

Selected Tidal Marsh Plant Species of the San Francisco Estuary

A Field Identification Guide



Printed March 2007

Prepared for the

San Francisco Estuary Invasive Spartina Project
(a project of the California State Coastal Conservancy)

by

Peter Baye, Ph.D.
Coastal Plant Ecologist

KEY TO SYMBOLS



..... **California Native**



..... **Rare Species**



..... **Invasive Species**



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INTRODUCTION

This guide was prepared to assist Invasive Spartina Project (ISP) staff and volunteers with recognition and accurate field identification of tidal marsh plants that are likely to occur within control project and monitoring sites of the Invasive Spartina Project, San Francisco Estuary, California.

The coverage of tidal marsh plant species conforms with the ISP's geographic and ecological range of activities, from Benicia (North Bay) to Alviso (South Bay). Eastern and northern Suisun Marsh is excluded geographically because the ISP has no project sites there. The geographic scope of this guide is primarily San Francisco and San Pablo Bay, including the extreme western portions of the Suisun Bay and Grizzly Bay area.

The ecological scope of the species covered is limited to periodically flooded tidal wetlands below the upper drift-line zone (tidal litter deposits at high tide line) in saline or brackish (mesohaline) marshes. Species restricted to fresh-brackish (oligohaline) marshes are not included. Species limited to terrestrial ecotones of tidal marshes at the upper limit of tidal action are also excluded, because the upper elevational limit of non-native *Spartina* occurs below this ecological threshold. The species selected include (a) widespread species likely to be found at many ISP project sites; and (b) uncommon or sensitive species that are a concern for monitoring and impact avoidance.

The primary purpose of this field guide is to serve as an introductory photographic reference for rapid preliminary identification of plants found in tidal marshes at invasive Spartina control sites, focusing on recognition characters that do not rely on specialized training in plant morphology. This field guide is intended to be used in conjunction with either county, state, or regional floras with formal identification keys for diagnostic identification. For full contemporary species descriptions, diagnostic characters, and keys to the genera and species, the following sources are currently (2006) recommended:

Hickman, J.C., ed. 1993. The Jepson Manual: Higher Plants of California. University of California Press.

Corrections and nomenclature updates for the Jepson Manual: Jepson Flora Project, <http://ucjeps.berkeley.edu>

eFloras <http://www.efloras.org>

Flora of North America (online): <http://hua.huh.harvard.edu/FNA/families.shtml>

Best, C., J.T. Howell, W. & I Knight, and M. Wells. 1996. A Flora of Sonoma County. California Native Plant Society. (Generally applicable to Marin and Sonoma County, following Jepson Manual treatment; needs updating)

Some closely related or similar species are treated together in this field guide, with species contrasts noted. Exhaustive species treatments are not given here in complex genera; they are given as references to similar species where diagnostic keys are required for identification.

For verification of field-identified plants, particularly for ambiguous specimens or uncertain determinations, voucher specimens (pressed herbarium specimens) and photographs of live plants (whole plants and details of shoots, leaves, flowers, fruits) are recommended.

The field guide is divided into broad-leaf plants and graminoids [grasslike plants: grasses, sedges, rushes, bulrushes, etc.], ordered by family and genus, in alphabetical order. The relatively small local tidal marsh flora and emphasis on visual recognition precludes the need for a master key.

Plants are listed in this field guide under nomenclature used in the 1993 Jepson Manual, for practical reference. For reporting and publication, contemporary nomenclature (revised scientifically accepted

and widely used taxonomy) rather than 1993 Jepson Manual taxonomy is recommended, however. Currently accepted botanical names are given where appropriate, based on taxonomic revisions published in the Flora of North America. Familiar, persistent synonyms found in older references are also cited. Some additional information on technically complicated taxonomic revisions of important, widespread species is given in Appendix 1.

Families generally follow the Jepson Manual, with a few exceptions of widely accepted realignments of families, such as the former Chenopodiaceae.

Simplified habitat descriptions specific to the San Francisco Estuary are provided to help clarify geographic distributions, and provide supplemental information for identification. These descriptions refer to salt marsh, brackish marsh, and fresh-brackish marsh. These marsh types are often informal terms that refer to vegetation assemblages as well as actual or inferred salinity gradients. Formal classifications of saline wetlands based on salinity alone also exist for fresh-brackish (oligohaline), brackish (mesohaline, mixohaline) and salt (euhaline, polyhaline) marshes, but their applicability may depend on climate and seasonal patterns of salinity variation.

For practical purposes, “**salt marsh**” **vegetation** here refers to marshes dominated by pickleweed (*Salicornia*, *Sarcocornia*), cordgrass (*Spartina*), and saltgrass (*Distichlis*), and supports almost entirely halophytes (specialized salt-tolerant species), with summer soil salinities usually ranging from marine salinity (34 ppt or above) to at least 20 ppt most years.

“**Brackish marsh**” **vegetation** in our region is characterized by the dominance of sedge family species (tules, bulrushes; *Scirpus* (= *Schoenoplectus*, *Bolboschoenus*) spp. in the low to mid-marsh zone, and the relative high frequency of rushes (*Juncus* spp.) in the high marsh zone. Brackish marsh salinity ranges in the summer generally do not exceed 18 ppt for long periods (weeks), at which threshold dieback or senescence of sedge family species generally occurs. Brackish marshes often include relatively unspecialized species with marginal salt tolerance.

“**Fresh-brackish marsh**” **vegetation** is indicated by presence of cattails (*Typha*) in the low marsh zone in addition to tules and bulrushes, and presence of unspecialized or salt-intolerant freshwater marsh plants with significant frequency in the vegetation. Summer soil salinity of fresh-brackish marshes generally does not exceed 5 ppt in the root zone during the growing season.

This field guide also refers to different tidal marsh zones in habitat descriptions. **Zonation** of tidal marsh vegetation according to tidal elevations does not exist as in idealized, classic textbooks based on early 20th century European and Atlantic U.S. salt marsh studies. Tidal ranges and tidal datums vary significantly within the San Francisco Estuary, and vegetation response to hydroperiods varies with salinity, competition, tidal drainage patterns, and other factors. Therefore, tidal elevations do not closely correlate with vertical distribution of plant species across the Estuary. For qualitative descriptions of relative marsh zones, however, low, middle, and high tidal marsh can be practically distinguished and recognized visually with ease. **Low marsh** generally refers to marsh near mean tide level (mean sea level) that is regularly submerged each day, and is almost always emergent each day as well. Low marsh vegetation is almost always dominated by grasslike plants, and it may extend to Mean Low Water where tidal range and salinity is low (1 m or less, and less than 18 ppt; sedge family species generally dominant). But it usually approximates Mean Tide Line to Mean High Water where tidal range is near 2 m and salinity approaches marine concentrations in summer (cordgrass dominant). Where **semi-diurnal tides** (two unequal high and low tides each day) occur, as on the Pacific coast, **middle and high marsh zones** are distinguished. The **middle marsh** zone is submerged only by the higher high tides, and lies between Mean High Water and Mean Higher High water. The middle marsh zone dominates the marsh plain in mature tidal wetlands. The **high marsh zone** of the Pacific coast is infrequently flooded by tidal waters, mostly during spring tides of summer and winter. The high marsh zone lies above Mean Higher High Water, but its upper limits are poorly defined, and are influenced by storm surges, soil drainage, and soil types. High marsh zones occur along well-developed banks of some old tidal channels, and along landward edges of

tidal marshes (or edges of dikes, levees). The highest drift-lines often correspond to a shift in the gradient (**ecotone**, or transition zone) between high tidal marsh and terrestrial vegetation.

Note that many widespread terrestrial plant species occur incidentally in the upper tidal marsh edges, particularly in brackish or fresh-brackish tidal marshes. Most plants in the San Francisco Bay area have at least some tolerance to low levels of soil salinity (1-2 ppt; significant physiological stress usually occurs around 5 ppt for non-halophytes). The occurrence of salt-intolerant, generalist plant species in tidal marsh edges often reflects the terrestrial and weed floras of adjacent terrestrial habitats, and results from seed rain, rather than from stable integration into tidal marsh vegetation. Only a selected set of terrestrial species are included in this guide, limited to a few that occur regularly in assemblages dominated by salt or brackish marsh indicator species.

This guide was prepared for exclusive use by the ISP and the California State Coastal Conservancy. Because the ISP specializes in detection and identification of *Spartina* species often including cryptic hybrids, the genus is not included in this treatment.

Version 1.0 of this guide is based on the author's experience and a field test of the first draft of the guide with the ISP staff in June, 2006, at species-rich Marin County tidal salt marsh sites. Occasional revisions of the guide are expected with ongoing use, upon request by the ISP.

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BROADLEAF PLANTS

CARPETWEED FAMILY (Aizoaceae)



Iceplant, sea-fig, Hottentot-fig

Carpobrotus chilensis (Molina) N. E. Brown, *Carpobrotus edulis x chilensis* (Molina) N. E. Brown

Synonym: *Mesembryanthemum edule x M. chilense* (in older references)

Family: Aizoaceae (carpetweed family)

San Francisco Estuary range: Throughout.

Habitat: Terrestrial, with clonal spread into high tidal marsh zone; brackish or salt marshes, levees.

Recognition characters: Forms dense, creeping, prostrate, semi-woody clonal mats with coarse succulent shoots, deep green to purplish succulent leaves and stems; leaves triangular in cross-section, with clear tissue inside resembling ice. Flowers resemble pinkish to yellowish sea-anemones.

Diagnostic (key) characters: Pinkish flowers indicate hybridization with *C. chilense*, which is itself of hybrid origin.

Similar species: Related but dissimilar small annual *Mesembryanthemum nodiflorum* has tiny cylindrical leaves, drab dull yellow and tiny flowers.

Comments: Invasive non-native incorrectly identified as native in older texts. Pure *C. edulis* is rare if it exists; most populations are hybrid.



Slender-leaf iceplant

Mesembryanthemum nodiflorum L.

Family: Aizoaceae (carpetweed family)

San Francisco Estuary range: San Francisco and San Pablo Bays.

Habitat: Salt pond levees, hypersaline high marsh or dry pans, in sparse vegetation or gaps.

Recognition characters: Succulent annual with prostrate to ascending linear to cylindrical succulent foliage and shoots, often red at maturity. Dull white to yellowish flowers.

Similar species: *M. crystallinum* of marine coastal bluffs has flat, broad leaves, and seldom if ever occurs in SF Bay.

Comments: Non-native minor weed from South Africa.



New Zealand spinach

Tetragonia tetragonioides (Pallas) Kuntze

Family: Aizoaceae (carpetweed family)

San Francisco Estuary range: Throughout.

Habitat: High tidal marsh zone, levees.

Recognition characters: Fleshy flat triangular leaves on thick, branched stems, forming large prostrate masses; very large, angular, marble-sized detached dry fruits.

Comments: Invasive non-native weed, edible but tough unless growth is rapid and soft.

AMARANTH FAMILY (Amaranthaceae)



Spearscale (US, UK); fat-hen (regional vernacular name)

Atriplex triangularis Willdenow.

Current Botanical name: *Atriplex prostrata* Boucher ex de Candolle (Appendix 1)

Family: Amaranthaceae (traditionally Chenopodiaceae)

San Francisco Estuary range: Throughout.

Habitat: High and middle tidal marsh zones.

Recognition characters: Triangular leaves with basal lobes pointing backwards (hastate); striated reddish stems; mealy leaf surface; annual in tidal litter or disturbed marsh or intact closed vegetation.

Diagnostic (key) characters: Fruits, leaf shape

Similar species: Many, including *A. coronata*, *A. joaquiniana*, *A. patula* (subspecies *hastata* name also misapplied to *A. prostrata*), *A. rosea*, *Chenopodium chenopodioides*, *Chenopodium rubrum*. Check keys for diagnostic character comparison.

Comments: Widespread, possibly early introduction (non-native) in California, but seldom overabundant or dominant.



Wild beet

Jepson Manual name: *Beta vulgaris* L.

Family: Amaranthaceae (traditionally Chenopodiaceae)

San Francisco Estuary range: San Francisco Bay; rarely to San Pablo, Suisun bays.

Habitat: Disturbed soil of high tidal salt or brackish marsh edges.

Recognition characters: Taprooted, single crown with rosette of leaves or single main stem; looks like bolted, pale Swiss chard (same species); harsh taste. Broad, somewhat glossy leaves, curled under along edge; sometimes nearly leafless in fruit.

Similar species: Resembles related *Bassia*, *Atriplex*, *Chenopodium* species in aspect.

Comments: Non-native but not invasive. Common in SF Bay.



Above, left: erect *S. europaea*; above, right: decumbent (sprawling) *S. virginica*.
Below: large colony of *S. europaea* in fall color.



Annual pickleweed

Salicornia europaea L.

Synonyms: *S. depressa*, *S. rubra* Nelson

Family: Amaranthaceae (Amaranth family; traditionally in Chenopodiaceae)

San Francisco Estuary range: Sporadic throughout estuary, mostly San Francisco and San Pablo bays.

Habitat: Upper tidal mudflats, barren gaps in salt marsh vegetation, salt pans.

Recognition characters: Single-trunk bushy individual plants with ascending branches, colonizing bare mud. No woody perennial tissues. Bright crimson by mid-October: contrast with dull reddish green *S. virginica*.

Diagnostic (key) characters: Annual; lacks woody base or buds; branches not rooting on contact with mud.

Similar species: *S. bigelovii* (S. California, introduced to Humboldt Bay), *Salicornia virginica*.

Comments: Native to California, also to Europe, Atlantic U.S. Uncommon but locally abundant where it occurs in unstable, ephemeral populations.



Pickleweed

Salicornia subterminalis Parish

Current Botanical name: *Arthrocnemum subterminale* (Parish) Standley

Family: Amaranthaceae (Amaranth family; traditionally in Chenopodiaceae)

San Francisco Estuary range: Warm Springs, Fremont vicinity, San Francisco Bay; Suisun Bay, Grizzly Bay area.

Habitat: Dry upper high salt marsh ecotone with alkali grassland, high marsh salt pans.

Recognition characters: Very similar to *S. virginica* (*Sarcocornia pacifica*), but *S. virginica* has inconspicuous flowers clustered in axils (internodes) to the end of shoot tips; growth habit contrasts with *S. virginica*: *S. subterminalis* has relatively regular, geometric, decurrent ("christmas-tree") branching habit.

Diagnostic (key) characters: Distal 5-14 nodes of shoot tips lack flowers.

Similar species: *Salicornia virginica* (*Sarcocornia pacifica*).

Comments: Uncommon, but often overlooked.



Pickleweed, perennial pickleweed

Salicornia virginica L.

Current Botanical name: *Sarcocornia pacifica* (Standley) A. J. Scott, in part; *S. perennis* (Miller) A.J. Scott, in part (northwest, possibly Central California).

Family: Amaranthaceae (Amaranth family; traditionally in Chenopodiaceae)

San Francisco Estuary range: Throughout.

Habitat: Middle and high tidal marsh zones, salt or brackish marshes; also diked nontidal seasonal saline wetlands.

Recognition characters: Succulent leafless cylindrical jointed stems, semi-woody base, shrubby erect irregular branches or creeping growth habit; gray-brown in winter, green spring-summer, drab reddish green in fall.

Similar species: *S. europaea* is annual with single trunk, geometric branching, bright crimson by mid-October; upper mudflats, often mixed with *Spartina*. *Arthrocnemum subterminale* has geometric branch patterns, vegetative shoot tips.

Comments: Native dominant or abundant in tidal marsh vegetation. Perennial/woody species of former *Salicornia* are now placed in *Sarcocornia* or *Arthrocnemum*.



Mediterranean saltwort

Salsola soda L.

Family: Amaranthaceae (traditional Chenopodiaceae)

San Francisco Estuary range: Throughout, but mostly San Francisco and San Pablo bays.

Habitat: Often abundant, mostly high tide shorelines and disturbed marsh patches among shoreline debris, but also found in intact closed-cover salt marsh vegetation, especially along well-drained banks of channels and ditches.

Recognition characters: Cylindrical succulent leaves lacking rigid needle-like tips, often reddish to brilliant red in summer/fall. Annual.

Diagnostic (key) characters: Succulent foliage even in fruit, cylindrical leaves, no sharp spines.

Similar species: *Salsola tragus* Linnaeus (*S. kali* misappl.). Occasionally reported in estuary, particularly eastern Suisun Bay and Delta. *S. tragus* has harsh spine-tipped leaves, and bracts (leaf-like appendages below flowers and fruits) with non-green, transparent margins.

Comments: Invasive non-native species.



California sea-blite

Suaeda californica S. Watson

Family: Amaranthaceae (traditional Chenopodiaceae)

San Francisco Estuary range: Historic range in Central and South Bay (to Palo Alto), contemporary (2006) reintroduced range is San Francisco Peninsula; additional reintroductions are proposed by U.S. Fish and Wildlife in Berkeley, Oakland, San Leandro.

Habitat: Sandy high salt marsh, local sand or shell estuarine beaches in high tide line.

Recognition characters: Low pale gray-green semi-woody shrub growing from sprawling branched trunk; short linear fleshy leaves, inconspicuous pale green flowers in axils of leaves.

Diagnostic (key) characters: Leafy bracts extend to tips of flowering or fruiting branches, leaves at least as long as internodes (spaces between leaf axils); plant is hairless or nearly so.

Similar species: *Suaeda calceoliformis* (horned sea-blite) is a native annual high tide shoreline plant, rare in the San Francisco estuary, reported mostly from eastern San Pablo Bay and Suisun Bay. Its flowers have calyx lobes with distinctive horns and lateral wings. *S. moquinii* (seepweed) occurs in nontidal salt marshes and subsaline seasonal wetlands (dry flats in summer) in Fremont, is usually reddish-green in summer, has short, cylindrical, widely spaced leaves (internodes longer than leaves), and terminal leafless clusters of flowers (very small bracts) and fruits at branch tips.

Comments: Rare in San Francisco Bay, but current localities (Pier 94, Pier 98) are adjacent to hybrid *Spartina alterniflora* x *foliosa* colonies.

CARROT FAMILY (Apiaceae)



Wild celery

Apium graveolens Linnaeus

Family: Apiaceae (carrot family)

San Francisco Estuary range: Suisun Marsh.

Habitat: Brackish to fresh-brackish marsh, middle marsh and high marsh zone.

Recognition characters: Celery-scented leaves and seeds; typical white parsley/carrot inflorescence in early summer; celery leaf shape; tall perennial or annual in fruit; stalks yellow to yellow-brown by late summer, with celery seed attached.

Diagnostic (key) characters: Celery scent of foliage, dry fruits (seeds).

Similar species: *Oenanthe sarmentosa*, *Cicuta maculata*, *Sium suave*. These species are generally toxic, scented, but lacking distinctive celery scent.

Comments: Non-native invasive weed. Locally abundant at Suisun Marsh. Scarce elsewhere.



Mason's lilaopsis

Lilaeopsis masonii Mathias & Constance

Family: Apiaceae (carrot family)

San Francisco Estuary range: Lower Tolay Creek (San Pablo Bay) east. Uncommon, local.

Habitat: Low, sparse turf-like brackish marsh vegetation, often on exposed wave-scoured or eroding marsh banks.

Recognition characters: Creeping decumbent or prostrate rhizomatous forb; leaves reduced to hollow cylindric structures lacking blades; tiny white flowers lacking petals (calyx resembles petals). Leaves may be erect when plants grow beneath taller vegetation, nearly prostrate on exposed substrate.

Diagnostic (key) characters: Hollow, cylindrical leaves less than 1 mm wide without well-developed cross bars.

Similar species: *L. occidentalis* occurs primarily on lagoon shores of outer coast; leaves cross-barred and appear jointed; leaves usually 1 mm or thicker. Its leaves are often erect or ascending, inflated and hollow. *Eleocharis parvula* is somewhat similar in aspect and size, but its inflorescence is a tiny brownish acute spike. Its leaves are relatively rigid, erect, and not hollow.



Ditch-carrot, water-parsley

Oenanthe sarmentosa J.S. Presl.

Family: Apiaceae (carrot family)

San Francisco Estuary range: Mostly northern San Pablo Bay and Suisun Bay and eastward.

Habitat: Brackish, fresh-brackish middle marsh zone and creek banks, and nontidal freshwater marshes.

Recognition characters: Spreading horizontally by above-ground stems, climbing with support of taller plants; compound leaves resemble parsnip or celery leaves; white carrot-like flowers.

Similar species: *Conium maculatum* (coarse erect annual, fern-like leaves; often purple-spotted stem), *Sium suave* (coarse erect perennial, large compound leaves with lance-shaped segments)

Comments: Common in fresh-brackish ditches, channel edges.

ASTER FAMILY (Asteraceae)Left: *A. lentus*. Above: *A. chilensis*.detail *A. lentus*. photo: Doreen Smith**Suisun Marsh aster and Pacific aster***Aster lentus* Greene and *A. chilensis* Nees**Current Botanical names:** *A. lentus* = *Symphyotrichum lentum* (Greene) Nesom;*A. chilensis* = *Symphyotrichum chilense* var. *invenustum* (Greene) Nesom (Appendix 1)**Family:** Asteraceae (aster family)**San Francisco Estuary range:** Mostly in Suisun and Grizzly Bay area; also Napa-Sonoma Marshes.**Habitat:** High brackish to fresh-brackish tidal marsh zone.**Recognition characters:** Clonal colonies of erect shoots, narrow alternate leaves; in flower, pale lavender “daisy” flowers with distinct ray and yellow disc florets; in fruit, clusters of “blowball” heads (plumed/pappus seed-like dry fruits).**Diagnostic (key) characters:** Phyllaries on flowerheads distinguish these intergrading species, at least sometimes; need hand lens to view this trait.**Similar species:** Vegetative appearance closely resembles *Euthamia occidentalis*, which is easily distinguished in flower by all-yellow all-disc florets, no lavender ray florets.**Comments.** These aster species naturally intergrade and are difficult to distinguish in some populations. Both are rare in tidal marsh edges of the region, and *A. lentus* is globally rare. *A. chilensis* in tidal marsh habitats may be an evolutionarily distinct wetland ecotype; treat as a sensitive species.



Saltmarsh mulefat, saltmarsh baccharis

Baccharis douglasii DC.

Family: Asteraceae (aster family)

San Francisco Estuary range: Infrequent throughout estuary.

Habitat: High brackish marsh edges.

Recognition characters: Sticky-resinous foliage, clonal colonies of erect, tall semi-woody, mostly herbaceous shoots with few branches; white flowerheads in flat-topped clusters, like everlasting, in summer, fall.

Similar species: Related *B. salicifolia* sometimes occurs at margins of tidal marshes, particularly near freshwater stream mouths, fresh-brackish marshes. Does not resemble familiar congener, coyote-brush (*Baccharis pilularis*).



Coyote-brush

Baccharis pilularis DC.

Family: Asteraceae (aster family)

San Francisco Estuary range: Throughout.

Habitat: Terrestrial edges of high brackish tidal marsh, levees; uplands.

Recognition characters: Densely branched shrub with evergreen, hard, small wedge-shaped or oblong leaves; rounded crowns; up to 2 m tall; often abundant. Plumed seeds are abundant in fall on seed-bearing plants. Small white flowers.

Similar Species: *Isocoma menziesii* ssp. *vernonioides*, coast goldenbush, woody only at base; leaves longer (1-4 cm), small yellow flowers; *Brickellia californica*, leaves longer (1-6 cm), slightly hairy, often clustered.

Comments: Can be invasive on disturbed soils; seldom dominant in intact tidal marsh edge vegetation.



Brass-buttons

Cotula coronopifolia L.

Family: Asteraceae (aster family)

San Francisco Estuary range:

Throughout.

Habitat: High and middle marsh zones, brackish or salt; edges of salt pans, saline seasonal wetlands, usually in sparse or disturbed vegetation.

Recognition characters: Variable form: amphibious floating aquatic forms (flooded pans, seasonal

wetland pools) and strict, short, terrestrial forms. Smooth, fleshy, irregularly lobed leaves and stems; leaves alternate; broad (approximately 1 cm) yellow button-like circular flowerheads on long stalks; flowers with small disc florets, no ray florets.

Similar species: *Lasthenia glaberrima*, flowers with rays 1 mm long; leaves opposite. *Cotula australis*, leaves alternate, hairy clasp stem; small flowerheads (2-5 mm wide).

Comments: Mostly perennial, but can behave as annual in desiccated wetlands.



Western goldenrod

Euthamia occidentalis Nuttall

Synonym: *Solidago occidentalis* (Nuttall) Torrey & A. Gray

Family: Asteraceae (aster family)

San Francisco Estuary range: Mostly San Pablo and Suisun, Grizzly Bay areas.

Habitat: High tidal brackish marsh zone, freshwater and riparian wetland habitats.

Recognition characters: All-yellow flowerheads on tall, slender, erect stems in dense creeping clonal colonies, narrow lance-shaped leaves

Diagnostic (key) characters: Yellow flowerheads

Similar species: In vegetative state, similar to *Aster chilensis*, *A. lentus* of same high brackish tidal marsh habitats. These have purple flowers.

Comments: Clonal, colonial perennial, locally abundant.

San Francisco Bay gumplant

Grindelia stricta de Candolle var. *angustifolia* (A. Gray)
M.A. Lane

Family: Asteraceae (aster family)

San Francisco Estuary range: Throughout; intergrades with *G. camporum* in Suisun Bay, Grizzly Bay area.

Habitat: Mostly high tidal marsh along well-drained banks of tidal creeks; also high marsh zone, brackish and salt marsh.

Recognition characters: Bright yellow daisy-like flowers in open panicles, white-gummy resinous flowerheads with recurved phyllaries, bushy, highly branched sub-shrubs with fleshy deep green leaves

Diagnostic (key) characters: Subshrub in tidal marsh; erect habit, semi-evergreen.

Similar species: *Grindelia camporum* (terrestrial)

Comments: natural hybrid zone in Suisun Bay area; intermediates with yellowish, less fleshy leaves, panicles with small bracts, less evergreen, habit more perennial than subshrub.



SCCA



Poverty-weed

Iva axillaris Pursh ssp. *robustior* (Hook.) Bassett

Family: Asteraceae (aster family)

San Francisco Estuary range: Scattered localities, uncommon throughout Estuary.

Habitat: Gravelly tidal marsh edges, natural marsh berms, sandy or gravelly estuarine shores.

Recognition characters: Creeping low-growing colonies, gray-green elliptical leaves, inconspicuous ragweed-like flowers and fruits.

Similar species: *Cressa truxillensis* has similar appearance, but is prostrate, fine-stemmed.



Jaumea

Jaumea carnosa (Lessing) A. Gray

Family: Asteraceae (aster family)

San Francisco Estuary range: Throughout, but most frequent west of Suisun Bay.

Habitat: Middle and high tidal marsh zones, salt or brackish marsh.

Recognition characters: Fleshy gray-green leaves, prostrate stems; yellow flowerheads. Foliage aromatic.

Comments: Widespread, often common. Locally abundant in marsh plains, forming large, pale gray-green patches.



Rayless smooth goldfields

Lasthenia glaberrima DC.

Family: Asteraceae (aster family)

San Francisco Estuary range: Toly Creek east through Suisun and Grizzly Bay area.

Habitat: Poorly drained brackish tidal marsh, high or middle marsh zone; edges of tidal ponds, nearby vernal pools.

Recognition characters: Annual with lax, spreading, soft but brittle stems, clambering in adjacent vegetation in spring; yellow flowers lack ray florets. Withered by summer.

Diagnostic (key) characters: Phyllaries fused (sheath-like green covering around flowerhead); absent or undeveloped ray florets.

Similar species: Sometimes misidentified or overlooked as *Cotula coronopifolia*, especially before flowering.

Comments: Becoming rare in brackish tidal marshes.



Smooth goldfields, yellow-rayed goldfields

Lasthenia glabrata Lindley **ssp. glabrata**

Family: Asteraceae (aster family)

San Francisco Estuary range: Eastern Petaluma Marsh to eastern Montezuma Slough. Historically in SF Bay.

Habitat: High brackish marsh zone in sparse vegetation, or edges of salt pans. Also in vernal pools, seasonal wetlands inland.

Recognition characters: Erect spring annual plant with yellow daisy-like flowers, few branches; usually in colonies.

Diagnostic (key) characters: Large yellow rays, partially fused phyllaries.

Similar species: Garland chrysanthemum (*Chrysanthemum coronarium*) is much larger and is limited to disturbed, weedy urban marsh edges above tide line.

Comments: Becoming rare in brackish or saline tidal marshes.



SCCR



Salt marsh fleabane

Pluchea odorata (L.) Cass.

Family: Asteraceae (aster family)

San Francisco Estuary range: Suisun and Grizzly Bay area, east to Carquinez Strait (Southampton Marsh vicinity).

Habitat: Brackish high marsh, often near channel banks.

Recognition characters: Erect perennial less than 1 m tall, with soft pubescent gray-green glandular leaves, strongly scented. Pale pink-violet flowerheads appear late summer to fall.





Marsh ragwort, butterweed

Senecio hydrophilus Nutt.

Family: Asteraceae (aster family)

San Francisco Estuary range: Northeastern Napa Marsh, Carquinez straits and east to Delta. Formerly found in south San Francisco Bay, where it is likely extirpated. Uncommon.

Habitat: High fresh-brackish tidal marsh zone, especially near well-drained banks of tidal creeks or ditches. Also in non-tidal brackish or alkaline marshes outside the Estuary.

Recognition characters: Thick, smooth somewhat fleshy large elliptic leaves, somewhat like mule's-ears (*Wyethia* spp.), spreading or upright on erect, tall hollow shoot 1 m high or more. Clusters of yellow flowerheads, often lacking rays.

BORAGE FAMILY (Boraginaceae)



Menzies' fiddleneck

Amsinckia menziesii (Lehmann) Nelson & J.F. McBride

Family: Boraginaceae (borage family)

San Francisco Estuary range: Throughout, but sparsely distributed.

Habitat: High tidal marsh ecotone, and adjacent levees.

Recognition characters: Robust annual plants with rough, hispid broad leaves, orange-yellow to rich yellow flowers on elongate branches of inflorescence, slightly coiled at tip; flowering March-April most years.

Similar species Two varieties of *A. menziesii* are recognized. *A. m.* var. *menziesii* has pale yellow flowers only 5-7 mm long, mostly included within the green calyx. *A. m.* var. *intermedia* (shown in photo above) has larger (7-20 mm) orange-yellow flowers with floral tubes extending beyond calyx; more common in baylands. *A. spectabilis* is locally common along tidal marsh edges of the outer coast; lobes of its calyx are partially fused together, not separated as in *A. menziesii*.



Wild heliotrope

Heliotropium curassavicum Linnaeus.

Family: Boraginaceae (borage family)

San Francisco Estuary range: Widely scattered localities in south bay, Suisun Bay area.

Habitat: High tidal marsh and arid upland ecotone, often in silty or sandy sediment.

Recognition characters: Fleshy glaucous foliage (whitish waxy bloom) appearing blue-green to yellowish gray-green. Shoots form sprawling clumps emerging from perennial crown or taproot; shoots also spreading from lateral roots. Inflorescence has coiled branches with dull white (fresh) to maroon-tinged (in maturity) flowers.

Similar species: No perennial congeners or similar species in estuary. Annual popcorn flowers (*Plagiobothrys*) may occur in high brackish tidal marsh.



Popcorn flower

Plagiobothrys bracteatus (T.J. Howell) I.M. Johnston.

Family: Boraginaceae (borage family)

San Francisco Estuary range: Mostly northern San Pablo Bay to Suisun and Grizzly Bay area; also in vernal pools, similar seasonal wetlands.

Habitat: High brackish tidal marsh, near high tide line or in fresh-brackish depressions, ecotones with seasonal wetland depressions in alkaline to subsaline grassland.

Recognition characters: Slender prostrate or ascending stems, highly branched from base, annual, with tiny white 5-petal flowers on flowering branches coiled near tip.

Similar species: *P. stipitatus* also occurs in tidal marsh edges; growth habit generally ascending to erect, lacking well-developed leafy bracts in most of inflorescences; diagnostic characters are microscopic, technical features of seed-like nutlets and attachment to base of flower. Otherwise similar in overall appearance.

MUSTARD FAMILY (Brassicaceae)



Broadleaf pepperweed, slough mustard, whitetop

Lepidium latifolium L.

Family: Brassicaceae (mustard family)

San Francisco Estuary range: Throughout region, but most abundant in brackish marshes.

Habitat: Middle and high tidal brackish marsh zones, high salt marsh zone, levees, subsaline seasonal wetlands.

Recognition characters: Masses of tiny white flowers, horseradish-scented coarse roots, colonial root-suckering clonal growth habit, dense to monotypic stands of erect, strict stems.

Diagnostic (key) characters: Silicles (dry fruits) notched at tip but not winged, smooth tall leafy stems, leaves not clasping stem; perennial crowns and roots.

Similar species: *Cardaria draba* is highly similar, but mostly restricted to eastern Suisun Marsh. All native *Lepidium* species in tidal marshes are tiny annuals, infrequent and seldom detected.

Comments: Extremely invasive non-native clonal perennial forb.



Radish

Raphanus sativus L.

Family: Brassicaceae (mustard family)

San Francisco Estuary range: Throughout.

Habitat: High marsh zone and terrestrial ecotone, levees; generally disturbed, weedy terrestrial habitats.

Recognition characters: Masses of white, lavender, or occasionally dull and pale yellow 4-petal flowers on tall, branched stalks; juvenile plants with rosettes of lobed leaves.

Similar species: *Brassica nigra* (usually terrestrial; pale yellow flowers; beak of fruit shorter, slender).

Comments: Of the terrestrial wild mustard species found near tidal marshes, radish commonly establishes within drift-lines and high tidal marsh vegetation, among tidal marsh dominant species like saltgrass, pickleweed. It is most abundant (often dominant) on disturbed levees, a primary seed source.

CARNATION OR PINK FAMILY (Caryophyllaceae)



Perennial saltmarsh sand spurrey

Spergularia macrotheca (Hornem.) Heynh.

Family: Caryophyllaceae (carnation or pink family)

San Francisco Estuary range: Sporadic throughout, more frequent in salt marshes.

Habitat: High and middle tidal marsh zone, brackish and salt marsh. Also on coastal bluffs in central San Francisco Bay and outer coast.

Recognition characters: Perennial taproot, fleshy narrowly triangular leaves, glandular (sticky-hairy) inflorescence, pink or white 5-petal small flowers.

Diagnostic (key) characters: Perennial, 7-10 stamens; glandular-hairy calyx persists in fruit.

Similar species: All *Spergularia* spp., but only *S. macrotheca* has fleshy perennial taproot in high tidal marsh.

Comments: Uncommon native, more frequent in outer coast bays.



Annual saltmarsh sand spurrey

Spergularia marina (L.) Grisb.

Current botanical name: *S. salina* J.S. Presl. & C. Presl.

Family: Caryophyllaceae (carnation or pink family)

San Francisco Estuary range: Throughout.

Habitat: Middle and high tidal marsh zones, salt or brackish marsh. Often found in bare or sparsely vegetated patches, pan edges.

Recognition characters: Low-growing annual forb, slender stems, 5-petal light pink flowers, succulent narrow leaves. Leaves are often covered with silt film after high tides in San Francisco Bay because this species often grows at lower tidal elevations than *S. macrotheca*.

Diagnostic (key) characters: 2-5 stamens, seeds 0.3-0.7 (0.8) mm

Similar species: *Spergularia media* (6-10 stamens), *S. macrotheca* (perennial taproot, 7-10 stamens).

Comment: Native annual.

MORNING-GLORY FAMILY (Convolvulaceae)



Alkali-weed

Cressa truxillensis Kunth

Family: Convolvulaceae (morning-glory family)

San Francisco Estuary range: Mostly Suisun and Grizzly Bay area, where it is most common; infrequent in San Francisco Bay, San Pablo Bay.

Habitat: High tidal marsh and terrestrial grassland ecotone, brackish or salt marsh; alkali grasslands.

Recognition characters: Prostrate creeping shoots from rhizomes, forming low-growing sparse or dense stands; whitish gray-green pubescent narrow leaves, inconspicuous flowers in summer. Often occurs in harsh, dry soils (sand, compacted silty sand, or gravel) with stunted *Distichlis*, *Frankenia*, and terrestrial grasses.

Similar species: *Iva axillaris* is coarser, with erect branches and larger elliptic and obtuse leaves. *Frankenia salina* lacks whitish gray-green pubescent leaves.

DODDER FAMILY (Cuscutaceae)



Salt marsh dodder

Cuscuta salina Engelman var. *major*

Family: Cuscutaceae (dodder family)

San Francisco Estuary range: Throughout.

Habitat: High and middle tidal marsh zones, brackish or salt, associated with non-graminoid halophytes.

Recognition characters: Conspicuous orange-yellow to rich orange masses of tangled wire-like stems completely blanket host vegetation in patches ranging from less than a square foot to hundreds of acres of tidal marsh, visible from planes or aerial photos. Patches sometimes proliferate whitish bell-shaped small flowers.

Diagnostic (key) characters: Multiple varieties are recognized; var. *major* is expected in tidal salt marshes within San Francisco Estuary, distinguished by minor and variable floral characters.

Similar species: Other terrestrial *Cuscuta* species

Comments: Full parasite on stems of host plants, usually broadleaf halophyte forbs or shrubs. Pickleweed is most common host. Can become dominant over large areas of high marsh edges or marsh plains, and may cause dieback of host vegetation, vegetation gaps.

PEA FAMILY (Fabaceae)



Bird's-foot trefoil

Lotus corniculatus L.

Family: Fabaceae (pea family)

San Francisco Estuary range: Throughout.

Habitat: Brackish high marsh zone, terrestrial grassland ecotone.

Recognition characters: Bright yellow clusters of pea flowers spring and summer, dark green foliage, low-growing perennial forbs with taproot and persistent crown.

Similar species: No other yellow-flowered forbs with pea-like flowers within brackish marsh.

Comments: Non-native, becoming locally invasive in wet years.

FRANKENIA FAMILY (Frankeniaceae)



Alkali-heath

Frankenia salina (Molina) I.M. Johnston

Family: Frankeniaceae (frankenian family)

San Francisco Estuary range: Throughout.

Habitat: High tidal marsh zone and upper middle marsh zone.

Recognition characters: Small 5-petal pinkish flowers on evergreen subshrubby to perennial mounding or spreading plant, small elliptical non-fleshy leaves, fine branches; spreading locally in clumps by root-suckers.

Diagnostic (key) characters: No congeners in our region.

Similar species: Vague resemblance to *Spergularia* species in general aspect of flowers, but *Frankenia* is a branched semi-woody subshrub.

Comments: Common species throughout Estuary.

GENTIAN FAMILY (Gentianaceae)



Centaury, canchalangua

Centaureum venustum (A. Gray) Robinson

Family: Gentianaceae (gentian family)

San Francisco Estuary range: Throughout, but more common in North Bay and east to Delta.

Habitat: High tidal marsh and grassland ecotone with sparse cover, alkali or subsaline grassland, seasonal wetlands.

Recognition characters: Annual forb with clusters of pink 5-petal flowers in erect panicles, on erect plants 10-30+ cm tall, sessile (stalkless) opposite elliptic leaves. Flowers appear in May-July, persisting even when soil is dry and other annuals have withered. Center of pink flower has white “rim” and throat. Fruit is dry, slender capsule.

Similar species: There are several closely related and easily confused *Centaureum* species, some native, some non-native. Some nominally native species may be misclassified introduced European species. *C. muehlenbergii* (treated in Jepson Manual as native, but possibly = *C. pulchellum* of Europe) is widespread in seasonal wetlands, especially in the North Bay. It is distinguished by small petals (less than 5 mm), a pink rather than white throat of the floral tube (see photo above), sessile (stalkless) flowers, and flat-topped inflorescence. *C. davyi* (native) has slightly larger petals (to 7 mm), but occurs mostly on the outer coast in seasonal wetlands and sandy flats within dunes. *C. trichanthum* (native) has a stigma that appears to lack lobes, in contrast with the lobed fan-like stigma of *C. venusta* (see photo above; blue arrow = stigma). *C. trichanthum* intergrades with *C. venustum*.

Diagnostic characters: Very difficult because of intergradation among similar species, and some taxonomic confusion as well.

LOOSESTRIFE FAMILY (Lythraceae)



Hyssop-leaf loosestrife

Lythrum hyssopifolium L.

Family: Lythraceae (loosestrife family)

San Francisco Estuary range: Throughout.

Habitat: Brackish tidal marsh, middle marsh zone; subsaline or nonsaline seasonal wetlands, vernal pools.

Recognition characters: Erect annual, generally unbranched, with small oblong-elliptic leaves (basal leaves opposite, alternate above), 4 to 7 petals on pale pink small tubular flowers in leaf axils; narrow erect seed capsules on drying plants. Usually withering and dry by summer, but stems and capsules persist.

Similar species: *Lythrum californicum* is perennial, much larger (0.5 – 1 m), and restricted to delta and eastern Suisun Marsh.

Comments: Widespread naturalized non-native annual, seldom dominant.

BROOMRAPE FAMILY (Orobanchaceae)



Salt marsh owl's-clover, johnny-nip

Castilleja ambigua* ssp. *ambigua

Family: Orobanchaceae (traditionally Scrophulariaceae, broad-sense)

San Francisco Estuary range: historically widespread; reduced to Point Pinole and Southhampton Marsh local populations.

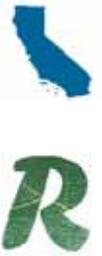
Habitat: High tidal salt marsh, brackish marsh zones, edges of salt pan (Point Pinole), or within seep-influenced rush-dominated marsh (Southhampton).

Recognition characters: Typically forms colonies of spring-flowering owl's clover with showy white-tipped bracts (tinged purple at Point Pinole), yellowish tubular flowers (maturing purplish at Point Pinole).

Diagnostic (key) characters: SF Estuary and Tomales Bay populations do not conform with current Jepson key and plant descriptions, geographic ranges, for named subspecies of *C. ambigua*. Pinole population approximates ssp. *insalutata* endemic of Monterey, unpublished var. *purpureotincta* of D. Keck (CAS). May be more than one taxon within SF estuary and adjacent grasslands; distinct morphological and geographic traits. Needs work.

Similar species: *Cordylanthus maritimus*, *Castilleja densiflora*.

Comments: Flowering time for detection is Mar-April (Point Pinole), May-June (Southhampton). Annuals wither by early summer.



Soft bird's-beak

Cordylanthus mollis Benth. **ssp. mollis**

Family: Orobanchaceae (traditionally Scrophulariaceae, broad-sense)

San Francisco Estuary range: Napa River to Point Pinole, through Suisun and Grizzly Bay area. Historically southwest to Corte Madera.

Habitat: High tidal brackish or salt marsh zone, edges of salt pans. Typically in sparse, low non-graminoid vegetation.

Recognition characters: Salt-crustured hairs (or brine-dewdrops in fog) on gray leaves with dense hairs, low ascending stems among supporting adjacent vegetation, or spreading on nearly barren marsh soil; pale cream-yellow tubular flowers early to late summer, infrequent to fall.

Diagnostic (key) characters: As above.

Similar species: *Castilleja ambigua*, *Cordylanthus maritimus*. Neither of these species has pure cream-yellow corollas and strongly gray-green salt-crustured hairy foliage with ascending tall stems.

Comments: Hemi-parasitic annual on roots of adjacent broadleaf tidal marsh plants for some water. Federally endangered.



Northern salt marsh bird's-beak; Point Reyes bird's-beak (misnomer)

***Cordylanthus maritimus* Benth. ssp. *palustris* (Behr) Chuang & Heckard**

Family: Orobanchaceae (traditionally Scrophulariaceae, broad-sense)

San Francisco Estuary range: Richardson Bay to Petaluma Marsh, Marin and Sonoma Counties. Historically throughout San Francisco Bay.

Habitat: High salt marsh zone, often in low, sparse vegetation (including vegetated edges of high marsh salt pans) in association with *Limonium* or very short *Salicornia virginica* and other annual halophytes with short stature. Substrate is usually either old salt marsh peat or stony, sandy, or compacted terrestrial clay soil.

Recognition characters: Purplish-green or gray-green hairy foliage with salt crystals (arid air) or brine droplets (in fog); whitish to pale rose tubular flowers with dark red-purple or brownish-red tips, protruding from leafy green or purplish-green bracts.

Diagnostic (key) characters: red-purple tipped snapdragon-like flowers, leafy dark green or gray-green bracts, sparsely hairy; sometimes with salt crystals.

Similar species: *Castilleja ambigua*, *C. mollis*. Only *C. maritimus* has deep reddish purple-tipped 'lips' of flower. Rarely mistaken with *Bellardia trixago* (non-native)

Comments: Flowers mostly June-July. Difficult to detect when not in flower; need local reference population to develop search image for surveys.

PLANTAGINACEAE Plantain family



Rattail plantain

Plantago coronopus L.

Family: Plantaginaceae

San Francisco Estuary range: Throughout.

Habitat: Disturbed edges of salt or brackish marshes, occasionally in high marsh zone, seldom in middle marsh zone (except in brackish marshes). Also in hard-packed terrestrial soils, levees, bluffs, roadsides, especially in or near saline habitats.

Recognition characters: Compact spikes on rosettes with spreading leaves. The leaves of *P. coronopus* almost always have linear lobes or are deeply cut, except in very small, stunted individuals. They are generally coarsely hairy and spreading nearly flat, seldom ascending like those of *P. maritima*, except in dense, crowded vegetation.

Similar species: *Plantago maritima* has leaves that are never lobed and always hairless or nearly so.

Comments: Invasive non-native annual to perennial forb of upper salt marsh edges, levees.



Dwarf plantain

Plantago elongata Pursh.

Family: Plantaginaceae Suisun Bay area within San Francisco Estuary, but rarely reported; easily overlooked.

San Francisco Estuary range: Throughout, mostly brackish high marshes, low marsh turfs or pool edges, North Bay; rare in South Bay; formerly common in 19th century according to Greene.

Habitat: Uncommon in well-drained brackish tidal marshes; more frequently associated with intermittent emergent brackish lagoon shores, pool, pan, or pond edges with nearly bare substrate (often sandy or silty) or very sparse cover.

Recognition characters: A miniature plantain, annual rosette of erect, linear leaves and a compact spike, usually withering by summer, and often purplish in maturity, up to 10 cm tall but usually only a few cm high and highly inconspicuous.

Similar species: Unlikely to be confused with robust perennial *Plantago* species, but somewhat similar to *Limosella* spp (mudworts) found in eastern Suisun and Grizzly Bay and Delta, and in vernal pools.

Comments: *P. bigelovii* A. Gray is considered a synonym of *P. elongata*.



Seaside plantain

Plantago maritima L.

Family: Plantaginaceae (Plantain family)

San Francisco Estuary range: Throughout, but found mostly around Golden Gate (Richardson Bay and San Francisco Peninsula); more common on outer coast salt marshes and coastal bluffs.

Habitat: Middle and high salt marsh zones, typically in relatively sparse or low vegetation, or colonizing gaps. Often associated with sandy or old peaty salt marshes with low, turf-like cover and high diversity of low-growing forbs and graminoids (*Jaumea carnosa*, *Triglochin* spp., *Limonium californicum*, *Spergularia* spp., etc.).

Recognition characters: Compact spike 8-18 cm long with cylindrical scape (stalk), growing from taprooted rosette of ascending or erect, firm, succulent linear leaves, convex on outer side, concave on inner side.

Similar species: Resembles a small version of the widespread *Triglochin maritima*, a true monocot with flower parts (anthers, carpels) usually six in number, and a well-developed transparent non-green ligule at the point of attachment to the leaf-sheath at the base of the plant. *Triglochin concinna* is extensively creeping (no taproot or rosette) and has flower parts in 3's or 6's. Calyx of *P. maritima* flowers is 4-lobed. *Plantago coronopus* has leaves that are almost always lobed, and are always flattened and slightly hairy, but it may approach *P. maritima* in aspect (overall morphology), size, and habitat. *Plantago subnuda* occurs in fresh-brackish tidal marshes, but has very broad blades.

Comments: Native to Pacific, Atlantic North American coasts, and in Europe. Resembles a grasslike (monocot) plant in vegetative form, but belongs to a broad-leaf family. The typical salt marsh form (or ecotype) of *P. maritima* with linear, succulent, and usually ascending to erect leaves was formerly distinguished taxonomically as var. *juncooides* (rush-like). Salt marsh populations are generally well differentiated and distinct from broadleaf, spreading rosettes of bluff form of *P. maritima* in this region.

BUCKWHEAT FAMILY (Polygonaceae)



Detail of large, achene (seed-like fruit) and flower of *P. marinense*.

Knotweeds; common knotweed, Marin knotweed

Polygonum arenastrum Boreau (common knotweed), *Polygonum marinense* T. Mert & Raven (Marin knotweed)/ *P. robertii* Lois, *Polygonum patulum* M. Bieb, *Polygonum prolificum* (Small) Robinson

Family: Polygonaceae (buckwheat family)

San Francisco Estuary range: San Rafael Bay north and east to Suisun and Grizzly Bay area.

Habitat: Brackish high and middle marsh zone, sometimes salt marsh, growing through adjacent vegetation.

Recognition characters: This suite of similar annual knotweeds has slender spreading or prostrate stems, lance-shaped or narrowly elliptic green leaves, and membranous non-green stipules sheathing stems at leaf axils. They are variable, and their taxonomy is relatively uncertain as well. *P. marinense* is distinguished by shiny black-to-olive-brown, seed-like dry fruits 3.5 – 4.5 mm long, relatively large compared with similar species; the others have dull-coated, smaller fruits. They are highly similar in overall appearance, and require careful keying of multiple specimens for accurate identification. Refer to Jepson Manual key.

Comments: *P. marinense*, once presumed to be a rare endemic species of Point Reyes tidal marshes, has been suspected of being a misidentified non-native species, *P. robertii* of the Mediterranean. Its rapid recent spread through the northern San Francisco Estuary (San Rafael Bay, Napa Marsh, Suisun Bay area) in the last two decades is consistent with invasive non-native species status. The other knotweeds listed here are all non-native and fairly common in tidal brackish marshes of the North Bay and Suisun Marsh/Martinez marshes.



Curly dock

Rumex crispus L.

Family: Polygonaceae (buckwheat family)

San Francisco Estuary range: Throughout

Habitat: Brackish high marsh and terrestrial ecotone.

Recognition characters: Erect, strict panicles of flowers and bract-covered fruits, brown at maturity, with inflated tubercles surrounding dry fruits. Large lance-shaped leaves.

Similar species: *Rumex occidentalis*, distinguished by pinkish flower bracts lacking tubercles.

Comments: Widespread non-native weed. Native perennial *Rumex salicifolius* occurs mostly along the outer coast marshes, and has spreading or nearly prostrate stems with fleshy leaves.



Golden dock, sea dock

Rumex maritimus L.

Family: Polygonaceae (buckwheat family)

San Francisco Estuary range: Throughout; sporadic.

Habitat: Brackish or salt marsh, often in debris near or in high tide line, occasionally in middle marsh zone.

Recognition characters: Yellow-green to golden-yellow dry fruits in clusters of leaves on erect stems, with projecting teeth at margins of dry fruits.

Similar species: *R. crispus* lacks teeth on edges of fruits.

Comments: Native shoreline “weed” of bays, tidal marshes, and ocean shores. Often overlooked.





Western dock

Rumex occidentalis S. Watson

Family: Polygonaceae (buckwheat family)

San Francisco Estuary range: Northern San Pablo Bay east through Suisun and Grizzly Bay area.

Habitat: Brackish high marsh, fresh-brackish marsh.

Recognition characters: Large, somewhat thickened or fleshy, broadly lance-shaped leaves, tall flowering stems; pinkish panicles of immature fruits in spring/early summer, brownish-pink by fall.

Diagnostic (key) characters: Lack of tubercles (air-filled swellings around seeds) in dry fruits.

Similar species: *Rumex obtusifolius* (non-native; tubercles on fruits), *R. crispus* (non-native; green to dark brown tubercled fruits), *R. salicifolius* (native; leathery leaves, prostrate growth habit, dull yellowish-green flowers, and pale fruits).

Comments: Native; uncommon, rare in drought years, common in some areas in wet years.

PRIMROSE FAMILY (Primulaceae)



Sea-milkwort

***Glaux maritima* L.**

Family: Primulaceae (primrose family)

San Francisco Estuary range: Lower Tolay Creek east through Suisun and Grizzly Bay area; historically throughout estuary.

Habitat: Brackish middle marsh zone.

Recognition characters: Forming colonies; succulent short leaves tightly arranged; prostrate or with ascending branches within adjacent low vegetation; five-merous whitish to pale brown-purple rotate flowers, solitary in leaf axils at stem; flowers lack true petals; sepals act as petals.

Similar species: None.

Comments: Distribution along northern North American and European coasts, native; more common northward.

ROSE FAMILY (Rosaceae)



Silverweed

Potentilla anserina L

Current synonym: *Argentina anserina* (L.) Rydb.

Family: Rosaceae (rose family)

San Francisco Estuary range: Throughout, but most common in northern San Pablo Bay and Suisun, Grizzly Bay area.

Habitat: Middle and high brackish tidal marsh zone.

Recognition characters: Resembles yellow-flowered strawberry plant with creeping above-ground runners, but with compound leaves; leaves have silky silver-white undersides, green above; stolons and aerial roots are often pink.

Comments: Often associated with *Juncus balticus* (*J. arcticus*)

Grasses and Graminoids

(Grasses, sedges, rushes, other monocots)

[CARROT FAMILY (Apiaceae): see *Lilaeopsis masonii*, exceptional grass-like morphology within a broad-leaf family]

SEDGE FAMILY (Cyperaceae)



Clustered field sedge

Carex praegracilis W. Boott

Family: Cyperaceae (sedge family)

San Francisco Estuary range: Potentially throughout, but most remaining modern localities are north of the Golden Gate.

Habitat: Middle and high tidal marsh zone, particularly in brackish marsh; usually found at terrestrial ecotones with freshwater seeps or streams, but sometimes on edges of old, undisturbed levees.

Recognition characters: Dense clonal turfs of fine grass-like stems and slender (1-3 mm wide) leaves, small flowerheads and seed heads.

Diagnostic (key) characters: See key for *Carex*, preferably in county or regional flora for shortest key.

Similar species: Many *Carex* species, but few similar species occur in saline/brackish tidal marshes (*C. densa*, leaves 3-8 mm wide). In vegetative state, resembles other tidal marsh graminoids in gross morphology: *Festuca rubra*, *Juncus gerardii* (both regionally rare in tidal marsh), *Spartina patens*.

Comments: Often overlooked, but uncommon in remaining tidal marshes.



Common or creeping spikerush

Eleocharis macrostachya Britton

Family: Cyperaceae (sedge family)

San Francisco Estuary range: Throughout, but common only in brackish marshes of San Pablo, and especially Suisun, Grizzly Bay area.

Habitat: Middle brackish tidal marsh zone; high marsh where freshwater seeps, drainages occur.

Recognition characters: Colonial, extensively rhizomatous; cylindrical, hollow or spongy, soft leaves; spring leaves soon yellow and die in response to dryness or salinity; vertical spike-like inflorescence.

Similar species: Resembles rush (*Juncus*) species in aspect, but leaves are soft and deciduous.



Dwarf spikerush

Eleocharis parvula (Roemer & Schultes) Link

Family: Cyperaceae (sedge family)

San Francisco Estuary range: Northern San Pablo Bay, Suisun and Grizzly Bay area.

Habitat: Turf-like, eroded brackish middle marsh; tidal brackish pan beds, brackish ditch beds, seasonal brackish pond beds, sometimes co-dominant with *Ruppia*.

Recognition characters: Tiny thread-like tufts.

Similar species: Closely resembles *Isolepis (Scirpus) cernuus* vegetatively, and easily mistaken with it, overlooked. Gross similarity to *Juncus bufonius*.

Comments: Reportedly rare, but may be locally abundant where it occurs.



Tule, hardstem tule

Scirpus acutus Bigelow

Current Botanical name: *Schoenoplectus acutus*

Family: Cyperaceae (sedge family)

San Francisco Estuary range: Throughout.

Habitat: Brackish to freshwater perennial nontidal or tidal marshes, low tidal marsh zone (to shallow subtidal in microtidal western delta).

Recognition characters: Tall (2-4 m), dense, often monotypic colonies from extensively creeping rhizomes, entirely cylindrical stems, bladeless; often grayish-green or blue-grayish green.

Diagnostic (key) characters: Stems are round in cross-section, not angled like those of *S. californicus*; floral bract is spotted, awn contorted.

Similar species: Very similar to *Scirpus (Schoenoplectus) californicus*, with which it hybridizes and forms intermediates, not uncommon in some areas of Suisun Marsh. *S. californicus* is obtusely 3-angled (rounded triangular in cross-section) on at least a portion of the stem. *S. acutus* has cylindrical stems and is often more blue-green, but inflorescences are similar in gross appearance.

Comments: Frequently dominant in brackish tidal and nontidal marshes. Highly important traditional textile plant of Native Americans inhabiting Delta and Bay Area. Can out-compete early-invading cattails or cordgrasses in brackish marshes during primary marsh succession.



Three-square bulrush, chairmaker's rush

Scirpus americanus Pers.

Current Botanical name: *Schoenoplectus americanus*

Invalid synonym: *S. olneyi* A. Gray (misapplied traditionally to *S. americanus*)

Family: Cyperaceae (sedge family)

San Francisco Estuary range: Primarily northern Estuary.

Habitat: Middle brackish tidal marsh zone, usually in poorly drained portions of the marsh plain interior.

Recognition characters: Extensive colonies from widely creeping rhizomes; culms strongly concave, prominently angled 3-sided erect culms; small compact inflorescence appearing lateral below tip of culm; dark green or dark olive-green.

Diagnostic (key) characters: Long rhizomes, strongly 3-angled culms, compact head-like panicles.

Similar species: General aspect of tules, but concave 3-angled stems are distinctive.

Comments: Nomenclature often confused with *S. pungens* due to misapplication of name *S. americanus* to this taxon in older (Munz, Thomas, etc.) California floras and references.



Tule

Scirpus californicus (C. Meyer) Steudel

Current Botanical name: *Schoenoplectus californicus*

Family: Cyperaceae (sedge family)

San Francisco Estuary range: Throughout.

Habitat: Brackish to freshwater perennial nontidal or tidal marshes, low tidal marsh zone (to shallow subtidal in microtidal western delta).

Recognition characters: Tall (2-4 m) obtusely 3-angled stems with convex sides above, becoming subcylindric at base; dull olive-green; relatively open panicles, 20 to many spikelets; dominant or monotypic stands, extensively creeping rhizomes.

Diagnostic (key) characters: Obtusely 3-angled stems.

Similar species: *Scirpus (Schoenoplectus) acutus*, with which it hybridizes and forms intermediates.

Comments: Frequent dominant in brackish tidal and nontidal marshes. Highly important traditional textile plant of Native Americans inhabiting Delta and Bay Area. Can out-compete early-invading cattails during primary marsh succession.



Low bulrush

Scirpus cernuus Vahl.

Current Botanical name: *Isolepis cernua* (Vahl) Roemer & Schultes

Family: Cyperaceae (sedge family)

San Francisco Estuary range: Throughout.

Habitat: High and middle tidal brackish marsh zone, often in low, turf-like, or sparse vegetation, especially wave-eroded marsh banks, shorelines.

Recognition characters: Tiny tufts of thread-like erect grasslike leaves.

Diagnostic (key) characters: Annual, no perennating buds or rhizomes; involucre leaf (below flowerhead) <0.5 cm.

Similar species: *Isolepis carinata* Hooker & Arnott ex Torrey, is closely similar; *Eleocharis parvula*, *Juncus bufonius* have similar gross morphology.

Comments: Often overlooked.



Alkali-bulrush

Scirpus maritimus L.

Current Botanical name: *Bolboschoenus maritimus* (L.) Palla

Family: Cyperaceae (sedge family)

San Francisco Estuary range: Western Suisun Bay, San Pablo Bay, San Francisco Bay.

Habitat: Middle brackish tidal marsh zone; also non-tidal brackish marshes, intermittent lagoon edges.

Recognition characters: Dense colonies from extensively creeping rhizomes, 3-angled stems; compact clusters of flowerheads subtended by three long leaf-like bracts; rhizomes bear hard “tubers”. Often deciduous during periods of high summer marsh soil salinity in drought years.

Diagnostic (key) characters: Irregular V-shaped non-green and veinless membrane at top of sheath on side of culm opposite of blade juncture.

Similar species: *Scirpus (Schoenoplectus) robustus* is closely related and hybridizes, forming intermediates in some geographic areas; species boundaries vary in taxonomic treatments, further confused by misapplication of names in older floras and references.

Comments: Tubers may persist dormant for years during high-salinity phases of fluctuating brackish-salt marshes of San Pablo Bay (esp. Napa-Sonoma Marshes, Petaluma Marsh) during droughts, so marshes may rapidly fluctuate between pickleweed dominance and alkali-bulrush dominance (pickleweed understory) with short-term climate changes. Invades salt marsh during consecutive series of high rainfall years. Often out-competed by tules (*S. acutus*, *S. californicus*) or cattails (*Typha* spp.) in lower salinity brackish or fresh-brackish marshes.

RUSH FAMILY (Juncaceae)



Wire rush, salt rush, Baltic rush

Juncus balticus Willdenow.

Current Botanical name: *Juncus arcticus* Willdenow. var. *balticus*

Family: Juncaceae (rush family)

San Francisco Estuary range: Throughout, but mostly San Pablo Bay through Suisun and Grizzly Bay area.

Habitat: High and middle tidal brackish marsh zone, brackish edges of salt marshes where streams, seeps occur.

Recognition characters: Dense and usually dominant (sometimes monotypic) clonal stands of stiff, dark green or olive/brownish green erect, slender cylindrical stems, panicles appearing lateral below tips; matted persistent leaf litter.

Diagnostic (key) characters: 6 stamens, perennial, extensively creeping thick rhizomes.

Similar species: *Juncus patens*, *J. lescurii* (intergrades), *J. arcticus* var. *mexicanus*, *J. gerardii*.

Comments: Abundant to co-dominant in brackish tidal marsh plains and edges, Suisun Marsh, Napa Marsh, and east in Delta region.



Toad rush

Juncus bufonius L.

Family: Juncaceae (rush family)

San Francisco Estuary range: Throughout.

Habitat: Middle and high tidal brackish marsh zone, seasonally wet or ponded sparsely vegetated depressions in high tidal salt or brackish marsh. Very common in disturbed soils of terrestrial seasonal wetlands.

Recognition characters: Diminutive annual grass-like tufts, usually 5-20 cm tall.

Diagnostic (key) characters: Annual, tufted, diminutive, with narrow erect leaves.

Similar species: Multiple varieties have been recognized, sometimes difficult to apply to variable characters in populations. See keys in regional floras. Similar in appearance to *Scirpus (Isolepis) cernuus*, *Eleocharis parvula*.

Comments: Common native annual, often overlooked, especially in mixed taller tidal marsh vegetation.



Black-grass

Not in 1993 Jepson Manual

Current botanical name: *Juncus gerardii* Loisel

Family: Juncaceae (rush family)

San Francisco Estuary range: Currently (2006) only at Southampton Marsh, Benicia; potential to spread to brackish marshes in region.

Habitat: Brackish high tidal marsh and upper middle marsh plain.

Recognition characters: Dense clonal turf-like colonies with fine stems and leaves, brittle when dry; sparse flowering and fruiting culms with typical rush flowers occur only at edges of colonies; in our region, foliage deciduous in response to high salinity or drying soil, with regrowth following soil wetting at low salinity.

Diagnostic (key) characters: Rhizomatous; true leaf blades (narrow, soft tissues); use Abrams key for *Juncus* of all Pacific States, since it is not included in Jepson Manual.

Similar species: Superficially resembles *Spartina patens*, *Carex praegracilis* in vegetative morphology, but not similar to any *Juncus* spp. in our region.

Comments: Introduced in Pacific Northwest and also at Southhampton Marsh, Benicia, also the unique San Francisco Estuary locality of *Spartina patens*. In Washington State tidal marshes, apparently not invasive or dominant, but forming monotypic, spreading large clones at Southhampton Marsh, displacing native vegetation of mature native tidal brackish marsh. Important “watch list” invasive non-native wetland plant for brackish tidal marshes in California.



Iris-leaved rush

Juncus xiphioides E. Meyer

Family: Juncaceae (rush family)

San Francisco Estuary range: Throughout, but most remaining tidal marsh populations are in northern estuary, Tolay Creek, Point Pinole and east through Suisun Bay and Delta. Historically present in south bay tidal marshes.

Habitat: Brackish upper edges of tidal marshes, often in seeps, contacts with seasonal streams; occasionally on fresh-brackish marsh plains.

Recognition characters: Extensively creeping by rhizomes forming large clonal colonies, often monotypic; flat iris-like leaves.

Diagnostic (key) characters: Few-flowered clusters in panicle, extensively rhizomatous.

Similar species: *J. phaeocephalus* var. *paniculatus* (clump-forming, many-flowered clusters in panicle).

Comments: Uncommon in modern tidal marshes.

ARROW-GRASS FAMILY (Juncaginaceae)



(detail flower photo: Sarah Gill)

Creeping sea arrow-grass

Triglochin concinna Burt Davy

Family: Juncaginaceae (arrow-grass family)

San Francisco Estuary range: Throughout.

Habitat: Middle tidal marsh plain, brackish or salt marsh, in low turf-like vegetation, typically in older peat-rich marsh plains or sandy marsh substrates.

Recognition characters: Forms turf-like colonies of uniform low height, like lawns; green or purple-green foliage, often in contrasting clones.

Diagnostic (key) characters: Long creeping slender rhizomes, 2-lobed or split ligule at leaf sheath.

Similar species: *Triglochin striata* (uncommon, mostly fresh-brackish marsh, northern and eastern Suisun Bay/Grizzly Bay area); overall clone/patch aspect similar to *Lilaeopsis masonii*, *Eleocharis parvula*; small clones with robust plants in brackish marsh may resemble stunted *T. maritima*.

Comments: Infrequent; locally common in mature, old tidal marshes or unproductive substrates with low or sparse turf-like tidal marsh vegetation.





Sea arrow-grass

Triglochin maritima L.

Family: Juncaginaceae (arrow-grass family)

San Francisco Estuary range: Throughout.

Habitat: Middle and high tidal marsh zone, brackish and salt marsh; most abundant and robust in brackish marsh, or near seeps, tidal creek banks.

Recognition characters: Discrete clumps with fleshy, narrow, ascending leaves, and tall scapes.

Diagnostic (key) characters: Ligule of leaf sheath entire, unlobed; very short rhizomes, well-developed caudex (central stalk).

Similar species: *Plantago maritima*, *Plantago nudata* (flower parts 4, not 6), *Triglochin concinna* (creeping, not taprooted, and turf-like)

Comments: Infrequent but widespread.

LILY FAMILY (Liliaceae)



Asparagus

Asparagus officinalis* L. ssp. *officinalis

Family: Liliaceae (lily family)

San Francisco Estuary range: Widespread, locally common, vicinity of Tolay Creek east through Napa-Sonoma Marshes and Suisun and Grizzly Bay area.

Habitat: High and middle brackish marsh zone.

Recognition characters: Unique tall, erect, feathery shoots; familiar asparagus spears in spring; orange spherical fruits in summer. Spherical fruits the size of peas; glossy, green and ripening bright orange. Often undetected in tidal marsh vegetation despite conspicuousness.

Diagnostic (key) characters: Same as recognition characters.

Similar species: *A. asparagoides*, not in tidal marshes.

Comments: Widespread and locally common, seldom abundant; delicious non-native wild asparagus.



GRASS FAMILY (Poaceae)



Australian bentgrass

Agrostis avenacea Gmelin

Family: Poaceae (grass family)

San Francisco Estuary range: Northern San Pablo Bay and San Rafael Bay, rapidly expanding range; abundant in Napa-Sonoma Marsh.

Habitat: High tidal marsh and terrestrial edges, levees, brackish ditches, seasonal ponds.

Recognition characters: Fine capillary branches of panicles, becoming silky “tumbleweed” masses in dispersal. Flat leaves float on surface when plants are submerged.

Similar species: No other *Agrostis* species have detached capillary panicles.

Comments: Highly invasive, rapidly spreading. Can rise from absent to dominant in seasonal wetlands, ditches, in a single year.



Saltgrass

Distichlis spicata (L.) E. Greene

Family: Poaceae (grass family)

San Francisco Estuary range: Throughout.

Habitat: High and middle tidal marsh zone, brackish or salt marsh, levees, saline seasonal wetlands. Often dominant in the high salt marsh zone, especially in gently sloping ecotones with grasslands. Also often dominant in the middle marsh zone of brackish marsh plains. In sandy salt marsh soils, saltgrass may be more abundant than pickleweed in the high marsh.

Recognition characters: Thick stoloniferous (above-ground creeping stems, or runners) or rhizomatous (below-ground creeping, rooting stems) clonal mats, often forming thick and spongy turf of accumulated, persistent leaf and stem litter; salt glands with surface crystals on leaves.

Similar species: *Pennisetum clandestinum*, *Agrostis stolonifera*, in vegetative phase.

Comments: Native, abundant to dominant in tidal marshes throughout estuary.



Red fescue (coastal marsh ecotype)

Festuca rubra L.

Family: Poaceae (grass family)

San Francisco Estuary range: Within tidal marshes, central San Francisco Bay and western San Pablo Bay. More common in outer coast tidal marsh edges today. Terrestrial ecotypes occur in coastal grassland. Worldwide distribution in many habitat types.

Habitat: High and middle tidal marsh zone, brackish or salt marsh; populations (ecotypes) adapted to terrestrial soils occur on coastal bluffs, hillslopes, where marine climate influence (fog zone) is significant.

Recognition characters: Forms tussocks (clumps) or spreading compact colonies from short rhizomes. Fine, narrow, inrolled soft erect leaves, sometimes with a conspicuous whitish bloom (glaucous forms) making leaves appear grayish or whitish blue-green. Non-glaucous forms are yellowish green.

Similar species: No other fescue species occur in salt marshes in our region. *Puccinellia nutkaensis* has coarse leaves and lacks rhizomes.

Comments: *F. rubra* is highly variable, and its populations evolve into morphologically and physiologically distinctive locally adapted forms, some of which have been treated as varieties or subspecies.

Hedgehog dogtail grass

Cynosurus echinatus L.

Family: Poaceae (grass family)

San Francisco Estuary range: Potentially throughout.

Habitat: High tidal marsh ecotone with terrestrial grassland; incidental in tidal marsh edges, extending from terrestrial grasslands.

Recognition characters: Annual grass, but green and flowering after many other Mediterranean annual grasses have withered in June or July. Long awns (needle-like projections of grass flower and seedhead) provide “hedgehog” appearance of compact head-like inflorescence and seedhead.



Similar species: *Hordeum marinum* ssp. *gussoneanum*, also in high tidal marsh edges, has subparallel, geometric pattern of awns projecting from rows of spikelets (flowers) in seedheads.

Comments: Relatively uncommon in tidal marsh edges, but common to dominant in some annual grasslands.

SOOR



Meadow barley

Hordeum brachyantherum Nevski

Family: Poaceae (grass family)

San Francisco Estuary range: Throughout.

Habitat: High and middle brackish marsh zone, high marsh and terrestrial ecotone of salt marshes; seasonal wetlands in alluvial grassland.

Recognition characters: Purplish spikes on tall culms when in flower, on plants scattered in mixed vegetation, often with *Distichlis*, *Leymus*, *Polypogon*.

Diagnostic (key) characters: Perennial buds and shoot structures at base, glumes up to 19 mm.

Similar species: All *Hordeum* species within the

Estuary. See keys in local floras.

Comments: Native perennial of valley grasslands and alluvial edges of brackish and salt marshes. Salt-tolerant ecotypes (locally adapted populations with relatively high salt tolerance) are expected to differ from terrestrial populations on non-saline soils.





Mediterranean barley

Hordeum marinum Hudson *ssp. gussoneanum* (Parlatore) Thellung

Synonyms: *Hordeum hystrix* Roth, *H. geniculatum* Allioni

Family: Poaceae (grass family)

San Francisco Estuary range: Throughout.

Habitat: Upper edges of high tidal marsh, ecotones with seasonal wetlands or terrestrial grasslands; brackish depressions in high marsh zone; seasonal wetlands in adjacent nontidal habitats.

Recognition characters: Often grows in dense masses, even patches of single species. Remnants of seedheads persist into summer and fall on dead annual plants. Stiff, strongly spreading awns are conspicuous in seedheads.

Similar species: See key for barley (*Hordeum*) species; *Cynosurus echinatus* flowers late in spring or early summer and has softer, shorter awns.

Comments: Early winter-spring annual in wetlands with periods of shallow standing water in winter, seeding in April-May or June most years, withering but persistent by summer. Relatively high salt tolerance for a generalist annual grass.



Creeping wildrye

Leymus triticoides (Buckley) Pilger

Family: Poaceae (grass family)

San Francisco Estuary range: Throughout, but more frequent in northern estuary today.

Habitat: Terrestrial edges, ecotone, and high tidal marsh, brackish and salt marsh, often with *Distichlis spicata*, *Cressa truxillensis*, *Hordeum brachyantherum*.

Recognition characters: Strongly rhizomatous, often dense creeping colonies extending from terrestrial to saline wetland habitats, monotypic or dominant over large patches; wheat-like, uniform tall (0.5-1.0 m) stands, green or gray-green in summer; in summer, many populations have whitish bloom (glaucous, gray-green appearance) on flat leaves. Narrow spikes of overlapping spikelets, usually more than 1 per node.

Similar species: *Leymus x multiflorus* is a widespread naturally occurring hybrid, larger leaves and taller culms (to 2 m in our area), not glaucous; often misidentified as *L. triticoides*; intermediates probably occur.

Comments: Often overlooked, formerly major or dominant element of valley grasslands and alluvial grassland ecotones of tidal marshes. Mature clones are highly competitive against both native and non-native weeds of tidal marsh edges.



(*L. multiflorum*)



(*L. multiflorum*)



(*L. perenne* intermediate)

Italian ryegrass

Lolium multiflorum Lamarck

Family: Poaceae (grass family)

San Francisco Estuary range: Throughout.

Habitat: High and middle brackish tidal marsh zone, seeps at edges of tidal salt marshes, and through terrestrial ecotone and adjacent terrestrial grassland of tidal salt or brackish marsh; abundant on some levees.

Recognition characters: Narrow spikes of regularly spaced, divergent spikelets.

Similar species: *Lolium perenne* L., perennial ryegrass, lacks awns and has spikelets usually appressed to the axis of the spike; intermediates (hybrid backcrosses) between *L. multiflorum* and *L. perenne* are common, and often have with very short awns. *Leymus triticoides* is coarser, green in summer even in dry soil, and its leaves are often glaucous (whitish bloom on leaves). *Leymus triticoides* usually has more than one spikelet in each node of the spike-like seed-head.

Comments: Common in tidal marsh edges; non-native, sometimes invasive on levees.





Rabbit's-foot grass

Polypogon monspeliensis (L.) Desfontaines

Family: Poaceae (grass family)

San Francisco Estuary range: Throughout.

Habitat: Brackish seasonal wetland depressions, pans around upper edges of brackish marshes, and poorly drained areas (intermittent standing water) within high brackish tidal marsh zone.

Recognition characters: Pale green flowerheads and seedheads have appearance of soft fur (rabbit's foot namesake). Often conspicuous in large colonies. Often associated with *Cotula*.

Diagnostic (key) characters: Glumes only slightly lobed.

Similar species: *Agrostis exarata*, *Polypogon interruptus*, *P. maritimus* (uncommon).

Comments: Non-native, often invasive in disturbed seasonally ponded wetlands, but seldom persisting in abundance within dense perennial vegetation.



Sicklegrass

Parapholis incurva (L.) C.E. Hubbard

Family Poaceae (grass family)

San Francisco Estuary range: Throughout.

Habitat: Disturbed high tidal marsh edges.

Recognition characters: Low, decumbent annual tufts, purplish in maturity; culms with scale-like leaves are curved or twisted, often towards center of isolated clumps, or ascending in dense colonies. Spikes shatter when mature.

Diagnostic (key) characters: Two glumes per spikelet (on one side of culm or overlapping), and single vein on lemma distinguish from similar *Hainardia*.

Similar species: *Hainardia cylindrica* (Willd.) Greuter has similar appearance in vegetative growth and culm. It is recognized by its straight, erect culms that also readily shatter when mature. *Hainardia* has short, stiff, leaf-like bracts diverging from the base of spikelets at the lower portion of the spike. *Hainardia* is morphologically distinguished by its single glume per spikelet (2 in *Parapholis*) and 3-veined lemma in spikelet (flower/fruit).

Comments: Weedy non-native annual salt-tolerant grass.



Alaska alkali-grass

Puccinellia nutkanesis (J.S. Presl.) Fern. & Weath.

San Francisco Estuary Range: San Francisco Bay.

Habitat: High to middle tidal salt marsh zone.

Recognition characters: Distinct, conspicuous erect perennial bunchgrass in salt marsh, flat to involute (rolled) blades, panicles have erect lower branches when seeds are ripe.

Similar species: Sometimes vegetative plants are confused with non-native *Spartina* species (*S. densiflora*, *S. patens*).

Comments: Uncommon bay-wide, but can become locally common some years. Common in Point Reyes.

CATTAIL FAMILY (Typhaceae)



Typha angustifolia L.



T. domingensis Persoon

Narrowleaf cattail, southern cattail, and broadleaf cattail

Typha angustifolia L., *T. domingensis* Persoon, and *T. latifolia* L.

San Francisco Estuary range: Throughout.

Habitat: Fresh-brackish low tidal marsh zone, and near seeps or stream mouths at edges of brackish or salt marshes; widespread in non-tidal fresh to fresh-brackish marsh.

Recognition characters: Cattails hybridize and form intermediates. *T. angustifolia* (narrowleaf cattail) has narrow leaves (blades 4-12 mm wide) and a segment of naked stem between the sausage-like spikes of male and female flowers. *T. latifolia* (broadleaf cattail) has broad leaves (1-3 cm wide) and lacks a gap between male and female sausage-like flower spikes. *T. domingensis* (southern cattail) has a gap between male and female flower spike segments, female flowers bright yellow to orange-brown, and dotted glands at the base of the leaf on the side facing stems. *T. x glauca* is uncommon and variable, but usually has blue-green leaf blades and leaf sheaths with ear-like appendages (auricles).



Typha latifolia L.

APPENDIX

Excerpts of revised taxonomic treatments since 1993 Jepson Manual.
Source: Flora of North America (online)

Arthrocnemum subterminale

- Flowers distinct in each cyme, not adnate; outer seed coat hard, tuberculate: **Arthrocnemum**,
- Flowers of each cyme adnate to distal branch of inflorescence; outer seed coat thin, covered with hooked or straight hairs: **Sarcocornia**
- (**annual Salicornia spp. retained in Salicornia**)

Arthrocnemum subterminale (Parish) Standley, J. Wash. Acad. Sci. 4: 399. 1914.

Syn: *Salicornia subterminalis* Parish, Erythraea 6: 87. 1898

Plants forming clumps to 1 m in diam.; persistent woody bases up to 2.5 cm in diam. **Stems** procumbent to erect, often much-branched, 10-30 cm, fleshy joints bright green, 3-20 × 2-3 mm. **Inflorescences** of many spikes, 5-35 mm, often with 5-10 sterile segments distally; fertile segments 2-20, 2-3 × 2-3 mm. **Flowers**: 1.5-2 × 1.2-1.5 mm; anthers 0.5-1 mm. **Seeds** dark brown, 1-1.4 mm.

Flowering late spring-late summer. Salt marshes, depressions in alkali sage scrub; 0-100(-400) m; Calif.; Mexico (Baja California, Sinaloa, Sonora).

Atriplex prostrata (*A. triangularis*)

Atriplex prostrata Boucher ex de Candolle in J. Lamarck and A. P. de Candolle, Fl. Franç. ed. 3. 3: 387. 1805.

Thinleaf orache, spearscale, fat-hen

Syn: *Atriplex triangularis* Willdenow

Herbs, monoecious, erect, decumbent or procumbent, branching, 1-10 dm; stems subangular to angular, green or striped. **Leaves** opposite or subopposite at least proximally; petiole (0-)1-3(-4) cm; blade triangular-hastate, lobes spreading, 20-100 mm and almost as wide, base truncate or subcordate, margin entire, serrate, dentate, or irregularly toothed, apex acute to obtuse. **Flowers** in spiciform naked spikes 2-9 cm, sometimes forming terminal panicles; glomerules tight, contiguous or irregularly spaced. **Fruiting bracteoles** green, becoming brown to black at maturity, triangular-hastate to triangular-ovate, veined or veins obscure, 3-5 mm, thin to thickened, spongy, base truncate to obtuse, margin united at base, lateral angles mostly entire, apex acute, faces smooth or with 2 tubercles. **Seeds** dimorphic: brown, flattened, disc-shaped, 1-2.5 mm wide, or black, 1-1.5 mm wide; radicle subbasal, obliquely antrorse to spreading. **2n** = 18.

Flowering in summer-fall. Sea beaches, salt marshes or other saline habitats; 0-2000 m; introduced; Alta., Man., N.B., N.S., Ont., P.E.I., Que., Sask.; Ariz., Calif., Colo., Conn., Del., Idaho, Ill., Ind., Iowa, Kans., Ky., Maine, Md., Mass., Mich., Minn., Mo., Mont., Nebr., Nev., N.H., N.J., N.Mex., N.Y., N.C., Ohio, Oreg., Pa., R.I., Utah, Va., Wash.; Eurasia.

Atriplex prostrata often grows with willow, tamarix, *Scirpus* (*Schoenoplectus* and *Bulboschoenus* segregates), *Juncus*, *Distichlis*, and *Typha*. Perhaps the phase along coastal eastern North America is indigenous, but this and the related *Atriplex heterosperma* evidently moved quickly from one palustrine habitat to another following subsequent introductions from the Old World. They were probably initially introduced as ballast waifs, and subsequently dispersed by waterfowl. The two species are now commonplace in lands within and adjacent to marshes in much of North America west of the initial sites of introduction.

The name for the species taken up here follows the nomenclatural interpretation of J. McNeill et al. (1983).

Carpobrotus chilensis, *C. edulis* x *chilensis*

Carpobrotus chilensis (Molina) N. E. Brown, J. Bot. 66: 324. 1928.

Iceplant, sea-fig

Syn: *Mesembryanthemum chilense* Molina, Sag. Stor. Nat. Chili ed. 2, 133. 1810

Stems to 2 m; gray fracturing bark with mahogany, shiny surface beneath. **Leaves** glaucous; blade rounded-triangular in cross section, widest distal to middle, 4-7 × 0.5-1.2 cm, outer angle smooth. **Inflorescences:** pedicel 10-50 mm. **Flowers** 3-5 cm diam.; calyx lobes slightly triangular in cross section, 10-20 mm, outer angle smooth; petals 100-140, rose-magenta, 2-3-seriate, 10-25 mm; stamens 100-250, white, 3-4-seriate, 4-7 mm, papillate proximally; anthers yellow; stigmas 2-3 mm, shorter than stamens, papillate adaxially. **Fruits** green to yellowish, oval to subglobose, 17-20 mm; receptacle tapering to pedicel. **Seeds** 200-350.

Flowering year-round, mostly early spring-summer. Coastal dunes and bluffs, margins of estuaries, along roadsides; 0-100 m; introduced; Calif., Oreg.; Mexico; South America; s Africa.

The flowers of *Carpobrotus chilensis* open in the morning and close at night.

Most of the material currently found in California is probably of hybrid origin, potentially from five species. In previous floras, California material has been misidentified as *Carpobrotus aequilaterus* Haworth, which was published with a description of vegetative characters only and no type specimen. A. H. Haworth (1812) stated that it was most closely related to *Mesembryanthemum elongatum* Haworth, which today would be assigned to *Conicosia*. S. T. Blake (1969) selected two Salm-Dyck illustrations to typify *C. aequilaterus*. One illustration, from Chile, has been identified by the Bolus Herbarium in South Africa as *C. deliciosus* L. Bolus, a species from southwest Africa. The second illustration matches horticultural material in Australia but not material collected in California. Historical material collected in San Diego was identified by John Torrey in 1854 as *Mesembryanthemum dimidiatum* Haworth, now *Carpobrotus dimidiatus* (Haworth) N. E. Brown, from southeast Africa. The introduction would likely have been from Portuguese ships traveling around the Cape of Good Hope to the east in the 1500s. Material identified as *C. dimidiatus* is also found on the Juan Fernandez Islands off Chile, a provisioning stop for early sailing vessels. There is more recently introduced material in California of *C. edulis*, *C. acinaciformis* (Linnaeus) L. Bolus, and *C. quadrifidus* L. Bolus from southwest Africa. Of those, only *C. edulis* has naturalized.

Material collected today and identified as *Carpobrotus chilensis* is hybridized with *C. edulis* to such an extent that good material of the second parent may no longer exist in California. In Chile, there are five South African species---*C. edulis*, *C. deliciosus*, *C. muiirii* L. Bolus, *C. mellei* L. Bolus, and *C. dimidiatus*---in addition to hybrids among these. All of these South African species found in Chile are referred to in the literature and on herbarium sheets as *C. chilensis*. R. A. Philippi (1864) designated a lectotype for *C. chilensis*. This specimen was a mixed sheet of *C. edulis* and a second species with purple flowers. The sheet was unfortunately cut apart, and the second fragment is now separated from the identifying labels.

SELECTED REFERENCE Bicknell, S. H. and E. M. Mackey. 1998. Mysterious nativity of California's sea fig. *Fremontia* 26: 3-11.

Isolepis cernua

Isolepis cernua (Vahl) Roemer & Schultes in J. J. Roemer et al., Syst. Veg. 2: 106. 1817.

Syn: *Scirpus cernuus* Vahl, Enum. Pl. 2: 245. 1805; *S. cernuus* var. *californicus* (Torrey) Beetle; *S. cernuus* subsp. *californicus* (Torrey) Thorne

Plants annual (or perennial?); rhizomes usually obscured by culm bases and very short, sometimes vertical and elongated. Culms 4-40 cm × 0.2-0.5 mm. Leaves sometimes sparsely orange-punctate at 10-15X; sheaths usually reddish proximally; distal blade rudimentary to much longer than sheath, often exceeding culm, to 20 cm × 0.2-1 mm. Inflorescences: involucre bract 1, sometimes subtending flower or resembling enlarged floral scale, 2-6(-23) mm. Spikelets 2-5 × 1-2 mm; scales partly or completely dark orange to red-brown, rarely stramineous, midrib greenish to stramineous, not gibbous, obscurely to prominently 3-11-veined, midrib keeled near apex, membranous, hyaline, apex rounded to acute, with mucro less than 0.1 mm; proximal scale to 2 mm; other scales 1.2-1.8 × 1-1.3 mm. Flowers: anthers 0.3-0.6 mm; styles 3-fid or 3-fid and 2-fid. Achenes falling separately from scales, medium to dark brown or stramineous, ellipsoid to obovoid, compressed-trigonous to thickly biconvex, lateral angles usually prominent, abaxial angle

prominent to obscure, faces convex or adaxial face slightly concave, 0.8–1 × 0.5–0.7 mm, distinctly papillose at 10–15X to obscurely papillose at 40X, often with thin whitish surface layer. 2n = 30.

Fruiting late spring–winter (Pacific Coast), winter–spring (Texas). Wet, freshwater to brackish places on beaches, dunes, marine bluffs, sandy areas, mostly coastal; 0–800 m; B.C.; Calif., Oreg., Tex., Wash.; Mexico (Baja California); temperate South America; Eurasia; Africa; Australia; New Zealand.

Isolepis cernua is widespread and variable. Four varieties were recognized by A. M. Muasya and D. M. Simpson (2002). Only var. *cernua* is known from North America. The earliest collection I have seen from the Pacific Coast is from 1888; the earliest collection I have seen from Texas is from 1974.

Isolepis carinata

Isolepis carinata Hooker & Arnott ex Torrey, Ann. Lyceum Nat. Hist. New York. 3: 349. 1836.

Syn: *Isolepis koilolepis* Steudel; *Scirpus carinatus* (Hooker & Arnott ex Torrey) A. Gray 1868, not Smith 1809; *S. koilolepis* (Steudel) Gleason

Plants annual; rhizomes absent. Culms 1–25 cm × 0.2–0.3 mm. Leaves: sheaths green to stramineous or brown; distal blade mostly much longer than sheath, to 5 cm × 0.2–0.5 mm. Inflorescences: involucre bract 1, 5–25(–33) mm. Spikelets 1–10 × 1.5–2 mm; scales stramineous to pale orangish, midrib region often greenish, markedly gibbous, prominently to obscurely veined, midrib keeled, finely reticulate at 20X, membranous, hyaline, apex rounded, awned; proximal scale to 2.5(–5) mm, awn to 2 mm; other scales 1.8–2 × 1–1.2 mm, awn 0.2–0.5 mm. Flowers: anthers 0.2 mm; styles 3-fid. Achenes often falling with and clasped by floral scales, dark orange-brown or often whitish, broadly ellipsoid to obovoid or outline subcircular, nearly equilaterally trigonous, faces concave, 1–1.5 × 0.7–1 mm, papillose at 10–15X, papillae in many vertical rows, often obscured by thin, minutely reticulate, whitish surface layer.

Fruiting spring. Wet, often drying, freshwater places in grasslands, rock barrens, open woods, lawns, cultivated fields, waste places; 0–800 m; Ala., Ark., Calif., Fla., Ga., Ill., Kans., Ky., La., Miss., Mo., N.C., Okla., S.C., Tenn., Tex.

Isolepis carinata sometimes occurs in mixed populations with the very similar *I. pseudosetacea*.

Juncus arcticus

Juncus arcticus Willdenow, Sp. Pl. 2: 206. 1799.

Arctic rush

Herbs, perennial, 2–10 dm. Rhizomes long-creeping. Culms erect, 1–3 mm diam. Cataphylls several. Leaves: blade usually absent (present in var. *mexicanus*). Inflorescences lateral, 3–many-flowered, loose to congested; primary bract barely exceeding to many times longer than inflorescence. Flowers variously pedicellate; bracteoles membranous; tepals chestnut brown or paler, lanceolate, (2.5–)3.3–5.5(–6) mm, margins clear; inner series loosely subtending capsule at maturity; usually slightly shorter, margins scarious to clear, apex acutish to obtuse; stamens 6, filaments 0.2–1.1 mm, anthers 0.9–2.2 mm; style 0.9–1.5 mm. Capsules 3-locular or infrequently pseudo-3-locular, oblate to narrowly ovoid, 3.5–4(–4.5) mm, equal to or exceeding perianth. Seeds dark amber, oblate to ellipsoid, 0.6–0.8 mm.

Varieties 3 7 (3 in the flora): North America; Mexico; South America; Asia.

Numerous entities have been circumscribed and recognized at various nomenclatural ranks by a plethora of authors addressing state or regional floras. In considering the *Juncus arcticus*-*balticus* complex as a whole in North America, one is soon confronted with a wide-ranging and obviously polymorphic complex that has not read the literature. It is abundantly clear that the systematics of the group will not be solved on the basis of morphology alone and that resolution of the problem is ripe for molecular investigations.

Blade-bearing leaves absent	9b var. <i>balticus</i>
Distal 1 or 2 leaves with obvious blade	9c var. <i>mexicanus</i>

Sarcocornia pacifica (Salicornia virginica)

Sarcocornia pacifica (Standley) A. J. Scott, Bot. J. Linn. Soc. 75: 369. 1978.

Woody stems erect or procumbent, creeping and sometimes rooting at base, 10-50 cm; stems sparingly to much-branched, younger branches with fleshy segments 5-20 × 2-4 mm. **Terminal spikes:** larger with 12-40 segments, 20-85 mm. **Fertile segments:** larger 2-4.5 × 2.5-3.8 mm; central flowers 1.6-2.8 × 1-2.5 mm; anthers 0.7-1 mm. **Seeds** 1.2-1.5 mm, pubescent; hairs curved or hooked, longer hairs 1-2 mm.

Flowering late summer-early fall. Coastal salt marshes, tidal flats; 0 m; Calif., Conn., Del., Fla., Ga., Md., Mass., N.H., N.J., N.Y., N.C., R.I., S.C., Va.; Mexico.

Sarcocornia pacifica appears to be endemic to the Americas, although its precise delimitation and distribution are unclear. Well-grown plants can be easily recognized by the long terminal spikes, but depauperate plants are difficult to distinguish from *S. perennis*. The name *Salicornia virginica* has often been applied to this species.

Sarcocornia perennis

Sarcocornia perennis (Miller) A. J. Scott, Bot. J. Linn. Soc. 75: 367. 1978.

Syn: *Salicornia perennis* Miller, Gard. Dict. ed. 8, Salicornia no. 2. 1768

Woody stems prostrate to procumbent, creeping and usually rooting, often forming mats to 1 m diam.; with numerous, erect stems, simple or sparingly branched, 10-20(-30) cm, larger fleshy segments 10-25 × 2-3 mm. **Terminal spikes:** larger with 7-14 fertile segments, 10-25 mm. **Fertile segments:** larger ones 1.6-3.1 × 2.9-4.4 mm; central flowers 1.3-2.8 × 1.3-2.7 mm; anthers 0.8-1 mm. **Seeds** 1.1-1.3 mm, pubescent; hairs strongly curved or hooked, most exceeding 1 mm, slender. **2n** = 18.

Flowering late summer-early fall. Salt marshes and tidal flats; 0 m; B.C.; Alaska, Oreg., Wash.; s, w Europe; sw Asia; n, s Africa.

Sarcocornia perennis has also been reported from the coasts of the northeastern United States, but most of these plants appear to be depauperate individuals of *S. pacifica*. However it is possible that some plants from New England are *S. perennis*, and further study is needed to determine the precise distinction between *S. perennis* and *S. pacifica*.

Plants with creeping, rooting, woody stems; erect stems simple or sparingly branched, 10-20(-30) cm; longest terminal spikes with 7-14 fertile segments

Plants with erect or procumbent woody stems, sometimes creeping and rooting at base; stems sparingly to much-branched, 10-50 cm; longest terminal spikes on plant with 12-40 fertile segments

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