.

**Elatine californica** A. Gray – CALIFORNIA WATERWORT. Tiny and inconspicuous annual in shallow water and later on drying mud of pools (Oswald 5334, TG; Oswald 5356, T29). Spring.

**Elatine chilense** Gay – CHILEAN WATERWORT. Inconspicuous annual on mud of seasonally flooded marshes (Oswald 5357, T29), sometimes growing in the same pond as *E. californica*. Spring.

**EUPHORBIAEACEAE – SPURGE FAMILY**

1. Plant silvery-hairy, flowers with a calyx, not borne within an involucre (cyathium). *Euphorbia*
2. Plant green, flowers lacking a true calyx, borne within a cup-shaped involucre (cyathium) surrounding several reduced male flowers and a female flower with a 3-lobed pedicel. *Euphorbia*
4. Plant and capsule glabrous. *Chamaesyce* supina
5. Appendages of glands deeply pitted into 3-5 scale-like structures 1 mm long; plants in and about drying vernal pools. *Chamaesyce hooveri*
6. Appendages entire or slightly lobed. *Chamaesyce zephyrilla*

**Chamaesyce hooveri** (Wheelere) Koutnik – HOOVER’S SPURGE. Discovered on the Sacramento Refuge by Joseph Silveira in 1992, Hoover’s spurge is locally common to abundant on summer-dry mud on the bottom of certain vernal pools [Silveira in 1992; P1; Silveira in 1992; TC2; Silveira in 1992 & Oswald 5951, TAB3; Oswald 5691, NE corner of T18]. CNPS Inventory List 1B. Summer. [Euphorbia hooveri Wheeler]

**Chamaesyce maculata** (L.) Small – SPOTTED SPURGE. Locally abundant annual weed on the edge of the Visitor’s Parking Arca (Oswald 5942). [Euphorbia maculata L.; E. supina Raf.]

**Chamaesyce serpyllifolia** (Pers.) Small – THYME­LEAVED SPURGE. Uncommon annual on the bank of Hunters Creek (Oswald & Silveira 5803, T44). Summer and fall. [Euphorbia serpyllifolia Pers.]

**Eremocactus setigerus** (Hook.) Benth. – TURKEY-MULLEIN. Reported as common on barren spots and along dirt roads in 1937 (Anderson 60). Today this common weedy native of roadsides in the North Valley is surprisingly uncommon at the refuge, being found only occasionally in dry fields (Wilbur in 1962; Oswald 5808, T44). Late spring and summer.

**FABACEAE – LEGUME FAMILY**

[Leguminosae]

1. Leaves trifoliate or palmately compound. L. trifoliate
2. Leaves palmately compound. L. palmate
3. Flowers pinkish, keel clinate on upper margins near the claws. *Lagopus microcarpus*
Astragalus tener A. Gray var. ferrissiae Liston – FERRIS’ MILK-VETCH. A rare annual that is locally common along the grassy margins of several alkaline pools and drainages in the northwest quarter of Cell 3, Tract AB (Oswald 6005, 6113, 6114), the only known location on the refuge. CNPS Inventory List 1B. Spring.

Lotus corniculatus L. – BIRD’S-FOOT-TREFOIL. According to Anderson’s list, this plant was sparse in a wet area near the entrance in 1937. It is now a common, widespread, and locally abundant perennial forb in marshy and vernal wet places (Wilbur in 1961). Native to Eurasia. Spring into summer; some plants blooming again in early fall.

Lotus wrangelianus Fisch. & C.A.Mey. – WRANGLER LOTUS. Locally common in upland grassy fields (Oswald 5319, TG; Oswald 6045, TS1). Spring. [L. subspinitus Lag., misapplied]

Lupinus microcarpus Sims var. microcarpus – PINK-FLOWERED LUPINE. Uncommon annual lupine forming colonies in wet clay soils in grassy fields (Silveira, TAB; Oswald, TG). Spring. [L. subvexus C.P.Sm.; L. ruber A.Heller]

Lupinus polycarpus Greene – SMALL-FLOWERED LUPINE. Locally common annual lupine in wet clay soils of grassy places (Anderson 78, sparse in N half of refuge; Hanson in 1950; Oswald & Silveira 6026, NW corner of TAB1). Spring. [L. micranthus Guss. misapplied. This lupine is included in L. bicolor Lindl. in The Jepson Manual, but it appears to be clearly distinct in our range.]

Medicago polymorpha L. – COMMON BUR-CLOVER. Common weedy annual forb along roads, on dikes, and in grassy fields (Marshall in 1954; Oswald 6116, TAB2). Some plants have essentially smooth fruits, a variant that is usually not taxonomically recognized (Marshall in 1954). Bur-clover is apparently much more common now than in 1937; Anderson (collection #11) lists it as sparse along the east boundary in Section 35. Spring. [M. polymorpha var. brevissima (Benth.) Heyn; M. hispida Gaertn., including var. confinis (W.D.J.Koch) Burnatt]

Melilotus alba (L.) Medik. – WHITE SWEET-CLOVER. Eurasian native that is found along the edge of marshes, creeks, and roads (Oswald, Wetlands Hiking Trail). Summer.

Melilotus indica (L.) All. – INDIAN SWEET-CLOVER. Common and widespread annual forb along levee roads and ditches and in grassy fields (Anderson 12, gravel pit; Marshall in 1954; Oswald 6043, TS5). Spring.

Robinia pseudoacacia L. – BLACK LOCUST. Several small trees have volunteered along the creek at the headquarters complex. Native to the eastern US. Spring.

Trifolium albopurpureum Torr. & A.Gray var. albopurpureum – INDIAN CLOVER. Reported as common over most of the refuge in 1938 (Anderson 104). It was not found during the 1993–94 survey. Spring.

Trifolium bifidum A. Gray var. decipiens Greene – DECEPTIVE NOTCH-LEAVED CLOVER. Locally common annual in grassy upland and on the banks of seasonally flooded marshes (Oswald 5320 & 5338, TG; probably the clover (#100) referred to T. gracilentum by Anderson in 1938). Spring.

Trifolium ciliatum Benth. – FOOTHILL CLOVER. Reported as common over most of the refuge in 1938 (Anderson 105). It was not found during the 1993–94 survey. Spring. [T. ciliatum Nutt.]


Trifolium ficatum Lindl. – SOUR CLOVER. Apparently common over most of the refuge in 1938 (Anderson 102). Today it is an uncommon annual in adobe soil of grassy fields (Oswald 6040, NE corner of P7; Oswald 6101, NW corner of P7B). Spring.

Trifolium hirtum All. – ROSE CLOVER. Widespread naturalized annual in northern California but apparently uncommon at the refuge (Oswald, edge of the Visitor’s Parking Lot). Native to Eurasia. Spring.

Trifolium microcephalum Pursh – SMALL-HEADED CLOVER. Inconspicuous annual known only from moist soil along a vernaly flooded swale on the northwest side of Cell 3, Tract AB (Oswald 6115). Spring.
Trifolium variegatum Nutt. – WHITE-TIPPED CLOVER. An abundant annual reported to grow over most of the refuge in 1938 (Anderson 98). Today it is only occasionally found on the margins of vernal pools and other vernaly wet depressions (Oswald, NE corner T16). Spring.

Vicia benghalensis L. – RED-FLOWERED VETCH. Uncommon annual forb along roads and in weedy fields (Oswald 5350, NE corner of T41). Native to Europe. Spring.

Vicia sativa L. ssp. sativa – GARDEN VETCH. Herbaceous annual growing in weeds along Norman Rd. (Oswald 6095). Native to Europe. Spring.

Vicia villosa ssp. varia (Host) Corb. – WINTER VETCH. Occasional to locally abundant annual in weedy fields and along roads and ditches (Oswald 5349, NE corner T41). Native to Europe. Spring. [V. villosa var. glabrescens W.D.J.Koch; V. dasycarpa Ten.]

FRANKENIACEAE – FRANKENIA FAMILY

Frankenia salina (Molina) I.M.Johnsl. – ALKALI SEA-HEATH. Ubiquitous herbaceous perennial in alkaline soils of upland fields, seasonally flooded marshes, and borders of vernal pools (Anderson 56, on all alkali spots and barren areas; Hanson 42-50, without a location; Marshall in 1954, without a location; Oswald 5406, TAB3). Late spring and early summer. [C. floribundum (Benth.) B.L.Rob.]

GERANIACEAE – GERANIUM FAMILY

Centaurium muehlenbergii (Griseb.) W. Wright ex Piper – JUNE CENTAURY. Attractive, locally abundant, and widespread annual in drying, grassy fields, along the edge of roads, and on the borders of marshes (Wilbur in 1961; Oswald 5361, SW corner T21). Late spring and early summer. [C. floribundum (Benth.) B.L.Rob.]

Erodium botrys (Cav.) Bertol. – LONG-BEAKED FILAREE. Annual forb on levees, along roads and in parking lots, and in grassy fields (Anderson 85, over entire area; Hanson in 1950, without a location; Oswald 5992, parking lot in the NE corner of T41). Native to southern Europe. Spring.

Erodium brachycarpum (Godr.) Thellung – SHORT-FRUITED FILAREE. Annual forb on levees and in grassy fields (Marshall in 1954, without a location; Oswald 5984, T18). Native to southern Europe. Spring.

Erodium cicutarium (L.) L’Hér. – RED-STEMMED FILAREE. Common annual on roadsides, dikes, and hiking trails, and grassy fields (Anderson 69 & 86, over most of the area; Oswald 5960, Wetlands Hiking Trail in T11). Native to Eurasia. Late winter to spring.

Erodium moschatum (L.) L’Hér. – WHITE-STEMMED FILAREE. Annual in weedy fields and edges of parking areas (Oswald 5953, Parking Area D at NE corner P7). Native to Europe. Early spring.

GERANIUM dissectionum L. – CUT-LEAVED GERANIUM. Common and widespread annual in vernaly wet, marshy places (Oswald 6098, woodlot in NE corner of T31). Native to Europe. Spring.

HYDROPHYLLACEAE – WATER-LEAF FAMILY

Phacelia ciliata Benth. – GREAT VALLEY PHACELIA. Annual forb represented by a single collection in the SNWR herbarium (Hanson in 1952, without a location). It was also reported as a few scattered plants on the refuge in 1938 (Anderson 97). Spring.

JUGLANDACEAE – WALNUT FAMILY

Juglans californica S.Watson var. hindseii Jeps. – NORTHERN CALIFORNIA WALNUT. Small trees, many of nut-bearing age, are scattered along Hunters Creek in the south edge of the refuge. This tree is included in List 1B of the CNPS Inventory, based on endangered native stands in Contra Costa, Napa, and Sacramento counties. It is widely planted along streets and highways in the North Valley and is used as a rootstock for English walnuts. It is now widely naturalized along creeks and rivers. [J. hindseii (Jeps.) Jeps. ex R.E.Sm.]

LAMIACEAE – MINT FAMILY

[Labiatae]

Lamium amplexicaule L. – GIRAFFEHEAD. Weedy annual along roads and in other disturbed places (Oswald 5997, NE side of P10). Native to Eurasia. Early spring.

Lycopus americanus Muhl. ex W.P.C.Bart. – AMERICAN BUGLEWEED. Common herbaceous perennial along the edge of marshes and in other wet places (Anderson 9, W boundary drain); Hanson in 1951, without a location; Marshall in 1954, bank of Logan Creek; Oswald 5638, S edge of TAB3). Summer into fall.

Marrubium vulgare L. – WHITE HOREHOUND. Reported as only a few isolated plants on the refuge in
1937 (Anderson 71, Gravel Pit & drain along W boundary). It is now a common and widespread weedy perennial along roads, dikes, trails, and in other disturbed places (Oswald 6112, TAB). Native to Europe. Spring.

**Mentha arvensis** L. – AMERICAN WILD MINT. Sparse herbaceous perennial reported from the Gravel Pit in 1937 (Anderson 55). It was not relocated during the 1993–94 survey. Late spring and summer.

**Pogogyne zizyphoroides** Benth. – SACRAMENTO POGOXYNE. Apparently rare on the refuge in 1937 (Anderson 58, near ditch W of headquarters). It is now a common and widespread annual forb on the margins of vernal pools and in other vernal wet, grassy places (Oswald 5297, NE corner T16). Spring.

**Stachys stricta** Greene – SONOMA HEDGE-NETTLE. Uncommon herbaceous perennial in wet soil along streams and other wet places (Wilbur & O’Neill in 1961, edge of rice checks; Oswald 5806, edge of Hunters Creek). This plant has a strong, unpleasant odor. Late spring into summer. [Stachys ajugoides Benth. var. stricta (Greene) Jeps.]

**Lentibulariaceae** – BLADDERWORT FAMILY

**Lymnanthes douglasii** R.Br. ssp. rosea (Hartw, ex Benth.) C.T. Mason – ROSY MEADOWFOAM. In 1938, rosy meadowfoam grew in small patches along the north and east boundaries of the refuge (Anderson 80). Today this herbaceous annual is known only from the margin of a small “hog wallow” in adobe soil in the southwest corner of Cell 3, Tract AB, where it is locally abundant (Oswald 6048). The veins in the petals seem to lack the reddish pigment seen in this subspecies on the east side of the valley, while the linear leaflets and prominently ridged nutlets correspond to the ssp. rosea rather than the ssp. nivea of the Inner North Coast Ranges to the west. Early spring.

**Lythraceae** – LOOSESTRIFE FAMILY

1. **Ammannia coccinea** Rottb. – VALLEY REDSTEM. Common annual in shallow water and later on the drying margins of ponds (Hanson 5-51, in a rice field; Oswald 5565, T15). Late spring and summer. [A. auriculata Willd., misapplied]

2. **Ammannia robusta** Heer & Regel – GREAT REDSTEM. Locally abundant annual in shallow water and on the drying beds of marshes (Oswald 5776, SE ¼ T28). Summer.

3. **Lythrum californicum** Torr. & A. Gray – CALIFORNIA LOOSESTRIFE. Rare or overlooked perennial along ditches, often growing among tules (Oswald 5890, T44). Summer and fall.

4. **Lythrum hyssopifolium** L. – HYSSOP LOOSESTRIFE. Common and widespread annual or biennial in drying marshes and on the borders and beds of seasonally flooded fields (Hills in 1982, Oswald 5414, NW corner T1B). Native to Europe. Spring & summer. [Includes L. adsurgens Greene, the perennial form of the species.]

5. **Lythrum trichogynum** Salzm. ex Spreng. – SLENDER-FRUITED LOOSESTRIFE. Common and widespread annual or biennial in drying marshes and seasonally flooded marshes (Oswald & Silveira 5403, TC2). Native to southern Europe. Spring & summer.

**Malvaceae** – MALLOWS

1. Style branches terminating in head-like or truncate stigmas.

2. Bracts below the calyx, petals yellow or orange, carpels 2-9 seeded ....................................................... *Abutilon*

3. Bracts of 1-several small bracts present below the calyx, low spreading plants, petals yellow-white, carpels with a single seed ....................................................... *Malva*

4. Style branches threadlike, longitudinally stigmatic on the inner side.

5. Bracts of 3 small bracts; flowers mostly in axils of regular stem leaves and much shorter than the leaves.

6. Small bracts at base of flower lanceolate to oblong ................................................................. *Malva nicaeensis*

7. Small bracts at base of flower linear.

8. Leaves mostly the width of the calyx (at SNWR?) ................................................................. *Malva neglecta* Willk.

9. Petals narrowly longer than the calyx ................................................................. *Malva parviflora*

10. (Bracts of 1 small bract or none, flowers in rosettes or spikes) ........................................ *Silene*

**Abutilon theophrasti** Medik. – VELVET LEAF. This common weed of surrounding agricultural areas is known at the refuge only from a single wild growing at the vehicle-fueling station at the headquarters complex (Oswald & Silveira 5800). Native to southern Asia. Late summer.

**Malva nicaeensis** All. – BULL MALLOW. Common annual to biennial weed along levees and roads (Marshall in 1956, without a location; Oswald 5534, SE corner Pool 10). Native to Eurasia. Spring.

**Malva parviflora** L. – LITTLE MALLOW. Common and locally abundant weedy annual on and along dike roads (Oswald, SE corner T15). Native to Eurasia. Spring.

**Malvella leprosa** (Ortega) Krapov. – ALKALI-MALLOW. Common and widespread perennial along roads, on alkaline flats, and in grassy fields (Anderson 34, on all alkali spots and barren areas; Hills in 1982, without a location; Oswald & Ahart 5424, along Nor-
man Rd.). Late spring & summer. [Sida hederacea (Douglas) Torr. & A.Gray]


MARTYNIACEAE – UNICORN-PLANT FAMILY

Proboscidea louisianica (Mill.) Tell. ssp. louisiana – COMMON UNICORN-PLANT. Represented by a single collection in the SNWR herbarium (Marshall in 1954). The plant was growing in a rice check. Summer. [Martinia proboscidea Gloxin]

MOLLUGINACEAE – CARPETWEED FAMILY

| Mollugo verticillata L. – INDIAN-CHICKWEED. Uncommon matted annual in roadside gravel (Oswald 5502, parking area at the viewing platform at the SE corner of the Tour Route). Native to tropical America. Late spring and summer. |
|-------------------|-------------------------------------------------|

MOSSACEAE – MULBERRY FAMILY

| Morus alba L. – WHITE MULBERRY. A single tree noted at the rookery in the northeast corner of Tract 37 (Oswald in 1993). Vegetative in September. |
|-------------------|-------------------------------------------------|

MYRTACEAE – MYRTLE FAMILY

| Eucalyptus camaldulensis Delh. – RIVER RED GUM. Tall tree planted at the Headquarters complex (Oswald 5961) and at several other places on the refuge (NE corner of Tract 7). Occasional seedlings volunteer. Native to Australia. Winter and early spring. |
|-------------------|-------------------------------------------------|

OLEACEAE – OLIVE FAMILY

| Olea europaea L. – OLIVE. A few scattered volunteers have been seen on the refuge (Oswald, NE corner of T31, Oswald, NE edge P5). A small grove has also been planted at the headquarters complex. Native to western Asia. |
|-------------------|-------------------------------------------------|

ONAGRACEAE – EVENING-PRIMROSE FAMILY

| Epilobium brachycarpum C. Presl – TALL ANNUAL WILLOWHERB. Locally abundant annual in dry soil along roads and levees (Oswald 5888, Pole Line Rd. along E side of T16 2). Late summer and fall. [E. paniculatum Nutt. ex Torr. & A. Gray, including var. laevicolium (Ryd.) Munz & tracyi (Ryd.) Munz] |
|-------------------|-------------------------------------------------|

OXALIDACEAE – WOOD-SORREL FAMILY

| Oxalis corniculata L. – CREEPING WOOD-SORREL. Common weed in the lawn at the Headquarters Building |
|-------------------|-------------------------------------------------|
PLANTAGINACEAE – PLANTAIN FAMILY

Plantago coronopus L. – CUT-LEAVED PLANTAIN. Common and widespread annual forb on dry roads, in moist clay soils in grassy fields, near vernal pools, and on alkali flats (OSWALD 5309, P11). Native to Europe. Spring.

Plantago elongata Pursh – ELONGATE PLANTAIN. Locally abundant on the drying beds of shallow vernal pools and in other vernal wet places (OSWALD 5310, P11). Spring. [P. bigelovii A.Gray, including ssp. californica (Greene) Bassett]

Plantago erecta E.Morris – ERECT PLANTAIN. Uncommon annual forming localized colonies in grassy fields (OSWALD 5989, SW corner of TAB1). Early spring. [P. hookeriiana Fisch. & C.A.Mey. var. californica (Greene) Poe]

Plantago lanceolata L. – ENGLISH PLANTAIN. Occasional perennial weed of loess and road sides (OSWALD & Ahart 5426, edge of Norman Rd.). Native to Europe. Spring & summer.

POLEMONIACEAE – PHLOX FAMILY

Linanthus bicolor (Nutt.) Greene – BICOLORED LINANTHUS. Small but attractive annual in adobe soil of grassy fields, often forming large populations (OSWALD 5988, SW corner of TAB1). Oswald, grassy flat on W side of P101. Spring.

Navaretia leucocophala Benth. ssp. leucocophala – WHITE-FLOWERED NAVARETTIA. Common and locally abundant along the edge of vernal pools, in seasonally flooded marshes at dry-down, and in vernal wet, grassy fields (ANDERSON 110, abundant over most of the refuge in 1938; OSWALD 5343, NW corner T31). Spring.

POLYGONACEAE – BUCKWHEAT FAMILY

Polygonum amphibium L. var. emersum Michx. – WATER SMARTWEED. Uncommon perennial forming localized colonies along the dry margins of seasonal marshes (OSWALD, south leg of the Tour Route in P1A3). The identification is tentative since all plants have been vegetative to date (in both 1993 and 1994). [P. occidentale Muhl.]

Polygonum arenarium Boreau – COMMON KNOTWEED. Common annual weed in dry soil of roads and paths, where it tends to have a prostrate growth form (ANDERSON 35, uncommon along drains and roads in 1937, MARSHALL in 1954, without a location; OSWALD 5946, NW corner of T53). Native to Europe. The closely related P. aviculare L., to which some of our plants have been routinely referred, is apparently not documented in California (THE JEPSON MANUAL, page 888). Spring and summer.

Polygonum hydropiper L. – WATER-PEPPER. Uncommon annual in shallow water and on wet mud along ditches (OSWALD 5935, Wetlands Hiking Trail on W side T11). Native to Europe. Late summer into fall.

Polygonum amphibium L. var. emersum Michx. – WATER SMARTWEED. Uncommon perennial forming localized colonies along the dry margins of seasonal marshes (OSWALD, south leg of the Tour Route in P1A3). The identification is tentative since all plants have been vegetative to date (in both 1993 and 1994). [P. occidentale Muhl.]

Polygonum lanceolata L. – ENGLISH PLANTAIN. Occasional perennial weed of loess and road sides (OSWALD & Ahart 5426, edge of Norman Rd.). Native to Europe. Spring & summer.

POLEMONIACEAE – PHLOX FAMILY

Linanthus bicolor (Nutt.) Greene – BICOLORED LINANTHUS. Small but attractive annual in adobe soil of grassy fields, often forming large populations (OSWALD 5988, SW corner of TAB1). Oswald, grassy flat on W side of P101. Spring.

Navaretia leucocophala Benth. ssp. leucocophala – WHITE-FLOWERED NAVARETTIA. Common and locally abundant along the edge of vernal pools, in seasonally flooded marshes at dry-down, and in vernal wet, grassy fields (ANDERSON 110, abundant over most of the refuge in 1938; OSWALD 5343, NW corner T31). Spring.

POLYGONACEAE – BUCKWHEAT FAMILY

Polygonum amphibium L. var. emersum Michx. – WATER SMARTWEED. Uncommon perennial forming localized colonies along the dry margins of seasonal marshes (OSWALD, south leg of the Tour Route in P1A3). The identification is tentative since all plants have been vegetative to date (in both 1993 and 1994). [P. occidentale Muhl.]

Polygonum amphibium L. var. emersum Michx. – WATER SMARTWEED. Uncommon perennial forming localized colonies along the dry margins of seasonal marshes (OSWALD, south leg of the Tour Route in P1A3). The identification is tentative since all plants have been vegetative to date (in both 1993 and 1994). [P. occidentale Muhl.]

Polygonum amphibium L. var. emersum Michx. – WATER SMARTWEED. Uncommon perennial forming localized colonies along the dry margins of seasonal marshes (OSWALD, south leg of the Tour Route in P1A3). The identification is tentative since all plants have been vegetative to date (in both 1993 and 1994). [P. occidentale Muhl.]

Polygonum amphibium L. var. emersum Michx. – WATER SMARTWEED. Uncommon perennial forming localized colonies along the dry margins of seasonal marshes (OSWALD, south leg of the Tour Route in P1A3). The identification is tentative since all plants have been vegetative to date (in both 1993 and 1994). [P. occidentale Muhl.]

Polygonum amphibium L. var. emersum Michx. – WATER SMARTWEED. Uncommon perennial forming localized colonies along the dry margins of seasonal marshes (OSWALD, south leg of the Tour Route in P1A3). The identification is tentative since all plants have been vegetative to date (in both 1993 and 1994). [P. occidentale Muhl.]

Polygonum amphibium L. var. emersum Michx. – WATER SMARTWEED. Uncommon perennial forming localized colonies along the dry margins of seasonal marshes (OSWALD, south leg of the Tour Route in P1A3). The identification is tentative since all plants have been vegetative to date (in both 1993 and 1994). [P. occidentale Muhl.]
Rumex crispus L. – CURLY DOCK. Abundant and widespread herbaceous perennial in marshy and grassy fields (Marshall in 1954, without a location; Oswald 6212, NW corner of TAB3). According to Anderson's list, this plant was already common along all of the drains, ditches, canals, lakes, and wet areas in 1937. Native to Eurasia. Spring.

Rumex dentatus L. – TOOTHED DOCK. Common and widespread annual forb on the edges of vernal pools, seasonally flooded marshes, and in other wet, marshy places (Oswald 5303, NE corner T19), Native to Eurasia. Spring. [R. dentatus ssp. klotzschianus (Meisn.) Rech.f.]

PORTULACACEAE – PURSLANE FAMILY
1 Calyx fused with the lower part of the ovary, its lobes coming off the summit of the capsule. Uniforms
2 Calyx and ovary free.  

Calandrinia ciliata (Ruiz & Pav.) DC. – REDMAIDS. Represented by a collection in the SNWR herbarium (Hanson in 1950, without a specific location cited) but not relocated during this study. Although native to California, the plant tends to be weedy. Spring.

Montia fontana L. ssp. amporitana Sennen – WATER MONTIA. Locally abundant annual in vertically wet soil of uplands and depressions in grasslands (Oswald 5699, NW portion of TG). Early spring.

Portulaca oleracea L. – COMMON PURSLANE. Occasional to locally common weed in disturbed places (Wilbur in 1962, N of headquarters; Oswald, edge of Visitor’s Parking at the headquarters complex; Oswald, parking area at viewing platform at SE corner of Tour Route). Native to Europe. Summer.

RANUNCULACEAE – BUTTERCUP FAMILY
1 Flowers several on a leafy stem, with large purple petals and sepals; fruits a capsule. Delphinium
2 Flowers single at the end of a leafless scape or nearly so, with inconspicuous white petals; fruit consisting of many achenes on an elongated receptacle. Myosurus

Delphinium variegatum Torr. & A.Gray ssp. variegatum – ROYAL LARKSPUR. Represented by a collection from along Hwy. 99 near the entrance to the refuge (Kridler in 1956) but not relocated during this study. Spring.

Myosurus minimus L. – TINY MOUSETAIL. Inconspicuous and easily overlooked annual on the drying margins of vernal pools and in other vertically wet drainages and depressions (Oswald 5335, TG). Occasional plants have very short scapes and would key to the ssp. apus (Greene) G.R.Campb., a plant in List 3 of the CNPS Inventory. However, these plants always seem to grow in marginal habitats and are probably best interpreted as depauperate forms of the typical long-scaped plant. Early spring. [Includes var. filiformis Greene & ssp. major (Greene) G.R.Campb.]

Myosurus sessilis S.Watson – SESSI L E MOUSETAIL. Uncommon but locally abundant annual on drying silty mud of shallow, seasonally flooded marshes and muddy-bottomed vernal pools (Oswald 5340, T282). Spring. [M. minimus L. var. sessiliflorus (Huth) G.R.Campb.]

ROSACEAE – ROSE FAMILY
1 Leaves simple. Pyracantha
2 Leaves pinnately compound. Rosa
3 Leaves whorled ternately compound; fruit a blackberry. Rubus

Pyracantha koidzumii (Hayata) Rehder – PYRACANTHA. Known from a single shrub growing along the levee on the south side of Pool 2 (Silveira in 1995). The seeds of pyracantha, a standard horticultural shrub, are dispersed by a number of fruit-eating birds, and it is not uncommon to find waifs in suitable habitat in Northern California. Native to Formosa. Spring.

Rosa multiflora Thurb. ex Murr. – RAMBLER ROSE. Introduced in many of the wildlife areas in the North Valley where it persists and sometimes volunteer. It is locally abundant in the woodland in the northeast corner of Tract 31 (Oswald 6097), forming patches of impenetrable brambles and sometimes climbing into trees. Native to Japan. Spring.

Rubus discolor Weihe & Noes – HIMALAYAN BLACKBERRY. Weedy perennial forming patches of impenetrable brambles along ditches and creeks and in other low places (Oswald, west boundary of refuge along the Wetlands Hiking Trail; Oswald, along Hunters Creek). Native to Eurasia. Spring flowering, the fruits ripening during the summer. [R. procerus Mueller]

RUBIACEAE – MADDER FAMILY
1 Leaves 3-8 in a whorl, fruit roundish, the carpels not curved outward on the inner face. Galium parisiense
2 Leaves 4-5 in a whorl, fruit much longer than broad, the carpels curved outward on the inner face. Galium murale


Galium murale (L.) All. – TINY BEDSTRAW. Inconspicuous but locally common annual weed in roadside gravel along Norman Rd. (Oswald & Ahari 5418). Native to Europe. Spring.

SALICACEAE – WILLOW FAMILY
1 Both with numerous bud scales; scales of catkins cut into narrow lobes; stamens 6-10. Populus
2 Both with a single bud scale; scales of catkins entire; stamens 1-10. Salix

Salix exigua Torr. – GLOBED WILLOW. 4 Tree, leaves narrowly lanceolate, gray-green above and below, catkins yellow, stamens 3–9, catkins appearing with or after the leaves. 5 Salix exigua var. exigua 6 Shrub or small tree; leaves dark green above, paler below, catkins scales black; stamens 7; catkins appearing before the leaves (at SNWR)… Salix lasiocarpa Benth.
7 Leaves definitely pubescent beneath. Leaves of leaves to blue-black, 0.3–4 mm wide, tapering at both ends, grayish-green on both surfaces, catkins yellow, catkins appearing with or after the leaves, the scales yellowish. Salix exigua 8 Leaves laciniate to oblanceolate or oblanceolate, mostly more than 1 cm wide, catkins appearing before the leaves, the scales black (at SNWR)… Salix lasiocarpa Benth.
9 Leaves distinctly toothed. 10 Leaves permanently pubescent beneath… Salix exigua
Populus fremontii S. Watson – FREMONT'S COTTONWOOD. A common tree on the refuge, although not as abundant as the black willow. Scattered trees grow along Logan Creek and other waterways, and it is common in the woodlot in Tract 31 and at the rookery in Tract 37. Early spring.

Salix exigua Nutt. – NARROW-LEAVED WILLOW. Common small tree tending to form small thickets along creeks and in marshy places. It is easily recognized by its graying leaves. Spring. [S. exigua var. stenophylla (Rydby.) C.K. Schneid.; S. hindsiana] Benth., including var. leucodendroides (Rowlee) C.R. Ball & parishiana (Rowlee) C.R. Ball]

Salix gooddingii C.R. Ball – GOODDING'S BLACK WILLOW. This is the most common tree on the refuge, growing along Logan Creek and other waterways. It is also common in the woodlot in Tract 31 and at the rookery in Tract 37. Spring. [S. nigra Marsh. var. vallicola Dudley; S. gooddingii var. variabilis Ball]

Salix lasiocarpa Bebb – RED WILLOW. Occasional tree along streams, marshes, and in woodlots (Oswald, TC). Oswald, Logan Creek along Pg6; Oswald, N edge of P1B, Oswald, rookery in the NE corner of T37. Early spring. [includes var. aragupia (Jeps.) C.R. Ball]

SCROPHULARIACEAE – FIGWORT FAMILY

SCROPHULARIA ANNUA – SEEP MONKEYFLOWER. Common along roads and in other disturbed places (Wilbur in 1961, road edges; Oswald 5503, parking area at viewing platform at SE corner of Tour Route). Native to Europe. Late spring and summer.

Mimulus guttatus Fisch. ex DC. – SEEP MONKEYFLOWER. Common and widespread in moist soil along vernal pools and drainages and on the edges of seasonally flooded marshes (Anderson 83, near Farmer Wate Lake, now approximated by PA1; Oswald 5990, W side of T24). This is a highly variable species in which many taxa have been named. The plants on the refuge are relatively small-flowered annuals. Spring.

Triphyllia eriantha (Benth.) T.I. Chuan & Heckard var. eriantha – JOHNNYTUCK. Common annual forb in grassy places (Hanson in 1952, without a location; Oswald 5968, TG). Spring. [Orthocarpus bidwilliiae A. Gray; O. eriantha Benth. var. erianthus]

Verbascum thapsus L. – MOOTH MULLEIN. Herbaceous biennial that is common along the edge of the Visitor's Parking area at Refuge Headquarters (Oswald 6157). Anderson (collection 21) lists this plant as rare along east boundary south of Norman Rd. in 1937. Native to Eurasia. Spring and summer.

Veronica anagallis-aquatica L. – BLUE WATER SPEEDWELL. Locally abundant herbaceous perennial in ditches, along the edge of seasonally-flooded fields, and in marshy places (Oswald 5305, T2; Oswald, ditch along W boundary bordering the Wetlands Hiking Trail; Oswald, edge of Logan Creek). Native to Europe. Spring.
Veronica peregrina L. ssp. xalapensis (Humb., Bonpl., & Kunth) Fennell – Persilane Speedwell. Common and widespread annual forb forming dense populations on the floor of drying vernal pools, along the edge of seasonally flooded marshes, and in other marshy places (Oswald 5342, T28; Oswald 6089, NE side T16). Spring.

Solanaceae – Nightshade Family

Nicotiana glauca Graham – Tree Tobacco. Erect shrub or small tree represented by a collection in the SNWR herbarium from along Hunter's Creek (O'Neill in 1961). This plant was not relocated during this study. Native to South America. Late summer.

Physalis acutifolia (Miers) Sandwith – Sharp-leaved Ground-Cherry. Known only from a single waif in the parking lot at the Checking Station south of Norman Rd. (Oswald 5817). It is most easily separated from the next species by its larger flowers (10-20 mm wide). Late summer. [P. wrightii A. Gray]

Physalis lanceifolia Nees – Lance-Leaved Ground-Cherry. Occasional weedy annual in localized populations on the dry bed of vernal wet pools and in disturbed places (Wilbur in 1961, in rice checks; Oswald 5690, NW corner of T11). The flowers are relatively small (3-8 mm wide). Native to South America. Summer. [P. angulata L. var. lanceifolia (Nees) Waterf.]

Solanum americanum Mill. – American Black Nightshade. Occasional annual to subshrub along the edge of marshes (Oswald, Wetlands Hiking Trail in T11). Spring and summer. [S. nodiflorum Jacq.]


Tamaricaceae – Tamarisk Family

Tamarix parviflora DC. – Small-flowered Tamarisk. Weedy shrub planted at several locations on the refuge (O'Neill in 1961, T40; Oswald 5358, NE side T31). Native to southeastern Europe. Early spring.

Tamarix ramosissima Ledeb. – Salt-Cedar. An attractive shrub planted at the headquarters complex (Oswald 6210). It blooms later in the spring than T. parviflora, and the flowers are a deeper red color. Native to eastern Asia. Late spring.

Urticaceae – Nettle Family

Urtica dioica L. ssp. holosericea (Nutt.) Thorne – Stinging Nettle. Occasional perennial forming colonies along creeks (Oswald, Logan Creek bordering TH and P11B; Oswald, Hunters Creek in T44). Late spring and summer.

Verbena – Veronica Family

Phyla nodiflora (L.) Greene var. nodiflora – Creeping Lipppa. Locally abundant creeping perennial on the floor of the woodlot in the northeast corner of Tract 31 (Oswald 6410). Late spring and summer. [Lippia nodiflora (L.) Michx. var. repens (Humb., Bonpl., & Kunth) Kuntze]

Phyla nodiflora (L.) Greene var. rosea (D. Don) Munz – Rosy Lippia. Naturalized South American perennial forming mats in lawns, along roads, and on banks of ponds (Oswald 5571, S edge of P10). Late spring and summer. [Lippia nodiflora (L.) Michx. var. rosea (D. Don) Munz]

Verbena litoralis Humb., Bonpl., & Kunth – Shore vervain. Scattered to common tall, clumped, herbaceous perennial along creeks and ditches (Oswald 5636, SW corner of T5; Oswald, Logan Creek; Oswald, Hunters Creek). Native to Central and South America. Late spring & summer. [V. brasiliensis Vell.]

Vitaceae – Grape Family

Vitis californica Benth. – California Grape. Uncommon woody vine climbing on trees along Logan Creek, bordering the east leg of the Tour Route. Late spring.

Zygophyllaceae – Caltrop Family

Tribulus terrestris L. – Puncture-vine. Occasional annual weed in roadside gravel and other disturbed places (O'Neill in 1961, S levee of P5; Oswald & Ahart 5423, along Norman Rd.). Late spring & summer.

Monocot Flowering Plants

Key to Families

1. Flowers 4-merous
2. Calyx becoming large and papery and enclosing the fruit.
3. Corolla yellow, tubes short
4. Corolla blue, tubes short
5. Species distinguished
6. Petals yellow, calyx lobes acute
7. Petals white, calyx lobes obtuse
8. Flowers not concealed
9. Plants larger, with stems, leaves, and usually well-developed roots
10. Plants smaller, with stems, leaves, and usually not well-developed roots
11. Leaves opposite
12. Leaves alternate
13. Flowers in axillary clusters
14. Flowers in terminal clusters
15. Flowers in racemose clusters
16. Flowers in umbellate clusters
17. Flowers in panicles
18. Flowers in thyrses
19. Flowers in cymes
20. Flowers in fascicles
21. Flowers in thyrse
22. Flowers in cyme
23. Flowers in umbel
24. Flowers in raceme
25. Flowers in panicle
26. Flowers in thyrsus
27. Flowers in cyme
28. Flowers in umbel
29. Flowers in raceme
30. Flowers in panicle
31. Flowers in thyrsus
32. Flowers in cyme
33. Flowers in umbel
34. Flowers in raceme
35. Flowers in panicle
36. Flowers in thyrsus
37. Flowers in cyme
38. Flowers in umbel
39. Flowers in raceme
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41. Flowers in thyrsus
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146. Flowers in thyrsus
147. Flowers in cyme
148. Flowers in umbel
149. Flowers in raceme
150. Flowers in panicle
151. Flowers in thyrsus
152. Flowers in cyme
153. Flowers in umbel
154. Flowers in raceme
155. Flowers in panicle
156. Flowers in thyrsus
157. Flowers in cyme
Phoenix canariensis Chabaud – CANARY ISLAND DATE PALM. Occasional volunteer along streams (Os­wald, NE end of T11). Several trees are also planted at Refuge Headquarters.

Washingtonia filifera (L. Lindem) H.A. Wendel. – CALIFORNIA FAN PALM. Several seedlings were noted on the bank of the creek bordering the north side of T11. This native of the Sonoran Desert is commonly planted in the North Valley.

**Cyperaceae – Sedge Family**

1. **Cyperus auritrus** (C.L. & H.) Seem. – Hisable Sedge. Occasional volunteer along streams (Oswald, NE end of T11). Summer.

2. **Cyperus conglomeratus** (J. Smith) C. B. Clarke. – CYPRESS SEDGE. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

3. **Cyperus esculentus** L. – CANARY ISLAND QUACK SEDGE. Common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

4. **Cyperus pachyceps** (Willd.) Trin. ex Steud. – WHEAT FEVERGRASS. Found along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

5. **Cyperus rotundus** L. – BICEFALO SEDGE. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

6. **Cyperus simulans** (Raf.) Hoffm. – CYPRESS SEDGE. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

7. **Echinochloa colona** (L.) Pers. – PYRETHRUM. Widely distributed in the area, found along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

8. **Eriophorum angustifolium** (Rydb.) Scribn. – TUSsock SEDGE. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

9. **Eriophorum vaginatum** L. – SONG SEDGE. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

10. **Juncus arcticus** L. – ARCTIC JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

11. **Juncus effusus** L. – WIDELEAF JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

12. **Juncus inflexus** L. – INCLINED JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

13. **Juncus maritimus** L. – MARITIME JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

14. **Juncus parvisiliquus** L. – SMALL-SPIKE JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

15. **Juncus articulatus** L. – ARCTIC JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

16. **Juncus inflexus** L. – INCLINED JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

17. **Juncus maritimus** L. – MARITIME JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

18. **Juncus parvisiliquus** L. – SMALL-SPIKE JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

19. **Juncus articulatus** L. – ARCTIC JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

20. **Juncus inflexus** L. – INCLINED JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

21. **Juncus maritimus** L. – MARITIME JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

22. **Juncus parvisiliquus** L. – SMALL-SPIKE JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

23. **Juncus articulatus** L. – ARCTIC JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

24. **Juncus inflexus** L. – INCLINED JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

25. **Juncus maritimus** L. – MARITIME JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.

26. **Juncus parvisiliquus** L. – SMALL-SPIKE JUNK. Locally common along the margins of marshy pools (Anderson 2, uncommon in west areas; Hanson in 1951, without a location; Oswald, NE end of T11). Summer.
Eleocharis macrostachya Britton – PALE SPIKE-RUSH. Common and widespread perennial rush forming extensive colonies in marshes, marshy fields, and shallow ponds (Anderson 64, without a specific location; Hanson 18-51, without a location; Oswald 5347, T38²). Spring and summer. [E. palustris (L.) Roem. & Schult., in part]

Eleocharis obtusa (Wildl.)Schult. var. engelmannii (Steud.) Gilly – ENGELMANN’S SPIKE-RUSH. Occasional annual spike-rush forming localized populations on drying mud along the margin of seasonal marshes (Oswald 5450, Wetlands Hiking Trail in T11¹). Spring.

Eleocharis parvula (Roem. & Schult.) Link ex Bluff & Fingerh. – LITTLE-HEADED SPIKE-RUSH. Delicate diminutive perennial forming extensive colonies in shallow water and later on dry mud of alkaline pools (Oswald 5333, TQ). Spring. CNPS Inventory List 4. [Includes the var. coloradoensis (Britton) Beetle]

Scirpus acutus Muhl. ex Bigelow var. occidentalis (S.Watson) Beetle – HARD-STEMMED TULE. Ubiquitous tall perennial sedge forming extensive colonies in marshes (Anderson 62, common in wet places but without a specific location; Hanson in 1951, without a location). Spring.

Scirpus fluviatilis (Torr.) A.Gray – RIVER BULRUSH. Uncommon perennial forming colonies on the edge of marshes (Hanson 12-51, Hanson 15-51, and Marshall in 1954, all without locations; Oswald 5355, E side P10). It is usually growing with S. tuberosus. Spring.

Scirpus maritimus L. – SALTMARSH BULRUSH. Occasional perennial forming colonies on the edge of permanent ponds and seasonally flooded marshes (Hanson in 1951, without a location; Oswald 5339, E side of T21¹). It sometimes forms mixed colonies with S. tuberosus. Spring and summer. [S. paludosus A.Nels.; S. maritimus var. paludosus (A.Nels.) Kükenth.; S. robus­tus Pursh, misapplied]

Scirpus mucronatus L. – ROUGH-SEEDED BULRUSH. Weedy perennial of rice fields and other wet places represented by two old collections in the SNWR herbarium (Marshall in 1951 & Wilbur in 1962, both without specific locations). Native to Eurasia. Summer.

Scirpus tuberosus Desf. – TUBEROUS BULRUSH. Common and widespread perennial sedge forming small to large colonies along the margins of most of the impoundments on the refuge (Hanson in 1951, without a location; Oswald 5303, T3). Native to Europe. Spring. [S. maritimus L. var. tuberosus (Desf.) Roem. & Schult.]

Hydrocharitaceae – WATERWEED FAMILY

[Includes Najadaceae of most western floras]

1 Leaf sheaths typically with ear-like appendages (at SNWR?) Najas graminea Deile
2 Leaf sheaths truncate or rounded, without ear-like appendages Najas guadalupensis

Najas guadalupensis (Spreng.) Magnus – COMMON WATER-NYMPH. Sometimes locally abundant submersed aquatic in shallow water of ponds (Marshall in 1954, without a specific location; Oswald 6464, S side of T11 beside Wetlands Hiking Trail). Summer into fall.

Juncaceae – RUSH FAMILY

1 Indentation seemingly lateral, the lowest bract cylindrical and exactly like a continuation of the stem.
2 Anthrars shorter than to equal to length of bract; plants densely tufted... Juncus effusus
3 Anthrars much longer than bract; plants forming spreading colonies from creeping rootstocks... Juncus bulbosus

Juncus bulbosus Wildl. – BALTIC RUSH. Rhizomatous perennial forming extensive colonies in fields and along roads and creeks (Oswald 6104, SW corner of T39; Oswald, along Hunters Creek; Oswald, S edge of T12¹). Spring.

Juncus bufonius L. var. bufonius – COMMON TOAD RUSH. Locally common in vernal wet fields and along the edge of marshes (Oswald 5366, T15). Spring.

Juncus bufonius var. concolor (S.Watson) T.J.Howell – CONGESTED TOAD RUSH. Locally abundant annual collected in a summer-dry marsh (Oswald 5346, T38²) and probably more widespread. Spring. [J. bufonius var. concolorii (S.Watson) T.J.Howell]

Juncus effusus L. var. pacificus Fernald & Wiegand – PACIFIC RUSH. Densely tufted perennial known only from a single colony growing in a weedy field bordering a tule marsh near the south end of Cell 2 of Tract C (Oswald 5948). Summer.

Lemnaceae – DUCKWEED FAMILY

1 Fried with 3-several nodules... Lemna minor
2 Fried with 1 rootlet...
3 Fried 3-several nodules... Lemna minor
3 Fried with prominent nodal and apical papules Lemna minor
3 Fried with a row of several papules along median, the nodal and apical not distinctly prominent, or papules obscure or lacking
4 Fried often orbicular, swollen on under side with enlarged air spaces, the upper surface often yellowish-green mottled with reddish pigment Lemna gibba
5 Fried often with a row of papules along median, the under side often suffused with reddish pigment Lemna minor
5 Fried smooth or with obscure row of papules on upper surface, not developing reddish pigment below... Lemna minor

Lemna minor Welw. – SUMMER DUCKWEED. Found on one occasion in a ditch at the southeast corner of Cell 5 of Tract 1 (Oswald 5958) where it formed a dense colony. This duckweed can be identified by the prominent nodal and apical papules, which are visible in the field with the aid of a 10X lens. Collected in late October, the plants vegetative. [L. perpusilla Torr., mis­applied]

Lemna gibba L. – INFLATED DUCKWEED. Uncommon but often locally abundant when found floating on the surface of ponds (Oswald 5308, P1). The fronds are dull green and frequently streaked with red. The lower surface is usually noticeably inflated. Most months (plants vegetative).
Lemna minor L. – COMMON DUCKWEED. Locally common in shallow water among tules, especially in the fall of the year (Oswald, near the beginning of the Tour Route, T13b). This species is very similar to L. turionifera and, in the absence of anthocyanin pigment and tur­tious, the two species probably cannot be reliably separated. All plants vegetative.

Lemna minuta Humb., Bonpl. & Kunth – LEAST DUCKWEED. Locally abundant on the margins of flooded ponds and in ditches (Oswald 5953, SW corner TD3; Oswald, between Norman Rd. and T23). All collections vegetative. [L. minima Humb. ex Phil.; L. minuscules Herter].

Lemna turionifera Landolt – TURION DUCKWEED. Occasionally but usually abundant when found in quiet water of ditches and along the edge of marshes (Oswald 5570, S edge of P102; Oswald, between Norman Rd. and T23). It is most reliably separated from L. minor by the development of reddish anthocyanin pigments on the lower surface. The plants also form starch-filled over­wintering bodies (turistic) during late fall and winter. All collections vegetative.

Spirodela polyrhiza (L.) Schleid. – COMMON DUCK­MEAT. Apparently uncommon, at least during this survey in 1993-94. A few plants were found mixed in with a dense population of Lemna minuta on the edge of a recen­tly flooded field (Oswald 5952, SW corner TD3). Plants vegetative.

LILIACEAE – LILY FAMILY

1 Flowers in scape-like umbel.
2 Perianth segments separate or nearly so.
3 Plants without an onion-like odor and taste... Allium
4 Plants with a strong onion-like odor and taste... Lepidium
3 Perianth segments united into a definite basal tube; plants without an onion-like odor and taste... Lepidium
2 Anthriscus
3 Anthriscus Brodiaea
4 Flowers not in scape-like umbel.
5 Green "foliage" consisting of needle-like bracts borne in the scale-like leaves; plant from rhizomes with fleshy tubers... Asparagus
6 Flowers white, style 3, distinct at the base... Zigadenus
7 Flowers yellow; style 1, more or less lobed at the summit... Calochortus

Allium ampeloprasum Torr. – CLASPING ONION. Un­common herbaceous perennial occurring in localized populations in adobe soil of grassy fields (Anderson 91, uncommon in 1938, Oswald 6046, SW corner of TAB3; Oswald 6099, NW corner of P7A4; Silveira, N edge T18). Spring.


Brodiaea coronaria (Salish.) Engl. var. coronaria – HARVEST BRODIAEA. Perennial from a fleshy bulb, typi­cally growing in adobe clay soils. At the refuge, it is known only from scattered colonies in upland grassland in the northwest corner of Tract G (Oswald 5322). Spring.


Muilla mariana (Torr.) S Watson – MUILLA. Bulb­ous perennial in adobe soil of grassy fields, often growing with Zigadenus fremontii (Oswald 6039, TG; Oswald 6047, SW corner of TAB3; Oswald in 1994, W side of P7A4). Spring.

Triteleia laxa Bentham. – ITHURIEL’S SPEAR. Perennia­l from a deep-seated bulb reported as abundant and found almost everywhere on the refuge in 1938 (Anderson 94). It is today known only from a localized population in adobe soil of a grassy flat in northwest corner of Cell 4, Pool 7A (Oswald 6100). Spring. [Brodiaea laxa (Benth.) S Watson]

Zigadenus fremontii (Torr.) Torr. ex S.Watson – FREMONT’S DEATH-CAMAS. Apparently common in 1938 over most of the refuge where the soil was not too wet (Anderson 87). Today only scattered colonies grow in adobe clay of low spots in grassy fields and on the bor­ders of marshy places (Marshall in 1954, entrance at RR; Oswald 5967, TG; Oswald, SW corner of TAB3). Early spring. [Includes vars. ineptus Jeps., minor (Hook. & Arn.) Jeps., & salsus Jeps.]

POACEAE – GRASS FAMILY

[Gramineae]

1 Spikelets with the glumes persistent, the spikelet axis joined above them, 1 to many-flowered; upper lemma frequently empty, spikelet axes often prolonged beyond the upper lemma.
2 Spikelets sessile or nearly so.
3 Spikes usually more than one; spikelets on one side of the axis, forming 1-sided spikes (Tribe Chlorideae).
4 Perianth segments separate or nearly so.
5 Lemmas awned, spikelets 7–12 mm long... Lepidium virginicum
6 Lemmas awned, spikelets 5–7 mm long... Lepidium virginicum
7 Perianth segments in an umbel-like arrangement... Opuntia
8 Spikelets terminal, single, spikelets alternating on opposite sides of the axis (Tribe Hordeae).
9 Spikelets solitary at each node of the spike axis.
10 Spikelets 1-flowered, awnless to awnless in the spike axis.
11 First glume absent, spike straight... Hymenocallis
12 First glume present, spike curved... Parapholis
13 Spikelets 2 to several-flowered, not awnless in the spike axis...
14 Spikelets placed edgewise to the spike axis... Lobelia
15 Spikelets placed flatwise to the spike axis... Byrneria
16 Spikelets 2–3 at each node... Lobelia
17 Spikelets at each node of the spike axis, the lateral pair pedicellate, usually reduced to awns.
18 Plants perennial...
19 Plants annual...
20 Glumes not castaneous... Hordeum marinum
21 Glumes castaneous... Hordeum marinum
22 Flowers in or on spike-like cymes or panicles.
23 Flowers in or on spike-like cymes or panicles.
24 Spikelets 1-flowered... Hordeum marinum
25 Spikelets with 2 sterile or male lemmas below the fertile lemma; spike 1-nerved (Tribe Phalarideae).
26 Spikelets in groups of 7, 1 fertile surrounded by 6 sterile, the group falling entire...
27 Spikelets all sterile, not falling entire in groups...
28 Plants perennial...
29 Plants annual.
30 Glumes broadly winged, pales of spikelet discoid...
31 Glumes wingless, pales linear or oblanceolate... Phalaris aquatica
32 Plants annual.
33 Plants perennial.
Agrostis avenacea J.G. Gmel. - PACIFIC BENT. Common and widespread weedy grass along the edge of marshes and in vernal wetly, grassy fields (Marshall in 1954, without a location; Oswald 5360, SW side T24). Late spring.

Alpeoporus saccatus Vasey - PACIFIC MEADOW-FOXTAIL. Annual common in vernal pools (Oswald 5326, TG). Spring.

Arundo donax L. - GIANT REED. Tall, tufted, bamboo-like perennial along streams, ditches, and marshy fields (Oswald 5366, Wetlands Hiking Trail). Native to Europe. Fall.

Avena barbata Brot. - BARBED OAT. Common and widespread annual along roads and in grassy fields. Native to southern Europe. Spring.

Avena fatua L. - WILD OAT. Annual grass along roads and in grassy fields (Anderson 30, common along large drains and on high ground; Hanson in 1950, without a location; Marshall in 1954, without a location). It is less common than the previous oat, from which it can be separated by the larger spikelets borne on thicker pedicles. The lemmae are pointed but lack the paired bristles found in A. barbata. Native to Europe. Spring.

Briza minor L. - LESSER QUAKING-GRASS. Uncommon or perhaps only inconspicuous annual in grassy fields (Oswald 5348, NE corner T41). Native to southern and western Europe. Spring.

Bromus diandrus Roth - RIPGUT BROME. Coarse annual grass along roads, on dikes, in weedy fields, and in other disturbed places (Hanson in 1950, without a location; Marshall in 1954, without a location). Native to Europe. Spring. [Bromus rigidus Roth]

Bromus hordeaceus L. - SOFT CHESS. Common and widespread grass in upland fields and along roads and ditches (Anderson 34, on rice checks throughout the refuge; Hanson in 1950, without a location; Oswald 6044, T5). Native to Eurasia. Spring. [B. mollis L., B. racemosa L., & B. scoparius L., misapplied]

Cortaderia selloana (Schult.) Asch. & Graebn. – URUGUAYAN PAMPASGRASS. Tall tufted perennial planted near the woodlot in Tract 31. A single clump, which would appear to be of natural origin, is located in T41. Native to eastern South America. Fall.

Crepis schoenoides (L.) Lam. – SWAMP PRICKLEGRASS or SWAMP-TIMOTHY. Common and locally abundant European grass on the dry beds of marshes (Oswald 5409, TAB3) and in roadside gravel. Late spring and summer. [C. vaginiflora (Forssk.) Opiz – AFRICAN PRICKLEGRASS. The first North American collection of this Eurasian annual was made by Burt-Davy at Norman in 1898. In 1937, Anderson lists it as being sparse in the southeast corner of section 25 (Anderson 28). Today it is a widespread and locally abundant weed on the dry beds of seasonally flooded marshes and in summer-dry ponds. Two forms occur on the refuge, sometimes growing side by side. One is very compact, forming small, round, brittle tufts less than 1 dm in diameter (Oswald 5497, NE¼ T18); the other has elongated internodes and forms loose spreading plants 2–3 dm in diameter. John R. Reeder of the University of Arizona has kindly examined a specimen of the latter type (Oswald & Ahart 5415, NE comer of TG). It is similar to C. vaginiflora. Late spring and summer. [C. aculeata (L.) Aiton, misapplied; C. niliaca Fig.]

Cynodon dactylon (L.) Pers. – BERMUDA-GRASS. Reported as uncommon near headquarters in section 15 in 1937 (Anderson 45). Today it is a common perennial forming dense matted colonies in dry marshes and along creeks, ditches, and roads (Oswald & Ahart 5419, edge of Norman Rd.; Oswald, P1A3). Native to Africa. Late spring and summer.

Deschampsia danthonioides (Trin.) Munro ex Benth. – ANNUAL HAIRGRASS. Widespread and locally abundant annual on the margins and drying beds of shallow vernal pools and drainages (Marshall in 1954, without a location). Spring.

Digitaria sanguinalis (L.) Scop. – HAIRY CRABGRASS. Weed in roadside gravel, lawns, and other disturbed places, rarely uncommon at the refuge (O’Neill in 1961, without a location; Oswald & Ahart 5420, along Norman Rd; Oswald, Visitor’s Parking Lot at the headquarters complex). Late spring into fall.

Distichlis spicata (L.) Greene – SALTGRASS. Widespread and locally abundant perennial in low, grassy fields and along marshes, especially in more alkaline places (Anderson 15, over most of the refuge; Hanson in 1951, without a location; Oswald & Ahart 5425, ditch along Norman Rd.). Spring. [Includes var. diversifolia Beetle, nana Beetle, stolonifera Beetle & stricta (Torr.) Beetle]

Echinochloa colona (L.) Link – JUNGLE-RICE. Reported as an uncommon grass in wet areas in 1937 (Anderson 70). It was not relocated during the 1993–94 survey. Native to Eurasia. Summer and fall.

Echinochloa crus-galli (L.) P.Beauv. – WATERGRASS or MILLET. Common along the edge of marshes and in flooded fields, where it is managed for waterfowl (Anderson 42, common along all wet places; Hanson in 1951, without a location; Oswald 5637, NW corner of P1). Native to Eurasia and Africa. Summer.

Elytrigia pontica (Podp.) Holub ssp. pontica – TALL WHEATGRASS. Common tall bunchgrass along roads and in grassy fields (Oswald 5696, along Norman Rd.). It has been seeded in several of the upland tracts in the south part of the refuge. Native to Eurasia. Summer. [Agropyron elongatum (Host) P.Beauv., in part]

Festuca arundinacea Schreb. – TALL FESCUE. Occasional tufted perennial along ditches and creeks (Oswald, Wetlands Hiking Trail in T16; Oswald, along Logan Creek bordering P1A3). Native to Europe. Spring.

Hainardia cylindrica (Willd.) Greuter – BARBGRASS. Uncommon but locally abundant European annual in grassy fields (Oswald 5411, N edge of TAB3; Oswald & Ahart 5413, NE corner of TG). It is superficially similar to sicklegrass (Parapholis incurva), from which it differs in having a straight rather than curved inflorescence and spikelets with single rather than paired glumes. It is not recorded from the northern Sacramento Valley in The Jepson Manual. [Monocotylus cylindrica (Willd.) Coss. & Durand]

Hordeum depressum (Scrbn. & J.G.Sm.) Rydb. – DWARF BARLEY. Common and widespread annual in vernal wet, alkaline soils, often on the borders of vernal pools (Hanson in 1950, without a location; Oswald 5229, NE corner T16). Spring.

Hordeum jubatum L. – FOXTAIL BARLEY. Widespread and attractive grass in roadside ditches, on the edge of marshes, and along shallow drainages in grassy upland fields (Anderson 13, W of headquarters area; Hanson in 1950, without a location; Marshall in 1954, without a location; Oswald 5317, T17). Spring, sometimes heading out again in the fall.

Hordeum marinum Huds. ssp. gussoneanum (Parl.) Thell. – MEDITERRANEAN BARLEY. Common annual along roads, along dry edges of vernal pools, in fields, and in waste places (Anderson 37, found on a few of the rice checks in 1937; Oswald 5301, NE corner T16). Native to Europe. Spring. [H. hystric Roth; H. geniculatum All.]

Hordeum murinum L. ssp. leporinum (Link) Arcang. – HARE BARLEY. Coarse annual on levees, along roads, and in other weedy places (Oswald 5966, Parking Area D in NE corner P7). Native to Europe. Spring. [H. leporinum Link]

Leersia oryzoides (L.) Sw. – RICE CUTGRASS. Common in wet soil or shallow water on the margins of marshes and streams, usually forming spreading colonies (Marshall in 1954, without a location; Oswald 5935, W edge of T113). Summer.

Leptochloa fascicularis (Lam.) A. Gray – BEARED SPRANGLETOP. Common annual on the dry beds of marshes (Hanson 17-51, without a location; Oswald 5499, NE corner of T18). Late spring and summer. [Diplachne fascicularis (Lam.) P. Beauv.]

Leptochloa uninervia (C.Presl) Hitchc. & Chase – MEXICAN SPRANGLETOP. Common grass in drying marshes (Oswald 5407, TAB3). Although listed as an annual, at least some of the plants on the refuge have a distinctly perennial aspect. Late spring. [Diplachne uninervia (C.Presl) Parodi]

Lolium multiflorum Lam. – ANNUAL RYEGRASS. Common and widespread annual grass along roads, in both marshy and upland fields, and in waste places (Marshall, without any data). Native to Europe. Spring.

Orcuttia pilosa Hoover – Hairy ORCUTTGRASS. Rediscovered at the refuge by Joseph Silveira in 1993, this rare annual grows on the dry beds of vernal pools in populations varying from less than 50 plants to more than a thousand individuals (Silveira & Oswald in 1993, P1; Silveira & Oswald in 1993, TC2; Oswald 5403, TAB3; Silveira & Oswald in 1993, TAB3; Silveira & Oswald in 1993, T18). Anderson collected an Orcuttia, which he identified as O. californica, on the damp bed of Farmer Waite Lake (now approximated by Cell 3 of Pool 1A) in 1937. Since O. pilosa was not separated from O. californica until 1941, O. californica would have been the logical choice available to him in Jepson’s Manual of the Flowering Plants of California (1925). Since O. californica as now defined is restricted to southern California, Anderson’s grass can reliably be referred to O. pilosa. CNPS Inventory List 1B. Late spring.

Oryza sativa L. – CULTIVATED RICE. At one time grown on the refuge and represented by an old collection in the SNWR herbarium (Hanson in 1951). Summer.

Panicum capillare L. – WITCHGRASS. Annual grass found in the parking area at the viewing platform at the south-east corner of the Tour Route (Oswald 5693). Summer.

Parapholis incurva (L.) C.E.Hubb. – SICKLEGRASS. Locally abundant European annual on the edges of drying alkaline pools and in vernaly wet grassy fields (Oswald 3313, P11). It is superficially similar to Ha­nardia ciliata diana, from which it differs in having a curved inflorescence and spikelets with paired glumes. It is recorded only from salt marshes along the coast in The Jepson Manual, page 1278. Spring. [Pholiurus incurva (L.) Schisch & Thell.]

Paspalum dilatatum Poir. – DALLISGRASS. Common perennial along marshes and in other wet places (Anderson 22, in drains, canals, ditches, and streams; Oswald, Wetlands Hiking Trail). Native to South America. Spring & summer.

Paspalum distichum L. – KNOTGRASS. Common and locally abundant perennial in shallow water or later on the dry margins of marshes (Oswald, P1A3). Late spring and summer.

Phalaris aquatica L. – HARDING-GRASS or PERL­GRASS. Tufted perennial scattered along roads and marshes and vernal pools (Oswald & Ahart 5416). Native to Mediterranean Europe. Spring. [P. tenoptera Hack.; P. tuberosa L. var. tenoptera (Hack.) Hitchc.]

Phalaris lemmonii Vasey – LEMMON’S CANARY­GRASS. Uncommon annual in shallow vernal pools in upland grassy fields (Oswald 5332, TG). Spring.

Phalaris minor Retz. – LESSER CANARY-GRASS. Occasional weedy annual along canals, creeks, and levees (Oswald 6159, NW corner T163). Native to the Mediterranean region. Spring.

Phalaris paradoxa L. – MEDITERRANEAN CANARY­GRASS. Occasional weedy annual in grassy fields and along roads (Marshall in 1954, without a location; Oswald 5352, NE corner T41). Native to Mediterranean Europe. Spring.

Poa annua L. – ANNUAL BLUEGRASS. Locally common annual on levee roads and in parking lots, lawns, and other disturbed places (Oswald 5963, levee road on N side P7). The plants are often grazed by wa­terfowl. Native to Europe. Spring.

Polypogon maritimus Willd. – MEDITERRANEAN BEARDOGRASS. Locally common annual in drying marshes and vernal pools (Hills in 1982, without a location; Oswald 5345, T18). Native to Mediterranean Europe and Africa. Spring.

Polypogon monspeliensis (L.) Desf. – ANNUAL BEARDOGRASS. Locally abundant annual along the edges of vernal pools, in vernaly wet drainages, and in ditches (Anderson 18, not common along Logan Creek and drains; Hanson in 1950, without a location). Native to southern and western Europe. Spring.

Puccinia simplex Scribn. – LESSER ALKALI­GRASS. Locally abundant annual on the margins of drying alkaline pools and scalds (Oswald 5328, TG). Spring.

Setaria parviflora (Poir.) Kerguelen – PERENNIAL BRISTLEGRASS. Uncommon tufted perennial in roadside ditches along Norman Rd. (Oswald & Ahart 5416). Late Spring. [S. graminicola (Lam.) P. Beauv., misapplied; S. gracilis Kunth]

Setaria pumila (Poir.) Roem. & Schult. – YELLOW BRISTLEGRASS. Annual grass represented by a collection
in the SNWR herbarium (O'Neill in 1961, Norman Rd. along West Canal seeps). Summer, [S. glauca (L.) P. Beauv.; S. lutescens (Weigel) F.T. Hubb.; Chaetochloa lutescens (Weigel) Stuntz]

*Sorghum halepense* (L.) Pers. – JOHNSON GRASS. Common perennial from stout rhizomes in moist to dry places along roads and creeks. Native to the Mediterranean. Late spring and summer.

_Tuctoria greenei_ (Vasey) Reeder – GREENE’S TUCTORIA. A rare annual grass discovered by Joseph Silveira in 1994 (Silveira s.n.). About 55 plants were found on the dry bed of a vernal pool in Cell 1 of Pool 1. The related *Orcuttia pilosa* grows in the same pool. CNPS Inventory List 1B. Late spring. [Orcuttia greenei Vasey]

_Vulpia myuros_ (L.) C.C.Gmel. var. hirsuta Hack. – FOXTAIL FESCUE. Common and locally abundant spring annual in fields, margins of vernal pools, and other grassy places (Oswald 6004, TAB). Native to Europe. Spring. [Festuca megaloura Hack.]

_Vulpia myuros_ (L.) C.C.Gmel. var. myuros – RATTAIL FESCUE. Common and locally abundant spring annual in fields, margins of vernal pools, and other grassy places (Marshall in 1954, without a location; Oswald 5302, NE corner T1). Late spring. [Festuca myuros L.]

**POTAMOGETONACEAE – PONDWEED FAMILY**

1. Leaves all submerged and similar
2. Leaves broad, finely serrate, the margins strongly undulate
   *Potamogeton crispus* L. – CRISPATE-LEAVED PONDWEED. Submerged in flowing water of streams and drainages (Oswald 6412, SW corner of the Tour Route). Native to Eurasia. Summer.

3. Leaves free from the leaves or rounded at the base
   *Potamogeton foliosus* Raf. var. foliosus – LEAFY PONDWEED. Submerged perennial in marshes (Anon. in 1950; Oswald, T15). Summer.

4. Leaves of 3 kinds, fertile (bread and leathery) and submerged (narrow or, if broad, thin)
   *Potamogeton pectinatus* L. – SAGO PONDWEED. Locally abundant submerged perennial in quiet water of deeper ponds and in flowing water of ditches (Anderson 47, in Gravel Pit Lake; Hanson 9-51, without a location; Oswald 5367, gravel pit in TC1; Oswald 5493, ditch near the SW corner of the Tour Route. In the latter plants, the sheath extends past the blade 4-7 mm, forming a hyaline ligule). Spring & summer.

5. Leaves mostly linear, the margins not serrate nor undulate
   *Potamogeton nodosus* Poir. – LONG-LEAVED PONDWEED. Represented by an old collection in the SNWR herbarium (Hanson 9-51, without a location), the plants growing in both running and still water 4-5 ft deep. It is also reported from the canal along Hwy. 99 in 1937 (Anderson 63). Summer. [P. americanus Cham. & Schult.]

**TYPHACEAE – CATTAIl FAMILY**

Typha angustifolia L. – NARROW-LEAVED CATTAIL. Relatively uncommon cattail, forming colonies in marshes (Oswald, S edge of PIA). Late spring.

_Typha domingensis_ Pers. – SOUTHERN CATTAIL. This is the more common of the narrow-leaved cattails in marshy places on the refuge (e.g., between the visitor’s parking area and the headquarters complex). Late spring.

Typha latifolia L. – BROADLEAF CATTAIL. Widespread perennial forming large colonies in marshes, sloughs, and ditches. Late spring.

**ZANNICHELLIIACEAE – HORNED-PONDWEED FAMILY**

_Zannichellia palustris_ L. – HORNED-PONDWEED. Locally abundant submerged perennial in ditches and marshes (Marshall in 1955, without a location; Oswald 5469, west boundary of the refuge near the headquarters complex; Oswald 5574, T30). Spring and summer.
APPENDIX I. Plants growing on the Sacramento National Wildlife Refuge that are listed in the CNPS Inventory of Rare and Endangered Vascular Plants of California (Skinner & Pavlik, 1994).

Astragalus tener var. ferrisiae, List 1B.
Atriplex cordulata, List 1B.
Atriplex depressa, List 1B.
Atriplex joaquiniana, List 1B.
Atriplex persistens, List 1B.
Chamaesyce hooveri, List 1B, PT.
Cordylanthus palmatus, List 1B, CE, FE (transplant populations).
Eleocharis parvula, List 4.
Juglans californica var. hindsii, List 1B (our plants naturalized).
Lepidium latipes var. heckardii, List 1B.
Myosurus minimus ssp. opus, List 3 (identification uncertain; see discussion under M. minimus).
Orcuttia pilosa, List 1B, CE, PE.
Tuctoria greenei, List 1B, CR, PE.

CNPS LISTS

1B Rare, threatened, or endangered in California and elsewhere.
3 Plants about which we need more information—a review list.
4 Plants of limited distribution—a watch list.

STATE LISTS

CE State listed, endangered.
CR State-listed, rare.

FEDERAL LISTS

FE Federally listed, endangered.
PE Federally-proposed, endangered.
PT Federally-proposed, threatened.
APPENDIX II. Plot map showing the distribution of some of the rare plants on the Sacramento National Wildlife Refuge.

- Astragalus tener var. ferrisiae
- Atriplex cordulata
- Atriplex depressa
- Atriplex joaquiniana
- Atriplex persistens
- Chamaesyce hooveri
- Cordyline rhomboidalis
- Lepidium latipes var. heckardii
- Orcuttia pilosa
- Tuctoria greenei
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