

Coastal Flooding and Erosion Forecast

Riley Young Morse
Gulf of Maine Ocean Observing System

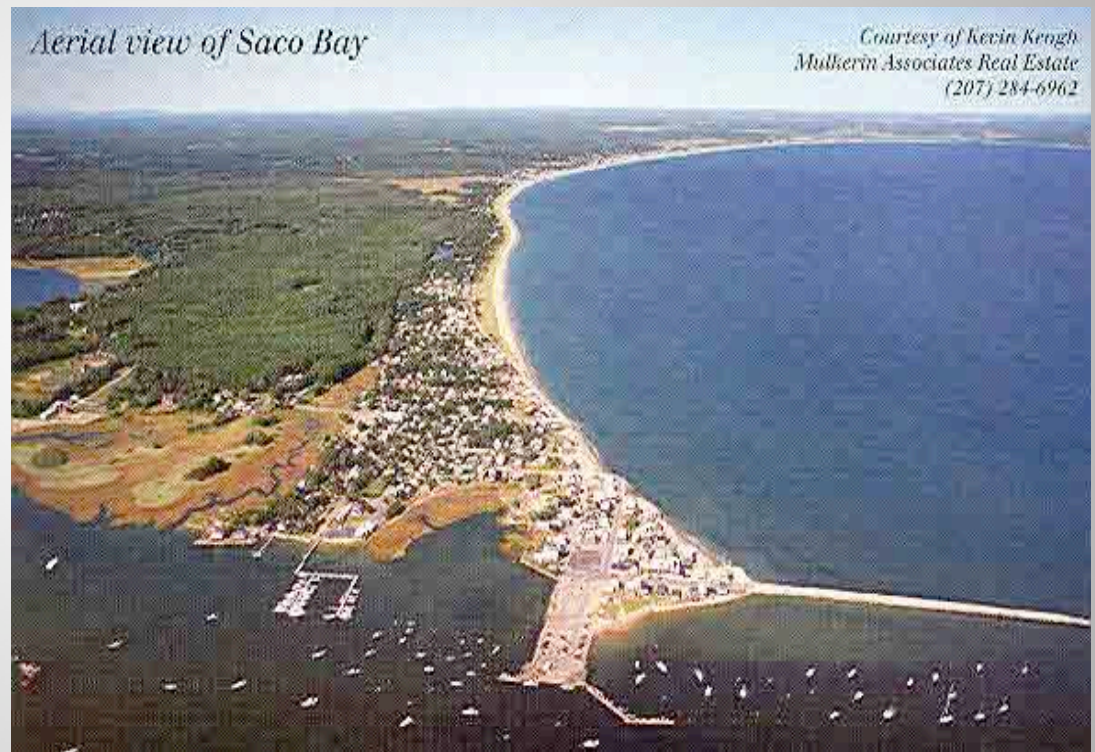


Northeast Region
Coastal Hazards Workshop
November 19-20, 2008
New London, Connecticut

Saco, Maine

...on a good day

- “Splash-over” can lead to severe damage (even more than inundation)
- More common than coastal flooding
- Often confined to most vulnerable locations south of Portland
 - Examples: Camp Ellis, Gooches Beach, Mother’s Beach, York Beach, Rye Beach etc.



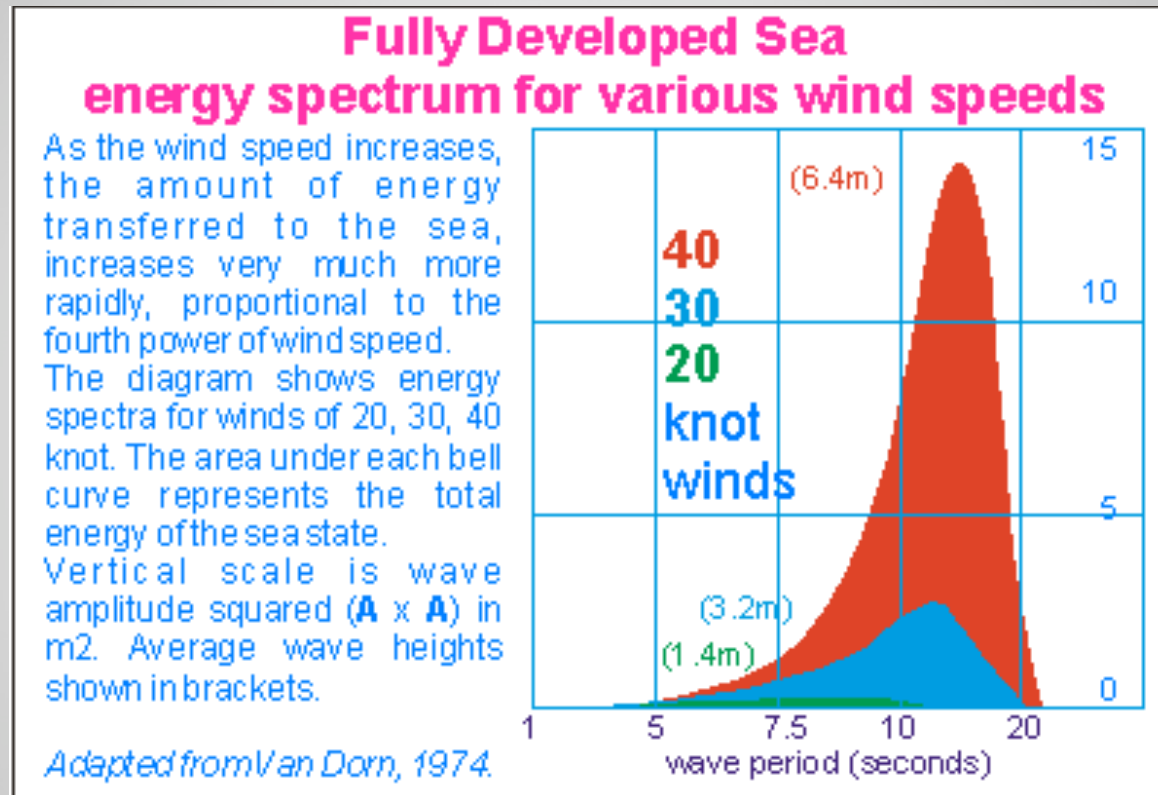
Saco, Maine

...on a bad day



Splash-over Damage
Spring 2005

We know strong winds (and time) produce high energy waves



So...What is the Relationship Between Large Waves and coastal Flooding?

...As Wave Heights and Storm Tides Increase...
the threat of Coastal Flooding also increases

Coastal Flooding and The Relationship between High Storm Tides and Large Ocean Waves

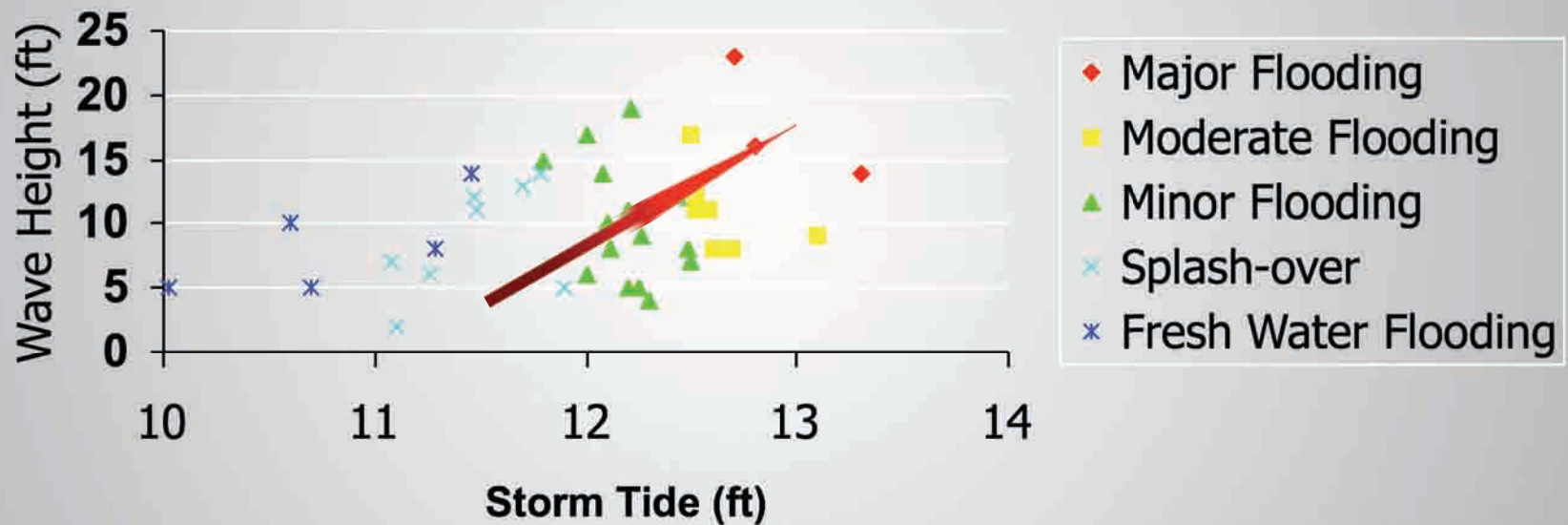


Figure 8: The empirical relationship between storm tide, waves and coastal flooding (1980-2007).

...Also...as wave heights increase...damage due to “splash-over” can occur with tides below flood stage...

Coastal Flooding and The Relationship between Storm Tide and Large Ocean Waves

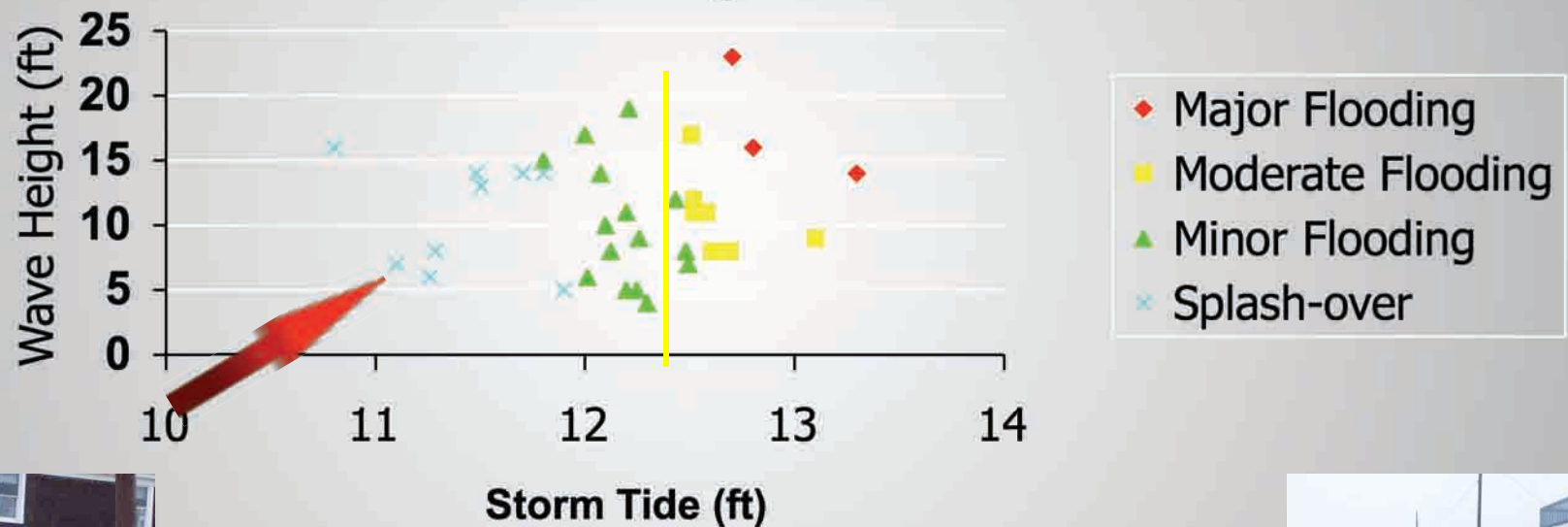


Figure 8: The empirical relationship between storm tide waves and coastal flooding (1980-2007).



Problem: How do we communicate complex forecasts of splash-over and damage potential on one diagram to...

- Emergency managers
- Public
- Meteorologists/Geologists/Oceanographers, etc.

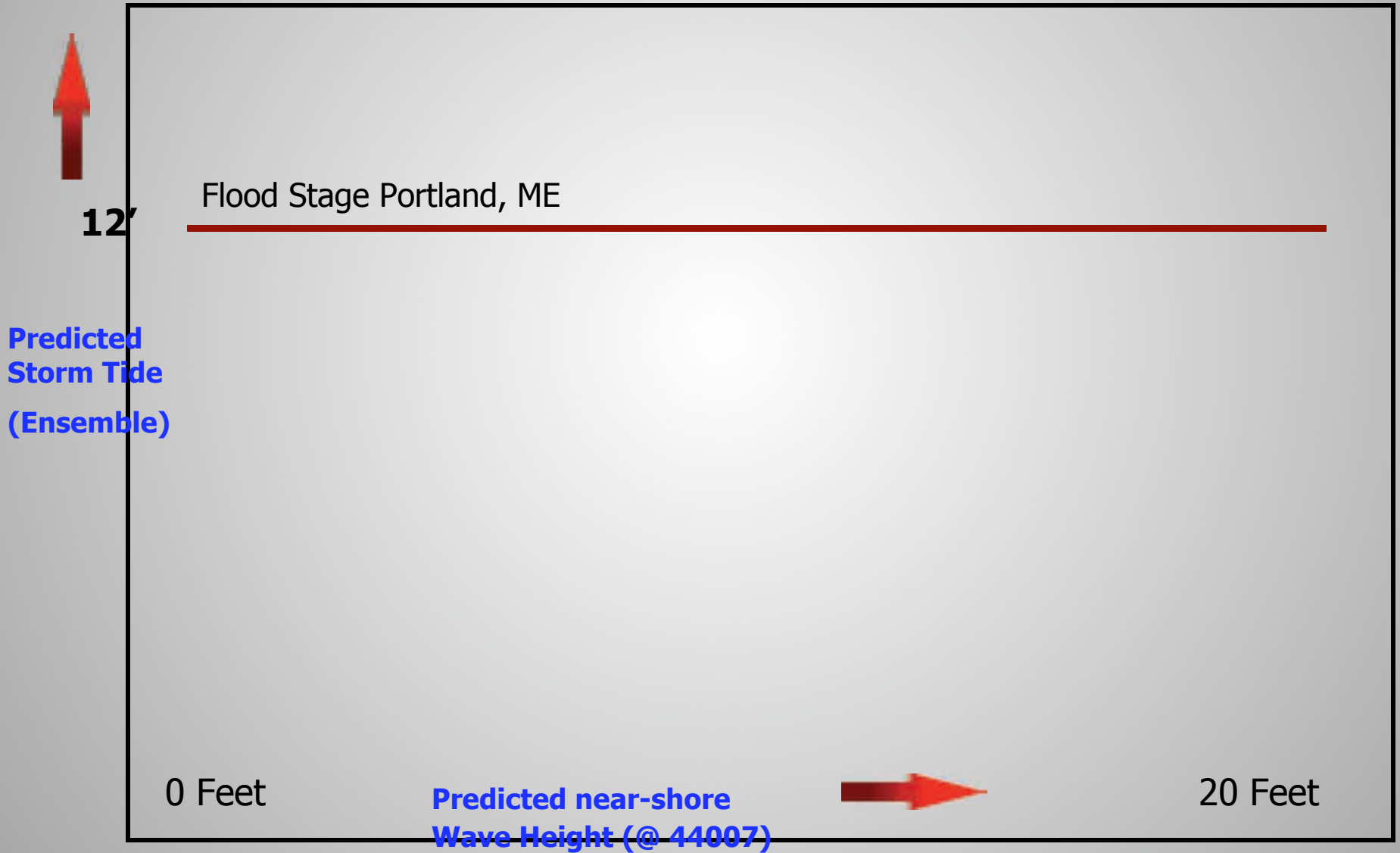


York Beach, Maine



Saco, Maine St. Patrick's Day (2007)

Goal: Graphically Depict the damaging effects of both storm tides and large ocean waves

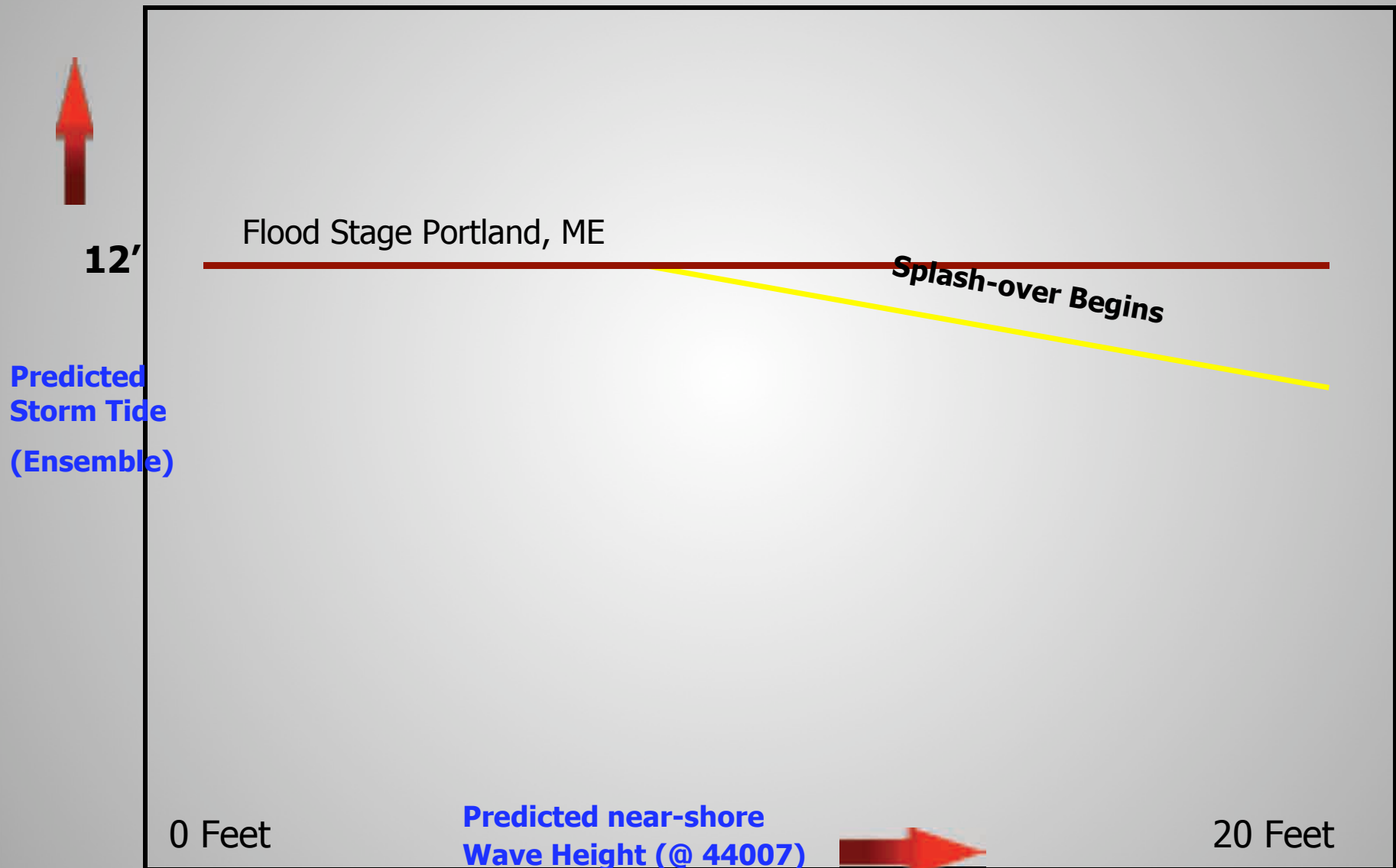


*** Table: Known combinations of storm tides (below flood stage) and wave heights that resulted in “Splash-over” damage (ME/NH)**

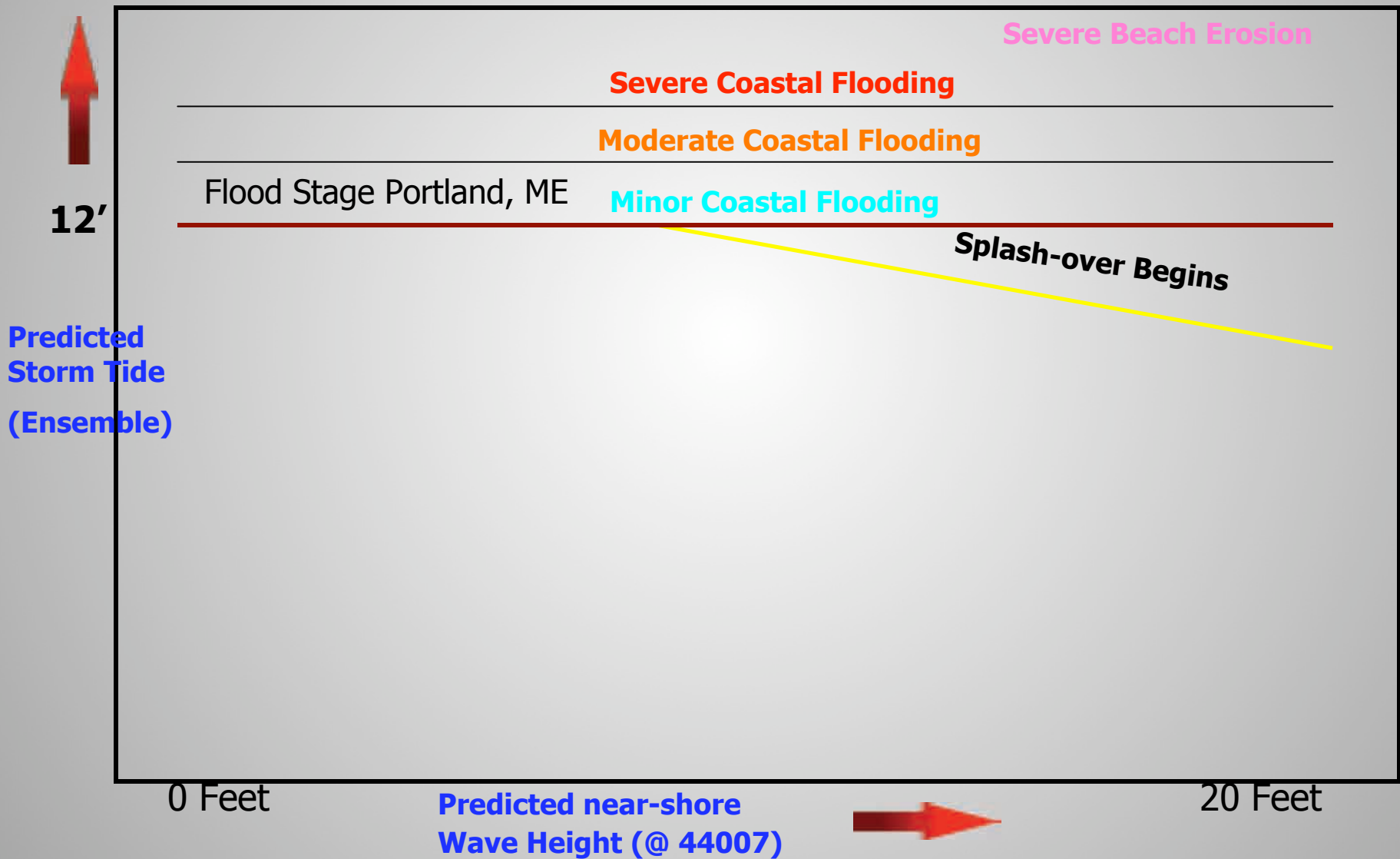
<u>Date</u>	<u>Near-shore waves</u>	<u>Coinciding Storm Tide (Below FS)</u>
3/4/91	7'	11.08' (Portland Harbor)
1/4/94	6'	11.26'
3/6/97	5'	11.91'
10/10/98	8'	11.28'
9/29/03	14'	11.48'
4/3/05	14'	11.68'
5/7/05	13'	11.48'
10/25/05	16'	10.77'
3/13/07	14'	11.80'
12/16/07	16'	11.17'

* Frequency of occurrence higher than limited database would suggest

Add a Benchmark for the onset of damage due to wave action



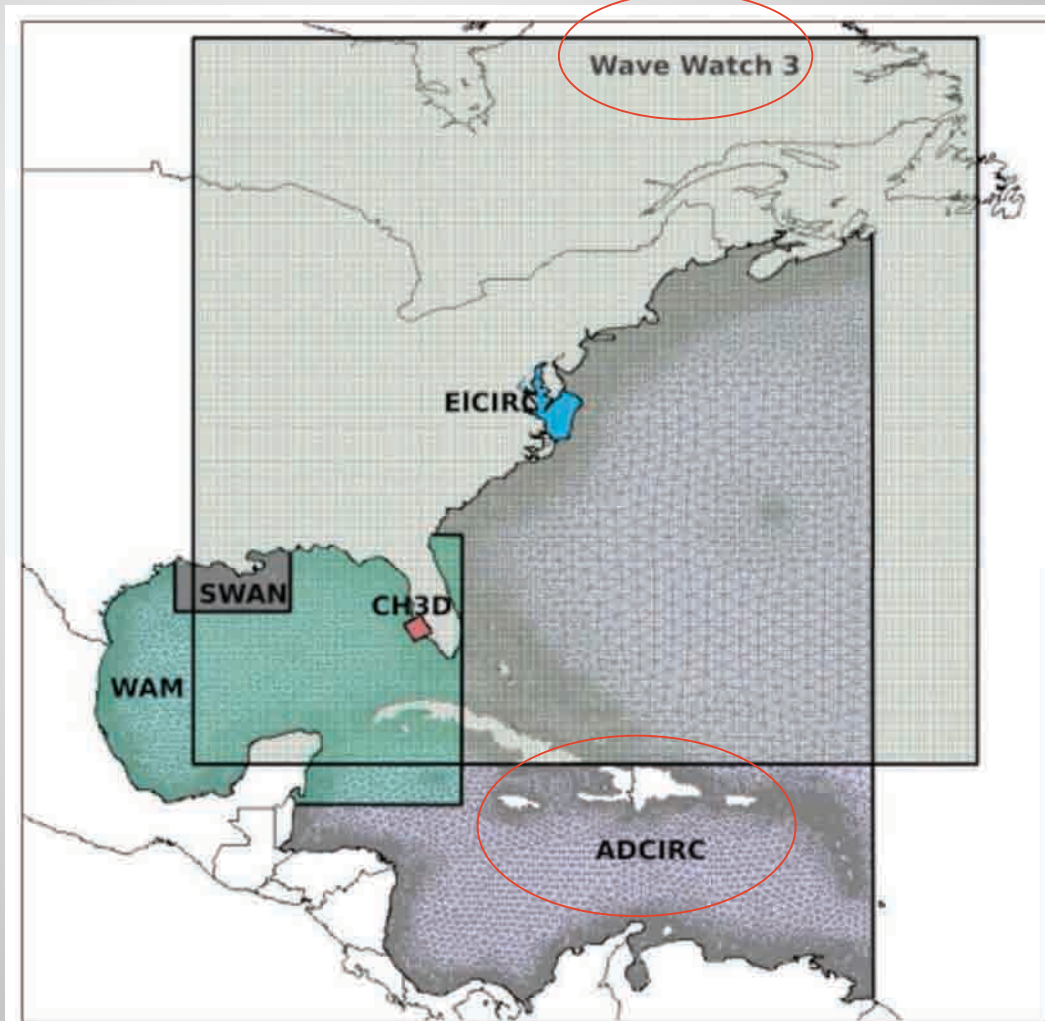
Next: Add categories of coastal flooding and beach erosion from the climatology.



The Scientific Community

An Ensemble of Wave & Surge Models

SCOOP supports a variety of coastal wave, surge, and water-level models along the Atlantic and Gulf Coasts



Patriots' Day Storm 2007

A Working Prototype Coastal Flood Nomogram:

Available at www.GoMOOS.org/coastalflooding

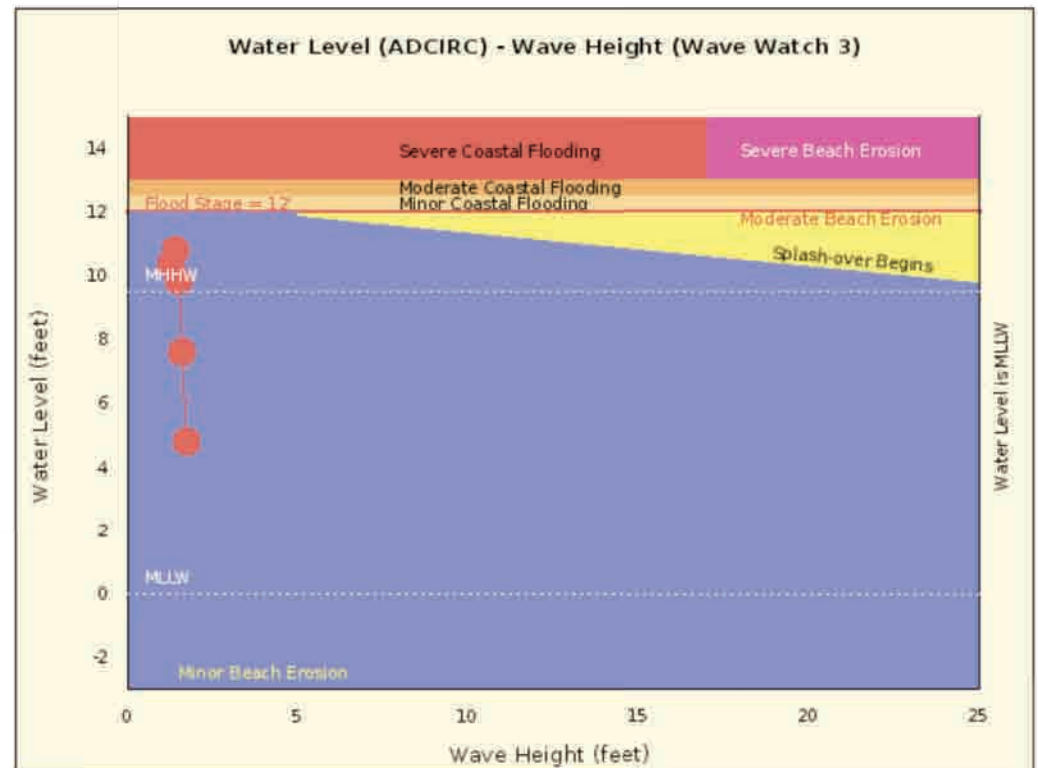


- Four high tide cycles with waves greater than 20'
- Combination caused tremendous damage during the storm
- Forecast predicted days in advance there was a high likelihood of this happening

Coastal Flooding and Erosion Forecast

Water Level & Wave Height Interaction Nomogram:

[Nomogram](#) | [How to read nomogram](#) | [Project Overview](#)



<< >> ▶ ■ FASTER SLOWER

04/15 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

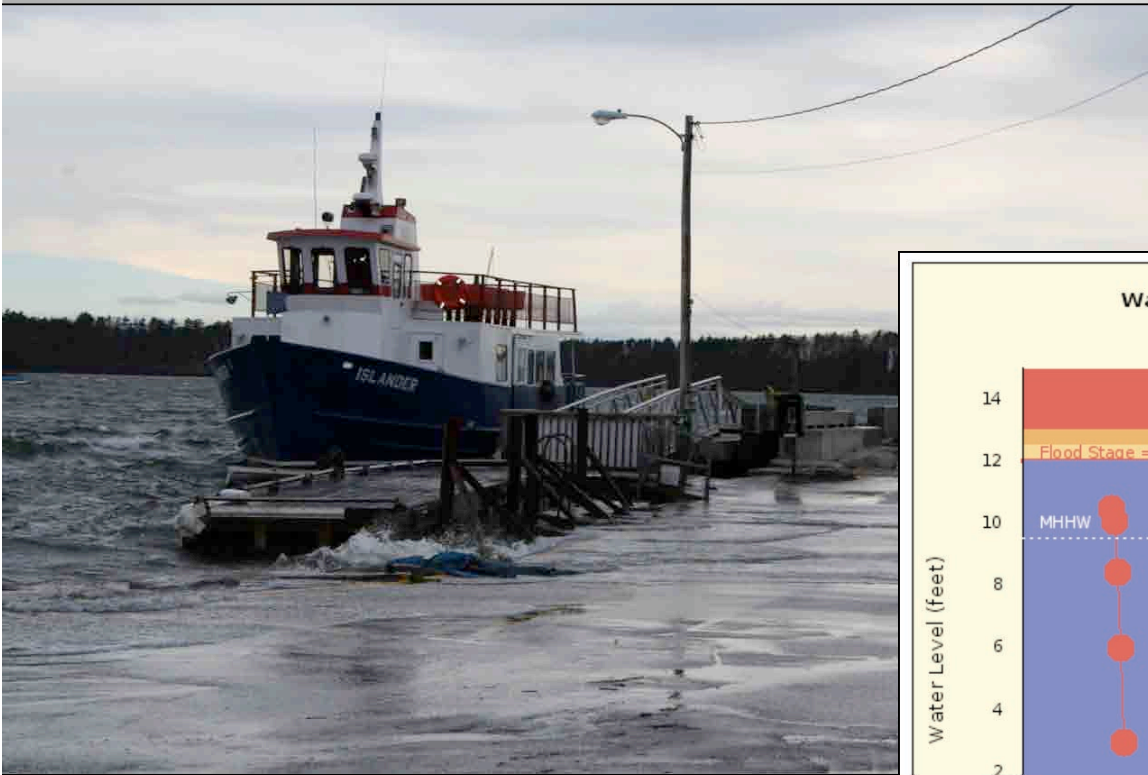
04/16 00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00

04/16 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

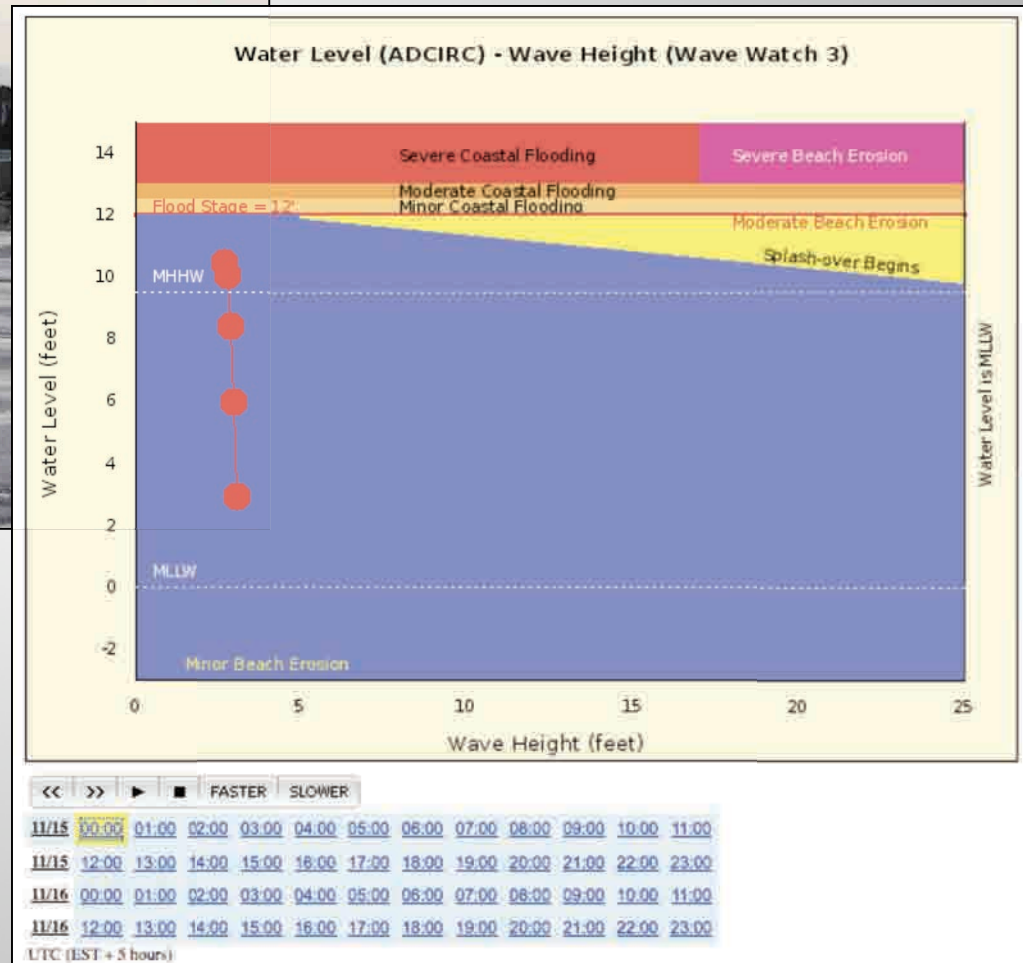
04/17 00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00

UTC (EDT + 4 hours)

Just Another Storm, November 15-16, 2008



- Forecast was for a high water level event, with minimal waves (Coastal Flooding)
- Targeted forecast to low-lying areas that would be impacted by high water level



Next Steps...

- Developed prototype for Scituate - needs fine tuning (more storm data!)
- Add real-time observation data to validate models
- Add additional forecasts - beach erosion
- We can roll this out in other areas in the Northeast - just requires input (storm data) and interest/need!



Thank you to our Partners

- John Cannon, National Weather Service, Gray, ME
- Will Perrie, Bedford Institute of Oceanography, Halifax, NS
- Brian Blanton, Renaissance Computing Institute, Chapel Hill, NC
- The entire SCOOP Team at SURA
- NERACOOS

