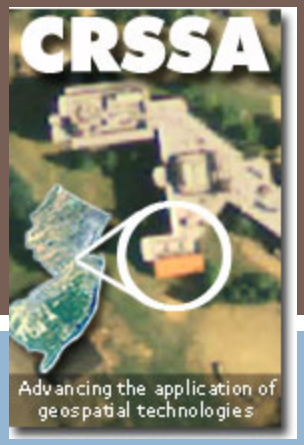
NEW JERSEY INTERACTIVE ONLINE SEA LEVEL RISE AND FLOOD MAPPING WEBSITE

Lisa Auermuller
Rick Lathrop



Jacques Cousteau
National Estuarine Research Reserve

Collaboration

- The project is a collaboration between the Rutgers University Center for Remote Sensing & Spatial Analysis (CRSSA), the Jacques Cousteau National Estuarine Research Reserve (JC NERR), and the NOAA Coastal Services Center.
- Funding for the project came from the NOAA Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET)

Sea Level Rise: It's all in your perspective.

How do we deal with Sea Level Rise?

…..Or not deal with it….?

What are WE doing about it?

Created an Interactive Sea Level Rise and Flooding Vulnerability Mapping Website to aid place-based decision-making

How are we doing this?

- Website Usability Testing
- Needs Assessment
- Beta Version
- “Final” version

Usability Testing

A digital media evaluation method that measures the effectiveness of your digital product with members of your target audience.

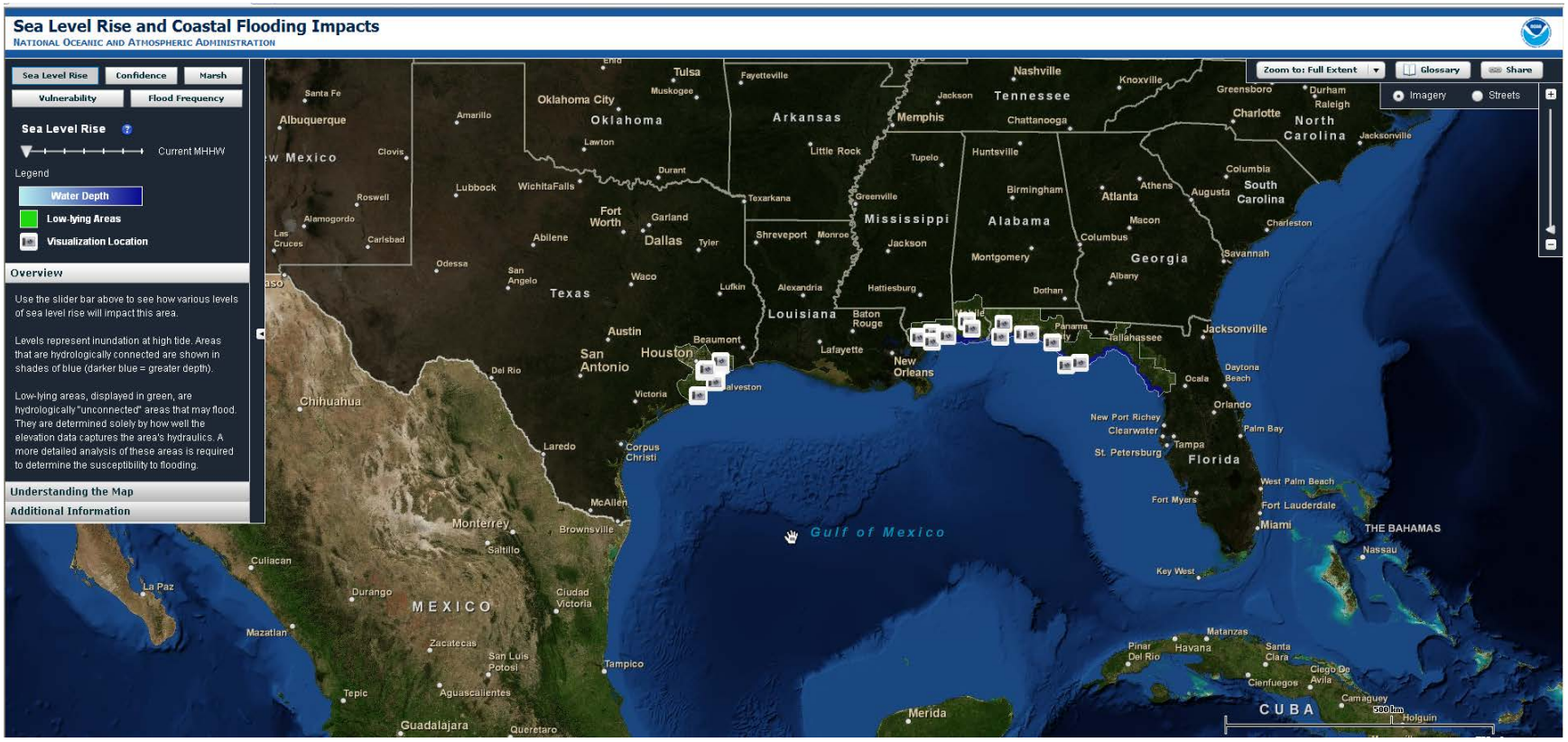
- Verify appeal of designs
- Verify effectiveness of designs
- Determine usefulness of content
- Determine how best to display data

Usability Results – The Must Haves!

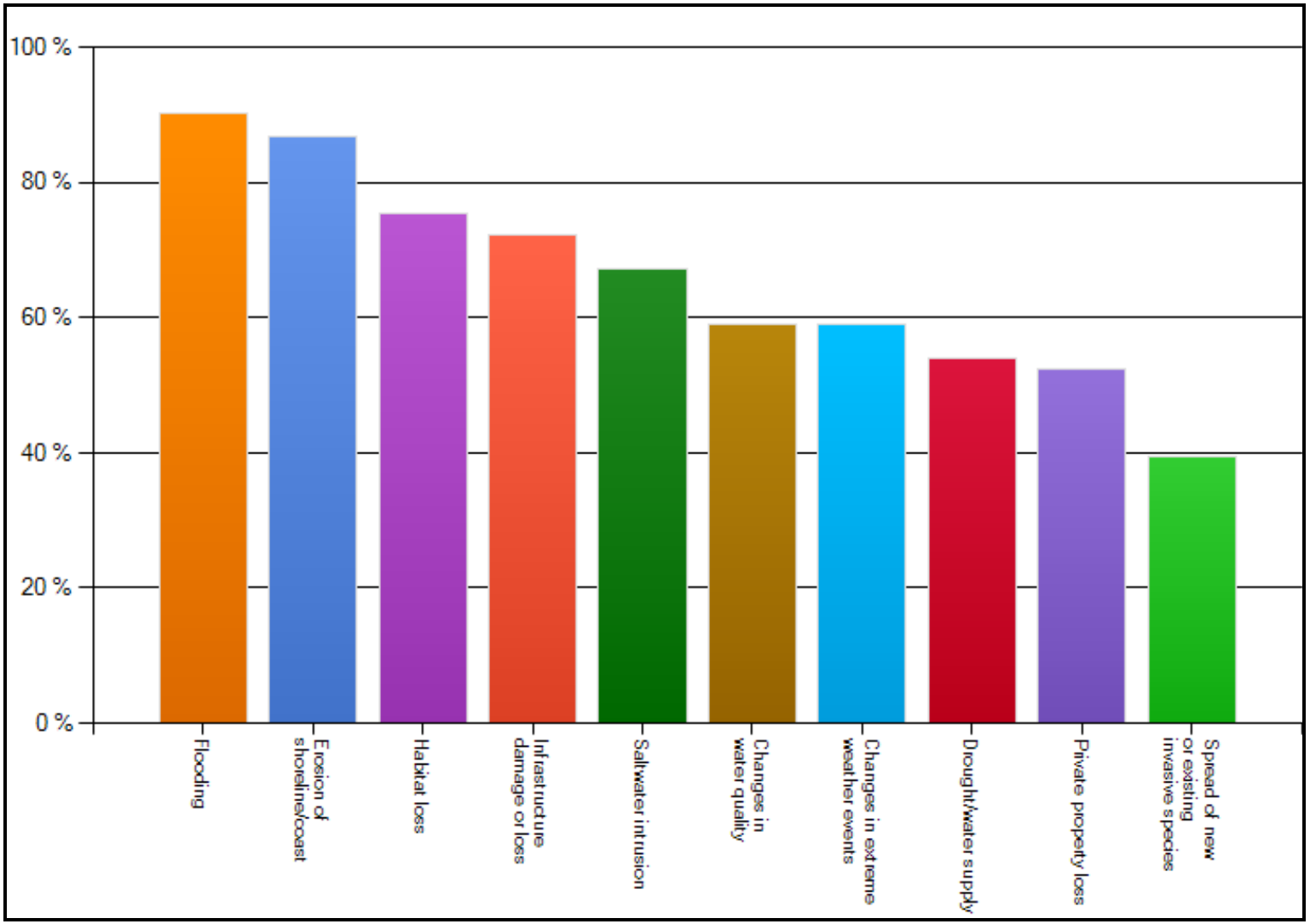
- *Website Introduction/Overview and Directions are Critical*
- *Help, Tutorial, FAQ's, Keys, Legends, Roll Over Descriptions and a Search Box are Important*
- *Definition Terminology - Provide background and justification*
- *Google-maps Platform was User-Friendly*
- *A Picture Tells a Thousand Words*
- *A Slider Bar is Effective*
- *Data Layers are Useful*
- *Website Interactivity (i.e. User-defined Analyses and Scenarios)*
- *Allow for Map/Analyses Download*

The “Uber” Website?

www.csc.noaa.gov/digitalcoast/tools/slrviewer/

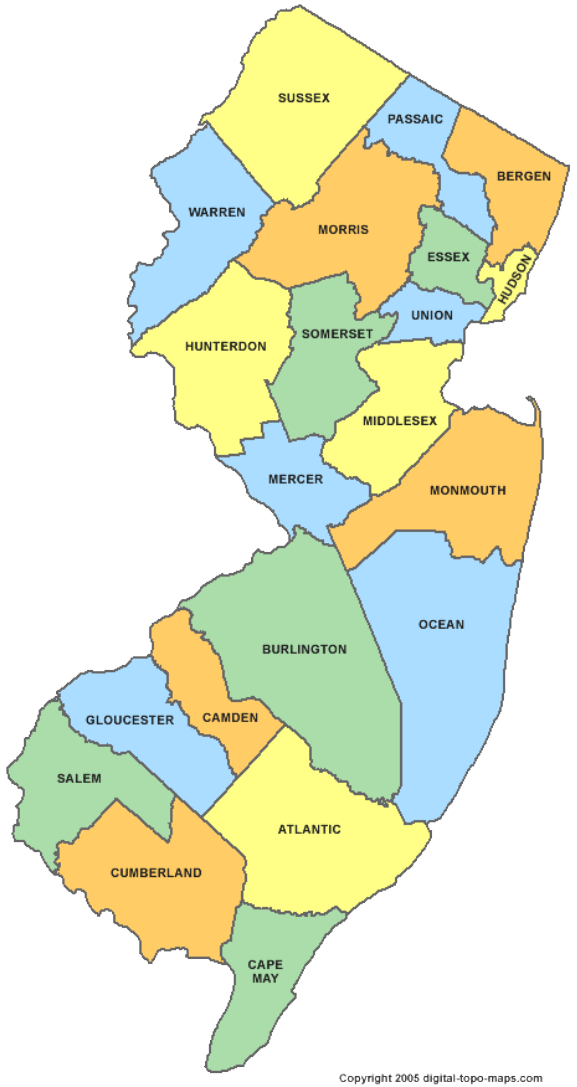


Needs Assessment



Beta Version with testing…

- Additional flooding layers
- Show SLR and flooding together
- Iconic Jersey Shore locations
- Layer transparency
- Municipal Boundaries



Website Demonstration

- *Website Overview and Directions are Critical*
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FloodMapper Website

Funding provided by NOAA's Cooperative Institute for Coastal and Estuarine Environmental Technologies (CICEET), and Sustainable New Jersey

Produced in collaboration with the NOAA Coastal Services Center (CSC) through a partnership with the Jacques Cousteau National Estuarine Research Reserve (JCNERR) and the Grant F. Walton Center for Remote Sensing and Spatial Analysis (CRSSA), Rutgers University

This interactive mapping website was designed and created to provide a user-friendly visualization tool that will help get information into the hands of local communities who need to make decisions concerning flooding hazards and sea level rise.

This website should be used to promote enhanced preparedness and land use planning decisions with considerations for possible future conditions.

http://slrviewer.rutgers.edu/

Website composed by the Grant F. Walton Center for Remote Sensing and Spatial Analysis (CRSSA), Rutgers University, in partnership with the Jacques Cousteau National Estuarine Research Reserve (JCNERR), and in collaboration with the NOAA Coastal Services Center (CSC), © 2012. CURRENTLY DRAFT STATUS as of 08/20/2012.

RUTGERS

NJ Flood Mapper

Jacques Coustea National Estuarine Research Reserve (JCNERR)
Grant F. Walton Center for Remote Sensing and Spatial Analysis (CRSSA)

OVERVIEW

IS SEA LEVEL RISING?

HOW DOES SEA LEVEL RISE AND STORM SURGE INTERACT?

WHY IS THE SEA LEVEL RISING?

HOW DO TIDAL CYCLES AFFECT COASTAL FLOODING?

CLIMATE CHANGE AND FLOODING

HOW CAN NJ FLOOD MAPPER BE USED FOR LONG RANGE PLANNING?

NOW WHAT DOES MY COMMUNITY DO?

CITED SOURCES

NJ FLOOD MAPPER OVERVIEW

This interactive mapping website was designed and created to provide a user-friendly visualization tool that will help get information into the hands of local communities who need to make decisions concerning flooding hazards and sea level rise. This website should be used to promote enhanced preparedness and land use planning decisions with considerations for possible future conditions.

The ***NJFloodMapper*** uses high resolution mapping of the land surface elevation to model areas vulnerable to sea level rise. FEMA Q3 floodplain maps, coastal evacuation routes, state/municipal level infrastructure and socio-demographic information are included to provide a fuller picture of vulnerability to flooding hazards.

This project is a collaboration with the NOAA Coastal Services Center (CSC) through a partnership with the Jacques Cousteau National Estuarine Research Reserve (JCNERR) and the Grant F. Walton Center for Remote Sensing and Spatial Analysis (CRSSA), Rutgers University.

Contact

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For information about NJFloodMapper:

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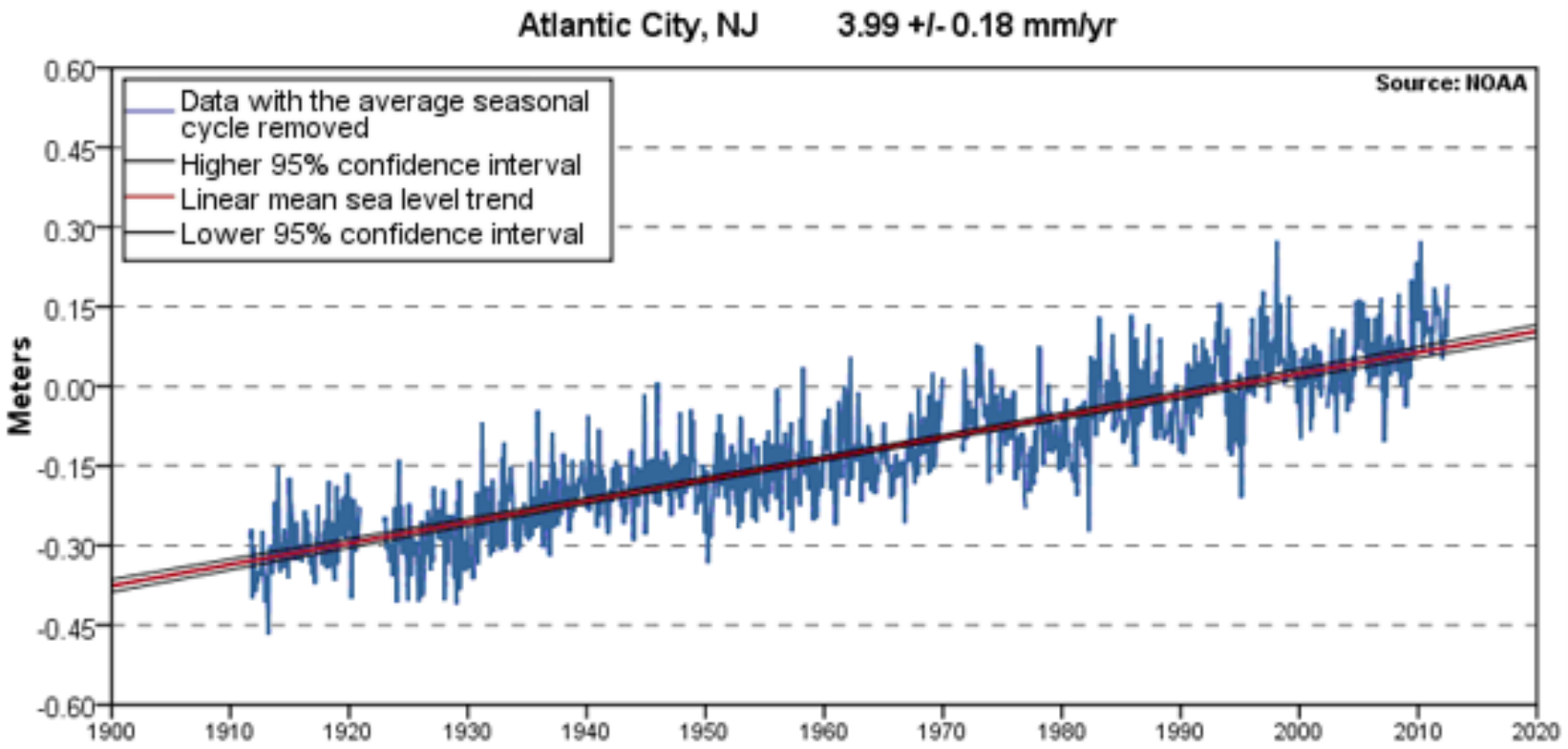
Rising sea level is a physical reality that is impacting the New Jersey and the entire Mid-Atlantic coastline. Predicted future rates are expected to increase to 12 mm/yr (or 0.5 in/yr). This means that by 2050 sea level rise is expected to rise by approximately 1 foot and by 2100 sea level rise is projected to rise about 3 feet along the Jersey shore.



The mean sea level trend over the past century is 3.99 millimeters/year (0.15 in/yr) which is equivalent to a change of 1.31 feet in 100 years. Graphic Credit: NOAA

http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8534720%20Atlantic%20City,%20NJ

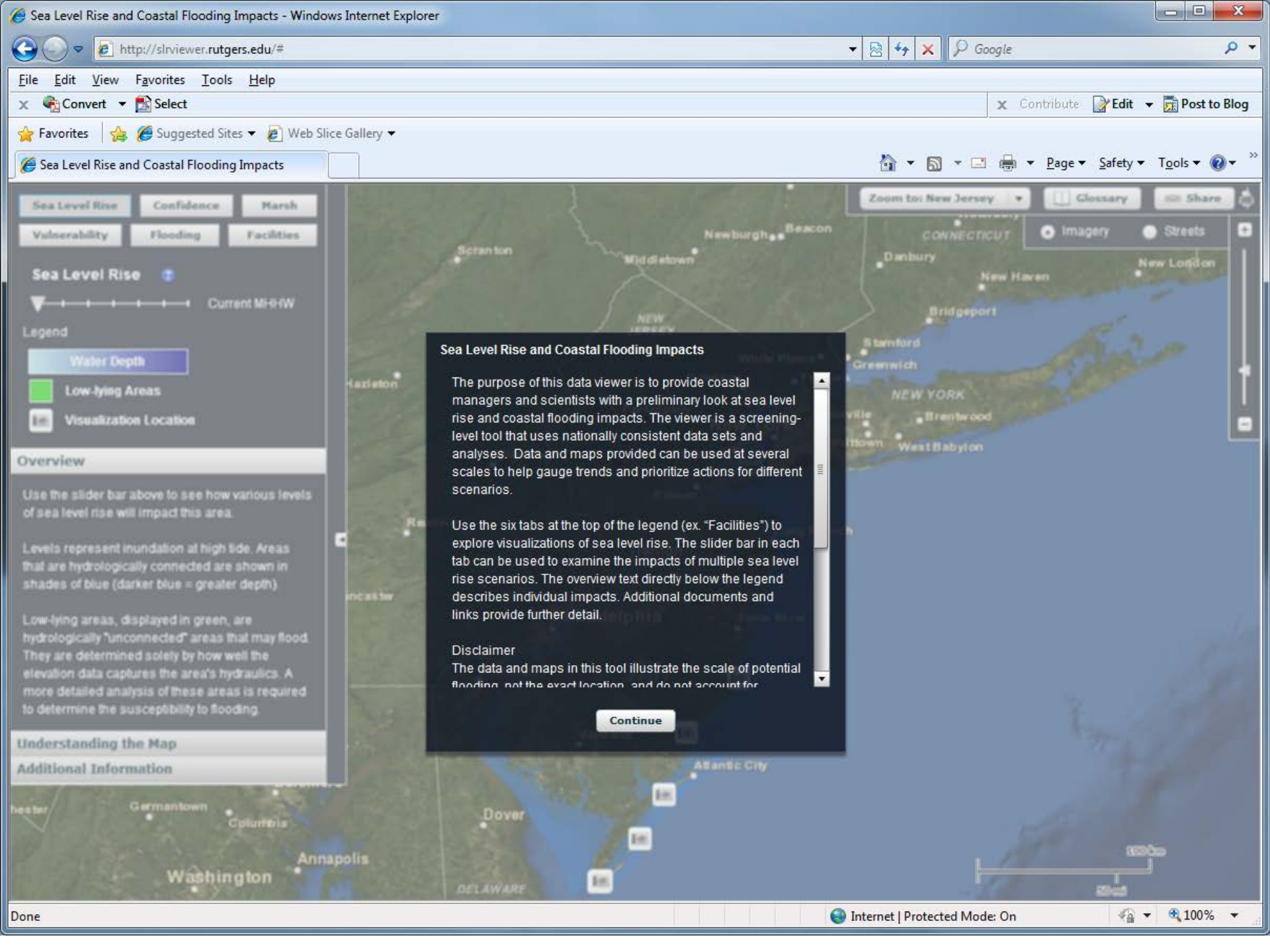
HOW CAN NJ FLOOD MAPPER BE USED FOR LONG RANGE PLANNING?

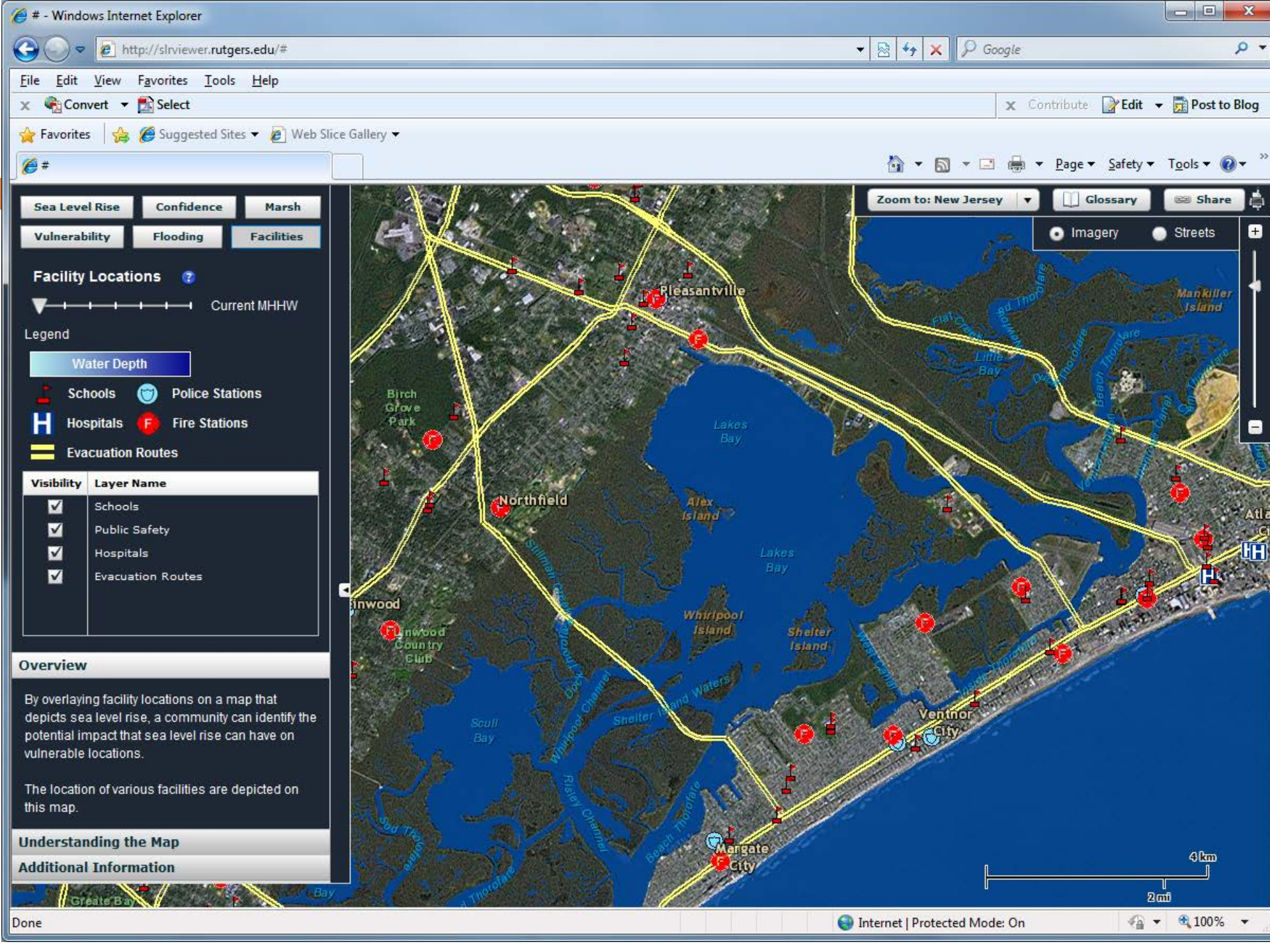
- This web application was designed to promote enhanced preparedness and land use planning decisions with considerations for possible future sea level rise. It was not designed as a real-time emergency operations tool.

- Many government officials and planners agree that the year 2050 represents a reasonable planning horizon. Scientists' best estimates are for an additional 1 foot of sea level rise by 2050. Given that normal tidal ranges often exceed 2 feet above MHHW, a 3 ft SLR is a suggested starting point for planning purposes.

NJ FLOOD MAPPER CAPABILITIES

- The ***NJFloodMapper*** uses high resolution mapping of the land surface elevation to model areas vulnerable to sea level rise. FEMA Q3 floodplain maps, coastal evacuation routes, state/municipal level infrastructure and socio-demographic information are included to provide a fuller picture of vulnerability to flooding hazards.


Sea Level Rise and Coastal Flooding Impacts - Windows Internet Explorer
http://slrviewer.rutgers.edu/#
File Edit View Favorites Tools Help
Convert Select
Contribute Edit Post to Blog
Favorites Suggested Sites Web Slice Gallery
Sea Level Rise and Coastal Flooding Impacts
Page Safety Tools
Sea Level Rise
Confidence
Marsh
Vulnerability
Flooding
Facilities
Sea Level Rise
Current MHHW
Legend
Water Depth
Low-lying Areas
Visualization Location
Overview
Use the slider bar above to see how various levels of sea level rise will impact this area.
Levels represent inundation at high tide. Areas that are hydrologically connected are shown in shades of blue (darker blue = greater depth).
Low-lying areas, displayed in green, are hydrologically "unconnected" areas that may flood. They are determined solely by how well the elevation data captures the area's hydraulics. A more detailed analysis of these areas is required to determine the susceptibility to flooding.
Understanding the Map
Additional Information
Zoom to: New Jersey
Glossary
Share
Imagery
Streets
Sea Level Rise and Coastal Flooding Impacts
The purpose of this data viewer is to provide coastal managers and scientists with a preliminary look at sea level rise and coastal flooding impacts. The viewer is a screening-level tool that uses nationally consistent data sets and analyses. Data and maps provided can be used at several scales to help gauge trends and prioritize actions for different scenarios.
Use the six tabs at the top of the legend (ex. "Facilities") to explore visualizations of sea level rise. The slider bar in each tab can be used to examine the impacts of multiple sea level rise scenarios. The overview text directly below the legend describes individual impacts. Additional documents and links provide further detail.
Disclaimer
The data and maps in this tool illustrate the scale of potential
Continue
Scranton
Middletown
Newburgh
Beacon
Danbury
New Haven
New London
Bridgeport
Stamford
Greenwich
NEW YORK
Brentwood
West Babylon
Atlantic City
Dover
Germantown
Columbia
Annapolis
Washington
DELAWARE
Done
Internet | Protected Mode: On
100%



- Windows Internet Explorer
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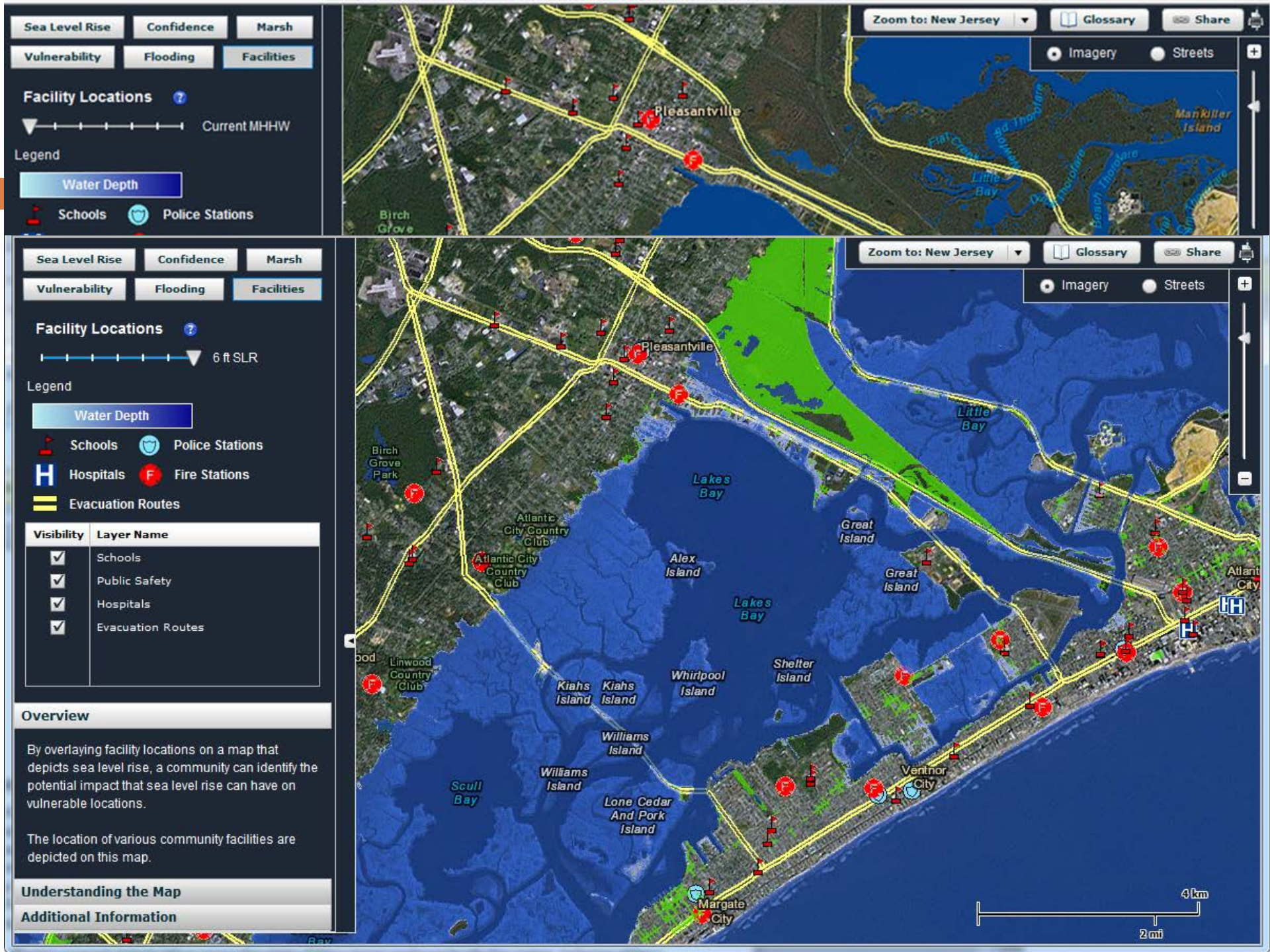
File Edit View Favorites Tools Help
Convert Select
Contribute Edit Post to Blog
Favorites Suggested Sites Web Slice Gallery
Page Safety Tools
Sea Level Rise
Confidence
Marsh
Vulnerability
Flooding
Facilities
Facility Locations
Current MHHW
Legend
Water Depth
Schools
Police Stations
Hospitals
Fire Stations
Evacuation Routes
Visibility
Layer Name
Schools
Public Safety
Hospitals
Evacuation Routes
Overview
By overlaying facility locations on a map that depicts sea level rise, a community can identify the potential impact that sea level rise can have on vulnerable locations.
The location of various facilities are depicted on this map.
Understanding the Map
Additional Information
Zoom to: New Jersey
Glossary
Share
Imagery
Streets
Pleasantville
Birch Grove Park
Northfield
Lakes Bay
Alex Island
Whirlpool Island
Shelter Island
Scull Bay
Ventnor City
Margate City
Mankiller Island
Little Bay
Shelter Island Waters
Whirlpool Channel
Risley Channel
Beach Thorofare
4 km
2 mi
Done
Internet | Protected Mode: On
100%

Facilities

- The facility locations were originally developed from the Federal Emergency Management Agency HAZUS data set and then quality checked for locational accuracy.
- The evacuation route data were provided by the NJ Department of Transportation. Many of the bridges were not attributed with heights, requiring an analyst to ascertain a minimum span height.


Sea Level Rise
Confidence
Marsh
Vulnerability
Flooding
Facilities
Facility Locations
Current MHHW
Legend
Water Depth
Schools
Police Stations
Zoom to: New Jersey
Glossary
Share
Imagery
Streets
Pleasantville
Birch Grove
Mankiller Island
Little Bay
Sea Level Rise
Confidence
Marsh
Vulnerability
Flooding
Facilities
Facility Locations
6 ft SLR
Legend
Water Depth
Schools
Police Stations
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Fire Stations
Evacuation Routes
Visibility
Layer Name
Schools
Public Safety
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Evacuation Routes
Overview
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The location of various community facilities are depicted on this map.
Understanding the Map
Additional Information
Zoom to: New Jersey
Glossary
Share
Imagery
Streets
Pleasantville
Birch Grove Park
Little Bay
Lakes Bay
Atlantic City Country Club
Great Island
Alex Island
Lakes Bay
Great Island
Linwood Country Club
Kiahs Island
Kiahs Island
Whirlpool Island
Shelter Island
Williams Island
Williams Island
Scull Bay
Lone Cedar And Pork Island
Ventnor City
Margate City
4 km
2 mi

Sea Level Rise | Confidence | Marsh

Vulnerability | Flooding | Facilities

Sea Level Rise

Current MHHW

Legend

- Water Depth
- Low-lying Areas
- Visualization Location

Overview

Use the slider bar above to see how various levels of sea level rise will impact this area.

Levels represent inundation at high tide. Areas that are hydrologically connected are shown in shades of blue (darker blue = greater depth).

Low-lying areas, displayed in green, are hydrologically "unconnected" areas that may flood. They are determined solely by how well the elevation data captures the area's hydraulics. A more detailed analysis of these areas is required to determine the susceptibility to flooding.

Understanding the Map

Additional Information

CRC Building

Use the slider to view a simulation of sea level rise at this location.

CRC Building

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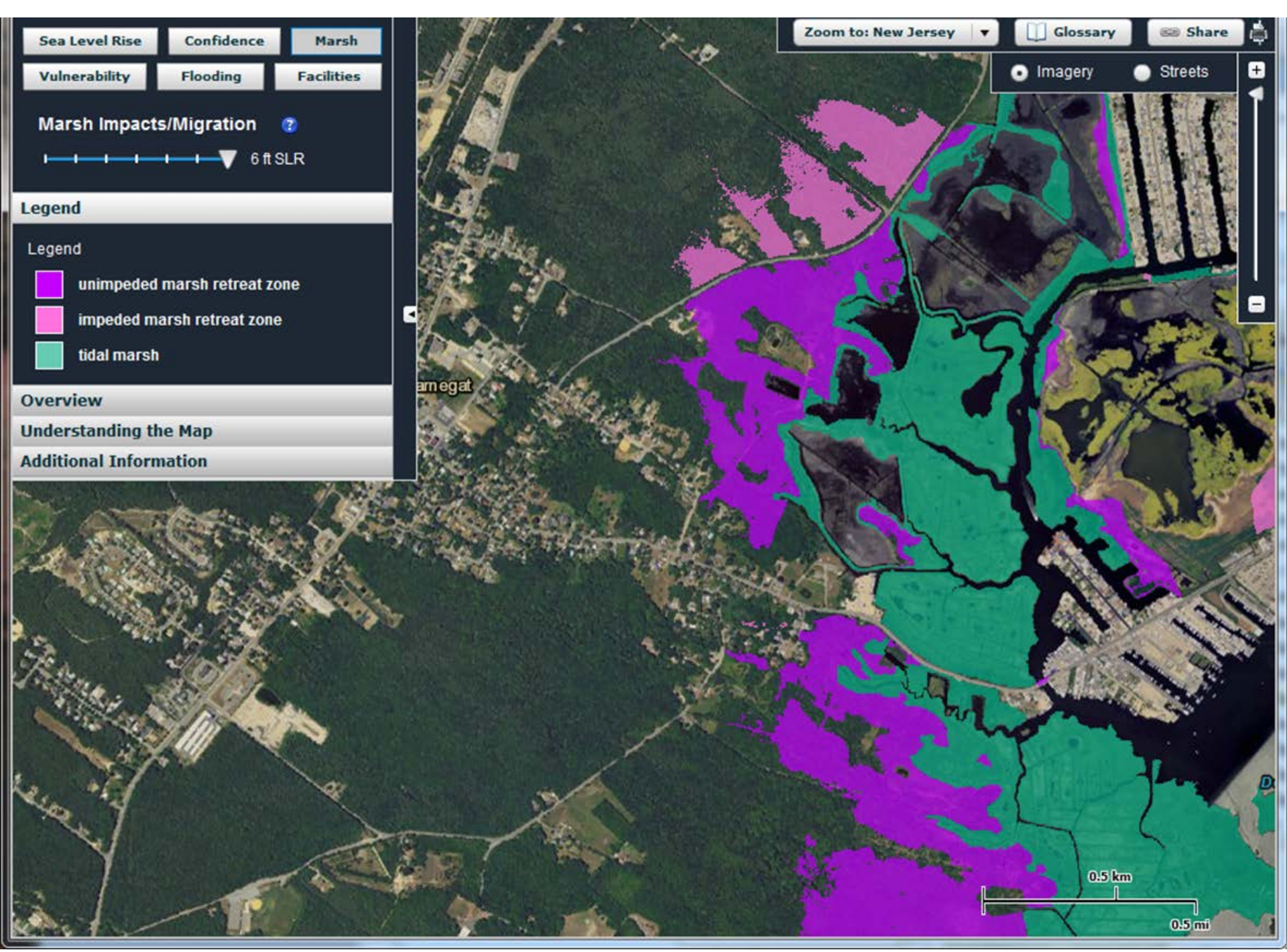
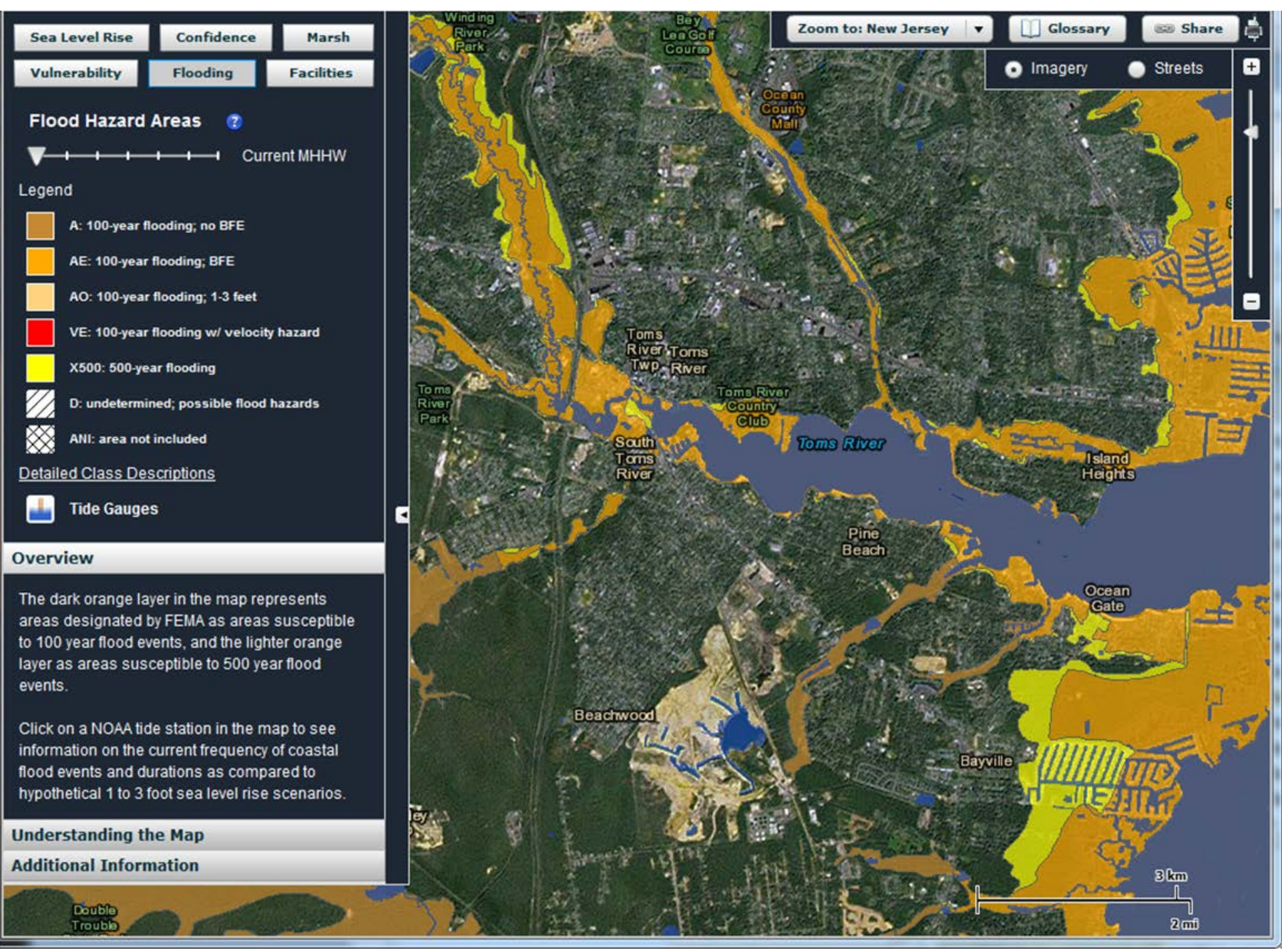
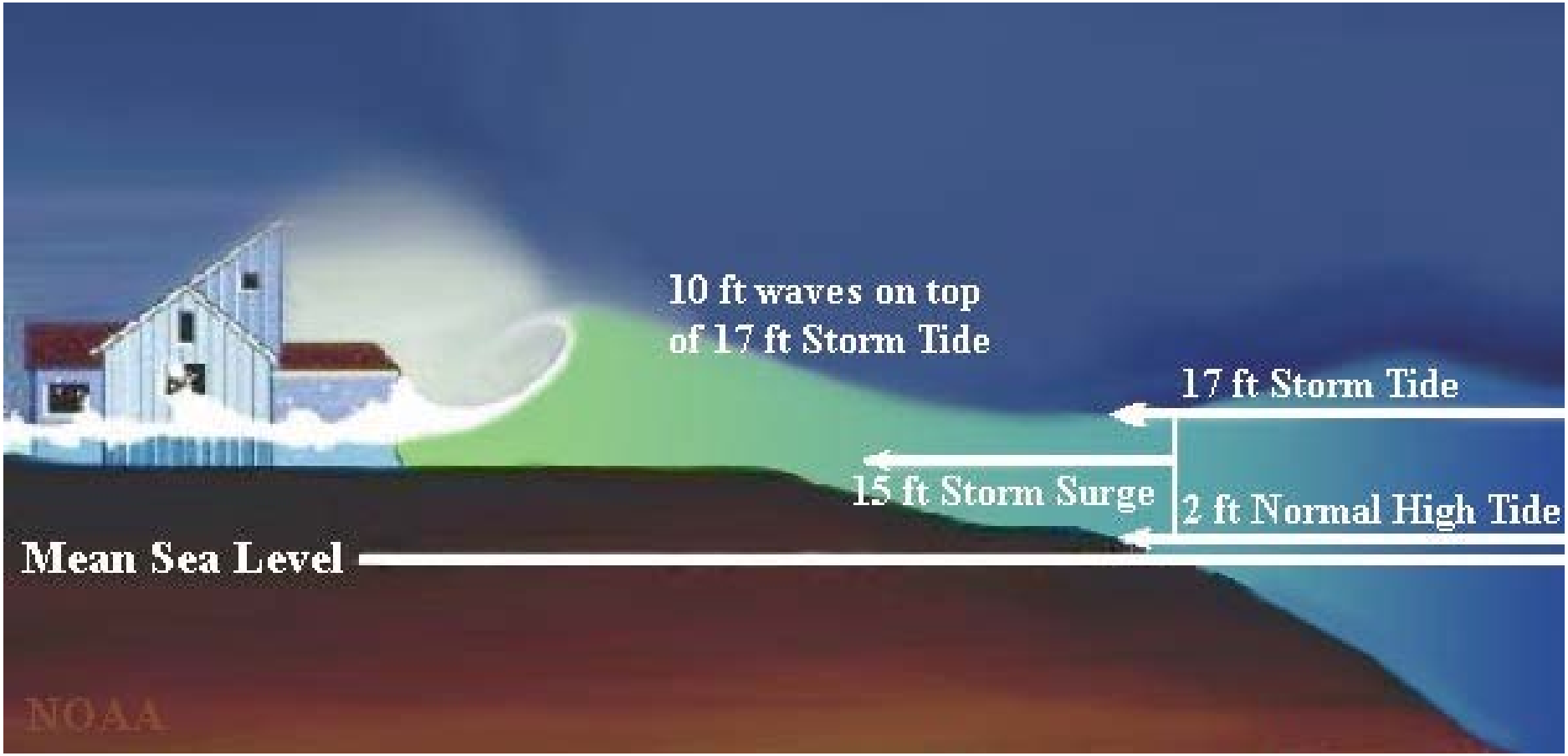

Sea Level Rise
Confidence
Marsh
Vulnerability
Flooding
Facilities
Marsh Impacts/Migration
6 ft SLR
Legend
Legend
unimpeded marsh retreat zone
impeded marsh retreat zone
tidal marsh
Overview
Understanding the Map
Additional Information
Zoom to: New Jersey
Glossary
Share
Imagery
Streets
0.5 km
0.5 mi


Sea Level Rise
Confidence
Marsh
Vulnerability
Flooding
Facilities
Flood Hazard Areas
Current MHHW
Legend
A: 100-year flooding; no BFE
AE: 100-year flooding; BFE
AO: 100-year flooding; 1-3 feet
VE: 100-year flooding w/ velocity hazard
X500: 500-year flooding
D: undetermined; possible flood hazards
ANI: area not included
Detailed Class Descriptions
Tide Gauges
Overview
The dark orange layer in the map represents areas designated by FEMA as areas susceptible to 100 year flood events, and the lighter orange layer as areas susceptible to 500 year flood events.
Click on a NOAA tide station in the map to see information on the current frequency of coastal flood events and durations as compared to hypothetical 1 to 3 foot sea level rise scenarios.
Understanding the Map
Additional Information
Zoom to: New Jersey
Glossary
Share
Imagery
Streets
Winding River Park
Bey Lea Golf Course
Ocean County Mall
Toms River Twp
Toms River
Toms River Park
Toms River Country Club
South Toms River
Toms River
Island Heights
Pine Beach
Ocean Gate
Beachwood
Bayville
Double Trouble
3 km
2 mi

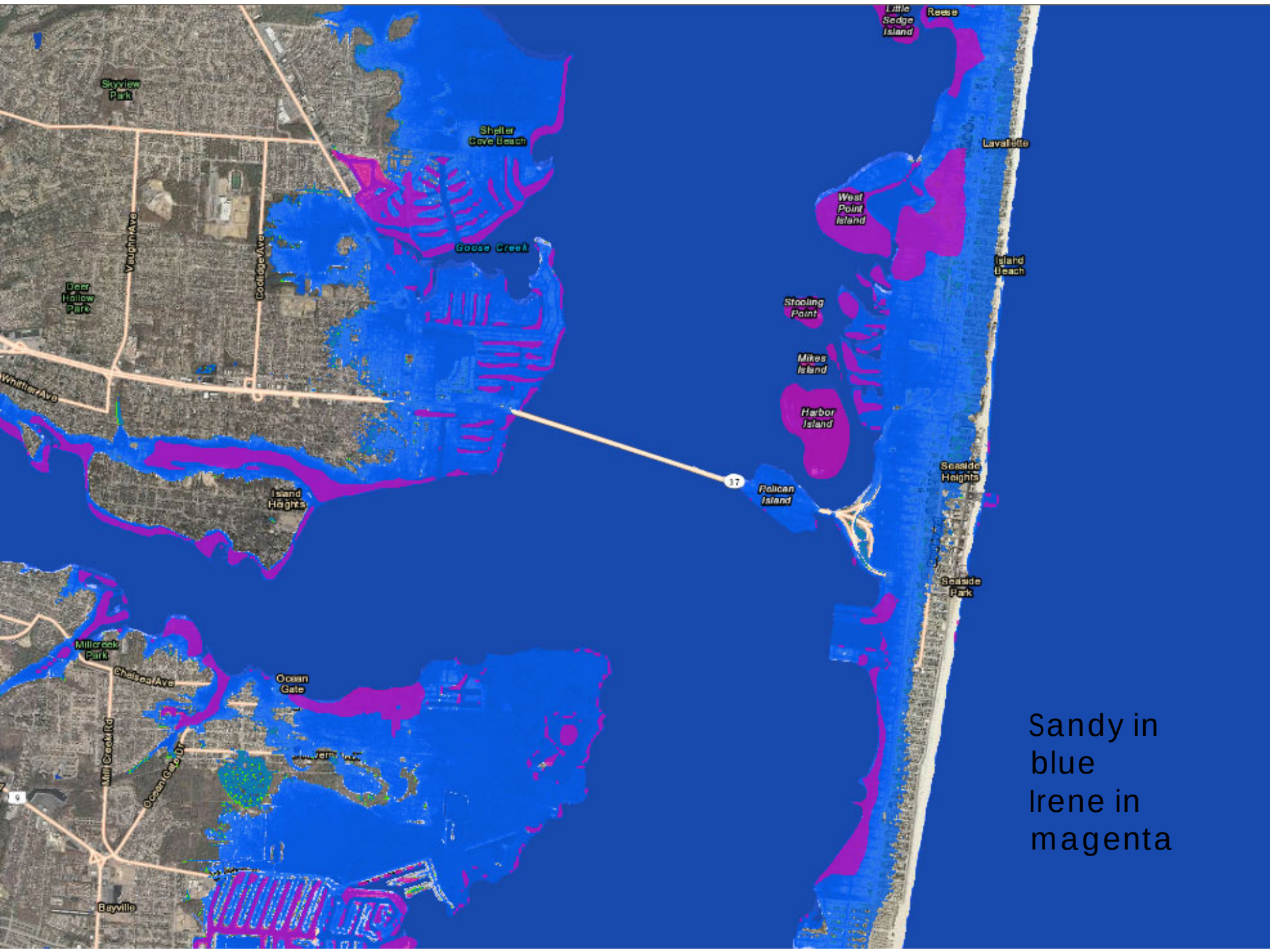
Storm Surge



Storm Tide = Storm Surge + Normal High Tide

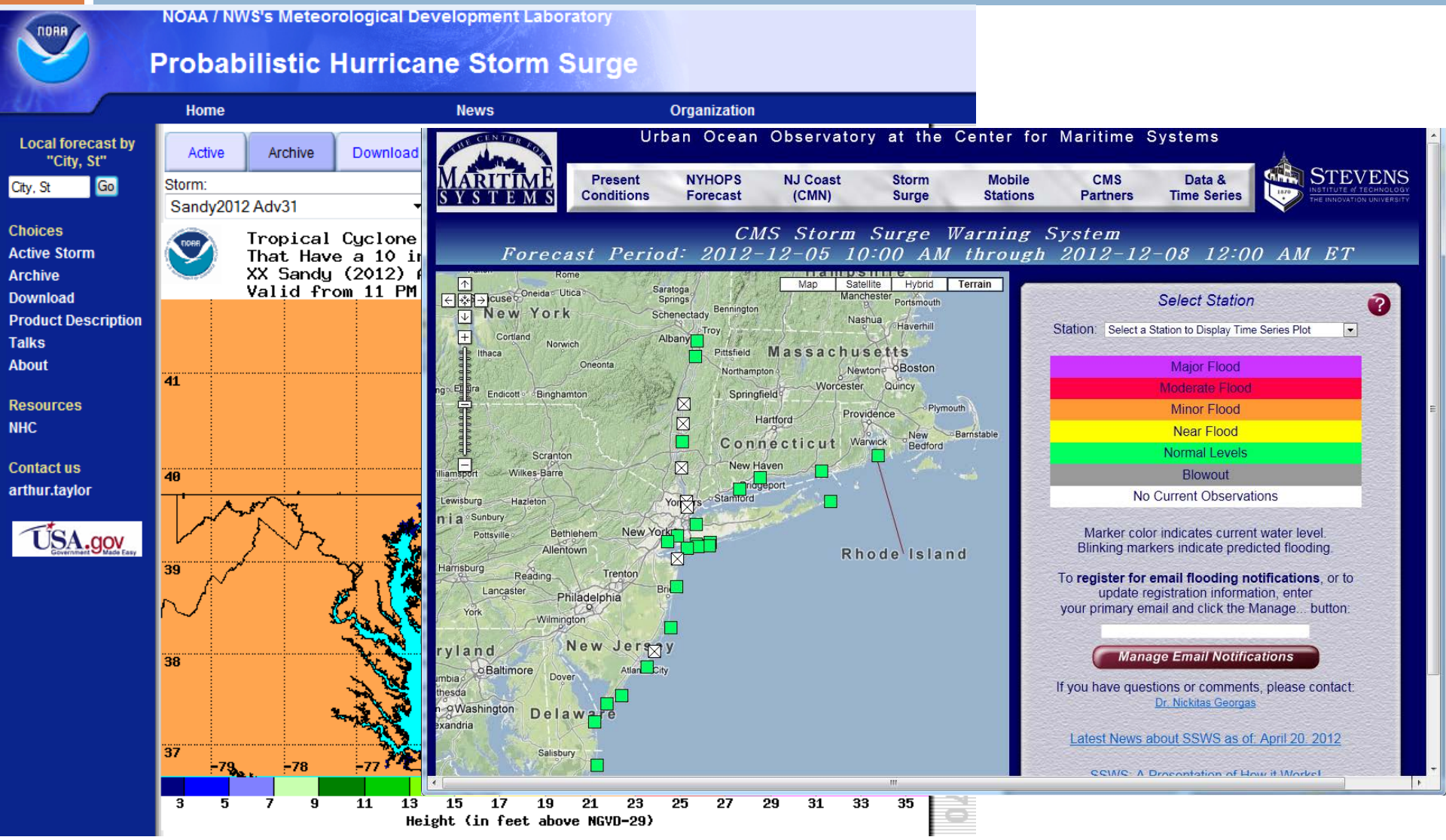
Storm Surge

- While the NJFLOOD MAPPER tool does not explicitly model storm surge, higher sea levels associated with possible storm surge (on top of expected SLR) can be visualized using the NJFloodMapper tool.
- However, caution is warranted in that, as Hurricane Sandy has demonstrated, extremely severe storms may have surge levels + wave heights higher than the 6 ft SLR mapped here.



Sandy in blue
Irene in magenta

Where we should be going…



Challenges

- V-DATUM corrections and SLR water surface generation: processing intensive
- NOAA CSC SLRViewer template written in older version of ArcFlex (version 1.2), limiting the incorporation of some features desired by the end-users
- Maintaining up-to-date information on facilities and evacuation routes. Ideally these data would be ingested from a web feature service hosted by the originating agency.

FUTURE IMPROVEMENTS

- We are presently working on refining the development of socio-economic indices of vulnerability.
- As the barrier island terrain has changed in places post-Sandy, updated LiDAR-derived topography will be incorporated as it is made available (and as appropriate).
- We will continue to add and update critical facilities and infrastructure data.

Closing Thoughts

- Geographic Visualization → Place-based decision support system
- NJFloodMapper as a vehicle to innovate with
- National consistency vs. local customization
  - SLR data
  - tools

New Jersey Sea Level Rise and Coastal Inundation Mapper: Summary

To address these needs, we have developed the New Jersey Sea Level Rise and Coastal Inundation Mapper (www.NJFloodMapper.com) to help decision-makers visualize the vulnerability of key infrastructure within their communities to sea level rise or storm surge. The project had three main outcomes:

1) Enhanced GIS/LiDAR- based assessment of coastal infrastructure and habitat vulnerability to sea level rise;
2) Collaboration with user groups to develop a suite internet-accessible, user-friendly mapping and visualization tools to meet their identified needs; and
3) Extensive outreach to local communities to promote enhanced preparedness and land use planning decisions in the face of continued sea level rise.

Almost ready to go operational