USDA Natural Resources
Conservation Service

# Ecological site R016XB002CA
# Salt-Affected, Stratified, Fluventic

Accessed: 04/28/2024

## General information

**Provisional**. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.


**Figure 1. Mapped extent**

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

## MLRA notes

Major Land Resource Area (MLRA): 016X–California Delta

16 – California Delta

Most of this area is in the California Trough Section of the Pacific Border Province of the Pacific Mountain System. A small part at the west edge of the area is in the California Coast Ranges Section of the same province and division. This MLRA was originally the conjoined flood plain along the Sacramento and San Joaquin Rivers. As sediment from these rivers built up in San Pablo Bay, a delta formed, creating many streams that divide this nearly level area into “islands.” Strong levees and drainage systems are needed to protect the islands from flooding. Elevation of the islands ranges from below sea level to slightly above sea level. This area is underlain by interbedded marine, estuarine, and fine-grained non-marine sediments transported to the delta by the Sacramento and San Joaquin Rivers as they flowed into San Pablo Bay. As the sediments built up, a delta formed and freshwater mixed with brackish water in marshes and on flood plains. As the marsh vegetation became covered with new sediments, the organic matter content in the soils built up to very high levels. When drained and exposed to the air, these peaty soils oxidize and shrink and then subside.

This provisional land resource unit (LRU) 16B is loosely tied to the Suisun Bay area and is distinguished from the inland LRU 16A by increased levels of water salinity and the effects of salinity on ecological sites within that area.

## Classification relationships

Using the December 2010 draft EPA ecoregion level IV: 7j, Delta polygon mostly closely overlaps with MLRA 16.

MLRA 16 mostly aligns with the USFS (1997) ecological subsection 262AI, Great Valley, Delta.

## Ecological site concept

This site is a complex patchwork of salt-affected, upland and facultative wetland plant communities that are primarily adapted to fluctuating water tables influenced primarily by tidal events.

Found in floodplain locations and alluvial fans on slopes ranging from 0 to 2%.
The soils are characterized by thermic entisols and mollisols with stratified primarily fluventic sediments, with fine-silty textures, derived from alluvium.
Drainage is poor.

Salinity is relatively high and will have significant impacts on vegetation and management response.

## Associated sites

| | |
|---|---|
| R016XB001CA | **Tidally-Influenced, Salt-Affected**<br>016XB001 is most immediately effected by tidal surface waters and is largely comprised of organic soils. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Atriplex lentiformis*<br>(2) *Baccharis pilularis* |
| Herbaceous | (1) *Distichlis spicata*<br>(2) *Salicornia virginica* |

## Physiographic features

This ecological site is situated on old stream terraces derived from alluvium and predating the flanking recent soils. This site makes up the initial mineral core of what are now a complex series of estuary islands in the Suisun Bay and stand at a slightly higher elevation than those adjacent soils and by contrast are water discharge areas by virtue of evapotranspiration and as evidenced by increased salinity in the soils and indicated by the vegetation occurring on the ecological site.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Stream terrace |
| Flooding duration | Brief (2 to 7 days) to long (7 to 30 days) |
| Flooding frequency | Rare to occasional |
| Elevation | 0–2 m |
| Slope | 0–2% |
| Water table depth | 41–183 cm |
| Aspect | Aspect is not a significant factor |

## Climatic features

Sunset Magazine Climate Zone 17 – Marine effects in Southern Oregon, Northern and Central California

Greater influence of coastal fog with cooler conditions through most of the year than immediately inland.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 287 days |
| Freeze-free period (average) | 355 days |
| Precipitation total (average) | 635 mm |

## Climate stations used

- (1) FAIRFIELD [USC00042934], Fairfield, CA

## Influencing water features

## Soil features

The soils associated with this ecological site are very deep and poorly drained soils developed from mixed alluvium on stream terraces.

Surface textures are typically silty clay loam. Subsurface textures are sandy loam, very fine sandy loam, silt loam, silty clay loam, and clay. Electrical conductivity of the soil (EC) ranges from 8 to 16 dS/m and Sodium Adsorption Ratio (SAR) is 0 to 10 throughout.

These soils are poorly drained with very slow to slow permeability. The high water table is root limiting for crops. Levees, drainage ditches and pumping of the water table alter the drainage of these soils. Typically the water table is within 1.5 to 2 feet of the surface during the winter months and regulated to a depth of 3 to 5 feet below the soil surface during the growing season. The soil moisture regime is Aridic (due to high sodium) and Xeric. The soil temperature regime is thermic.

The soils that are correlated to this ecological site are the Merritt (Fine-silty, mixed, superactive, thermic Fluvaquentic Haploxerolls), and Valdez (Fine-silty, mixed, superactive, nonacid, thermic, Aeric Fluvaquents).

This ecological site has been correlated with the following mapunits and soil components in MLRA 16:

CA095; Solano County Area, California:

Vd; Valdez silty clay loam, wet; Valdez; 85
Ve; Valdez silty clay loam, clay substratum; Valdez; 85

CA113; Yolo County Area, California

Mp; Merritt complex, saline-alkali; Merritt; 60
Mp; Merritt complex, saline-alkali; Merritt; 30

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Alluvium–sandstone and shale<br>(2) Alluvium–shale and siltstone<br>(3) Alluvium–mudstone |
| Surface texture | (1) Sandy clay loam |
| Family particle size | (1) Loamy |
| Drainage class | Poorly drained |
| Permeability class | Very slow |
| Soil depth | 152 cm |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |

| | |
|---|---|
| Available water capacity (0-101.6cm) | 7.62–12.7 cm |
| Electrical conductivity (0-101.6cm) | 8–16 mmhos/cm |
| Soil reaction (1:1 water) (0-101.6cm) | 7.4–9 |
| Subsurface fragment volume <=3" (Depth not specified) | 0% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

## Ecological dynamics

This ecological site is a complex tidally-influenced riverine complex of marshes, seasonal wetlands and emergent wetland vegetation types of the Suisun Marsh. It is also the second most extensive ecological site within the land resource unit making up approximately 12% of identified soils while comprising just 2% of the MLRA. In the most general sense, this historically this site would be the highest points among a series of islands subject to variable inundation by runoff and/or tidal waters several times each year.

Unlike the closely associated young organic soils of 016XB001, the mineral soils of this ecological site are alluvial and likely occur on streambanks deposited before the end of the Ice Age. As sea levels rose and sediment discharge to the west incrementally decreased and water tables rose concurrently, the edges of these streambanks became the building edge of sediments leading to development of the newer organic soils. While isolated pockets of this ecological site occur across the LRU, the best representation is the large wedge of the hallmark Valdez soil series as it cuts across Grizzly Island where it is flanked by organic soils to the north and south. This wedge nearly encompasses the entirety of the California Dept. of Fish and Wildlife’s Grizzly Island Wildlife Area.

Most of this ecological site has been subject to significant surface modifications in the form of levelling and deposition of dredged materials. Levelling is apparent across the site and linear edges of soil map unit polygons indicate where extensive manipulation has occurred. It is likely topsoil from the site was used to overtop dredged materials to improve agronomic potential over the resident muck and the supplied spoils. The extent of materials moved is not assessed here but based on the location of proximate channels, one might assume that the core of the “Valdez Wedge” remains comprised primarily of native soil substrate, albeit levelled.

The influence of dislocation of the soils on vegetation potential is unclear but is presumed to have not dramatically influenced the effect of salinity as drawn by surface evaporation and plant transpiration from subsurface waters. Most of the species currently found this ecological site are at least somewhat salt tolerant species and most salt sensitive species lack significant presence. The current two dominant native species are pickleweed (Salicornia virginica) and saltgrass (*Distichlis spicata*) while subordinate natives include spear saltbush (“fat hen”) (Atriplex triangularis), coyote brush (*Baccharis pilularis*), big saltbush (*Atriplex lentiformis*), and alkali weed (*Cressa truxillensis*).

Much of the area has been planted to species to provide food and cover and/or flooded for waterfowl habitat. That said, cultivation is fairly limited and livestock grazing and/or fire are used where possible to control less desirable vegetation which degrade waterfowl habitat (Suisun Marsh Local Protection Program, 1999). Competing vegetation on this ecological site includes a wide array of non-native species such as fennel, sea fig, bull thistle, annual grasses, and wild celery.

Grazing and browsing by wildlife likely stimulated grass growth and somewhat reduced recruitment of shrubs but by and large, fire would have provided the most dramatic shift between community phases. In the absence of fire and grazing or other vegetation control, it is assumed that shrub species would have come to dominate the canopy while forbs and grasses decrease in cover. Following fire, shrubs would likely give way to grass and forb dominance. Under natural conditions, unusually prolonged inundation may have facilitated shrub die-off and similarly lead to an increase in grass dominance followed by an increase in forb expression.

State 3 conceivably produces the most vegetative biomass due to management inputs.

## State and transition model

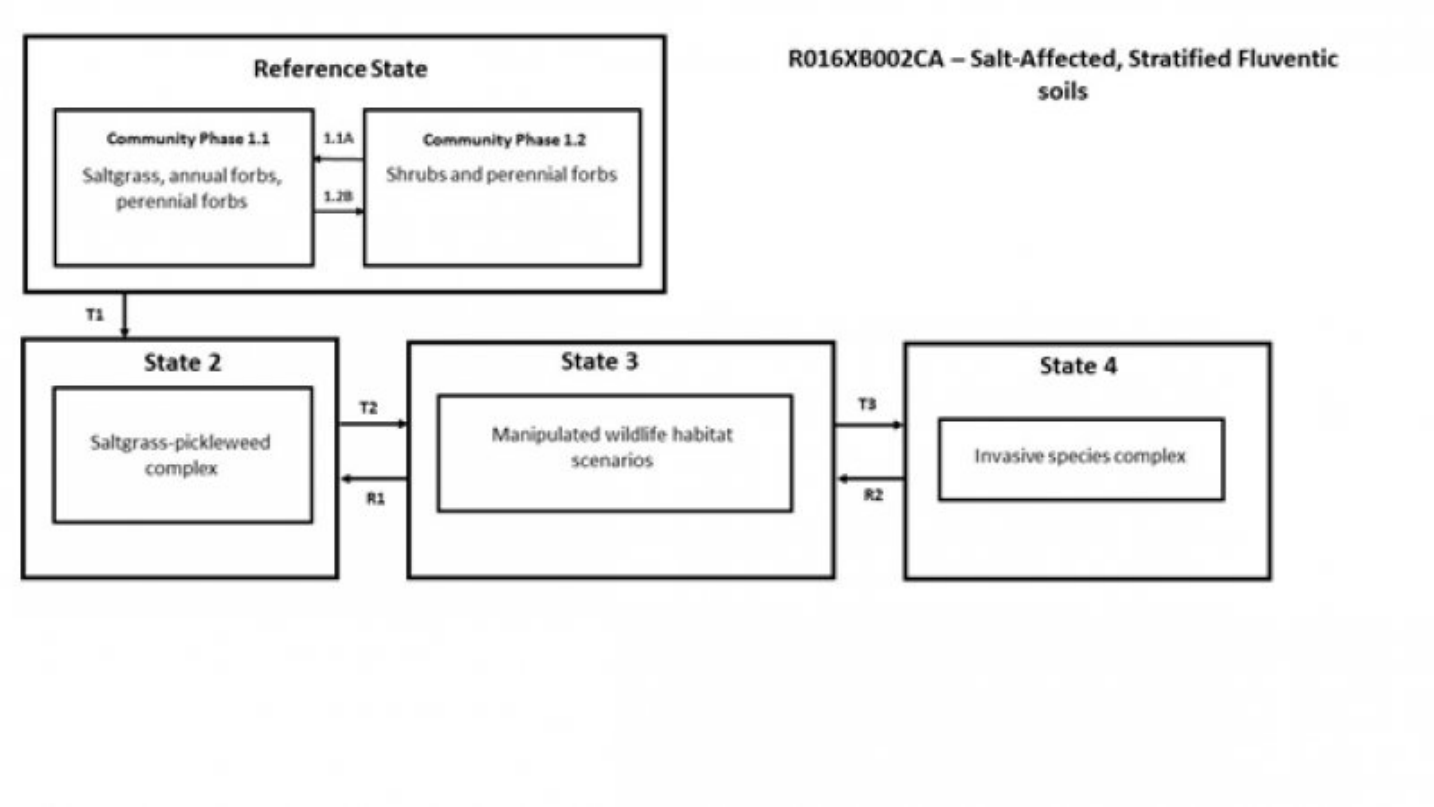


**Figure 6. STM016XB002**

### State 1
### Reference State

The reference state was likely a patchy complex of shrubs, perennial forbs, annual forbs, and saltgrass and fire is the most likely driver of changes in vegetation dominance. It is conceivable that in the absence of fire, most of the ecological site would eventually become dominated by shrubs such as coyote brush and big saltbush. Interruption of shrub dominance following die-off of shrubs as a result of prolonged flooding, is assumed to be historically infrequent for this ecological site as it occupies a higher position on the landscape and lacks the organic soil properties which would occur under frequent flooding scenarios.

### Community 1.1
### Saltgrass, annual forbs, perennial forbs

Saltgrass and annual forbs dominate the canopy cover while shrubs and perennial forbs are minor occupants of the site.

### Community 1.2
### Shrubs and perennial forbs

Coyote brush and big saltbush tend to be most competitive on higher portions of the micro-relief and lower elevations of the ecological site such as swales may have been dominated by blackberry and wild rose. Overall grass and annual forb cover is greatly reduced.

### State 2
### Levelled and Drained State

This state represents a recovery of a simplified natural community following abandonment of initial cultivation efforts. While some isolated stands of native shrubs occur on higher positions within the extent of the site, the

existing slope is linear-linear and broken up by drainage ditches. The two dominant species are saltgrass and perennial pickleweed and the occasional native shrub stands typically are dominated by coyote brush and big saltbush. This is a managed state with burning and water management occurring to reduce preponderance of undesirable vegetation. Manual control of smaller extents of undesirable vegetation is ongoing. Saltgrass remains subdominant and annual forbs may be apparent in Spring. While restoration may be possible, it has not been demonstrated on this ecological site. It is assumed that the primary methods for restoration would involve reshaping the soil surface to simulate the historic low-relief landscape and thereby increase the diversity of niches which might be exploited by native species.

### State 3
### Wildlife Management Scenarios

This is a highly managed state for waterfowl cover and/or food plots. This is the representative state. This state may be comprised of many different species planted in blocks with differing cover quality and rates of maturation to provide a diverse habitat conditions to meet the needs of many species, not just waterfowl. Due to the complexity of adaptive management and social priorities, these scenarios are not described in detail here and the user is directed to contact the California Department of Fish and Wildlife for current and historic details of vegetation management. Invasive species are actively managed through water management, fire and complementary control methods.

### State 4
### Invasive Species Complex

This invaded state is dominated by a complex of invasive species with resident desirable species in decline. Long term eventual dominance would most likely be by fennel or similar tall species, but prior to canopy closure, bull thistle, sea blight, wild celery and perennial pepperweed are likely to appear as equal competitors while canopy gaps are present.

### Transition T1
### State 1 to 2

The soils of the site have been leveled and drained for agronomic production. Little of the historic topography is intact across the majority of this ecological site.

### Transition T2
### State 2 to 3

Agronomic and management inputs for habitat management.

### Restoration pathway R1
### State 3 to 2

Removal of agronomic inputs and in most cases, replacement of resident vegetation with species of the target state would be required to return the condition of the site to State 2.

**Conservation practices**

| |
|---|
| Restoration and Management of Rare and Declining Habitats |

### Transition T3
### State 3 to 4

Agronomic inputs manipulate vegetation considerably in terms of structure, cover and composition.

### Restoration pathway R2
### State 4 to 3

It is assumed that given enough management intensity, as demonstrated by landowners in the area, that some

areas can be returned to the previous state

**Conservation practices**

| |
|---|
| Prescribed Burning |
| Integrated Pest Management (IPM) |
| Upland Wildlife Habitat Management |
| Invasive Plant Species Control |

## Additional community tables

## Other references

Herbold, B., and P.B. Muyle, 1989. The ecology of the Sacramento-San Joaquin Delta: a community profile. U.S. Fish Wildl. Sew. Biol. Rep. U(7.22). xi + 1% pp.

Kneib R, Simenstad C, Nobriga M, Talley D. 2008. Tidal marsh conceptual model. Sacramento (CA): Delta Regional Ecosystem Restoration Implementation Plan.

Galloway, D., Jones, D. and Ingebristen, S.E., 2013. Land Subsidence in the United States. USGS Circular 1182.

Sands, A. 1977. Riparian Forests in California: Their Ecology and Conservation. Institute of Ecology, UC Davis and Davis Audubon Society, Pub. No. 15.

Vaghti, M. G., and Keeler-Wolf, T, 2004. “Suisun Marsh Vegetation Mapping Change Detection 2003”. California Department of Fish and Game, Wildlife Habitat Data Analysis Branch.

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## Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

| | |
|---|---|
| Author(s)/participant(s) | |
| Contact for lead author | |

| | |
|---|---|
| Date | |
| Approved by | |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant:

Sub-dominant:

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth ( in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**

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