

Salt Marsh Adaptation in the Narrow River



Wenley Ferguson

On Pettaquamscutt: Winter Speaker Series

SAVE THE BAY®

NARRAGANSETT BAY

1939



1972



- RI has lost 53% of its historic salt marshes over the last two centuries* due to filling (loss of about 4,000 acres statewide)
- STB conducted bay-wide assessment of human impacts to salt marshes in 1996 to identify restoration opportunities
- Impacted marshes have since been restored by multiple partners

* Bromberg and Bertness, 2005

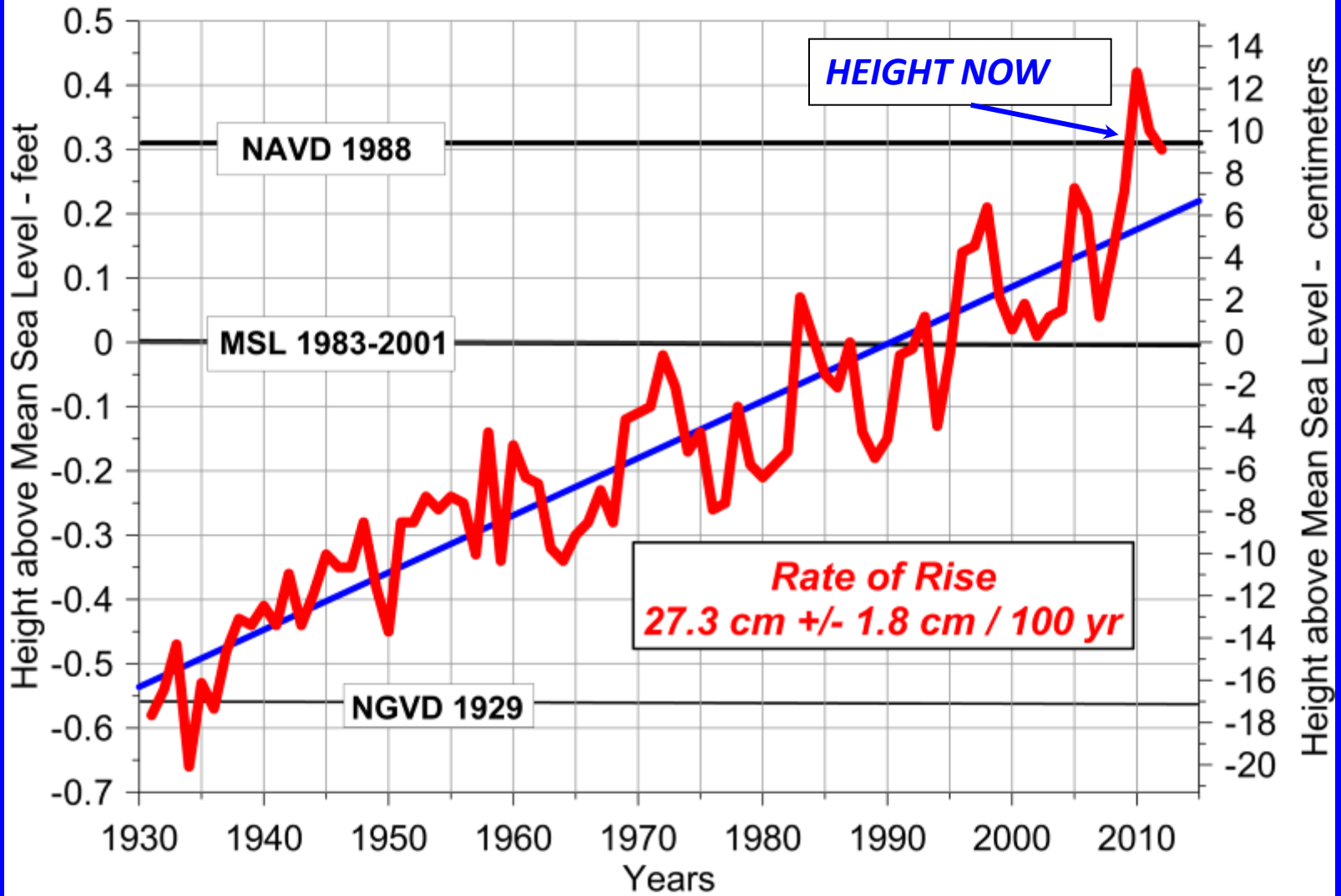
- Monitoring tidally restricted marshes has shown that conditions can change rapidly
- Similar degraded conditions have been found in marshes with no tidal restrictions
- Increased rate of sea level rise could be major driver of change



Initial field and aerial assessment of marshes

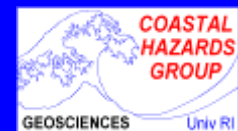


HISTORIC SEA-LEVEL RISE - Newport, RI



Adapted from:

http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8452660%20Newport,%20RI

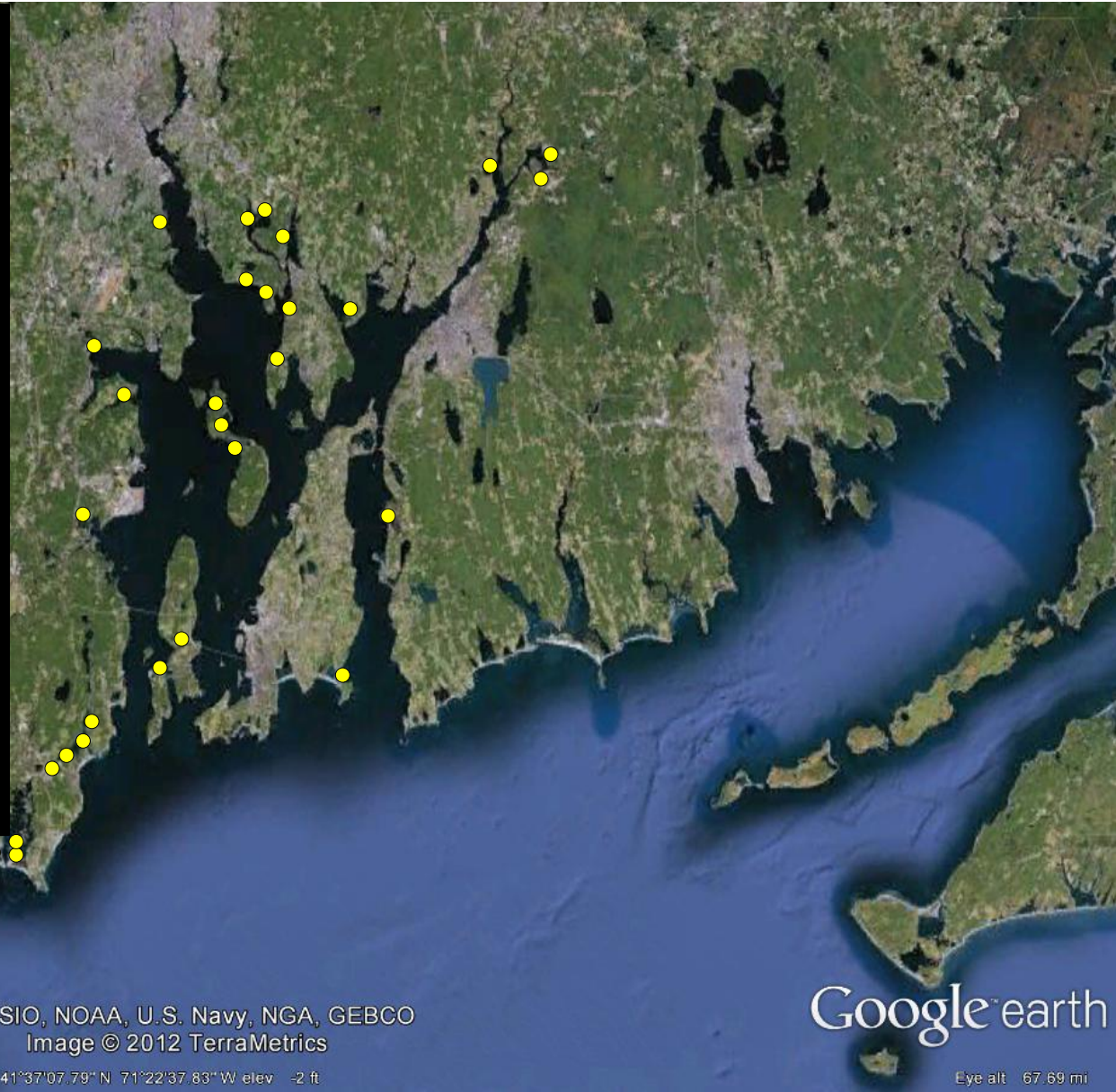


Boothroyd 2013

Region-wide assessment of Narragansett Bay and RI South Shore salt marshes: 2012-2014

Goals of RISMA:

- Establish baseline marsh condition
- Monitor changes over time of vegetation communities
- Identify adaptive management opportunities



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2012 TerraMetrics

41°37'07.79" N 71°22'37.83" W elev -2 ft

Google earth

Eye alt 67.69 mi

Belt Transect

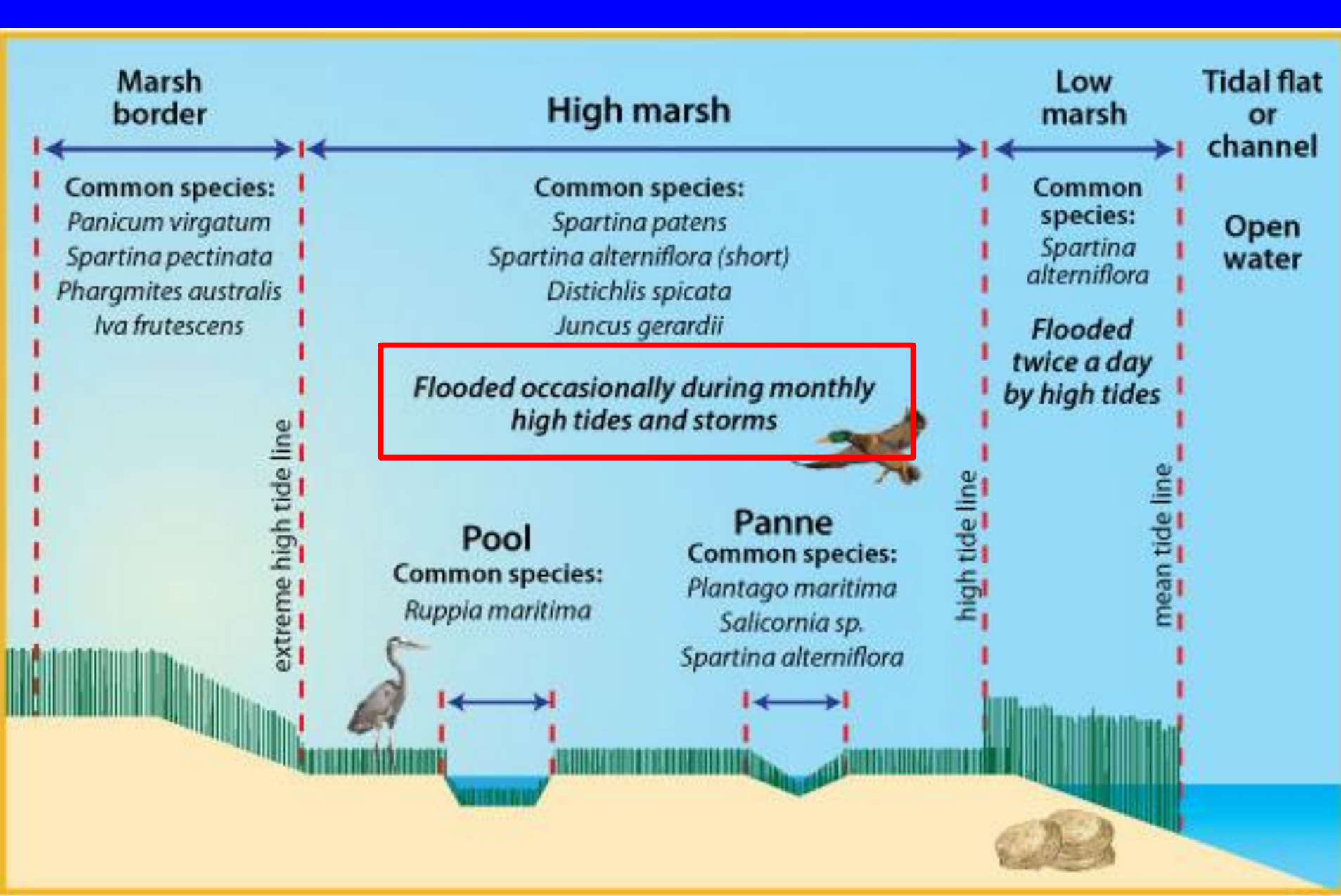


Bearing Capacity



- Monitored vegetation every 10 meters and width of plant communities
- Measured bearing capacity
- Additional data: salinity, mosquito density, fish presence

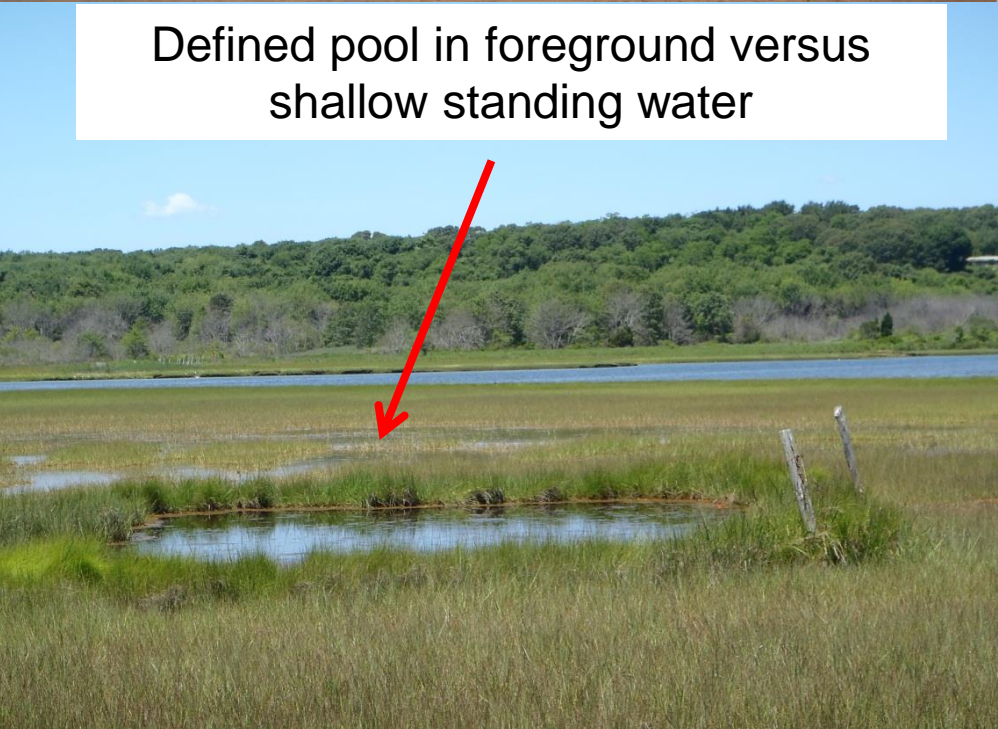




Shallow ponded water

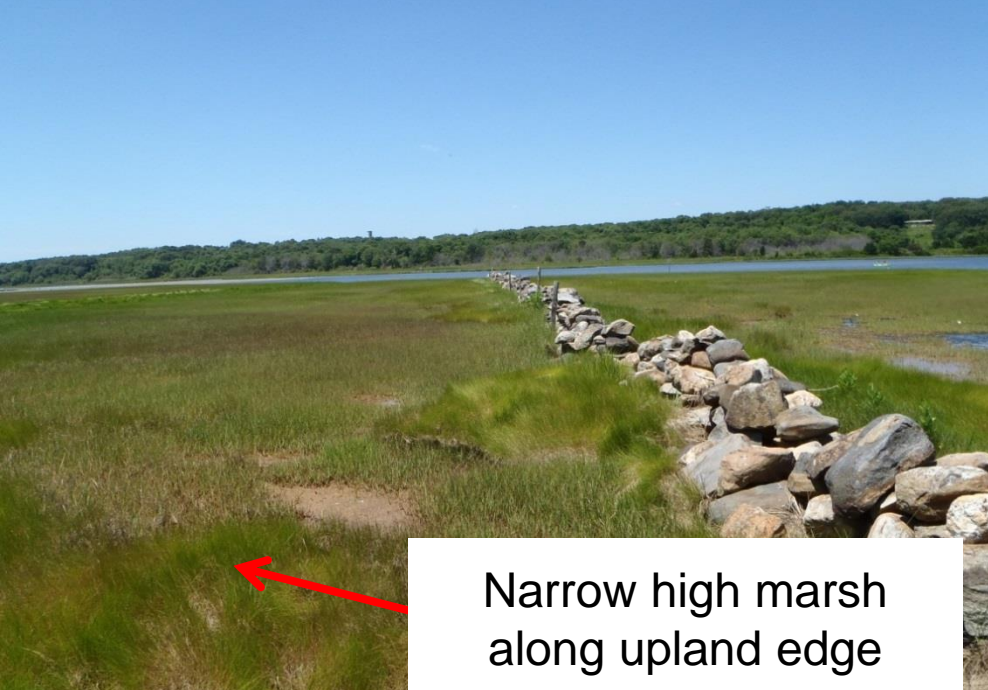


Defined pool in foreground versus shallow standing water



Mosquito breeding habitat

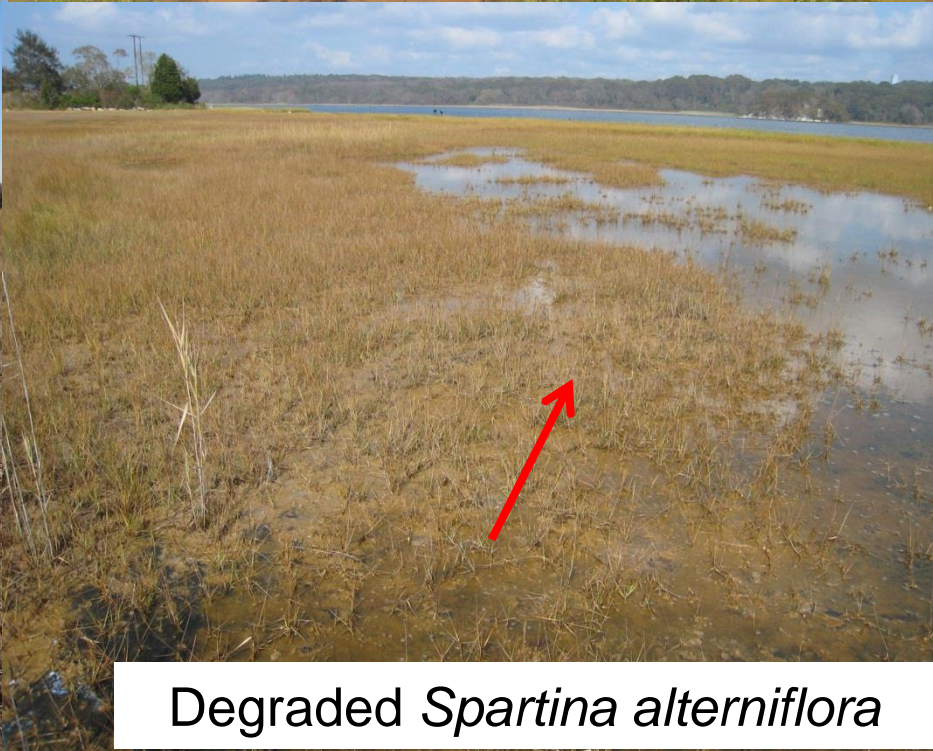




Narrow high marsh
along upland edge



Barren peat



Degraded *Spartina alterniflora*

Marsh erosion



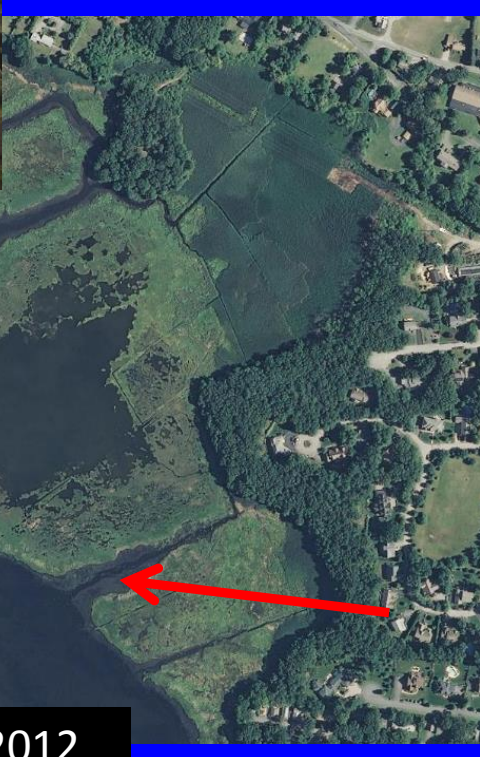
Mars

Cove,



1939

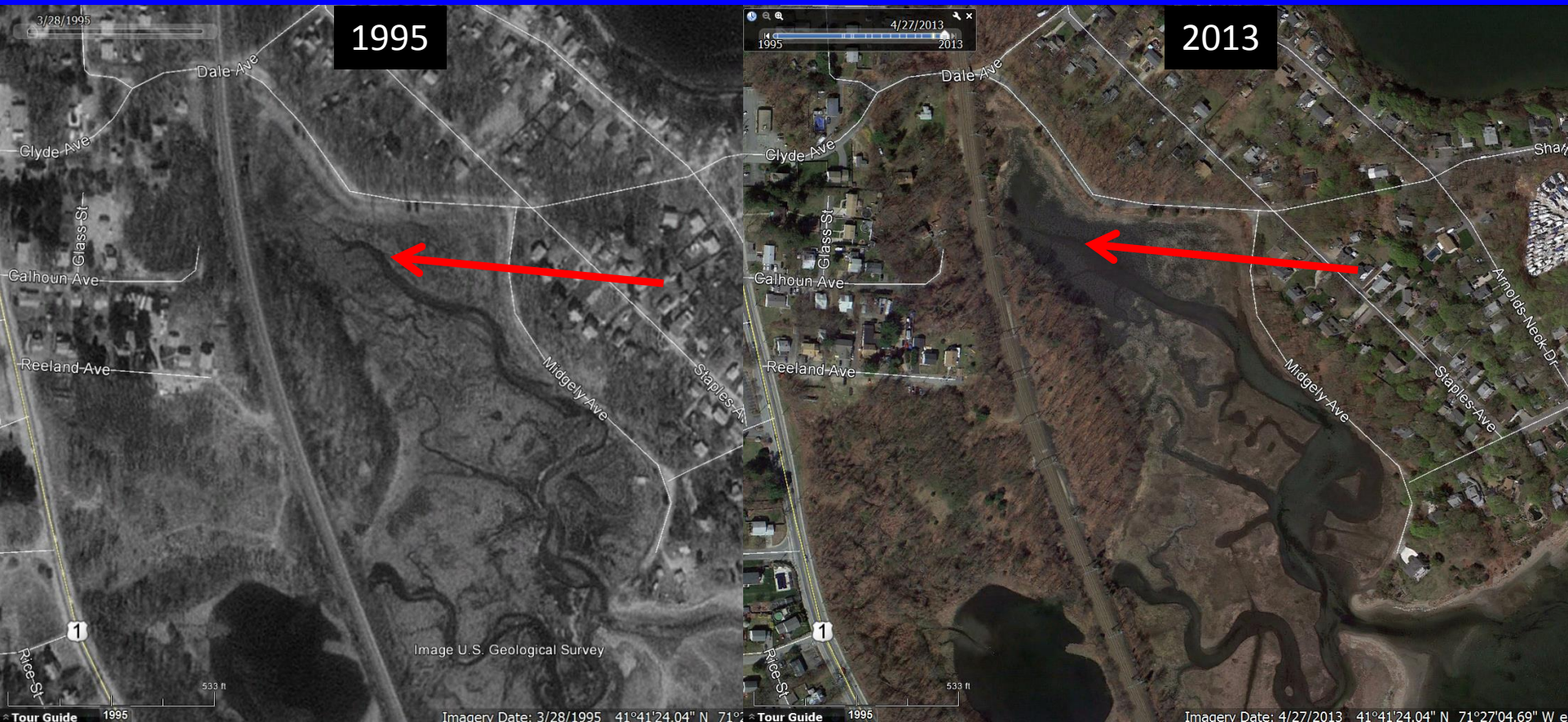
Florida Environmental Data Center (UREDCO), 2018, Unless by Florida Highway Trust Fund

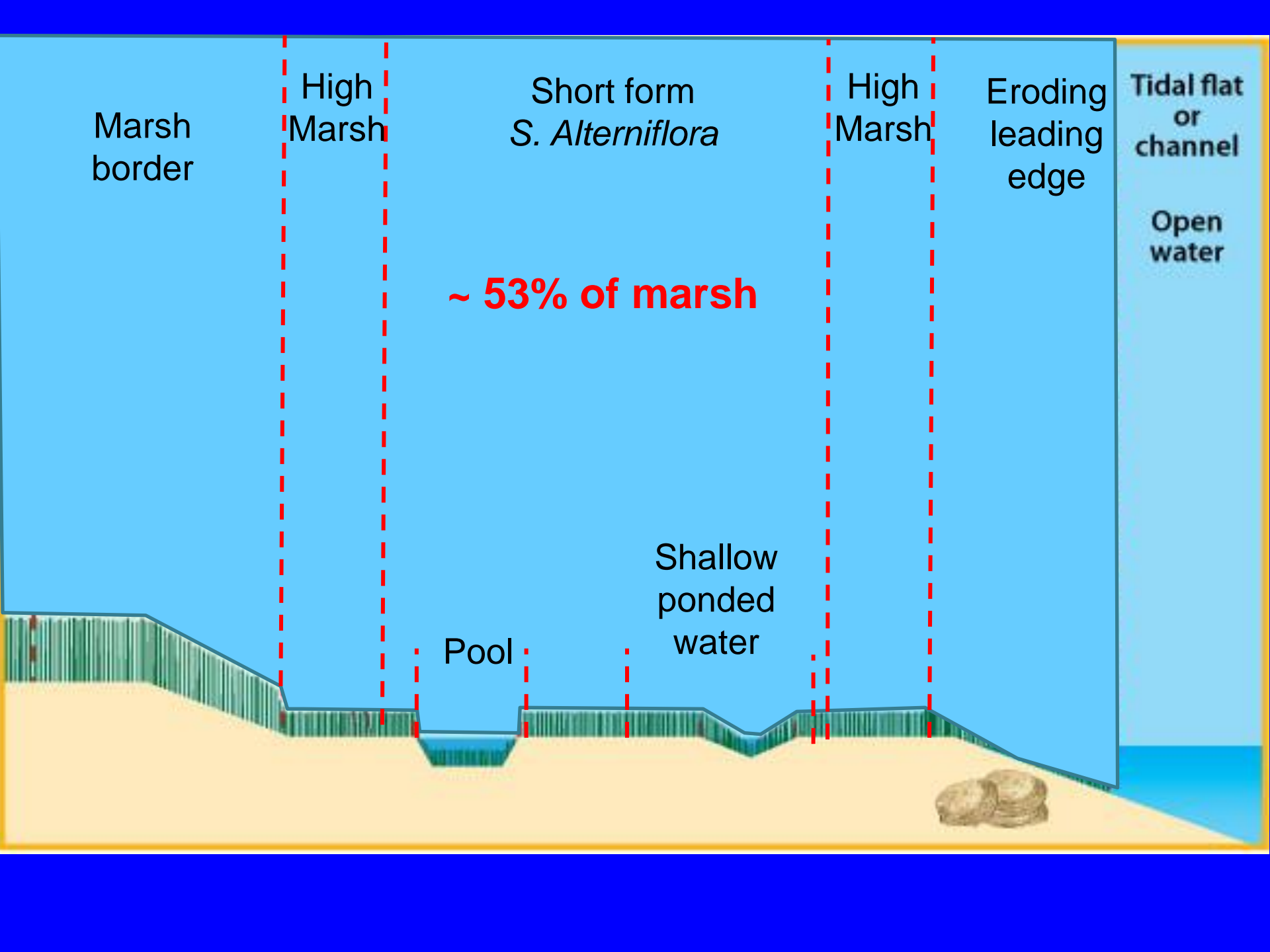


2012

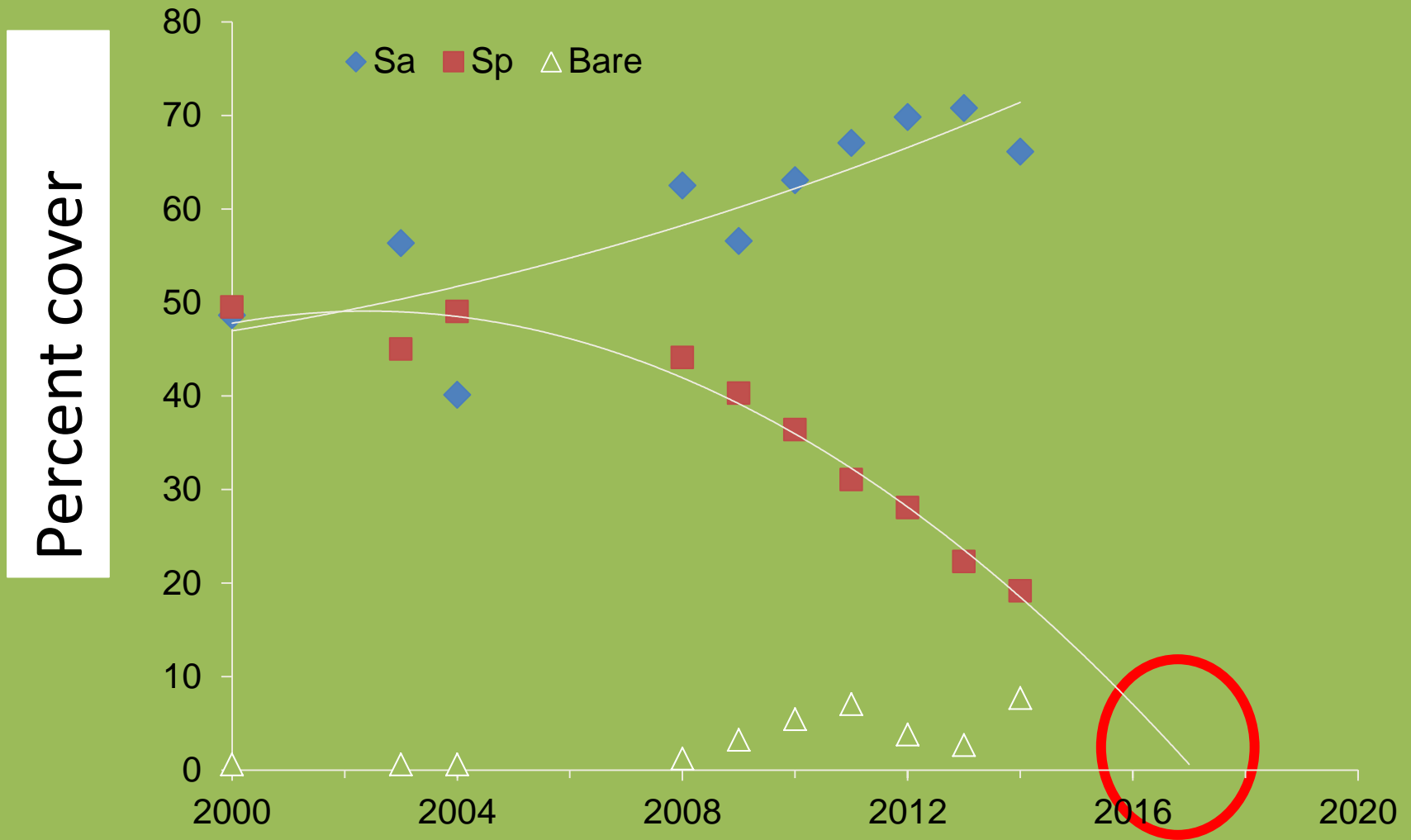
Marsh Loss: Mary's Creek, Warwick

1995-2013



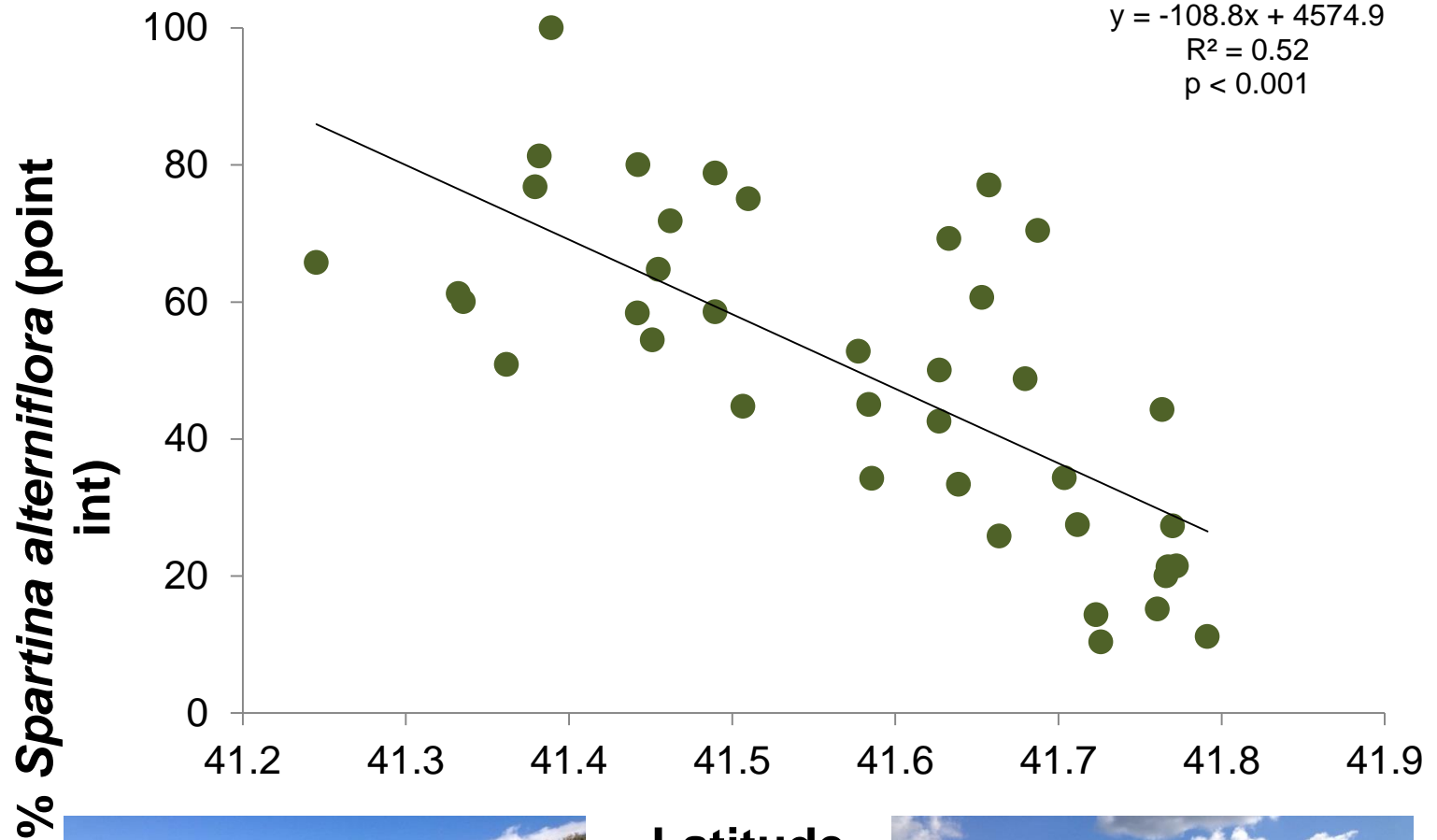


Coggeshall Marsh: Rapid loss of *Spartina patens*



Data courtesy of Narragansett Bay Estuarine Research Reserve

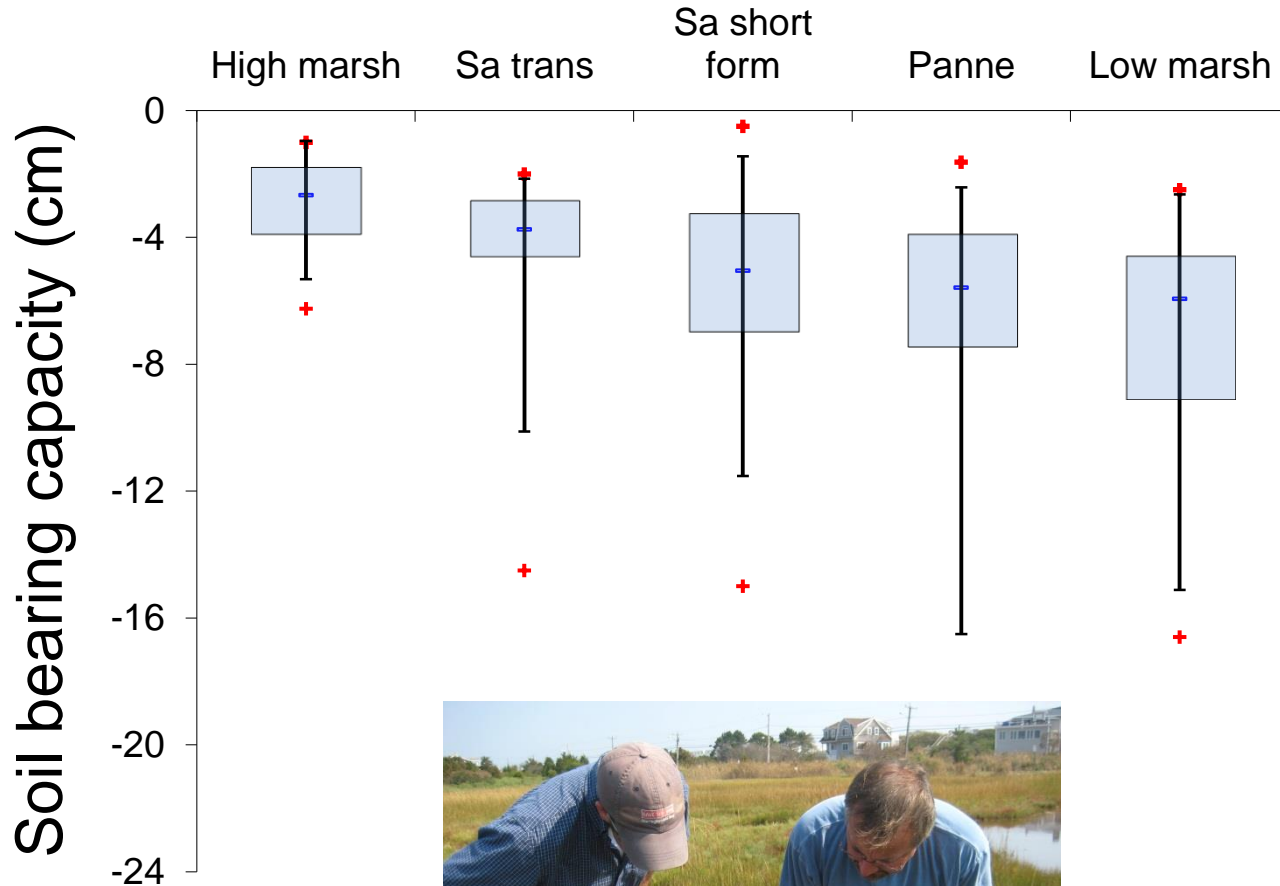
Latitudinal gradient



Latitude



Bearing Capacity Results



Adaptation Strategies

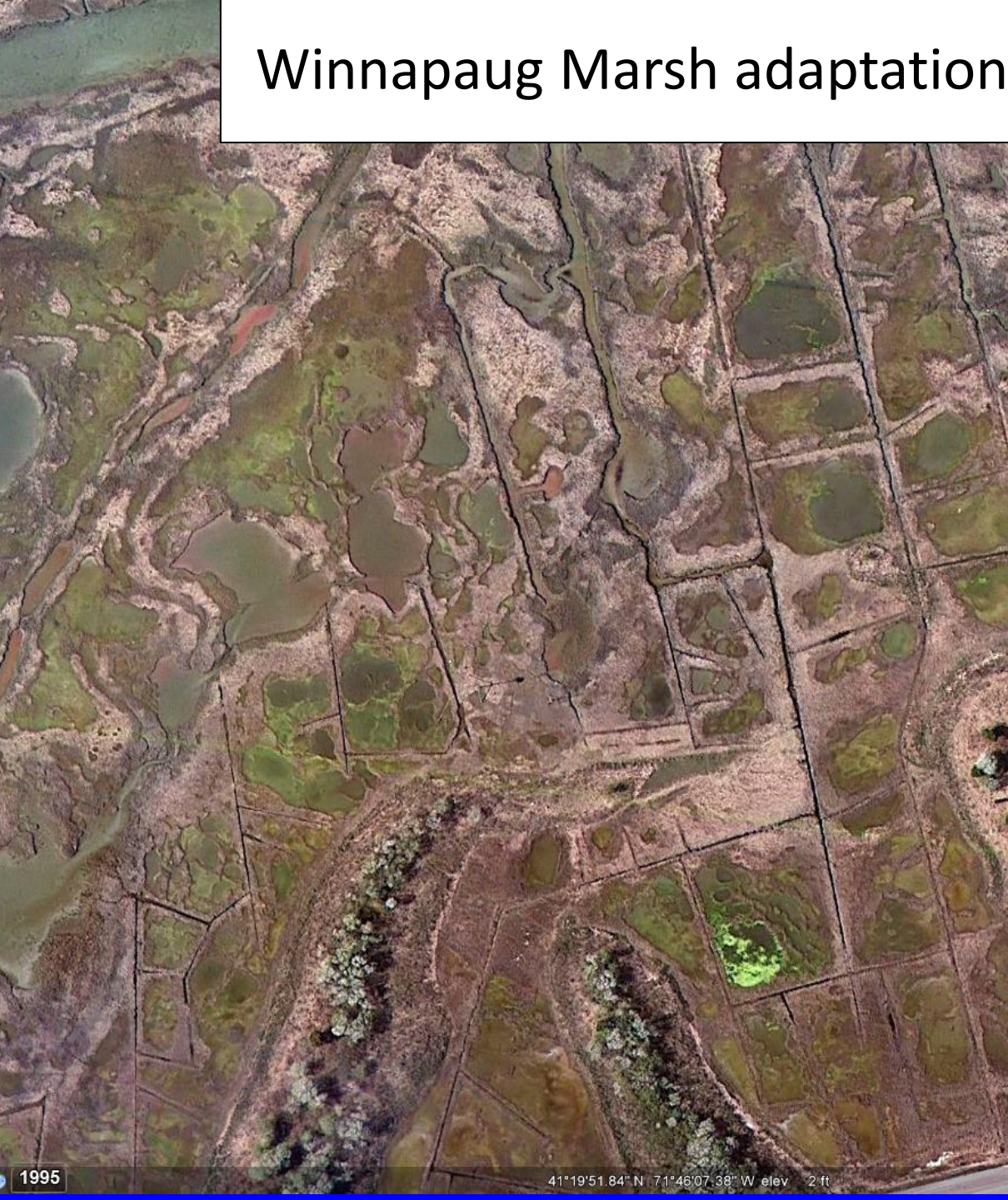
- In-Marsh
 - Drainage improvements (small creek excavation)
 - Elevation enhancement
- Upland
 - Adopt activities that facilitate marsh migration
 - Change/move land use activities that inhibit marsh migration
 - Remove physical barriers



Gooseneck Cove adaptive management



Winnapaug Marsh adaptation project





August 2011



Post adaptation: October 2013

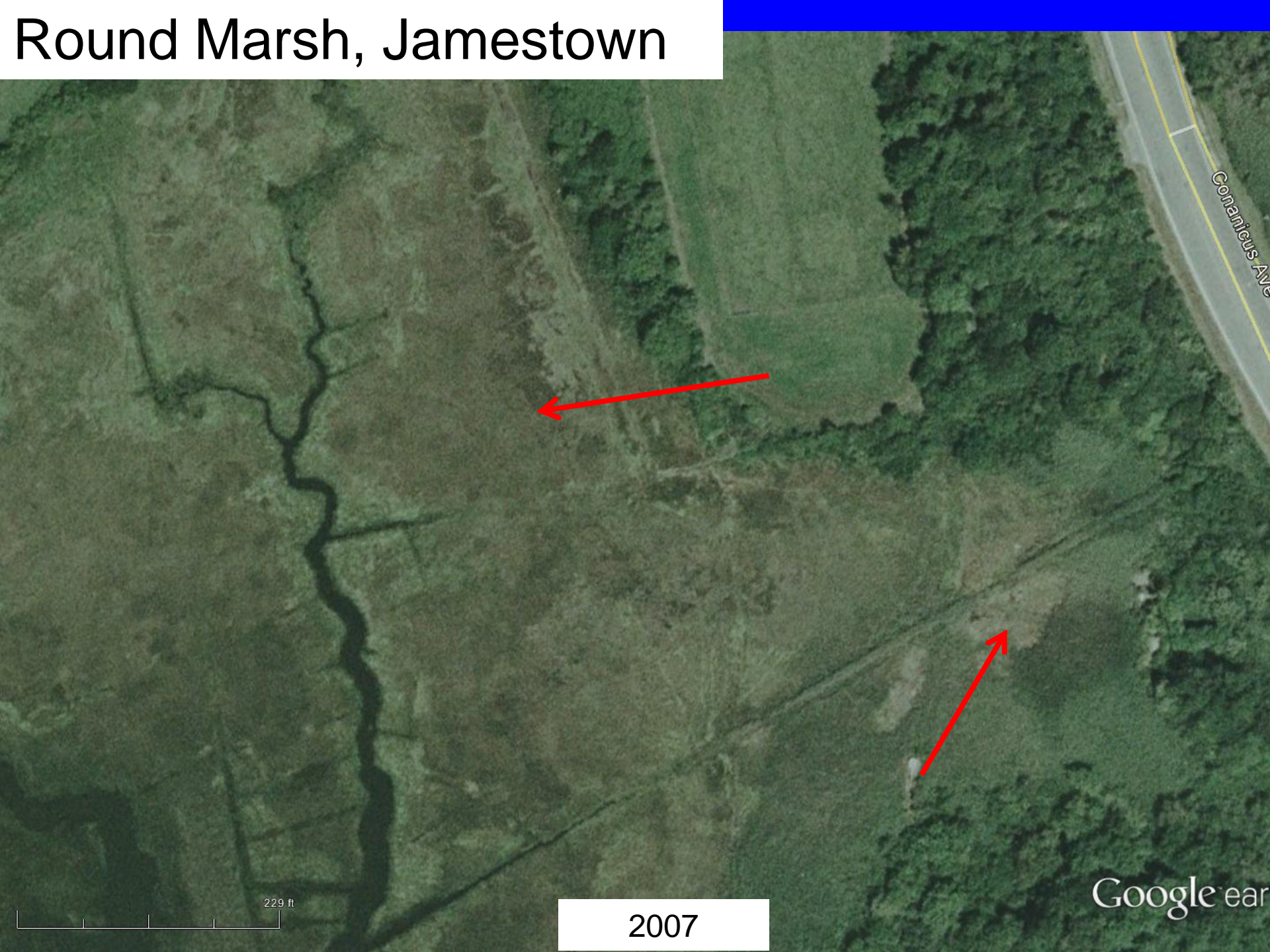


Revegetation along edge of former ponded area: 2014



2014

Round Marsh, Jamestown



Conanicut Ave



229 ft

2007

Google earth

Round Marsh Adaptation



Narrow River Proposed Runnel/Creek Restoration Sites



3441 ft

Google earth

North of Middlebridge 2002



Image © 2015 DigitalGlobe

Google earth

North of Middlebridge 2012



Narrow River Creek Excavation



South Middlebridge

Mosquito breeding habitat



Mosquito larvae



Trapped water in upper marsh



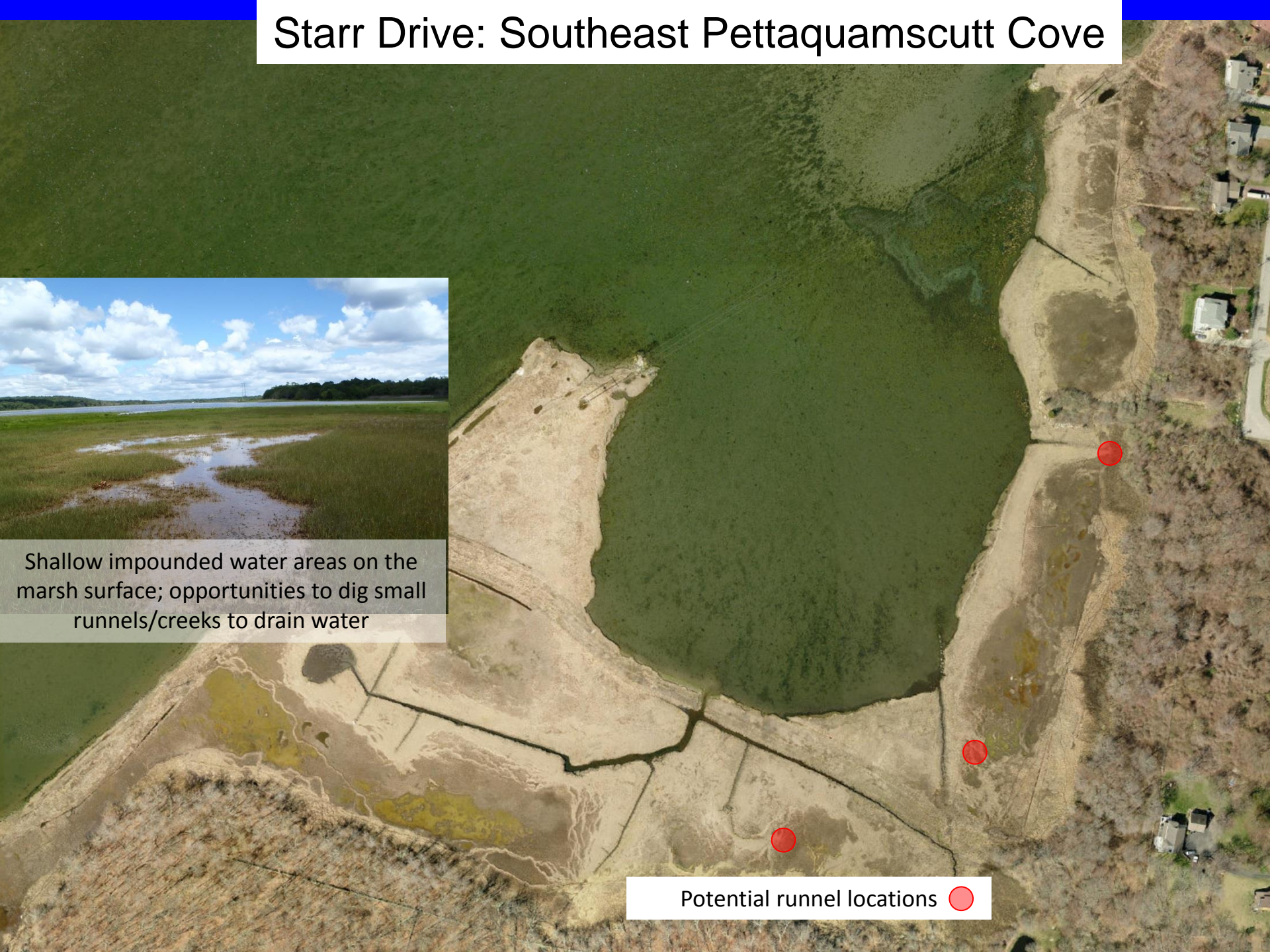
273 ft

Morgan Dr
Google e

Starr Drive: Southeast Pettaquamscutt Cove



Shallow impounded water areas on the marsh surface; opportunities to dig small runnels/creeks to drain water



Potential runnel locations 

Southwest Pettaquamscutt Cove

Ponded water adjacent to pool:
unstable peat/bog-like conditions



Area of marsh die-off



Crest Ave



Historic pools expanding onto
marsh surface



Adaptation Strategies

- In-Marsh
 - Drainage improvements (small creek excavation)
 - Elevation enhancement
- Upland
 - Adopt activities that facilitate marsh migration
 - Change/move land use activities that inhibit marsh migration
 - Remove physical barriers



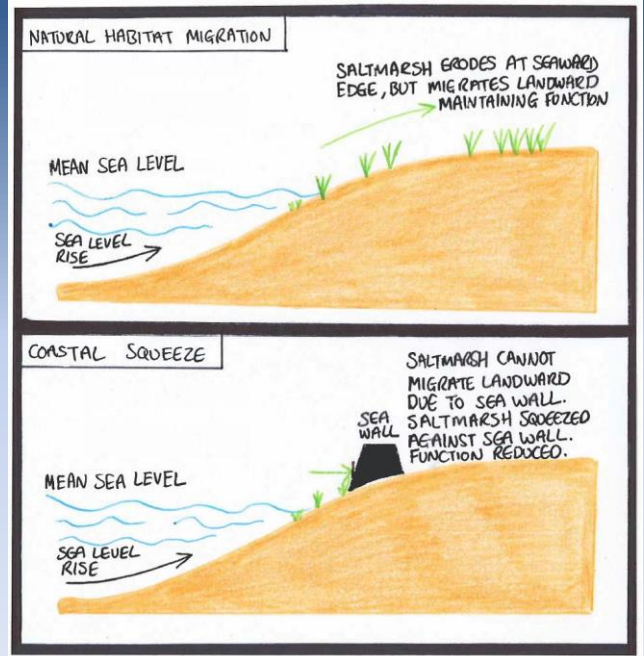
Potential end of road retrofit: Ash Street



Opportunity for pavement removal and creation of area for runoff infiltration



Marsh migration

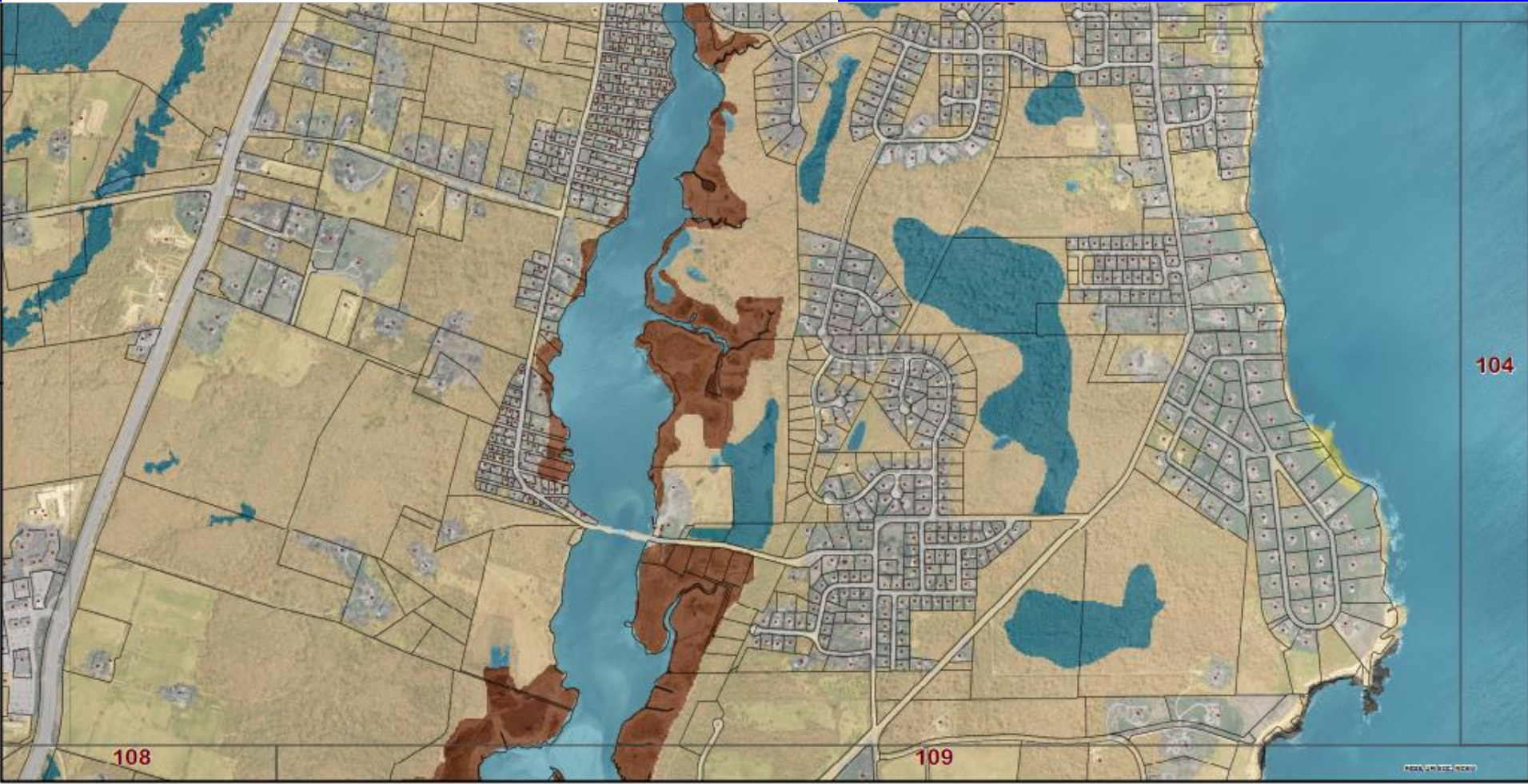


Winnapaug Pond Marsh

Marsh migration occurring yet impounded water creating mosquito breeding habitat



Marsh Migration Model



Map 103

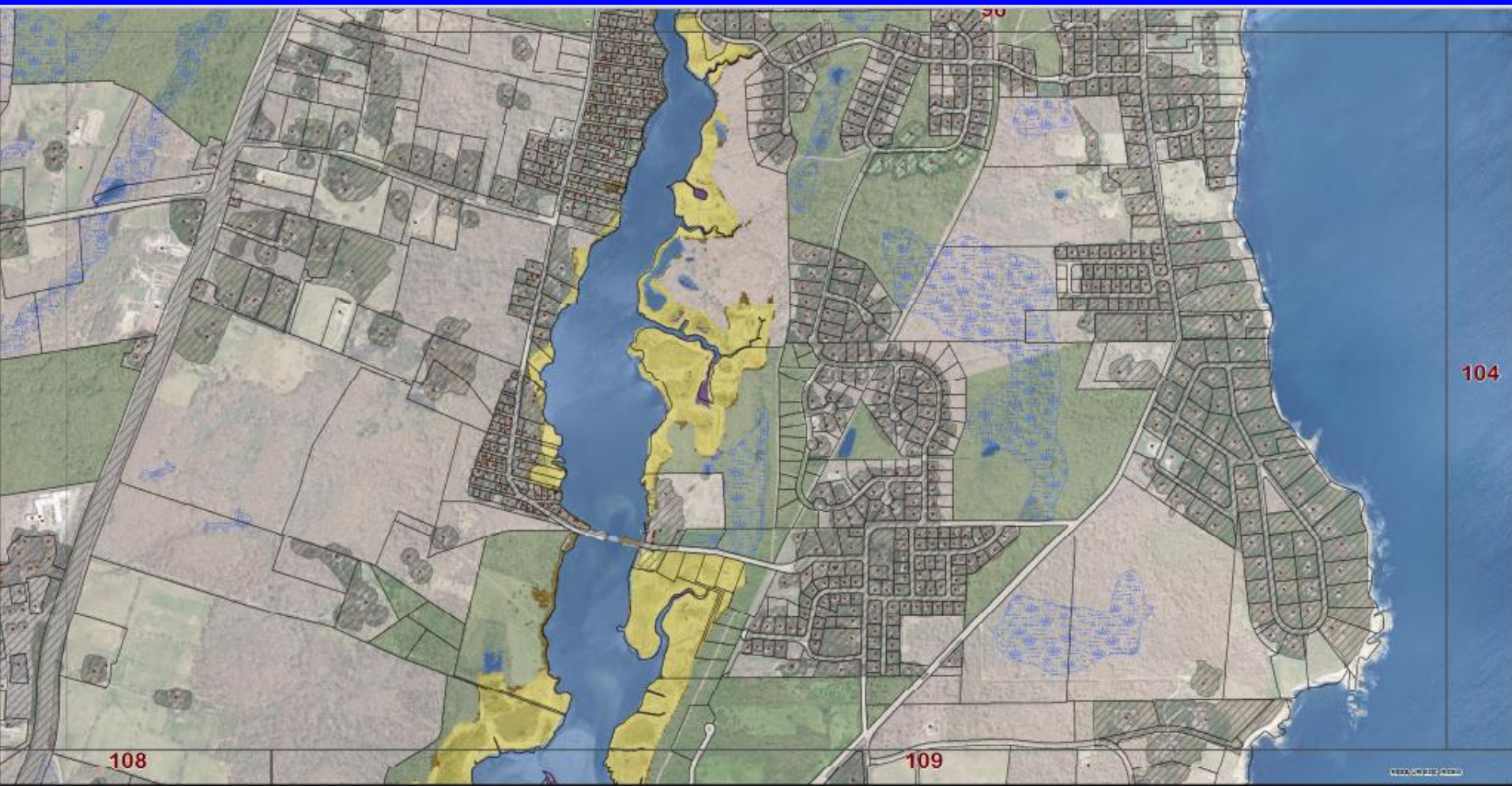


This map is not the product of a professional land survey. It was created for general reference, informational, planning, and guidance use, and is not a legally authoritative source as to the location of natural or manmade features. No warranty is expressed or implied, related to the spatial accuracy, reliability, completeness, or currentness of this map.

- Developed Upland
- Undeveloped Upland
- Rocky Intertidal
- Beach
- Tidal Flat
- Open Water
- Swamp
- Tidal Creek
- Salt Marsh
- Brackish Marsh
- Scrub/Shrub Transitional Marsh
- Fresh Marsh
- Hardened Shores
- Buildings
- Parcel Boundaries

Tidal Marsh Vulnerability Analysis: Current Condition





Map 103



1:10,000



This map is not the product of a professional land survey. It was created for general reference, informational, planning, and guidance use, and is not a legally authoritative source as to the location of natural or manmade features. No warranty is expressed or implied, related to the spatial accuracy, reliability, completeness, or currentness of this map.

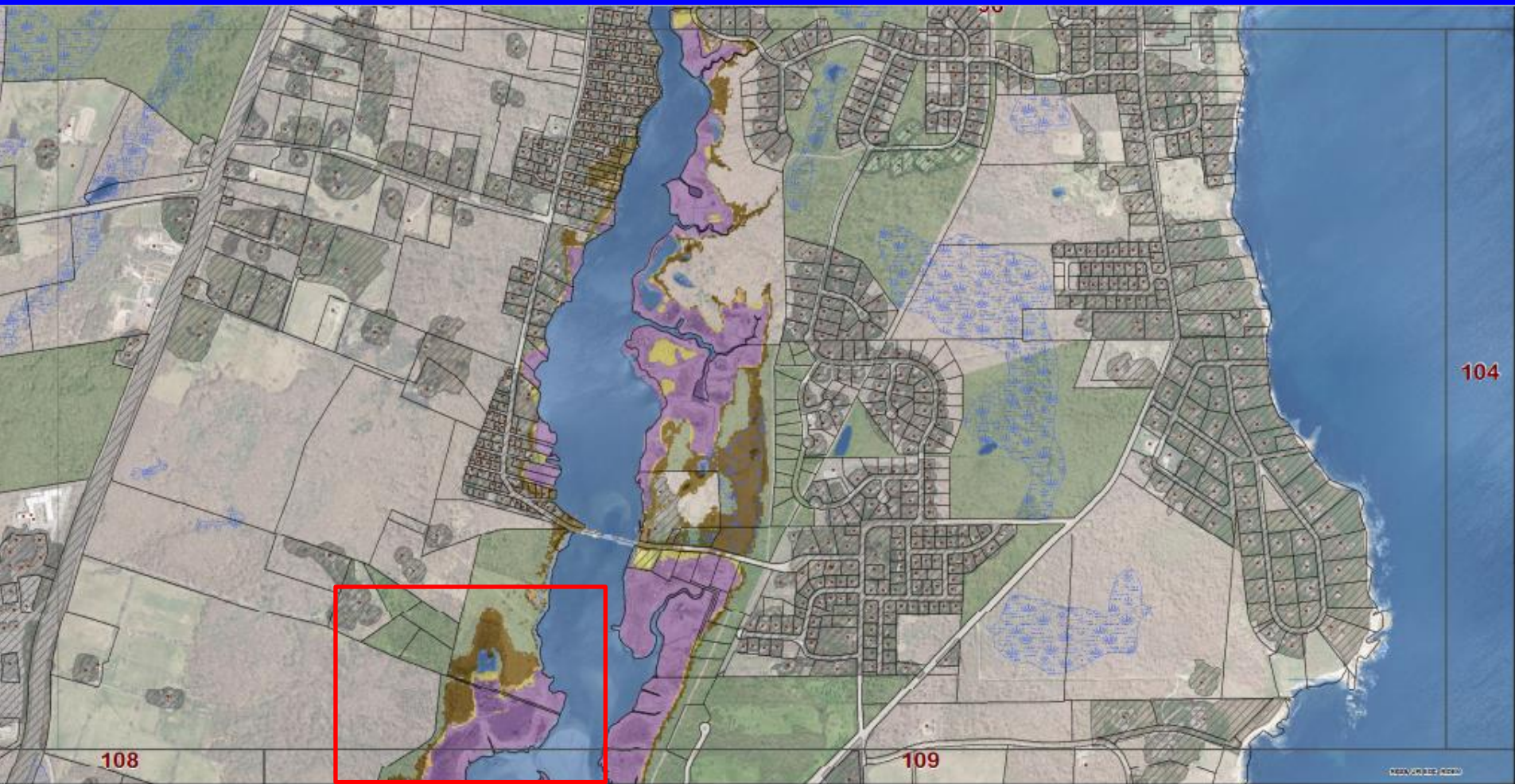
- Potential Marsh Zone
- Persistent Marsh Zone
- Potential Marsh Loss
- Open Water and Tidal Flat
- Current Fresh Wetlands
- Protected Open Space
- Hardened Shores
- Buildings
- Parcel Boundaries
- Developed Land
- CRMC Coastal Barriers

Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model



NOAA GREAT WATERS OF THE WORLD

Map produced by Kevin Ruddock. 4/1/2014



Map 103



1:10,000



This map is not the product of a professional land survey. It was created for general reference, informational, planning, and guidance use, and is not a legally authoritative source as to the location of natural or manmade features. No warranty is expressed or implied, related to the spatial accuracy, reliability, completeness, or currentness of this map.

- Potential Marsh Zone
- Persistent Marsh Zone
- Potential Marsh Loss
- Open Water and Tidal Flat
- Current Fresh Wetlands
- Protected Open Space
- Hardened Shores
- Buildings
- Parcel Boundaries
- Developed Land
- CRMC Coastal Barriers

Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model



CRMC



NOAA logo text

Map produced by Kevin Ruddock. 4/1/2014



Future Adaptation Efforts

- Conduct creek and runnel excavation beginning in spring of 2015
- Compare results of creek excavation to control sites at Middlebridge and Canonchet marshes
- Collaborate with USFWS on elevation enhancement project including planting *Spartina* grown in schools
- Identify adaptive management activities in upland to facilitate marsh migration

Thank You

