

Ecological site R016XA004CA Island Sandhills

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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.

Land resource unit (LRU) 016XA is the eastern portion of the MRLA and is distinguished from the western LRU 016B by lesser influence of river hydrology and salt water upon the ecological sites.

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 ecological site occurs on gently rolling low-elevation and mostly stable sandhills, primarily on islands and influenced by water table fluctuations and minor salt accumulation and vertical migration within the surface soil horizons.

Vegetation potential includes saltgrass (*Distichlis spicata*) and other salt tolerant species such as coyote brush (*Baccharis pilularis*) and salt fat hen (*Atriplex patula*) but current dominant species typically are Bermuda grass and annual grasses.

Associated sites

R016XA001CA	Tidally-Influenced, Freshwater 016XA001 occurs in a coarse mosaic with this site occupying low lying pockets between stable dunes and extending to the historic water's edge.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Baccharis pilularis</i> (2) <i>Atriplex triangularis</i>
Herbaceous	(1) <i>Distichlis spicata</i>

Physiographic features

This site occurs on ancient low-relief sand dunes extending from off-shore dunes and into the Delta floodplain. Unlike the inland dunes, this site is more obviously influenced by the water table by virtue of elevation and proximity to Delta waters. Some small extents of the site may occur below sea level as a result of subsidence of adjacent organic soils (016XA001).

Table 2. Representative physiographic features

Landforms	(1) Dune
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Rare to occasional
Ponding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Ponding frequency	None to occasional
Elevation	0–4 m
Slope	1–8%
Ponding depth	0–8 cm
Water table depth	51–102 cm
Aspect	Aspect is not a significant factor

Climatic features

Soil moisture as influenced by water table fluctuations augment precipitation which is typically 100% rain as it is for the entire MLRA.

Table 3. Representative climatic features

Frost-free period (average)	290 days
Freeze-free period (average)	341 days
Precipitation total (average)	330 mm

Climate stations used

- (1) ANTIOCH PUMP PLT #3 [USC00040232], Antioch, CA

Influencing water features

Soil features

The soils associated with this ecological site are very deep and developed from alluvium and eolian deposits derived from mixed sources.

Surface textures are sand, loamy sand, and fine sandy loam. Subsurface textures are sand, loamy sand, and fine sandy loam. Electrical conductivity of the soil (EC) is less than 4 d/Sm throughout. There is weak discontinuous calcium carbonate and silica cementation present but is not a root limiting horizon.

These soils are poorly drained with slow to rapid permeability. The high water table is root limiting for crops. Much of the areas' water table has been manipulated. In un-drained areas roots are limited by the water table occurring from approximately 20 inches and extending to about 40 inches below the surface throughout the year, and are saturated with water within a depth of 20 inches for 4 to 12 months a year. The soil moisture regime is aquic and the soil temperature regime is thermic.

The soils that are correlated to this ecological site are the Piper soils in map unit Ph (Coarse-loamy, mixed (calcareous), thermic Typic endoaquents) and Piper soils in map units Pd and Pe (Sandy, mixed, thermic Typic Psammaquents). The soils identified as Piper in this site do not meet the current criteria of the Piper series (Keys to Soil Taxonomy 12th Edition).

This ecological site has been correlated with the following mapunits and soil components in MLRA 16 CA013; Contra Costa County soil survey area, California

Pd; Piper sand; Piper

Pe; Piper loamy sand; Piper

Ph; Piper fine sandy loam; Piper

Table 4. Representative soil features

Parent material	(1) Eolian deposits–granite (2) Alluvium–sandstone (3) Alluvium–granite
Surface texture	(1) Sand (2) Sandy loam (3) Fine sandy loam
Family particle size	(1) Sandy
Drainage class	Poorly drained
Permeability class	Moderate
Soil depth	152–183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (0-101.6cm)	7.62–18.29 cm
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–15
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This ecological site historically would be represented by a complex series of comparatively high relief stable dunes in a mosaic pattern with 016XA001. Well sorted, discontinuously weakly cemented wind-deposited sands largely of granitic origin (Sierra Nevada) are the hallmark of the ecological site along the southern fringe of the western part of the LRU. Much of this site was historically occasionally inundated but due the high water table and capillary action of the sands, some salts have accumulated in the soil surface horizon and this site was able to support large amounts of saltgrass. Shrub species distribution across the site was likely largely dictated by the relative depth of the high water table. This site is of limited extent covering just 1% of the LRU near the city of Oakley, predominantly on Bethel and Jersey islands.

Almost all of this ecological site has been substantially altered from its pre-gold mining era conditions. This is largely due to levee construction and direct conversion to production agriculture. Most extents of the site not currently in agricultural production have been developed. Some areas retain the topography of low relief transverse dunes but most of it has been partially leveled for Bermuda grass production. Areas without active management or grazing are dominated by annual grasses, most notably ripgut brome which grows to only a moderate height, presumably due to salts in the soil and the resulting water stress on the plants.

Coyote brush, salt fat hen and lupine were historically the most likely shrub components on this site although coyote brush currently occurs only incidentally. Other shrubs and trees present in the mosaic are more likely associated with the sister site 016XA001 on the lowest portions of the mosaic with willows frequently accompanied by cattails and blackberry there.

Currently, pumping of groundwater is necessary to keep much of the site from continuous inundation as a result of subsidence. It is assumed here that much of the subsidence associated with the ecological site has been in conjunction with the 016XA001 portion of the mosaic; surficial losses of organic matter, while comparatively trivial in quantity, are assumed to have occurred on nearly the entire ecological site due to historic tillage and land levelling efforts.

State and transition model

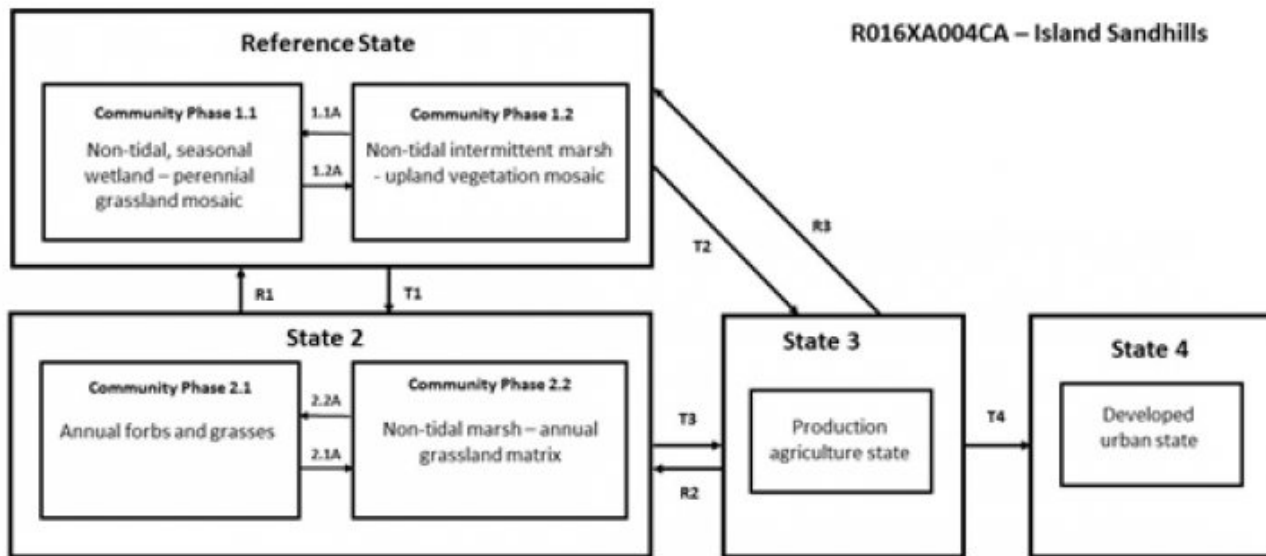


Figure 6. STM016XA004

State 1 Reference State

Saltgrass, coyote brush, salt fat hen, poison oak and bush lupine typically dominate upland areas whereas the intergrade between histic 016XA001 and this site includes some groundwater fed wetland species, primarily *Eleocharis* and *Juncus* species. Wetland vegetation may expand upslope somewhat during very wet years and then contract to the lower elevation during years of poor rainfall. Some amount of organic matter accumulation within this zone is likely, but not to the extent demonstrated in 016XA001.

Community 1.1 Non-tidal, seasonal wetland perennial grassland mosaic

Saltgrass, coyote brush, poison oak and bush lupine; meadow barley, spike rushes and *Juncus* species in concavities.

Community 1.2 Non-tidal, intermittent marsh - upland vegetation mosaic

California meadow barley, spike rushes and *Juncus* species dominate with expanded range of occurrence; bush lupine and coyote brush sparse or in patches with saltgrass restricting recruitment of young shrubs.

Pathway 1.2A Community 1.1 to 1.2

Two or more wetter than normal climate years facilitating the expansion of wetland vegetation upslope from the community's previous location.

Pathway 1.1A Community 1.2 to 1.1

Prolonged drought causing reduction in wetland obligate species along the upper elevations of seasonal wetlands.

State 2

Modified Surface Hydrology

This state is most likely to occur in the form of small exclusions in odd field corners and other unmanaged areas. Following reclamation and the introduction of disturbance favored, grazing-adapted annual species, most of the drier portions of the ecological site would come to be dominated by such species with decreasing amounts of saltgrass in areas left ungrazed. Shrub species would be mostly reduced to trace amounts in such areas due to active control. At the lower elevation of this ecological site, facultative annual wetland species would likely compete heavily at the drying fringe, reducing the extent of dominance by historic species, but not excluding them altogether.

Community 2.1

Annual forbs and grasses

Ripgut brome, farmer's foxtail, annual fescue, field bindweed, smooth cats ear, and to a lesser degree, saltgrass, poison hemlock and black mustard.

Community 2.2

Non-tidal marsh - annual grassland matrix

California meadow barley, spike rush, Juncus species, Mediterranean barley, scarlet pimpernel and saltgrass.

Pathway 2.1A

Community 2.1 to 2.2

Vegetation control such as mowing and grazing decreases competition for light and nutrients allowing the expansion of saltgrass and species adapted to moist to wet soil conditions such as meadow barley and spike rushes.

Conservation practices

Prescribed Grazing
Herbaceous Weed Control

Pathway 2.2A

Community 2.2 to 2.1

Removal of vegetation controls such as grazing and mowing increases the composition of introduced annual species thereby displacing wetland species along the wetter portions of the ecological site and reducing the success of saltgrass in drier areas.

State 3

Agricultural Production

Active agricultural use, primarily for Bermuda grass production. The current typical grass crop is likely following previous annual wheat and other small grain cultivation.

State 4

Developed

Developed with structures and attending infrastructure. While restoration is conceptually possible, it has not been demonstrated economically feasible. Compared to other ecological sites within the LRU, this ecological site presents fewer immediate hazards to structures and lesser likelihood of full restoration and therefore are less likely to be targeted for restoration.

Transition T1

State 1 to 2

Levee installation, land levelling, burning, and cultivation; introduction of grazing-adapted annual vegetation species

and brush control.

Transition T2

State 1 to 3

Levee installation, land levelling, burning, and annual cultivation; introduction of grazing-adapted annual vegetation species and brush control.

Restoration pathway R1

State 2 to 1

Restoration of natural hydrology, reintroduction of native species and control of competing non-native vegetation.

Conservation practices

Range Planting
Integrated Pest Management (IPM)
Tree/Shrub Establishment
Wetland Restoration

Transition T3

State 2 to 3

Levee installation, land levelling, burning, and annual cultivation; introduction of grazing-adapted annual vegetation species and brush control. Primary difference between T2 and T3 is the degree of surface disturbance and loss of soil organic matter resulting from annual tillage.

Restoration pathway R3

State 3 to 1

Removal of cultivation practices, restoration of natural hydrology, reintroduction of native species and control of competing non-native vegetation.

Conservation practices

Range Planting
Drainage Water Management
Integrated Pest Management (IPM)
Tree/Shrub Establishment
Wetland Restoration

Restoration pathway R2

State 3 to 2

Removal of cultivation practices.

Conservation practices

Wetland Enhancement

Transition T4

State 3 to 4

Conversion to urban land use.

Additional community tables

Other references

USDA, NRCS NASIS

Contra Costa Soil Survey (1977)

Piper series official series description.

Contributors

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Acknowledgments

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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:

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

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

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

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:

17. Perennial plant reproductive capability:
