

# **Coastal Hazards: Today and Tomorrow**

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RI Coastal Resources Management Council  
Coastal Education Series  
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# Shoreline Change

## Natural hazards

- ▶ Tropical storms-hurricanes
- ▶ Extra-tropical storms-nor'easters

## Some Effects of climate change and sea level rise

- ▶ Higher sea levels and storm surge
- ▶ Increased storm intensity (when it rains it pours)
  - risks to houses, infrastructure
  - (wastewater, transportation)
  - more stormwater/flooding
  - (natural resources)

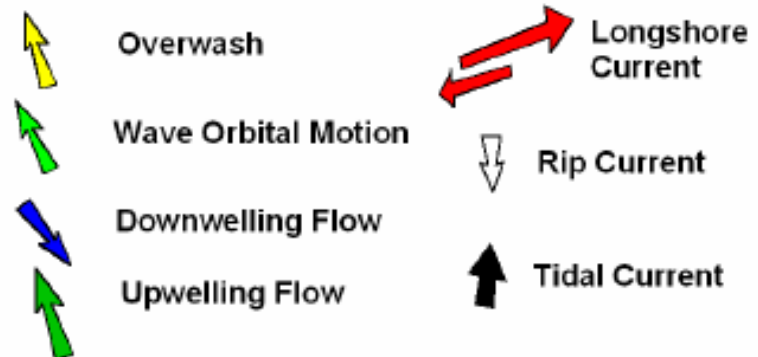
## Coastal Resources Management Program





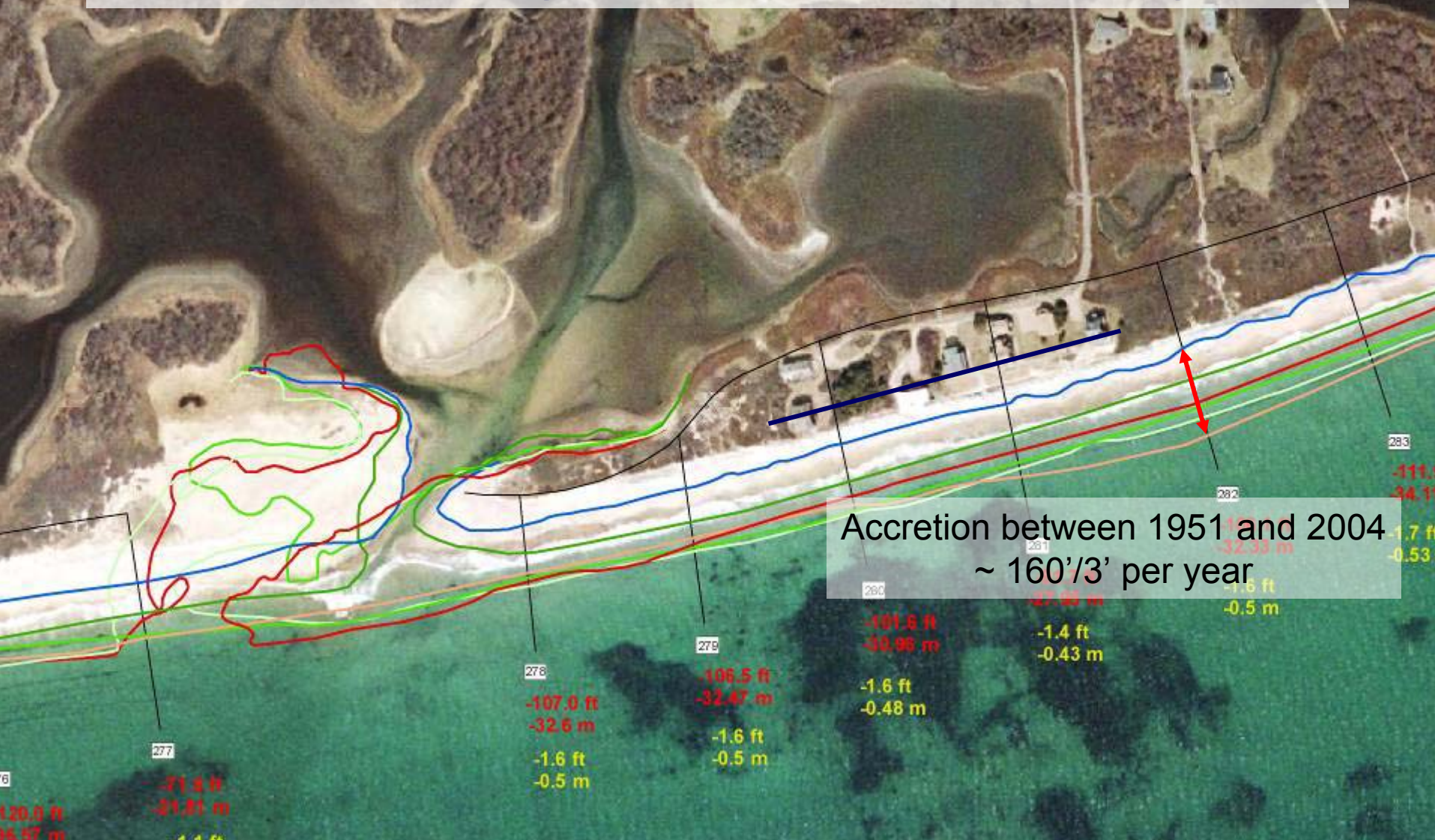
# SEDIMENT TRANSPORT PATHWAYS CHARLESTOWN-GREEN HILL BARRIER and HEADLAND

## Transporting Mechanism



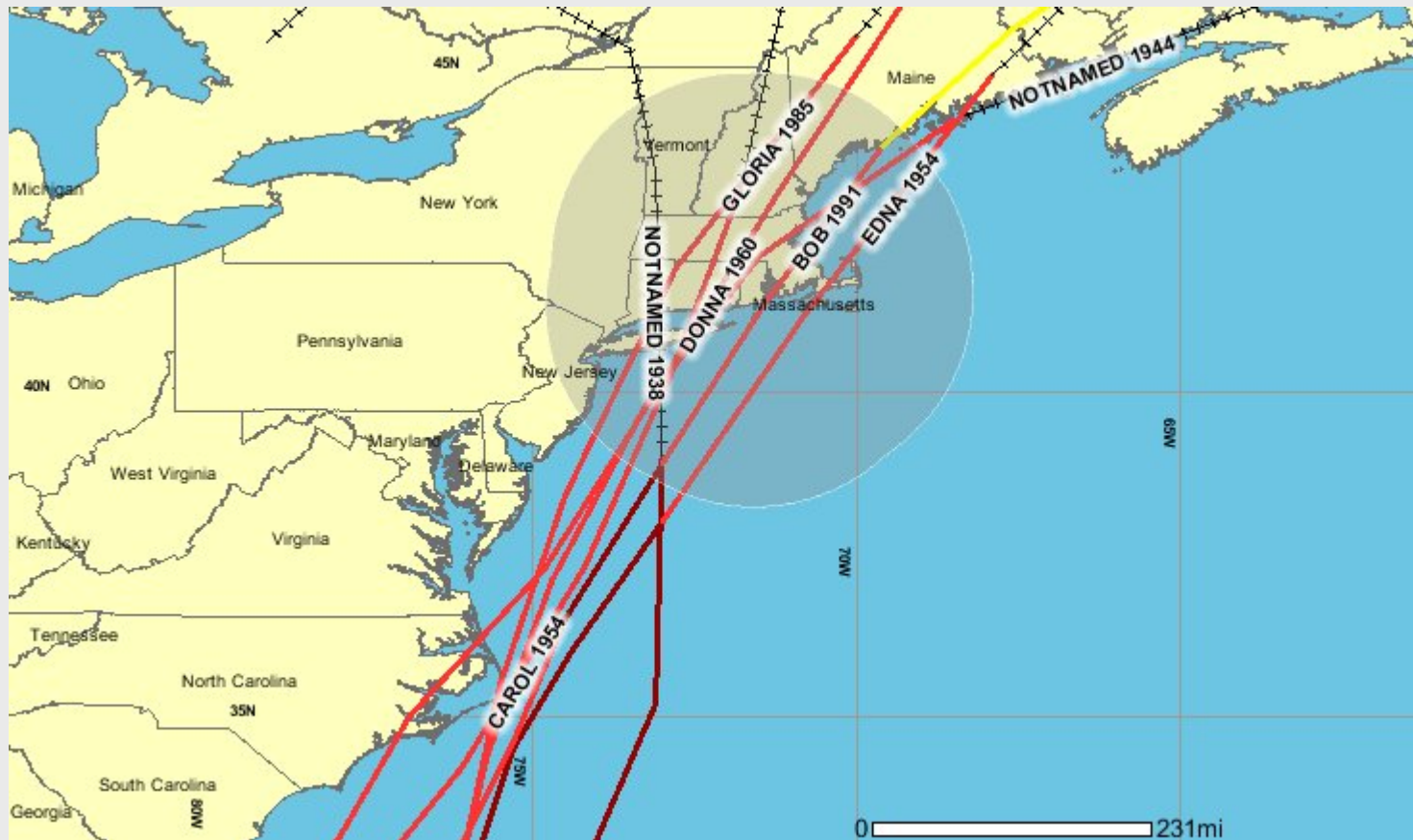


[http://www.crmc.ri.gov/maps/maps\\_shorechange.html](http://www.crmc.ri.gov/maps/maps_shorechange.html)



1939 shoreline (red) 1951 shoreline (pink) 1963 shoreline (light green)  
1975 shoreline (green) 1985 shoreline (dark green) 2004 shoreline (blue)

# Category 2-5 Historic Hurricane Tracks 1850-2007



From: <http://maps.csc.noaa.gov/hurricanes/viewer.html>



For many decades following the horrific "Great Gale of 1815," waterfront property such as the eastern side of Pleasant Street was viewed by the affluent population of the village as unfavorable for building homes. For this reason many small homes used by African-American/Native American people were built here. These folks served as domestics, teamsters, laborers, and fishermen in the community.



**History of the State of Rhode Island with Illustrations** Albert J. Wright, Printer, No. 79 Mille Street, corner of Federal, Boston. Hong, Wade & Co., Philadelphia 1878. This document made available free to the public for non-commercial purposes by the Rhode Island USGenWeb Project.  
Transcription 2004 by Beth Hurd, Images by Beth Hurd 2004 [www.rootsweb.ancestry.com/.../article271.html](http://www.rootsweb.ancestry.com/.../article271.html)



New Slideshow, Pleasant Street – North Kingstown Free Library

NINIGRET  
POND

# EAST BEACH BARRIER

September 1938 Hurricane  
3 Days After

Washover  
Fan

Surge Channel

Chimney

Swash Bar

Road

Seawall

886G-118)9-24-38-35021500

QUONOC HONTAUG R





From: New England Hurricane, Written and Compiled by Members of the Federal Writers Project of the Works Progress Administration, 1938



An aerial photograph showing a long, narrow barrier island stretching from the top left towards the bottom center. The barrier is composed of several distinct, rounded sections separated by small inlets. To the left of the barrier is a dark, open area representing the ocean. To the right is a large, calm body of water. The barrier itself appears to be a mix of sand and low-lying vegetation.

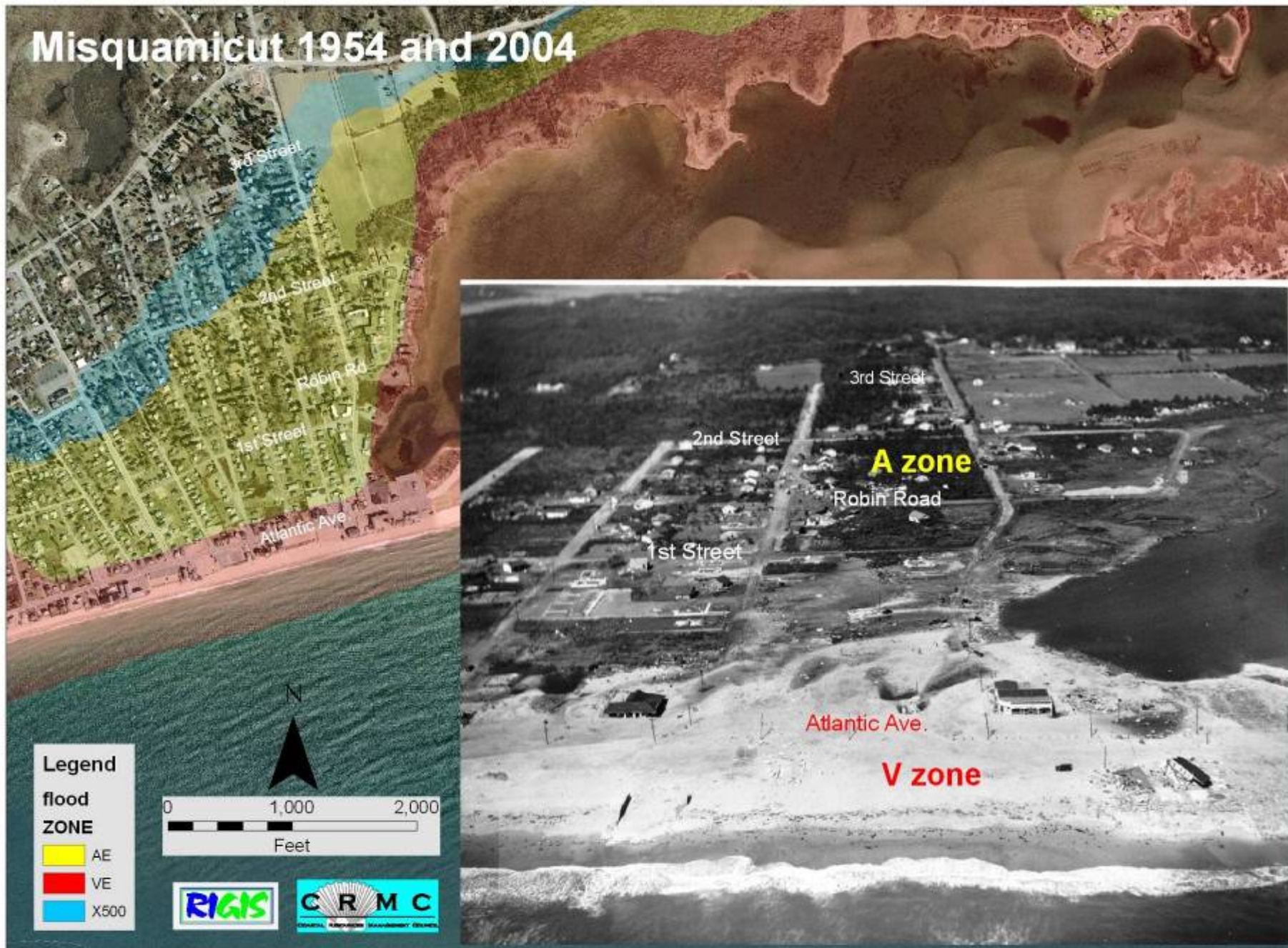
Quonochontaug Headland

Ninigret Pond

Block Island Sound

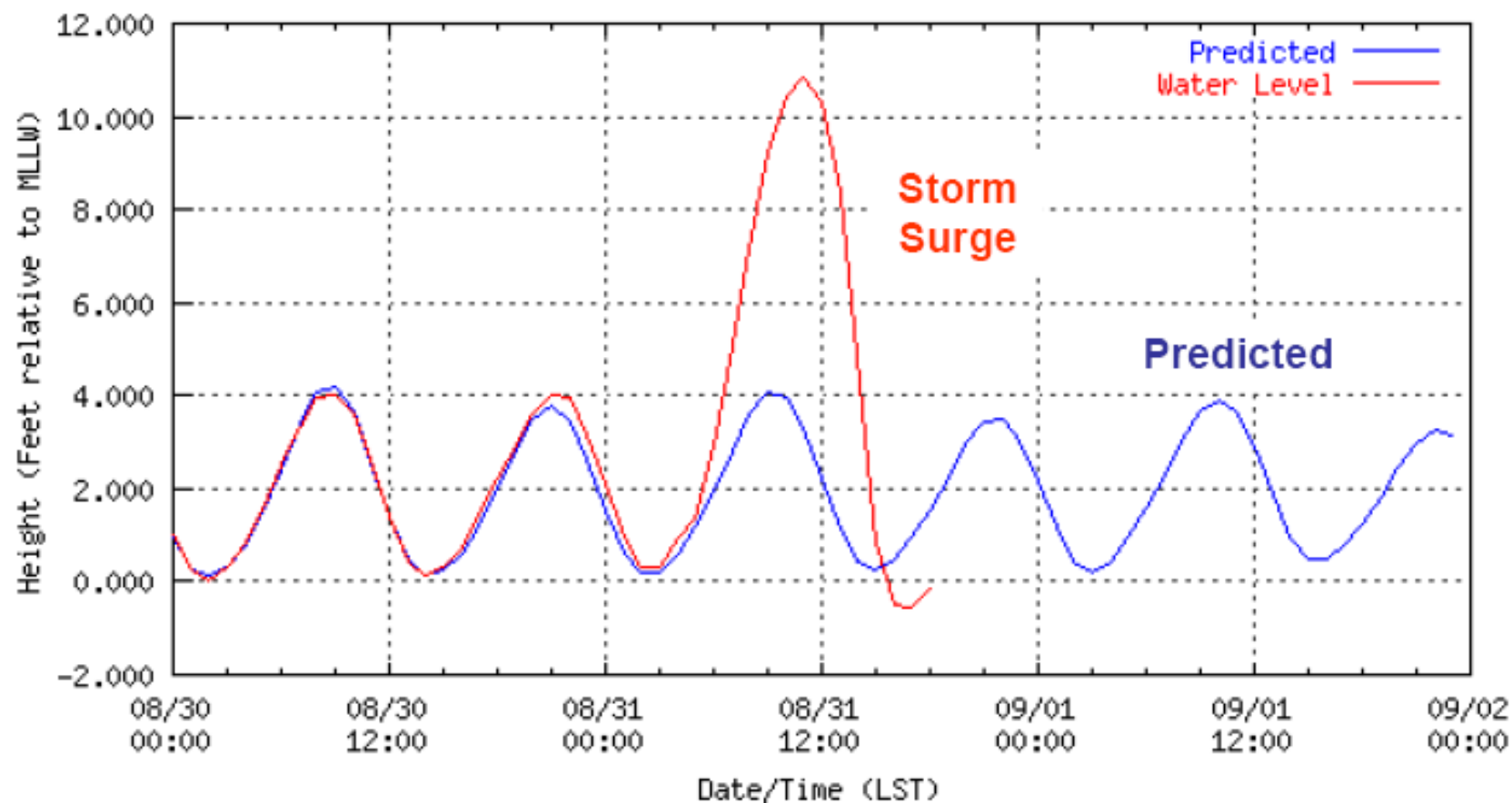
**East Beach Barrier  
after Hurricane Carol in 1954**

# Misquamicut 1954 and 2004





NOAA/NOS/CO-OPS  
Verified Hourly Height Water Level Plot  
8452660 NEWPORT, NARRAGANSETT BAY , RI  
from 08/30/1954 - 09/01/1954



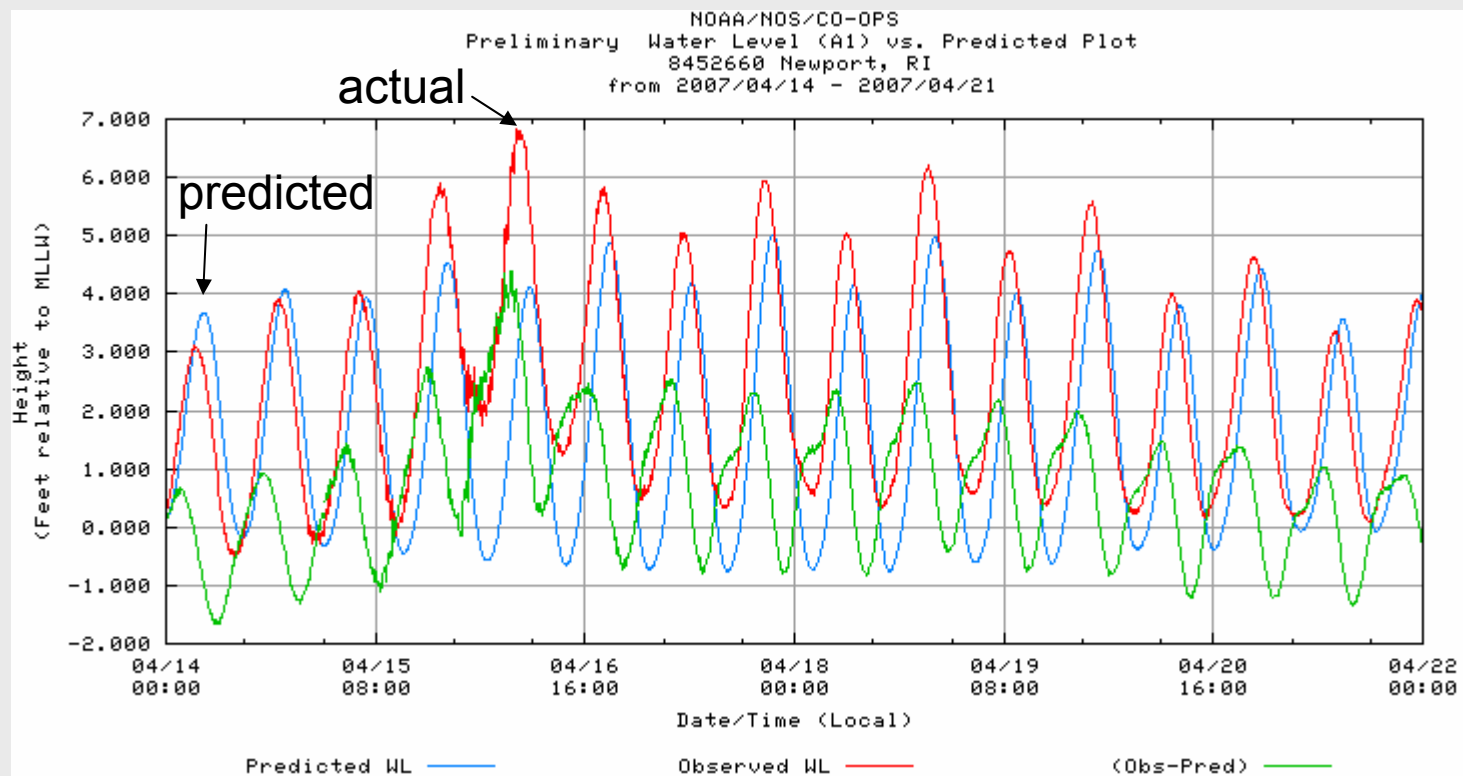
# Nor'easters (Extra Tropical Cyclones)

Strong low pressure system that affects the Mid-Atlantic and New England states.

Heavy snow, rain, and tremendous storm surge and waves

Wind gusts associated with these storms can exceed hurricane force in intensity.





# Coastal Erosion





# Browning Three Cottages – Patriots Day 2007



RE Hehre







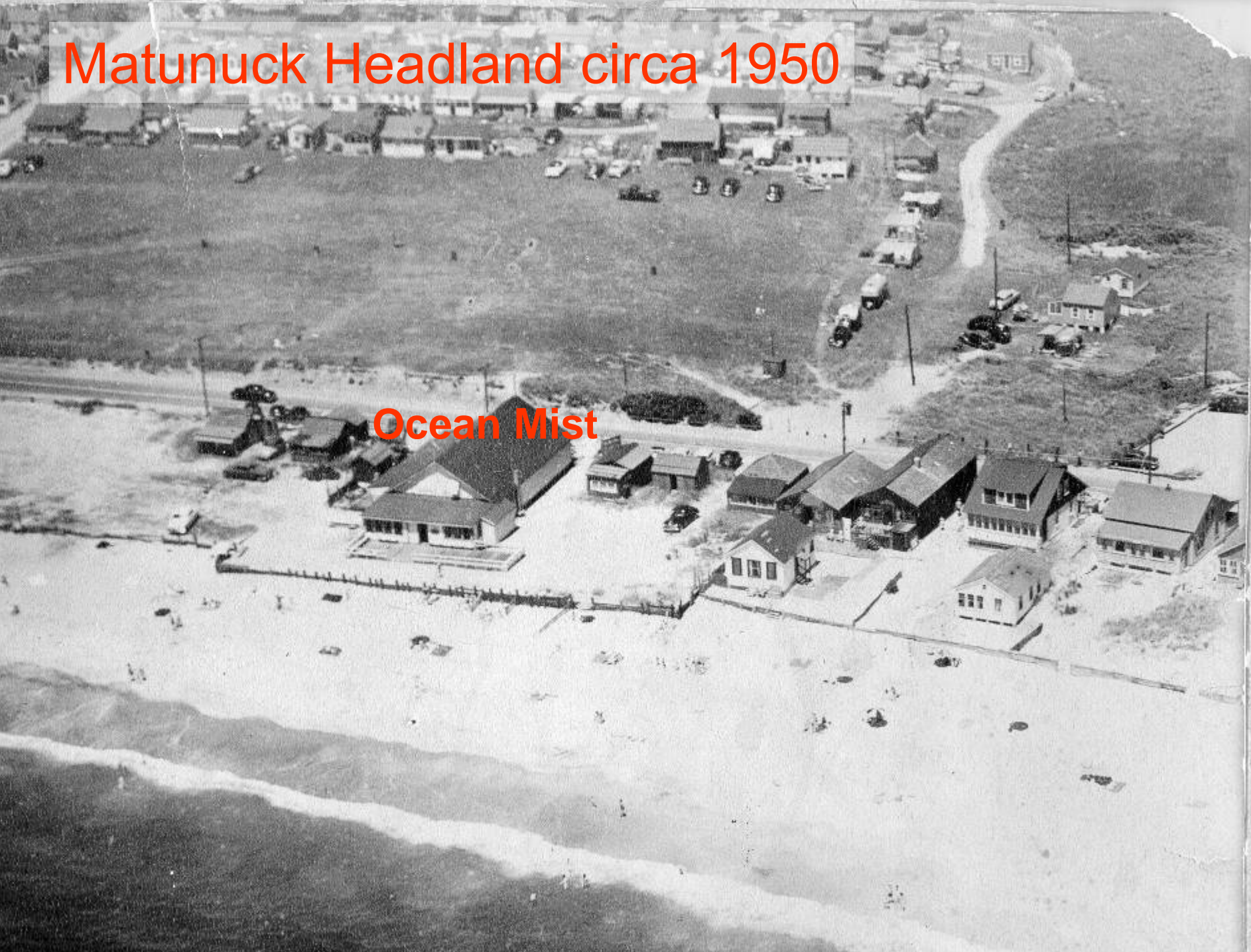






Matunuck Headland circa 1950

Ocean Mist









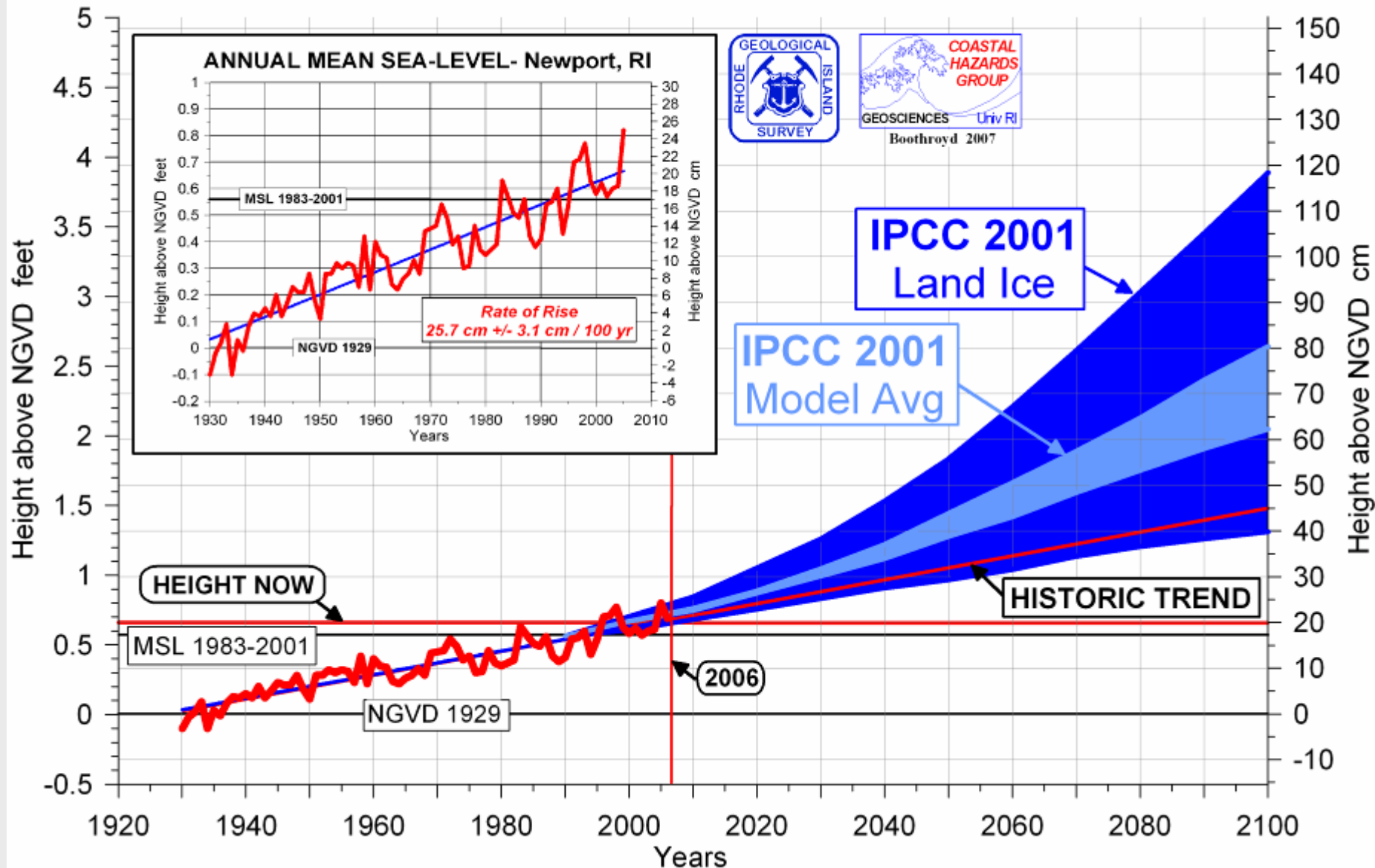


OWTS

Infrastructure threatened  
OWTS damage (public health concerns)

2005

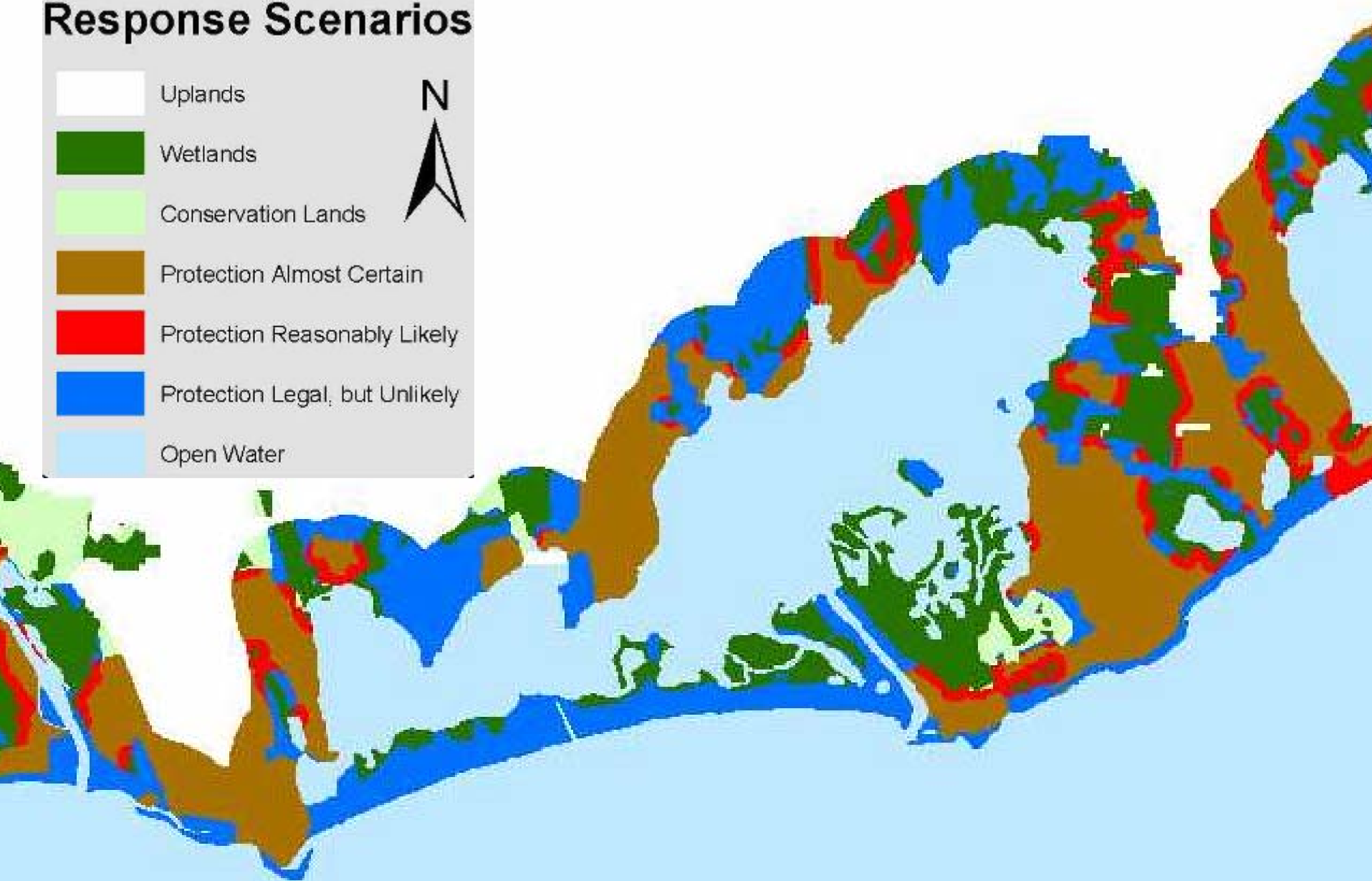
# ACCELERATED SEA-LEVEL RISE - Newport, RI



Courtesy of Jon Boothroyd



# Response Scenarios



## Inundation Scenario



Lands susceptible to **3 feet** of sea level rise - Quonochontaug Pond, Charlestown, RI.

Vinhateiro, 2008



## Inundation Scenario



Lands susceptible to **5 feet** of sea level rise - Quonochontaug Pond, Charlestown, RI.

Vinhateiro, 2008



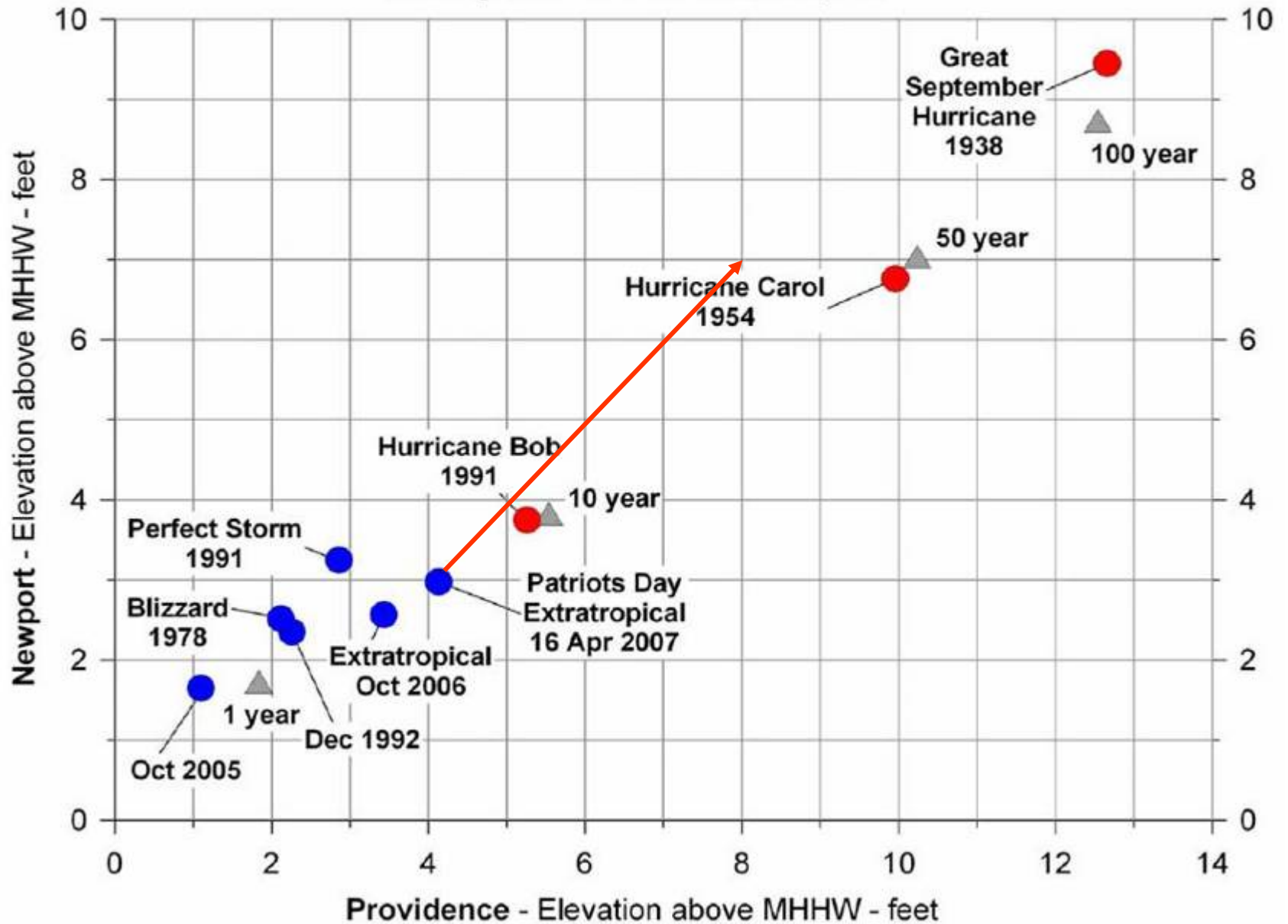


Patriot's Day Nor'easter  
April 2007  
Tides 3 feet above  
normal



# STORM-SURGE ELEVATION

## Newport - Providence, RI



# CRMC Policy

- Barrier policy (undeveloped, moderately developed, developed)
- Setbacks based on historic erosion rates
- Buffer zones
- Beneficial reuse of dredged material
- Low Impact Development in Metro Bay SAMP
- Habitat Preservation and Restoration
- Living Shorelines
- Sea Level Rise



# CRMC Undeveloped Barriers



• Westerly	240 acres
• Charlestown	415 acres
• South Kingstown	122 acres
• North Kingstown	42 acres
• Warwick	42 acres
• Barrington	87 acres
• Portsmouth	230 acres
• Tiverton	161 acres
• Little Compton	133 acres
• New Shoreham	225 acres
Total	1698 acres



# Setbacks





1939

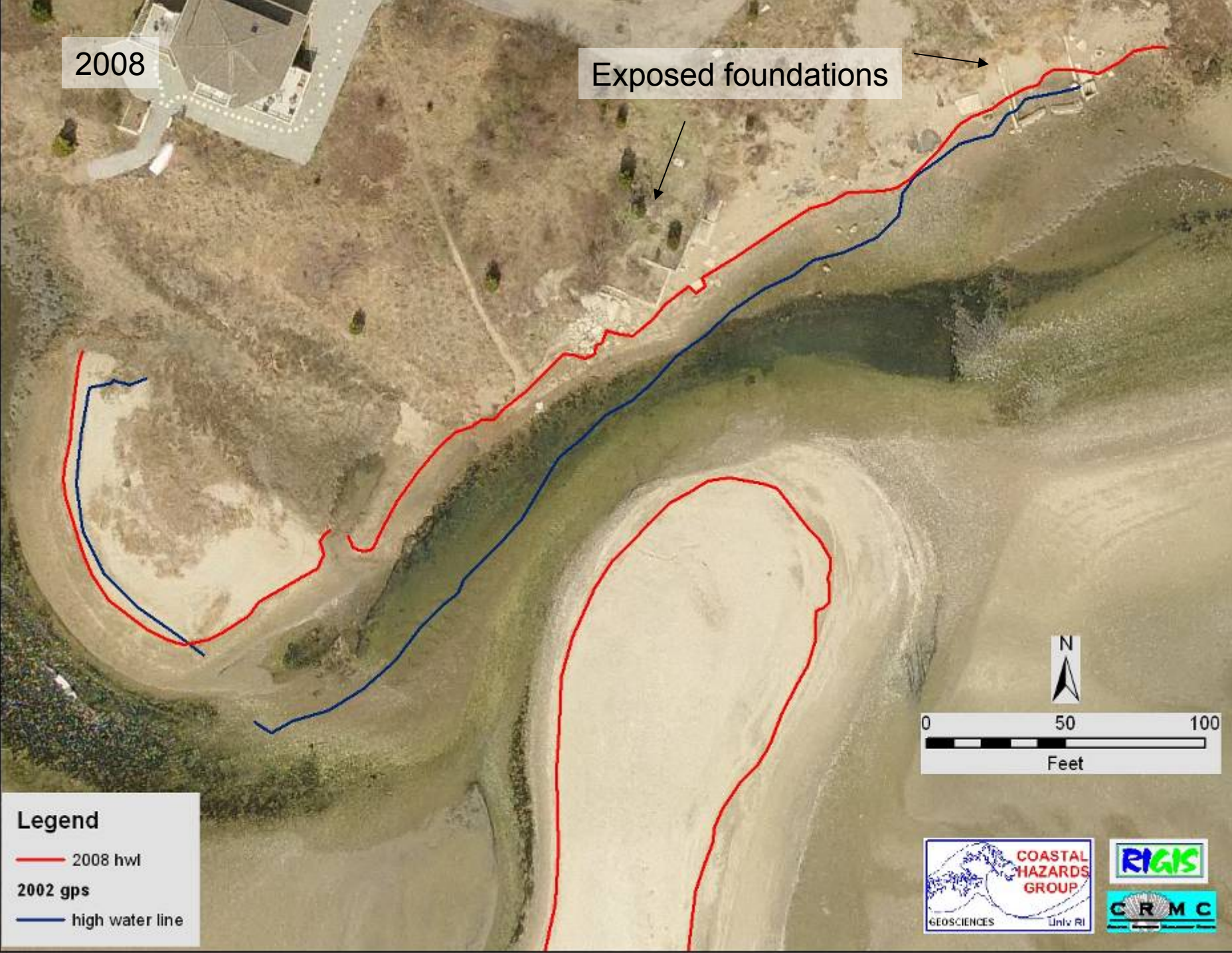
Some houses remain after hurricane storm surge  
Many foundations only





2008

Exposed foundations




### Legend

- 2008 hwl
- 2002 gps
- high water line





# Benefits of buffer zones

- 
- Slows water down
  - Enhance sediment filtration
  - Increase infiltration of surface water into the soil and groundwater
  - Expose contaminants to extended periods of biological, physical and chemical removal mechanisms



# Beneficial reuse of sediment



sediment disposal/beach replenishment

0 200 400 600 800  
Feet

Legend  
RIGIS Shorelines\_ft  
DATE  
1951  
1928





# Habitat Restoration





# Create and Implement a Comprehensive Living Shorelines Program

- Assess effectiveness of living shorelines as alternative to conventional structural shoreline protection techniques
- Develop criteria to determine suitable locations for implementation (existing hardened shorelines, bathymetry, erosion rates, habitat type, critical resources of concern)
- Build capacity of land trusts to address climate change through habitat protection



# Sea Level Rise Regulatory Policy for the CRMP (Adopted January 2008)

## Legislative authority-coordination

CRMC

State Building Official

RIEMA

RIDEM

## Policy

Proactively plan for climate change and sea level rise

Expect a base rate of 3 to 5 feet of sea level rise by 2100

Revisit the science to assess SLR rates

## RI FACCT (CRMC, SBC, RIEMA, RISG)

develop freeboard recommendations

developing RI StormSmart website

developing fact sheets for:

Coastal A zone determination

Rebuilding after a storm

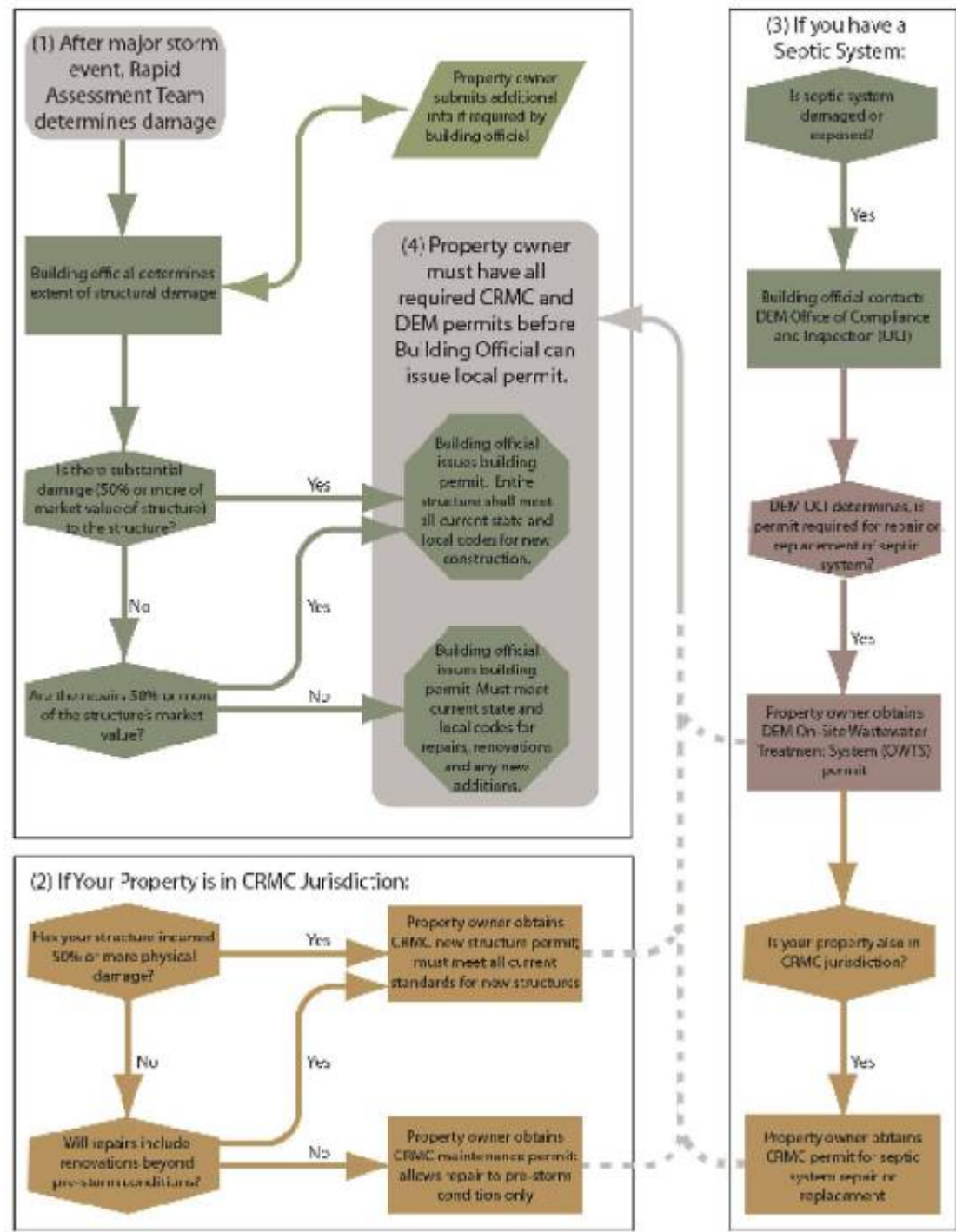
# FACCT Sheet 1: Rebuilding After a Storm

## Permitting Process Step-by-Step

Building Officials (green)

CRMC (Tan)

DEM (Brown)





# Questions?



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