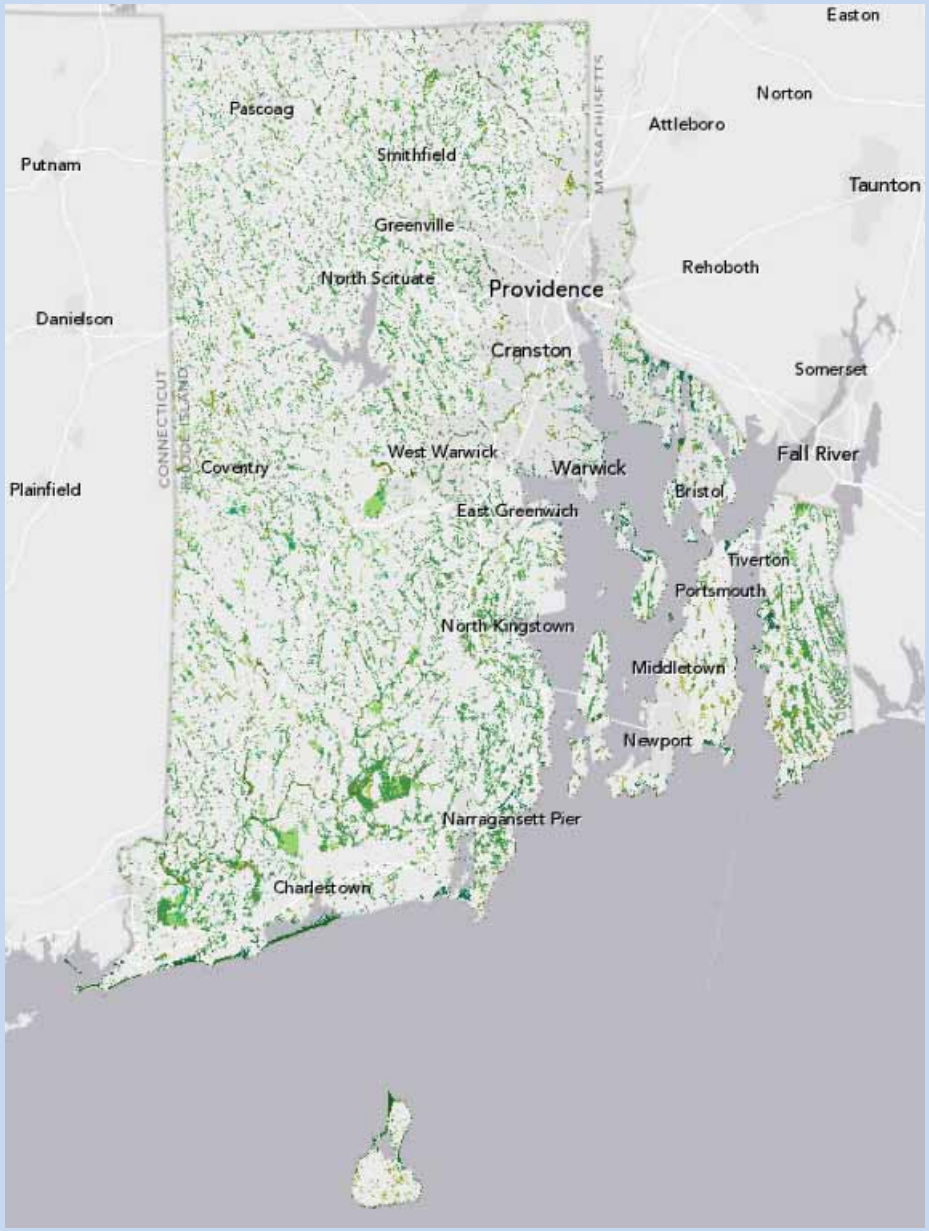
Sea Level Rise and the Conservation of Wetlands

RI Land and Water Summit
March 8, 2014

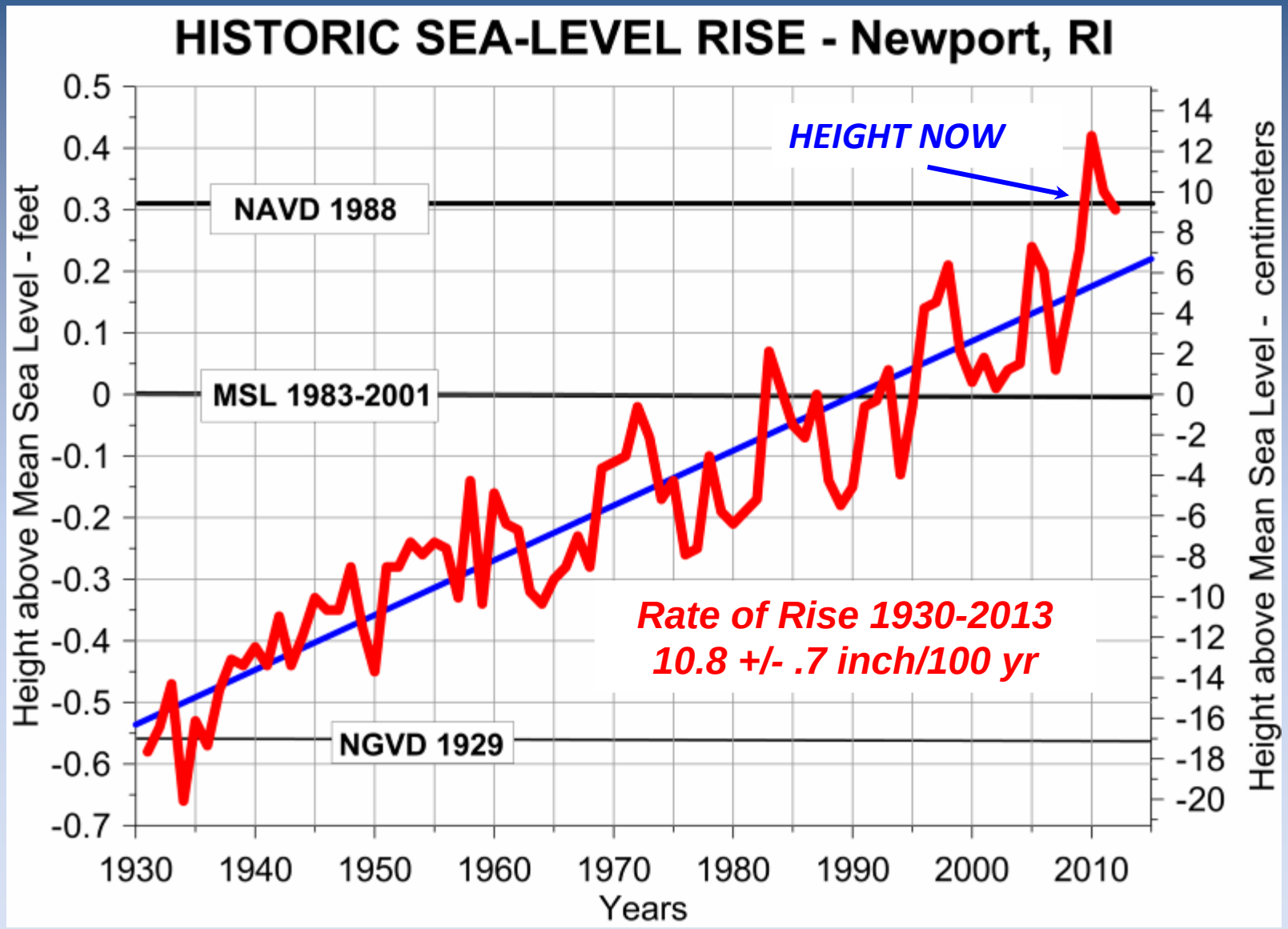
R. Hancock



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

RIGIS Rhode Island Geographic Information System

* Bromberg and Bertness, 2005

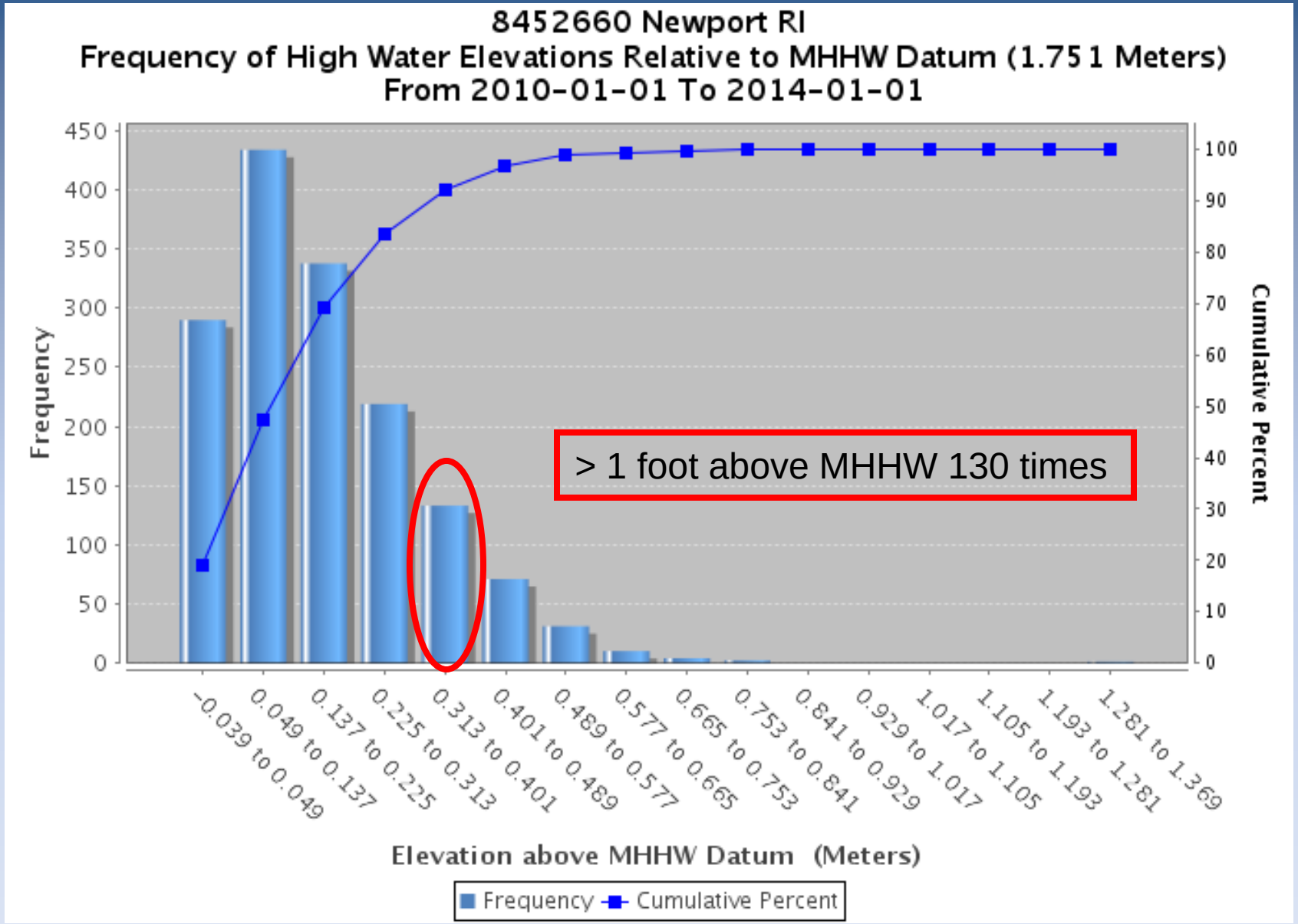


Adapted from:
http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8452660%20Newport,%20RI

GEOLOGICAL SURVEY RHODE ISLAND

COASTAL HAZARDS GROUP GEOSCIENCES Univ RI

Boothroyd 2013



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

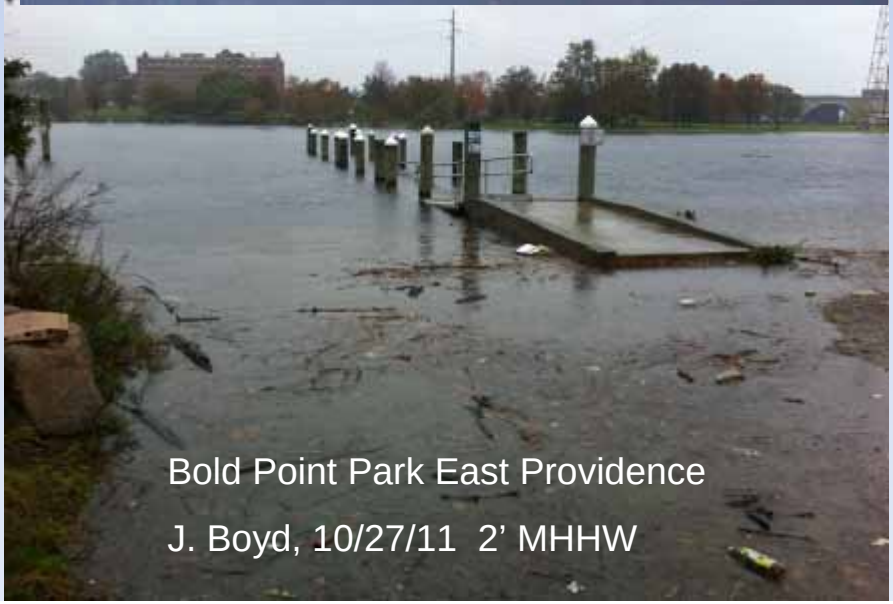
High Tides Affect our Communities Today

South Shore Ave., Warwick

W. Ferguson, 06/04/12 2.4’ MHHW

American Tourister, Warren

R. Calabro, 09/29/11 2.2’ MHHW

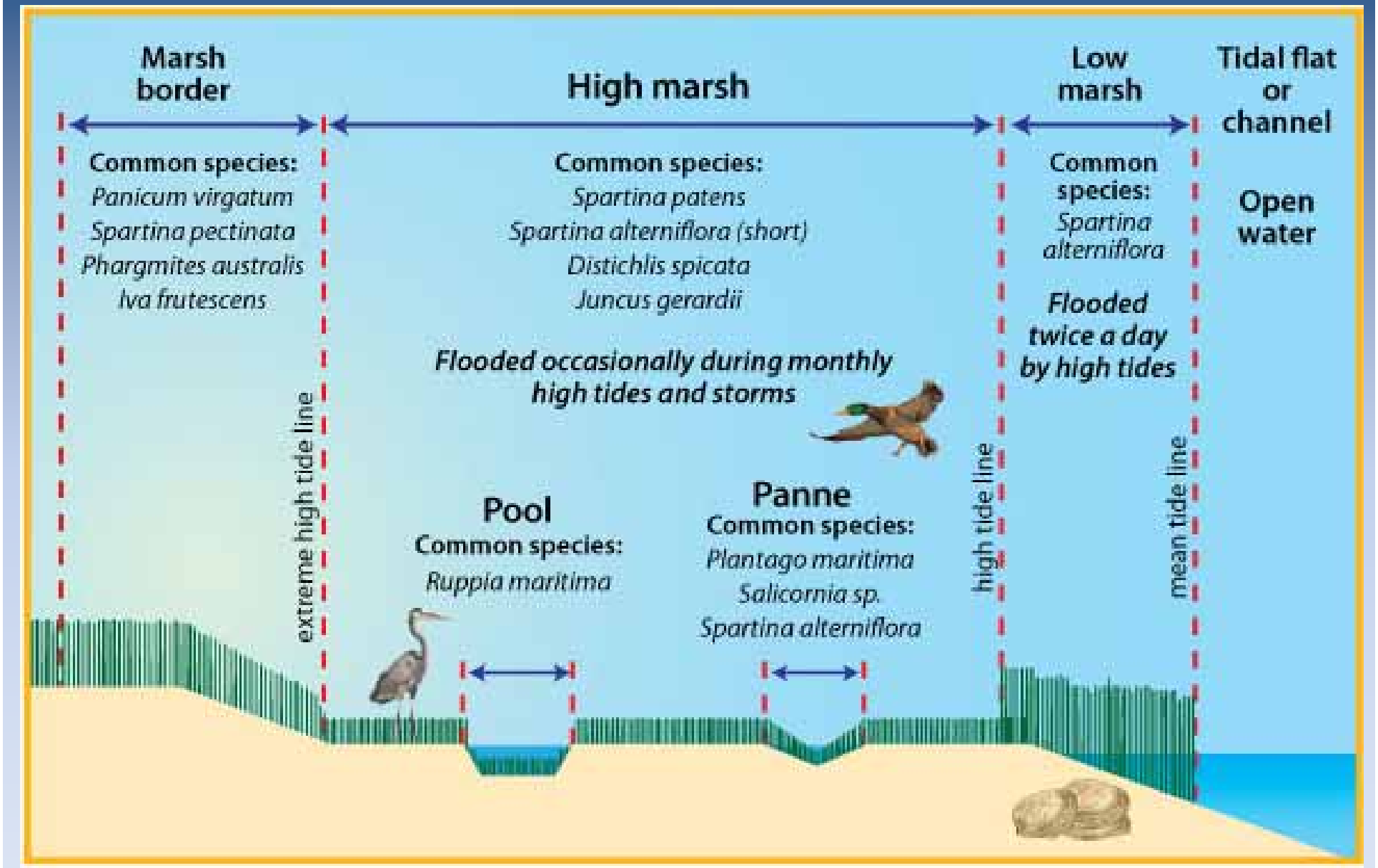


Bold Point Park East Providence

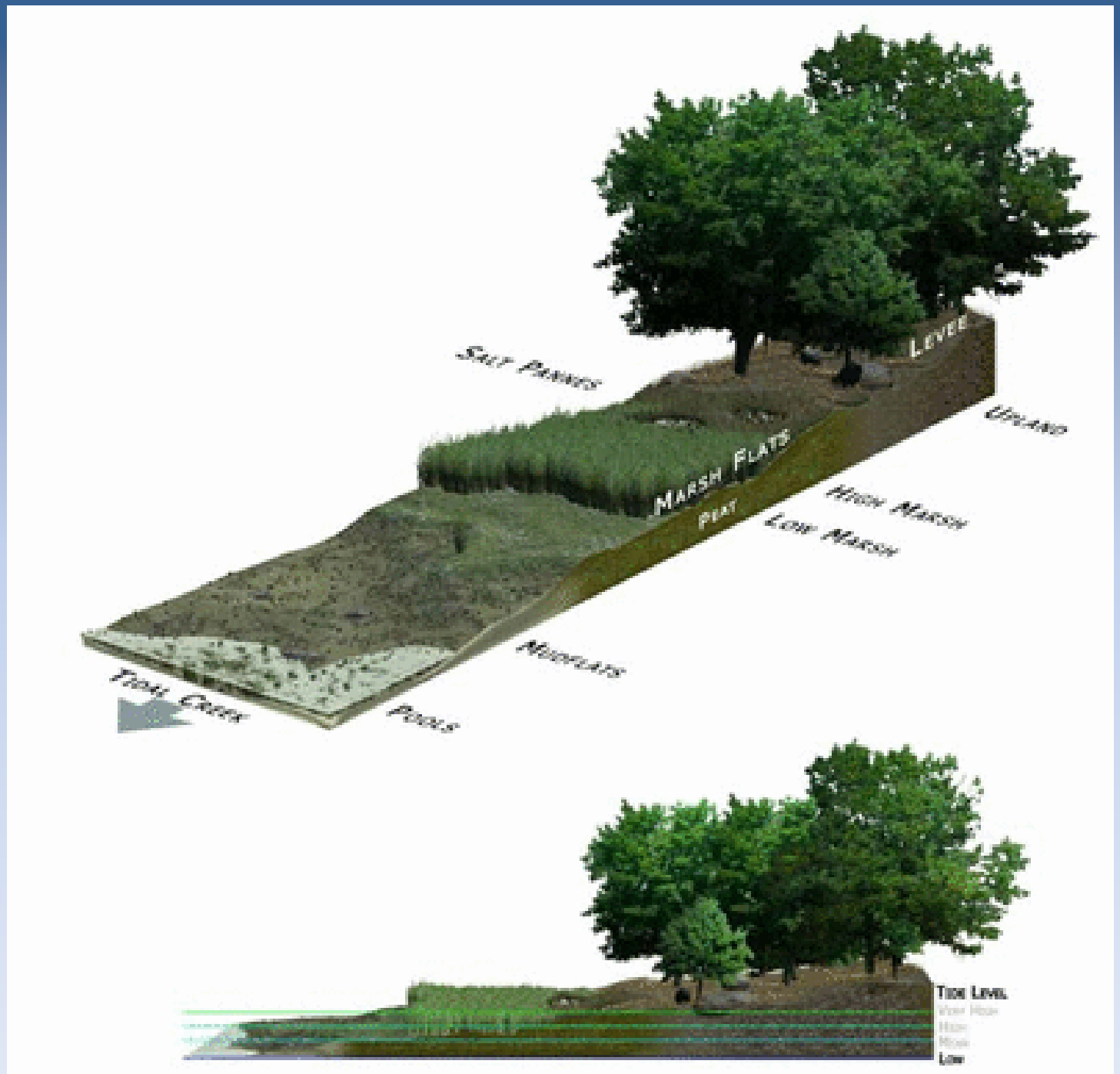
J. Boyd, 10/27/11 2’ MHHW

North Avenue, Jamestown

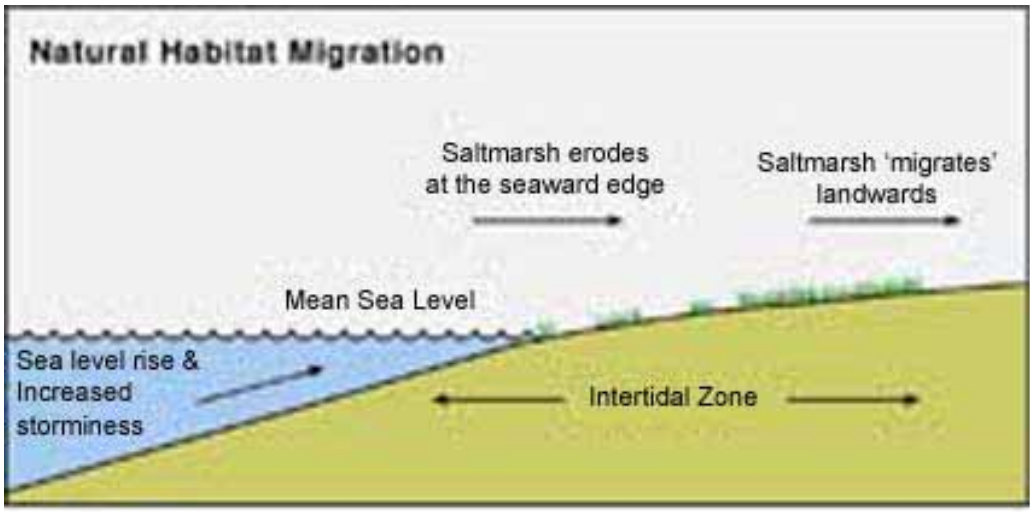
R. Calabro, 06/03/12 2’ MHHW

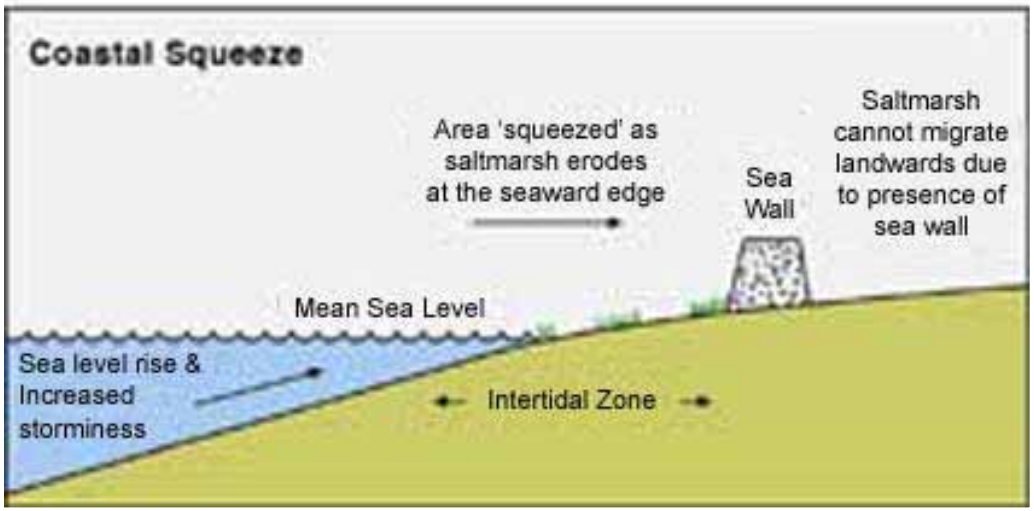


Source: Maine SeaGrant


Salt Pannes
Levee
Upland
Marsh Flats
Peat
High Marsh
Low Marsh
Mudflats
Tidal Creek
Pools
Tide Level
Low

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

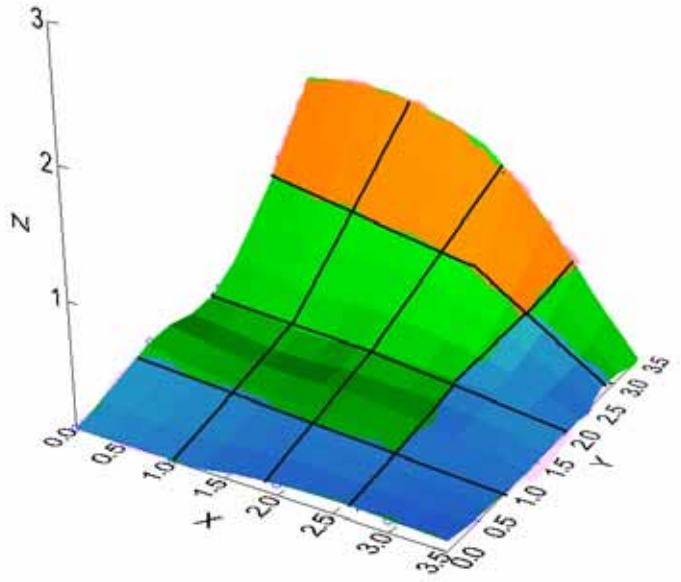
Sea Level Affecting Marshes Model (SLAMM)

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

Applied and improved since 1985

Used throughout the world

warren pinnacle consulting, inc.



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

Model Inputs - Each area is unique

SLAMM Subsites

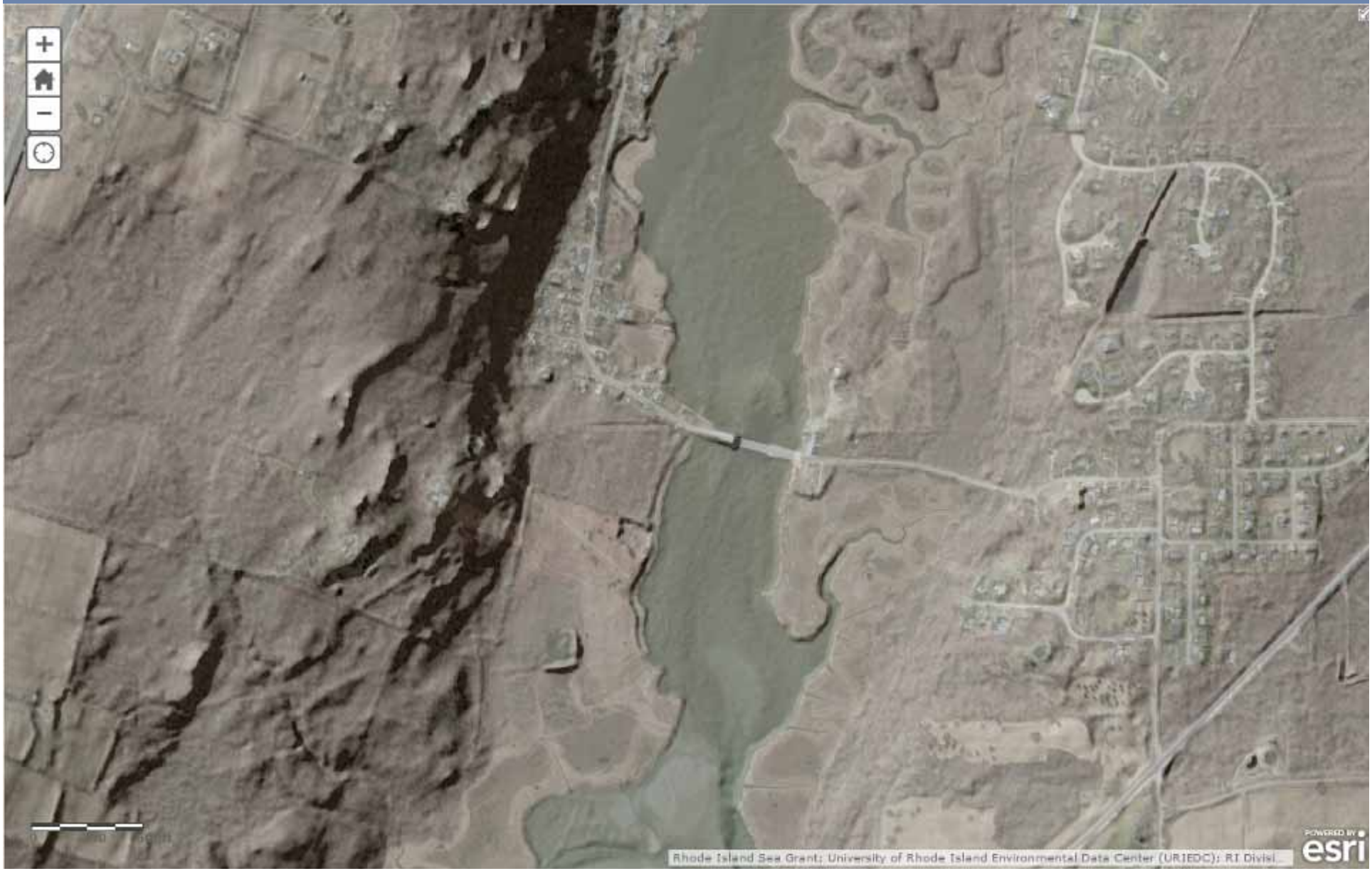
- ACOE Tidal Data Stations
- NOAA Tidal Stations

SLAMM Variables:

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

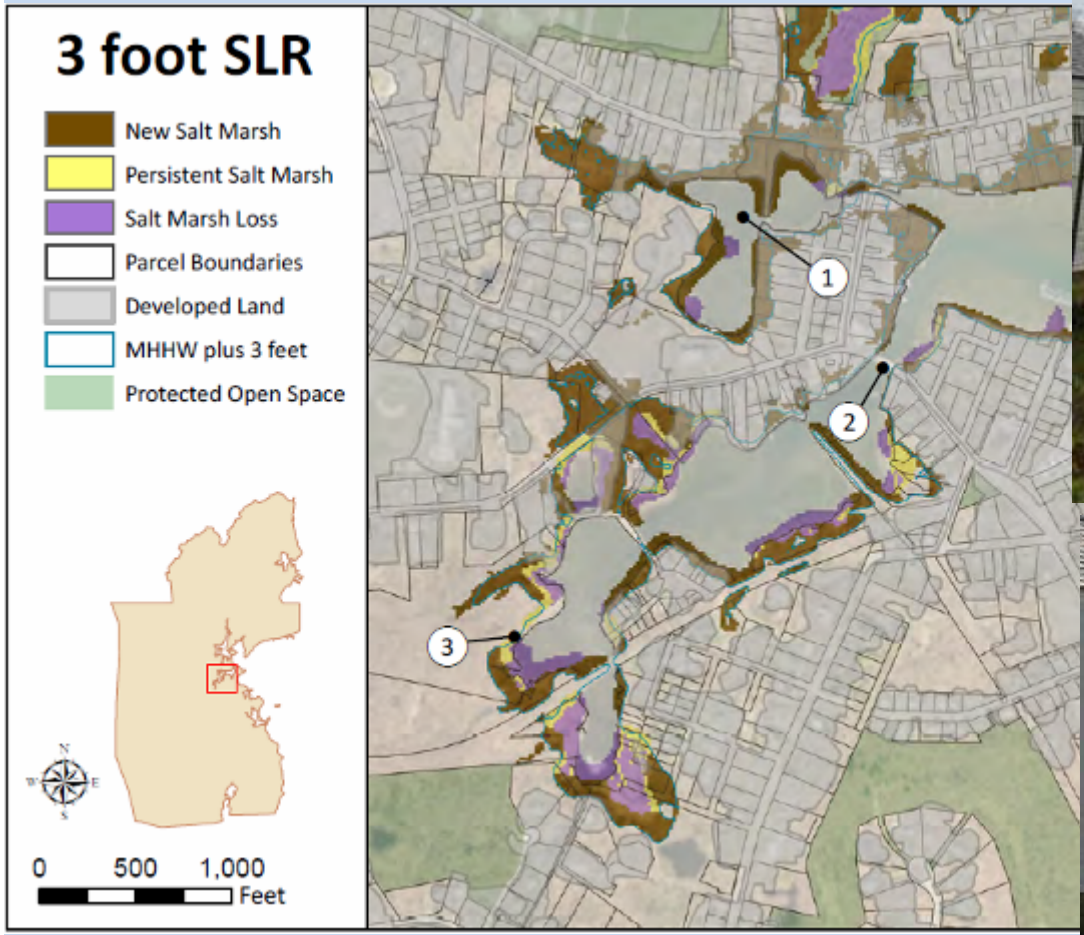
site	diurnal_range
RI Coast	0.8
LNB	0.94
LN-E	0.94
W-W	0.645
Q	0.68
NW	0.27
NN	0.27
PP-N	0.351
GH	0.16
BI South	0.991
BI Harbor Pond	0.86
BI GSP	0.89
PJ-N	1.11

Topography is the basis for Model



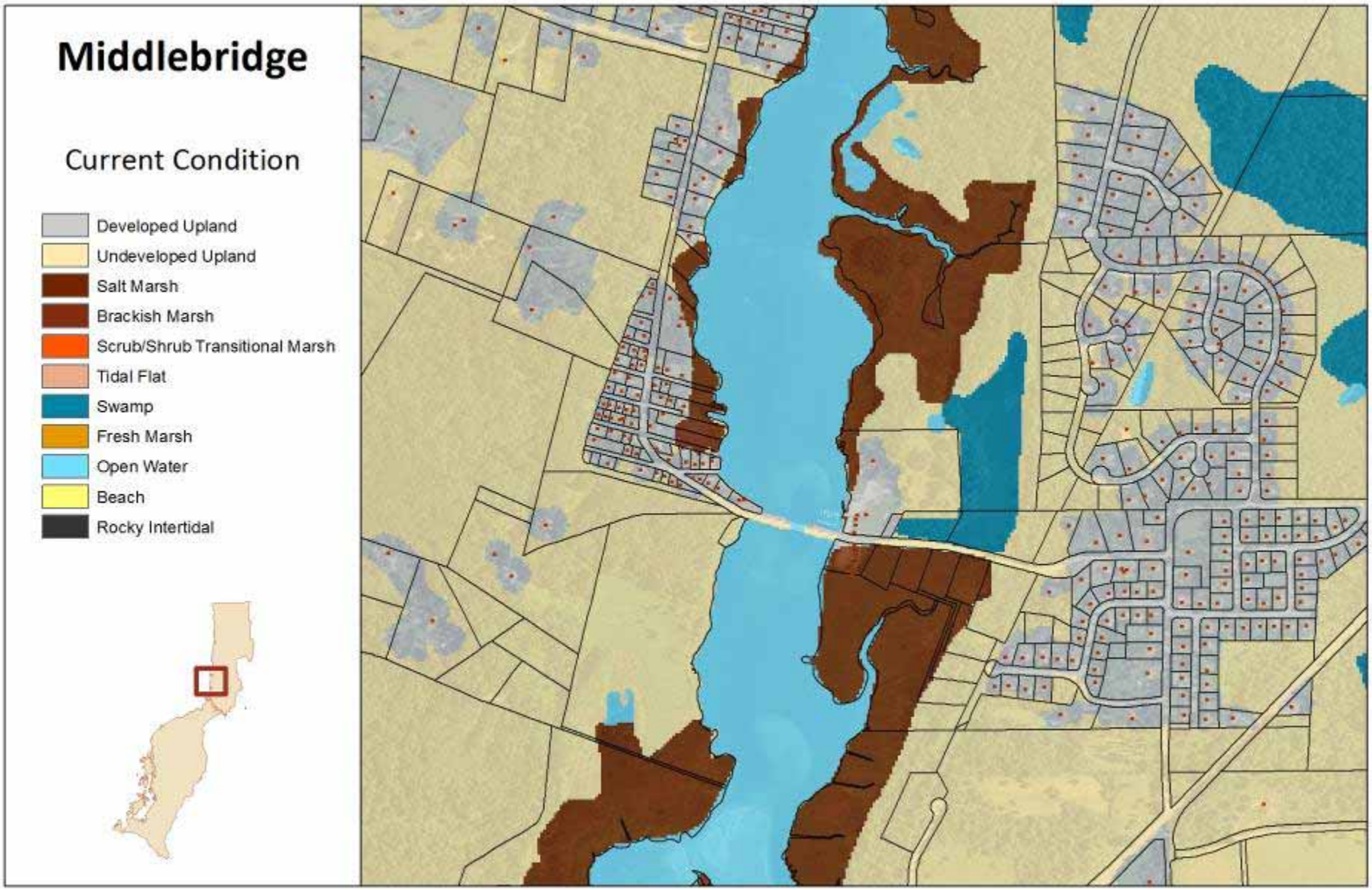
Sea Level Affecting Marshes Model (SLAMM)

North Kingstown Pilot Project (2011)

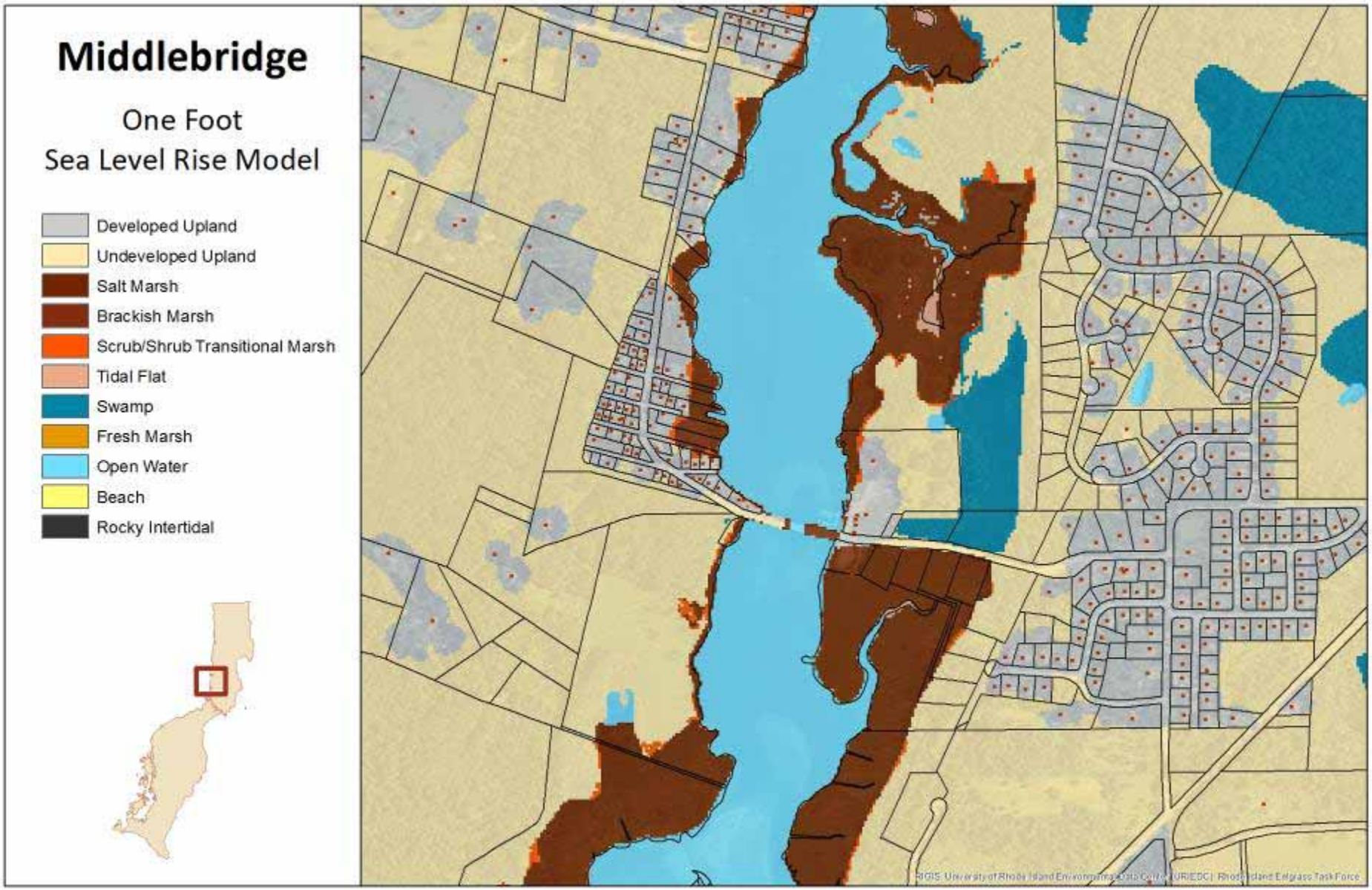


http://seagrant.gso.uri.edu/climate/habitat.html

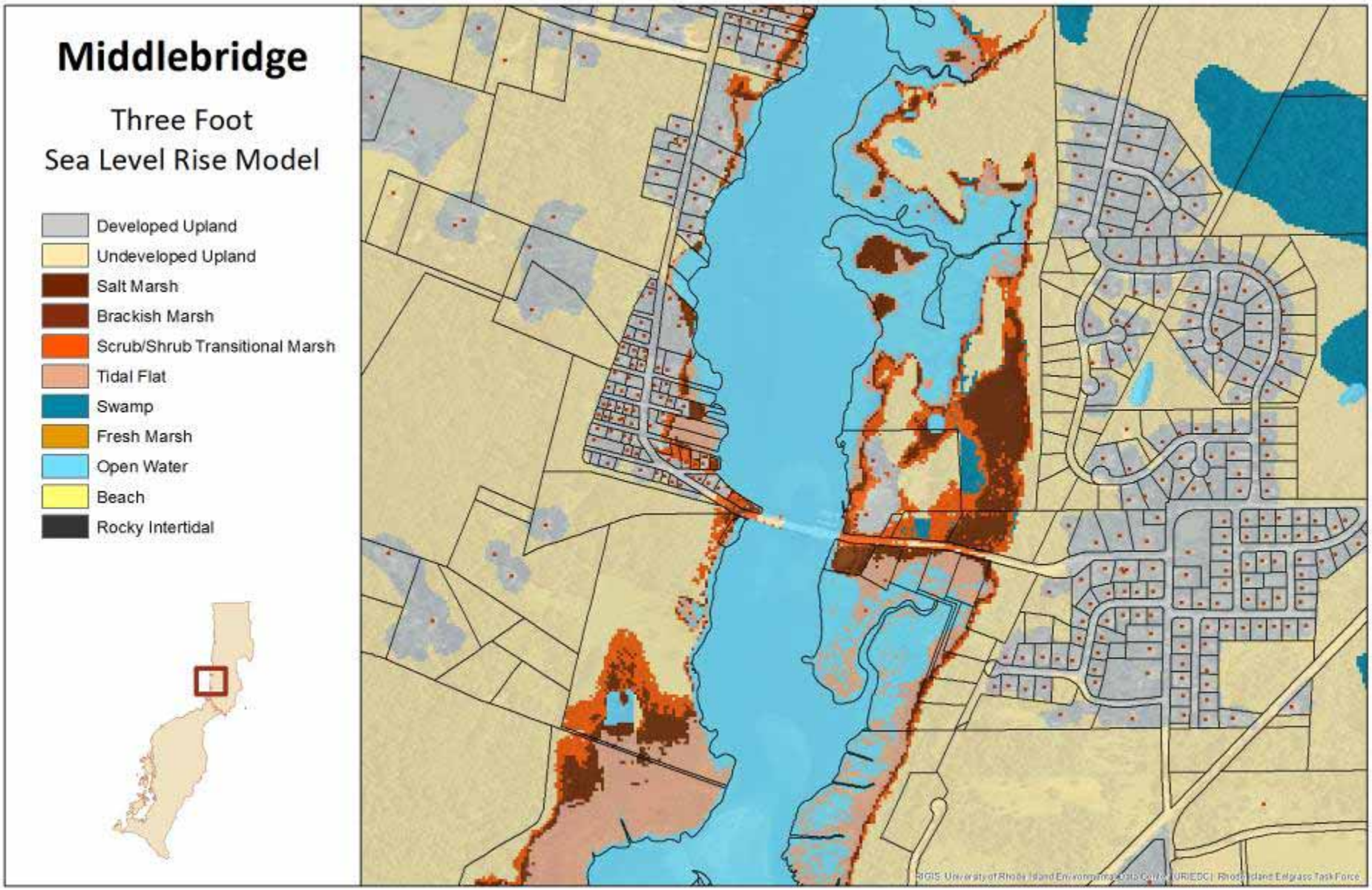
Modeling – Current Conditions



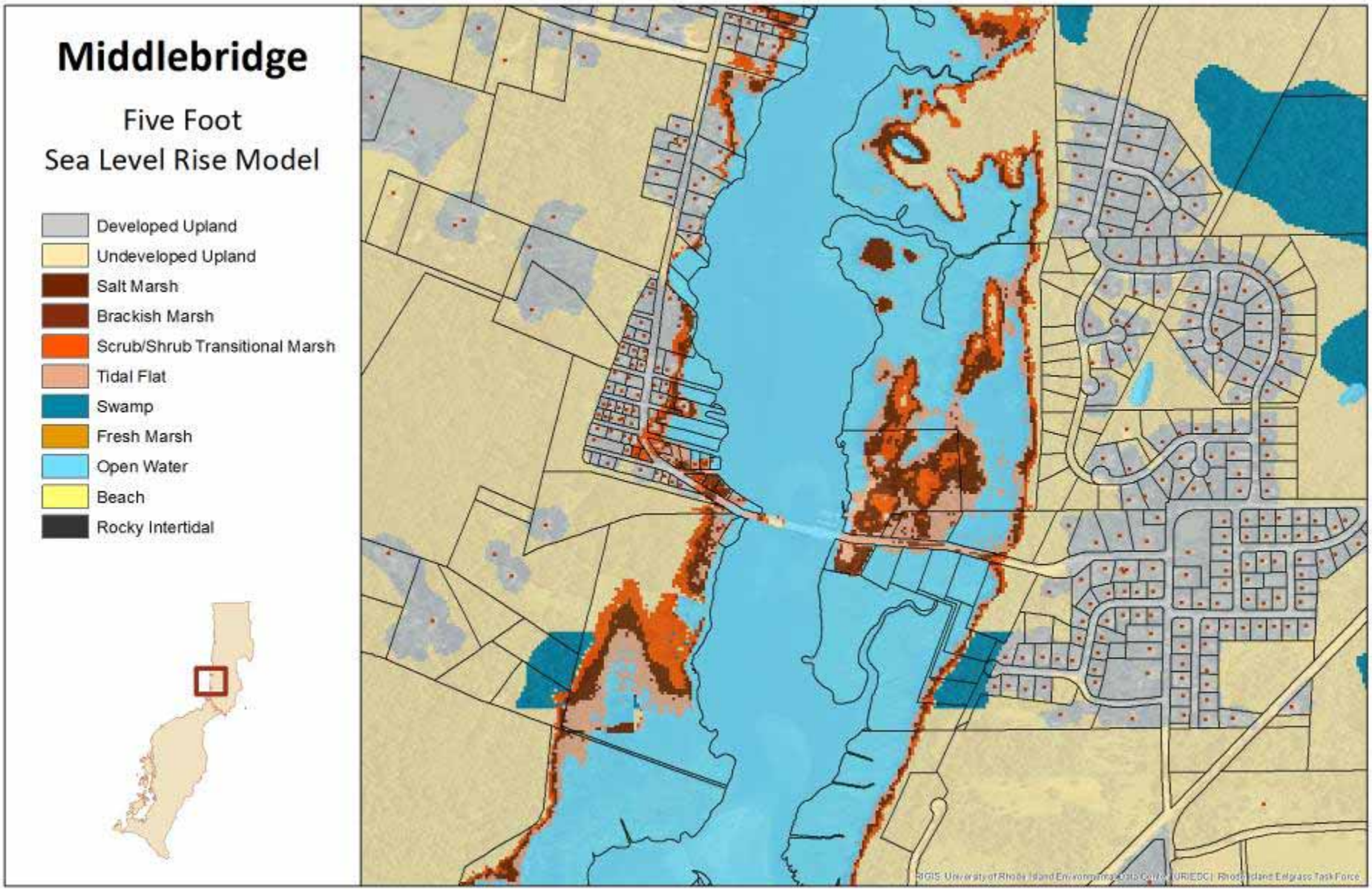
Model Results – 1’ SLR



Model Results – 3’ SLR



Model Results – 5’ SLR



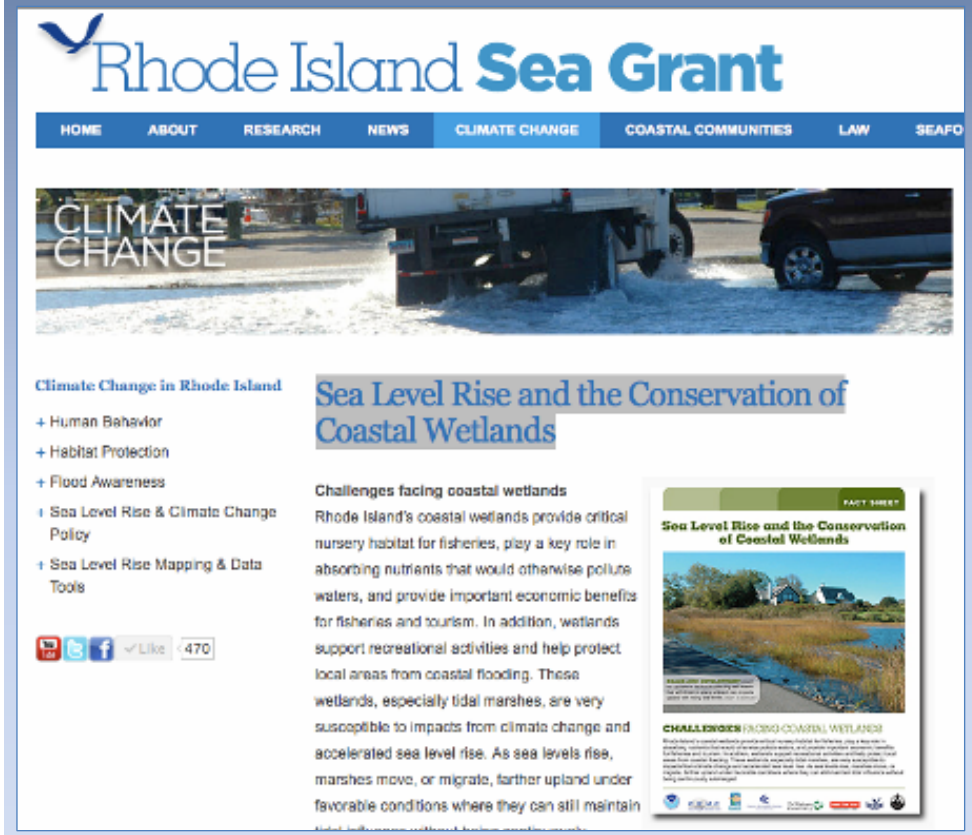
SLAMM Project Goals

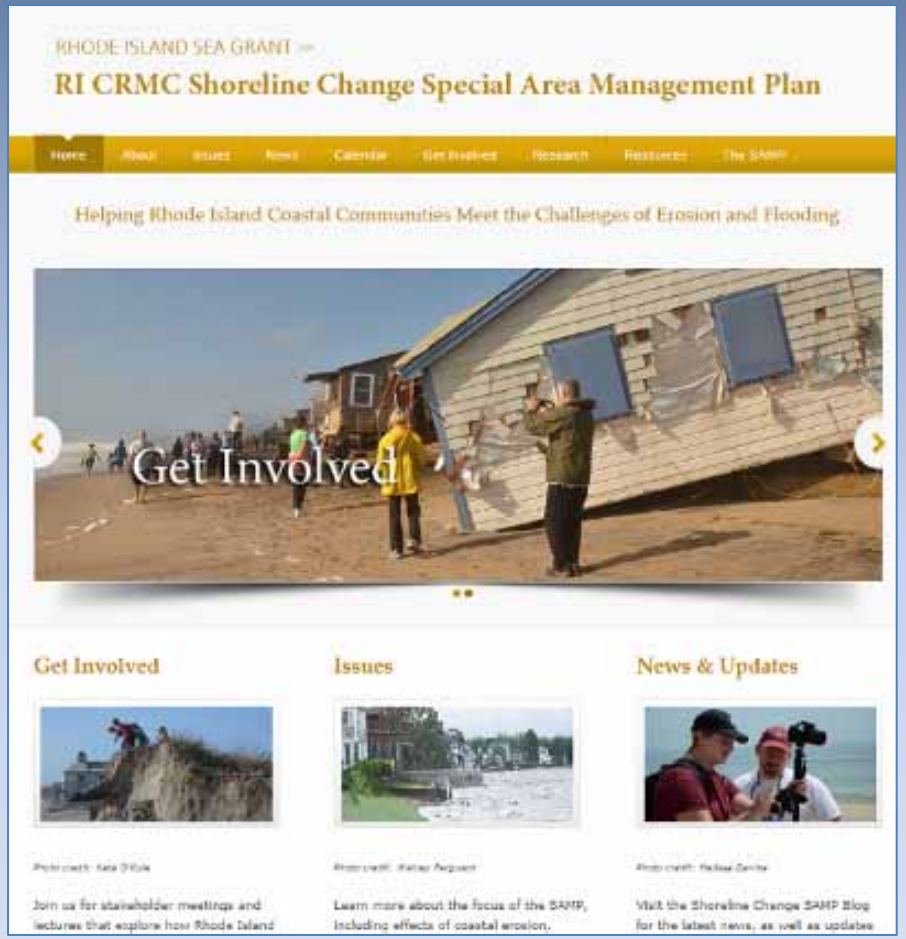
1. Develop marsh migration modeling results
2. Identify existing vulnerable wetlands
3. Identify impacted upland parcels – opportunities and challenges
4. Develop new CRMC coastal program adaptive strategies, policies and standards
5. Increase local capacity to proactively incorporate sea level rise 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…

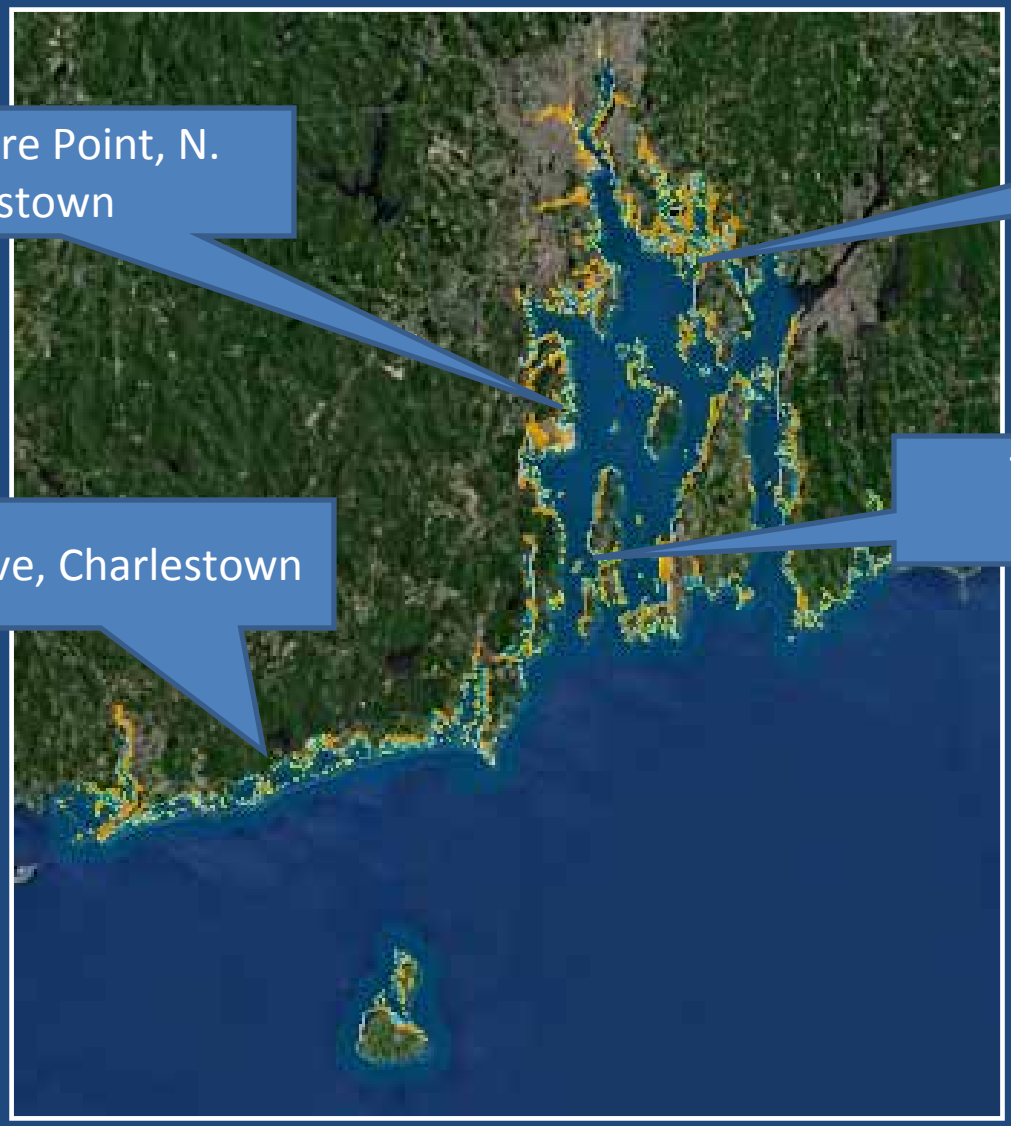




http://seagrant.gso.uri.edu/climate/habitat.html

www.beachsamp.org

CRMC · Coastal Resources Center · The Nature Conservancy · SAVE THE BAY. NARRAGANSETT BAY · Sea Grant Rhode Island · THE UNIVERSITY OF RHODE ISLAND



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

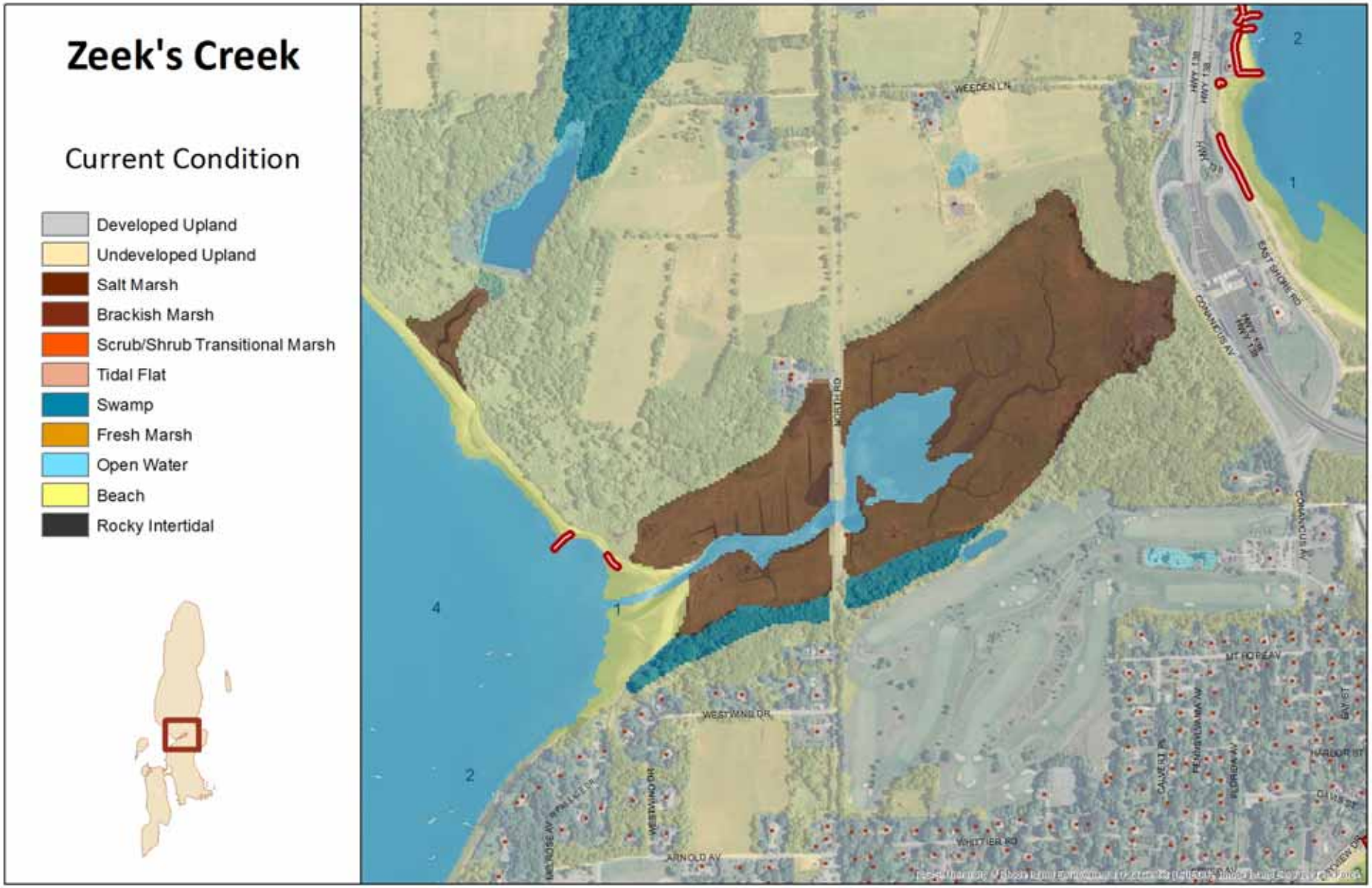
Jamestown – The Great Creek (Zeek's Creek)

High Tides Affect our Communities today –

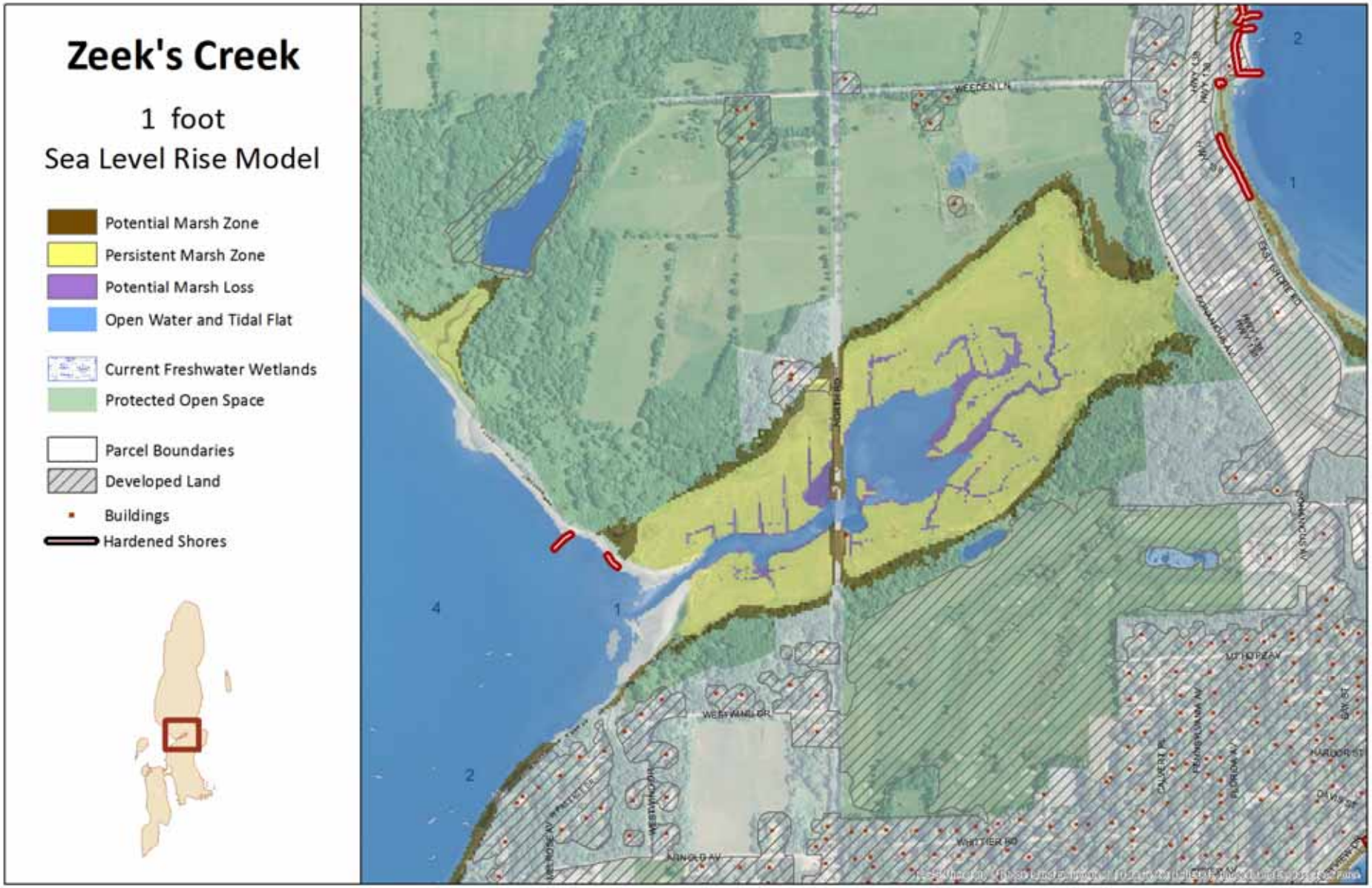
10/29/11 G. Martin

6/3/12 R. Calabro

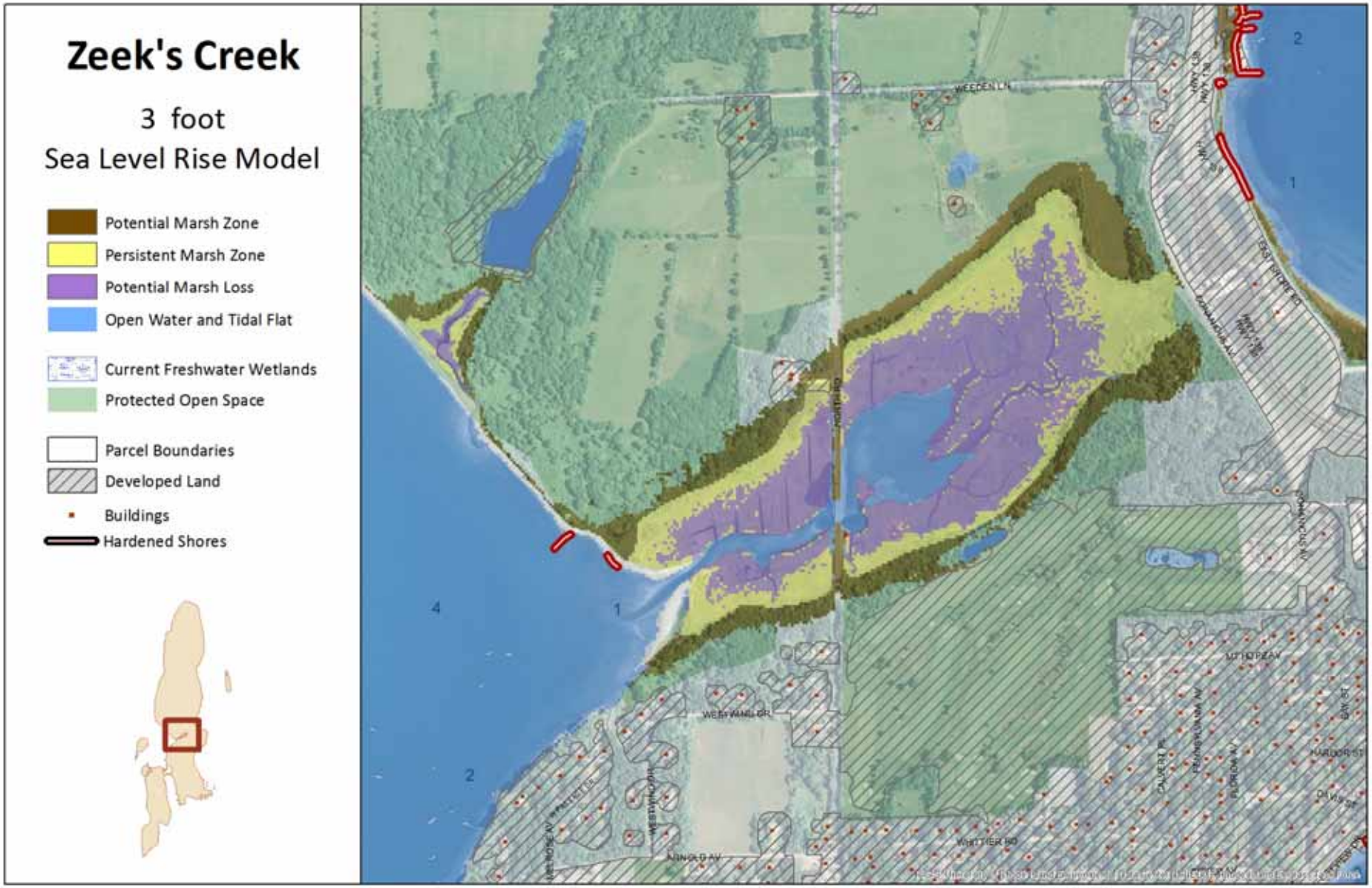
Modeling – Current Conditions



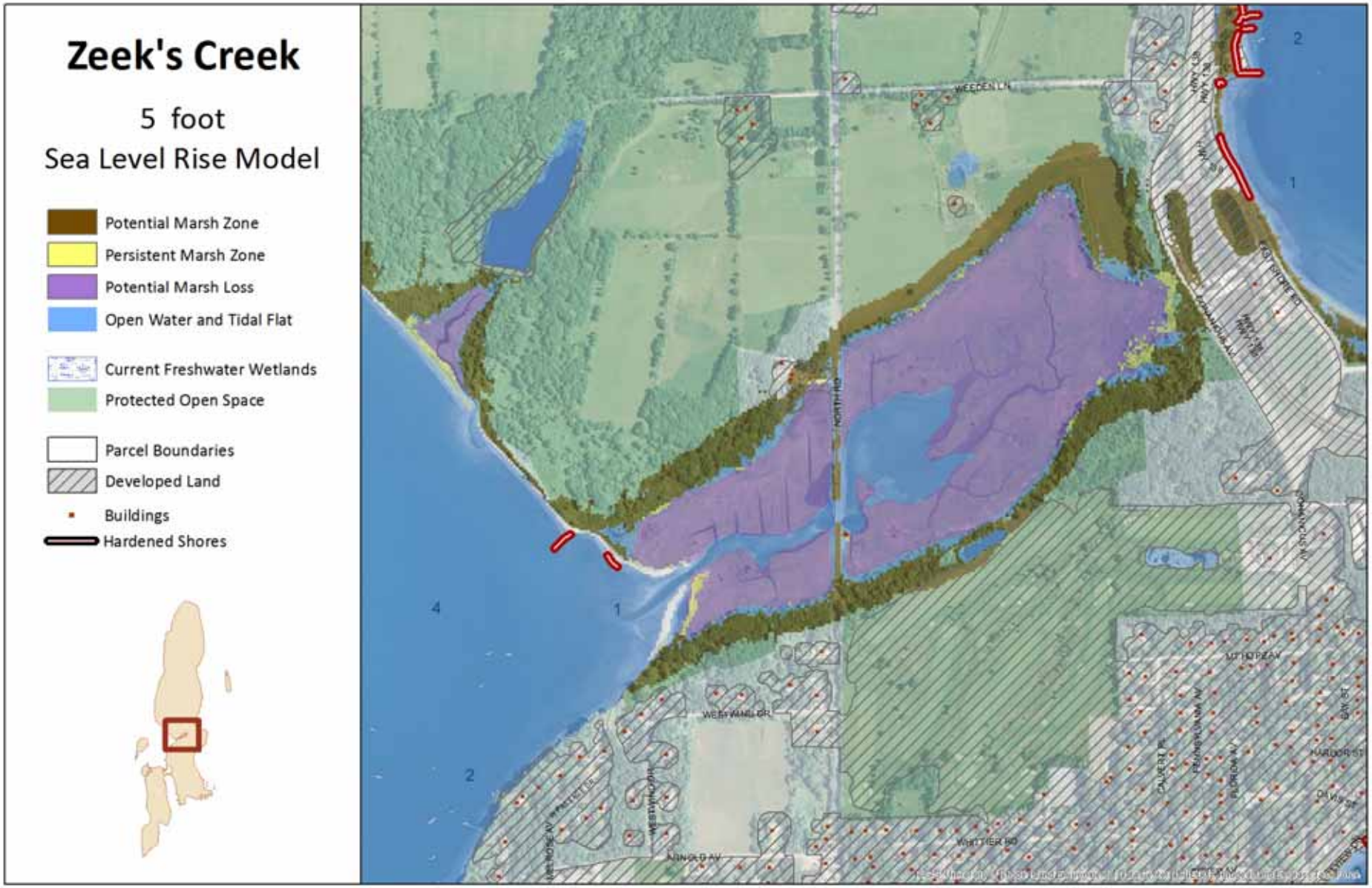
Model Results – 1’ SLR



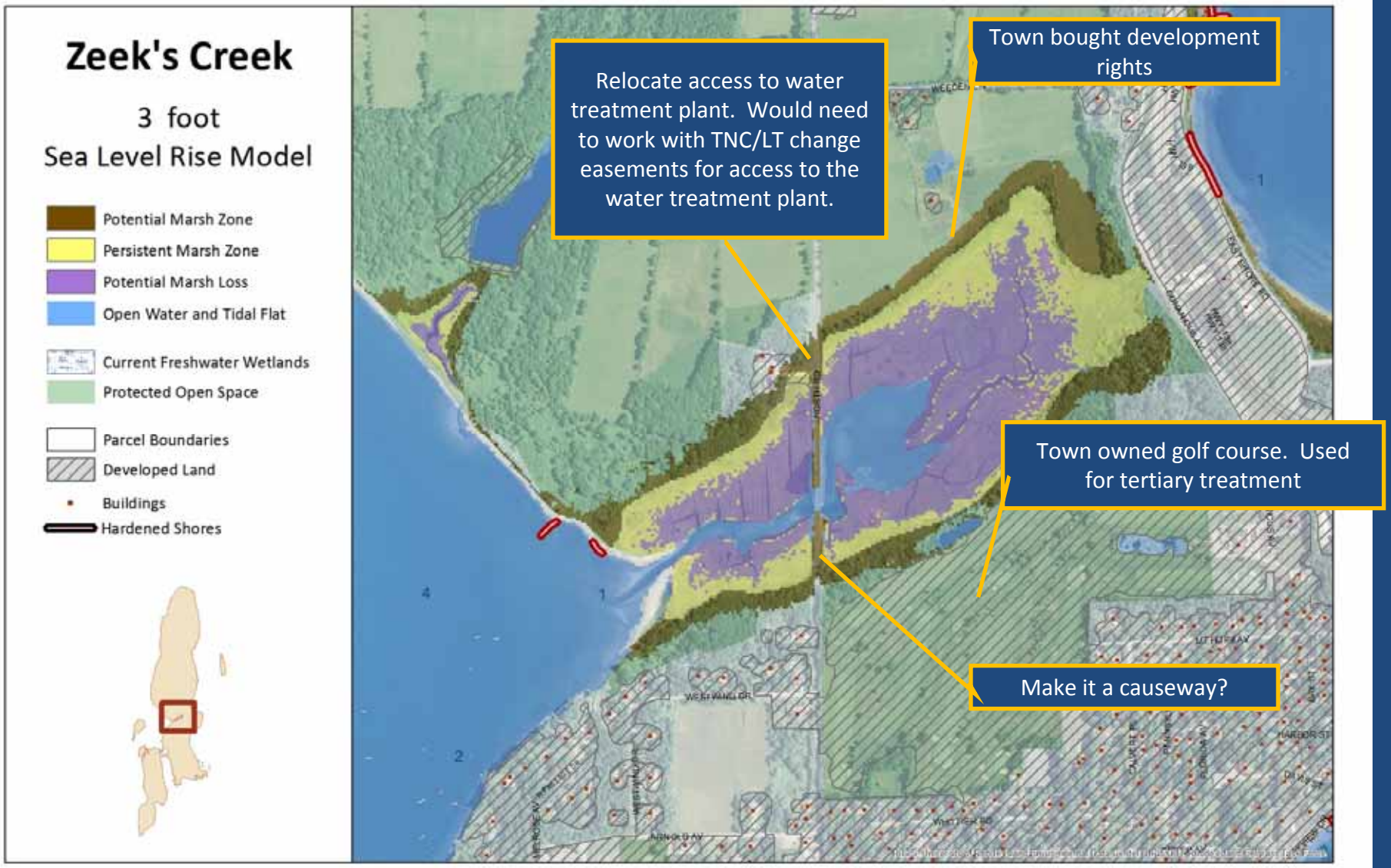
Model Results – 3’ SLR



Model Results – 5’ SLR



Jamestown

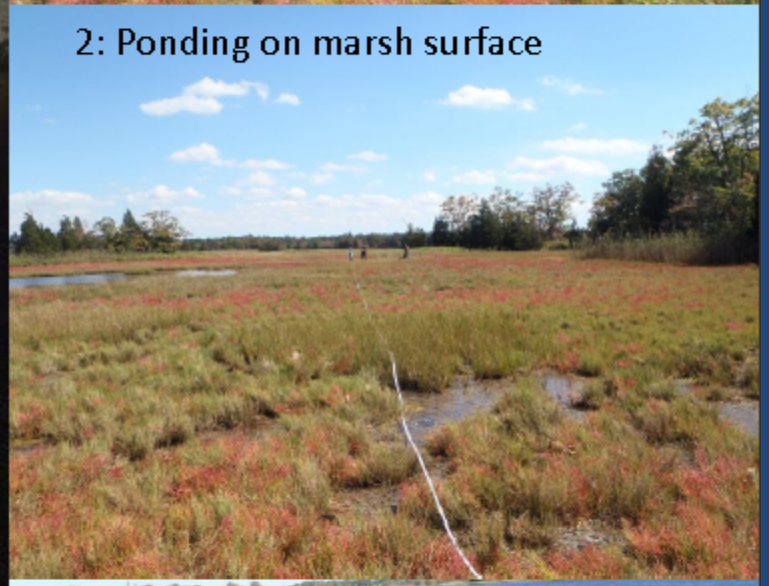

Zeek's Creek
3 foot
Sea Level Rise Model
Potential Marsh Zone
Persistent Marsh Zone
Potential Marsh Loss
Open Water and Tidal Flat
Current Freshwater Wetlands
Protected Open Space
Parcel Boundaries
Developed Land
Buildings
Hardened Shores
Relocate access to water treatment plant. Would need to work with TNC/LT change easements for access to the water treatment plant.
Town bought development rights
Town owned golf course. Used for tertiary treatment
Make it a causeway?

Barrington – Palmer River

Salt marsh assessment on western Palmer River marsh

1: Pickleweed sign of vegetation change

2: Ponding on marsh surface

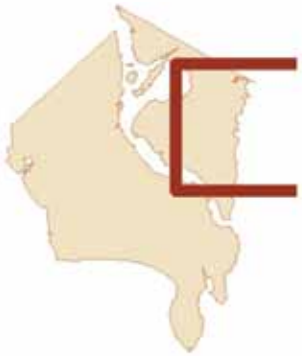


3: Leading edge of marsh erosion

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
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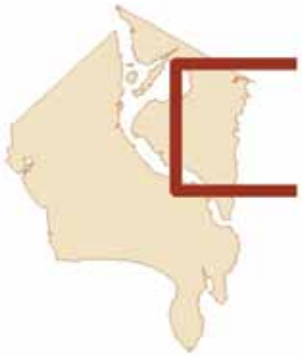
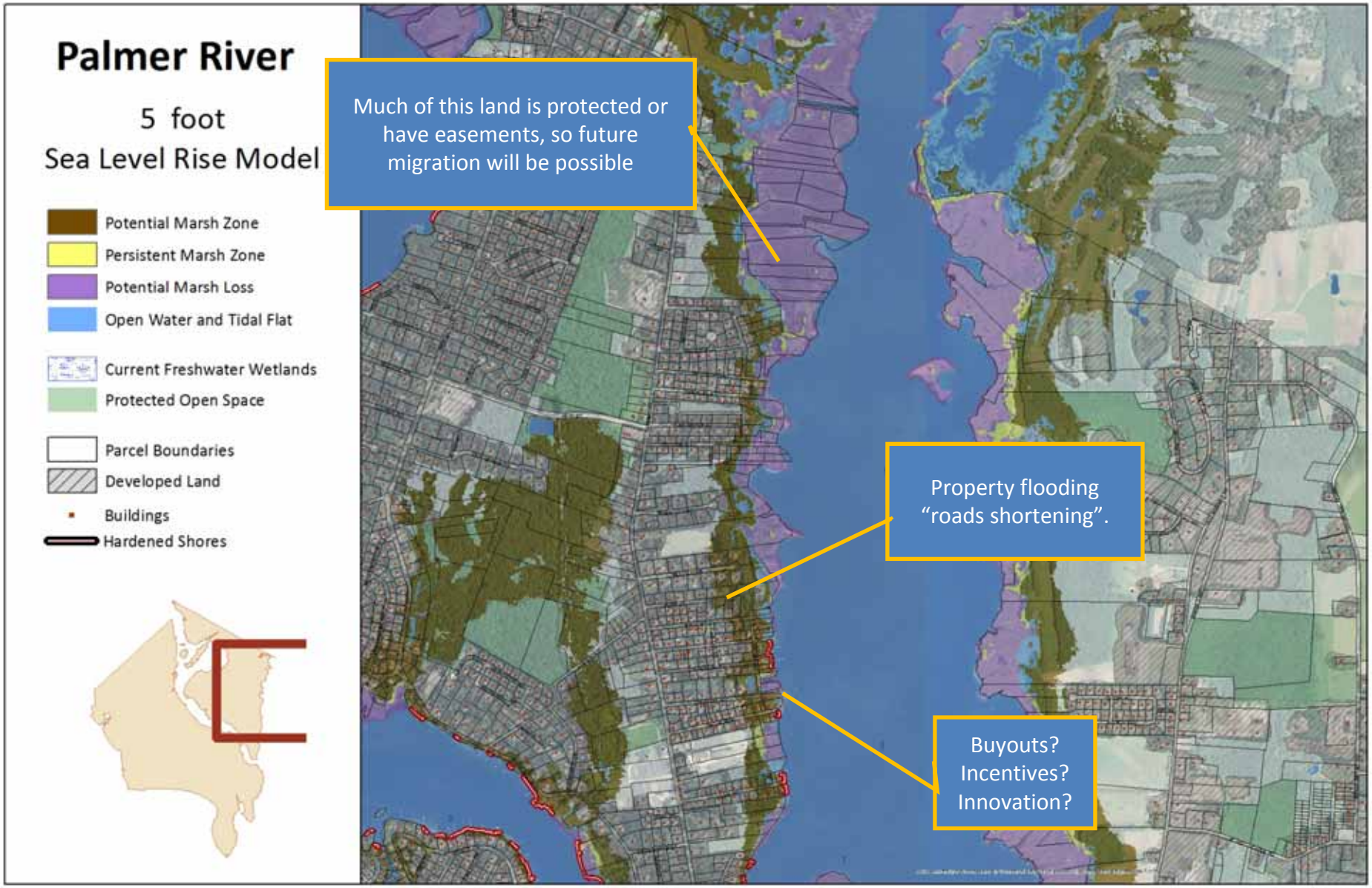
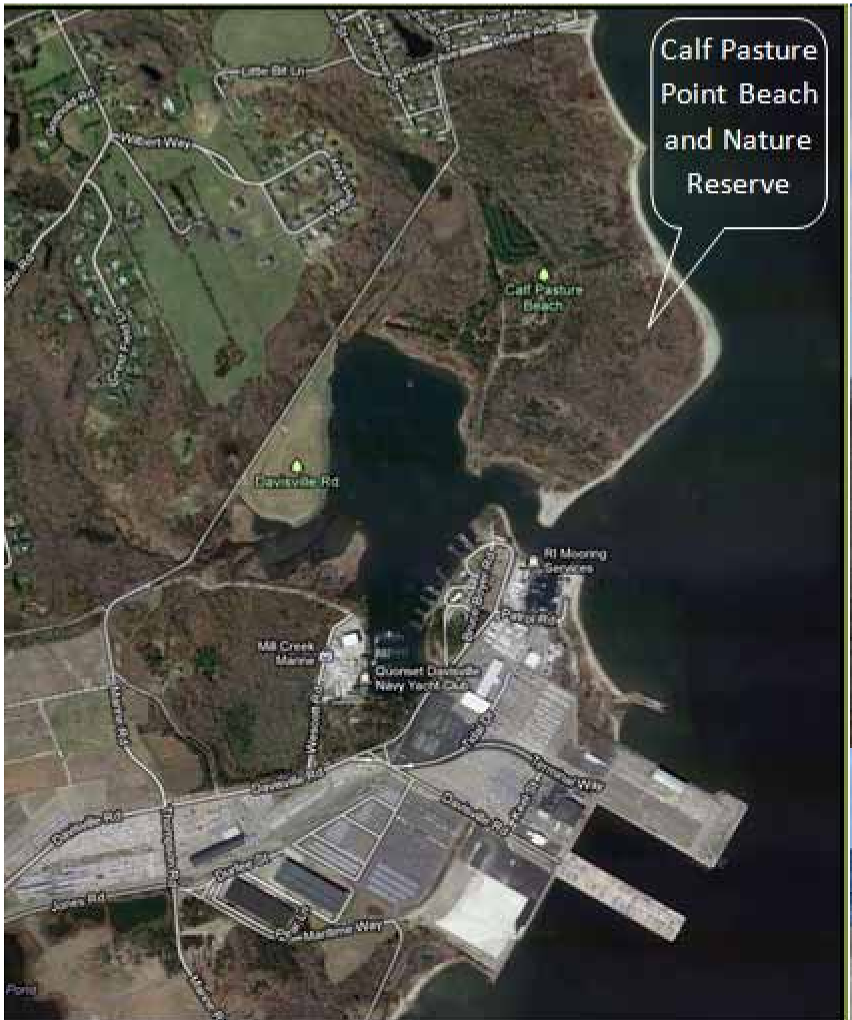
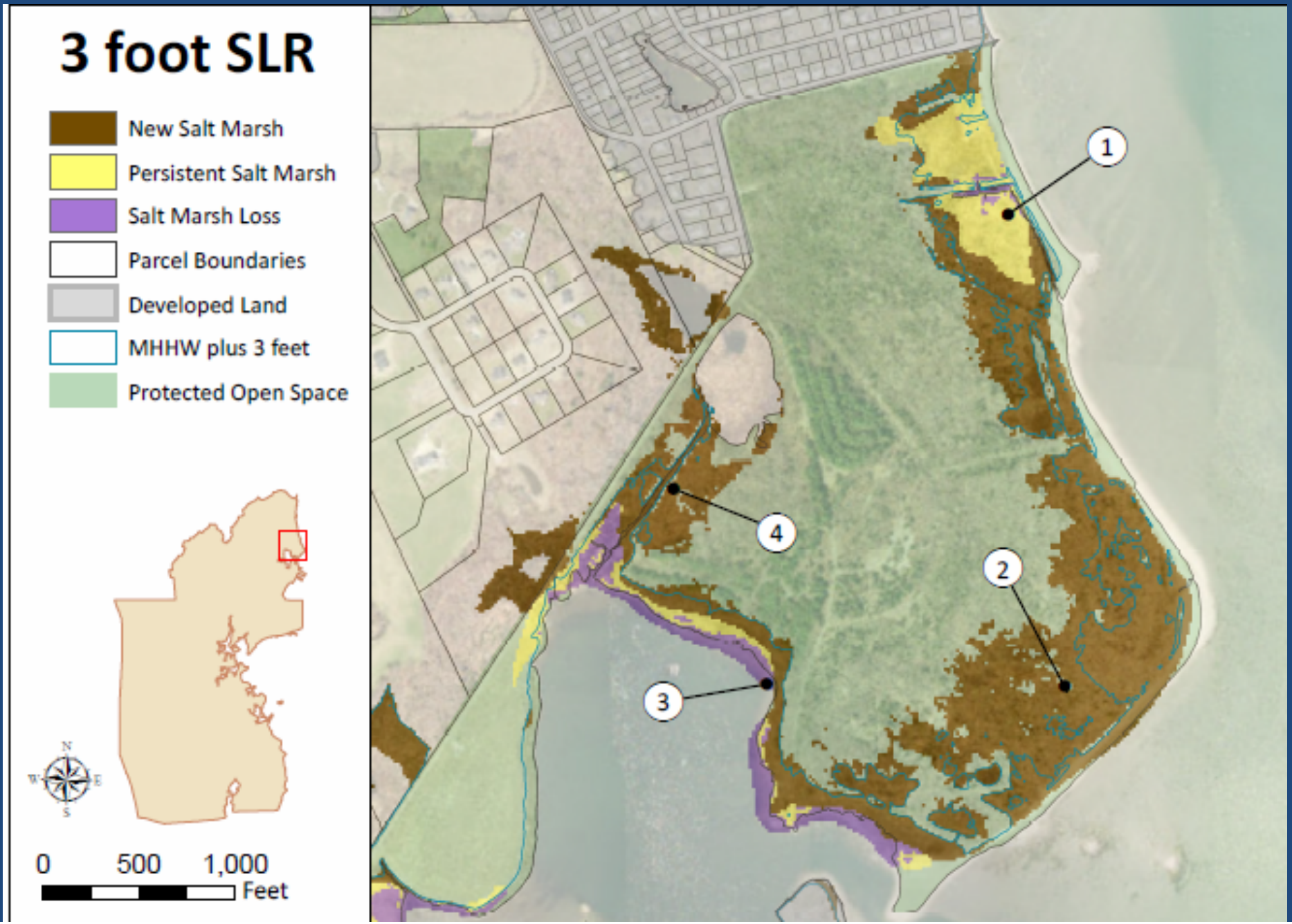



Palmer River
5 foot
Sea Level Rise Model
Potential Marsh Zone
Persistent Marsh Zone
Potential Marsh Loss
Open Water and Tidal Flat
Current Freshwater Wetlands
Protected Open Space
Parcel Boundaries
Developed Land
Buildings
Hardened Shores
Much of this land is protected or have easements, so future migration will be possible
Property flooding "roads shortening".
Buyouts?
Incentives?
Innovation?

North Kingstown – Calf Pasture Point


Calf Pasture Point Beach and Nature Reserve
Calf Pasture Beach
Davisville Rd
RI Mooring Services
Mill Creek Marine
Quonset Davisville Navy Yacht Club

SLAMM – Calf Pasture Point

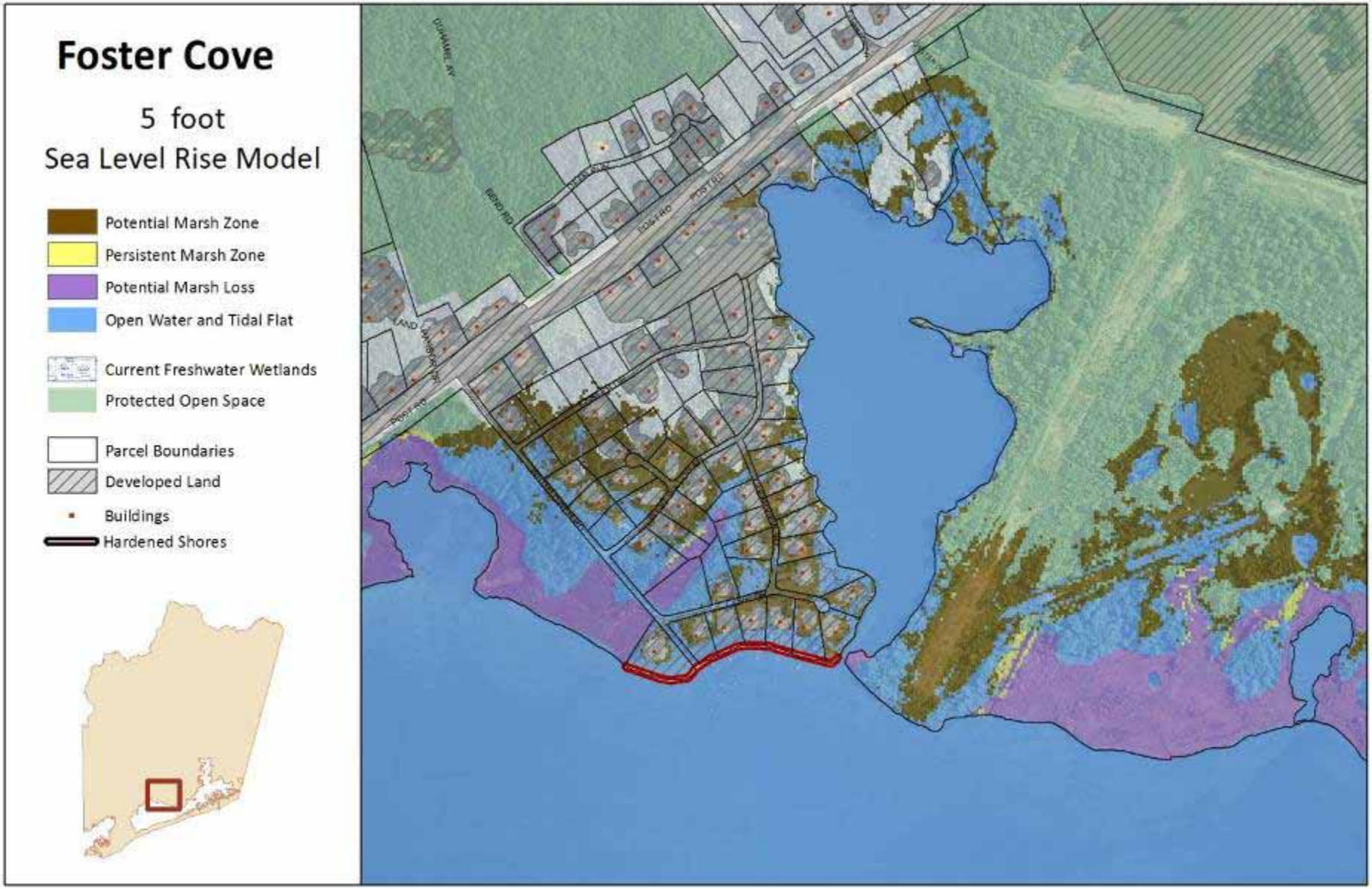


Charlestown – Foster Cove

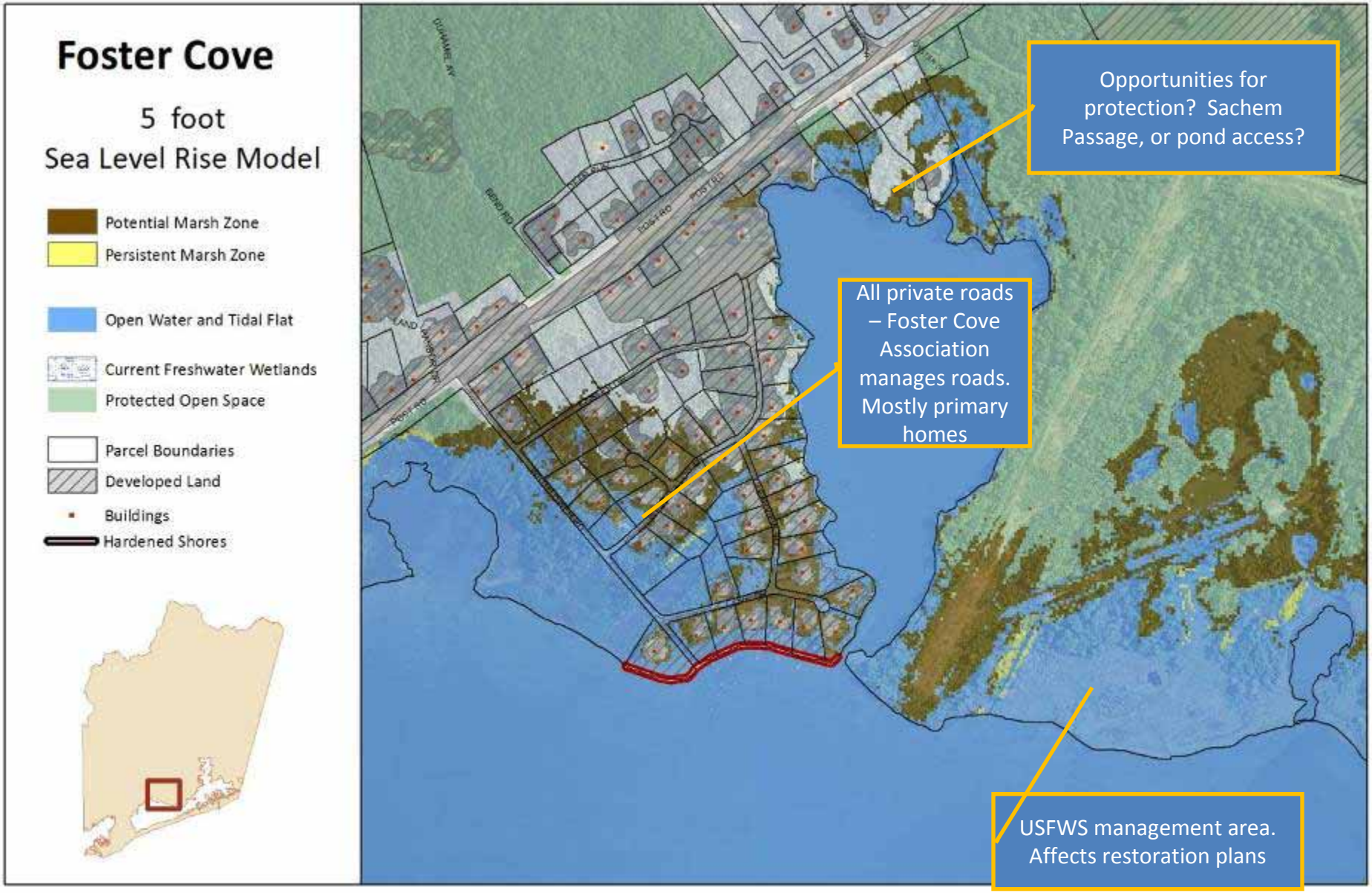
Model Results – 1’ SLR

Model Results – 3’ SLR

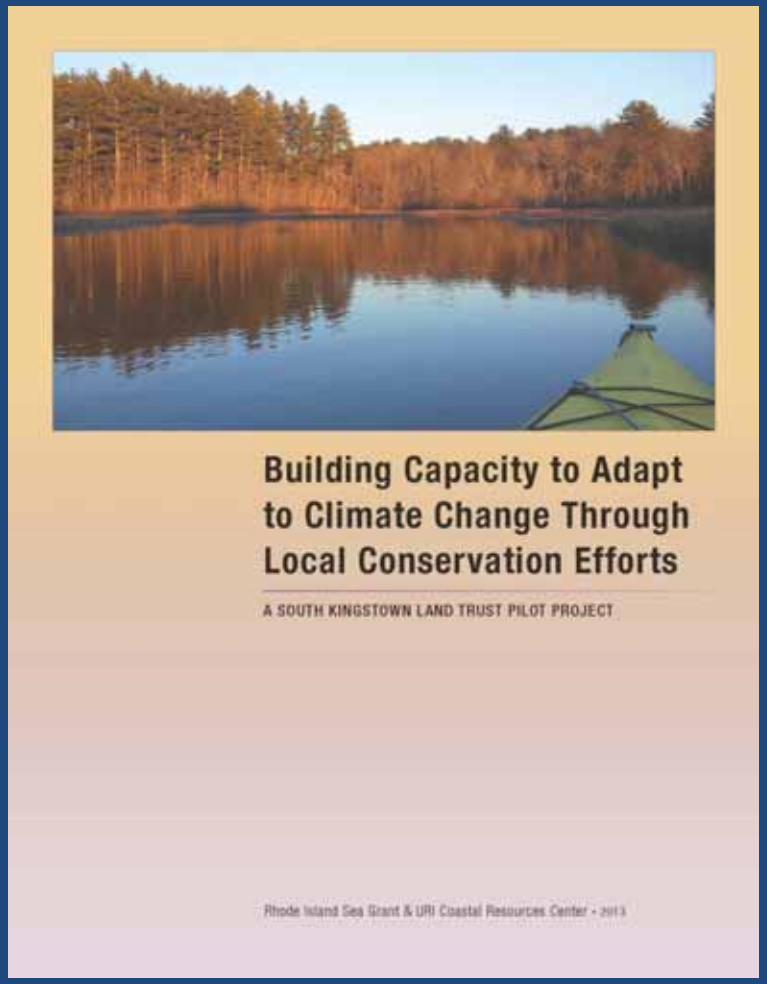
Model Results – 5’ SLR



Model shows potential future at 5’ SLR



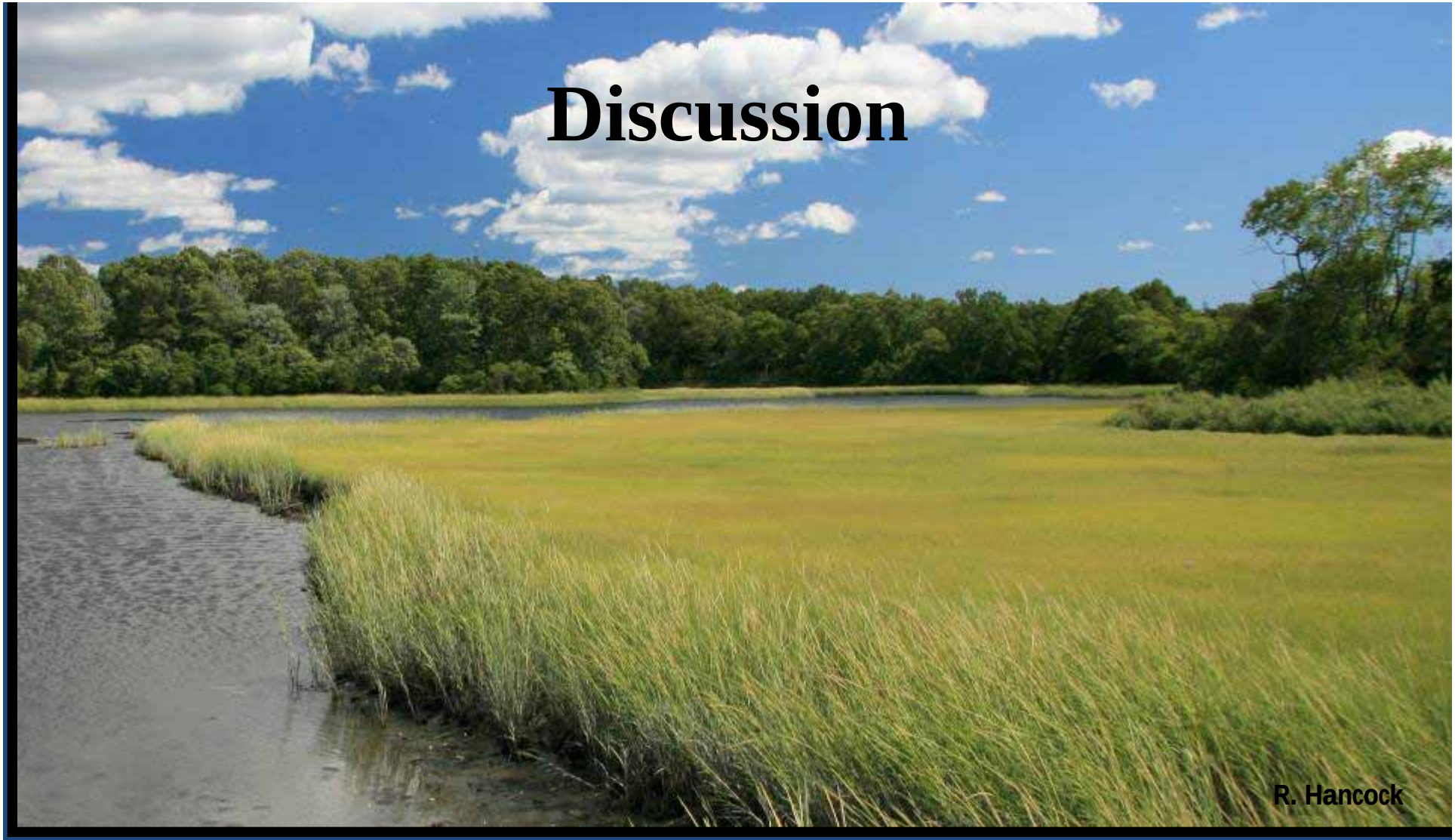
Recent Releases



WWW.RIClimateChange.org

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

Discussion



R. Hancock