

# **DELAWARE'S VULNERABLE COASTAL AREAS**

**and the**

# **DELAWARE INLAND BAYS and DELAWARE BAY RECONNAISSANCE STUDY**

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**Delaware Dept. of Natural Resources & Environmental Control**  
**Division of Watershed Stewardship**  
**Shoreline & Waterway Management Section**



- **Shoreline & Waterway Management Section**
- **Hurricane Sandy**
- **Post-storm Recovery – USACE**
- **North Atlantic Coast Comprehensive Study**
  - **Delaware Inland Bays and Delaware Bay  
Reconnaissance Study**
- **Vulnerable Areas**





# Division of Watershed Stewardship

Shoreline & Waterway Management Section

Beach Preservation Act of 1972

Beach Management Area

Beach Preservation Fund



# Coastal Construction Regulatory Program

## Shoreline Stabilization

## Technical Services

## Navigation/Dredging

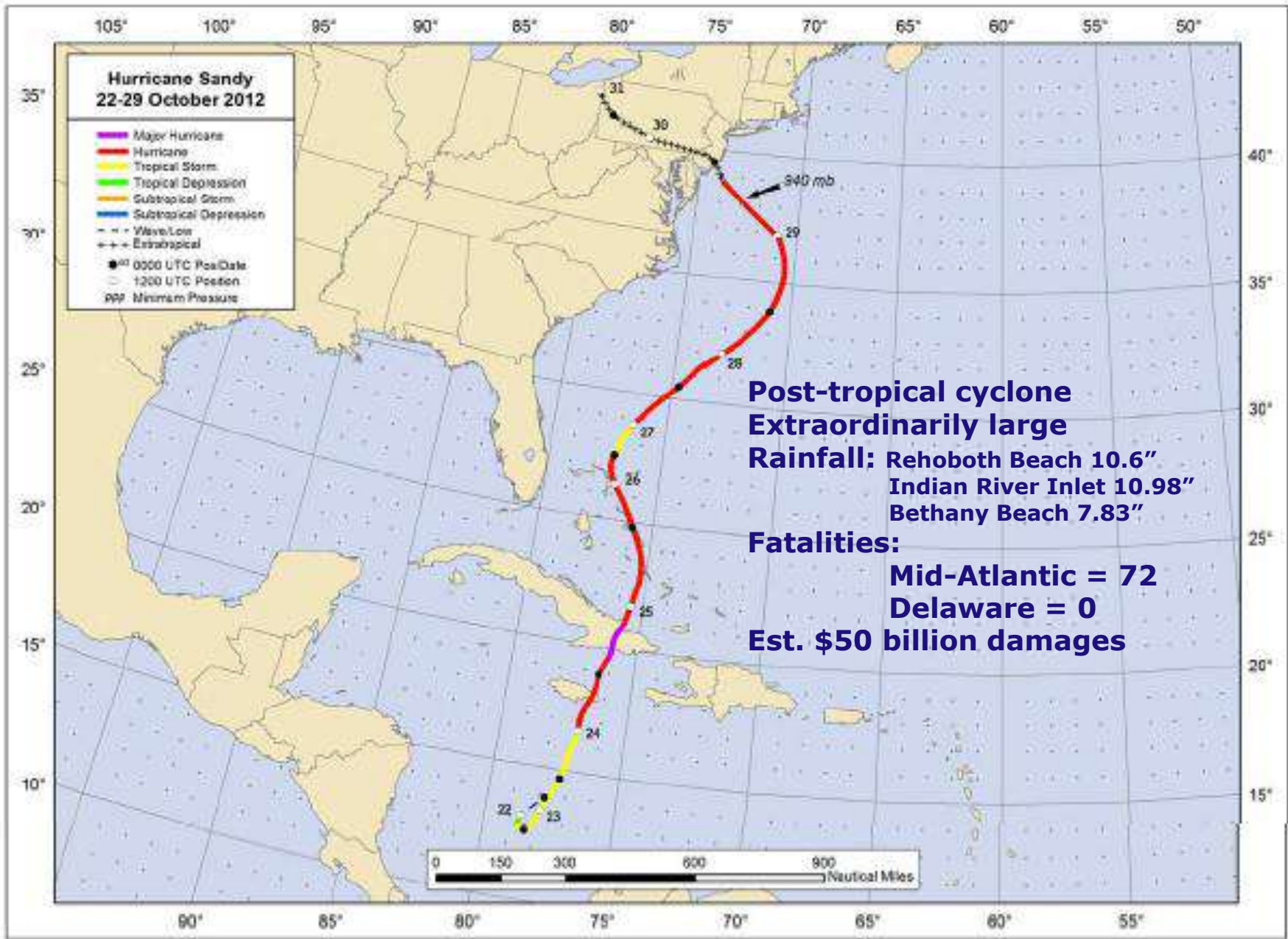
## Field Operations

## Research & Scientific Partnerships



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SHORELINE & WATERWAY MANAGEMENT



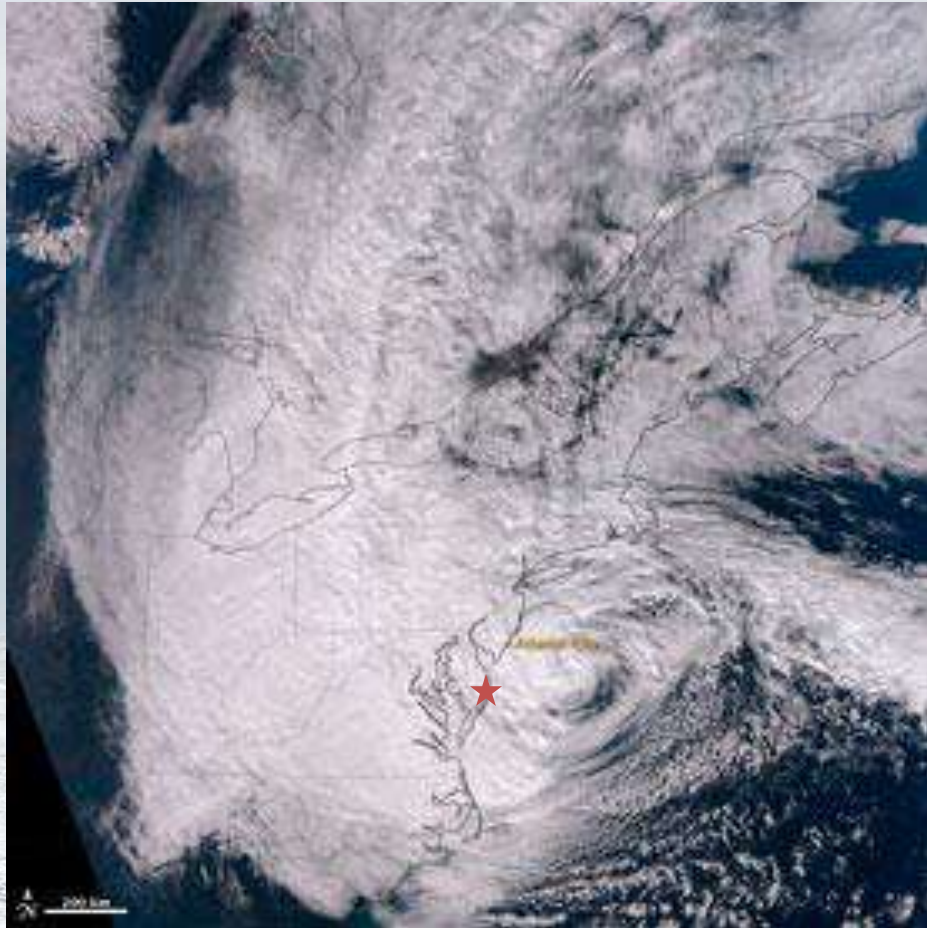
(Blake, et al 2013)

# HURRICANE SANDY

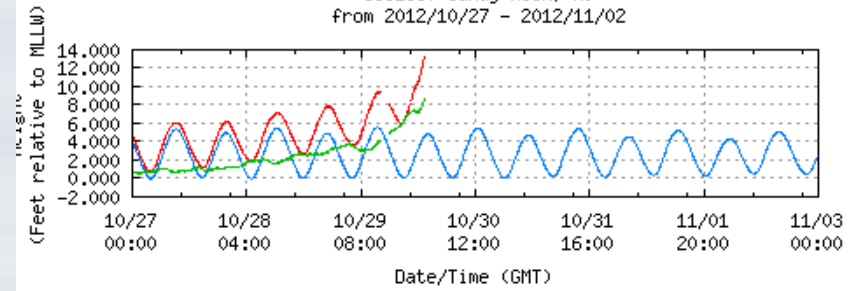


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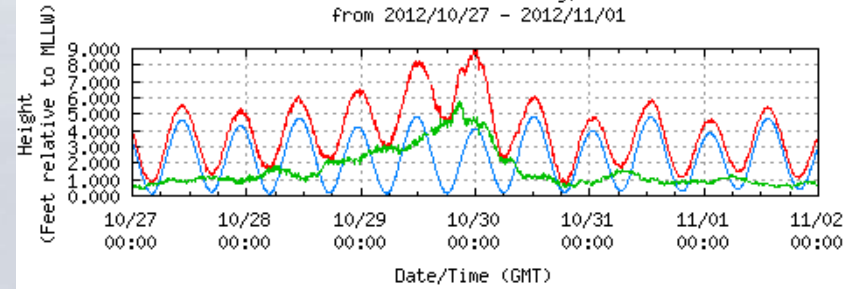
# WATER LEVELS



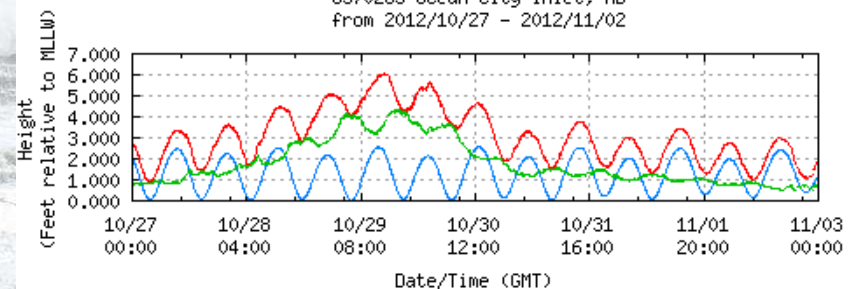
NOAA/NOS/CO-OPS  
 Preliminary Water Level (B1:2) vs. Predicted Plot  
 8531680 Sandy Hook, NJ  
 from 2012/10/27 - 2012/11/02



NOAA/NOS/CO-OPS  
 Preliminary Water Level (A1:1) vs. Predicted Plot  
 8534720 Atlantic City, NJ  
 from 2012/10/27 - 2012/11/01



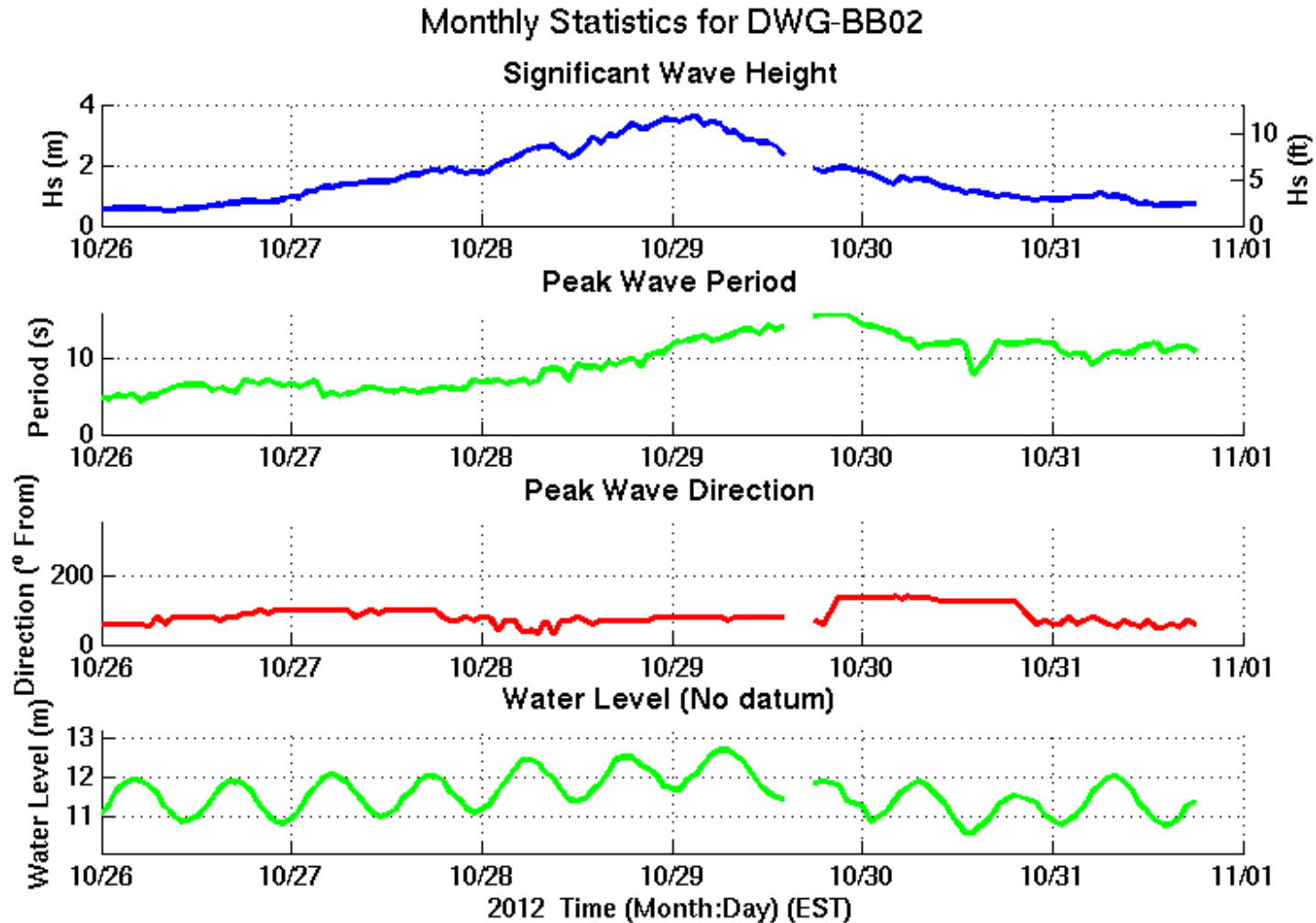
NOAA/NOS/CO-OPS  
 Preliminary Water Level (A1:1) vs. Predicted Plot  
 8570283 Ocean City Inlet, MD  
 from 2012/10/27 - 2012/11/02



# HURRICANE SANDY



# WAVES - Bethany Gauge



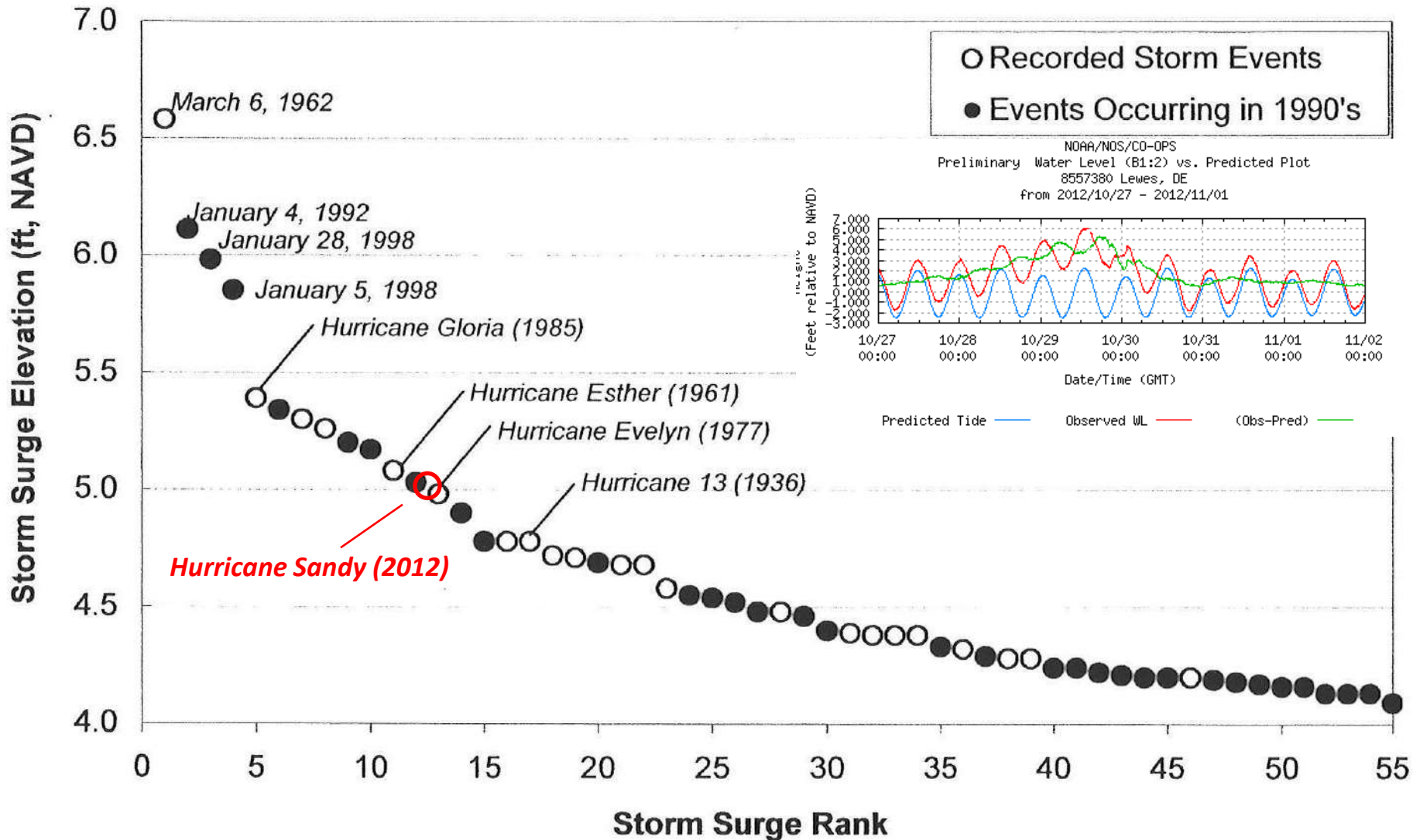
<http://www.frf.usace.army.mil/bethanybeach/bb.shtml>

HURRICANE SANDY



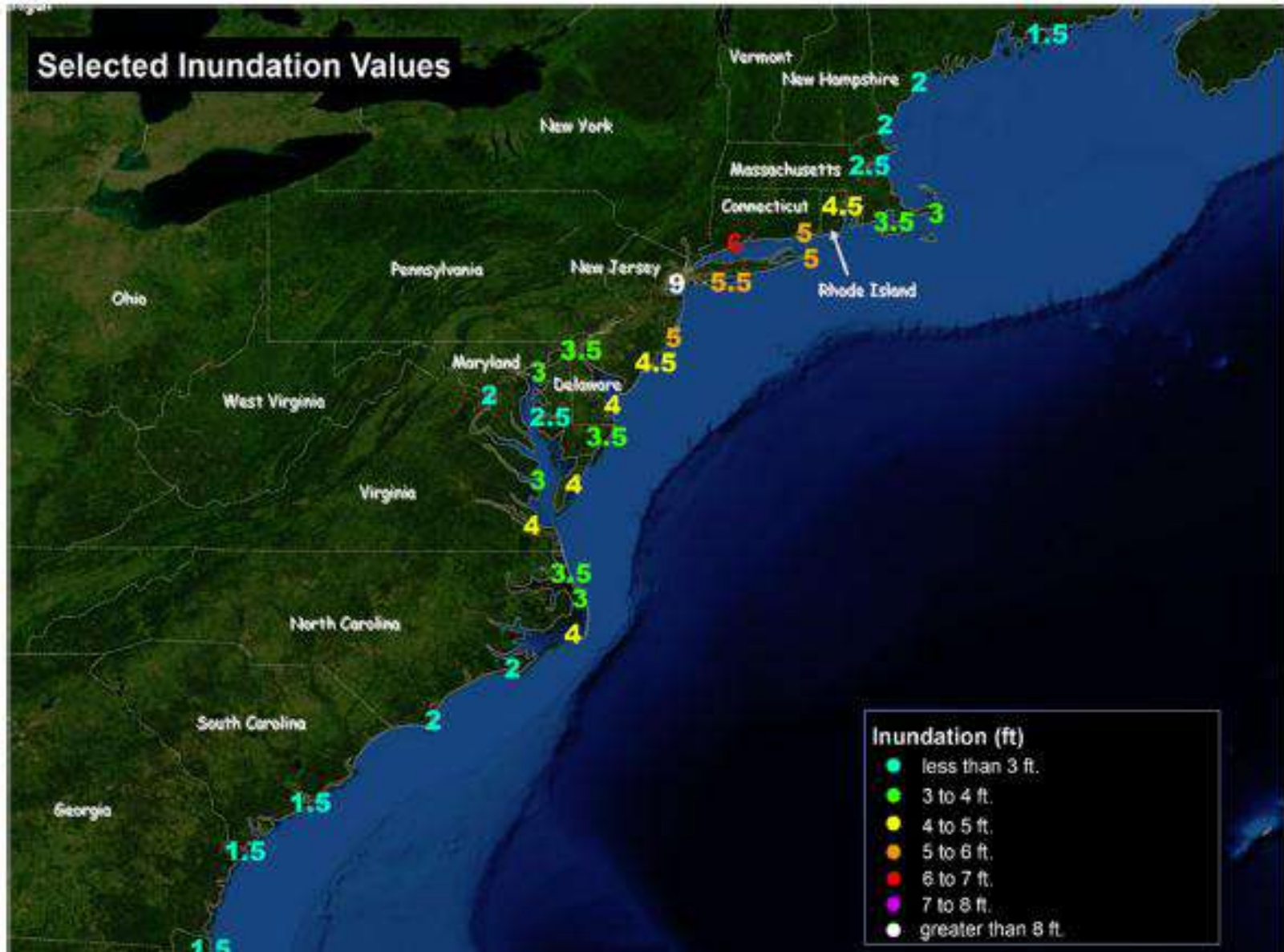
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# STORM SURGE





# INUNDATION



(Blake, et al 2013)

# HURRICANE SANDY



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Rehoboth Beach 10/29/2012











252,000 cy loss (dune to -15 ft NAVD88)



10/31/12; K McKenna



# Federal Disaster Relief Appropriations Act of 2013 (Public Law 113-2)

- Restore Federal Shore Protection Projects to Design Conditions
- Protection of US Route 1 at Indian River Inlet
- North Atlantic Coast Comprehensive Study (NACCS)  
Appendix L – State of Delaware

**POST H. SANDY**



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# Shore Protection Recovery



Location	Quantity of Sand Required (cy)
Rehoboth Beach/Dewey Beach	270,000-455,000
Bethany Beach/South Bethany Beach	310,000-476,000
Fenwick Island	260,000-389,000
Indian River Inlet (North Shore)	380,000-521,000

Berm elevation = 7.2 ft NAVD88

Dune elevation = 13.2 to 17 ft NAVD88

8/17/2011 PJ Smith

**POST H. SANDY**



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# IRI - Beach Nourishment 2013



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**POST H. SANDY**



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# NACCS

- \$19.5 million
- New Hampshire to Virginia
- States/USACE identify vulnerable areas
- Identify flood risk management opportunities
- Determine Federal participation in future cost-shared Feasibility Studies
- Due to Congress January 2015



North Atlantic Coast  
Comprehensive Study:  
Resilient Adaptation  
to Increasing Risk  
Appendix L  
State of Delaware  
Coastal Risk Framework



US Army Corps of Engineers  
North Atlantic Division  
ATR Draft  
November 8, 2013

# Delaware Inland Bays and Delaware Bay Reconnaissance Study

- 100% Federally Funded
- (Delaware) Focus Area of NACCS
- Visioning Sessions with Coastal Stakeholders
- Promote resilient coastal communities & reduce risk
- Determines Federal interest for continued Feasibility Study (50/50 cost-share)



Figure 1. Delaware Inland Bay and Delaware Bay Coast Focus Area Analysis Boundary

# Vulnerable Areas

## Impacted by H. Sandy

- Storm surge
- Damages

## Tidal

## Potential site for coastal flood risk management project

- Structural
- Non-structural
- Natural/nature-based
- Policy & programmatic



# New Castle Co.

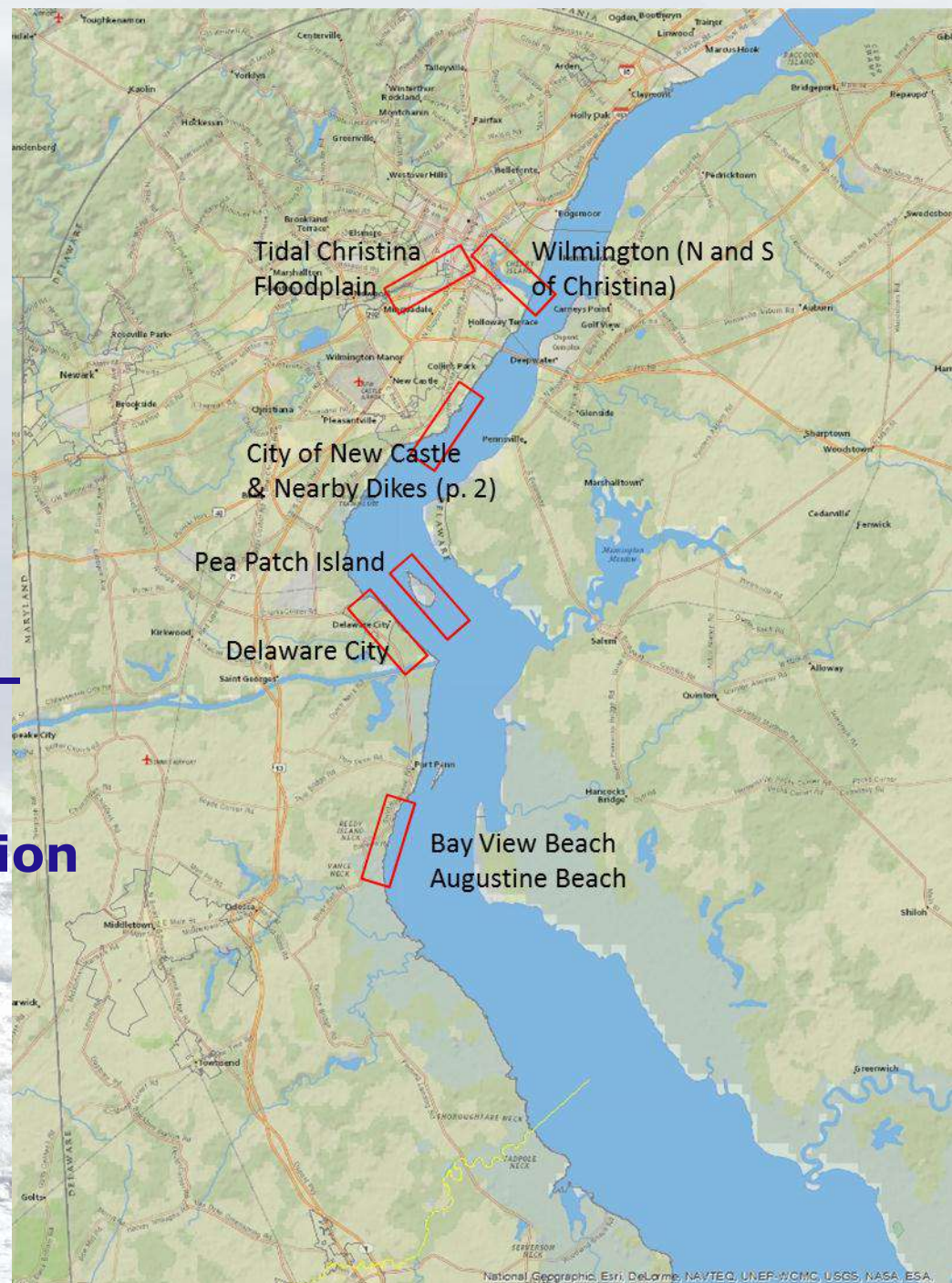
**Flood-prone Urban Areas –  
storm surge  
low elevation**

**Dikes –  
overtopped  
structural damage  
resultant flooding**

**Bay/River Shoreline Areas –  
storm surge  
low elevation  
limited shore protection**

**Federal Holdings –  
storm surge  
erosion of protective  
berms**

**VULNERABLE AREAS**

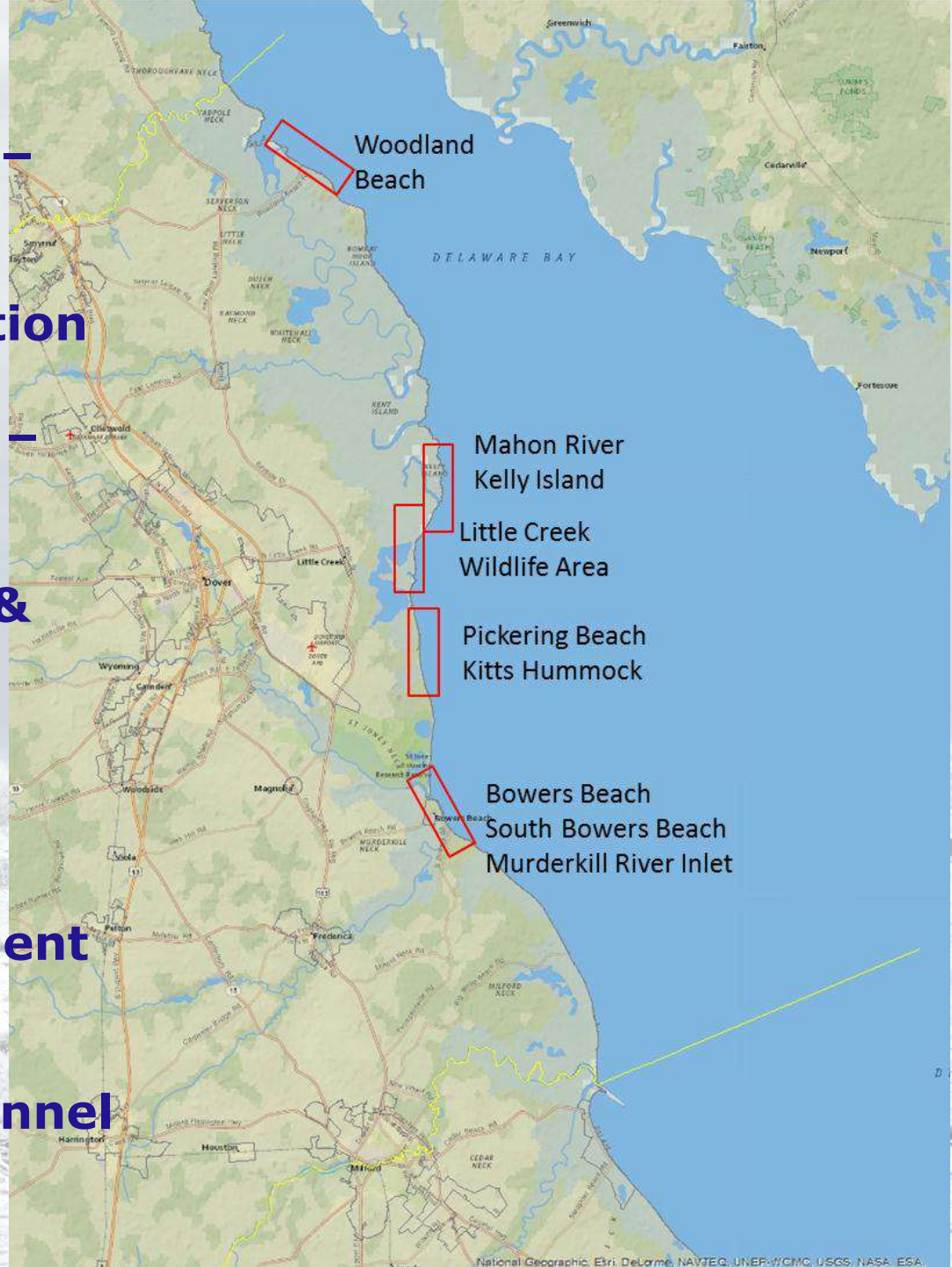


# Kent Co.

**Bay/River Shoreline Areas –**  
storm surge  
low elevation  
limited shore protection

**Bay Shoreline Beach Areas –**  
storm surge  
low elevation  
limited beach width &  
low dunes

**State Holdings –**  
storm surge  
erosion of protective  
berms & impoundment  
levees  
damages to jetties &  
shoaling within channel



**VULNERABLE AREAS**



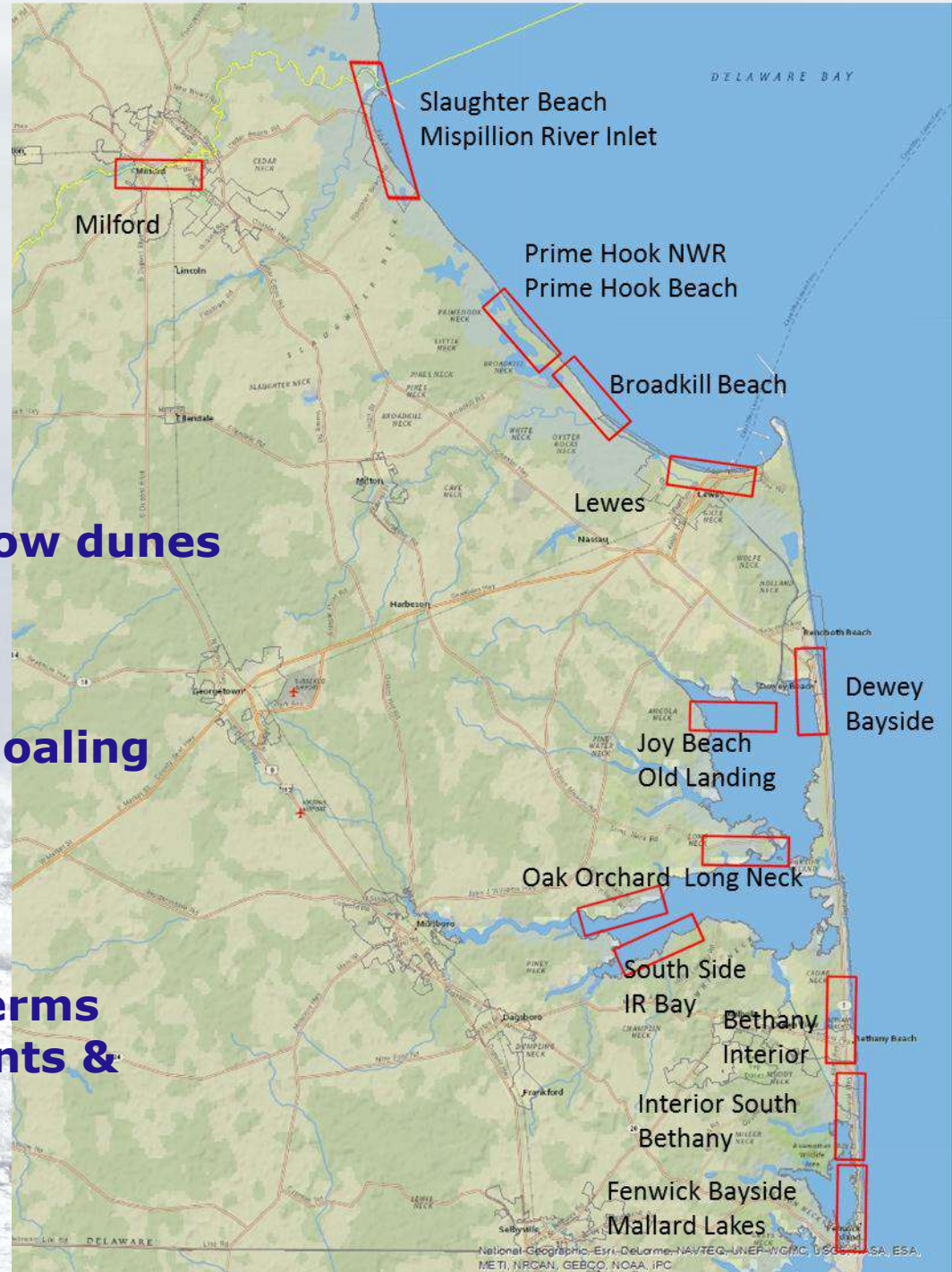
# Sussex Co.

**Flood-prone Urban Areas –  
storm surge  
low elevation**

**Bay Shoreline Beach Areas –  
storm surge  
low elevation  
limited beach width & low dunes  
impacts to access**

**State Holdings –  
damages to jetties & shoaling  
within channel**

**Federal Holdings –  
storm surge  
erosion of protective berms  
flooding of impoundments &  
marshes**

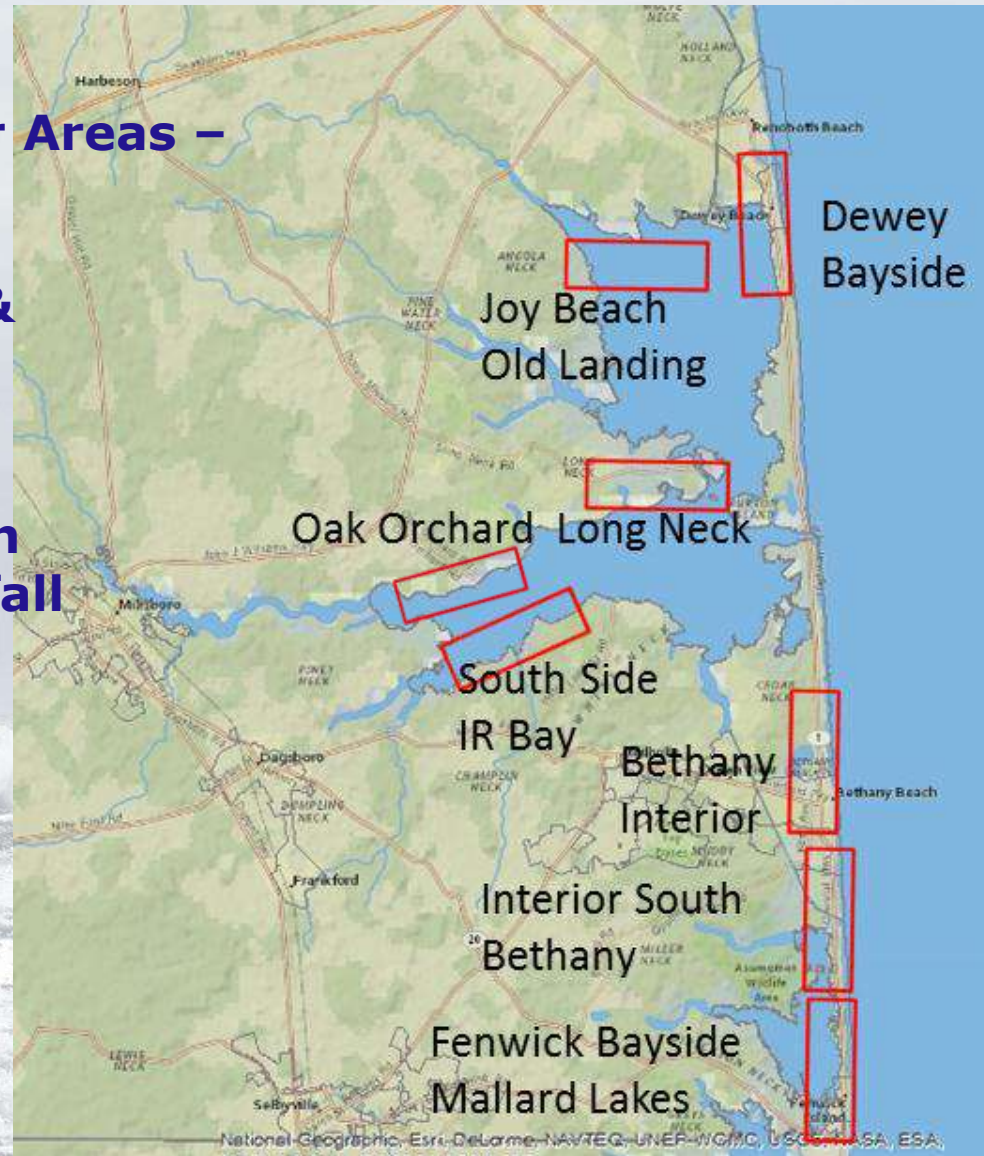


**VULNERABLE AREAS**

# Sussex Co.

**Flood-prone Bayside/Backbarrier Areas –**  
elevated water from bays  
low elevation  
flood damages to homes &  
roadways

**Atlantic Beach Interior Areas –**  
elevated water from ocean  
storm-water runoff & outfall  
drainage



**VULNERABLE AREAS**

# Next Steps

## Winter 2014 - Visioning Sessions State, Local, Non- Governmental Organizations

coastal resiliency, risk reduction  
measures, areas warranting further  
analysis, policy & institutional barriers

## Spring 2014 – Interagency Collaboration & Refinement of Draft Analyses

## Summer 2014 – Reviews & Finalize Report

## January 2015 – Report to Congress

<http://www.nad.usace.army.mil/CompStudy>





10/30/2012; T. Pratt

**Questions?** [www.dnrec.delaware.gov/swc/shoreline](http://www.dnrec.delaware.gov/swc/shoreline)



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