Science and Coastal Resilience:

DOI Hurricane Sandy Response Program

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U.S. Geological Survey

Department of Interior's Approach to Science and Ecosystem Services Following Hurricane Sandy

Response to Hurricane Sandy

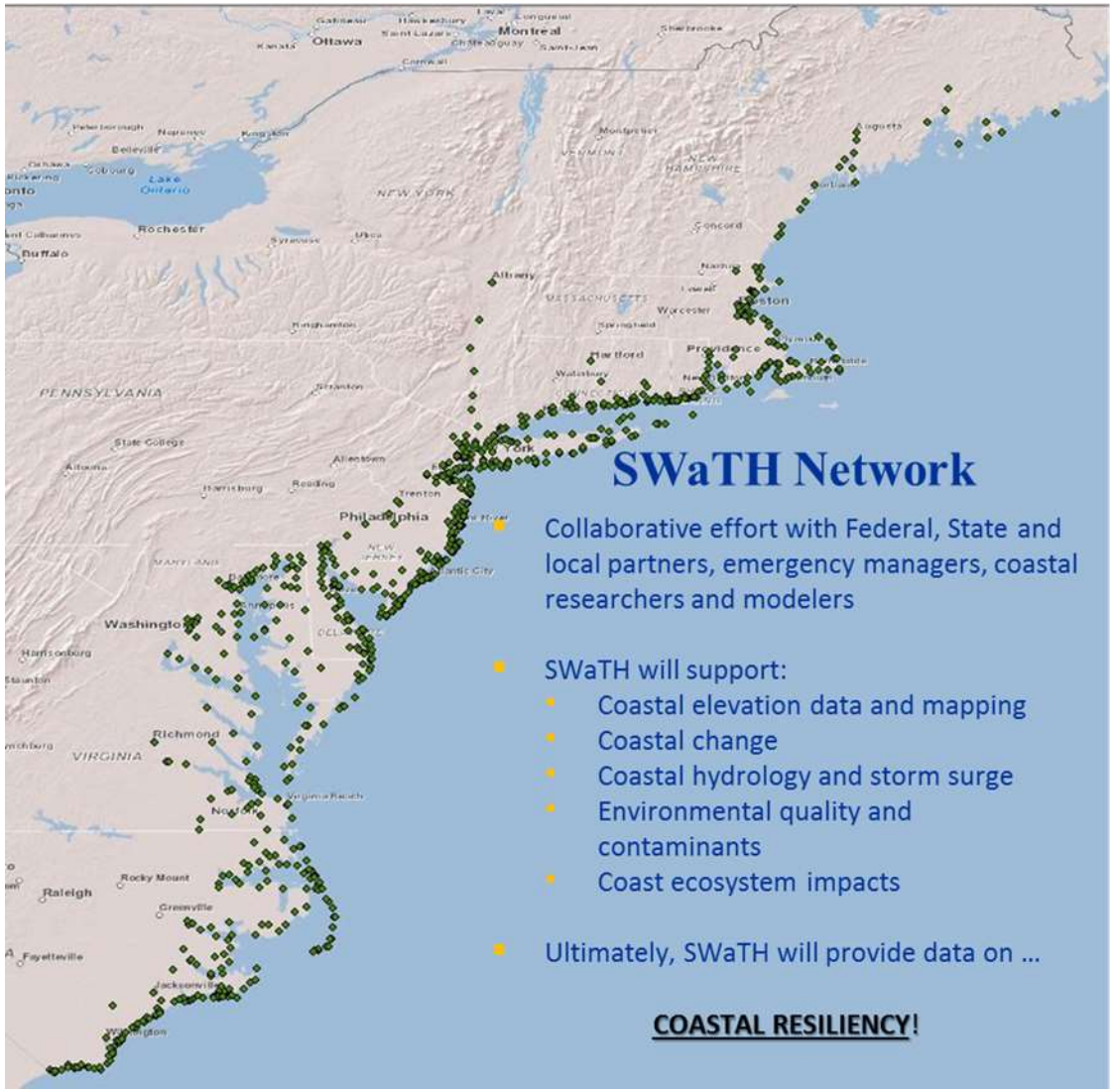
- To provide the knowledge needed to better anticipate and mitigate future damage from coastal storms and Sea Level Rise
- To establish the baseline of information and understanding essential to detect changes in coastal resilience both over time and as a result of our mitigation and restoration actions and,
- To develop monitoring and modeling strategies needed to track change, anticipate problems before they become chronic, verify and improve our models of environmental change, and develop best practices for sustaining or improving coastal resilience.

Examples of the Types of Science Funded

- *Beach, marsh and dune sustainability*
- *Surge and wave trends and vulnerabilities*
- *River connectivity assessment and restoration*
- *Marsh restoration, vulnerability, and migration*
- *Uplands and Watersheds dynamics*
- *Saltwater Intrusion in Maritime Forests*
- *Erosion/deposition in Estuaries*
- *Contaminants fate and transport*
- *Stability of the Built Environment: Grey infrastructure*
- *Stability of Green Infrastructure*

**** For rigorous assessment, different issues require different analysis***

Detecting Trends in Resilience Vulnerability



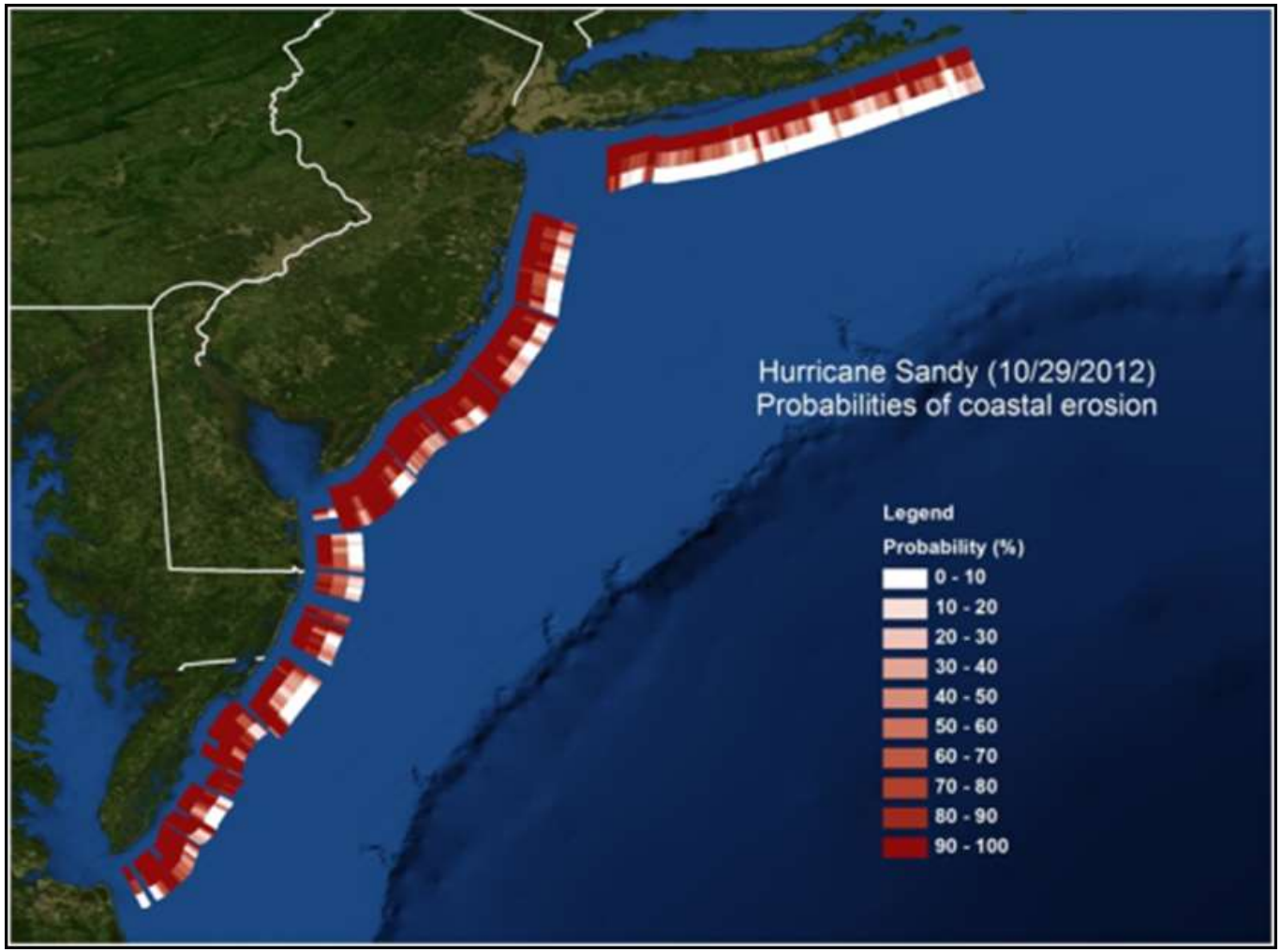
SWaTH Network

- Collaborative effort with Federal, State and local partners, emergency managers, coastal researchers and modelers
- SWaTH will support:
  - Coastal elevation data and mapping
  - Coastal change
  - Coastal hydrology and storm surge
  - Environmental quality and contaminants
  - Coast ecosystem impacts
- Ultimately, SWaTH will provide data on …

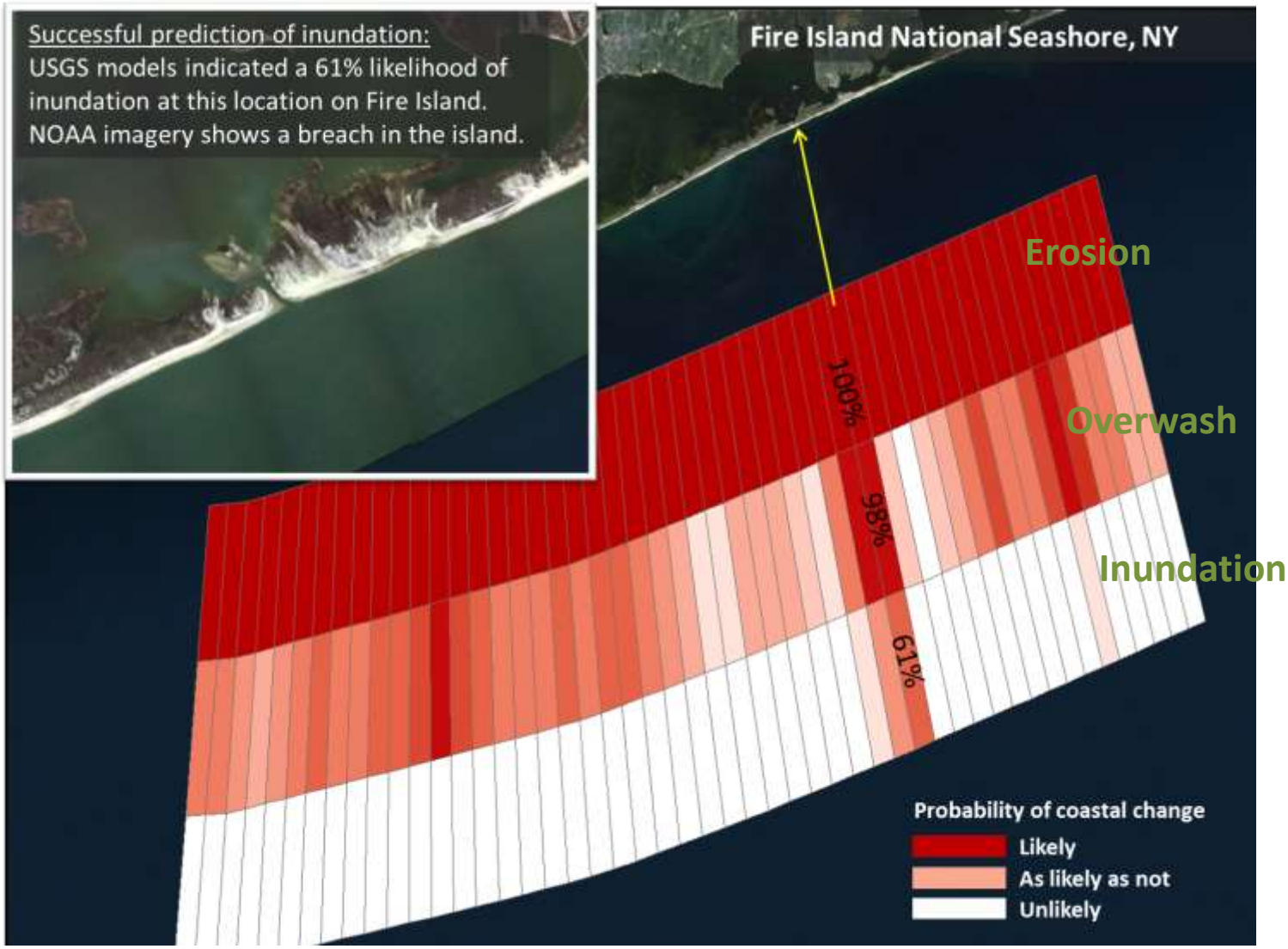
COASTAL RESILIENCY!

New LIDAR-Based Predictions of Sea Level Rise Vulnerability Lentz et al, 2016

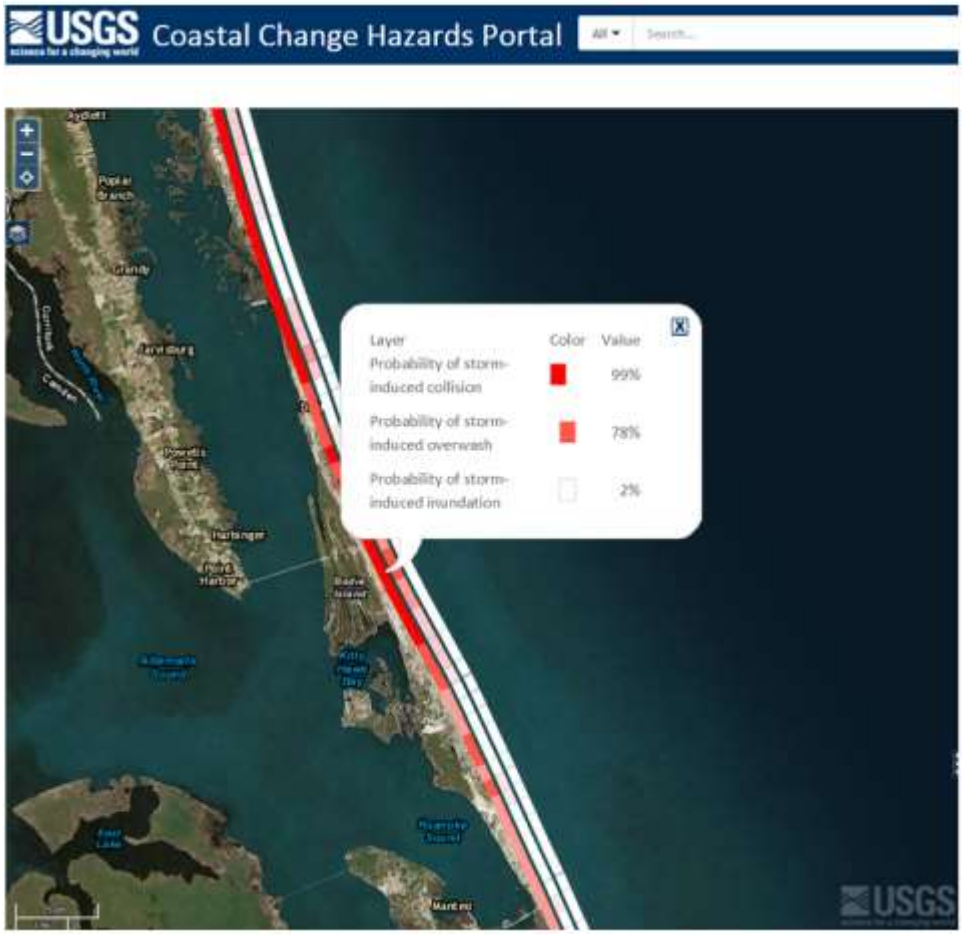
Real-time Forecast of Coastal Erosion During Hurricane Sandy



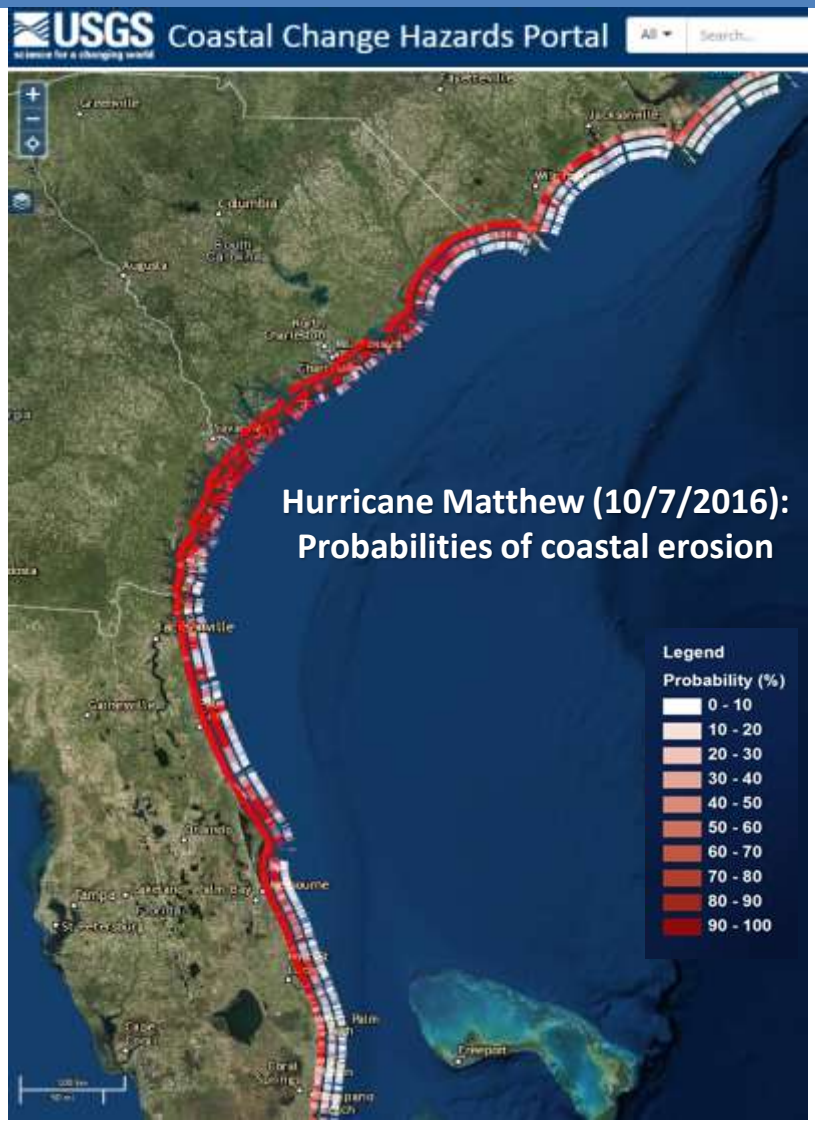
Real-time Forecast of Coastal Erosion During Hurricane Sandy

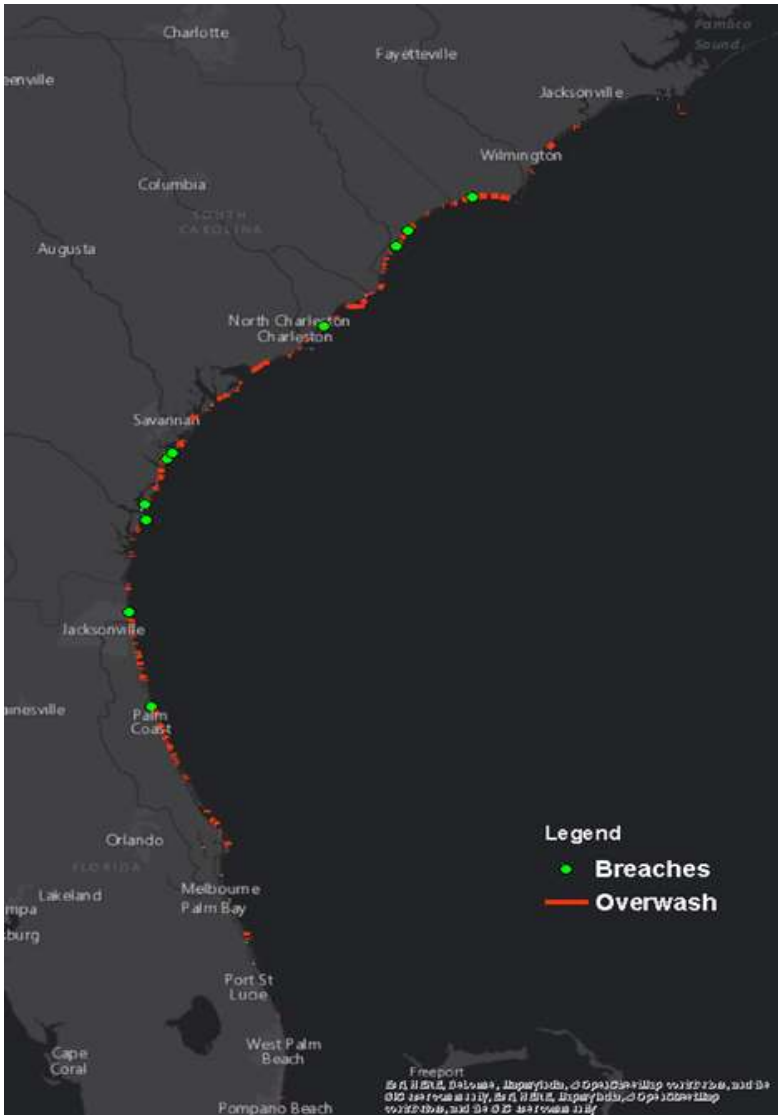


Real-time Forecast of Coastal Erosion During Hurricane Joaquin



Real-time Forecast of Coastal Erosion During Hurricane Matthew





Fire Island Wilderness Breach

Understanding Breach Dynamics

- **Breach migration, morphology, modeling (NPS, USGS)**
- **Bay water levels (Stony Brook University, USGS)**

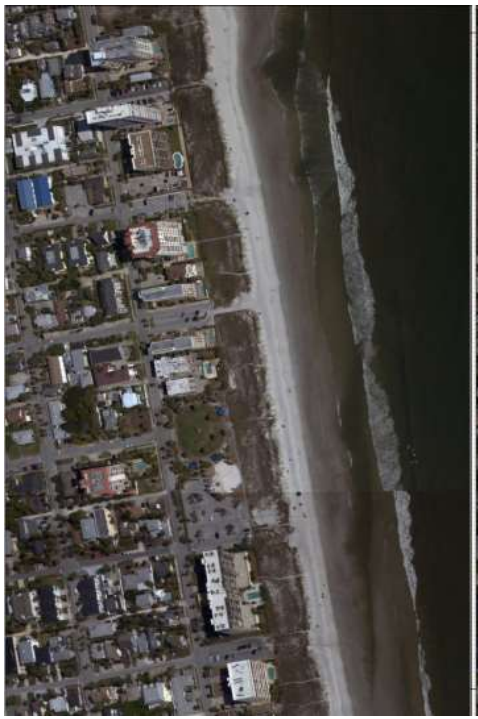
Photos: C. Flagg, Stony Brook University

Early Assessment of Coastal Change

- Spatial analysis to identify breaches, extent of overwash, and sand on roads or in marshes
- Visual identifications made by comparing pre- and post-storm NOAA imagery

Pre-Matthew

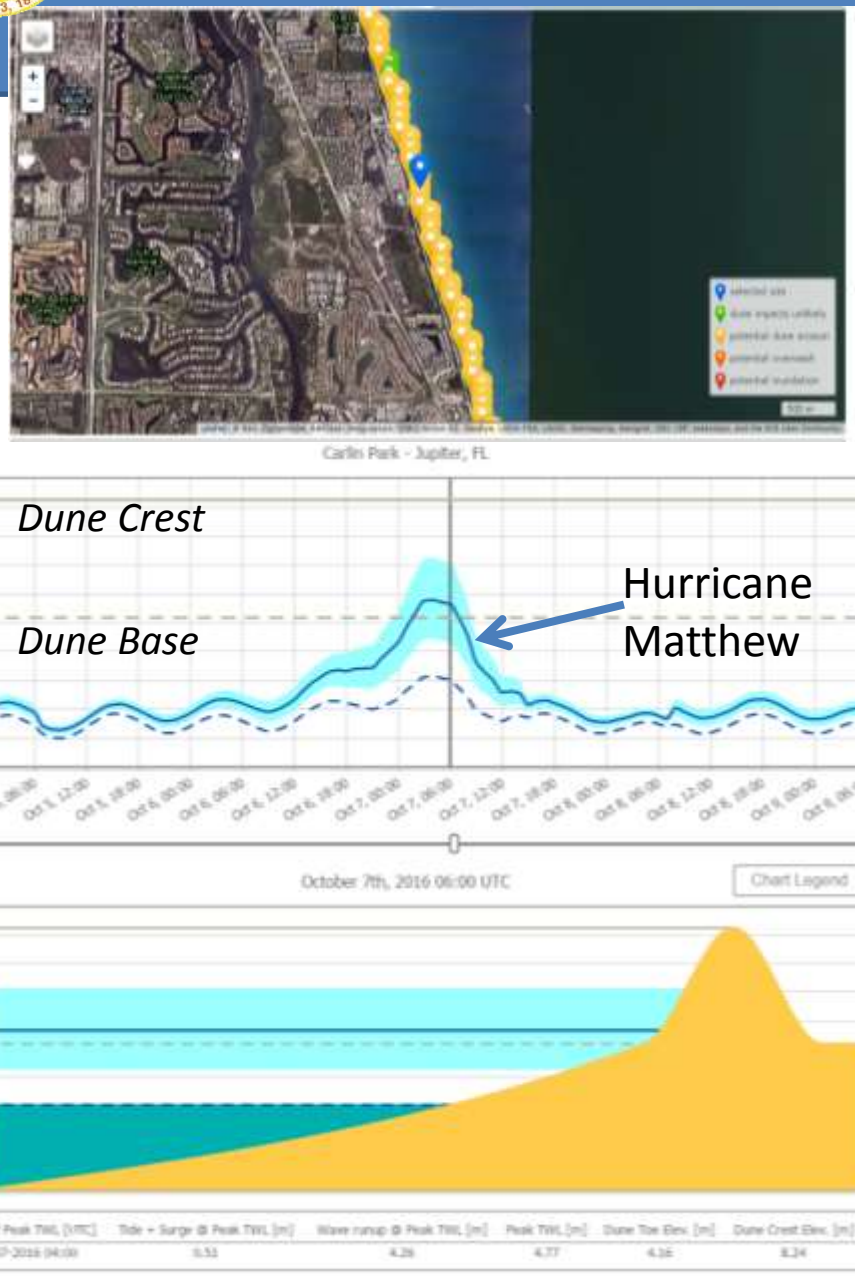
Post-Matthew



Pre-Matthew

Post-Matthew

Total Water Level and Coastal Change Forecast Viewer



USGS/NOAA/NWS Wave Runup Forecasts

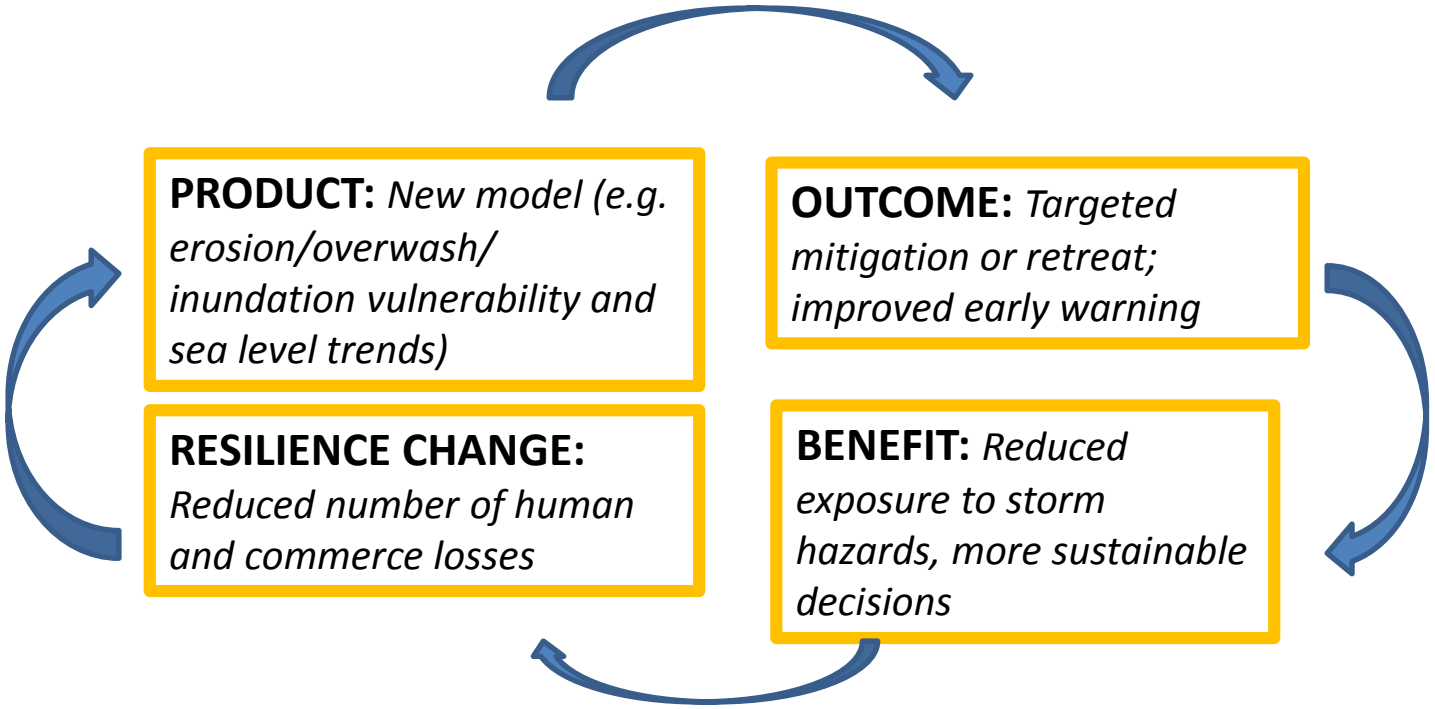
- An interagency effort that provides forecasts every 300-500 meters along the coast
- Forecasts include combination of tides, wind surge, and wave runup
- **Predicts the magnitude, timing, and duration of water level impacts**
- **Provides operational predictions that can trigger local coastal change warnings for all storm events**
- It is fully operational at four pilot sites and the methodology is designed to scale nationally

coastal.er.usgs.gov/hurricanes/research/twlviewer

DOI Science: Putting it All Together

GOAL: Predict and reduce coastal erosion for different scales/trajectories of storms

APPROACH: Start with science product and work toward a resilience solution

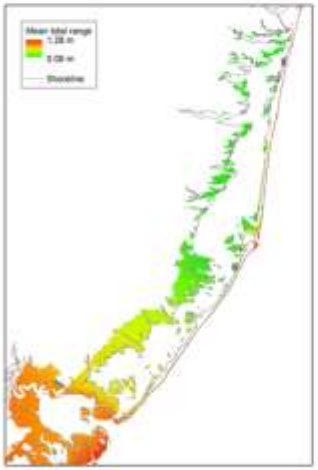


Synthesis: Wetland Classification

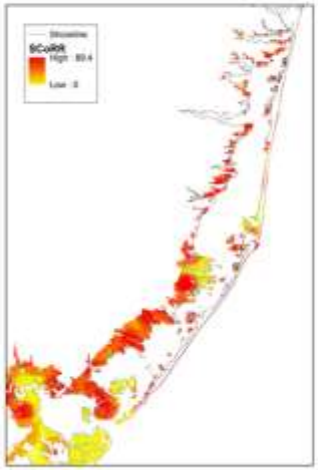
E.B. Forsythe National Wildlife Refuge: Wetland Synthesis

A First Step to a National Assessment of Wetland Physical Change

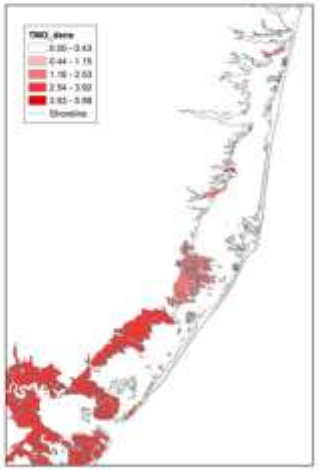
Tide range (driver)



Contaminant exposure (driver)



Bird density (service)



Thank You!