

# WET_LAND

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Wetlands are described as **lands** where saturation **with water is the dominant factor** determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface.

And yet...there is no single, correct, indisputable, ecologically sound definition for wetlands, primarily because of the diversity of wetlands and because **the demarcation between dry and wet environments lies along a continuum**.

Through this lens, WET_LAND explores how physical, chemical, social and political forces enacted by water and land affect Saxis Wildlife Management Area, and the site's prospects in light of climate change.

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Plant
Animal

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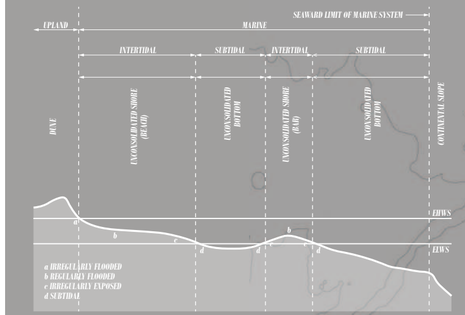
# Wetland Classification

The Cowardin Classification System, as used by USFWS, is intended to describe ecological taxa, and provide uniformity of concepts and terms for wetlands and deepwater habitats.

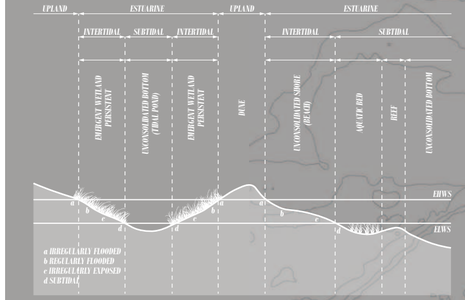
**Wetlands and Deepwater Habitats**

*Hierarchal (L1UBHh)*
- *System (L)*
  - *Subsystem (1)*
    - *Class (UB)*
      - *Subclass (-)*
        - *Water Regime (H)*
          - *Special Modifiers (h)*

| SYSTEM | SUBSYSTEM | CLASS |
|---|---|---|
| Marine | Subtidal | Rock Bottom, Unconsolidated Bottom, Aquatic Bed, Reef |
| | Intertidal | Aquatic Bed, Reef, Rocky Shore, Unconsolidated Shore |
| Estuarine | Subtidal | Rock Bottom, Unconsolidated Bottom, Aquatic Bed, Reef |
| | Intertidal | Aquatic bed, Reef, Streambed, Rocky Shore, Unconsolidated Shore, Emergent WEtland, Scrub-Shrub Wetland, Forest Wetland |
| Riverine | Tidal | Rock Bottom, Unconsolidated Bottom, Aquatic Bed, Rocky Shore, Unconsolidated Shore, Emergent Wetland |
| | Lower Perennial | Rock Bottom, Unconsolidated Bottom, Aquatic Bed, Rocky Shore, Unconsolidated Shore, Emergent Wetland |
| | Upper Perennial | Rock Bottom, Unconsolidated Bottom, Aquatic Bed, Rocky Shore, Unconsolidated Shore |
| | Intermittent | Streambed |
| Lacustrine | Limnetic | Rock Bottom, Unconsolidated Bottom, Aquatic Bed |
| | Littoral | Rock Bottom, Unconsolidated Bottom, Aquatic Bed, Rocky Shore, Unconsolidated Shore, Emergent Wetland |
| Palustrine | | Rock Bottom, Unconsolidated Bottom, Aquatic Bed, Rocky Shore, Unconsolidated Shore, Emergent Wetland, Scrub-Shrub Wetland, Forested Wetland |




*Distinguishing features and examples of habitats in the Marine System.*
*EHWS = extreme high water of spring tides*
*ELWS = extreme low water of spring tides*




*Distinguishing features and examples of habitats in the Estuarine System.*
*EHWS = extreme high water of spring tides*
*ELWS = extreme low water of spring tides*

Saxis WMA is predominantly a mixture of marine and estuarine wetlands, scrub-shrub patches, ponds, swaths of emergent grasses, and forested areas.

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Emergent Wetland
- Freshwater Pond
- Riverine

# Wetland Lexicon

According to USFWS, wetlands are identified and classified based on vegetation, visible hydrology and geography from the analysis of high altitude imagery.

**PATTERN**
analysis on aerial imagery

Polygonal and linear shapes are used to define wetland areas.

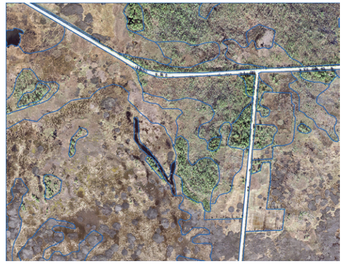
**CODING**
analysis on classification

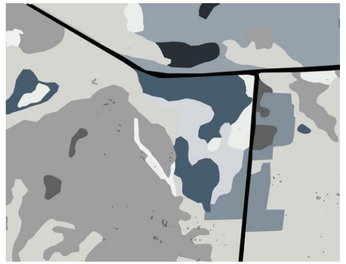
USFWS' coding system is used to describe ecological units that have certain homogeneous natural attributes.

**WET_LAND**
analysis on visual and intuited hydrology

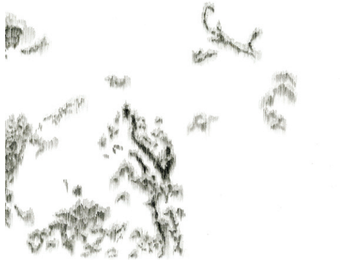
The presence of water in wetlands permeates over, below, and through the earth, much of it invisible to the eye.

**Site A**

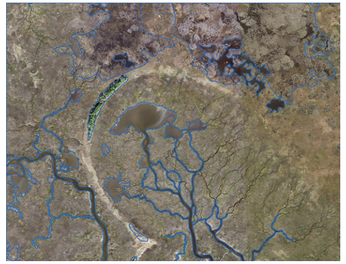




E2USM
E2SS1P
E2FO4P
E2FO4/SS4P
E2EM1Pd
E2EM1P
E2EM1Nd
E2EM1N
E2EM1/SS4P
E2EM1/FO4P
PFO4R



**Site B**

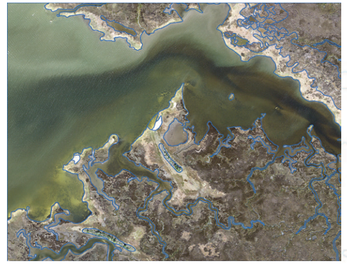


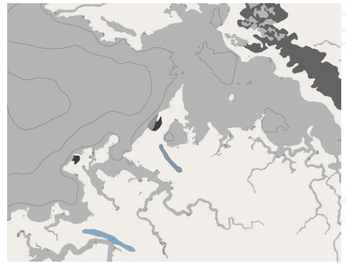


PSS4S
PSS3S
PSS1S
E1UBL
E2EM1N
E2EM1P

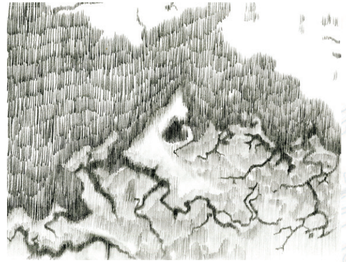


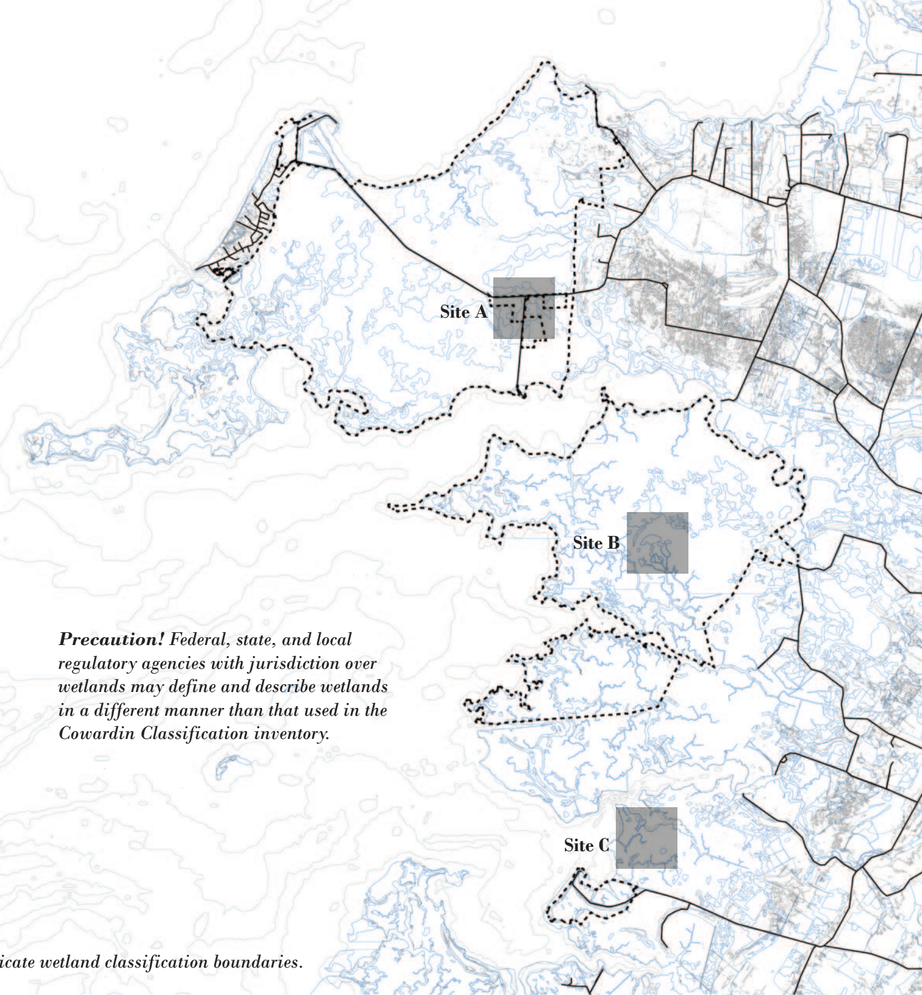
**Site C**





PSS3R
E1UBL
E2EM1N
E2EM1P
E2SS1/3P
E2USN
E2USP



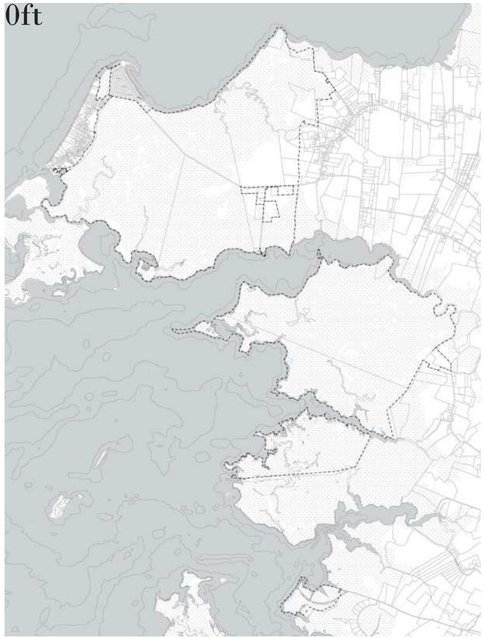



***Precaution!*** *Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in the Cowardin Classification inventory.*

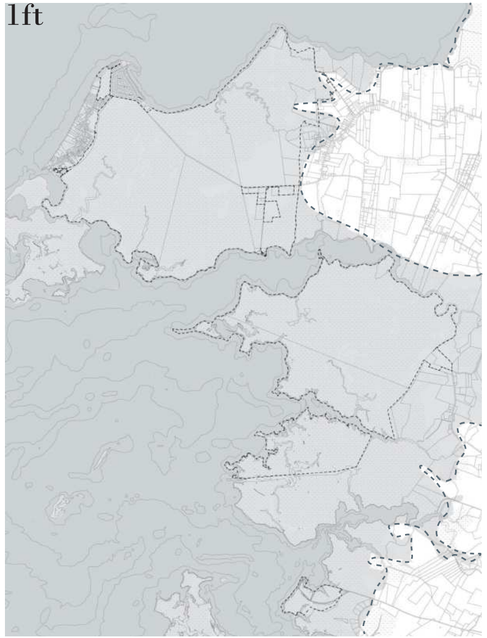
*Blue lines indicate wetland classification boundaries.*

# SEA LEVEL RISE

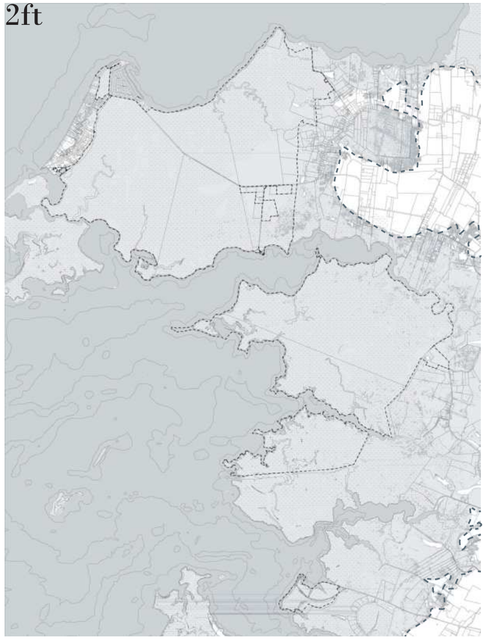
2025
0ft



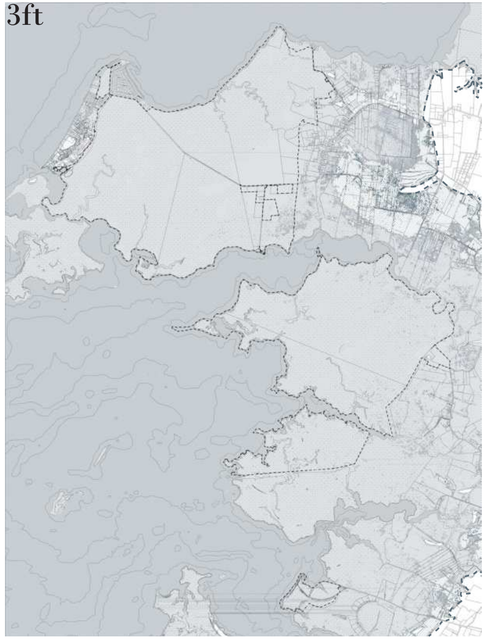
2030
1ft



2075
2ft



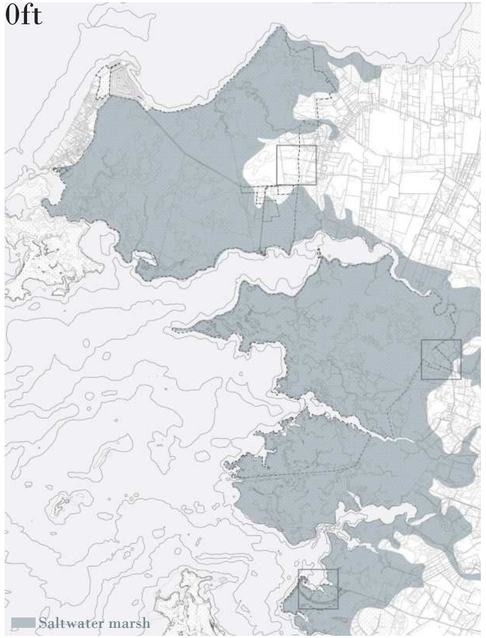
2100
3ft



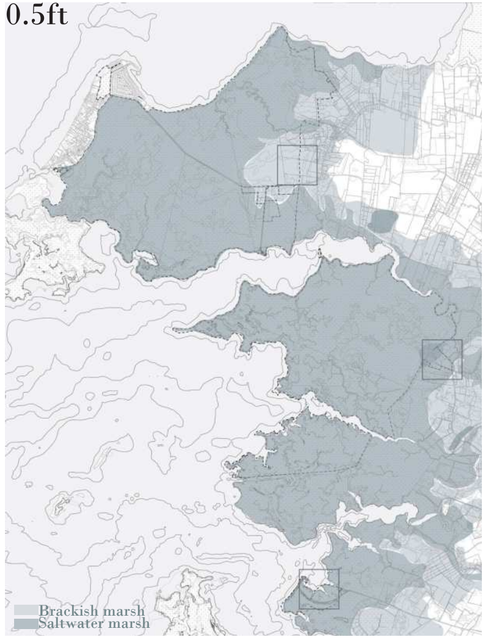


# MARSH MIGRATION

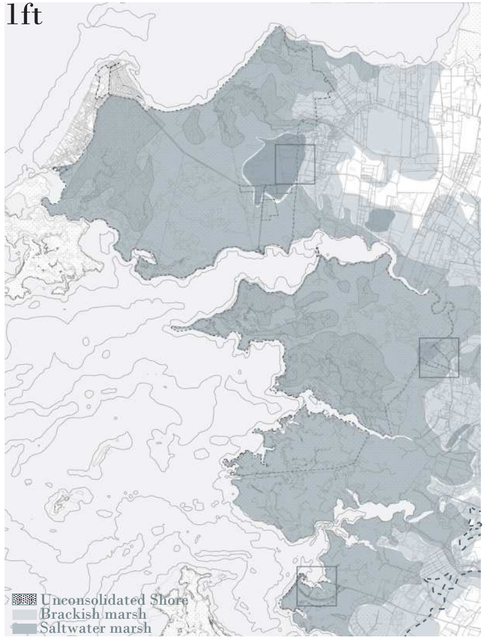
2025
0ft



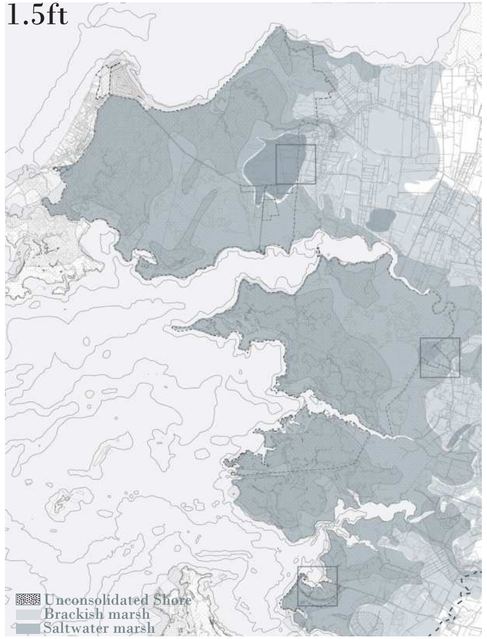

2030
0.5ft




2075
1ft

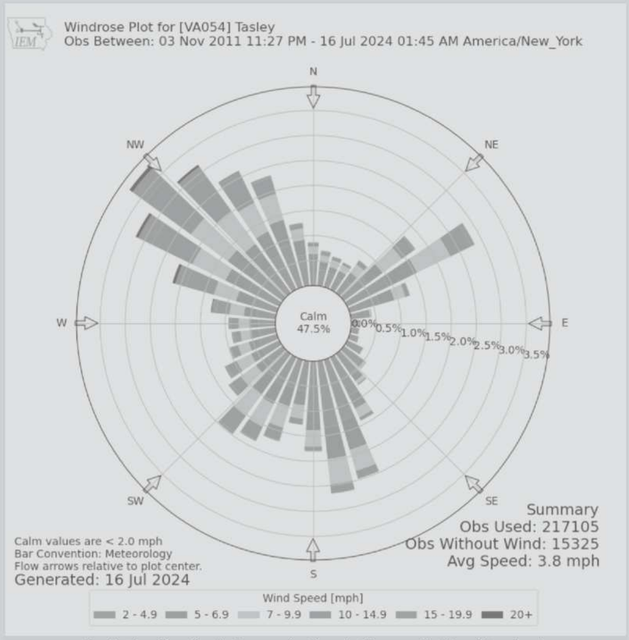


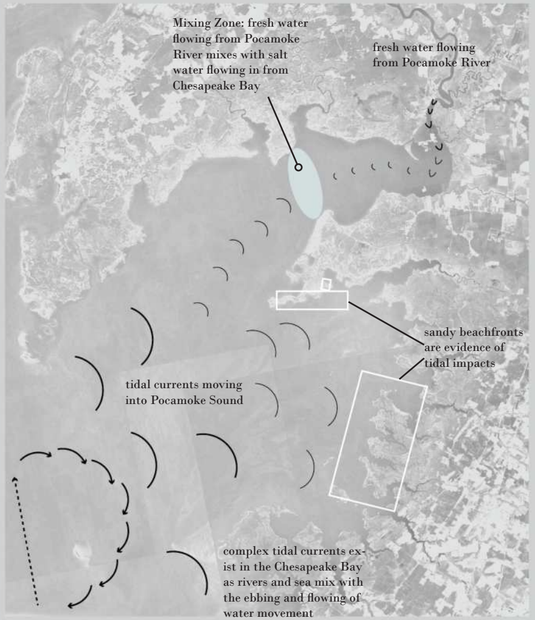

2100
1.5ft

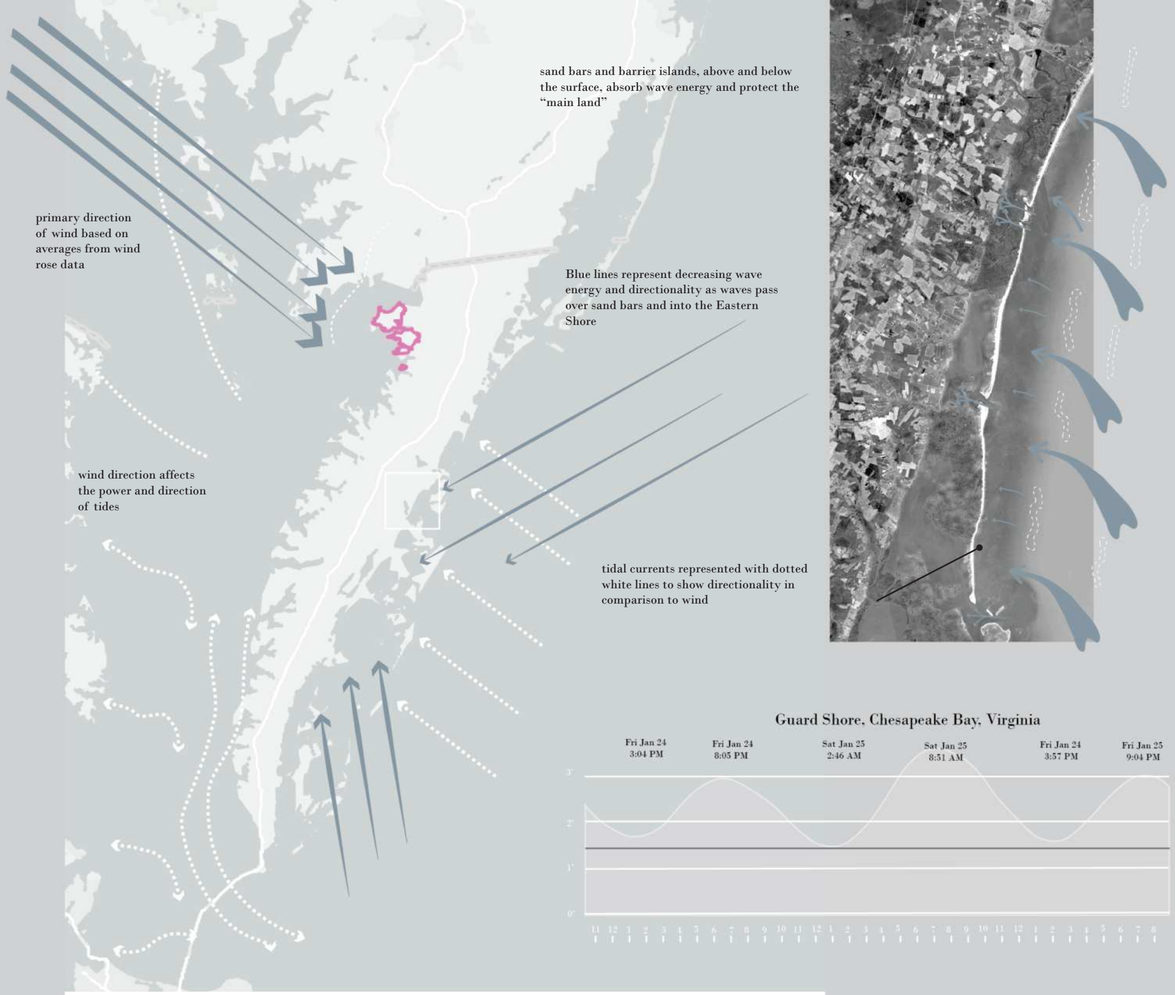




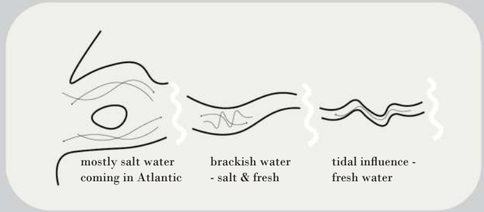

# TIDAL

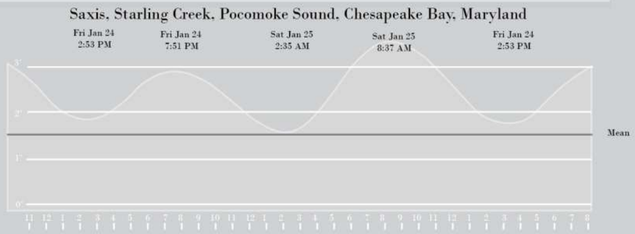

Windrose Plot for [VA054] Tasley
Obs Between: 03 Nov 2011 11:27 PM - 16 Jul 2024 01:45 AM America/New_York
N
NE
E
SE
S
SW
W
NW
Calm
47.5%
0.0%
0.5%
1.0%
1.5%
2.0%
2.5%
3.0%
3.5%
Summary
Obs Used: 217105
Obs Without Wind: 15325
Avg Speed: 3.8 mph
Calm values are < 2.0 mph
Bar Convention: Meteorology
Flow arrows relative to plot center.
Generated: 16 Jul 2024
Wind Speed [mph]
2 - 4.9
5 - 6.9
7 - 9.9
10 - 14.9
15 - 19.9
20+


Mixing Zone: fresh water flowing from Pocamoke River mixes with salt water flowing in from Chesapeake Bay
fresh water flowing from Pocamoke River
sandy beachfronts are evidence of tidal impacts
tidal currents moving into Pocamoke Sound
complex tidal currents exist in the Chesapeake Bay as rivers and sea mix with the ebbing and flowing of water movement


primary direction of wind based on averages from wind rose data
sand bars and barrier islands, above and below the surface, absorb wave energy and protect the "main land"
Blue lines represent decreasing wave energy and directionality as waves pass over sand bars and into the Eastern Shore
wind direction affects the power and direction of tides
tidal currents represented with dotted white lines to show directionality in comparison to wind



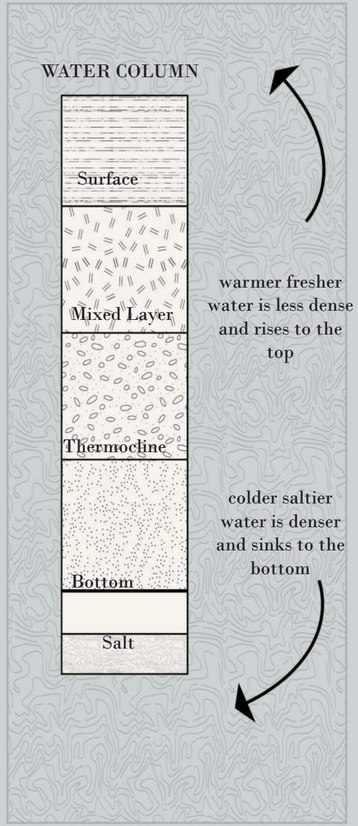

mostly salt water coming in Atlantic
brackish water - salt & fresh
tidal influence - fresh water

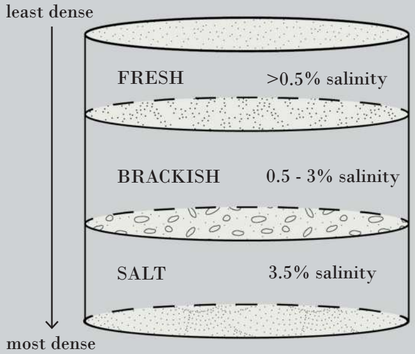

Saxis, Starling Creek, Pocomoke Sound, Chesapeake Bay, Maryland
Fri Jan 24 2:53 PM
Fri Jan 24 7:51 PM
Sat Jan 25 2:35 AM
Sat Jan 25 8:37 AM
Fri Jan 24 2:53 PM
Mean


Guard Shore, Chesapeake Bay, Virginia
Fri Jan 24 3:04 PM
Fri Jan 24 8:05 PM
Sat Jan 25 2:46 AM
Sat Jan 25 8:51 AM
Fri Jan 24 3:57 PM
Fri Jan 25 9:04 PM
Mean

# SALINITY

Salinity is fundamental to a wet land identity. It determines which plants can grow, which animals can inhabit spaces and when, determines the biodiversity present, and the overal functions of the wet land.

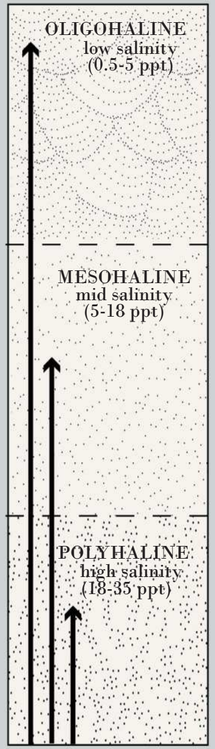


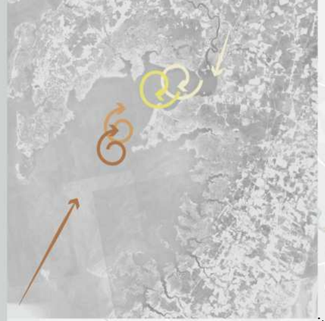







temperature and dissolved oxygen levels have an inverse relationship






fresh water flowing slowly from the Pocamoke River mixes with the salty water flowing up from the Atlantic, into the Chesapeake Bay, and into the Pocamoke Sound with the salinity levels changing with tidal flows, as well as shifts in temperature and dissolved oxygen

# People & Community



Grayson Chesser of Holden's Creek

Grayson can trace his ancestry all the way back to the first European to live on Holdens Creek. The property has remained in the family since the 1600s. My grandmother wouldn't stay here at night alone. So, they rented a house out near the station." Grayson works with the Farm Service Agency and the Conservation Reserve Enhancement Program to implement conservation practices on the farm, including 40 acres planted as pollinator habitat.

"From 2011 to 2017, the amount of Delmarva Peninsula farmland that converted into salt patches nearly doubled to more than 2,200 acres, the study estimates. That translates into as much as $107 million in annual crop losses in the region" (Bay Journal)



marsh

agricultural land

imminent threat of saltwater infiltration



Bob Fitzgerald and his ancestors have farmed the same land on Maryland's Eastern Shore off and on since 1666. **He will be the last.** Dubbed "Waller's Adventure," the 160-acre farm has begun sinking at an alarming rate. What started as a "little wet spot" has swollen in just the last few years into a bowl-shaped, 2-acre void, Fitzgerald said. "You can see where it's dead soil," he said, pointing to a bare swath of sand in the middle of the depression. "This is how you lose it," the 79-year-old added with rising concern in his voice. "This is how it starts."



Thelonious Cook of Mighty Thundercloud Edible Forest

Thelonious grows on seven acres on the Eastern Shore where his father grew up. He manages the farm as a sustainable ecosystem using permaculture techniques to enhance soil fertility and biodiversity. "Thelonius studied IT at JMU and although he grew up gardening as a child, he became exposed to sustainable farming while living in Tanzania and Ethiopia, working with an international relief and development organization. He then decided to pursue a Master's in Practicing Sustainable Development from Royal Holloway University of London. Bringing his experience in Africa back to the states, Thelonius now plants cultural niche products like callaloo, hibiscus, turmeric, and ginger."

# Community: People + Plants + Animals



OYSTERING



CRABBING



FISHING



HUNTING



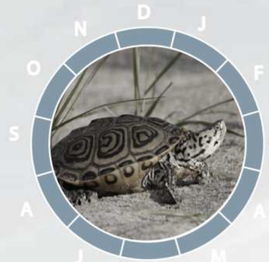
PADDLING



CAMPING



BIRDING

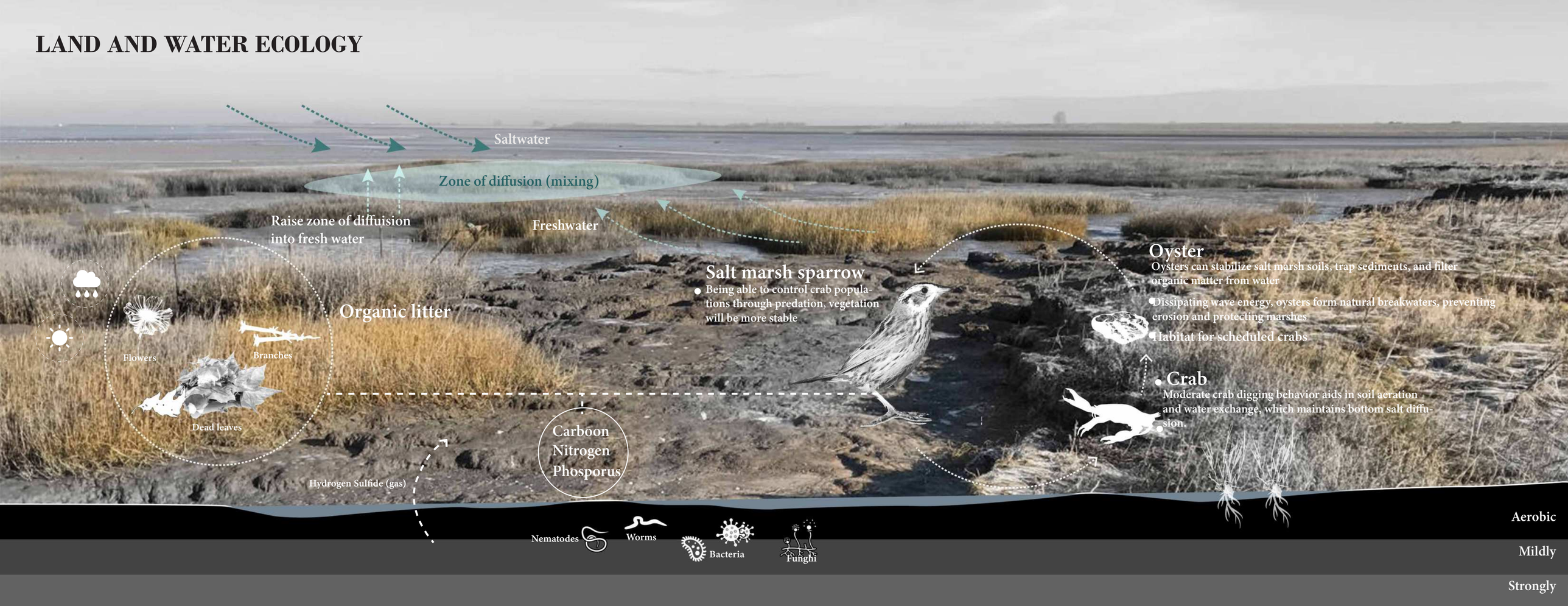


OBSERVING

# PLANT AND WATER ECOLOGY



# LAND AND WATER ECOLOGY



# Management and Funding

Saxis WMA is owned and managed at the state level by the Virginia Department of Wildlife Resources.



It is part of the Virginia Bird and Wildlife Trail, an organized network of outdoor sites highlighting the best places to see wildlife in the Commonwealth.

The trail is organized in 3 regions with Saxis WMA categorized under the Coastal Region.



Coastal Region



Piedmont Region



Mountain Region



Saxis WMA is among the 22 sites in the Eastern Loop, divided into 3 tracts: Free School Marsh, Michael Marsh, and Guard Shore. All 3 tracts are peninsulas, bordered by the brackish waters of Beasley Bay, Messongo Creek, and smaller fresh water creeks.



Guard Shore



Michael Marsh



Free School Marsh



Primary revenue sources and funding (as a percentage of annual revenue)

## Office of CONSERVATION INVESTMENT

*Partnering to fund conservation and connect people with nature*







*4% Miscellaneous*

*23% Federal Grants for Wildlife and Aquatics Support*

*6% Boat Registration and Titling Fees*

*10% Watercraft Sales and Use Tax*

*37% Hunting, Fishing, and Trapping Licenses, Permits and Stamps*

*17% Sales Tax on Outdoor Equipment for Hunting, Fishing, and Wildlife Watching*

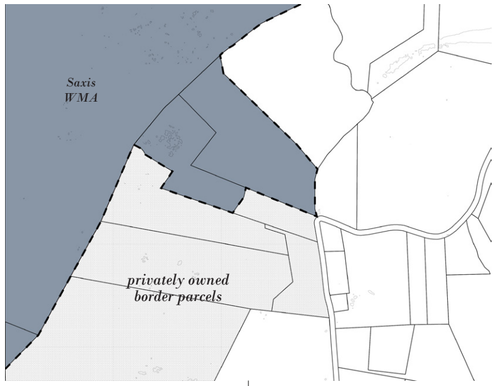
# Jurisdiction and Ownership

The site's boundary traces the edges of land parcels. However, a few pockets and protrusions of land are ambiguous in its acquisition, ownership and management as delineated by the site boundary.



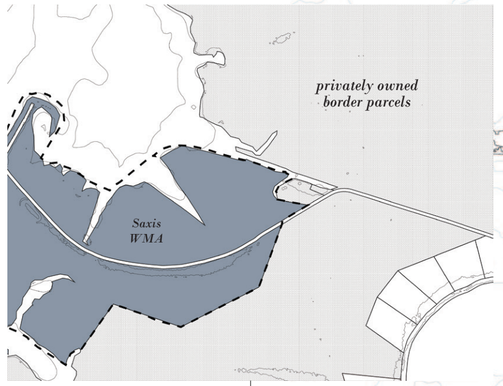

Site A

The site boundary in Site A traverses through the middle of four privately owned parcels. Just below is another privately owned parcel, completely outside of Saxis WMA's jurisdiction.



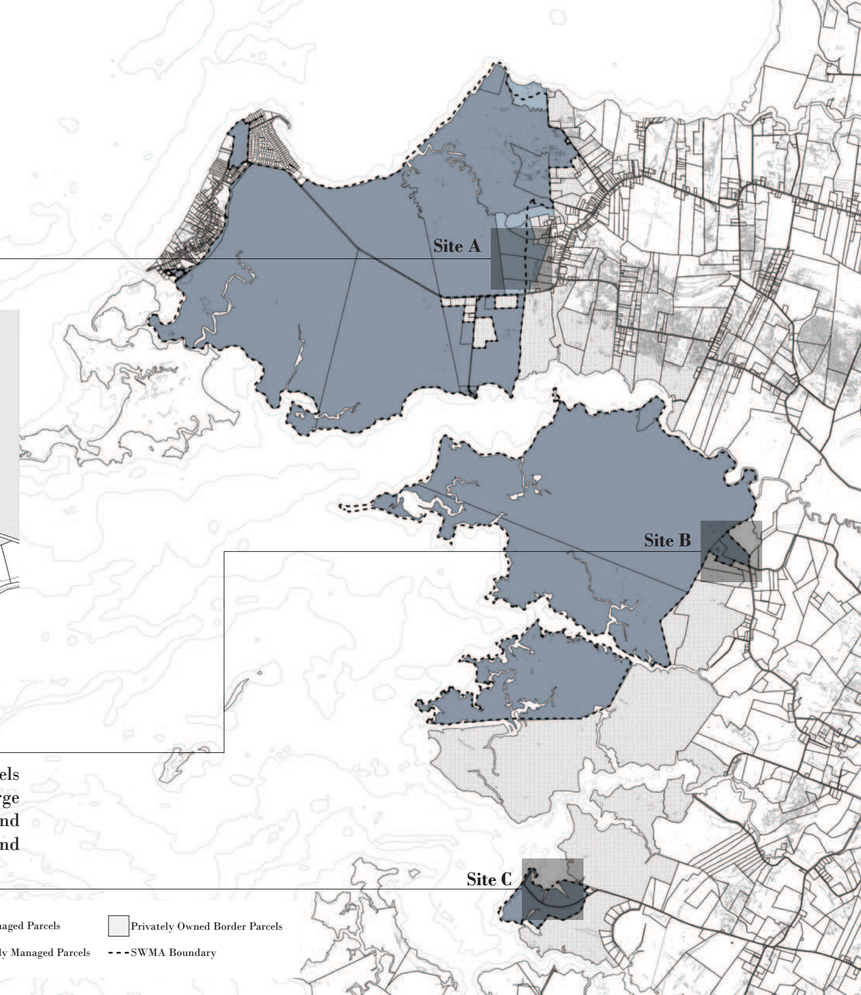

Site B

A protrusion from the main body of Michael Marsh connects to a road which serves as the only vehicular access point at this tract.




Site C

Acquired in 2002, Guard Shore is comprised of two parcels bisected by a road that follows a Delmarva bay. With large parcels of similar wetland classification bordering Site C and future sea level rise projections in mind, how will land acquisition be affected?



# Legacy of Labels

PRESERVATION / WILDERNESS MOVEMENT

CONSERVATION MOVEMENT

VIRGINIA WILDLIFE LEGISLATION

WETLAND LAWS

ENVIRONMENTAL MOVEMENT







**1872**
Yellowstone National Park is established

**1891**
Yosemite National Park is established

**1903**
Theodore Roosevelt establishes National Wildlife Refuge System

**1903**
Virginia General Assembly establishes a statewide system of wildlife law enforcement officers

**1916**
Virginia Department of Game and Inland Fisheries is established

**1918**
Migratory Bird Treaty Act signed

**1922**
Wilderness Society is formed

**1933**
Franklin D. Roosevelt creates the Civilian Conservation Corps

**1935**
Big Levels Wildlife Management Area in Augusta County was signed over to the U.S. Forest Service in 1935 for experimental wildlife management projects

**1937**
Passage of Federal Aid in Wildlife Restoration Act

**1940**
US Fish and Wildlife Service is established

**1951**
Nature Conservancy is formed

**1956**
USFWS identifies 20 types of wetlands

**1964**
Wilderness Act is passed

**1970**
Environmental Protection Agency is founded

**1979**
USFWS releases new definition of wetlands

**1984**
Chesapeake Bay Program is established

1860 1880 1900 1920 1940 1960 1980 1990

# GLOSSARY

**WET·LAND**
/wet land, wetlend/
*noun*
1. lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water.

2. must have one or more of: (1) at least periodically, the land supports predominantly hydrophytes; (2) substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil saturated with water or covered by shallow water at some time during the growing season of each year.

**ARTIFICIAL REEFS** Construction of reefs in nearshore areas to reduce the impacts of storm surge and waves

**BAR** a ridge of sand, usually underwater and parallel to the beach, sometimes exposed during low tides

**BATHYMETRY** the easier pf underwater depths, similar to the measurement of heights (topography) on land

**BREAKWATERS** Detached structures built parallel to the coast

**BRACKISH** inland waters of intermediate salinity but is not universally accepted, therefore mixosaline is used

**BULKHEADS** Vertical retaining walls to hold or prevent soil from sliding seaward

**CLASS** is the highest taxonomic unit below the Subsystem level. It describes the general appearance of the habitat in terms of either the dominant life form of the vegetation or the physiography and composition of the substrate-features that can be recognized without the aid of detailed environmental measurements

**CONSTRUCTED DUNES** Building or replacing dunes to protect communities form storm surge and wave action

**DAMS** Artificial barrier usually constructed across a stream channel to impound or store water

**DEEPWATER HABITATS** are permanently flooded lands lying below the deepwater boundary of wetlands

**DIKES/LEVEES** Solid constructed walls that prevent elevated water levels from flooding interior lowlands

**DROWNED TOPOGRAPHY** landforms now submerged because of a prior rise in the local relative sea level

**ESTUARINE SYSTEM** consists of deepwater tidal habitats and adjacent tidal wetlands that are usually semi enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The salinity may be periodically increased above that of the open ocean by evaporation

**FLOODGATES/BARRIERS** Adjustable gates that prevent storm surge from flooding coastal areas

**GROINS/JETTIES** Typcally short structures attached perpendicular to the shoreline, extending across at least part of the beach out into the surf zone

**CON·SER·VA·TION**
/ känser vaSHen/
noun
1. prevention of wasteful use of a resource. As in: the preservation, protection, or restoration of the natural environment and of wildlife. “nature conservation”

2. [Physics] the principle by which the total value of a physical quantity or parameter (such as energy, mass, linear or angular momentum) remains constant in a system which is not subject to external influence.

**HYDROPHYTES** water-dwelling plants are found in aquatic ecosystems, including wetlands. Some hydrophytes may be submerged in water, like hydrilla, while others float on the surface, like duckweed. Still others live in saturated substrate common in wetlands, where hydrophytes have adapted to the low-oxygen soil conditions that result from the soil being inundated or saturated with water

**INTERTIDAL** The substrate is exposed and flooded by tides; includes the associated splash zone

**ISOHALINE** a line or surface that connects points of equal salt concentration, or salinity, in an aquatic system

**LACUSTRINE SYSTEM** includes wetlands and deepwater habitats with all of the following characteristics : (1) situated in a topographic depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30% areal coverage ; and (3) total area exceeds 8 ha (20 acres)

**LITTORAL TRANSPORT** the movement of sediments along a coast driven primarily by wave energy

**MARINE SYSTEM** consists of the open ocean overlying the continental shelf and its associated high-energy coastline. Salinities exceed 30%, with little or no dilution except outside the mouths of estuaries

**MEAN SEA LEVEL (MSL)** the mean height of the water level (over a nineteen yea period of measurements). MSL is a legal reference for marine navigation and property lines in many jurisdictions

**MEAN LOW WATER MARK (MLW)** – Average water level at low tide. In Virginia, the rights of real property owners (littoral rights) extend to the boundary of the mean low water mark on real property bordering water (rivers, bays, creeks, shores)

**PALUSTRINE SYSTEM** includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is below 0.50%

**REVETMENTS** Armoring materials placed on an existing slope, embankment or seawall to protect the backside area from storm-driven waves

**RIVERINE SYSTEM** includes all wetlands and deepwater habitats contained within a channel, with two exceptions : (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean derived salts in excess of 0.50%

**SUBTIDAL** The substrate is continuously submerged

**SYSTEM** refers here to a complex of wetlands and deepwater habitats that share the influence of similar hydrologic, geomorphologic, chemical, or biological factors

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