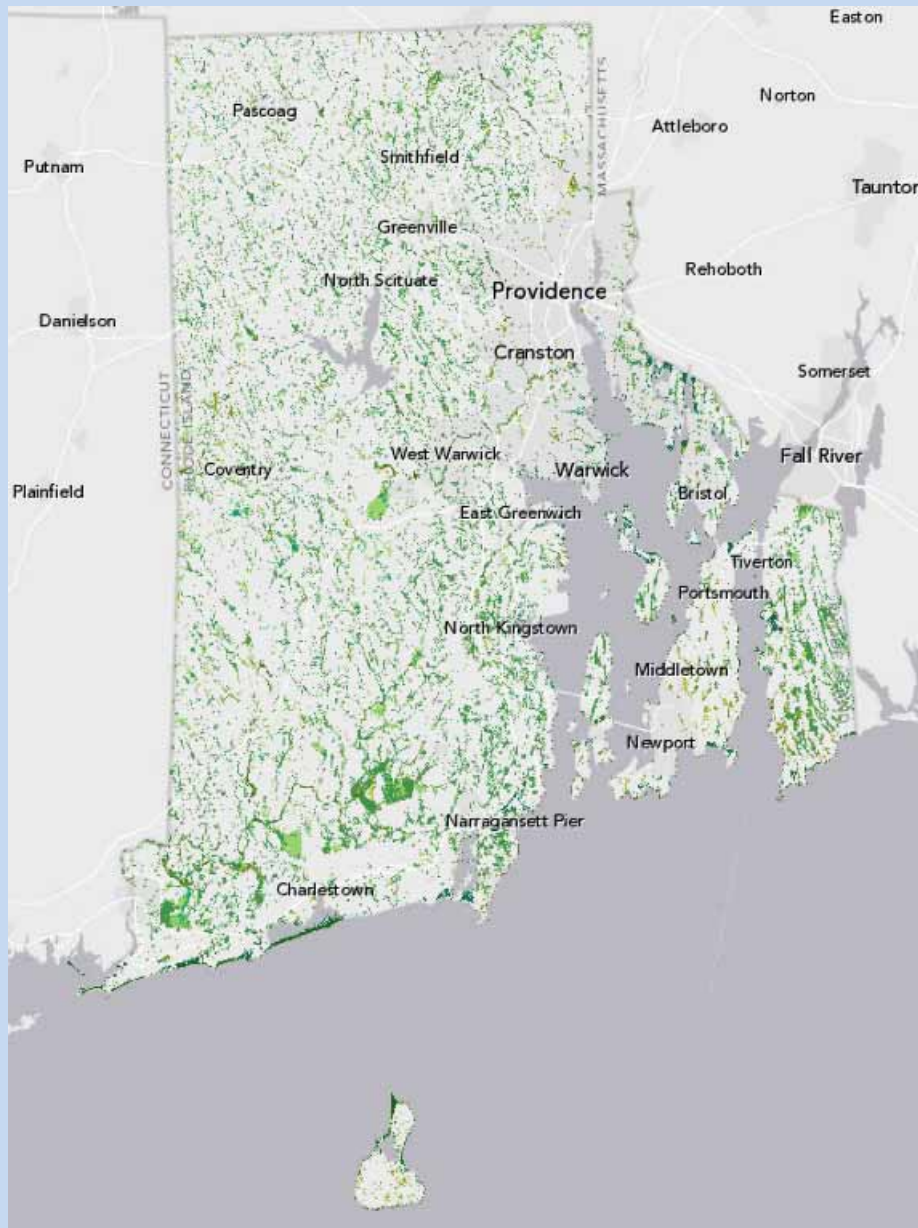


Sea Level Rise and the Conservation of Wetlands

RI Land and Water Summit
March 8, 2014

R. Hancock





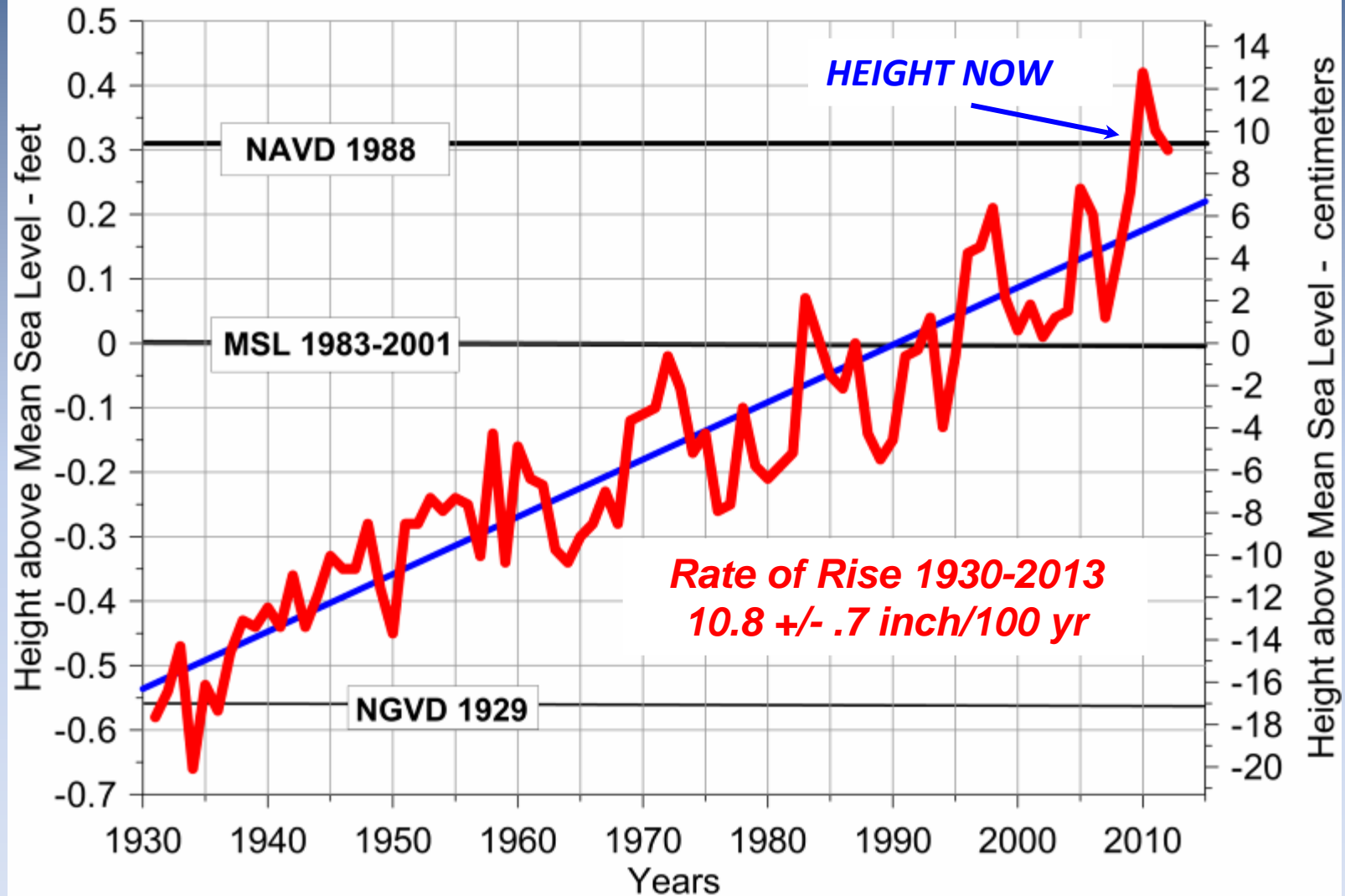
Rhode Island has lost 53% of its salt marshes over the last 200 years* due to man-made alterations (ditching and filling), resulting in a loss of approximately 4000 acres statewide



Rhode Island Geographic Information System

* Bromberg and Bertness, 2005

HISTORIC SEA-LEVEL RISE - Newport, RI



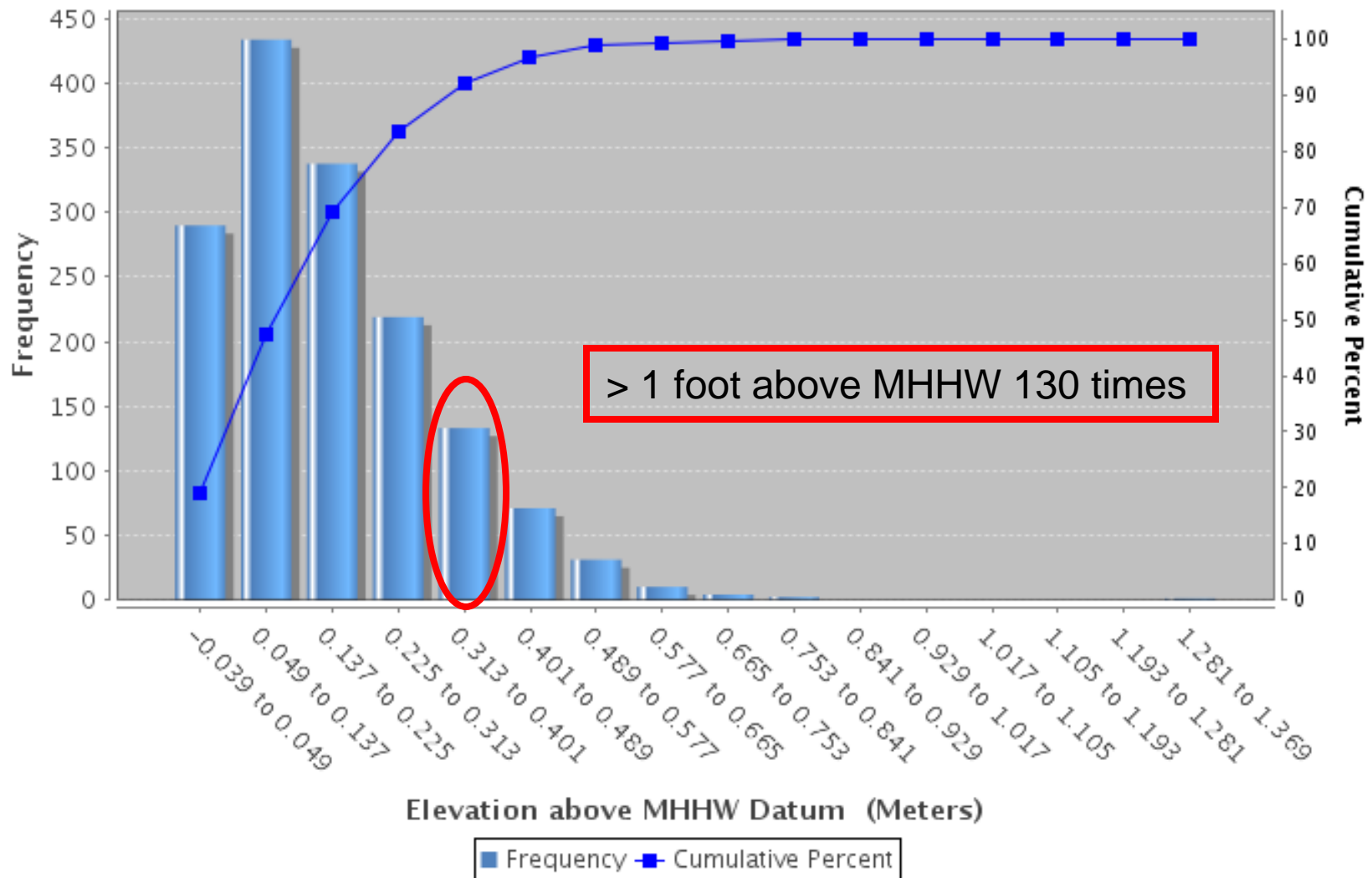
Adapted from:

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



Boothroyd 2013

8452660 Newport RI
 Frequency of High Water Elevations Relative to MHHW Datum (1.751 Meters)
 From 2010-01-01 To 2014-01-01



Source: <http://tidesandcurrents.noaa.gov/inundation/>

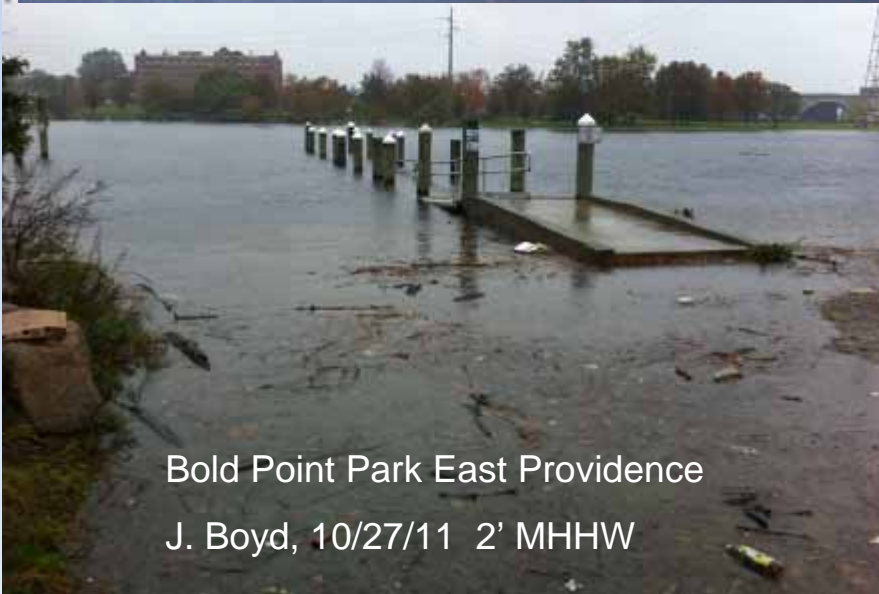
High Tides Affect our Communities Today



South Shore Ave., Warwick
W. Ferguson, 06/04/12 2.4' MHHW



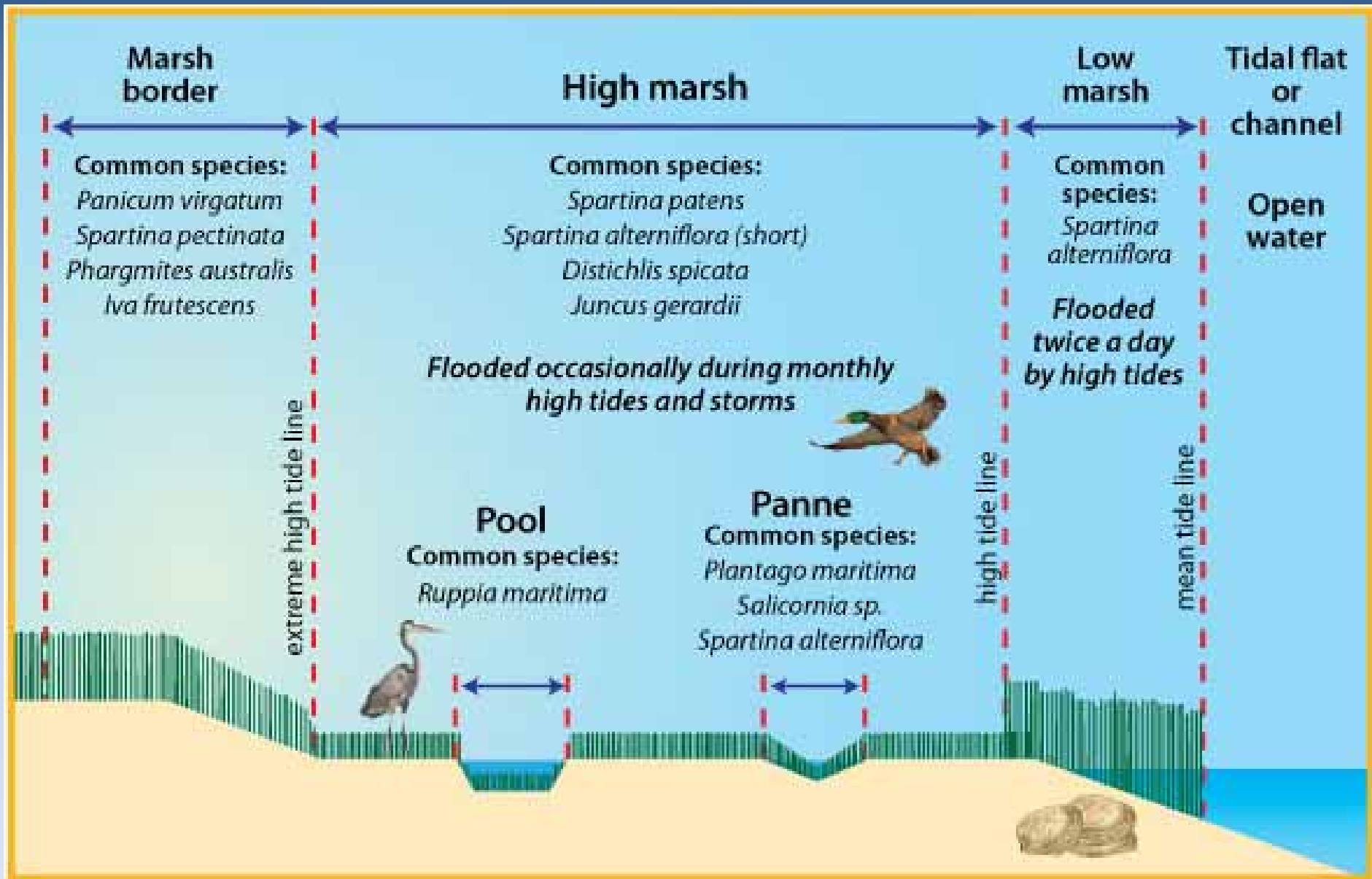
American Tourister, Warren
R. Calabro, 09/29/11 2.2' MHHW



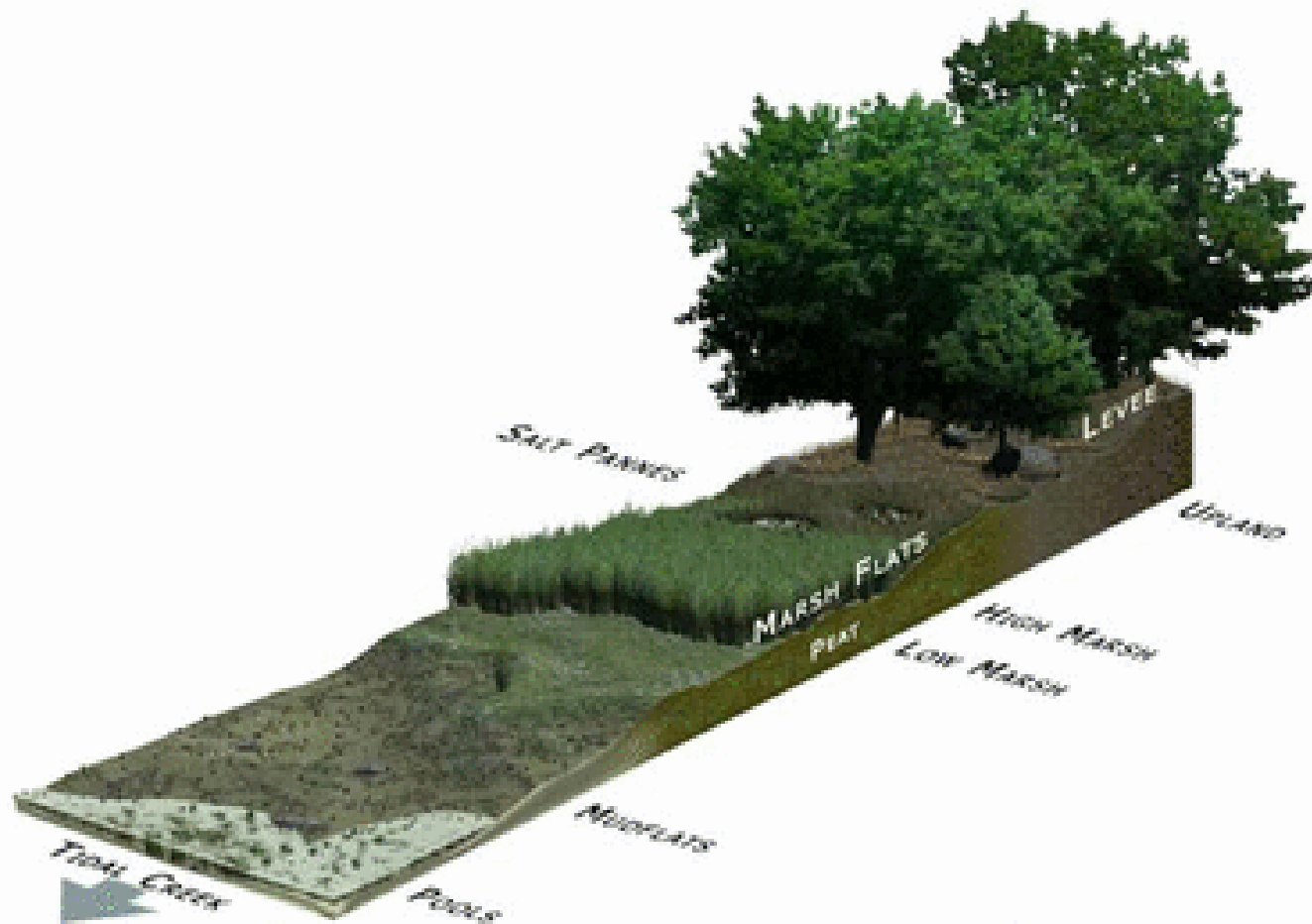
Bold Point Park East Providence
J. Boyd, 10/27/11 2' MHHW



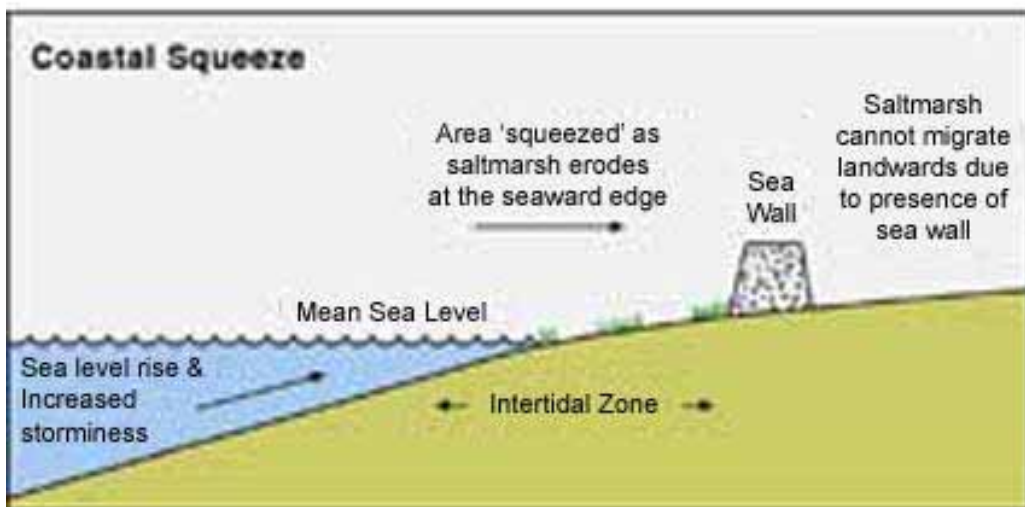
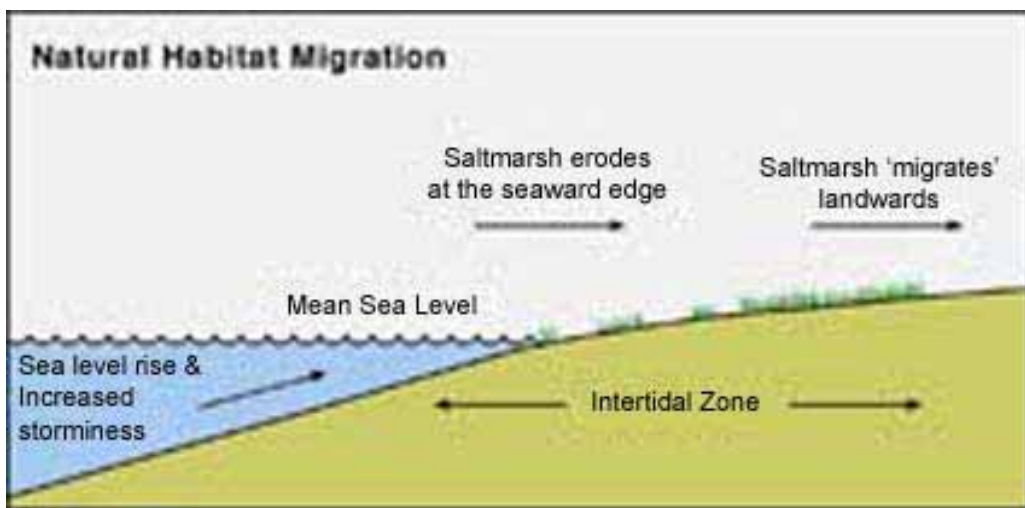
North Avenue, Jamestown
R. Calabro, 06/03/12 2' MHHW



Source: Maine SeaGrant



Opportunities for Upland Migration and Restoration



With the proper conditions, salt marsh can migrate upland

We can model *likely* future habitat



Marsh Migration



Source: Save The Bay

Impediments to Coastal Marsh Migration



STB's 10 years of restoration monitoring has shown that conditions can change rapidly in tidally restricted marshes

Recently, similar degraded conditions have been observed in marshes with no tidal restrictions



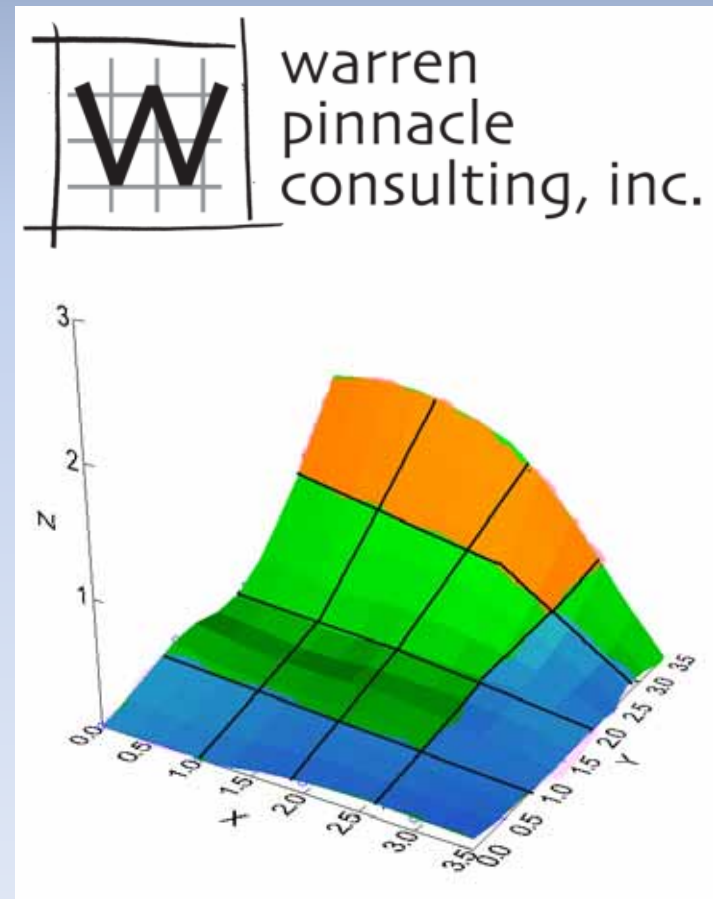
Sea Level Affecting Marshes Model (SLAMM)

Simulates the dominant
processes involved in wetland
conversions during long term
sea level rise

Applied and improved since
1985

Used throughout the world

<http://www.warrenpinnacle.com/prof/SLAMM/>



Model Inputs - Each area is unique

SLAMM Subsites

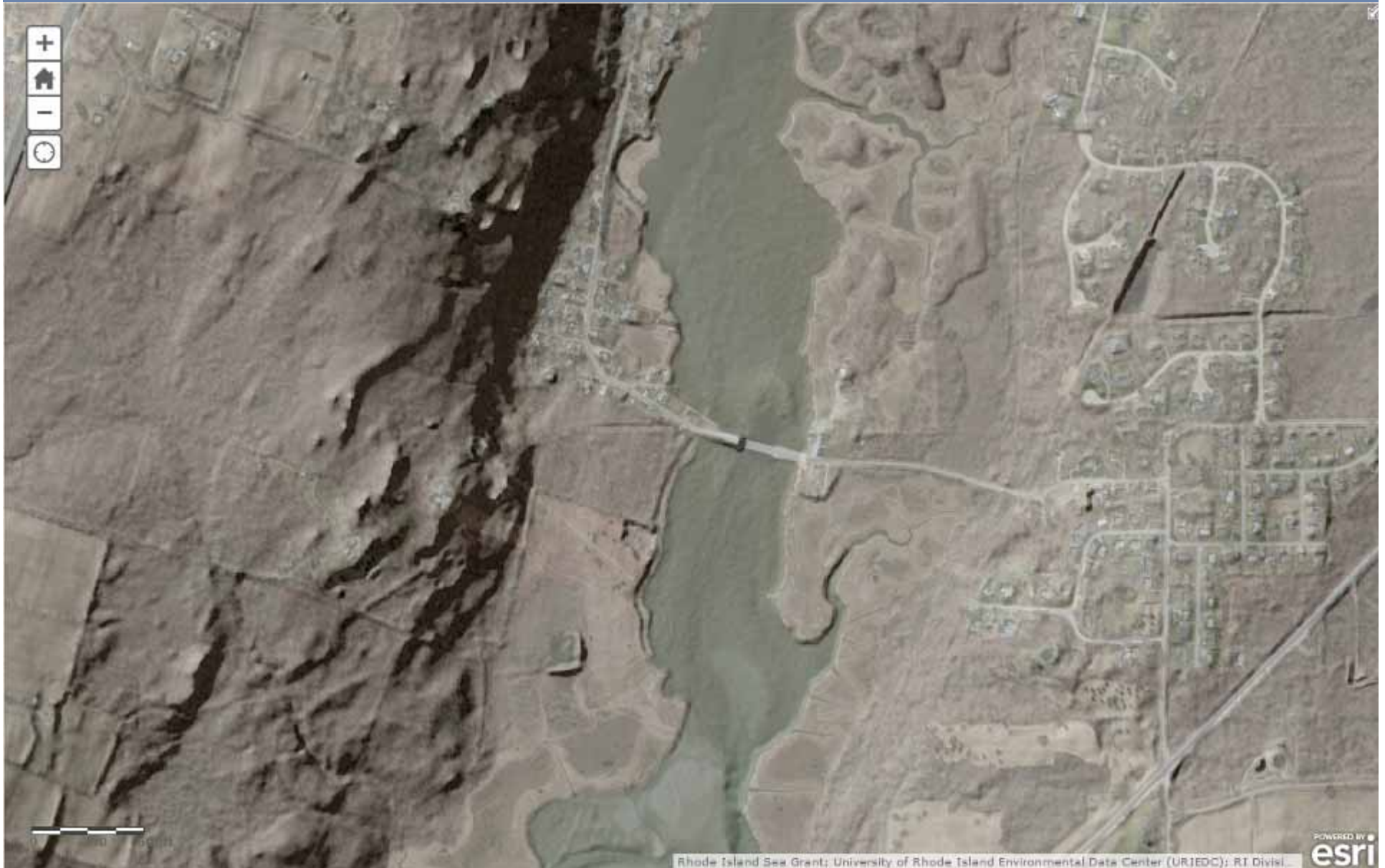
- ☆ ACOE Tidal Data Stations
- ⬠ NOAA Tidal Stations

SLAMM Variables:

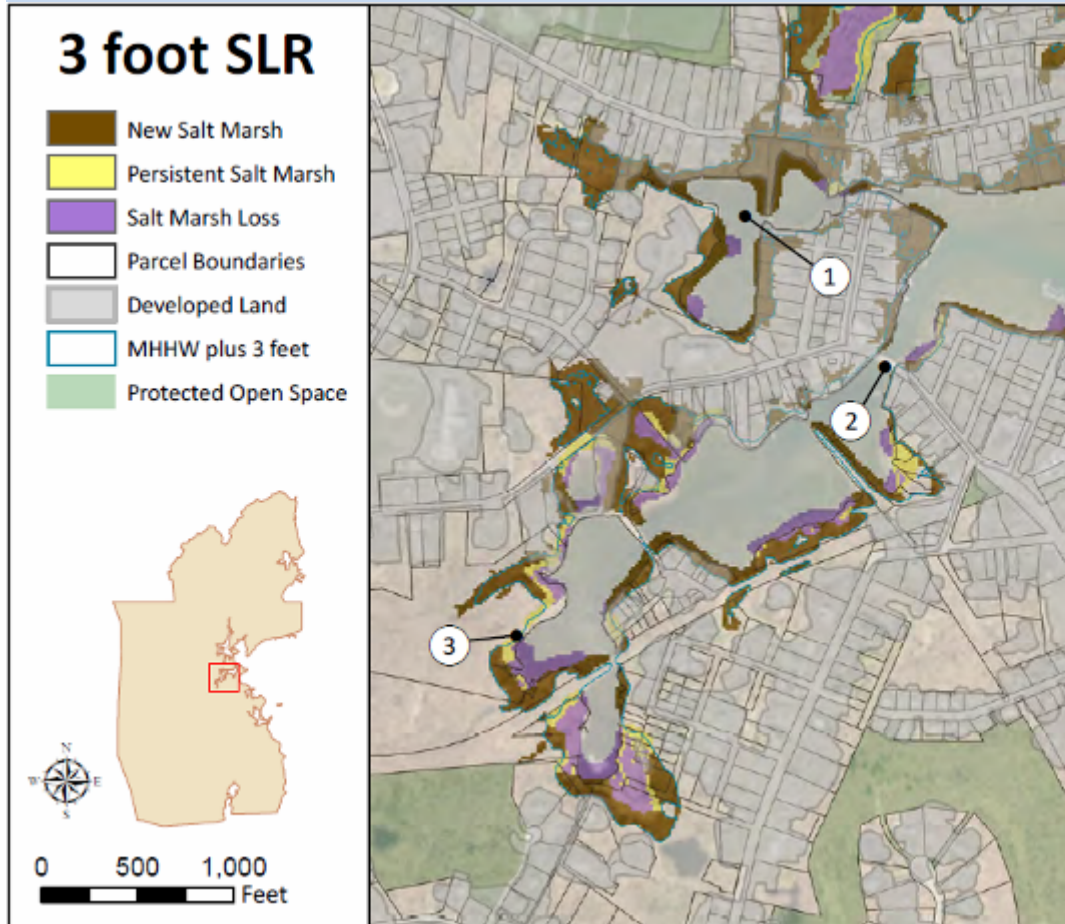
direction offshore
 MTL-NAVD88
 accretion rates
 erosion rates
 salt elevation
 sedimentaion rate
 storm frequency



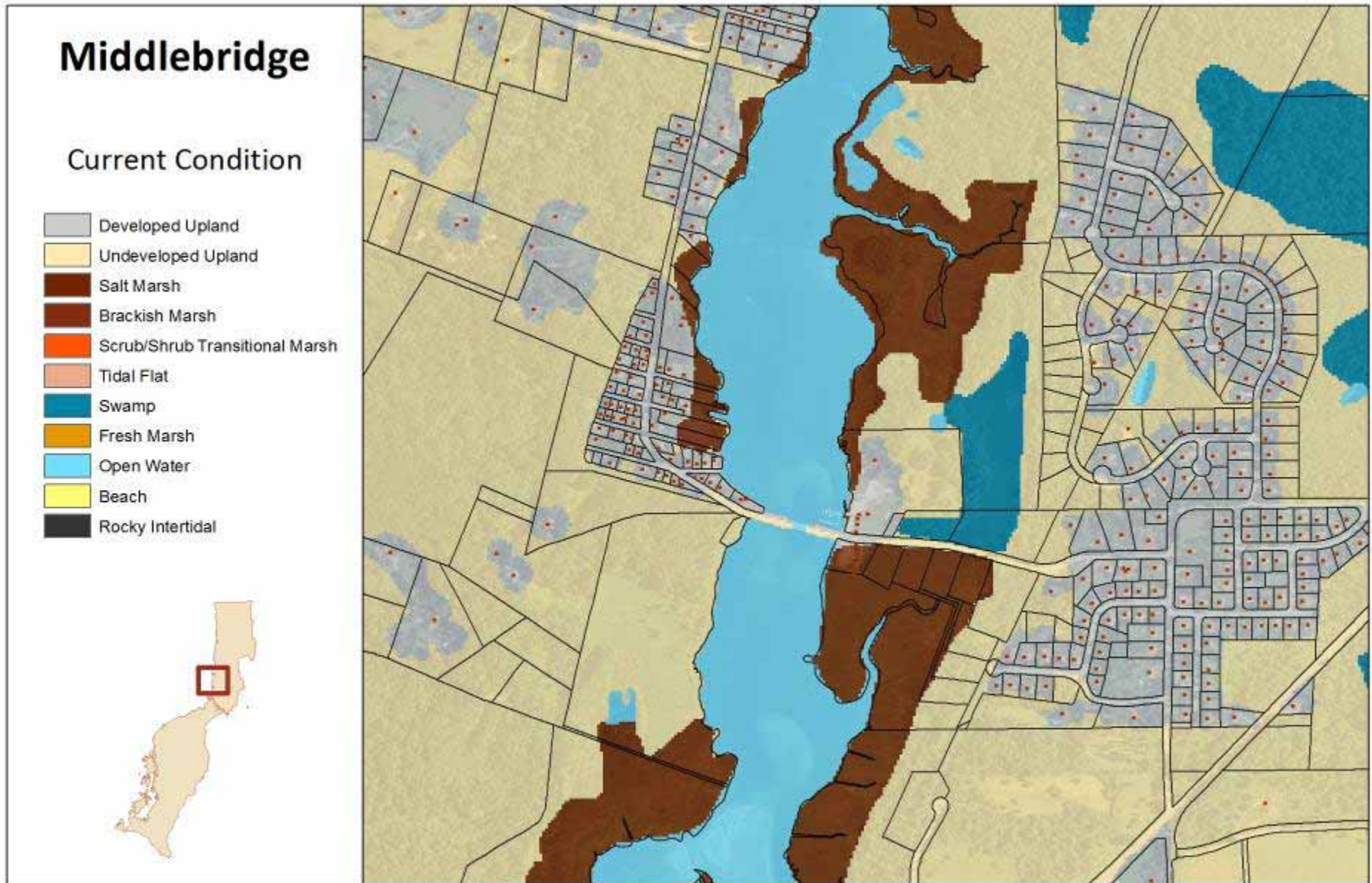
Topography is the basis for Model



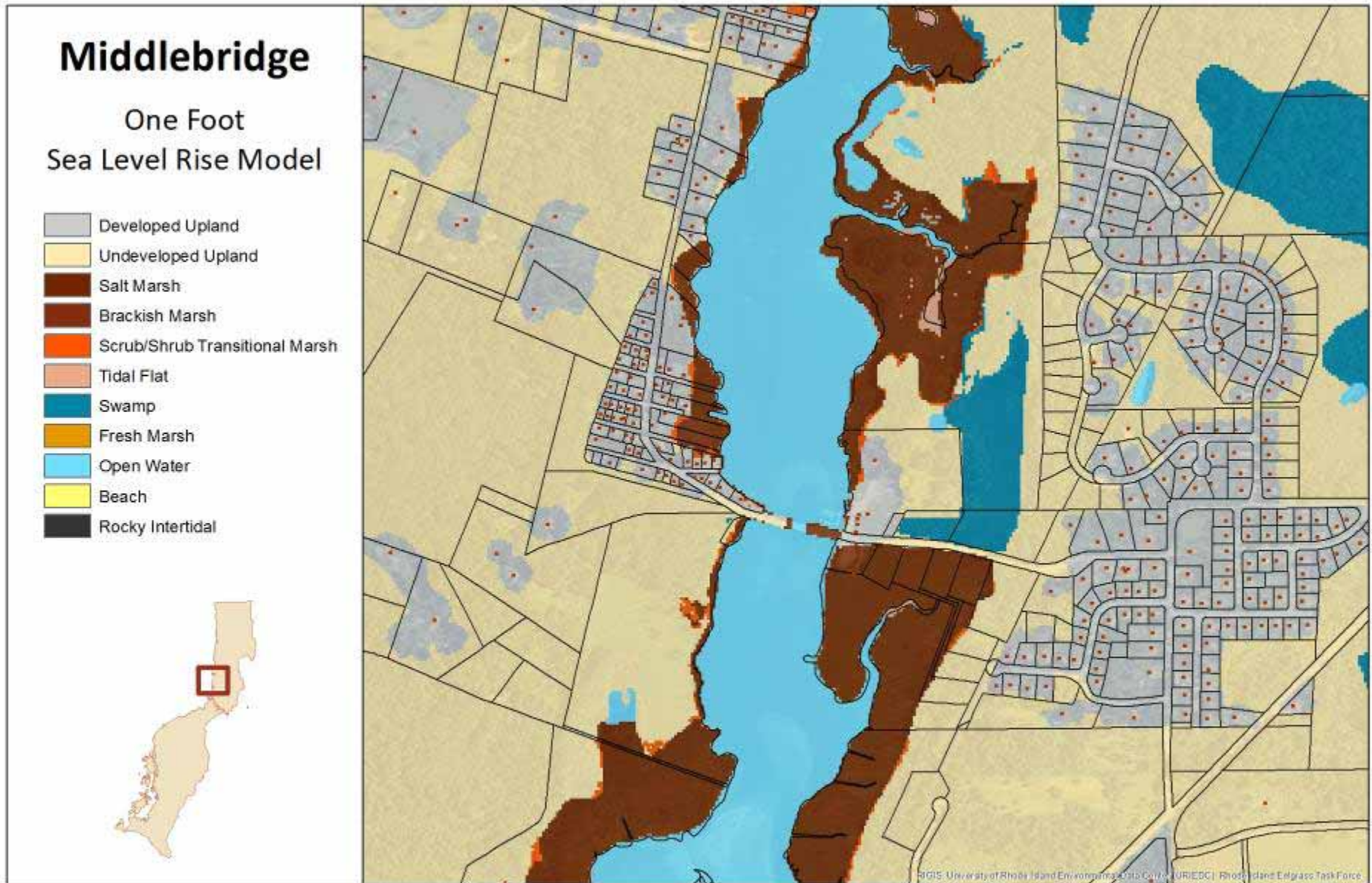
Sea Level Affecting Marshes Model (SLAMM) North Kingstown Pilot Project (2011)



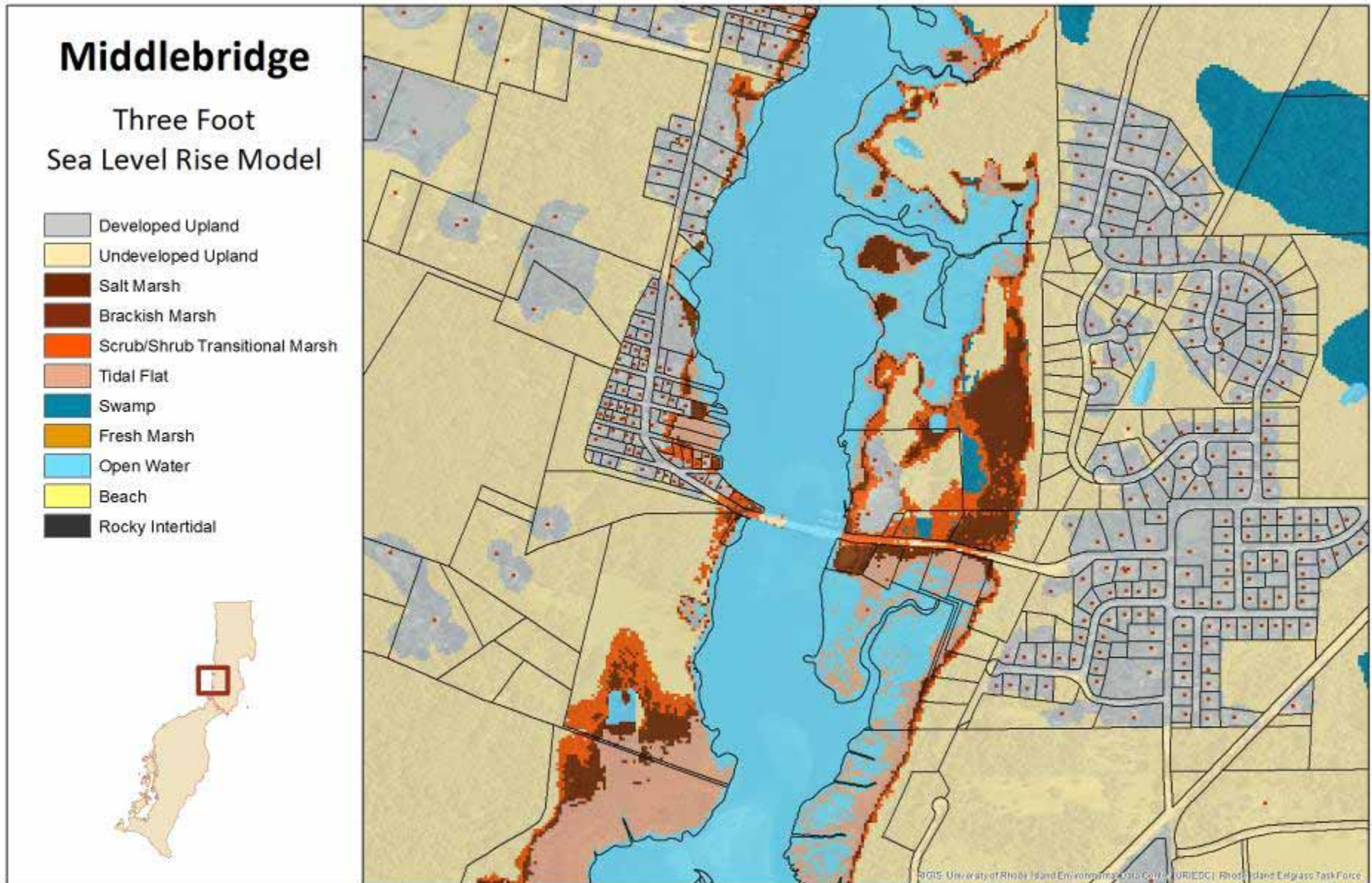
Modeling – Current Conditions



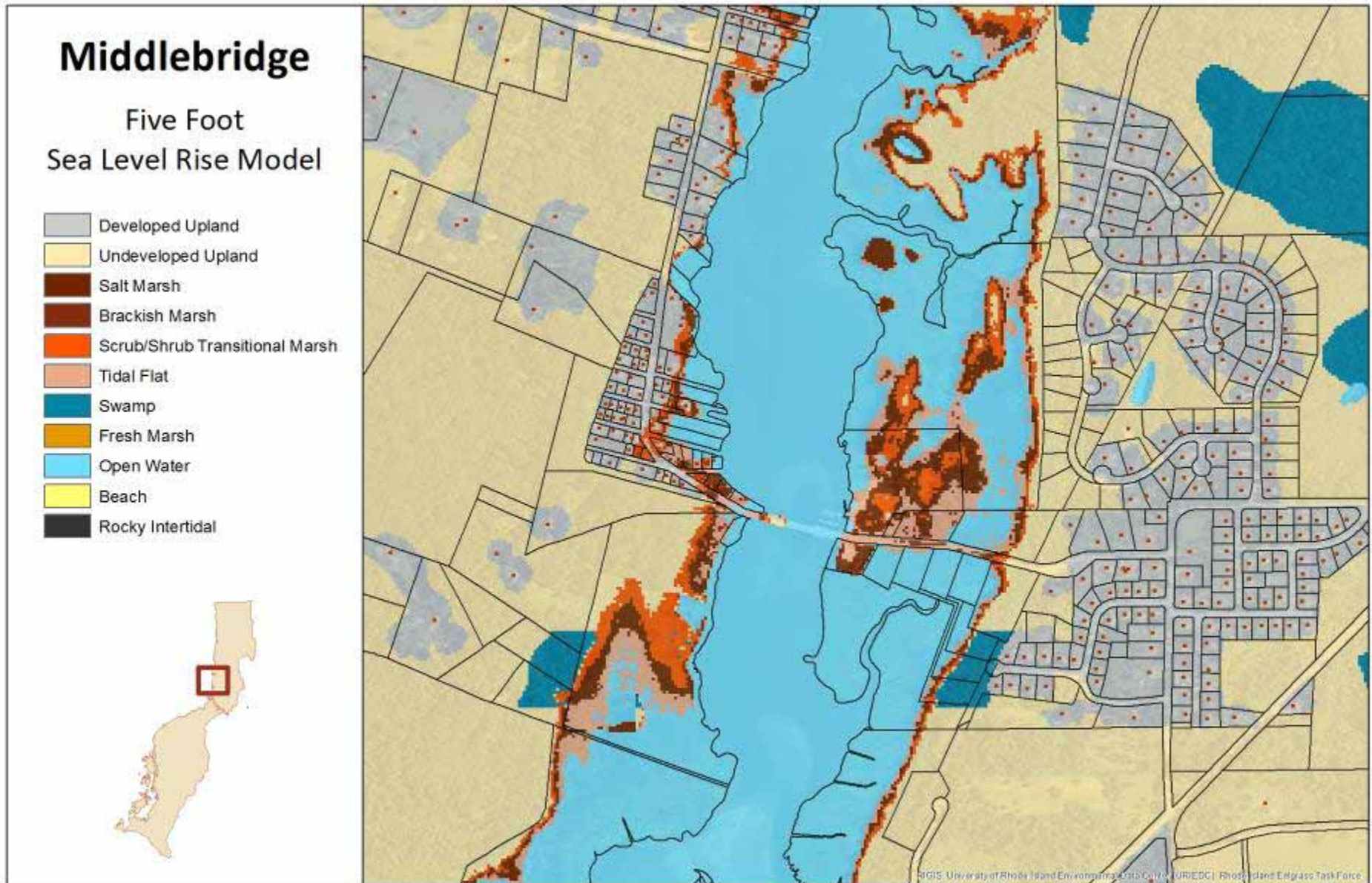
Model Results – 1' SLR



Model Results – 3' SLR



Model Results – 5' SLR



SLAMM Project Goals

1. Develop marsh migration modeling results
2. Identify existing vulnerable wetlands
3. Identify impacted upland parcels – opportunities and challenges
4. Develop new CRMC coastal program adaptive strategies, policies and standards
5. Increase local capacity to proactively incorporate sea level rise for wetlands (e.g., comprehensive plans, zoning codes, conservation, etc.)

Conservation Opportunities

1. Use model output to help prioritize coastal parcels for future conservation
2. Inform management of currently conserved parcels adjacent to coastal wetlands
3. Identify opportunities for removal of barriers to wetland inland migration

Work Underway...

Rhode Island Sea Grant

HOME ABOUT RESEARCH NEWS CLIMATE CHANGE COASTAL COMMUNITIES LAW SEAFO

CLIMATE CHANGE

Climate Change in Rhode Island

- + Human Behavior
- + Habitat Protection
- + Flood Awareness
- + Sea Level Rise & Climate Change Policy
- + Sea Level Rise Mapping & Data Tools

Sea Level Rise and the Conservation of Coastal Wetlands

Challenges facing coastal wetlands

Rhode Island's coastal wetlands provide critical nursery habitat for fisheries, play a key role in absorbing nutrients that would otherwise pollute waters, and provide important economic benefits for fisheries and tourism. In addition, wetlands support recreational activities and help protect local areas from coastal flooding. These wetlands, especially tidal marshes, are very susceptible to impacts from climate change and accelerated sea level rise. As sea levels rise, marshes move, or migrate, farther upland under favorable conditions where they can still maintain tidal influence without being submerged.

FACT SHEET
Sea Level Rise and the Conservation of Coastal Wetlands

CHALLENGES FACING COASTAL WETLANDS

Sea level rise poses a significant threat to coastal wetlands, and the loss of these ecosystems could have far-reaching impacts on the state's economy and environment. This fact sheet provides information on the challenges facing coastal wetlands and offers strategies for their protection and restoration.

YouTube | Facebook | Like | 470

RHODE ISLAND SEA GRANT

RI CRMC Shoreline Change Special Area Management Plan

Home About Issues News Calendar Get Involved Research Resources The SAMP

Helping Rhode Island Coastal Communities Meet the Challenges of Erosion and Flooding

Get Involved

Get Involved

Issues

News & Updates

Photo credit: Kate O'Neil

Join us for stakeholder meetings and lectures that explore how Rhode Island

Photo credit: William Argue

Learn more about the focus of the SAMP, including effects of coastal erosion,

Photo credit: Nathan Smith

Visit the Shoreline Change SAMP Blog for the latest news, as well as updates

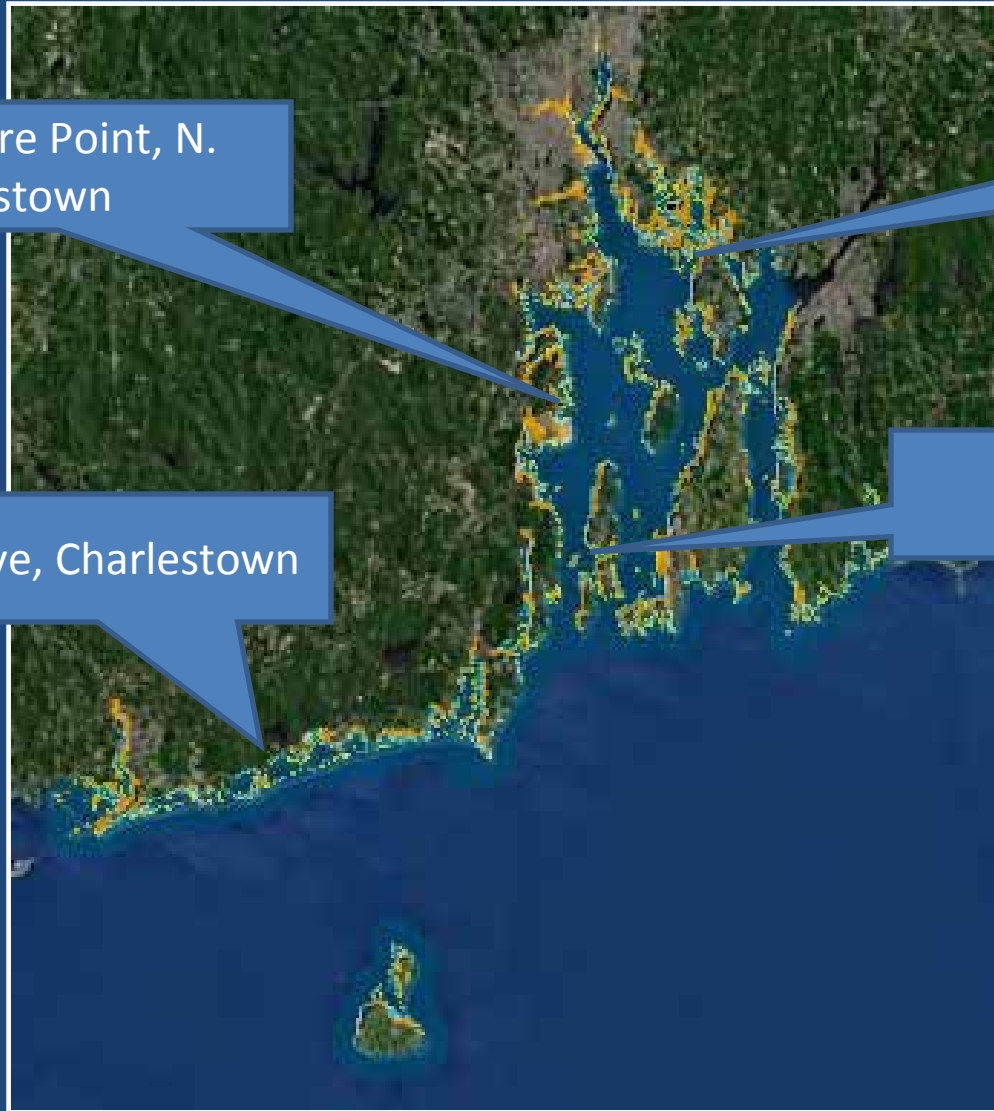
<http://seagrant.gso.uri.edu/climate/habitat.html>

www.beachsamp.org



THE UNIVERSITY OF RHODE ISLAND





Calf Pasture Point, N. Kingstown

Palmer River Barrington

Foster Cove, Charlestown

The Great Creek, Jamestown

http://seagrant.gso.uri.edu/climate/slr_tools.html

Jamestown – The Great Creek (Zeek's Creek)

High Tides Affect our Communities today –

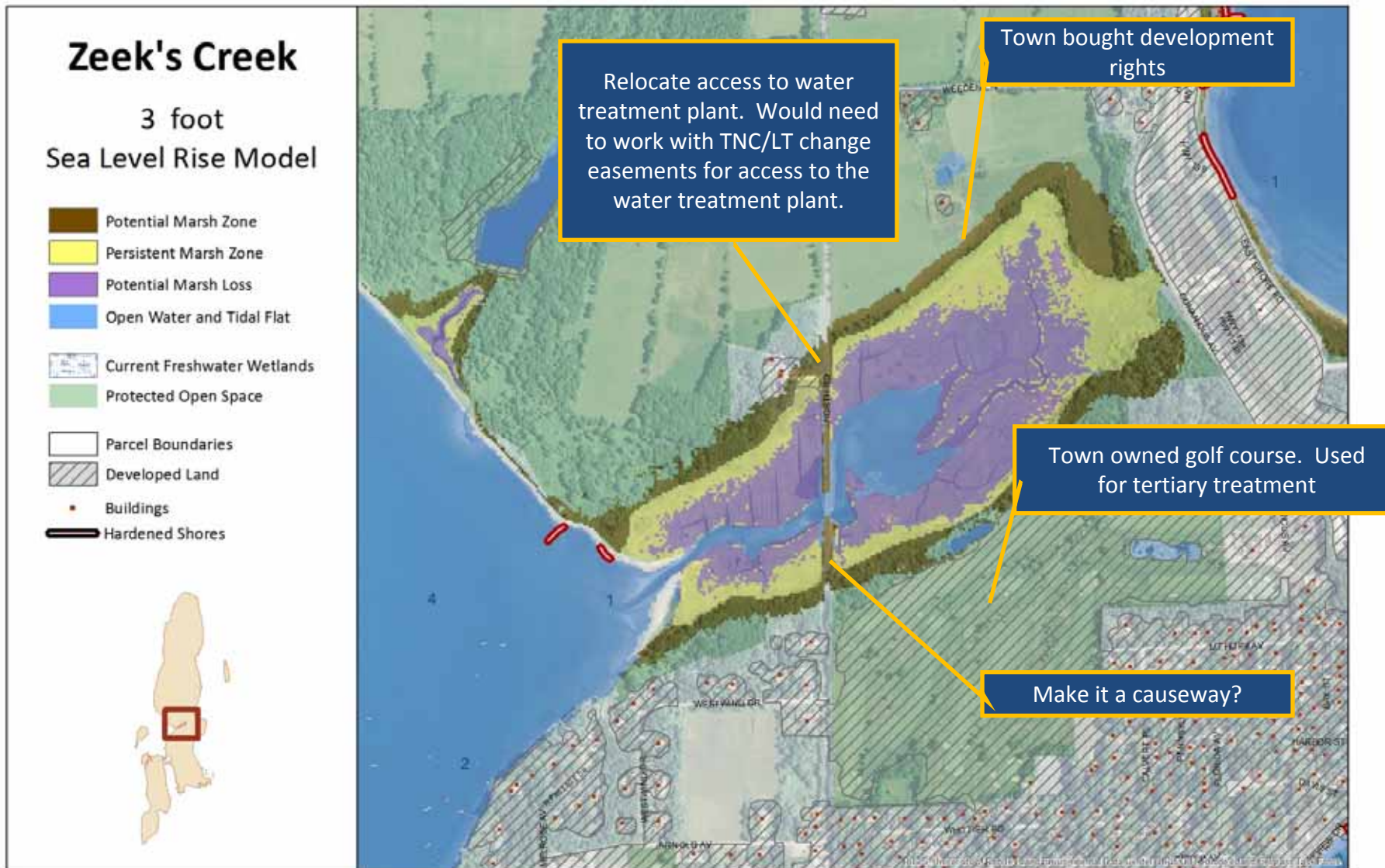


10/29/11 G. Martin



6/3/12 R. Calabro

Jamestown



Barrington – Palmer River

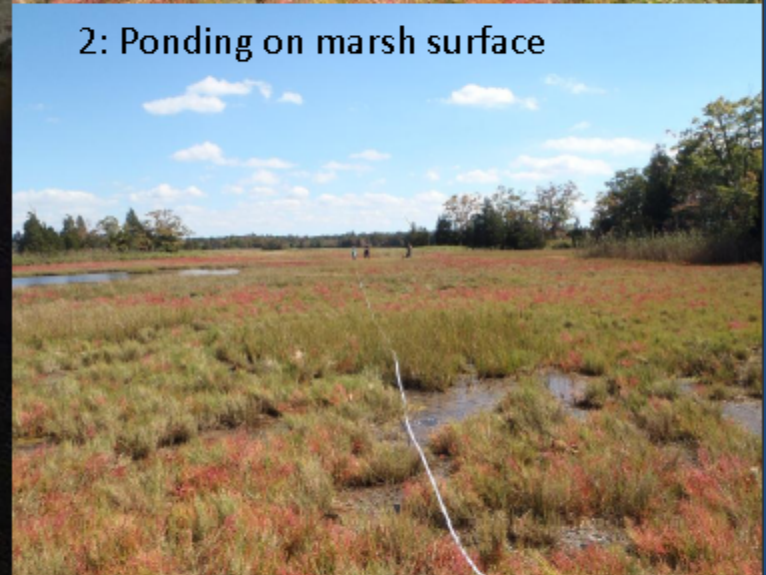
Salt marsh assessment on western Palmer River marsh



1: Pickleweed sign of vegetation change



2: Ponding on marsh surface













3: Leading edge of marsh erosion



Palmer River











1 foot Sea Level Rise Model

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



Palmer River











3 foot Sea Level Rise Model

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



Palmer River

5 foot Sea Level Rise Model

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



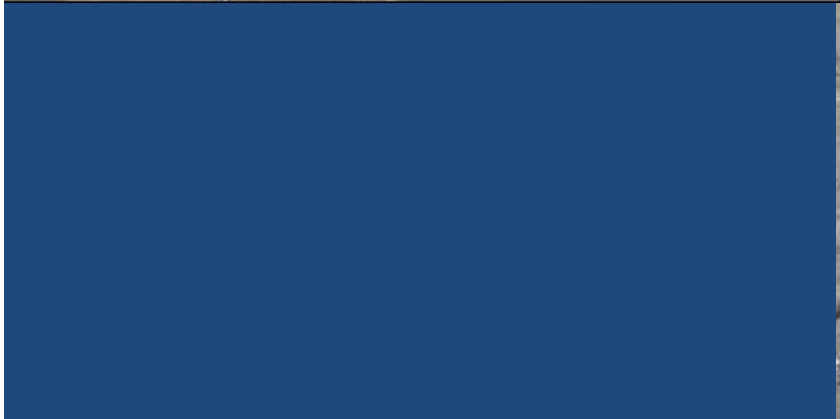
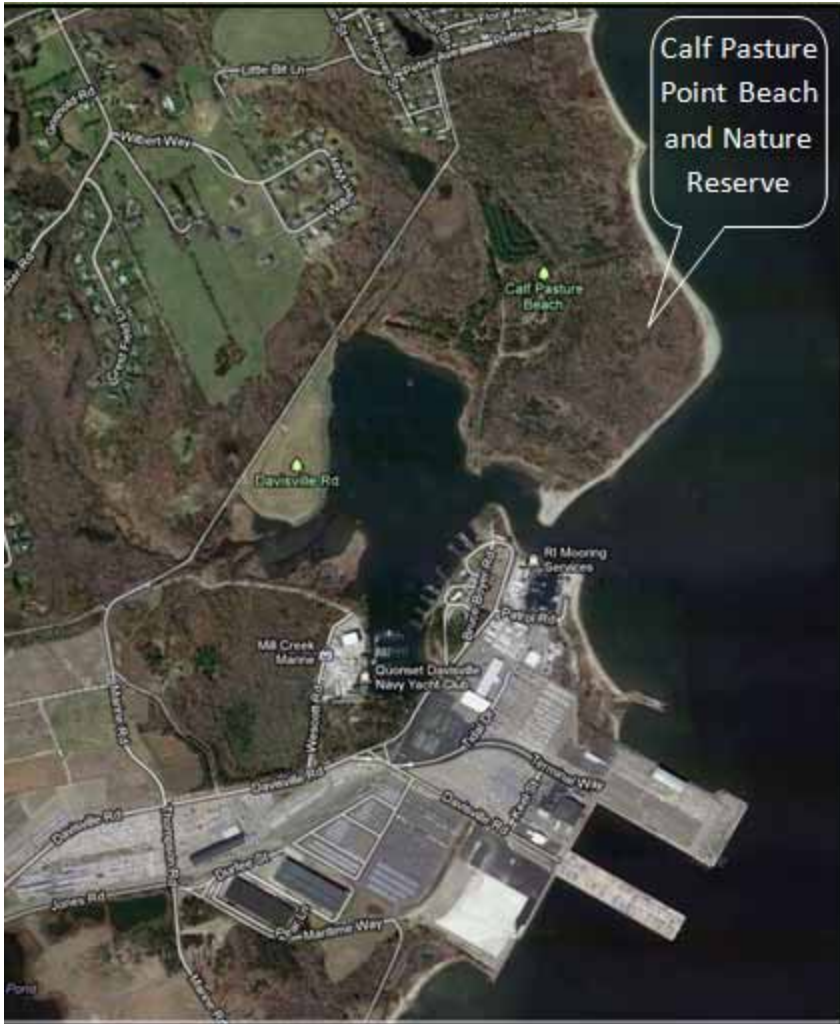
Much of this land is protected or have easements, so future migration will be possible

Property flooding
"roads shortening".

Buyouts?
Incentives?
Innovation?










North Kingstown – Calf Pasture Point



SLAMM – Calf Pasture Point

3 foot SLR

-  New Salt Marsh
-  Persistent Salt Marsh
-  Salt Marsh Loss
-  Parcel Boundaries
-  Developed Land
-  MHHW plus 3 feet
-  Protected Open Space



0 500 1,000
Feet



Charlestown – Foster Cove

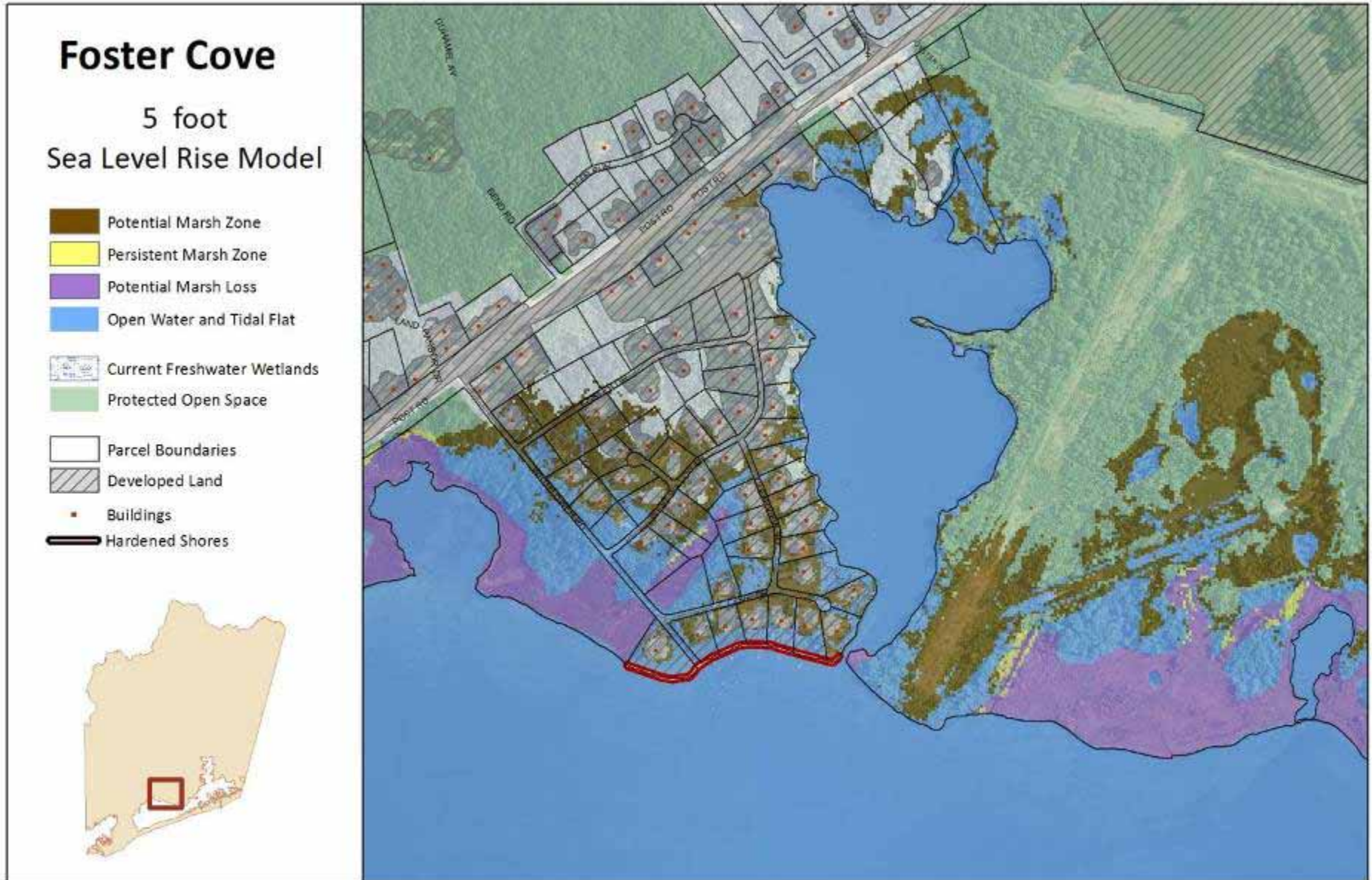
Model Results – 1' SLR



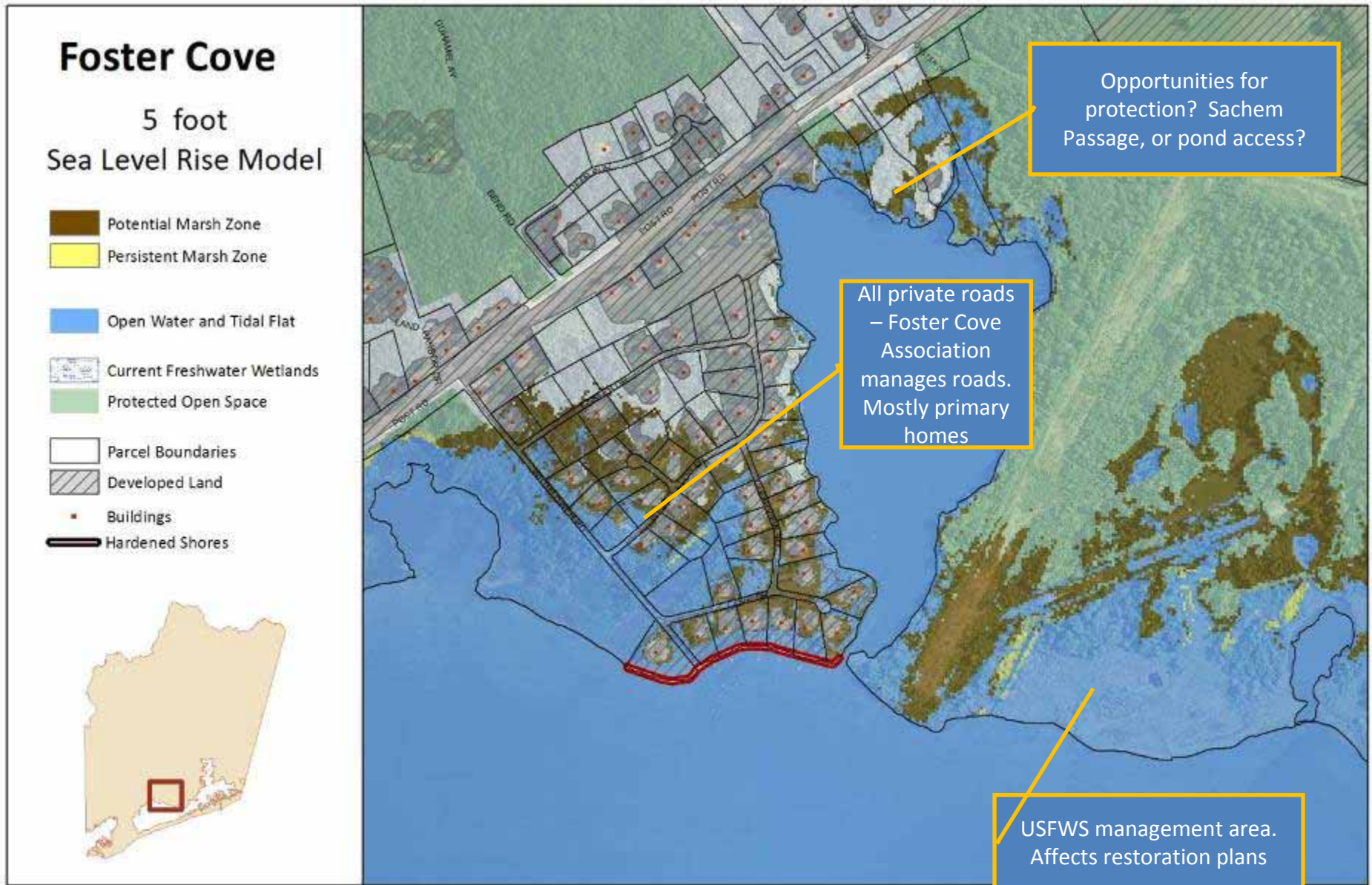
Model Results – 3' SLR



Model Results – 5' SLR



Model shows potential future at 5' SLR



Recent Releases



Building Capacity to Adapt to Climate Change Through Local Conservation Efforts

A SOUTH KINGSTOWN LAND TRUST PILOT PROJECT

Rhode Island Sea Grant & URI Coastal Resources Center • 2013



RI Climate Change Collaborative presents

www.RIClimateChange.org

What can we expect?

What can we learn?

What can we do?

Find out at riclimatechange.org

*Let us not seek to fix the blame for the past.
Let us accept our own responsibility for the future.*

—John F. Kennedy



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OF OCEANOGRAPHY

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WWW.RIClimateChange.org

seagrants.gso.uri.edu/climate/conservation.html

Discussion

R. Hancock

