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
Accretion between 1951 and 2004 ~ 160'/3' per year

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.
EAST BEACH BARRIER
September 1938 Hurricane
3 Days After

- NINIGRET POND
- Washover Fan
- Surge Channel
- Chimney
- Swash Bar
- Road
- Seawall
From: New England Hurricane, Written and Compiled by Members of the Federal Writers Project of the Works Progress Administration, 1938
Ninigret Pond

Block Island Sound

Quonochontaug Headland

East Beach Barrier after Hurricane Carol in 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
Matunuck Headland circa 1950

Ocean Mist
Infrastructure threatened
OWTS damage (public health concerns)

2005
ACCELERATED SEA-LEVEL RISE - Newport, RI

ANNUAL MEAN SEA-LEVEL - Newport, RI

Height above NGVD feet

Years


MSL 1983-2001
NGVD 1929

Rate of Rise 25.7 cm +/- 3.1 cm / 100 yr

NGVD 1929

IPCC 2001 Land Ice
IPCC 2001 Model Avg
HISTORIC TREND

MSL 1983-2001

2006

HEIGHT NOW

NGVD 1929

Years

1920 1940 1960 1980 2000 2020 2040 2060 2080 2100

Height above NGVD cm

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

Vinhateiro, 2008
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
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

<table>
<thead>
<tr>
<th>Location</th>
<th>Acres</th>
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<tbody>
<tr>
<td>Westerly</td>
<td>240 acres</td>
</tr>
<tr>
<td>Charlestown</td>
<td>415 acres</td>
</tr>
<tr>
<td>South Kingstown</td>
<td>122 acres</td>
</tr>
<tr>
<td>North Kingstown</td>
<td>42 acres</td>
</tr>
<tr>
<td>Warwick</td>
<td>42 acres</td>
</tr>
<tr>
<td>Barrington</td>
<td>87 acres</td>
</tr>
<tr>
<td>Portsmouth</td>
<td>230 acres</td>
</tr>
<tr>
<td>Tiverton</td>
<td>161 acres</td>
</tr>
<tr>
<td>Little Compton</td>
<td>133 acres</td>
</tr>
<tr>
<td>New Shoreham</td>
<td>225 acres</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1698 acres</strong></td>
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</tbody>
</table>
Setbacks
Some houses remain after hurricane storm surge
Many foundations only
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
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)