Sea Level Rise

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Hydrographic Services Review Panel Meeting

Providence, Rhode Island

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Today's Presentation

- **NOAA's observations, modeling, and research that enhance our understanding of sea-level rise**

- **Decision-support tools, training, and other products and services developed with partners to support sectors sensitive to sea level rise**

  Coastal communities and infrastructure

Drivers for NOAA's Sea-Level Rise Services

Legislative Mandates

- National Climate Program Act
- Global Change Research Act
- Hydrographic Services Improvement Act
- Magnuson-Stevens Fishery Conservation and Management Act
- Coastal Zone Management Act
- Marine Mammal Protection Act
- National Marine Sanctuaries Act
- Endangered Species Act
- Coral Reef Conservation Act

"Because global warming may result in a substantial sea level rise with serious adverse effects in the coastal zone, coastal states must anticipate and plan for such an occurrence."

Coastal Zone Management Act, 16 U.S.C. § 1451(I)

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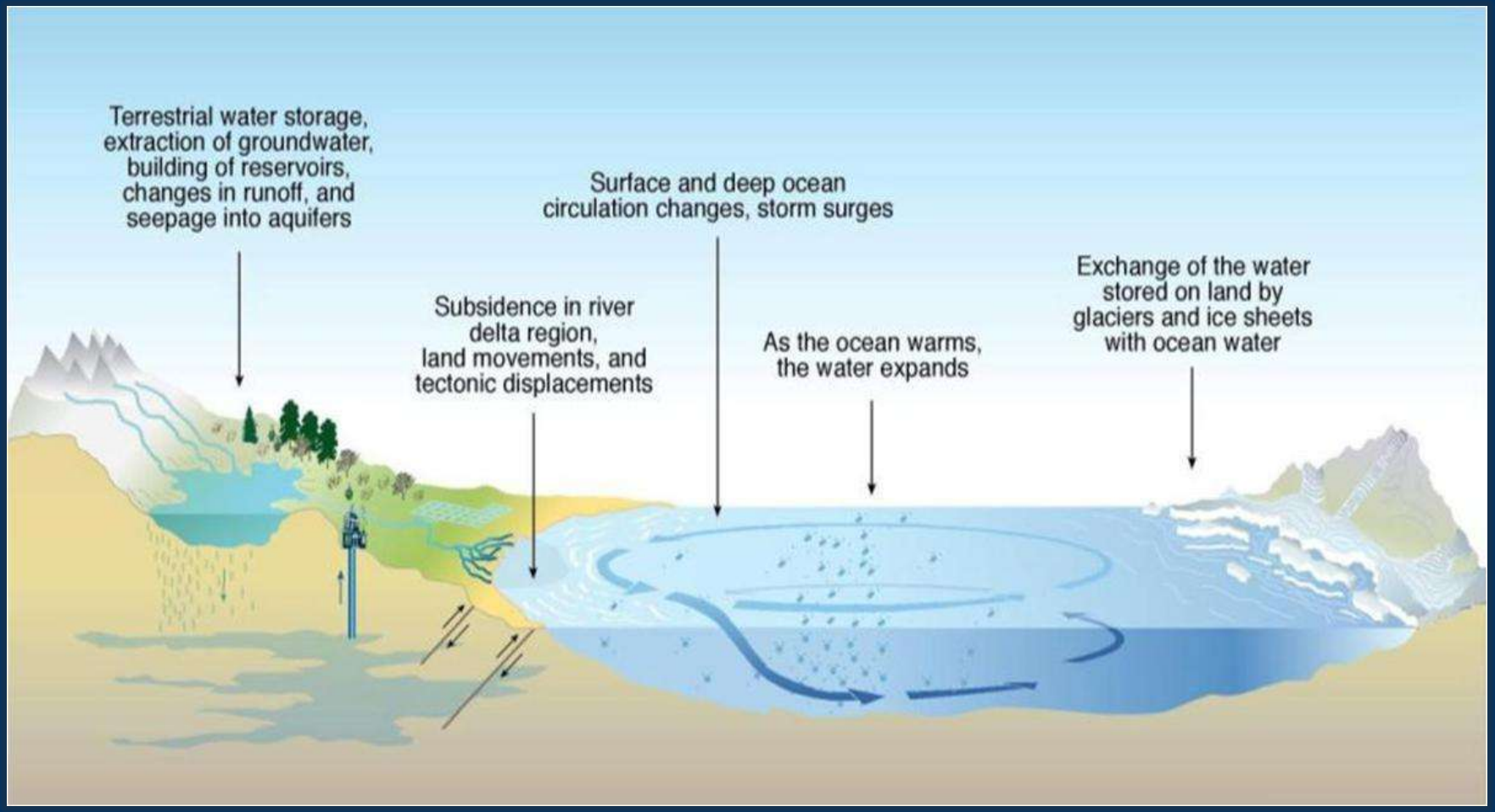
What Causes Sea Level to Change?



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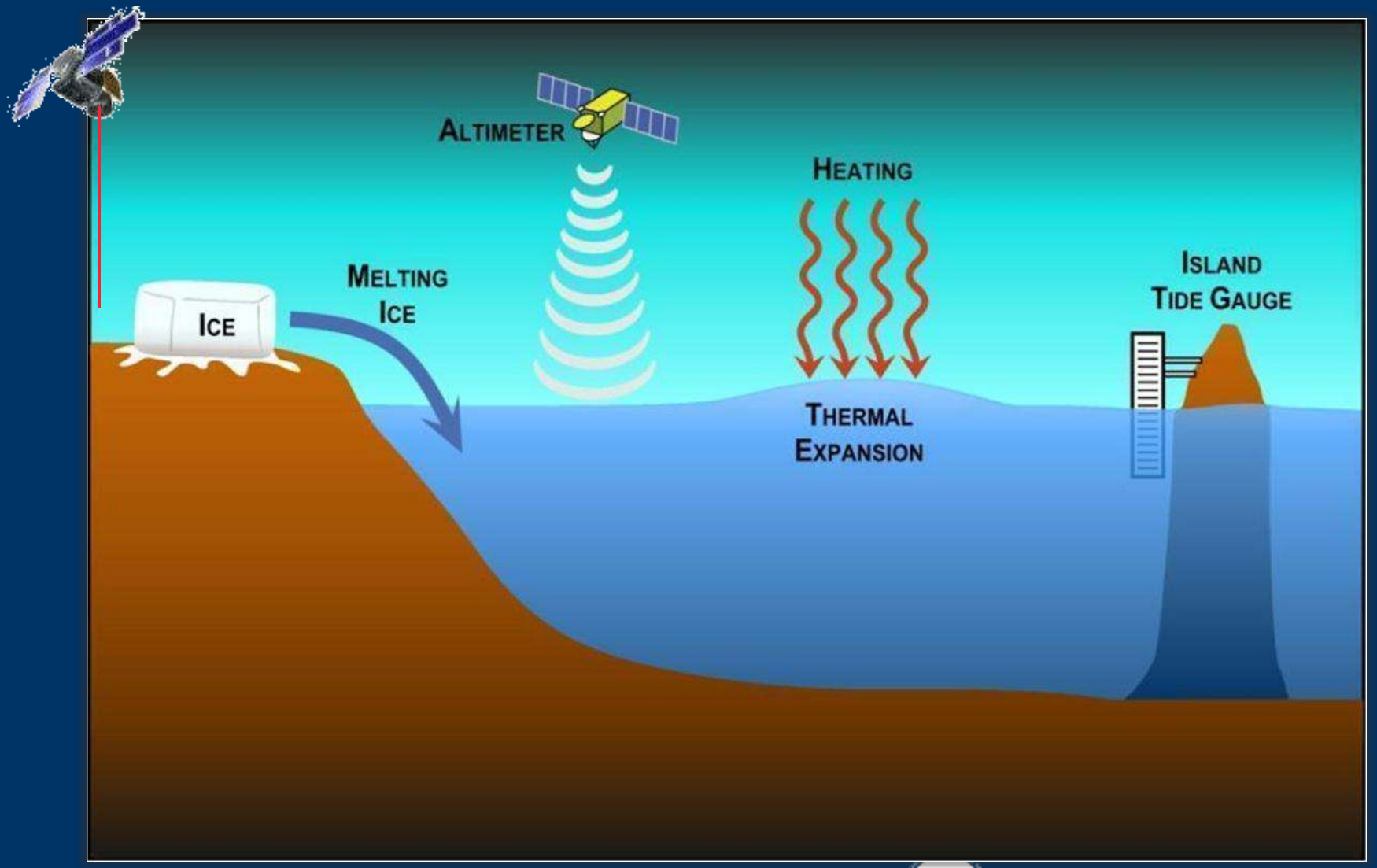
Measurements of Sea-Level Change



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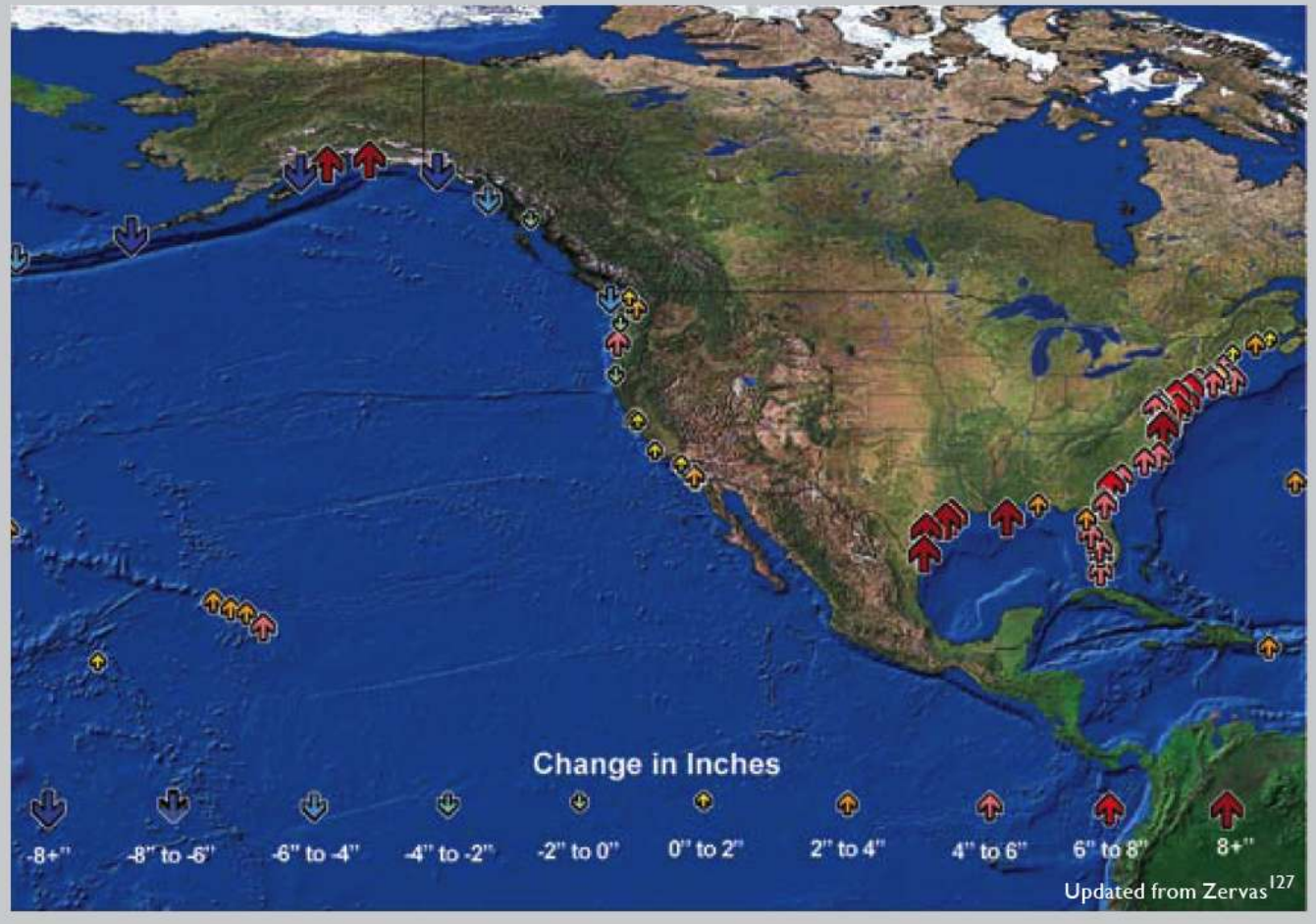
Relative Sea-Level Changes – 1958-2008



Observed changes in relative sea level from 1958 to 2008 for locations on the U.S. coast. Some areas along the Atlantic and Gulf coasts saw increases greater than 8 inches over the past 50 years.

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NOAA Sea Levels Online: *http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml*

Sea Level Trend in Providence

The map above illustrates regional trends in sea level, with arrows representing the direction and magnitude of change. Cl additional information about that station.

Sea Level Trends

mm/yr (feet/century)

9 to 12 (3 to 4)	3 to 6 (1 to 2)	-3 to 0 (-1 to 0)	-9 to -6 (-3 to -2)	-15 to -12 (-5 to -4)
6 to 9 (2 to 3)	0 to 3 (0 to 1)	-6 to -3 (-2 to -1)	-12 to -9 (-4 to -3)	-18 to -15 (-6 to -5)

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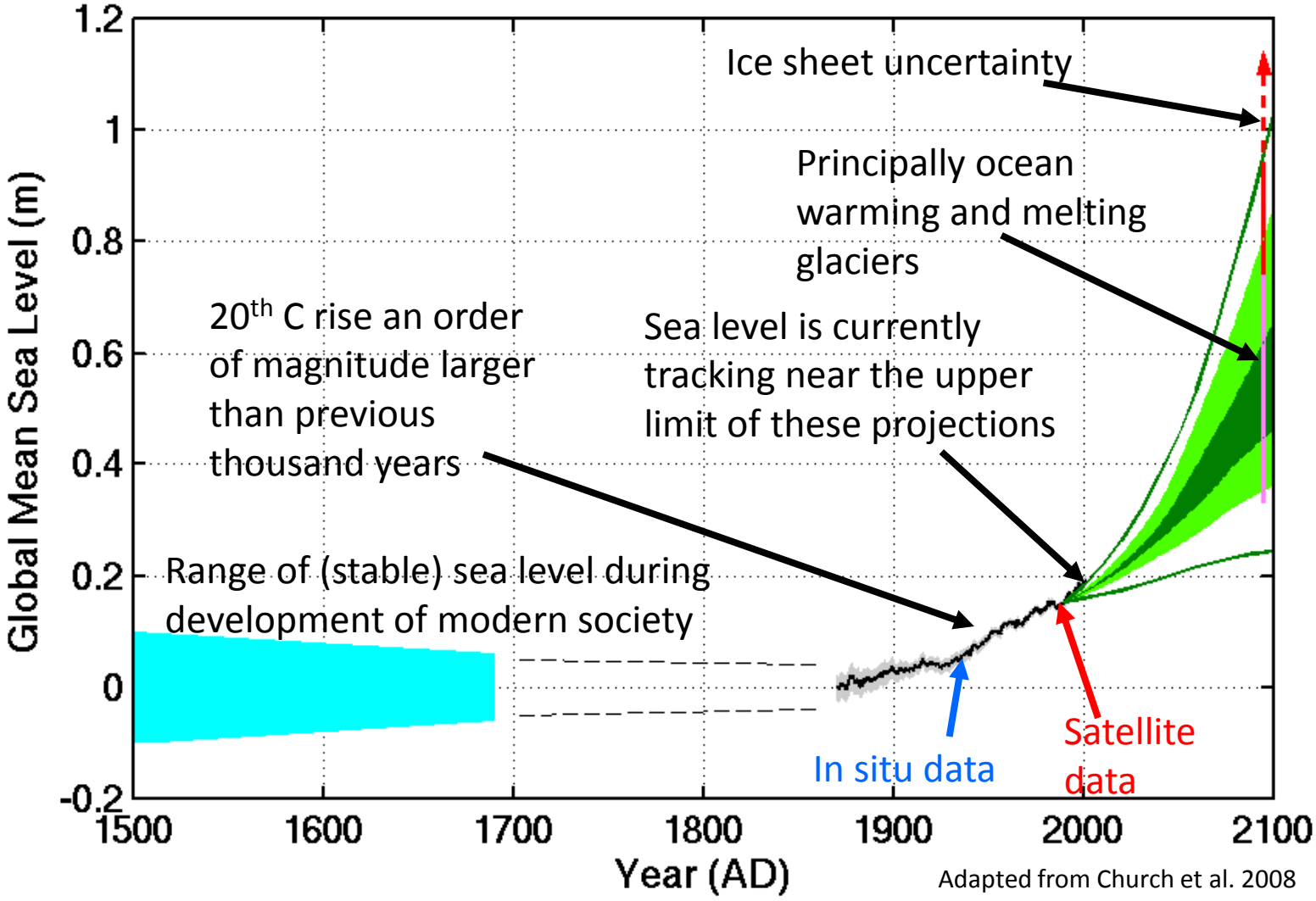
Today's Sea-Level Rise is Unprecedented



Adapted from Church et al. 2008

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Planning Challenges

Uncertain future

Overwhelming vulnerabilities

Financial constraints

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1. **Future emissions**
2. **Ecosystem response**
3. **Impacts to resources and communities**

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Planning Challenges

Uncertain future

Overwhelming vulnerabilities

Financial constraints

1. Densely populated coast
2. Substantial increases in the extent and frequency of coastal flooding
3. Increased risk of severe storm-related damage

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Planning Challenges

Uncertain future

Overwhelming vulnerabilities

Financial constraints

1. Costs of inaction are higher than those of adaptation
2. Communicating long term savings to decision makers

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Planning for Sea Level Rise: Coastal Policy

Table 1. Freeboard design recommendations for buildings and public infrastructure

Structure Classification[1]	Freeboard Height (feet)	Design Flood Elevation
Category 1 – Accessory structures	1	BFE + 1 foot
Category II – all residential	3	BFE + 3 feet
Category III – high occupancy buildings	4	BFE + 4 feet
Category IV – essential facilities (e.g., hospitals, fire, rescue, police, etc.)	4	BFE + 4 feet
Public Infrastructure – bridges, roadways, utilities, levees, etc.	5	BFE + 5 feet

[1] - Category I, II, III, and IV structures are defined in Rhode Island SBC-1 and SBC-2 and Table 1-1 in "Flood Resistant Design and Construction" American Society of Civil Engineers (ASCE/SEI 24-05, 2006)

Planning for Sea Level Rise: Visualizing Impacts

What will the future look like?

Flooding in Boston

Sea Level Rise in Delaware

CanVis in Rhode Island

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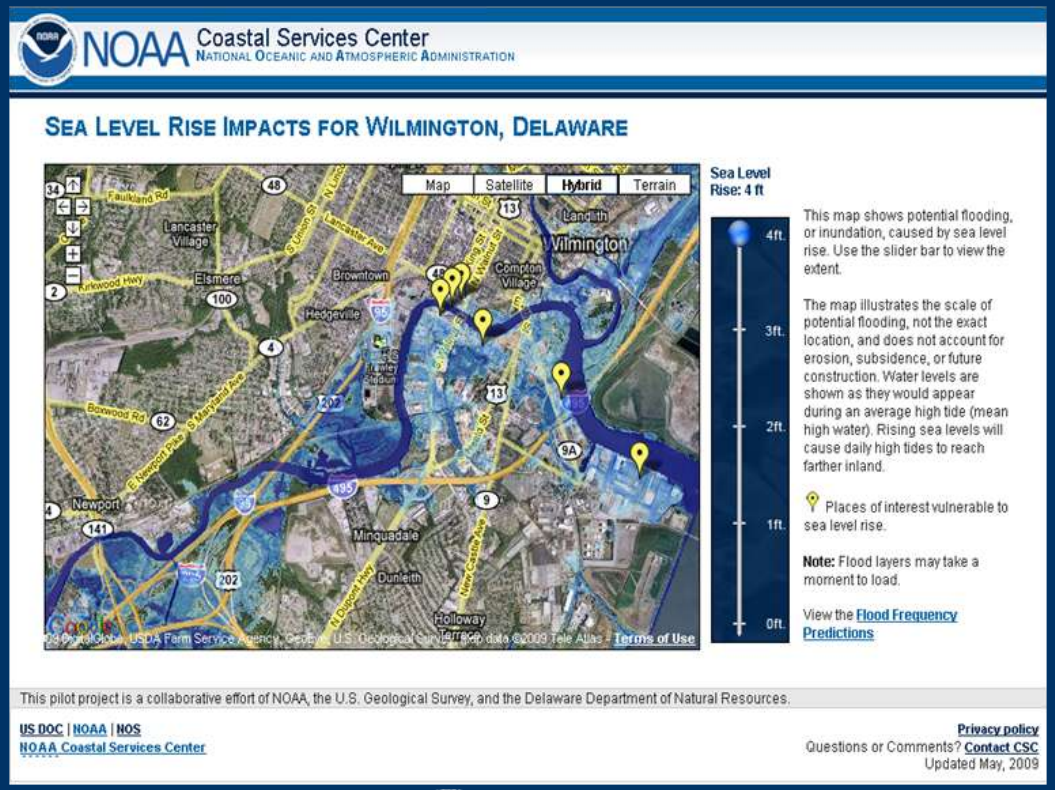

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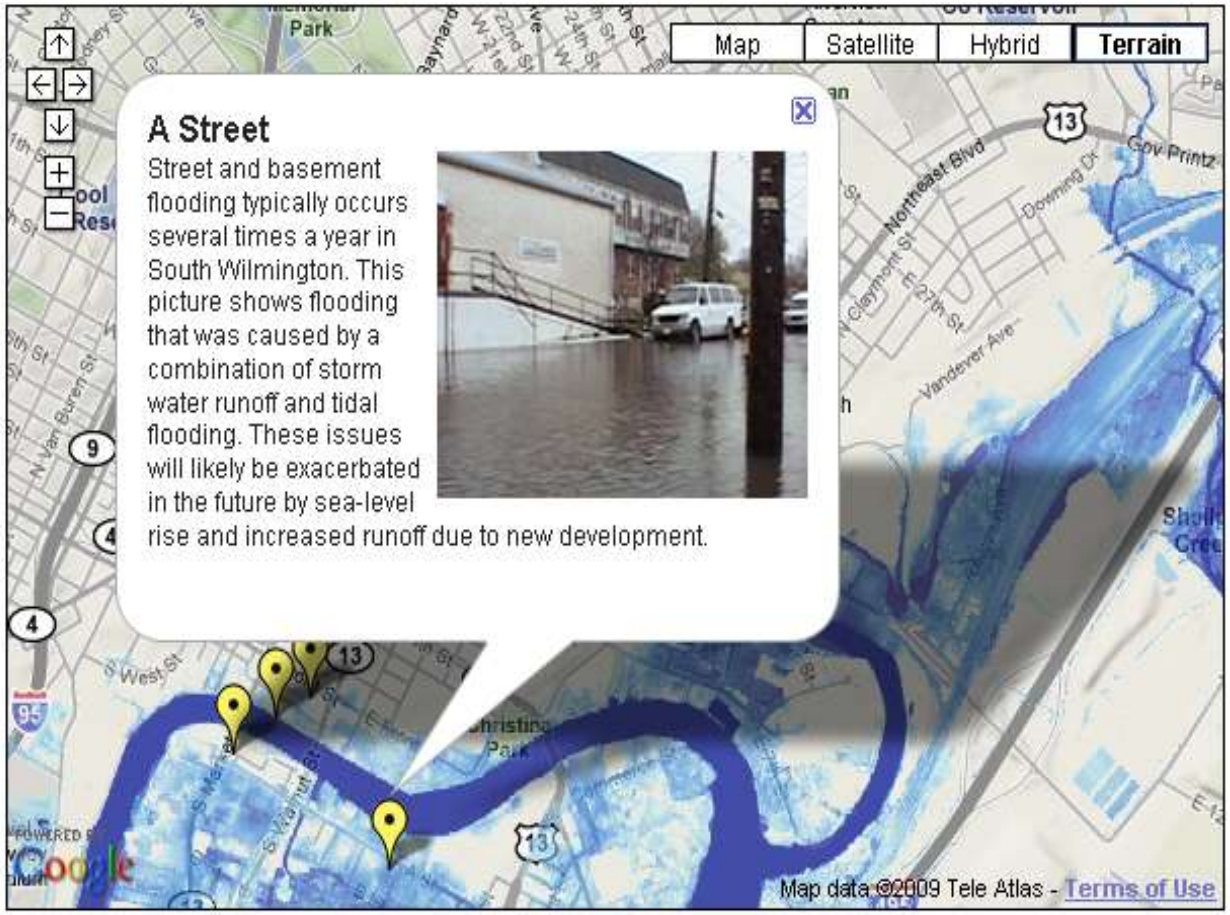
Sea Level Rise Impacts for Wilmington, Delaware



Sea Level Rise: 4 ft

Digital Coast Simulation Tool

This map shows potential flooding, or inundation, caused by sea level rise. Use the slider bar to view the extent.

The map illustrates the scale of potential flooding, not the exact location, and does not account for erosion, subsidence, or future construction. Water levels are shown as they would appear during an average high tide (mean high water). Rising sea levels will cause daily high tides to reach farther inland.

Places of interest vulnerable to sea level rise.

Note: Flood layers may take a moment to load.

View the **Flood Frequency Predictions**

This pilot project is a collaborative effort of NOAA, the U.S. Geological Survey, and the Delaware Department of Natural Resources.

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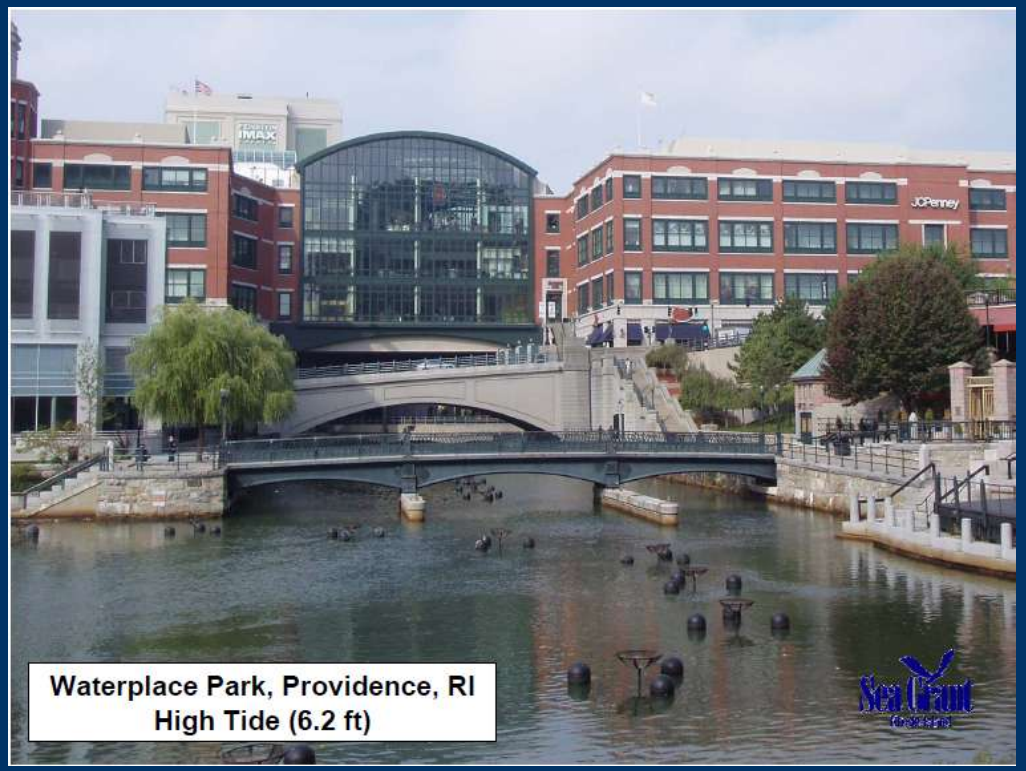

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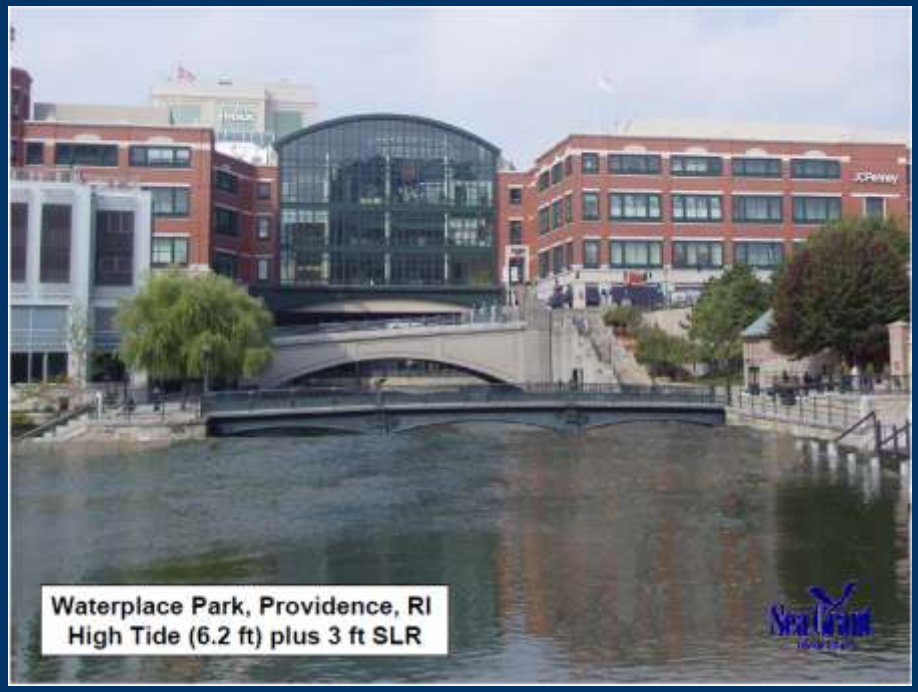

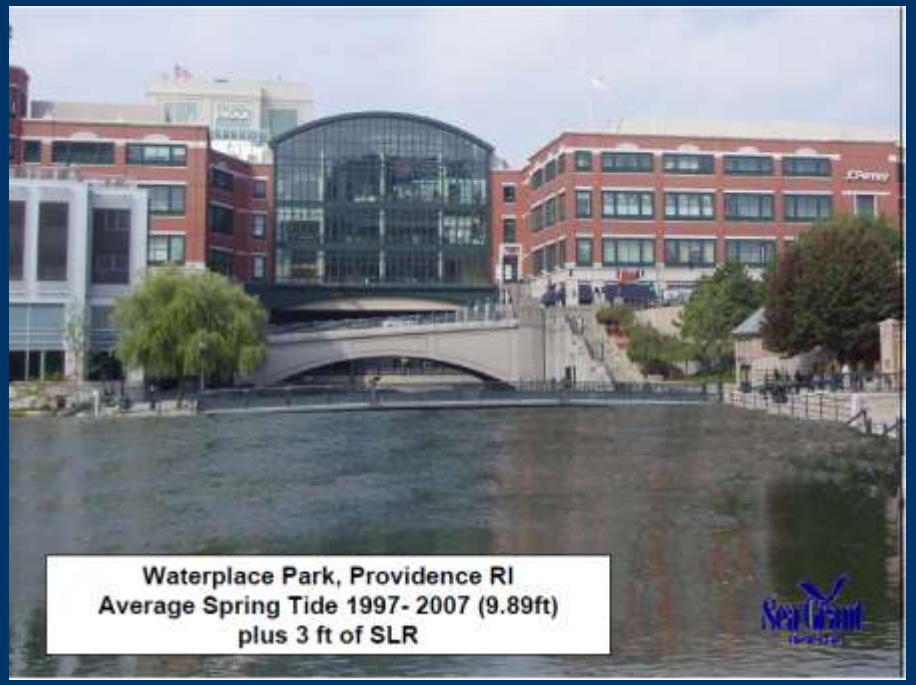

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NOAA Resources

- Sea Levels Online
- Sea Level Rise Impacts for Delaware
- CanVis
- Climate Adaptation Planning Guide
- NOAA Climate Portal

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Thanks!

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