



# SPECIAL AREA MANAGEMENT PLANS AND COASTAL RESILIANC

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Executive Director

Coastal Resource Management Council

State of Rhode Island





## Powers and Duties of the CRMC

Continual planning and management of the state's coastal resources

Development of plans , policies, and regulations necessary to implement its management program

Dredge Management Coordinator for the state

Aquaculture Coordinator for the state

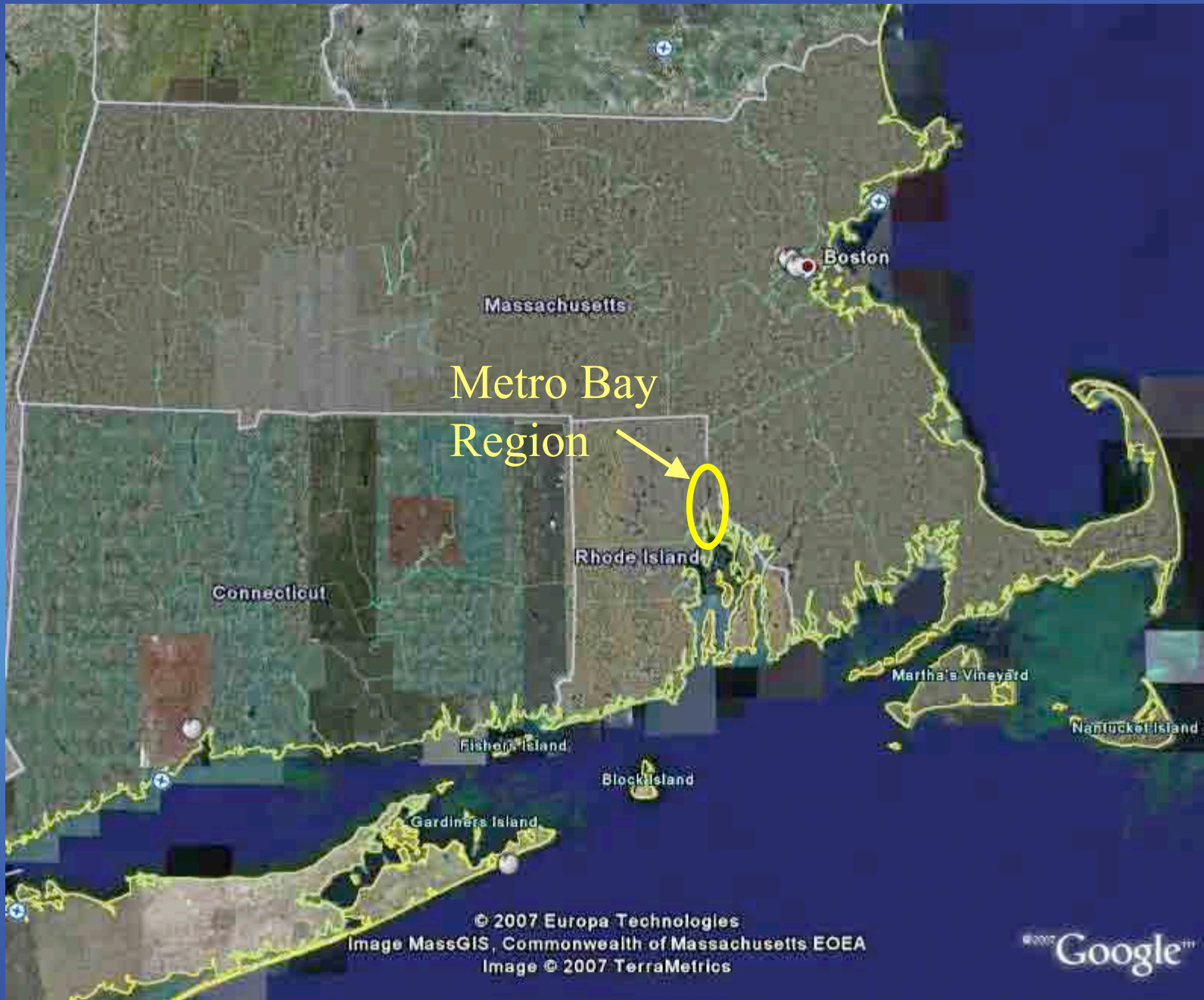
Coastal Management Coordination and Research

Normal operations- enforce CRMP, issue modify, deny, permits

Designation of state right of ways

Habitat Restoration

Biosecurity Board



Metro Bay  
Region

Boston

Massachusetts

Connecticut

Rhode Island

Martha's Vineyard

Nantucket Island

Fishers Island

Block Island

Gardiners Island

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Image MassGIS, Commonwealth of Massachusetts EOE  
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# CRMC Special Area Management Plans





# What is a SAMP?

A SAMP is a ecosystem management plan based on:

- salient issues that are tailored to the region
- synthesis of scientific knowledge
- government cooperation
- community participation
- regulations
- recommended actions.
- Federal Consistency
- Established as part of State and Federal law

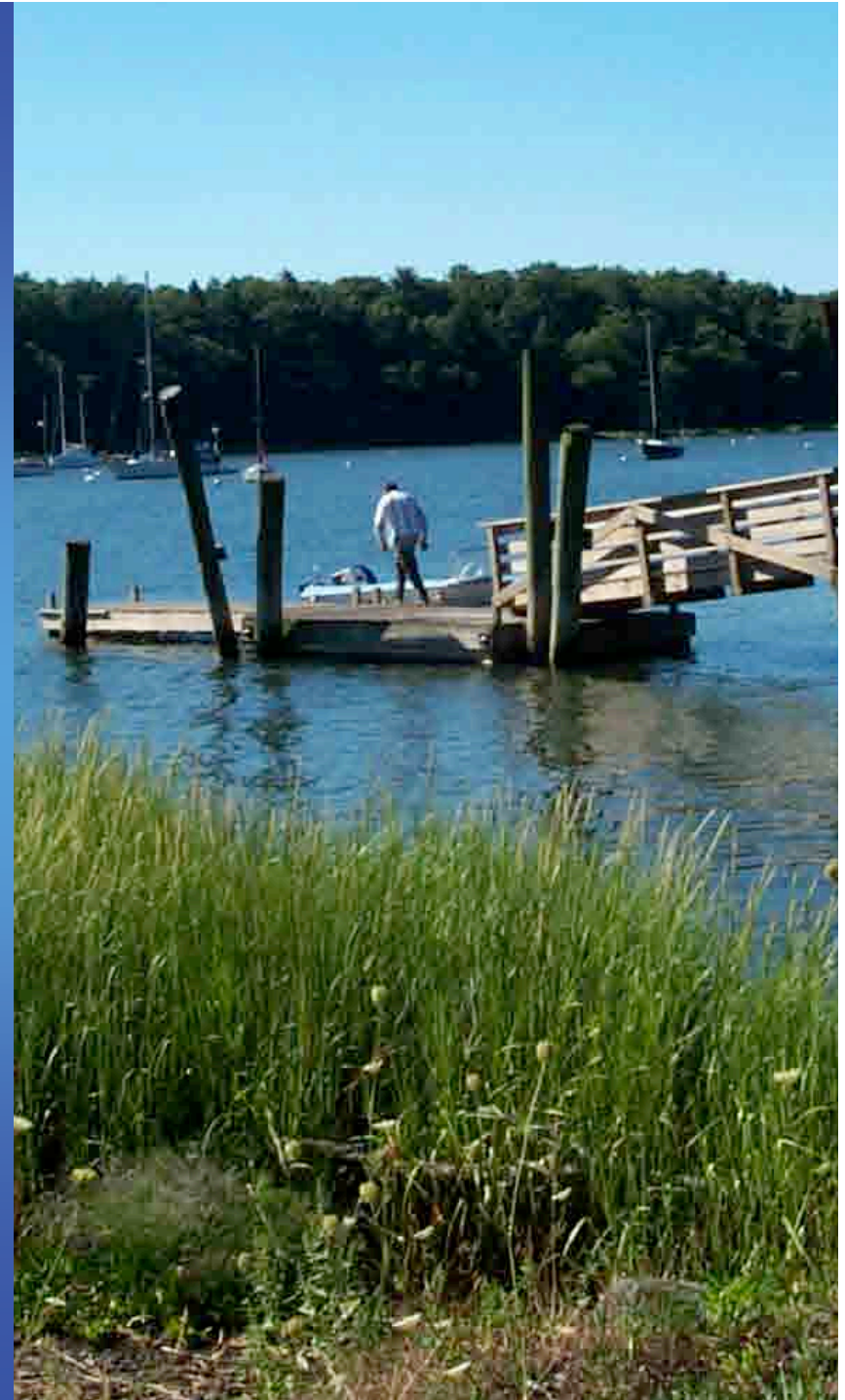


Photo by  
Richard Benjamin

# Urban Coastal Greenways

## A New Approach For Buffers in the Urban Coastal Environment

Rhode Island Coastal Resources Management Council





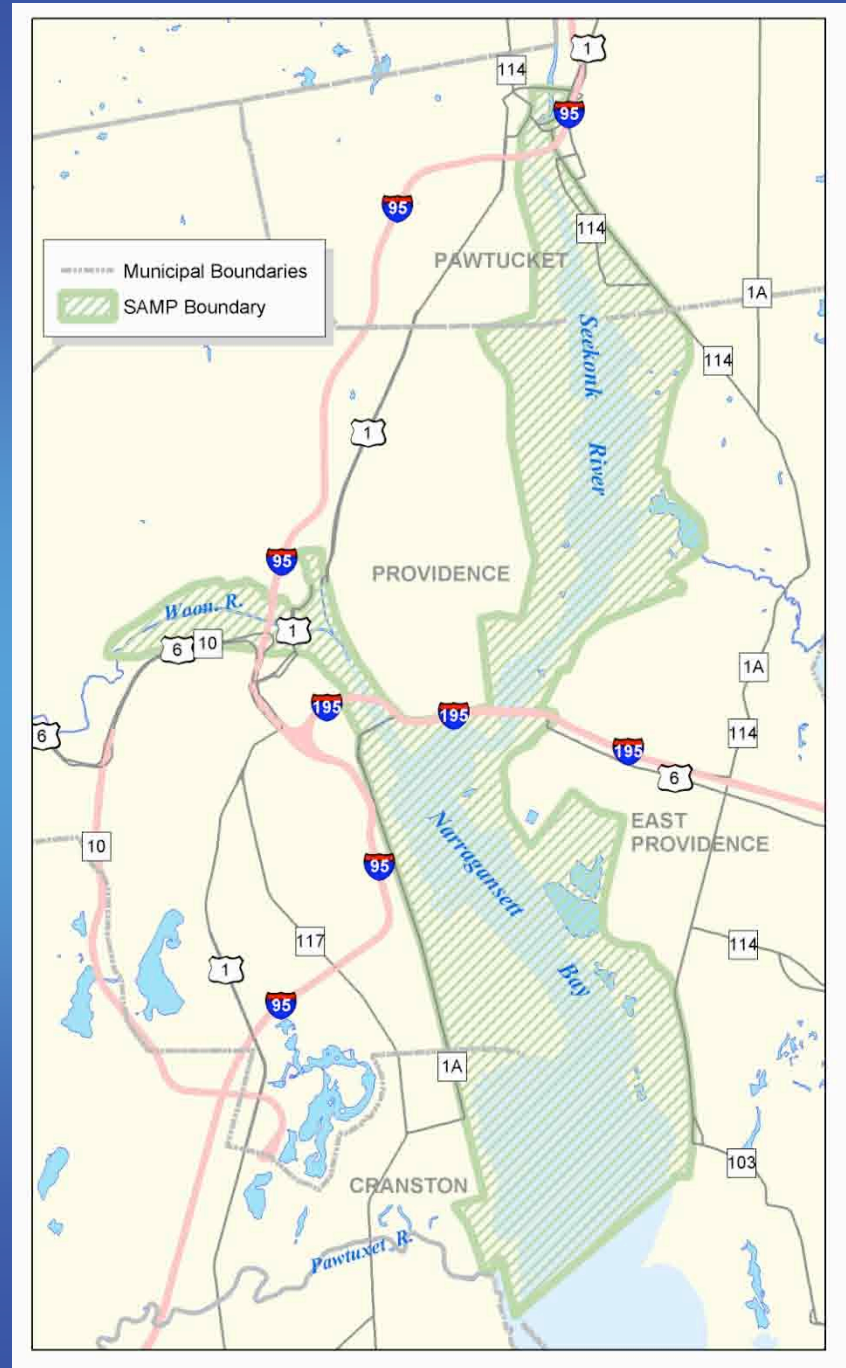
# Metro Bay Region SAMP Boundary

Cranston

Providence

Pawtucket

East Providence

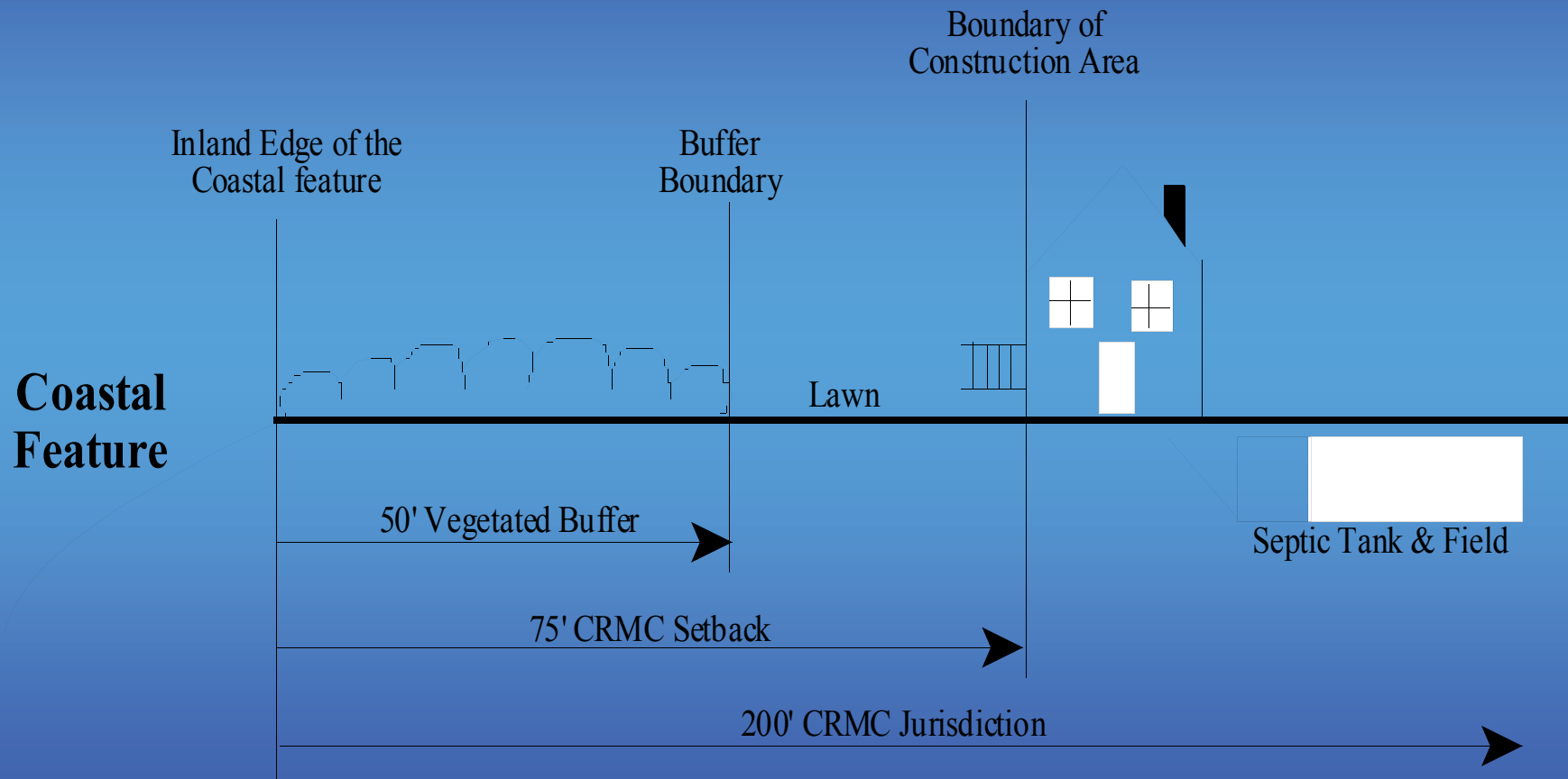


# Upper Providence River and Port of Providence





# RICRMP Section 150: Coastal Buffers



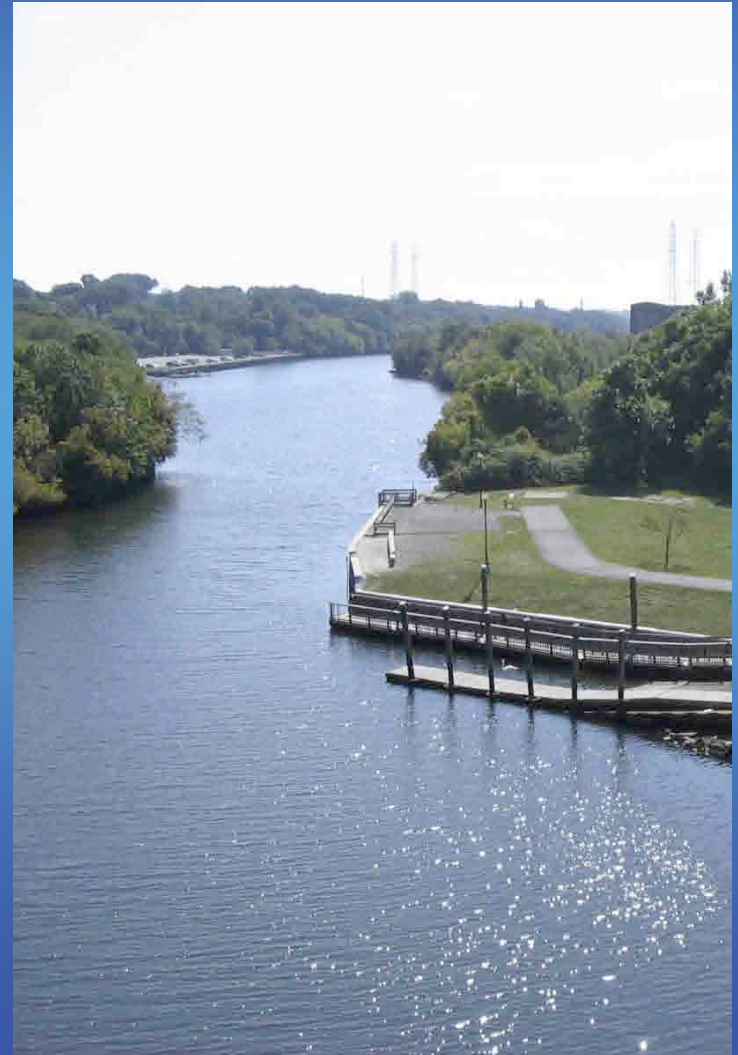
# **CRMC Setback & Buffer Rules**

**(Redbook Sections 140 & 150)**

- Applies to large residential coastal lots
- Setbacks in the metro region range from 150 feet to 175 feet of undisturbed natural vegetation
- Buffer width based on lot size and water type
- Little to no buffer management allowed
- **Variance is only option for reducing buffer...  
no Public Benefit from granting the variance**

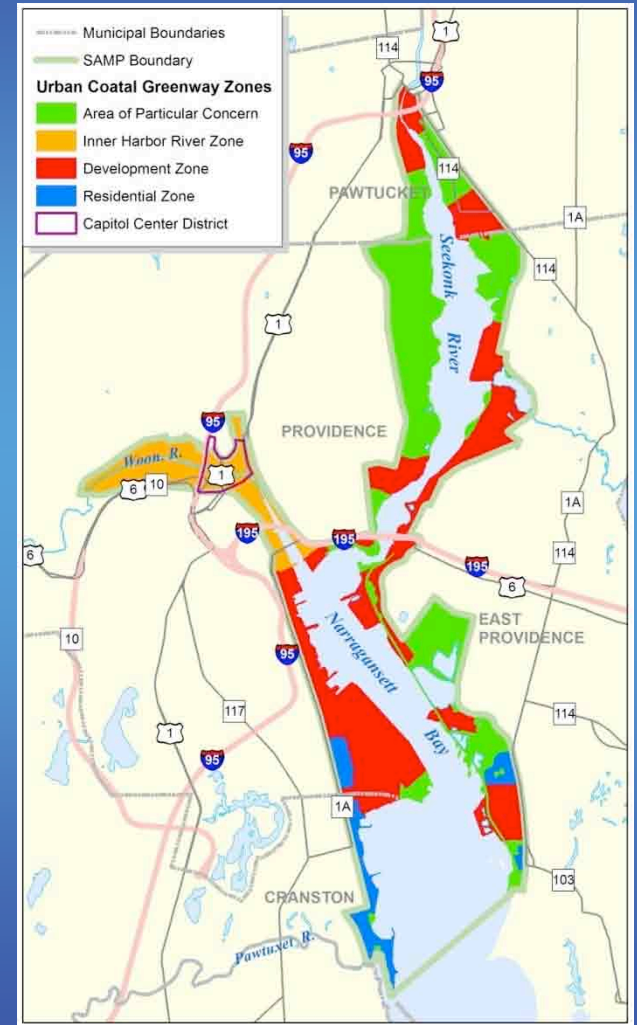
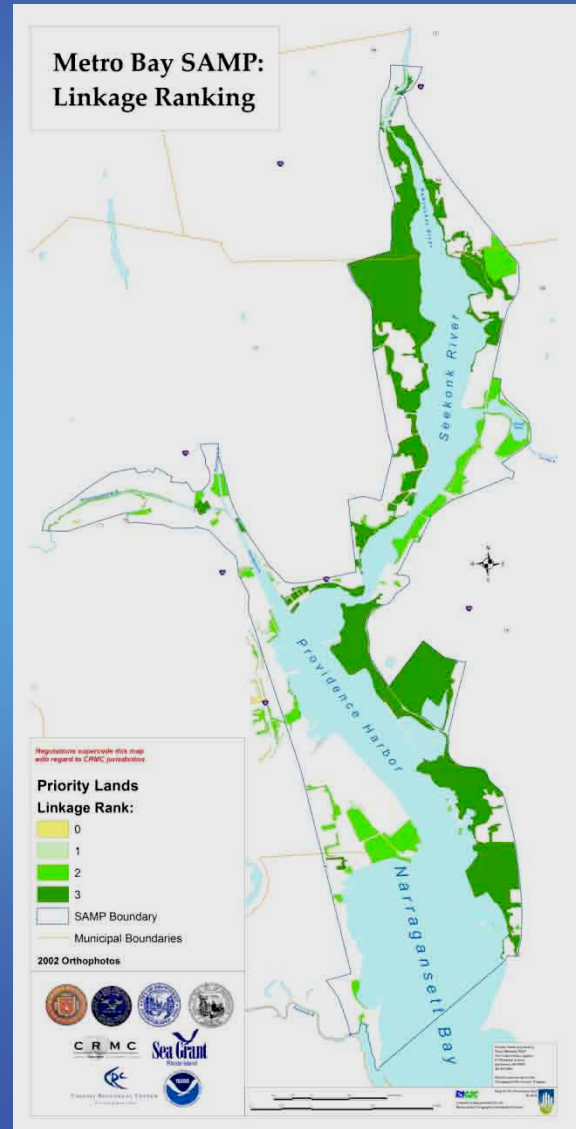
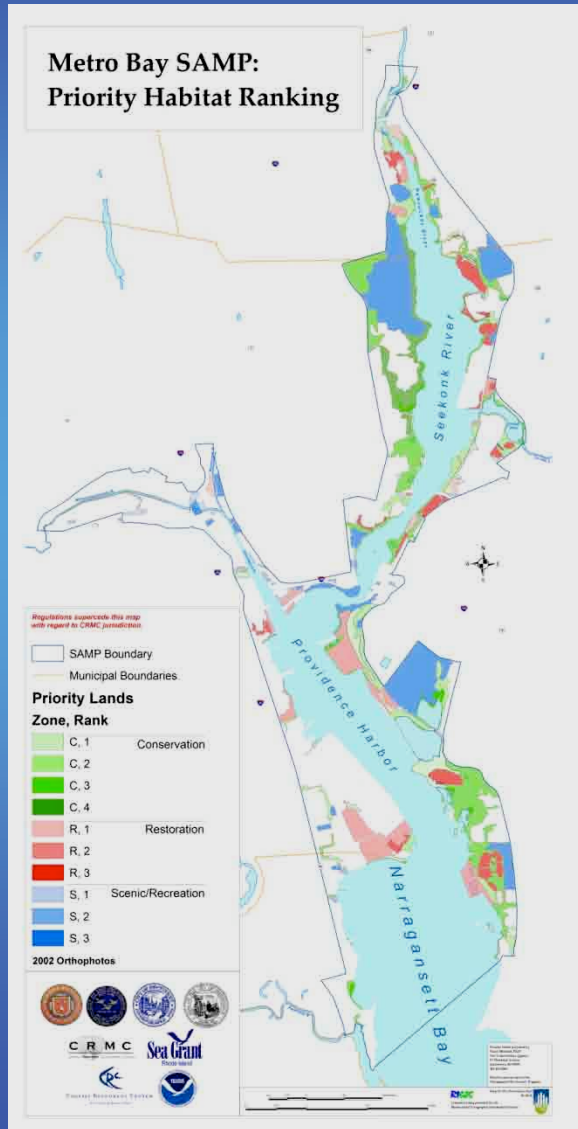
# The Challenge: A New Coastal Buffer Policy that...

- Acknowledges constraints of coastal *urban* redevelopment.
- *Protects or restores* coastal habitat and natural storm buffers.
- *Streamlines* permitting while allowing *flexibility* in meeting regulatory requirements.
- Reduces variance requests and increases *public benefit*.
- Increases *consistency* and *predictability* of process.





# Multiple Data Set Analyses to Determine UCG Zones

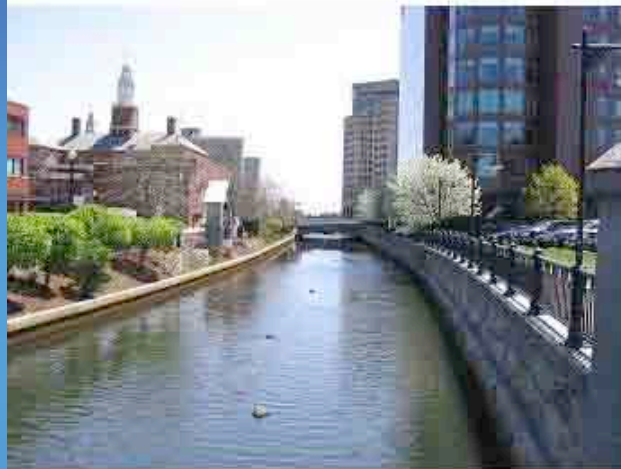


# Urban Coastal Greenways Policy

## For the Metro Bay Region

Cranston, East Providence, Pawtucket, and Providence

### An Amendment to the Providence Harbor Special Area Management Plan



Adopted by the RI Coastal Resources Management Council  
on October 10, 2006



# Main Goals of the UCG Policy

- 15% Vegetation of Entire Development Site
  - Sustainable Vegetation
- 100% Stormwater Management using LID
- Provide Public Access
- Flexible Greenway Widths
  - by UCG Zone
  - Exceptions for “Small Parcels”
  - Compensation Options  
(i.e., public amenities or habitat restoration fund)





# 100% Stormwater Management

- Onsite treatment of the water quality volume (first inch of stormwater runoff).
- Requirement for Low Impact Development (LID) practices (i.e., bioretention, filter strips, green roofs, etc.) and methods that support infiltration and groundwater recharge.



Source: Claytor 2005

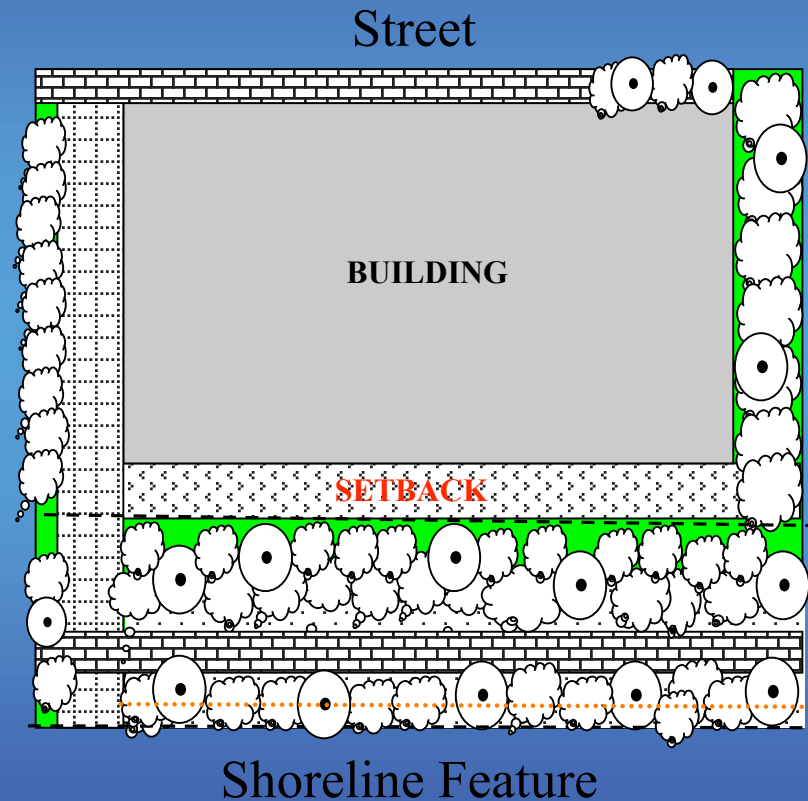


# LID and Climate Change

- Recent research examining impacts of climate change on rainfall depths (28-60% increase) demonstrated existing urban infrastructure (culverts) will be under-capacity by 35%
- There are 2 near-term achievable solutions:
  - Upgrade infrastructure--\$\$\$\$
  - Implement wide-scale LID requirements

# 15% Vegetation Requirement

- Sustainably landscaped.
- May include green roofs, rain gardens, landscaping elements, surface stormwater treatments, etc.
- “Appropriate mix” of trees, shrubs, & low-maintenance grasses.





## Public Access

- Continuous alongshore access (minimum 8' wide).
- Arterial (perpendicular) access connects public sidewalk to the alongshore access pathway.
- Pervious surfaces, supportive of emergency vehicles where necessary and ADA compliant.
- At least 2 parking spaces adjacent to access point and additional space/100' linear feet of shoreline.



urban  
coastal

PUBLIC



urban  
coastal  
greenway

PUBLIC

ACCESS





**Projects Approved Under The  
UCG To Date Will Open Up  
7050 New Linear Feet of Shoreline  
Some of Which Has Not Been Accessible  
since  
The Civil War.**

# Urban Coastal Greenway Design Manual

For the Metro Bay Region  
Dorchester, East Providence, Pawtucket, and Providence





# Woonasquatucket River & Promenade District

Recommendations for Management

Part of the Metro Bay SAMP Plan



# Internet Map Service (IMS) Application

The screenshot displays an Internet Map Service (IMS) application running in a Windows Internet Explorer browser. The browser's address bar shows the URL <http://204.17.79.245/website/samp1/viewer.htm>. The application interface includes a toolbar on the left with various map navigation tools such as 'Zoom In', 'Zoom Out', 'Zoom Fullscreen', 'Zoom to Active', 'Zoom to Last', 'Pan', 'Hotlink', 'Identify', 'Query', 'Measure', 'Set Units', 'Buffer', 'Select Rectangle', 'Clear Selection', 'Print', and 'Connect URL'. The main map area shows a map of Providence, Rhode Island, with various colored zones. A legend on the right side of the map lists layers such as 'Parcel Outlines', 'Hot Lot Labels', 'Aerial Photography (2002)', 'Roads', and 'Inland Water Features'. Below the legend is a 'Legend' section with color-coded boxes for 'Capital Center District', 'SAMP Boundary', 'Urban Coastal Greenway Zones', and 'RI Municipalities'. The map also shows a scale bar and a north arrow. The browser's taskbar at the bottom shows the Windows Start button and several open applications.

# Hurricanes impacting RI

<b>Storm Name (Date)</b>	<b>Date of Impact</b>	<b>Category</b>
No name 1869	Sep 8, 1869	3
No name 1938	Sep 21, 1938	4
Carol	Aug 31, 1954	2
Edna	Sep 11, 1954	2
Donna	Sep 12, 1961	2
Esther	Sep 21, 1961	3
Gloria	Sep 27, 1985	2
Bob	Aug 19, 1991	2
Floyd	Sep 17, 1999	Tropical Storm

At 4:45 p.m. the storm surge of the 1938 hurricane reaches the very heart of Providence, Rhode Island. Waves can be seen in front of the Biltmore Hotel (right building), while marooned pedestrians gather on the steps of Providence City Hall. ***RIGHT:*** Looking down Dorrance Street at the height of the hurricane. (Photos Providence Journal 1940).





# Metro Bay: "Achilles' Heel of the Northeast" (FEMA)



Surge Height 4.5 m (MLLW)

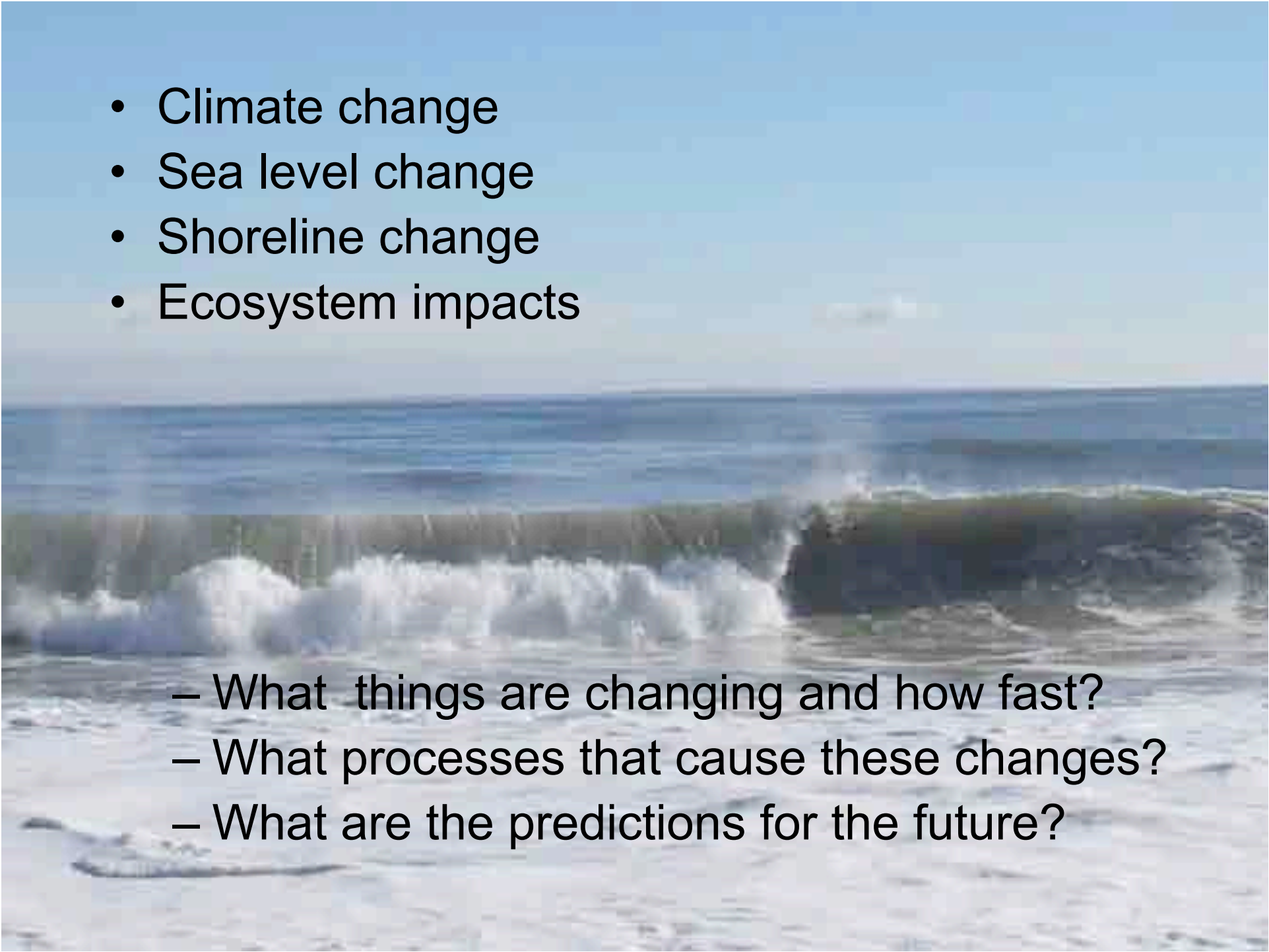
Image MassGIS, Commonwealth of Massachusetts EOE  
Image © 2005 MDA EarthSat  
© 2005 Sanborn

Google

Pointer 41°48'03.86" N 71°22'44.05" W

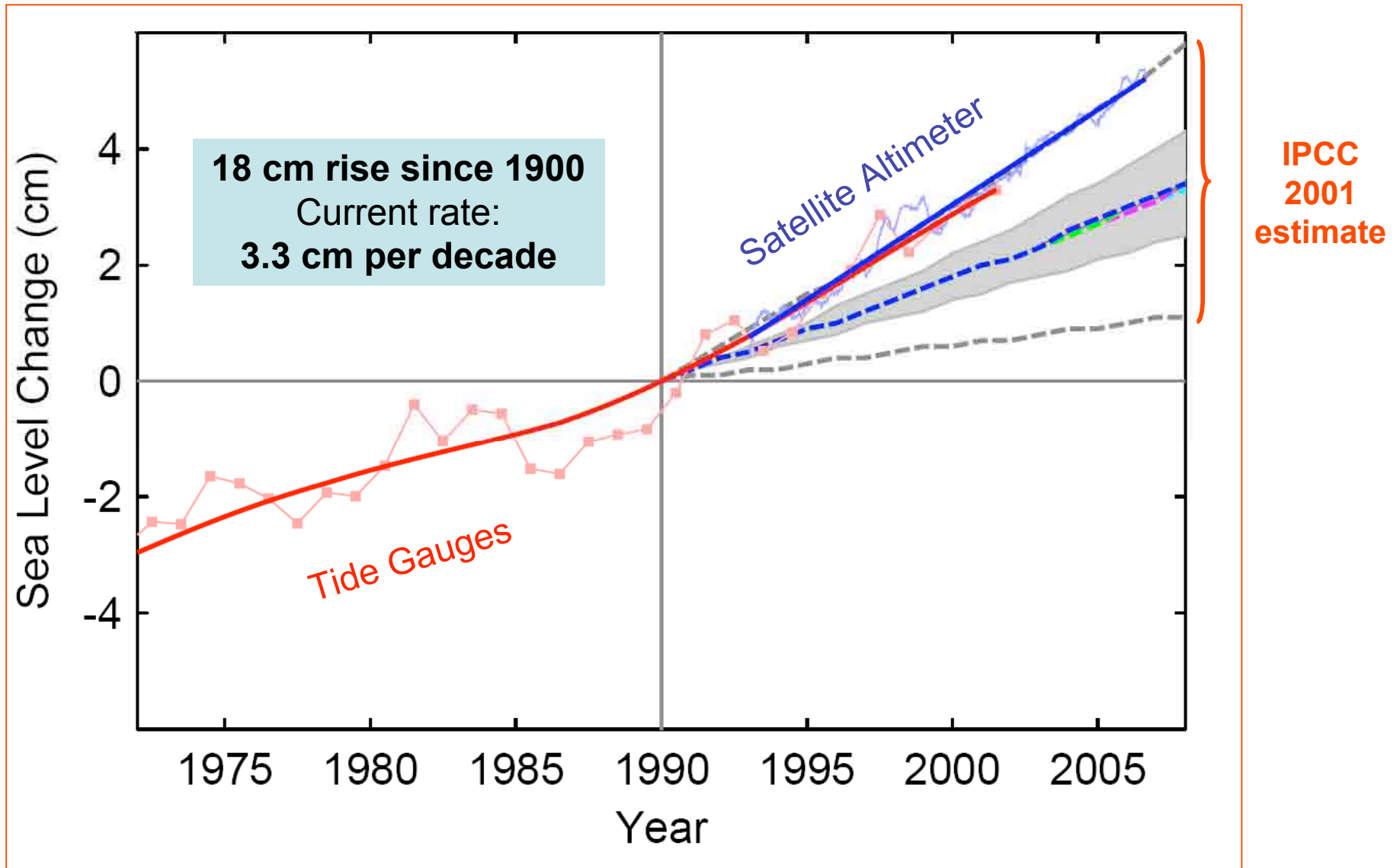
Streaming | 100%

Eye alt 2755 ft

- 
- Climate change
  - Sea level change
  - Shoreline change
  - Ecosystem impacts

- What things are changing and how fast?
- What processes that cause these changes?
- What are the predictions for the future?

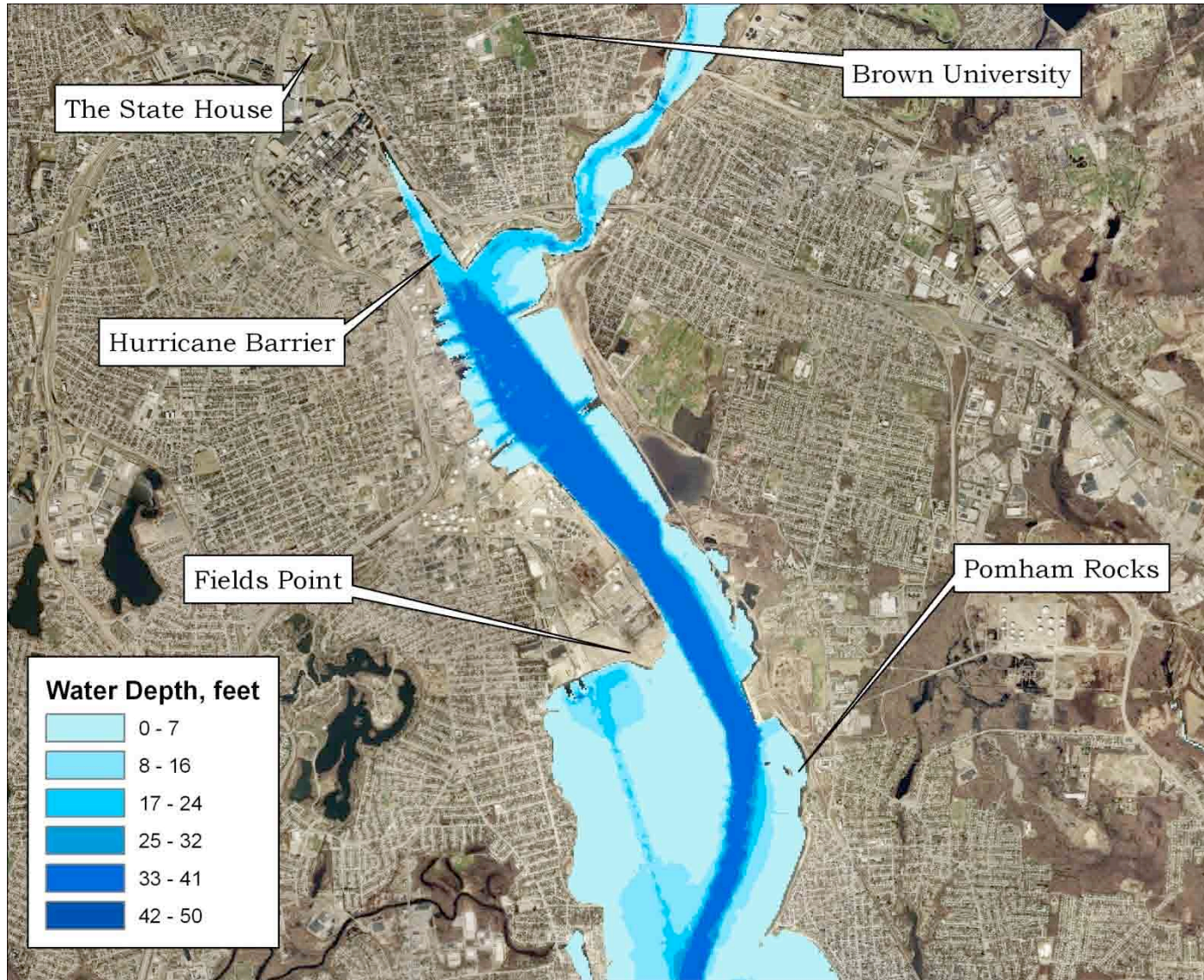
# Observed Global Sea Level Rise



Rahmstorf, Cazenave, Church, Hansen, Keeling, Parker and Somerville (Science 2007)

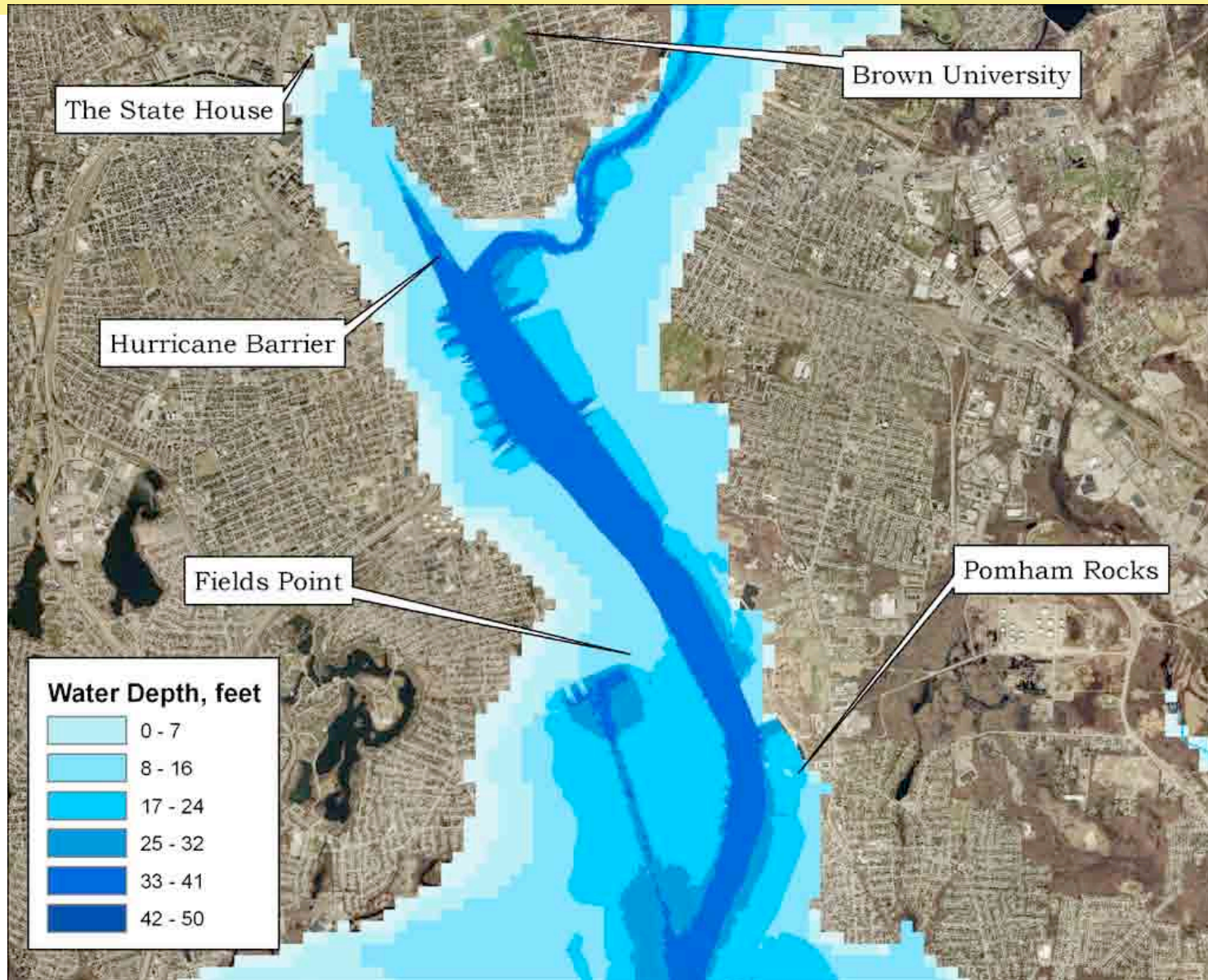


# Providence: present sea level



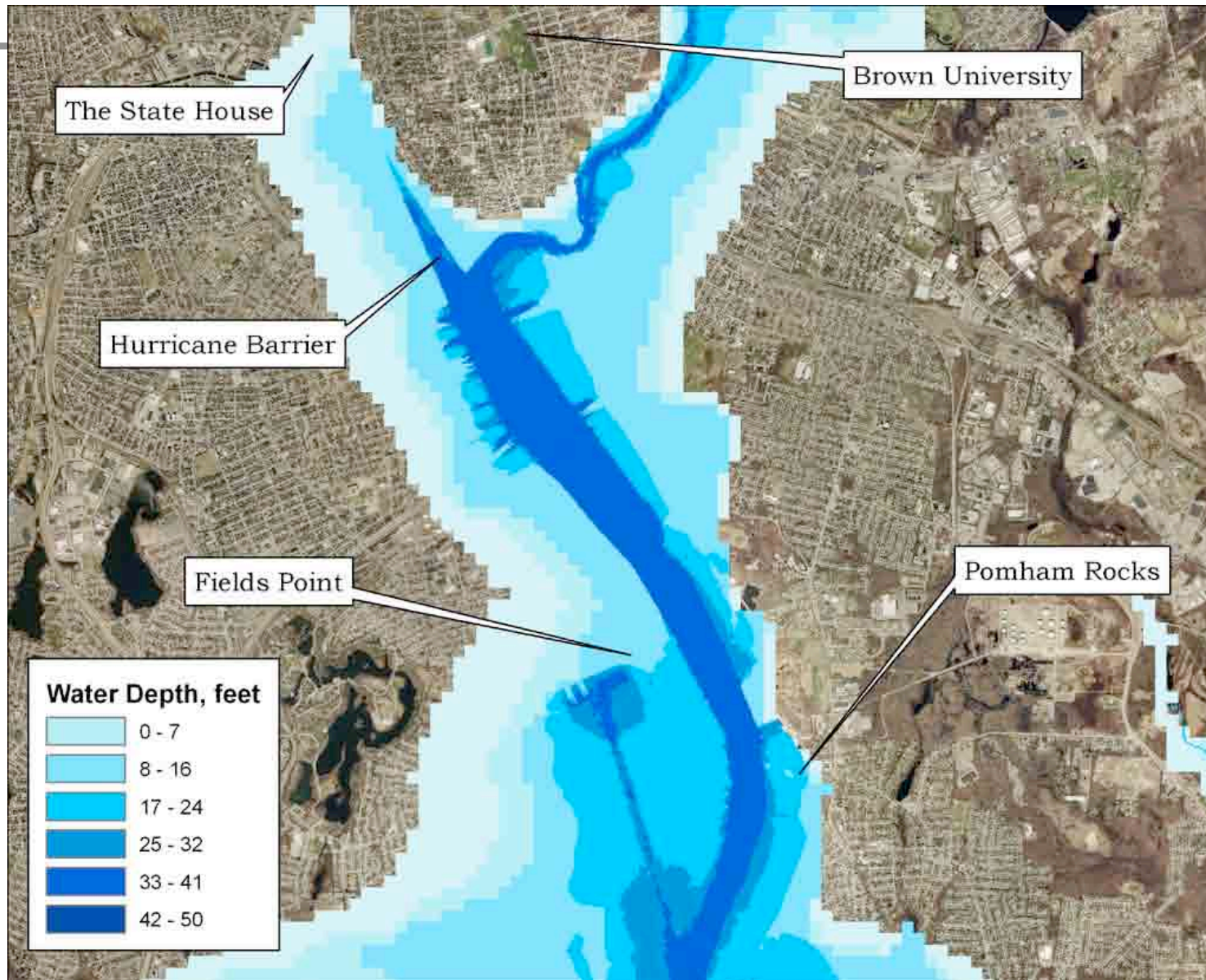


# Providence: 3 ft. sea level rise

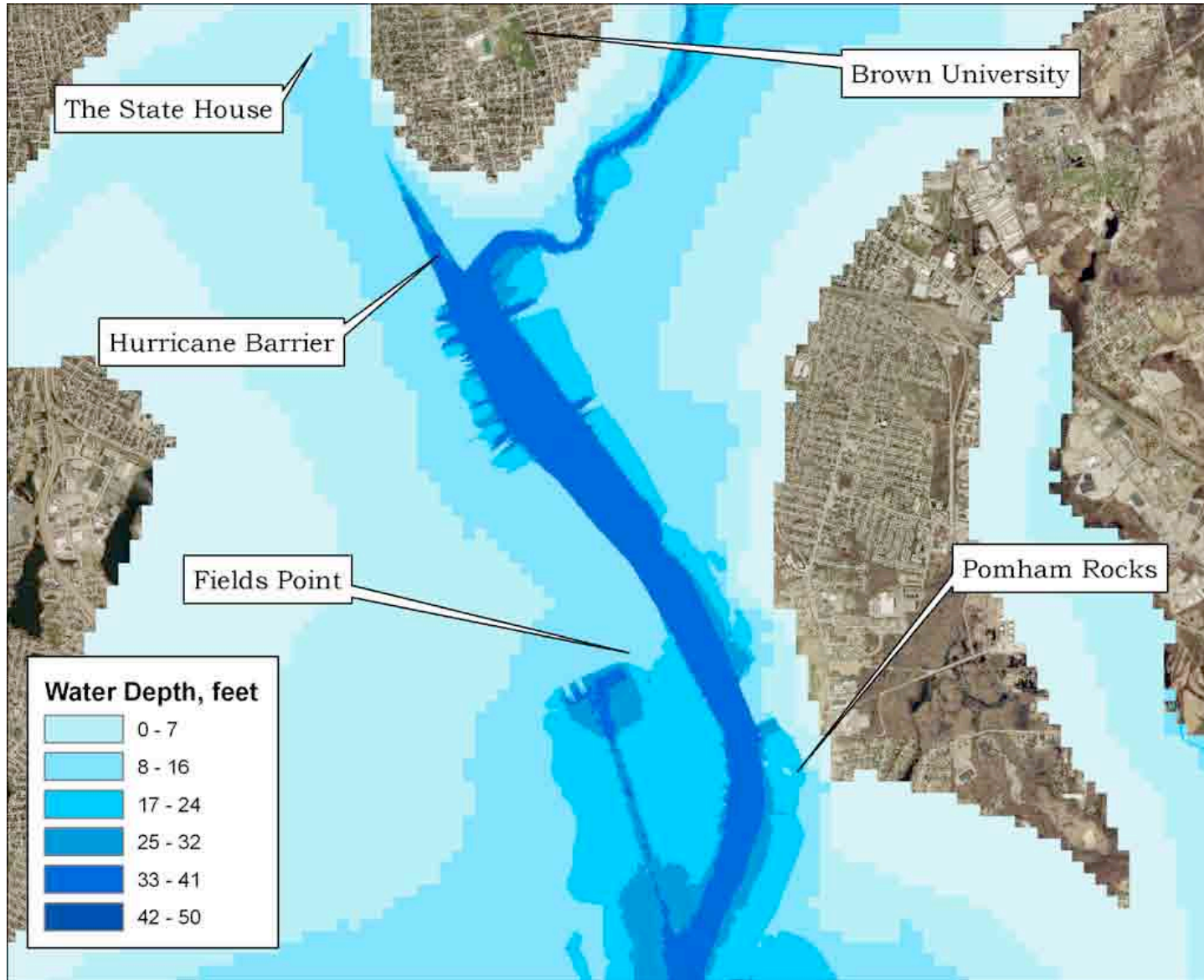




# Providence: 5 ft. sea level rise

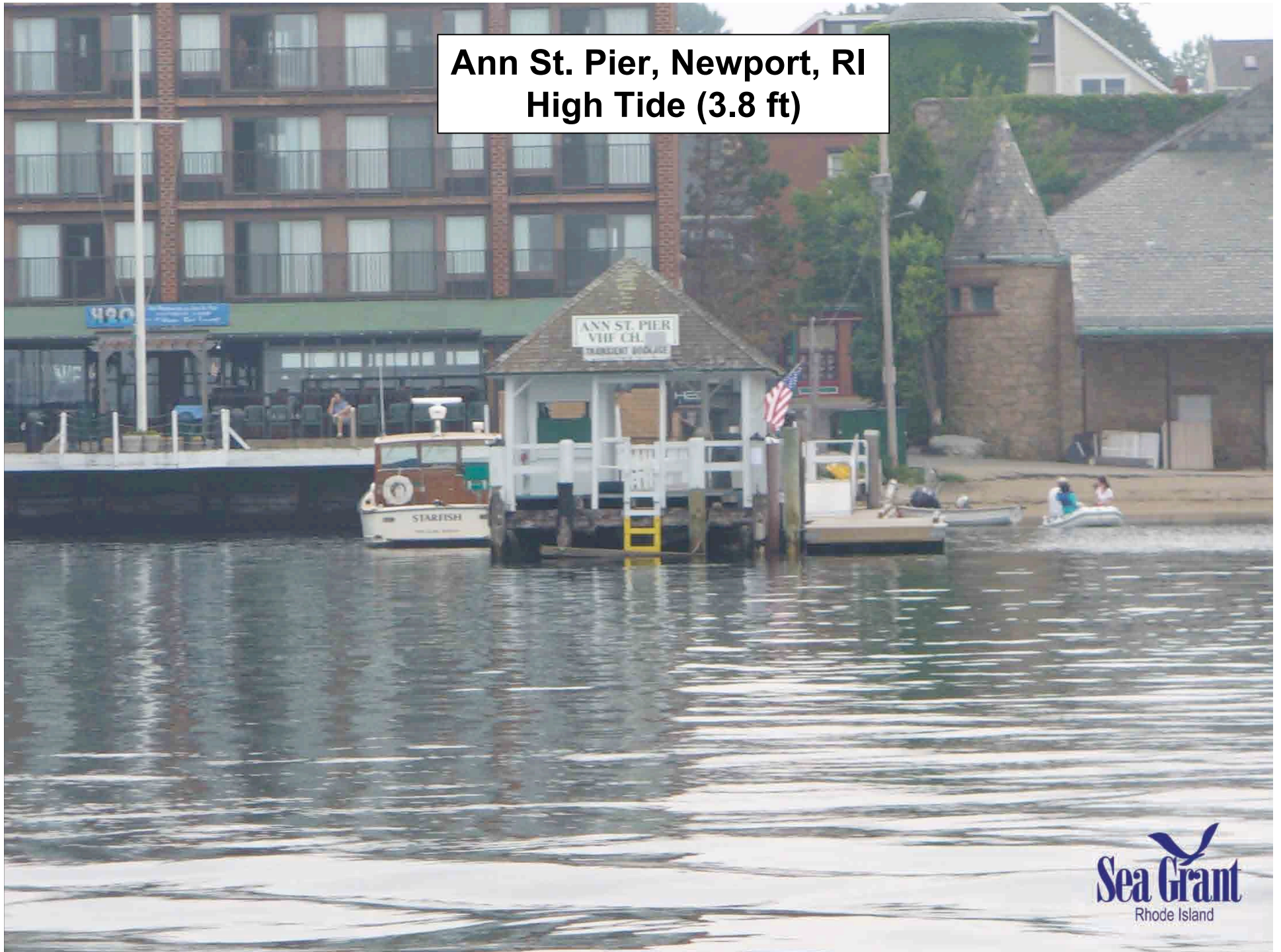


# Providence: 20 ft. sea level rise



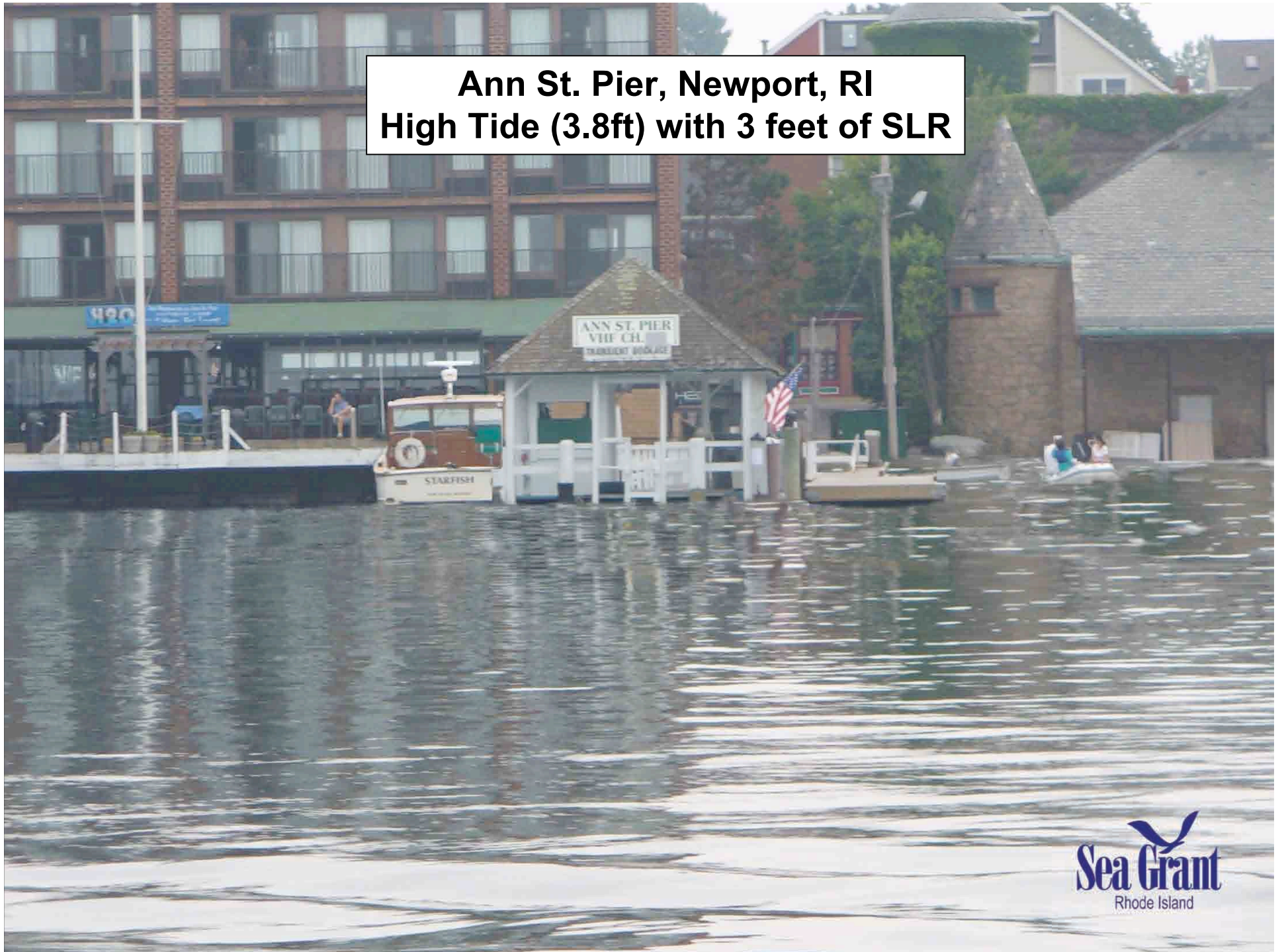


**Ann St. Pier, Newport, RI  
High Tide (3.8 ft)**



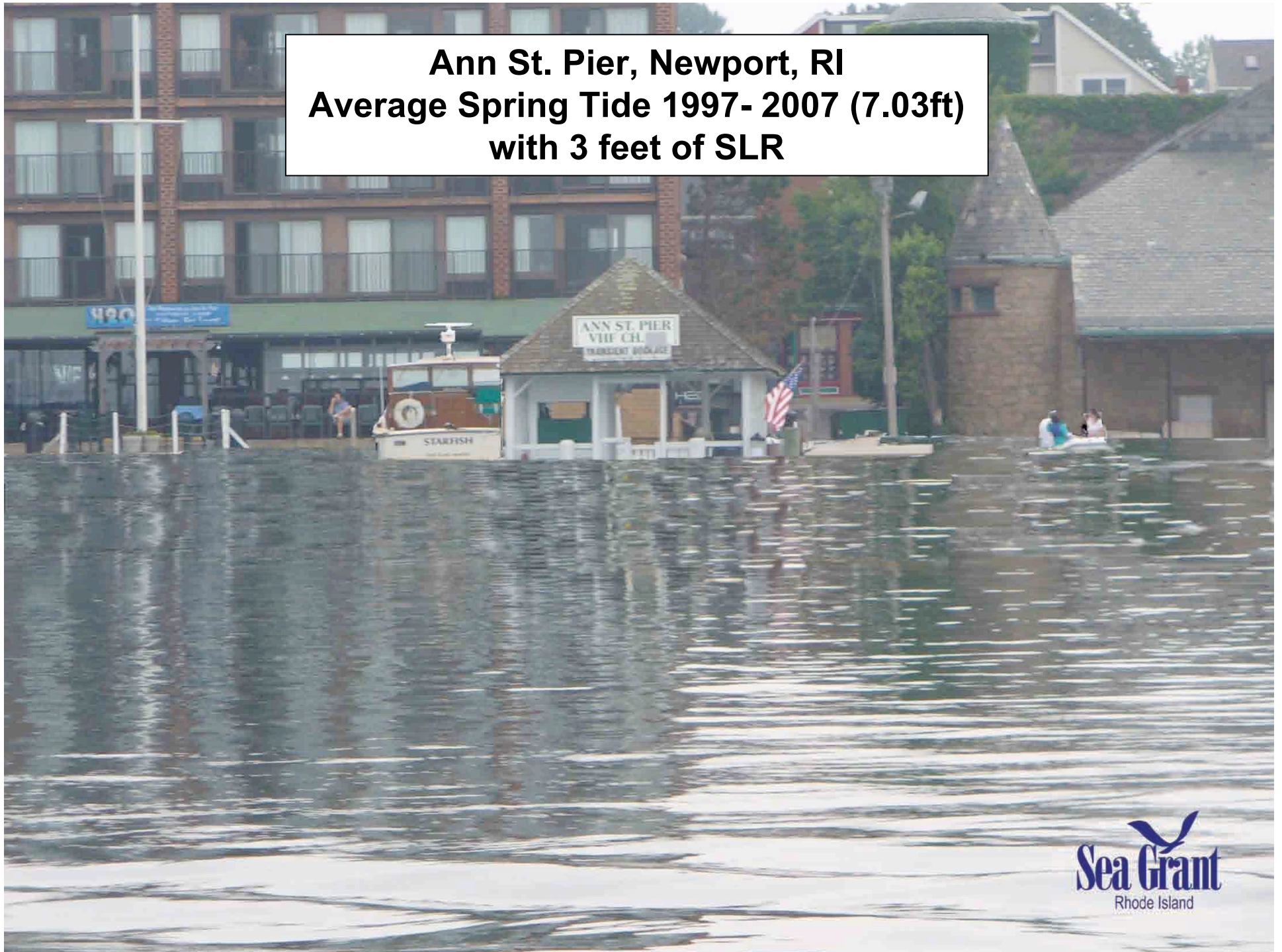


**Ann St. Pier, Newport, RI  
High Tide (3.8ft) with 3 feet of SLR**





**Ann St. Pier, Newport, RI  
Average Spring Tide 1997- 2007 (7.03ft)  
with 3 feet of SLR**



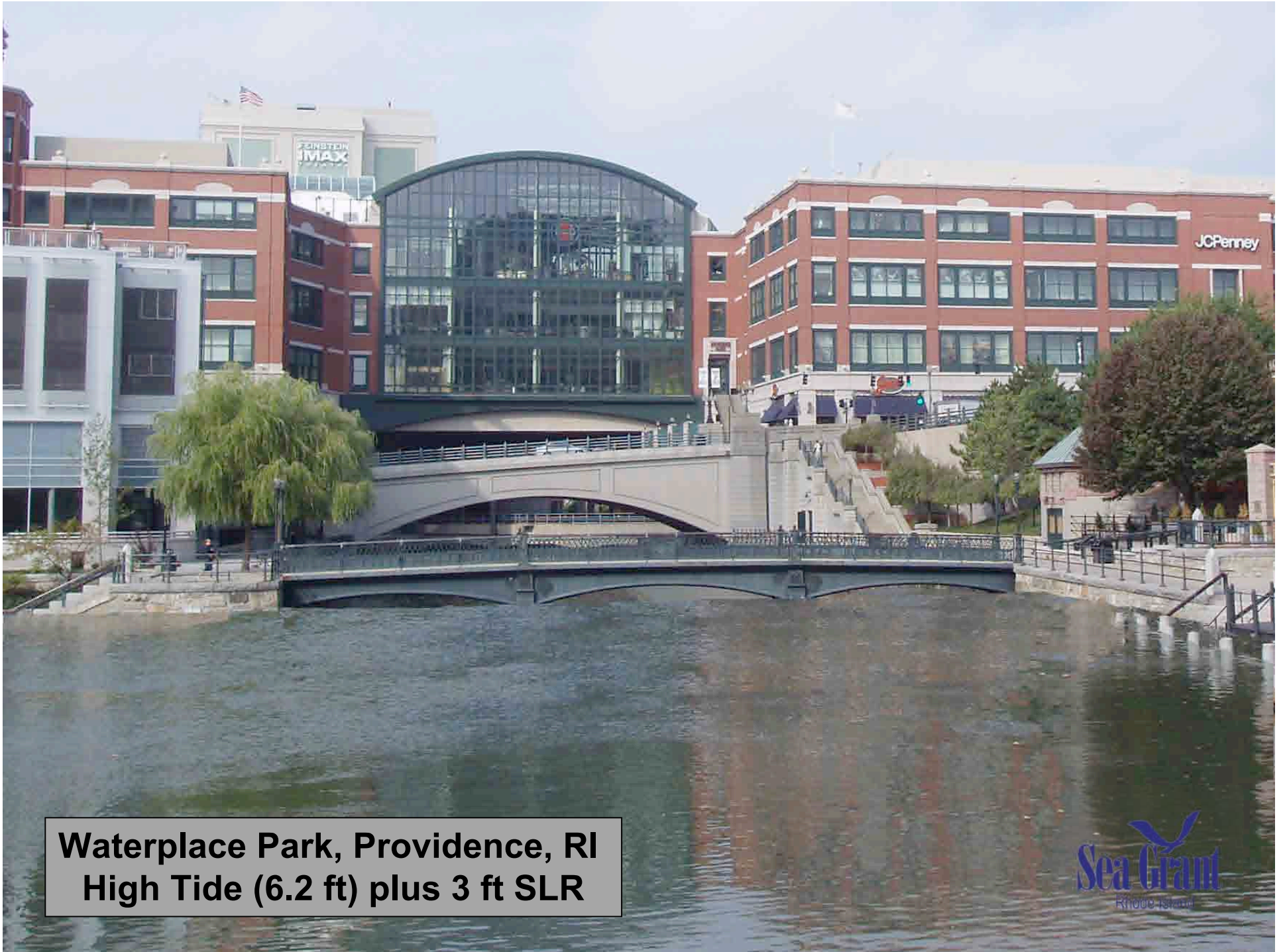




**Waterplace Park, Providence, RI  
High Tide (6.2 ft)**

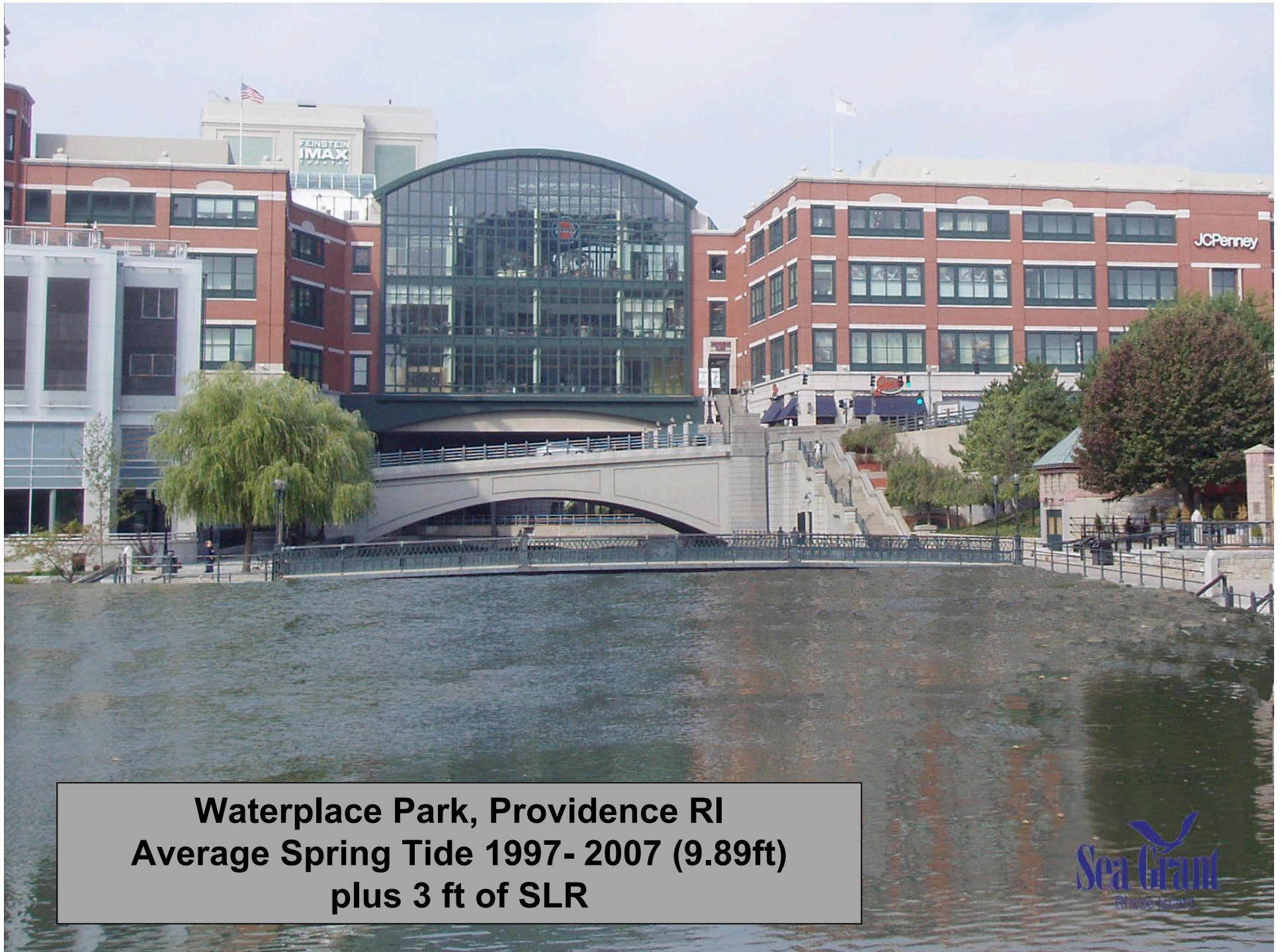






**Waterplace Park, Providence, RI  
High Tide (6.2 ft) plus 3 ft SLR**





**Waterplace Park, Providence RI**  
**Average Spring Tide 1997- 2007 (9.89ft)**  
**plus 3 ft of SLR**





# Sea Level Rise Policy

## Section 1.45 Climate Change and Sea Level Rise

### A. Definition

- Climate is the long-term weather average observed within a geographic region, and climate change refers to fluctuations in the Earth's climate system as a result of both natural and anthropogenic causes. Generally, climate change is evidenced by rising global temperatures, increasing extremes within the hydrologic cycle resulting in more frequent floods and droughts, and rising sea level.
- Sea level rise refers to the change in mean sea level over time in response to global climate and local tectonic changes. Sea level is the height of the sea with respect to a horizontal control point, or benchmark (e.g. The National Geodetic Vertical Datum of 1929 or NAVD 29, The North American Vertical Datum of 1988 or NAVD 88) and averaged over a period of time sufficient to smooth out fluctuations caused by waves and tides.
- Vertical datums are either fixed benchmarks such as NGVD 29 and NAVD 88 or site specific tidal datums such as mean high water, mean low water and mean sea level. NGVD 29 is based on the local mean sea level in 1929, which has changed over time. NAVD 88 is now the official civilian vertical datum for surveying and mapping activities in the United States. The conversion to NAVD 88 should be accomplished on a project-by-project basis. Tidal datums, such as mean sea level (MSL) or mean high water (MHW), vary according to the specific location, and represent the mean heights observed over the National Tidal Datum Epoch. Conversions between the datums can be made at [www.nwr.noaa.gov](http://www.nwr.noaa.gov) or calculated through the US Army Corps of Engineers COE/FSCOM (<http://wwwch2m.com/usa/sea/seaconversion.asp>).
- Sea level rise includes **relative** contributions - global changes responsible for world-wide variations in sea level (e.g. thermal expansion of seawater, melting glacial ice sheets), and **absolute** effects - regional changes in land surface elevations that are related to the tectonic response to ice or sediment loading, and land subsidence due to extraction of water or oil. The combination of **relative** and **absolute** effects at a particular location is known as relative sea level rise.

### B. Findings

- On very long (geologic) time scales, sea level naturally fluctuates in response to variations in continental configurations that cause changes in the Earth's climate system. Since the Last Glacial Maximum (approximately 20,000 years ago), global sea level has risen by over 300 feet (100 meters), as water that was previously trapped in continental ice sheets has made its way into the global ocean.
- Sea level rise is a direct consequence of global climate change. Greenhouse gas emissions to the atmosphere increase surface warming, which in turn increases the volume of ocean waters due to thermal expansion, and accelerates the melting of glacial ice. Atmospheric greenhouse gas concentrations are already higher than levels in the last interglacial period, when sea levels were 13 to 19 feet (4 to 6 meters) higher than at present (Church et al., 2006). Greenhouse gas concentrations are expected to continue to increase through 2100.

- Human activities and increased concentrations of greenhouse gases in the atmosphere have accelerated the historic rate of **relative** sea level rise. Over the last 100 years, sea levels have risen 0.34 feet (0.10 m) globally. The average rate of rise during the years between 1993 and 2003 was 0.71 in per year (1.8 mm/yr), and between 1993 and 2003 the rate nearly doubled to 1.3 in per year (3.3 mm/yr) (IPCC, 2007).
- In addition to rising global sea levels, the land surface in Rhode Island is subsiding at a rate of approximately 4 inches (1.0 mm) per century (Douglas, 1991). The combination of these two effects is evident from the long-term record recorded by the Newport tide gauge (Figure 1), which indicates a rate of 1.3 in +/- 0.2 in (33.3 mm +/- 5.1 mm) of relative sea level rise over the last century.
- The rate of sea level rise is accelerating. Future sea level rise, like the recent rise, is not expected to be globally uniform or linear. Some regions will become more substantially inundated than the global average, and others less. Of foremost concern is the world's **coastal** rise as observed from tide-gauge records over the past **century**. The rate of rise during the past 20 years is 25% faster than the rate of rise in any 20 year period that exists in the instrumental record (Church and White, 2006; <http://www.noaa.gov>, 2007).
- Model-simulated projections of global sea level over the 21st century are already demonstrating accelerated progression. Projections have ranged from 4 inches (10 cm) to several feet above current levels. As a result, sea-level estimates incorporating sea level rise modeling become more developed.

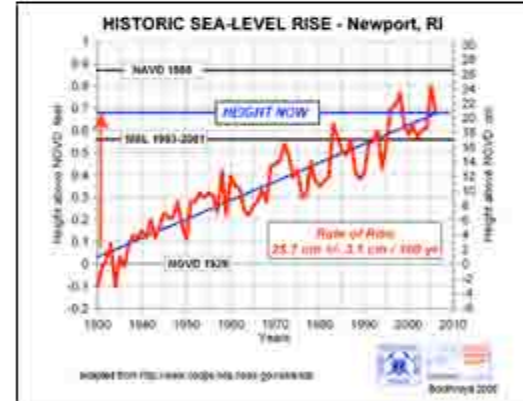
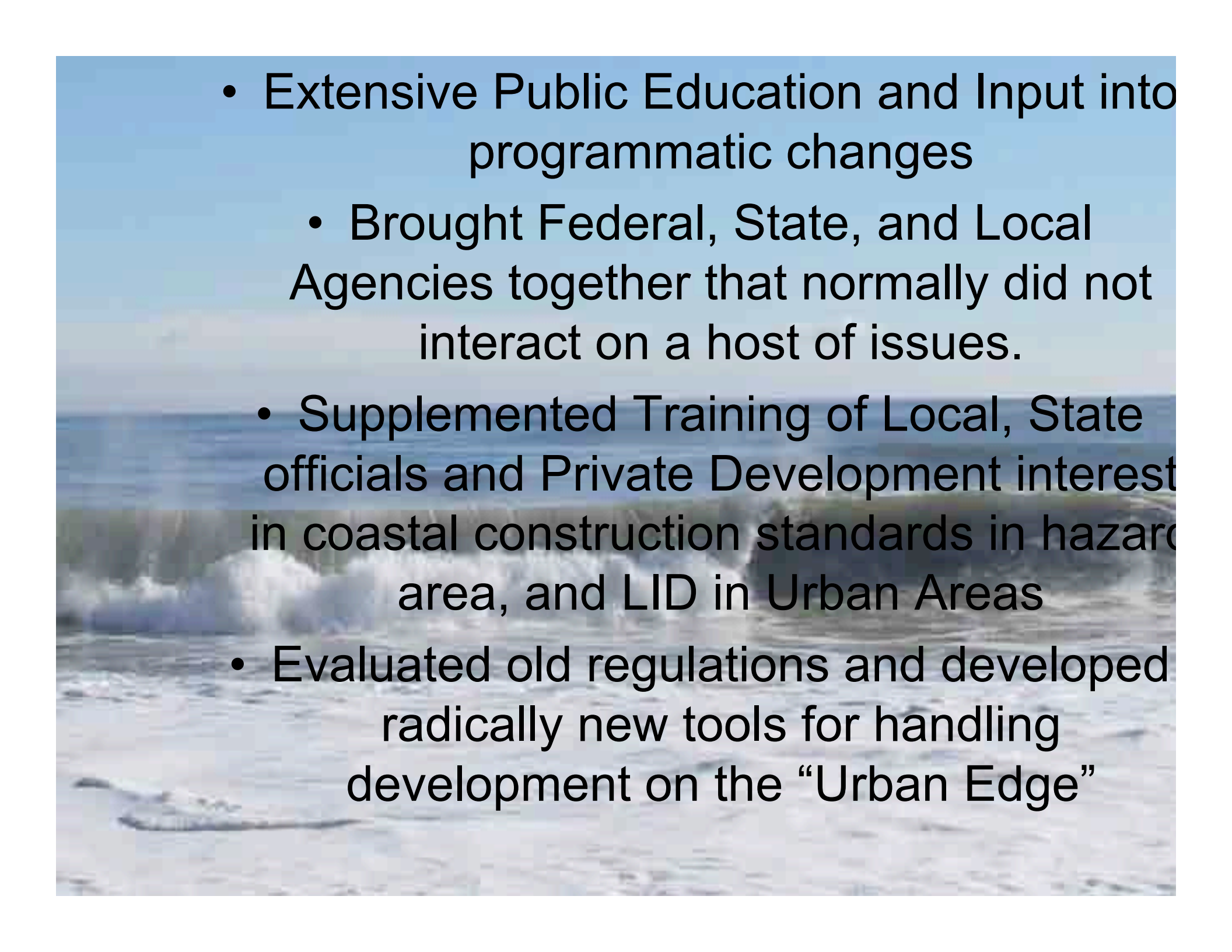


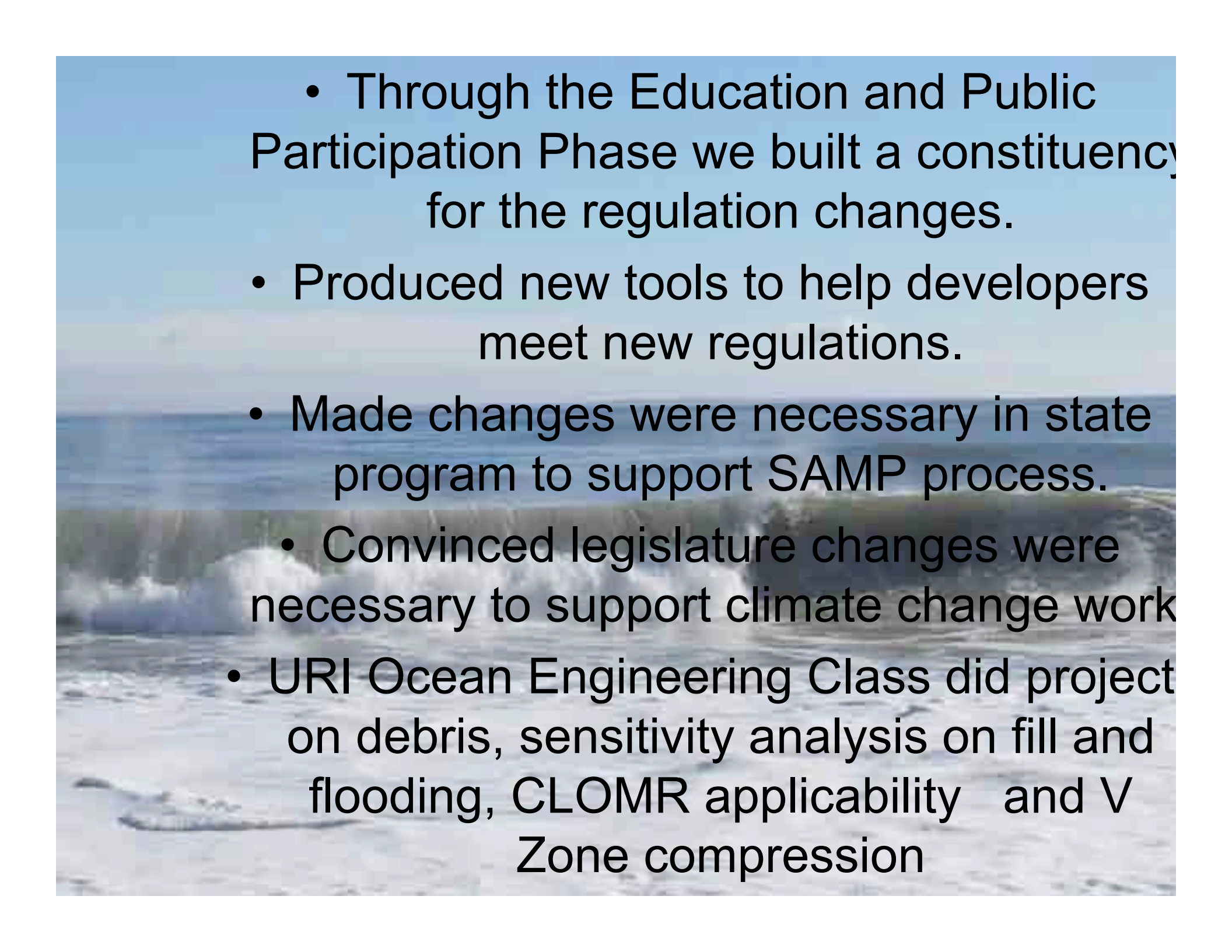
Figure 1 - Historic Sea Level Rise in Newport, RI shows an increase of approximately 64 feet between 1929 and 2006.

So What Did We Accomplish??



- 
- Extensive Public Education and Input into programmatic changes
    - Brought Federal, State, and Local Agencies together that normally did not interact on a host of issues.
    - Supplemented Training of Local, State officials and Private Development interest in coastal construction standards in hazardous area, and LID in Urban Areas
    - Evaluated old regulations and developed radically new tools for handling development on the “Urban Edge”



- 
- Through the Education and Public Participation Phase we built a constituency for the regulation changes.
  - Produced new tools to help developers meet new regulations.
  - Made changes were necessary in state program to support SAMP process.
  - Convinced legislature changes were necessary to support climate change work
  - URI Ocean Engineering Class did project on debris, sensitivity analysis on fill and flooding, CLOMR applicability and V Zone compression

# What Else Do We Need To Do?



- Still Working on Regulations for Sea Level
- Completing Working Water Front Chapter and Water Type Changes
- Final Wrap Up.

