



Overview of Hurricane Sandy Resiliency Projects Rhode Island NWR Complex

Nick Ernst, USFWS

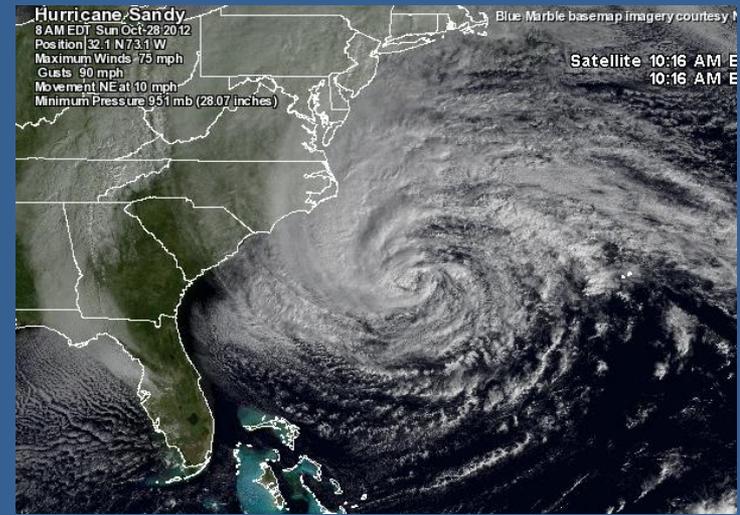
Hurricane Sandy Resiliency Funding

100 million awarded to federal agencies

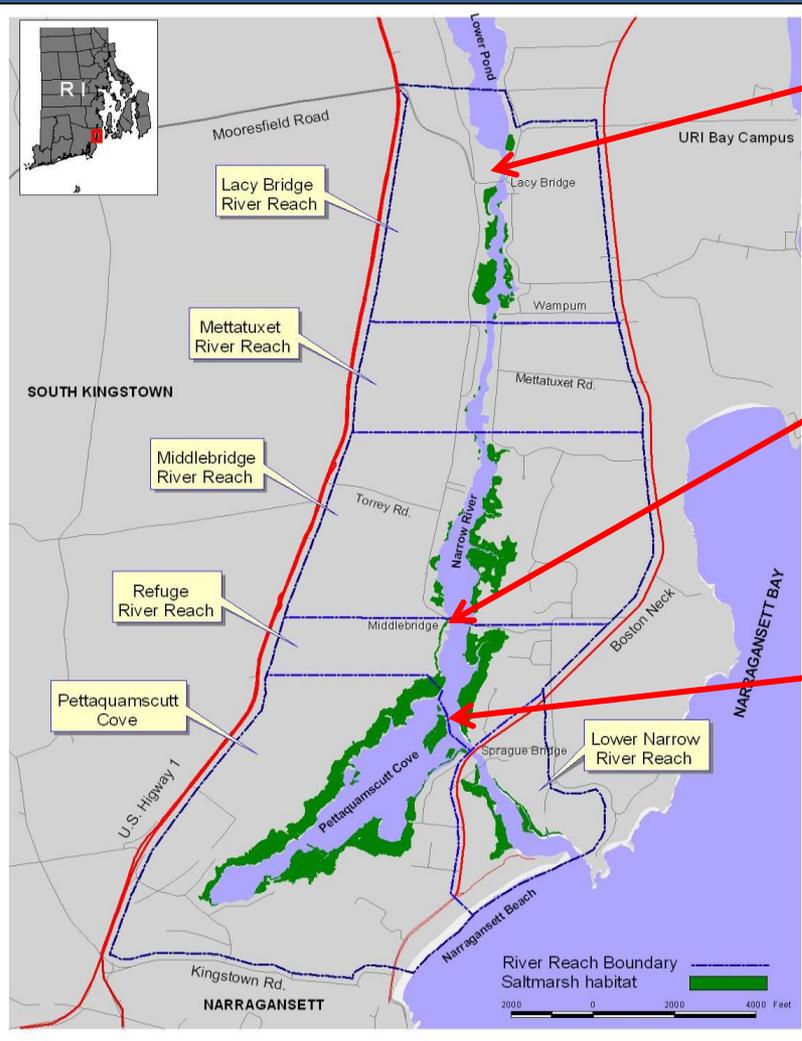
- To promote natural resource enhancement / resiliency against storms
- Projects selected on a competitive basis

Fish and Wildlife Service in Rhode Island received \$6 million

- Coastal Program (SNEP) \$2 million
 - Aquatic habitat connectivity
- Rhode Island National Wildlife Refuge Complex \$4 million
 - Saltmarsh habitat enhancement and resiliency
 - John H. Chafee NWR
 - Sachuest NWR



Site Description: John H. Chafee NWR /Narrow River



Near Lacy (Bridgetown) Bridge

- Average Temperature: 21.2 +/- 4.6 o C
- Average Salinity: 17.2 +/- 5.3 ppt
- Average Dissolved Oxygen: 7.7 +/- 1.7 mg/l

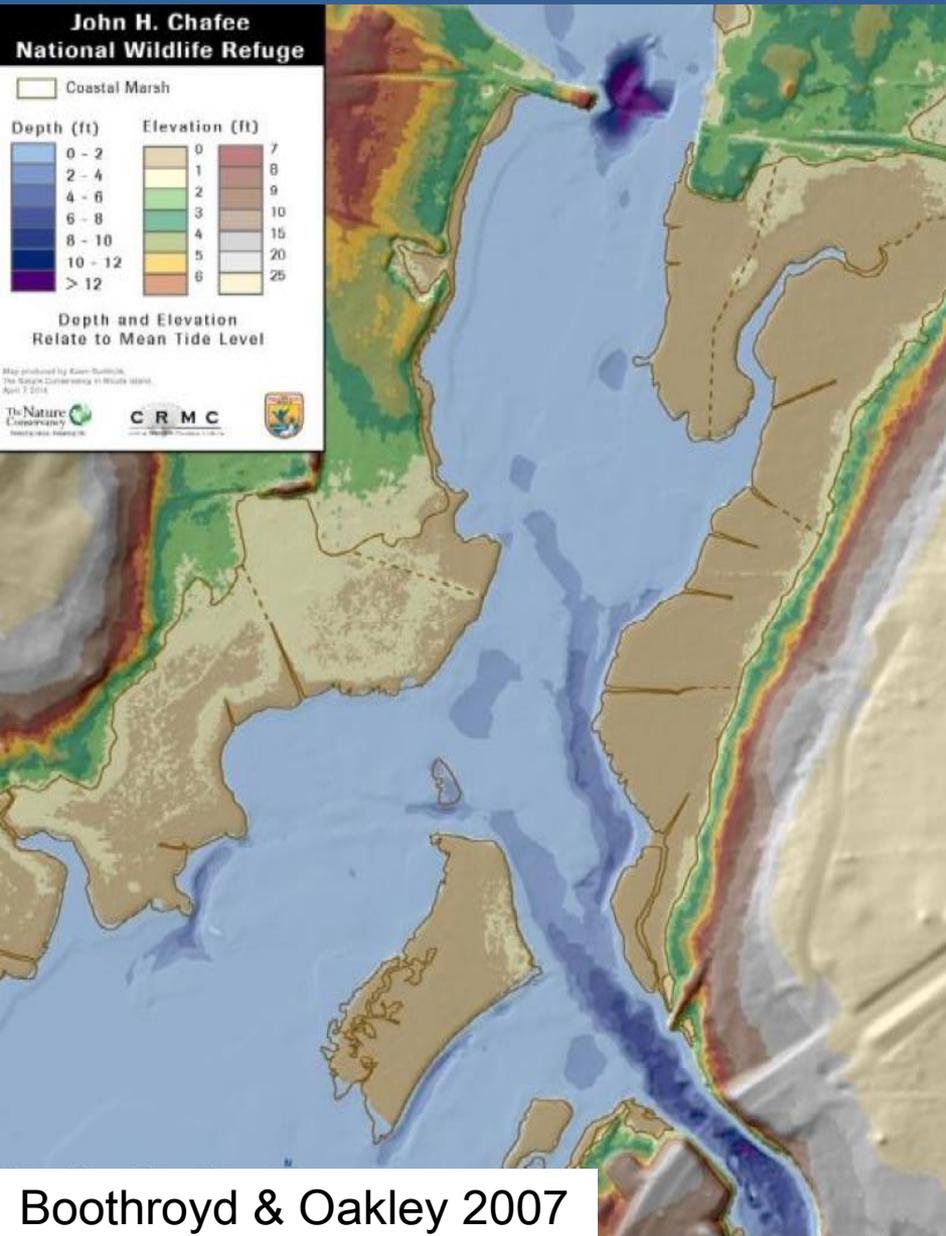
At Middlebridge

- Average Temperature: 20.3 +/- 4.2 o C
- Average Salinity: 26.9 +/- 5.3 ppt
- Average Dissolved Oxygen: 7.6 +/- 1.3 mg/l

At Refuge Reach (South of Middlebridge

- Average Temperature: 19.9 +/- 4.0 o C
- Average Salinity: 27.4 +/- 4.7 ppt
- Average Dissolved Oxygen: 7.6 +/- 1.3 mg/l

Bathymetry/Eelgrass



Boothroyd & Oakley 2007

Tidal Flats

Semipalmated Sandpiper



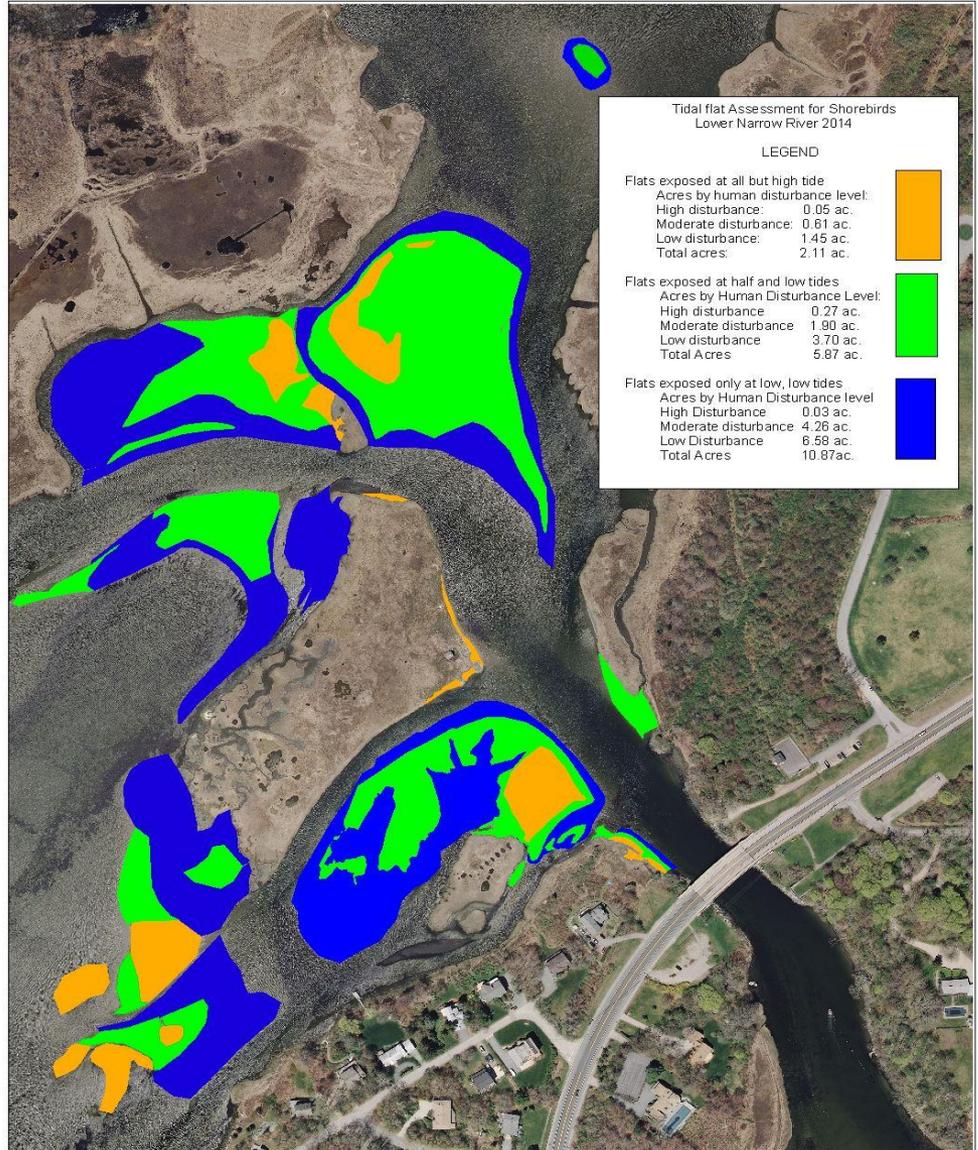
Semipalmated Plover



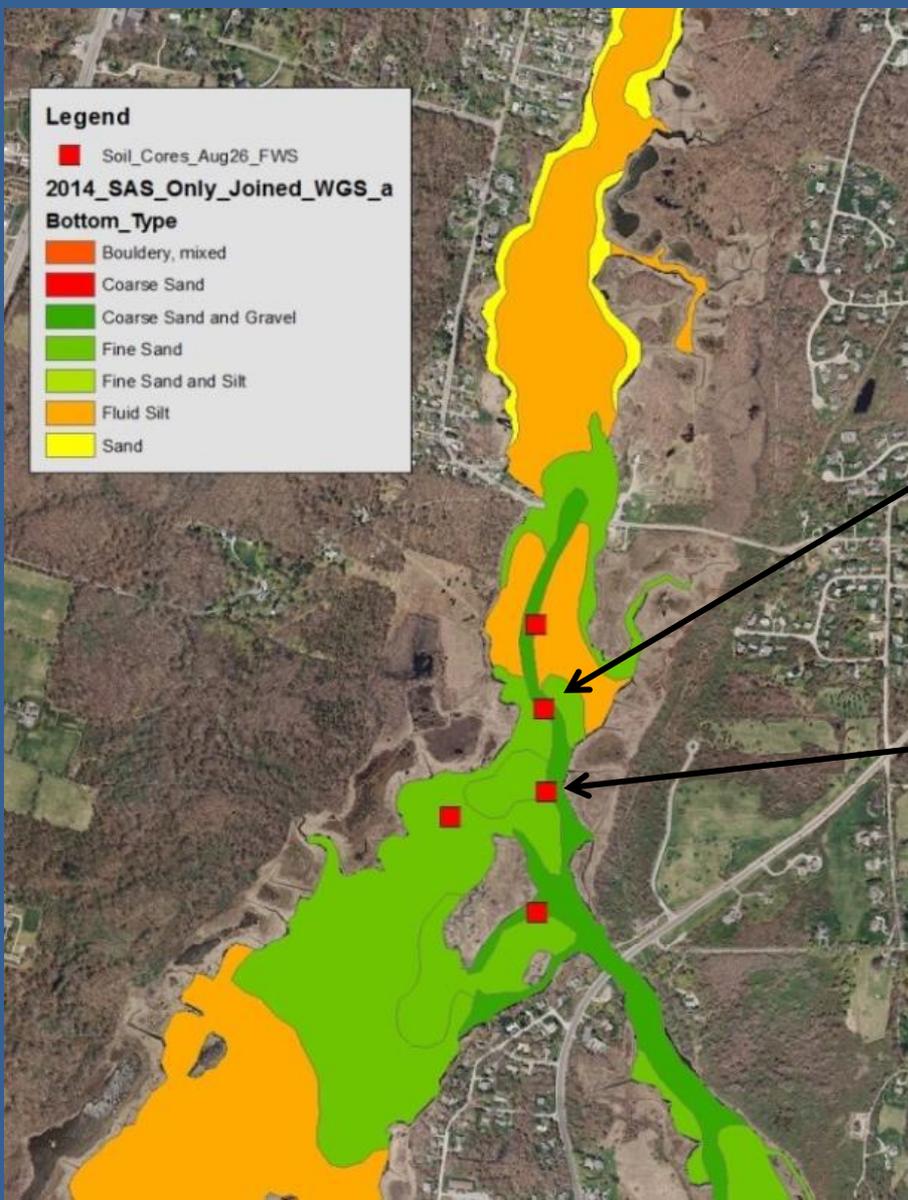
Sanderling



Short-billed Dowitcher



Benthic Habitats in the Central Portion of the Estuary (NRCS 2007).



Saltmarsh Vegetation

Spartina alterniflora



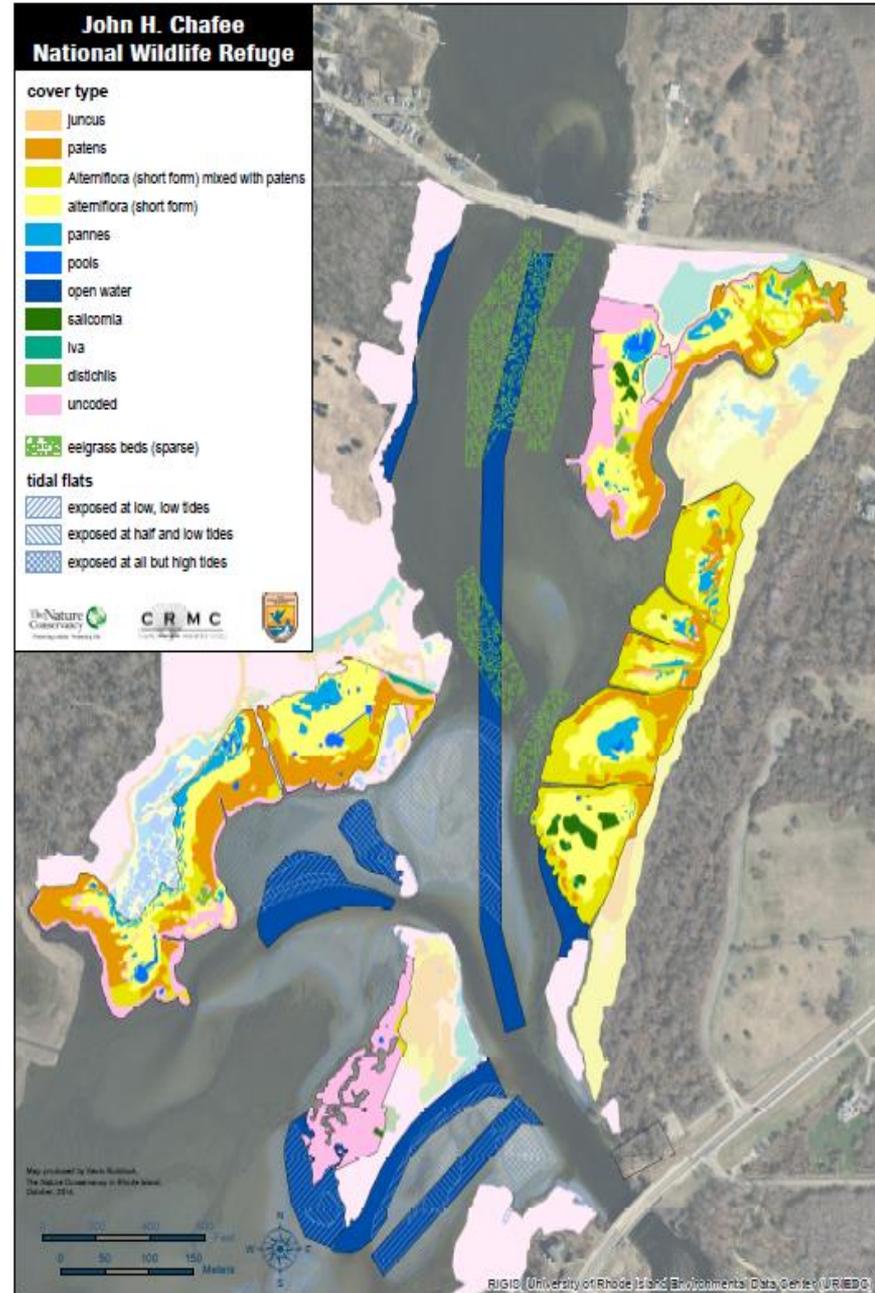
Spartina patens



Iva frutescens

Juncus gerardii

Distichlis spicata



Wildlife



Photo Credit :Brain Harris



Photo Credit :Brain Harris



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Photo Credit :Peter Paton



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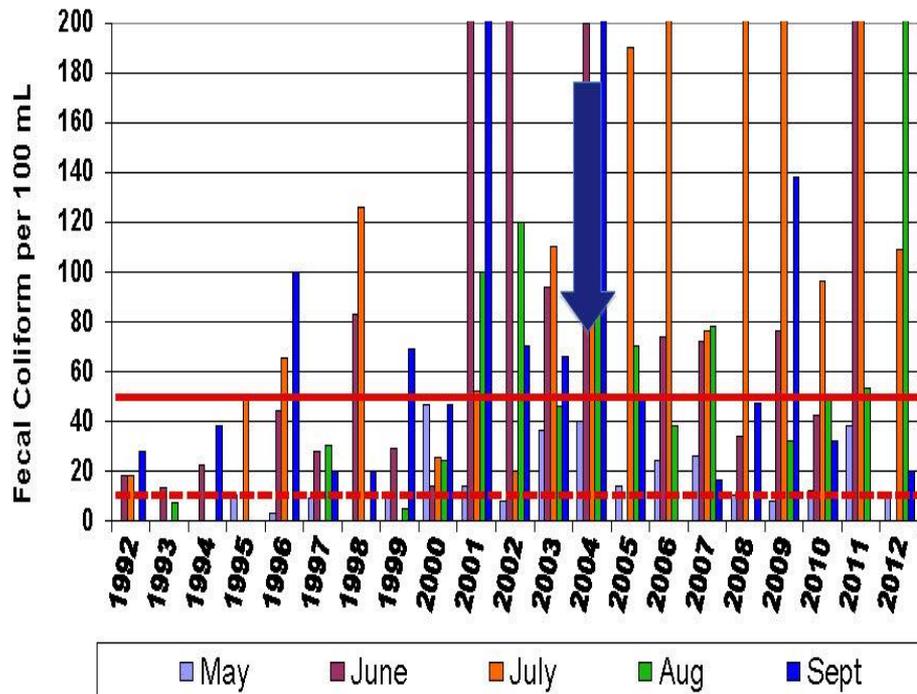


Photo Credit :Wiki Commons

Water Quality

NR-8: Middlebridge

NR-8: Bacteria - Fecal Coliform



- Water Monitoring for over 20 years
- Excessive Nitrogen and fecal coliform inputs
- Closed to Shellfishing since 1997

— Safe Swimming = 50 FC/100 mL
- - - Shellfishing = 14 FC/100 mL

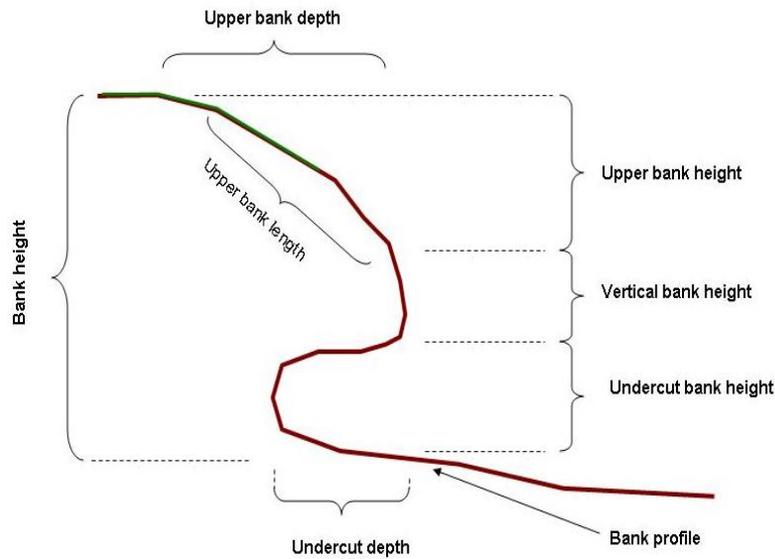


Shoreline Erosion

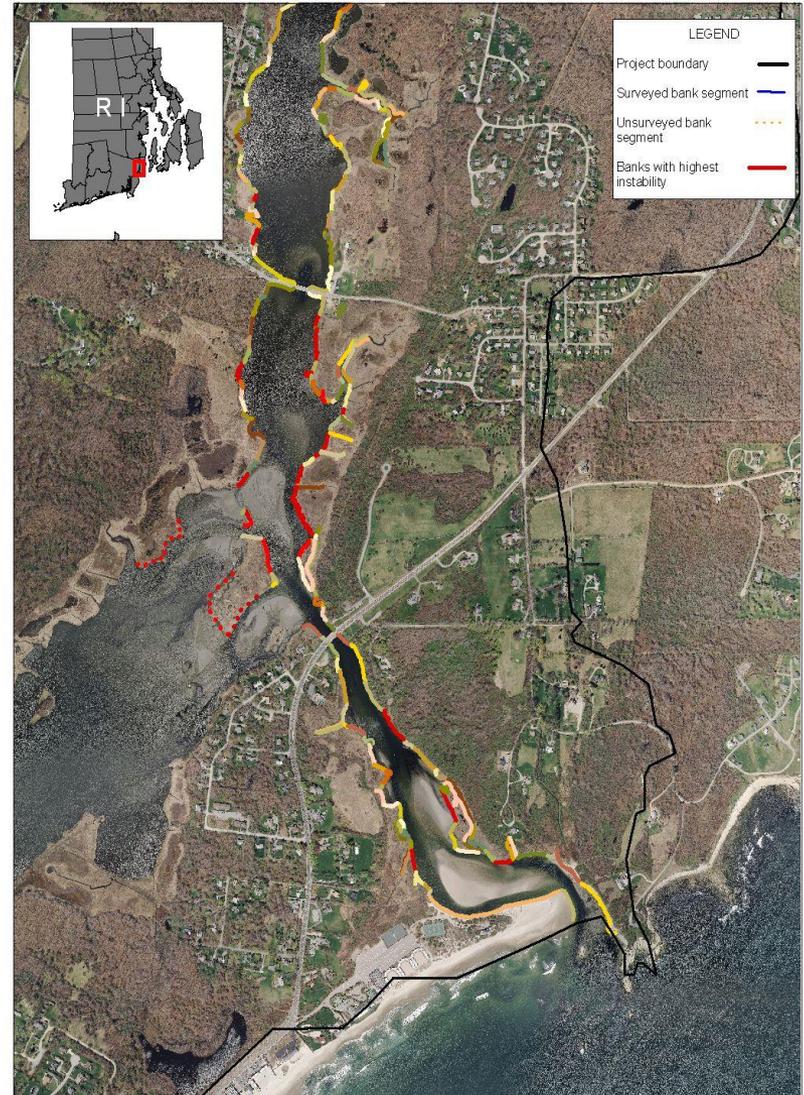
Undercut Banks

- Wind driven waves, boat wakes
- Sections of marsh edge slump off into Narrow River

Cross sectional view of typical saltmarsh riverbank, Lower Narrow River

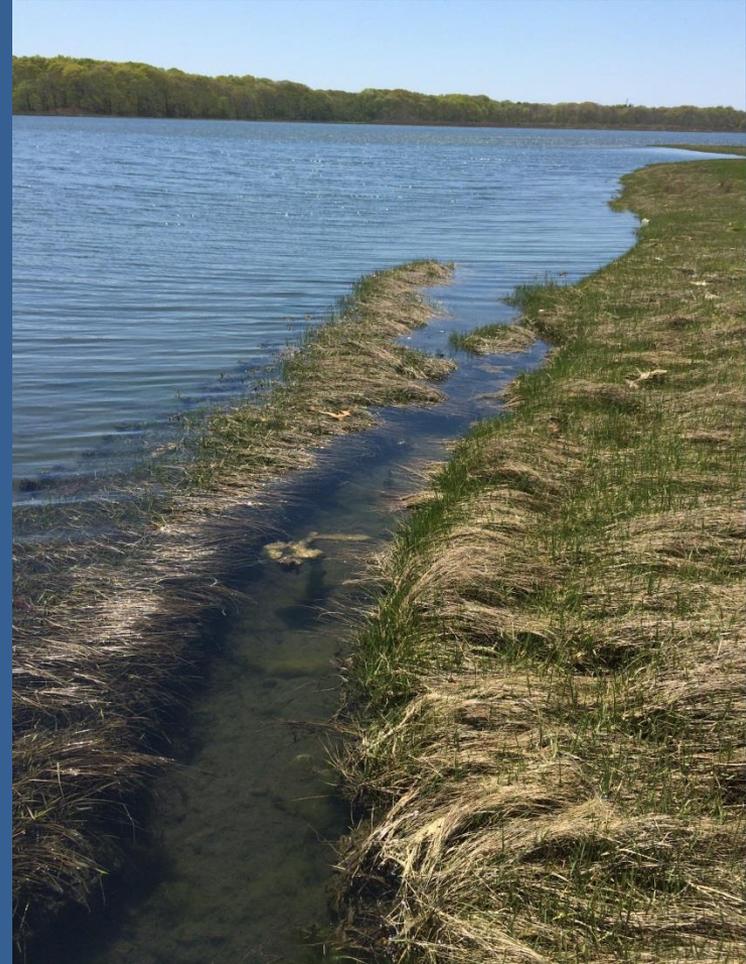


Saltmarsh Shoreline Stability Survey Summary, Narrow River Enhancement Project.



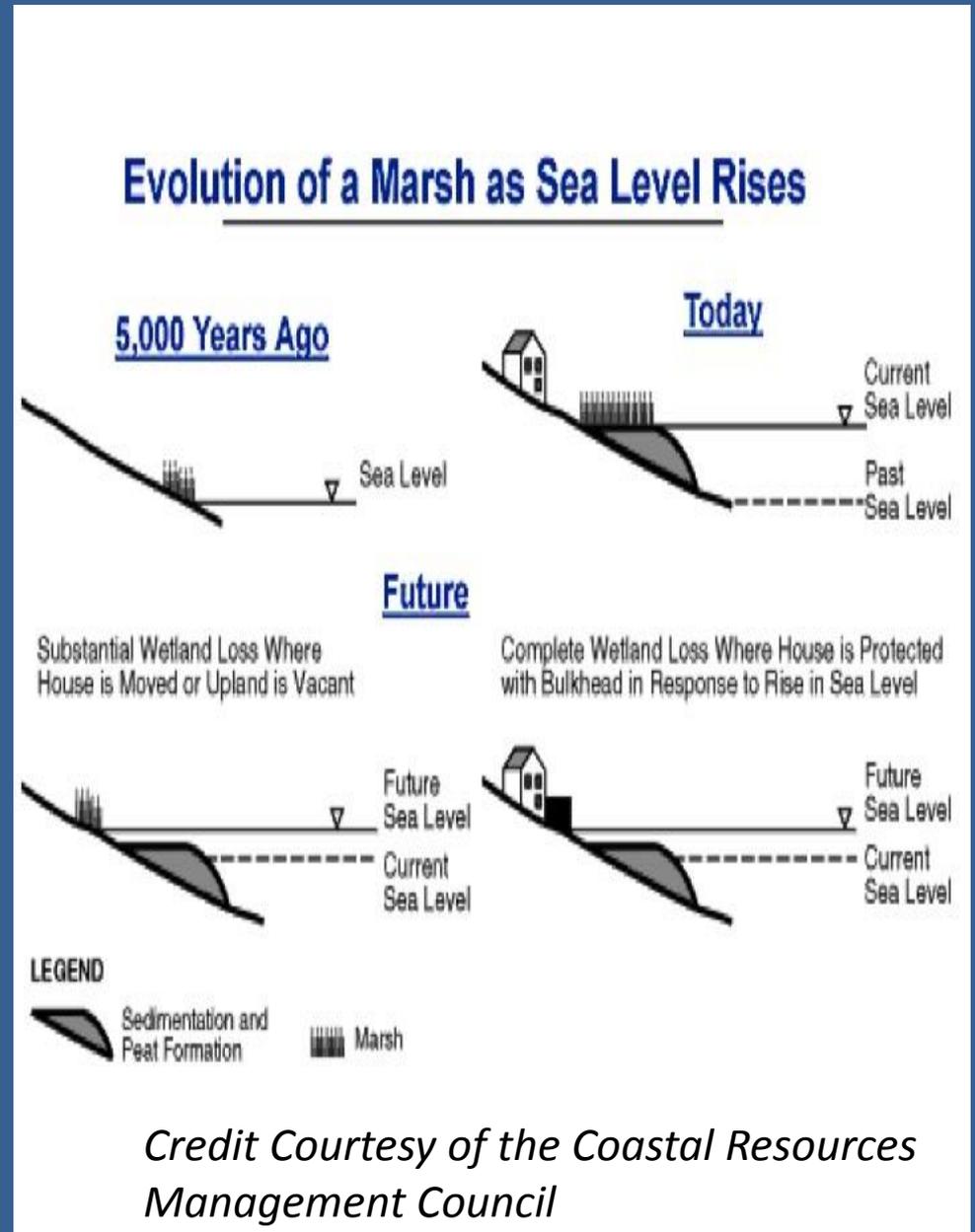
U.S. Fish and Wildlife Service
50 Bend Road, Charlestown, RI 02813
Based on RIGIS Data, Landlines approx.

Vertical Bank Loss



Sea Level Rise

- Sediment starved marshes low “elevation capital”
- Saltmarsh elevation growth about 2-3mm/year (accretion)
- Sea level rise (SLR):4 mm/year
- SLR outpacing marsh growth
- Limited Migration Corridors



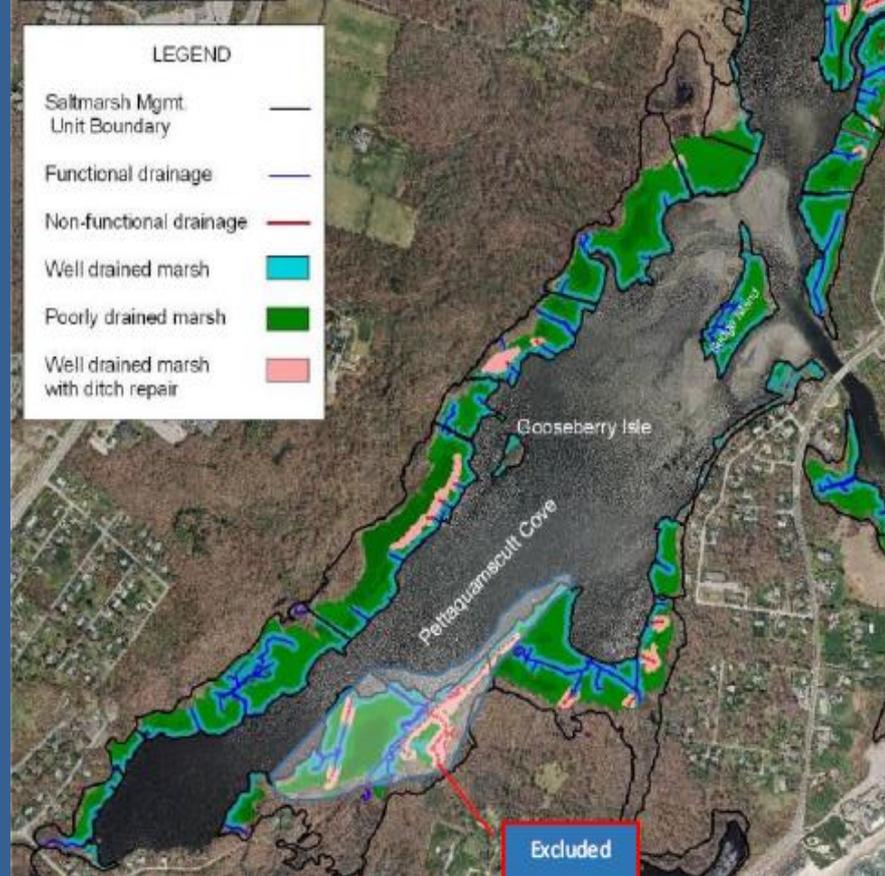
Degraded Vegetation

Poor Drainage

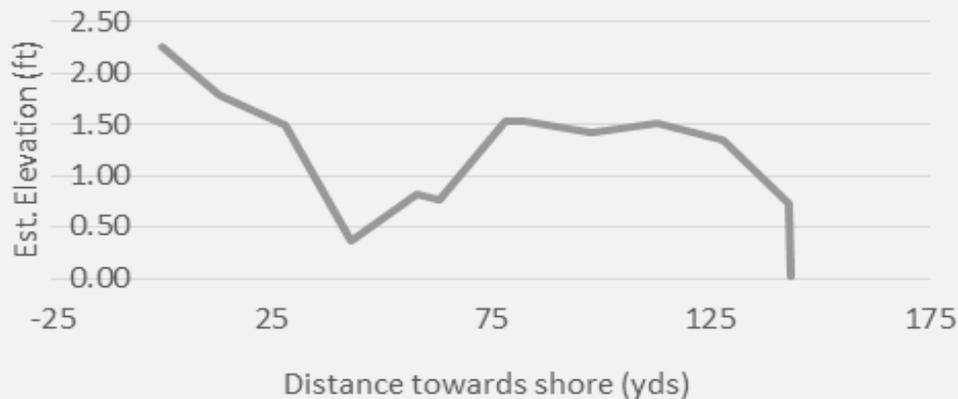
- 39% of saltmarsh degraded by waterlogging
- Short-form *S. alterniflora*,
- Loss of high marsh vegetation
- Unstable peat/bog-like conditions

Increased pools and pans

- 40% increase in pools and pans since 1939
- Loss of 14 acres of saltmarsh



Saltmarsh Surface Profile Unit PC02, T10



Narrow River Restoration Strategy

- Restoration team composed of experts from a variety of federal and state agencies, local municipalities, and conservation organizations
- Development of an integrated set of actions designed to prevent and reduce the ongoing degradation of estuarine habitat
 - Increase the ecological health of the Narrow River Estuary.
 - Improve the ability of the Narrow River ecosystem to adapt to changes brought about by sea level rise, climate

USDA NRCS	U.S. EPA
U.S. ACOE	U.S. DOC NOAA
RI Coastal Resource Management Council	RI Division Fish and Wildlife
RI Division Water Resources	RI Division of Marine Fisheries
University of Rhode Island	Town of South Kingstown
Town of Narragansett	Save the Bay
Narrow River Preservation Association	The Nature Conservancy
Center for Ecosystem Restoration	



Living Shorelines



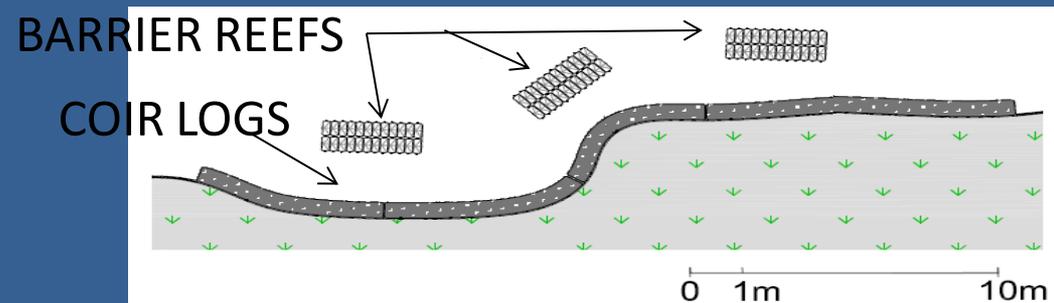
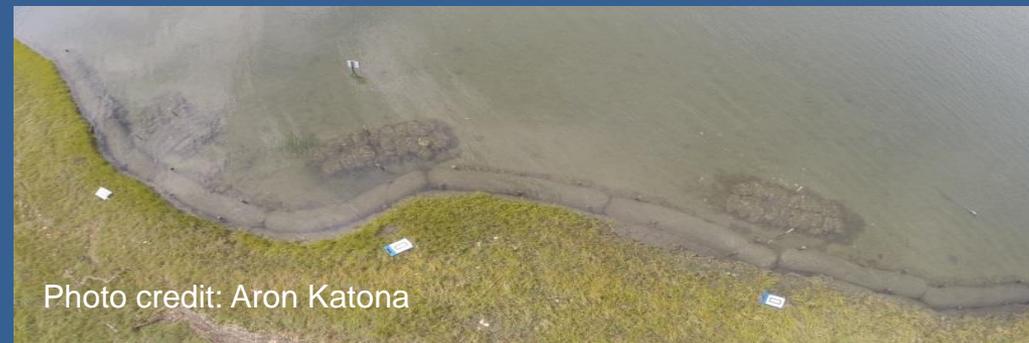
The Nature Conservancy

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Materials

- Construction finished on the 21st of April 2014
- Applied materials
 - Coir logs (20"φ & 16"φ)
white oak stakes, twine
 - Bagged oyster shell (barrier reef)
- Sites
 - Three ~100ft long experimental shore line section with 3 barrier reefs (2mx1m)
 - One control site
- Ultimately treat 3,000 ft of shoreline



Drainage Restoration

RUNNELS: Excavate shallow channels ,8-12” deep, 2’ wide

- Restore growing conditions for marsh vegetation
- Provide surface drainage
- Enhance habitat for small estuarine fish
- Enhance high marsh nesting habitat
- Reduce mosquito breeding habitat



Proposed Beneficial Use of Dredge Material

Dredging

- 35,629 cubic yards of material (sandy with fines 2-60%)

Eel grass Enhancement

- 7 acres excavated (-5 feet NAVD88)
- Thermal refugia estuarine fish
- 3 acres of upper tidal flat create shorebird foraging habitat

Low Marsh Creation

- 1.2 acres of low marsh creation

Increase Elevation Capital

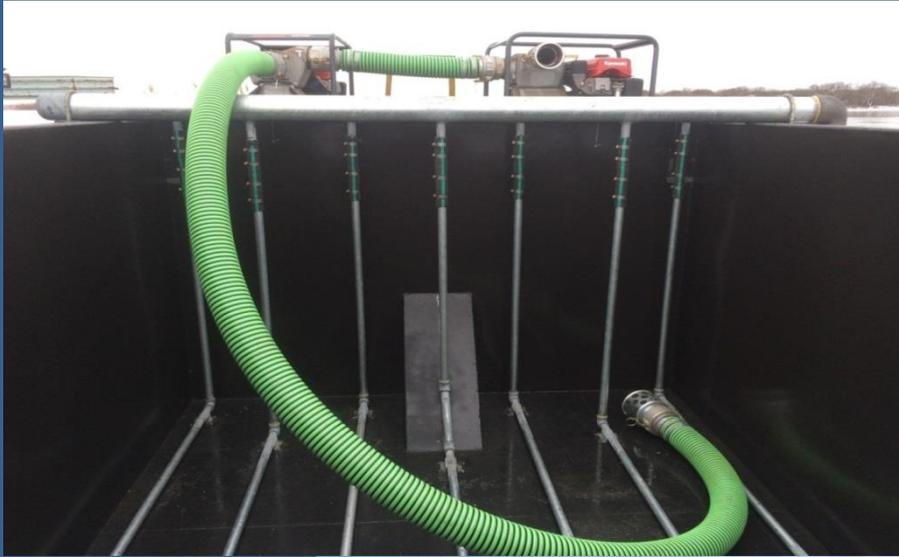
- 14 acres enhanced with Thin Layer Deposition (TLD)



Thin Layer Deposition Test



Thin Layer Deposition (Test)



Slurry Treatment



Mechanical Treatment



Monitoring: BACI Design

Hydrology

- Ground Water level
- Porewater Salinity

Sediment Elevation & Accretion

- Elevation surveys (RTK)
- Surface elevation & accretion with feldspar plots and SETS
- Bulk Density
- Soil Redox Potential
- Soil Mapping

Vegetation

- Species composition & abundance
- Plant height (dominant vegetation)
- Stem density
- Above ground production
- Below ground production
- Vegetation Community Mapping

Avian

- Species composition & abundance
- Saltmarsh Sparrow Demographics

Nekton

- Species composition & abundance



Sachuest NWR



History

- WW2-1970's: Navy
- 1970's –Present: U.S. Fish & Wildlife
- Past Restoration Efforts
 - 1970's : Water control structure under connector road
 - 1990's :Two additional culverts under connector road and improved ditch system “turkey foot”
 - 2004: South Marsh landfill remediation/new water control structure



Soils

➤ N3:

- 20cm peat
- 20-80 cm sand
- 80-110 cm silt loam

➤ S2-S4

- 90 cm mid/fine sand



RTK Elevation Survey

RTK Elevation Survey



Regional Surveyors (approx 2 days 1,361 pts)

Digital Elevation Model

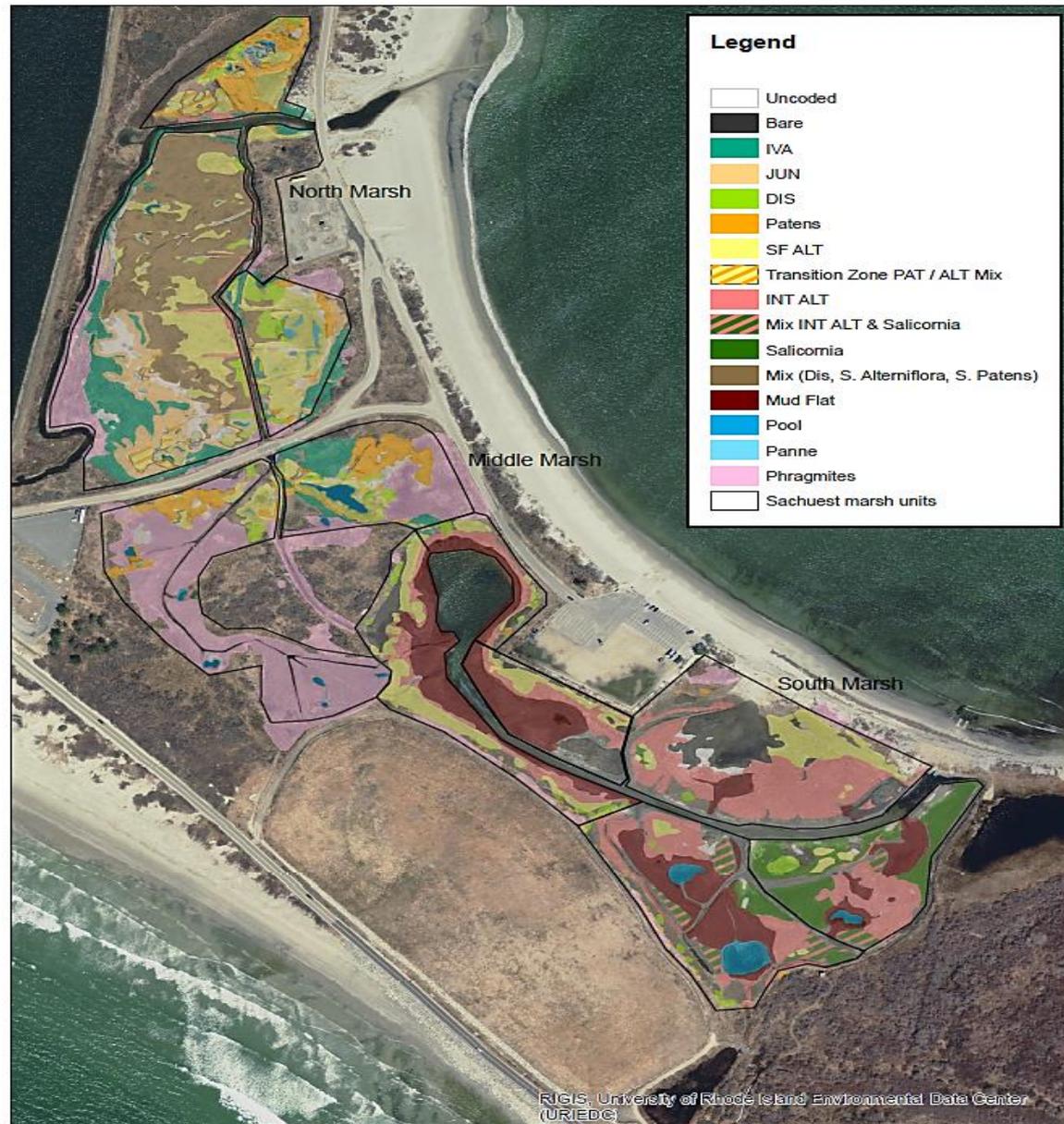


Created by TNC – Kevin Ruddick

Vegetation Cover Type

Appendix 2

Sachuest NWR Maidford River Resiliency Project - Cover Type Map



U.S. Fish & Wildlife Service
50 Bend Road, Charlestown, RI 02813
Land lines approximate

0 250 500 1,000 Feet

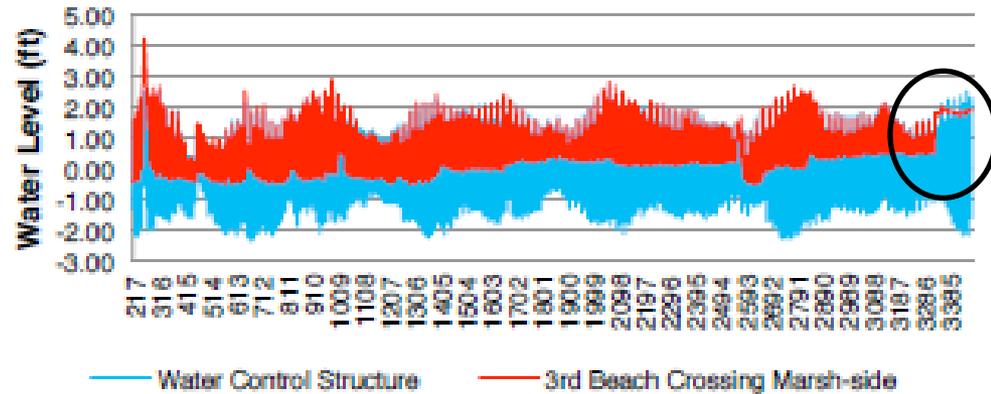


Tidal Dynamics

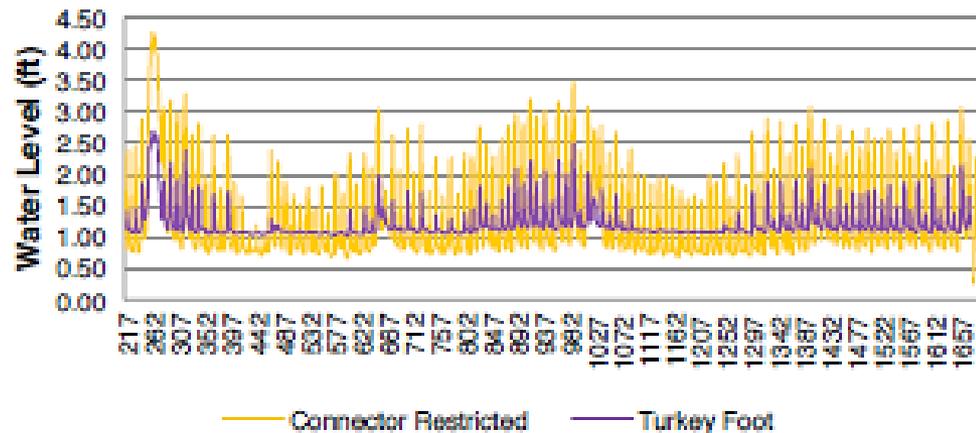
- Attenuated low tide: North Marsh and Turkey Foot
- Full tidal range: South Marsh
- Mouth of Mardford River frequently blocks with sand causing marsh flooding



Water Level (ft NAVD88) Comparison Between the Water Control Structure and at the Third Beach Crossing Marsh-side, Mardford Saltmarsh, March 28, 2014 - August 11, 2014. The x axis is the hourly observation number.

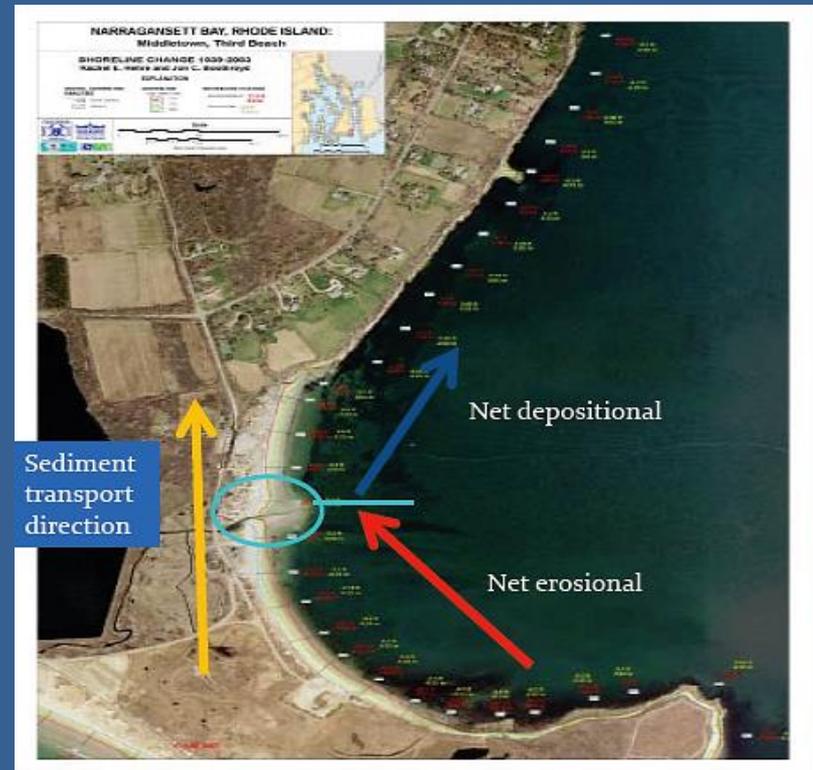


Water Level (ft) Comparison Between the Connector Road and the "Turkey Foot" area (Middle Marsh), Mardford Saltmarsh, March 28 2014 - August 11, 2014



Restrictions: Third Beach Road Culvert

Open vs Closed



Restoration Activities

- Restore marsh drainage
- Restore Maidford River Outlet
- Phragmites control
- Improve roads and parking lots
- Restoration of Maidford River Outlet
- Thin Layer Deposition
 - Plant areas receiving >4 inches
- Monitoring



Partners

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