

2ND ANNUAL
CAPE COASTAL
CONFERENCE

JUNE __6__



Linking Science with Local Solutions and Decision-Making

Climate Trends In New England and Its Impact on Storm Behavior; Riverine and Coastal Flood Impacts

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Objectives for this session:

- Part I: Looking at the bigger picture of a changing climate in New England and its impact on river flooding
 - Atmospheric Circulation & its role
 - Rainfall, Temperatures, Flood & Flash Flood Frequency
- Part II: Looking at Sandy – a classic “hydrbrid” storm
 - Atmospheric Chess-pieces
 - Why did we have so much damage on the south coast?
- Part III: Examining the region’s coastal vulnerability with respect to storm surge/coastal flooding

Part I: Examining Precipitation and Temperature Trends and the Atmospheric Circulation



Record flooding along the Fish and Saint John Rivers – northeast Maine, 4/30/2008



St-Jean-sur-Richelieu, Quebec, Canada, 5/6/11
Photo: AP//Canadian Press, R. Remoiz



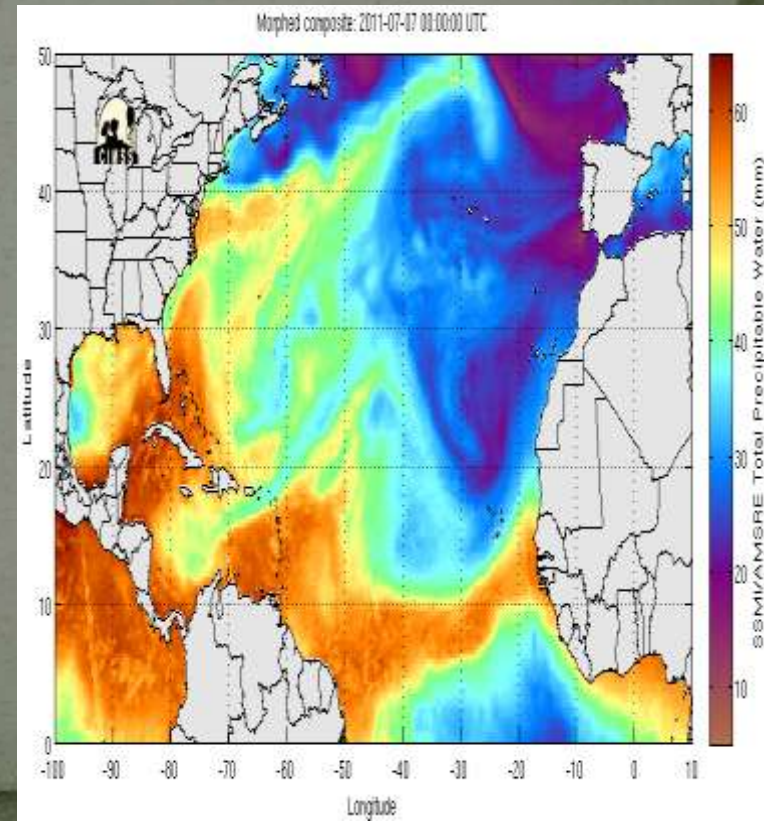
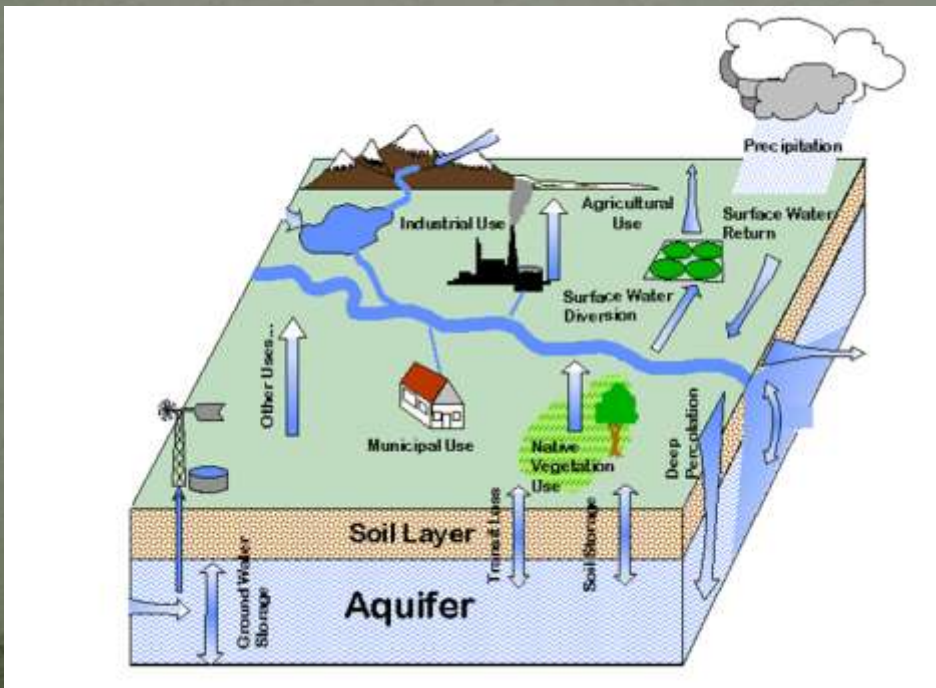
Providence Street – West Warwick, RI at 1030 am
Wednesday 3/31/10



Home washed off its foundation along the Schoharie Creek, Prattsville, NY – Tropical Storm Irene

Is there a common theme to recent ?

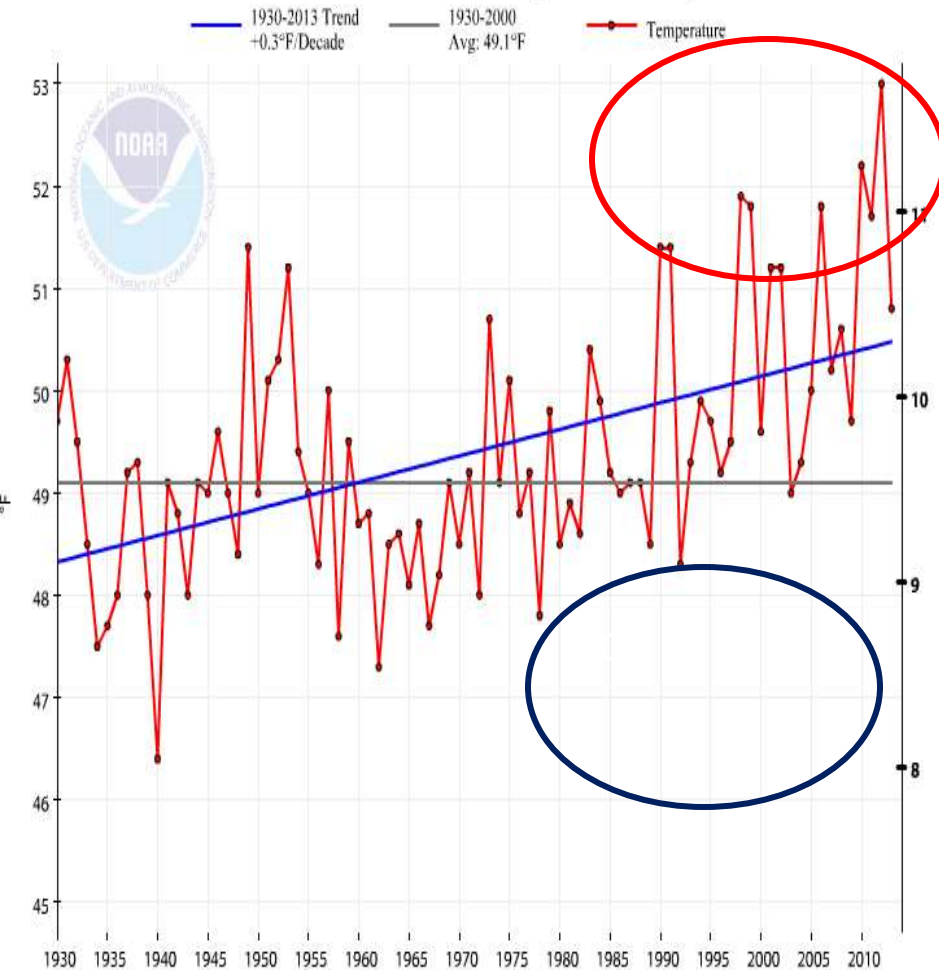
- Several:
 - Slow moving weather systems – a blocked up atmosphere
 - Multiple events in close succession or 1 or 2 slow movers
 - Resulted in saturated antecedent conditions before “main event”
 - Each fed by a “tropical connection”
 - Plumes of deep moisture



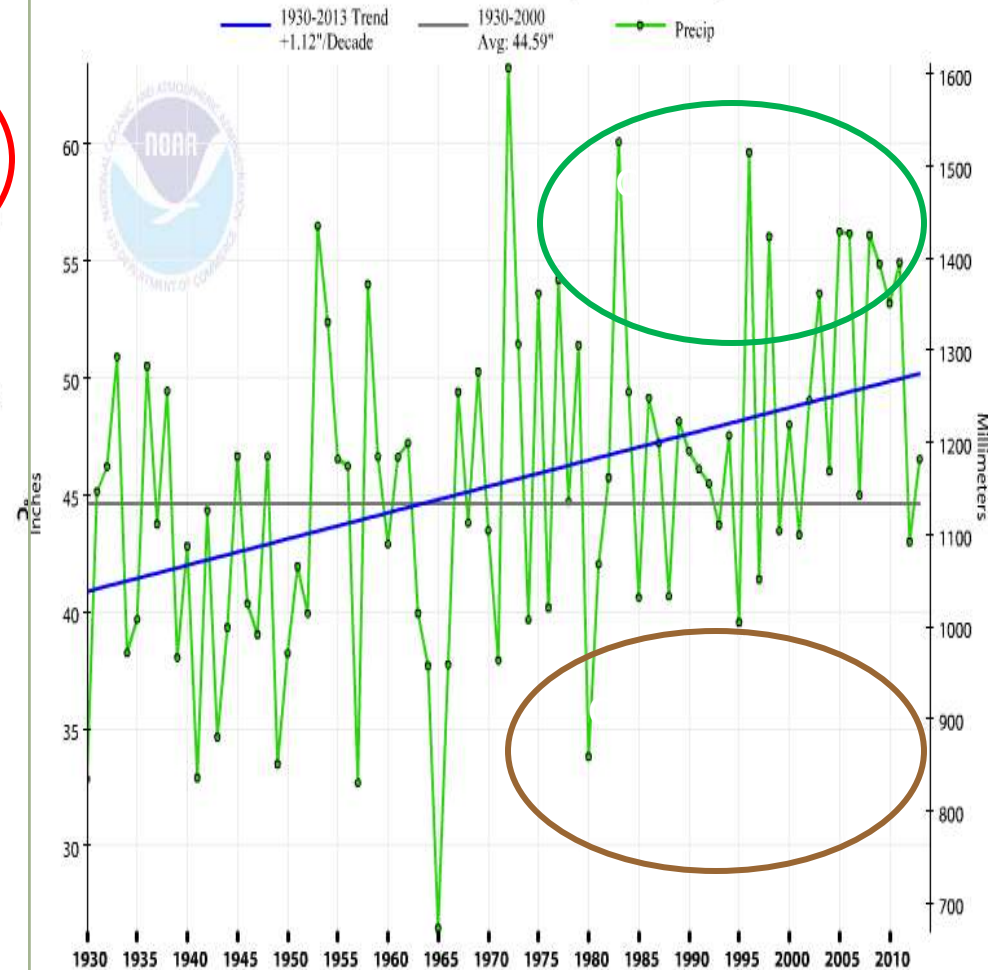
Flood Climatology/Flood Frequency

Warmer – Wetter – More Intense

Massachusetts, Climate Division 3, Temperature, January-December



Massachusetts, Climate Division 3, Precipitation, January-December

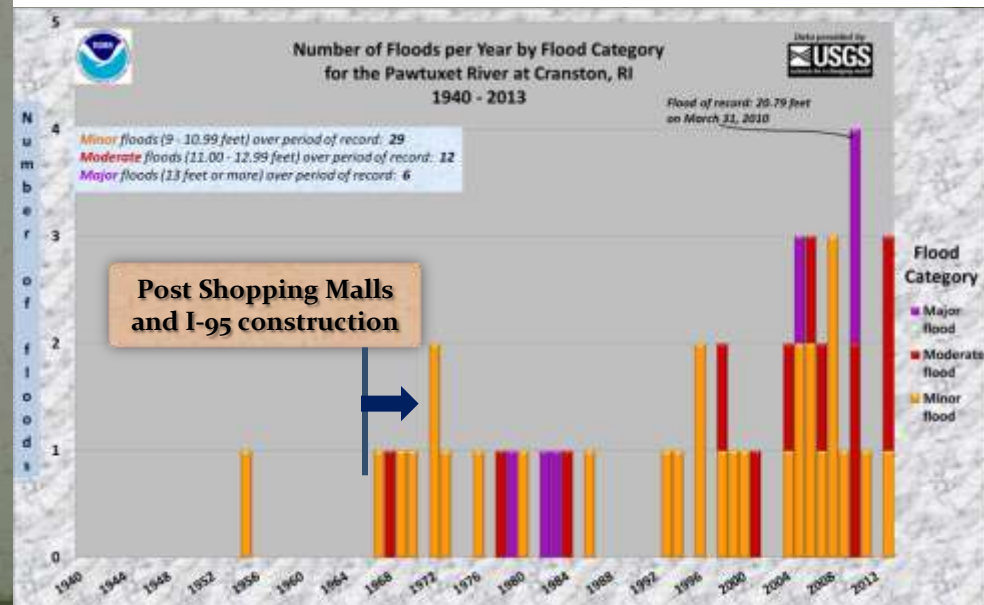
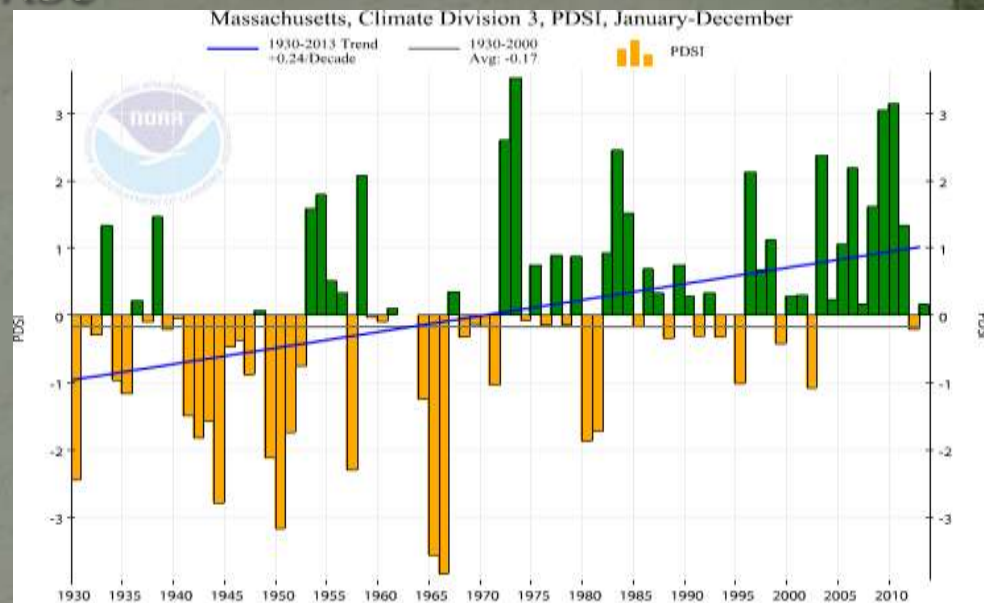


These trends illustrate a warmer and wetter regime in southeast New England

Flood Climatology/Flood Frequency

Warmer – Wetter – More Intense

- Increased flood frequency – and/or magnitude
- Most noticeable
 - In smaller watershed
 - Areas where there has been significant urbanization/land use change
 - Or in metro areas with very aged infrastructure
 - Fall River & New Bedford



Fall River Flash Flooding – 8/21/12
Photo: Right Weather

Part II: Coastal Vulnerability– Lessons to learn from Sandy



IRENE

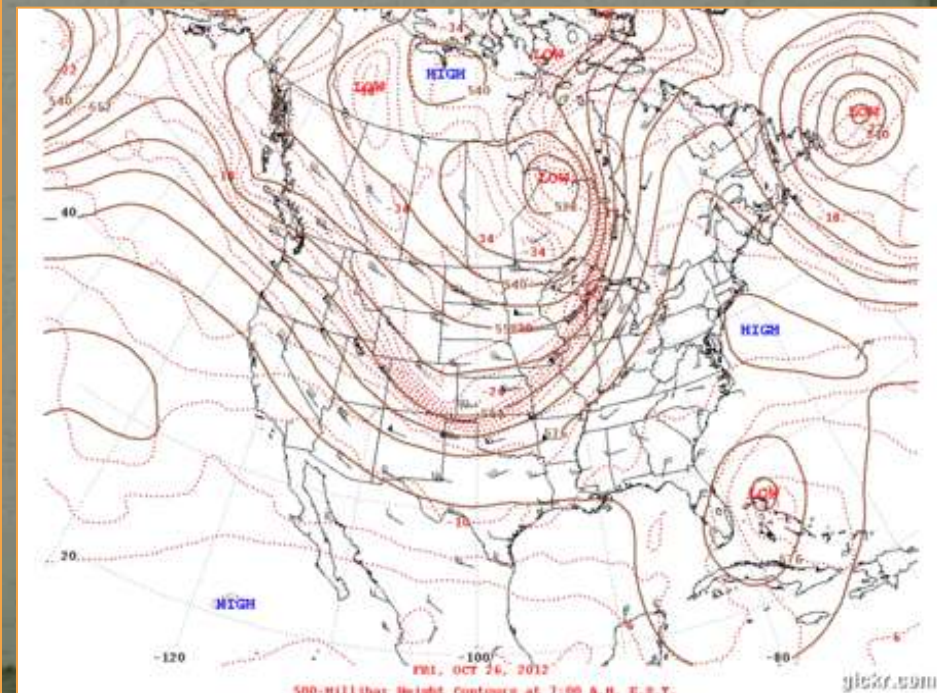
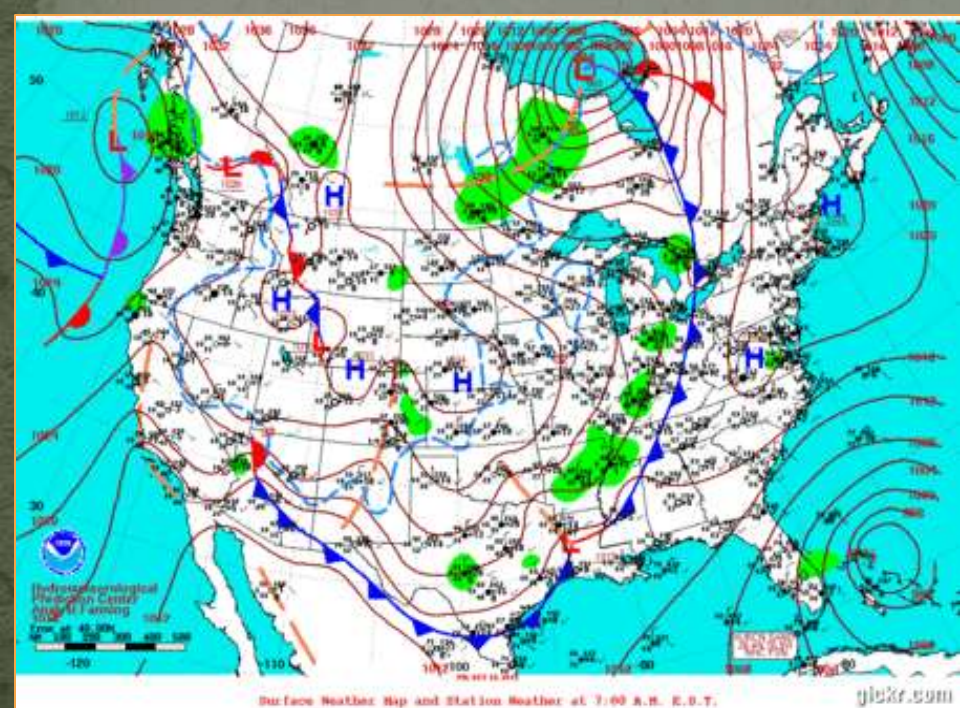


SANDY

- Irene: Widespread wind damage & power disruption in the east & devastating flooding rains in the west
 - “It’s all about the wind and rain!”
- Sandy: Significant coastal flooding but with less wind and little if any rain
 - “It’s all about the coastal flooding!”

Sandy: A Perfect Storm of Sorts

- Formed in the western Caribbean
 - Not at all unusual for late October
- Encountered a very deep trough of Low Pressure in the eastern United States and very strong High Pressure moving southward from the Canadian Maritimes
 - A winter-type dual jet stream set up (classic for a New England Hurricane)
 - Captured Sandy & blocked her attempt to race out to sea



Sea Levels Online

<http://tidesandcurrents.noaa.gov/sltrends/index.shtml>

East Coast

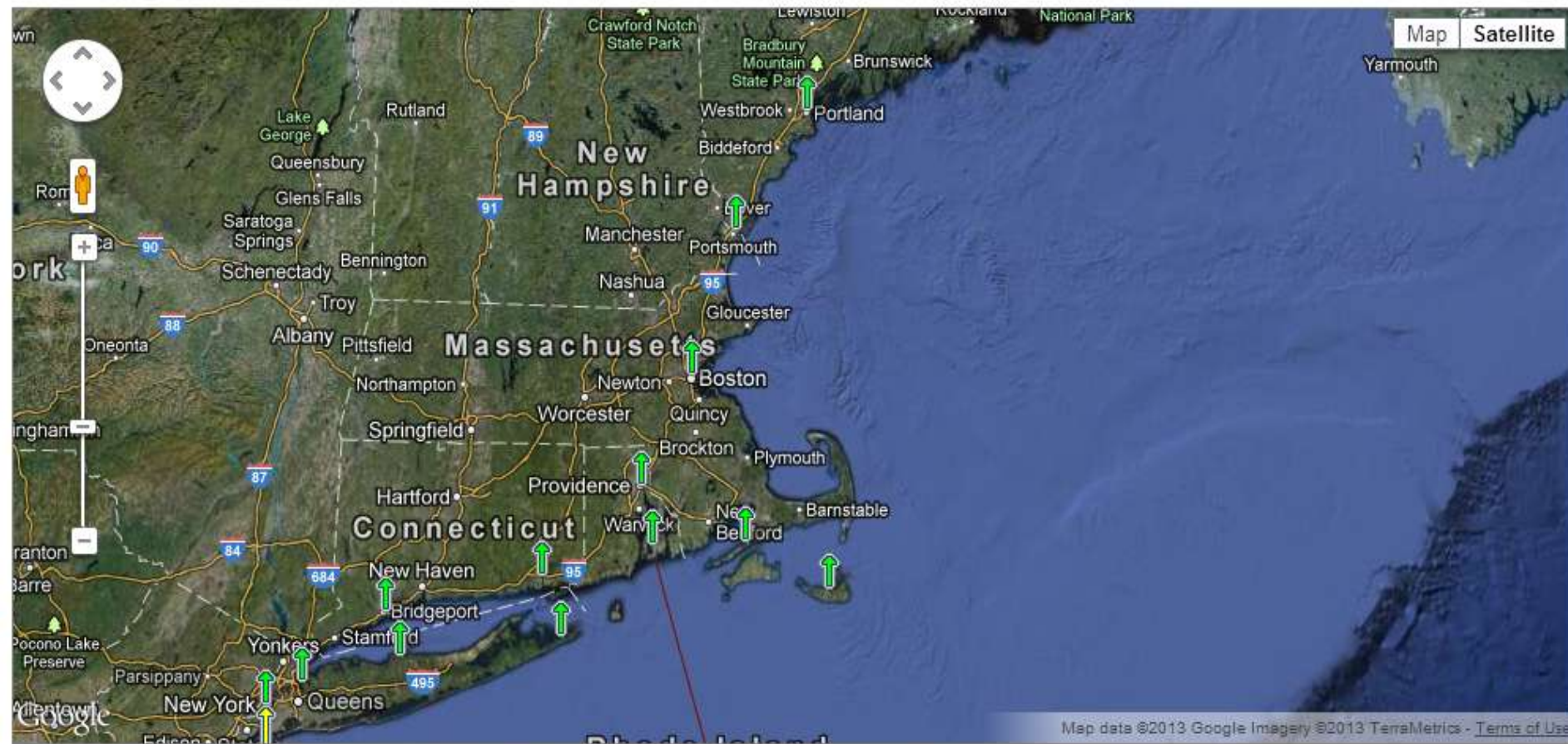
West Coast

Gulf Coast

Alaska

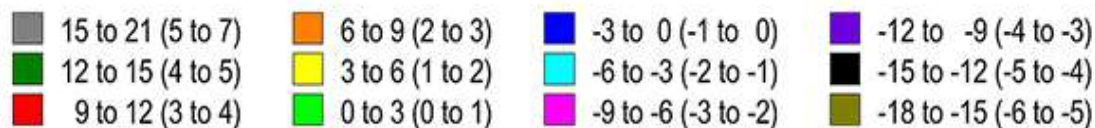
Hawaii

Global



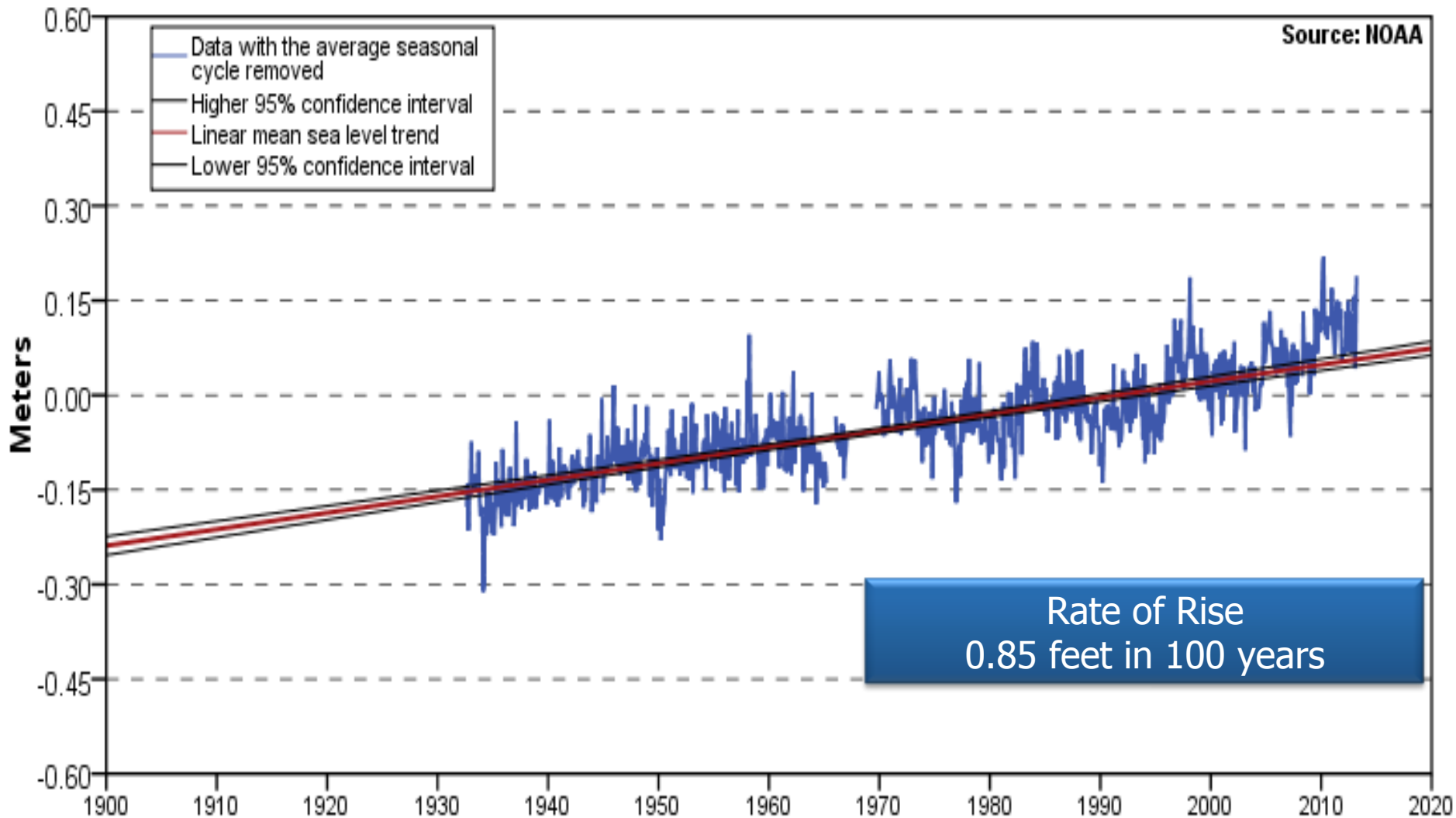
The map above illustrates regional trends in sea level, with arrows representing the direction and magnitude of change. Click on an arrow to access additional information about that station.

Sea Level Trends mm/yr (feet/century)



Woods Hole, MA

2.61 +/- 0.20 mm/yr



The mean sea level trend is 2.61 millimeters/year with a 95% confidence interval of +/- 0.18 mm/yr based on monthly mean sea level data from 1921 to 2006 which is equivalent to a change of 0.85 feet in 100 years.

Impacts of Frontal Erosion 1939-2012 - Browning Cottages, Moonstone Beach, RI



Superstorm Sandy - Browning Cottages



30 Oct 2012

<http://fema.maps.arcgis.com/home/webmap/viewer.html?webmap=>

Misquamicut Before Sandy



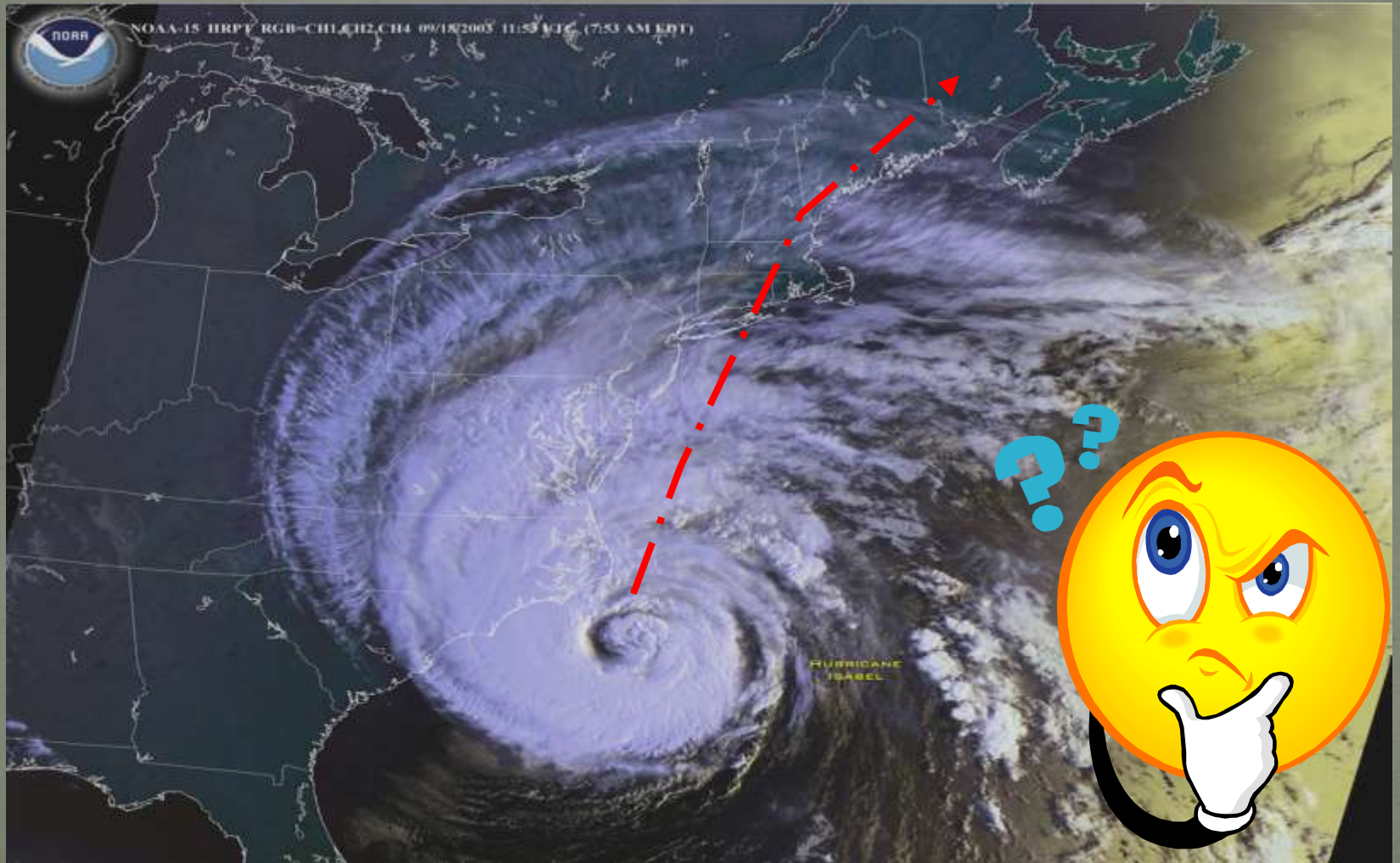
Misquamicut After Sandy



There's a reason why that step ends their!

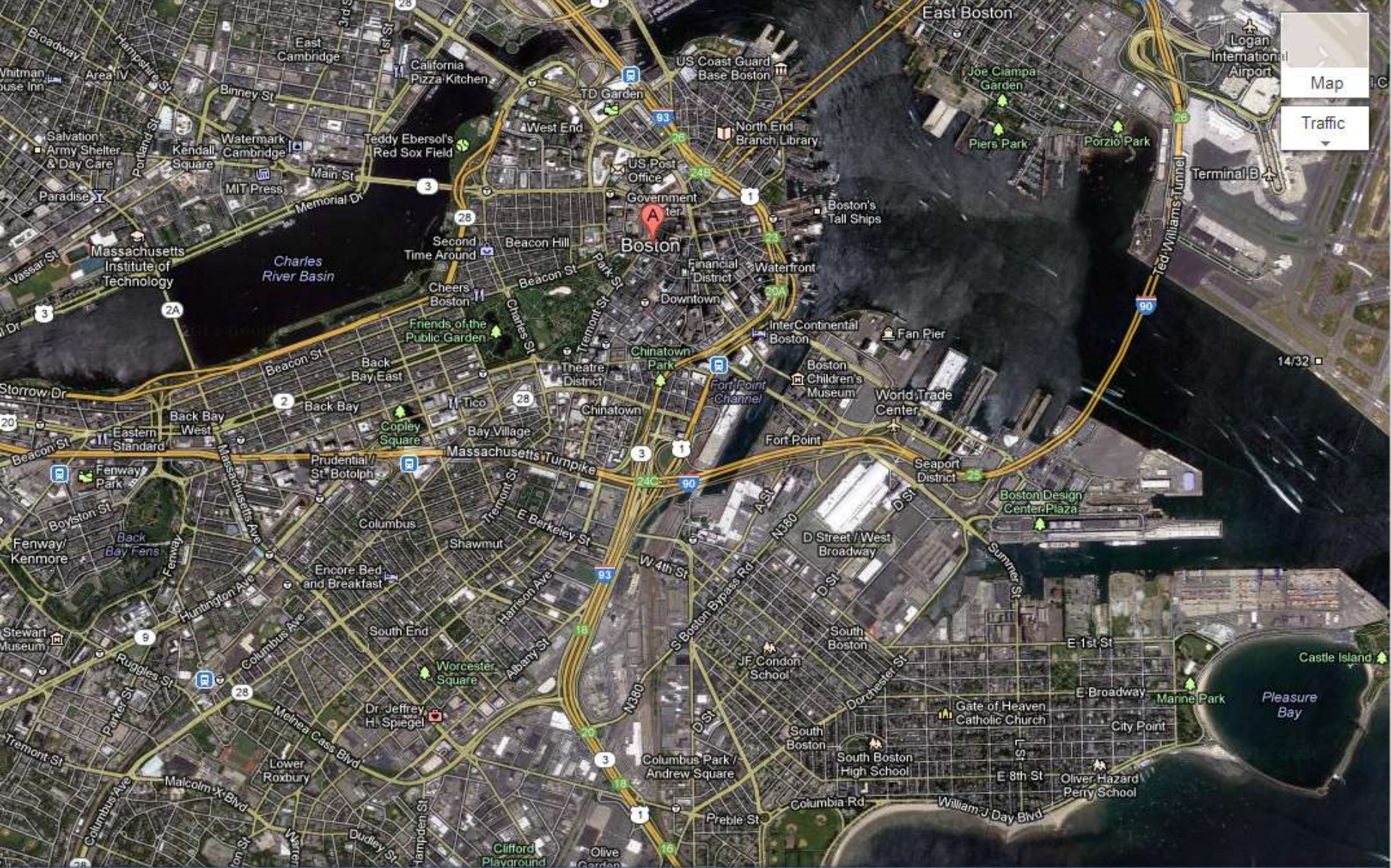


Part III: What is our Coastal Vulnerability



So What Might This Look Like?





While the Probability is Low
Impact Would Be Devastating!

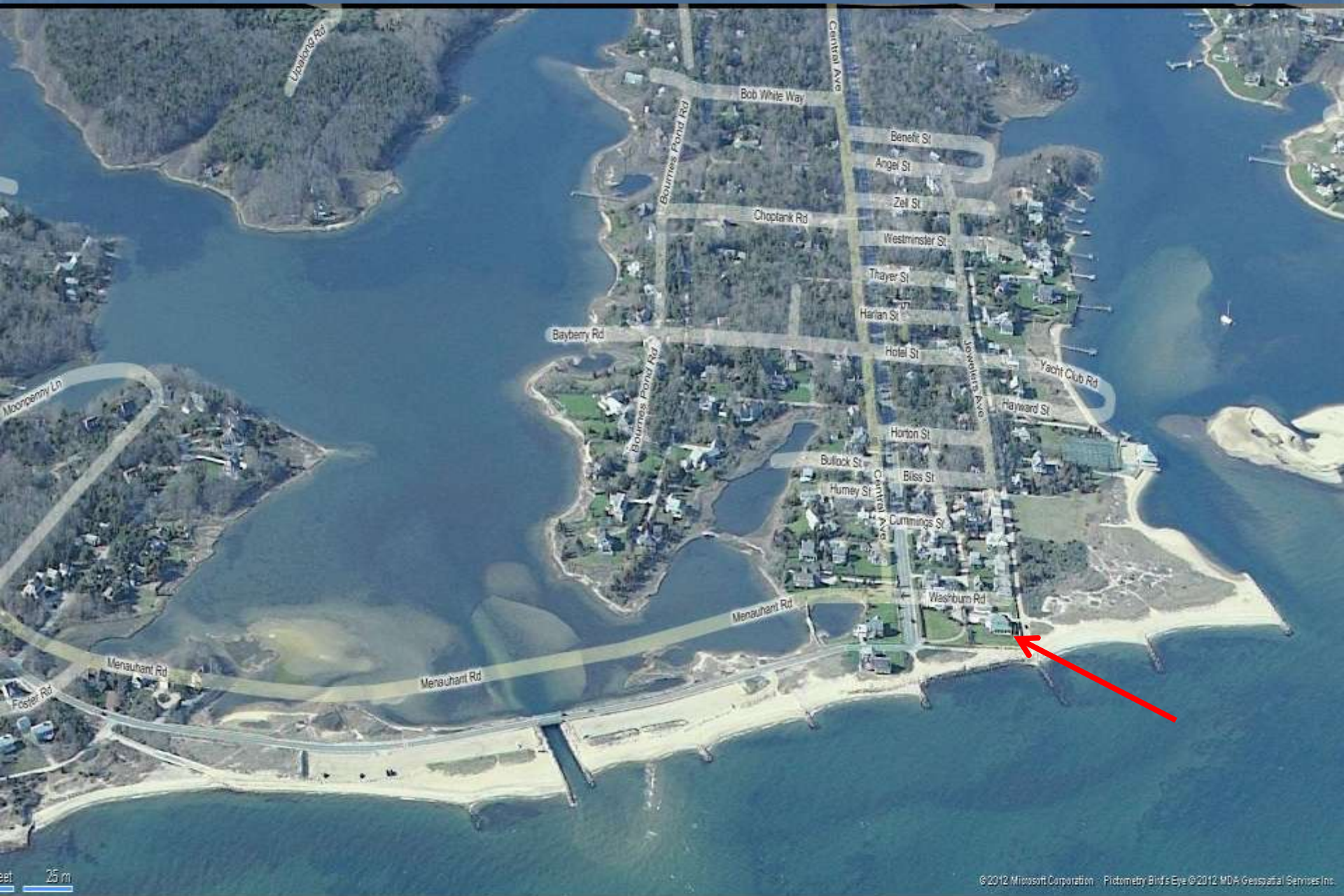
Let's take a trip to the Menauhant section of
Falmouth, Massachusetts



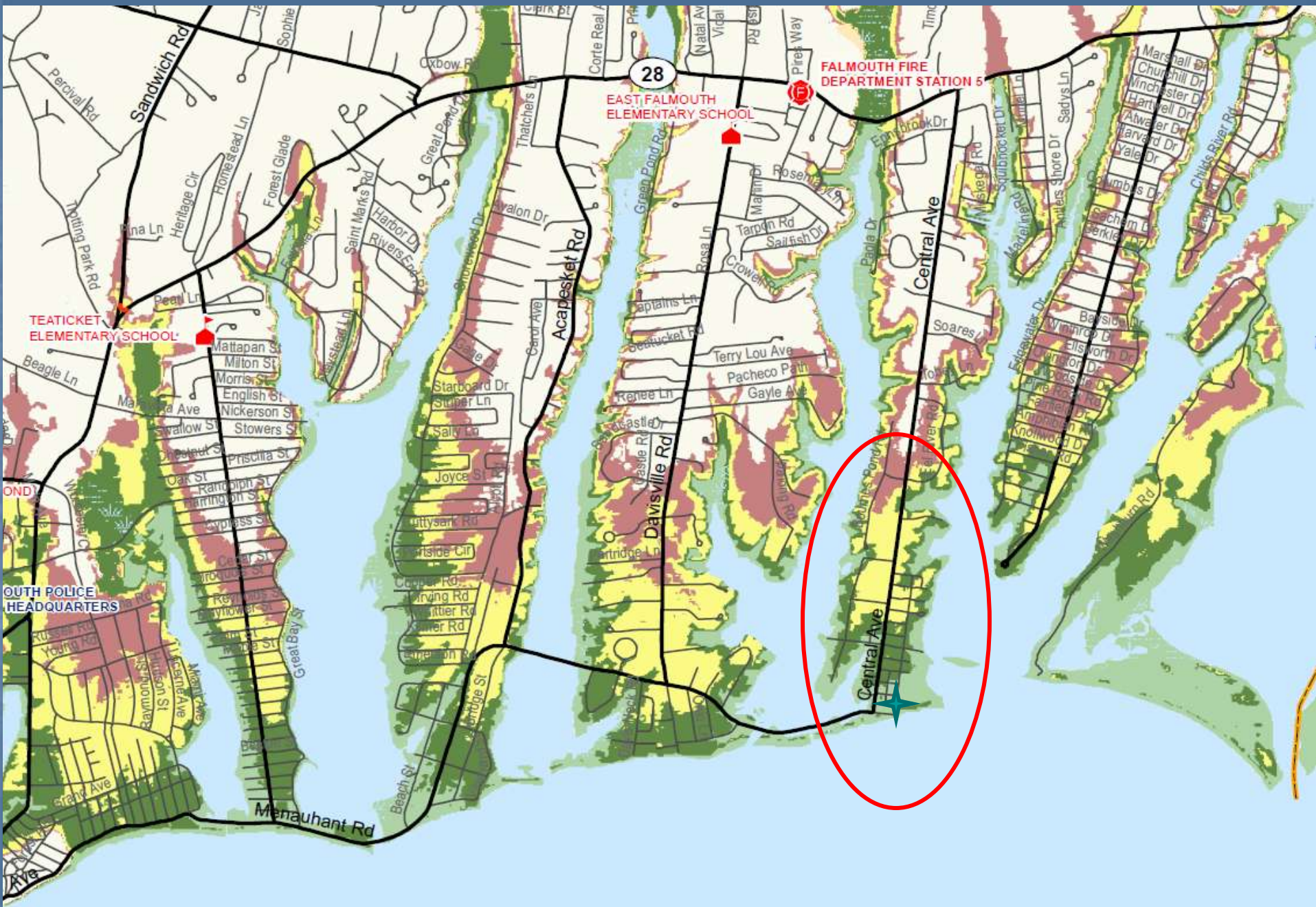
Hurricane Bob's Six Foot Storm Surge!



As it is today...



So What's The Real Potential?



Summary



IRENE



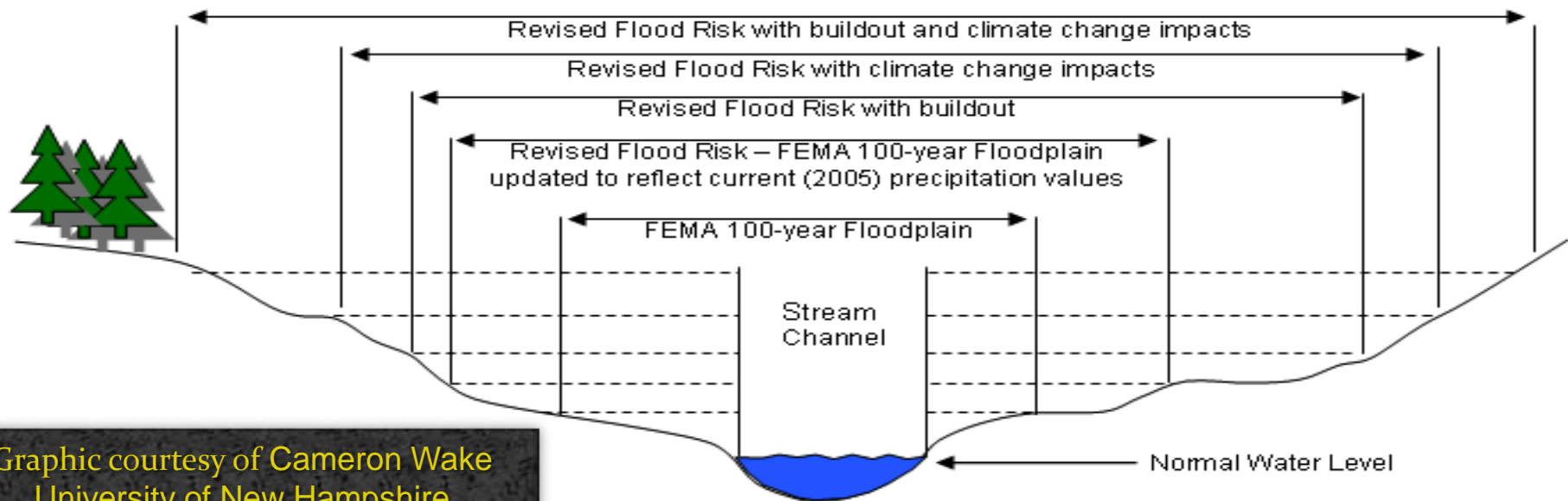
SANDY

- We are a tremendously vulnerable region
 - Planning is of the utmost importance – it must reflect storm events that will undoubtedly far exceed the damage from Irene & Sandy
- Shifts in precipitation frequency & inland flood behavior
- Impacts of Sea Level Rise and Erosion
 - Consider: Category 2 Hurricane producing inundation & damage comparable to what a Category 3 would have done 50 years ago!

Far reaching implications:

Protect, Adapt or Retreat???

- Floodplain, land use, infrastructure, dam spillway requirements, drainage requirements, non-point source runoff, bridge clearances, “hardening” of critical facilities in the floodplain, property values etc...
- Flood Insurance – work to increase participation
- How much risk are we willing to insure and accept?



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A photograph of a coastal scene. In the background, there are two houses built on stilts. The house on the right is a two-story grey house with white trim and a blue oval sign above a window. The house on the left is a white house. In the foreground, a red and white motorboat is on a sandy beach. Several colorful surfboards (red, blue, green) are stuck in the sand. A piece of driftwood lies on the sand. The sky is overcast.

THANK YOU!

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