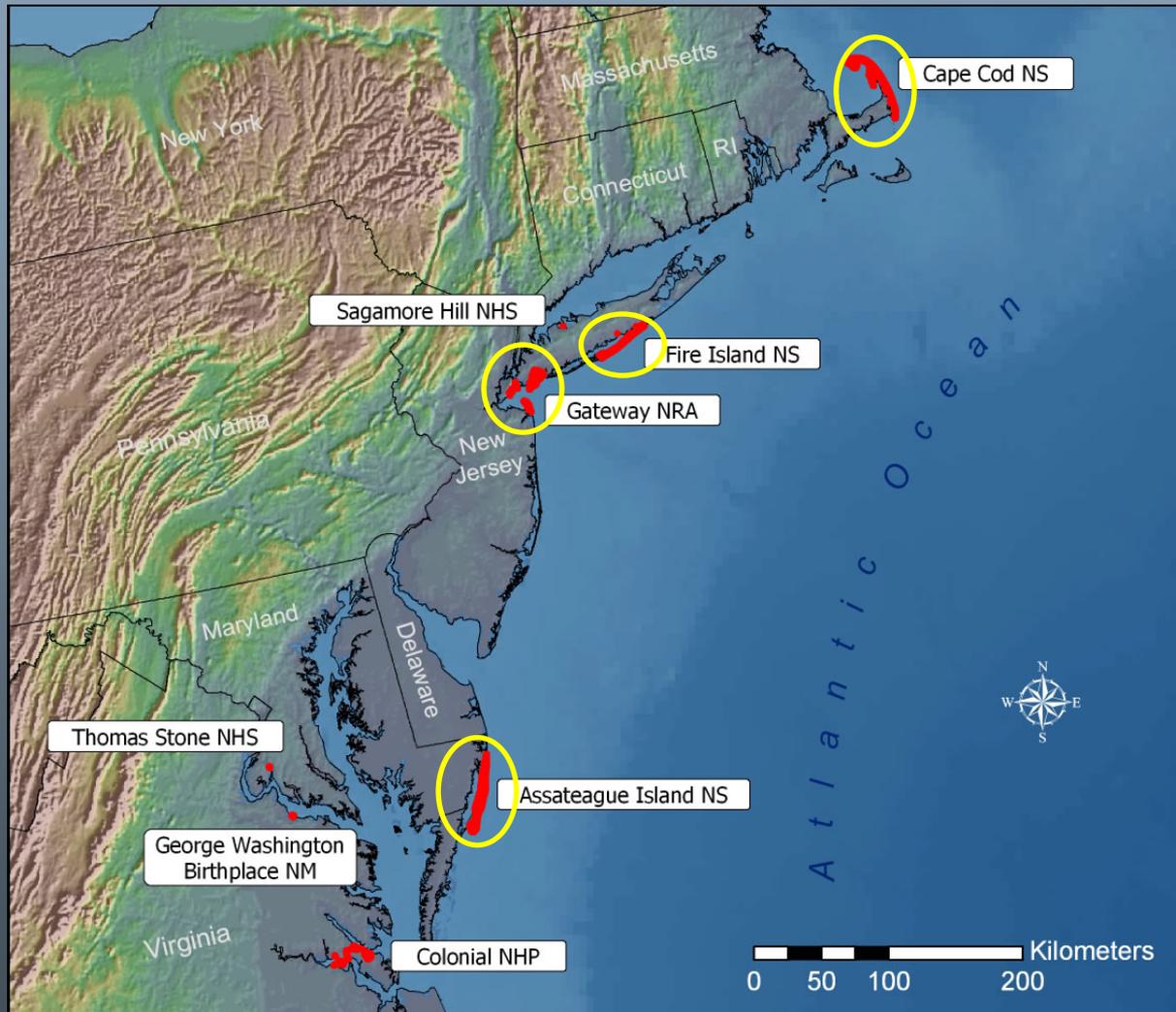




## Use of ArcGIS Online for Managing and Sharing Geospatial Data for Coastal Storm Response



# Northeast Coastal and Barrier Network, I&M Program



- Hurricane Sandy, Oct. 29, 2012
- \$21 million awarded in NPS resiliency and recovery projects in the NER
- 38 projects alone managed by NCBN / NAC CESU



# Northeast Coastal and Barrier Network, I&M Program



1. Elevation Mapping of Critical Park Areas for Planning and Post- and Future Storm Evaluation and Modeling
2. Data Management and Change Analysis of LiDAR and Other Geospatial Data Collected Pre- and Post-Hurricane Sandy





# Northeast Coastal and Barrier Network, I&M Program

THE  
UNIVERSITY  
OF RHODE ISLAND



1. **Elevation Mapping of Critical Park Areas for Planning and Post- and Future Storm Evaluation and Modeling**
2. Data Management and Change Analysis of LiDAR and Other Geospatial Data Collected Pre- and Post-Hurricane Sandy

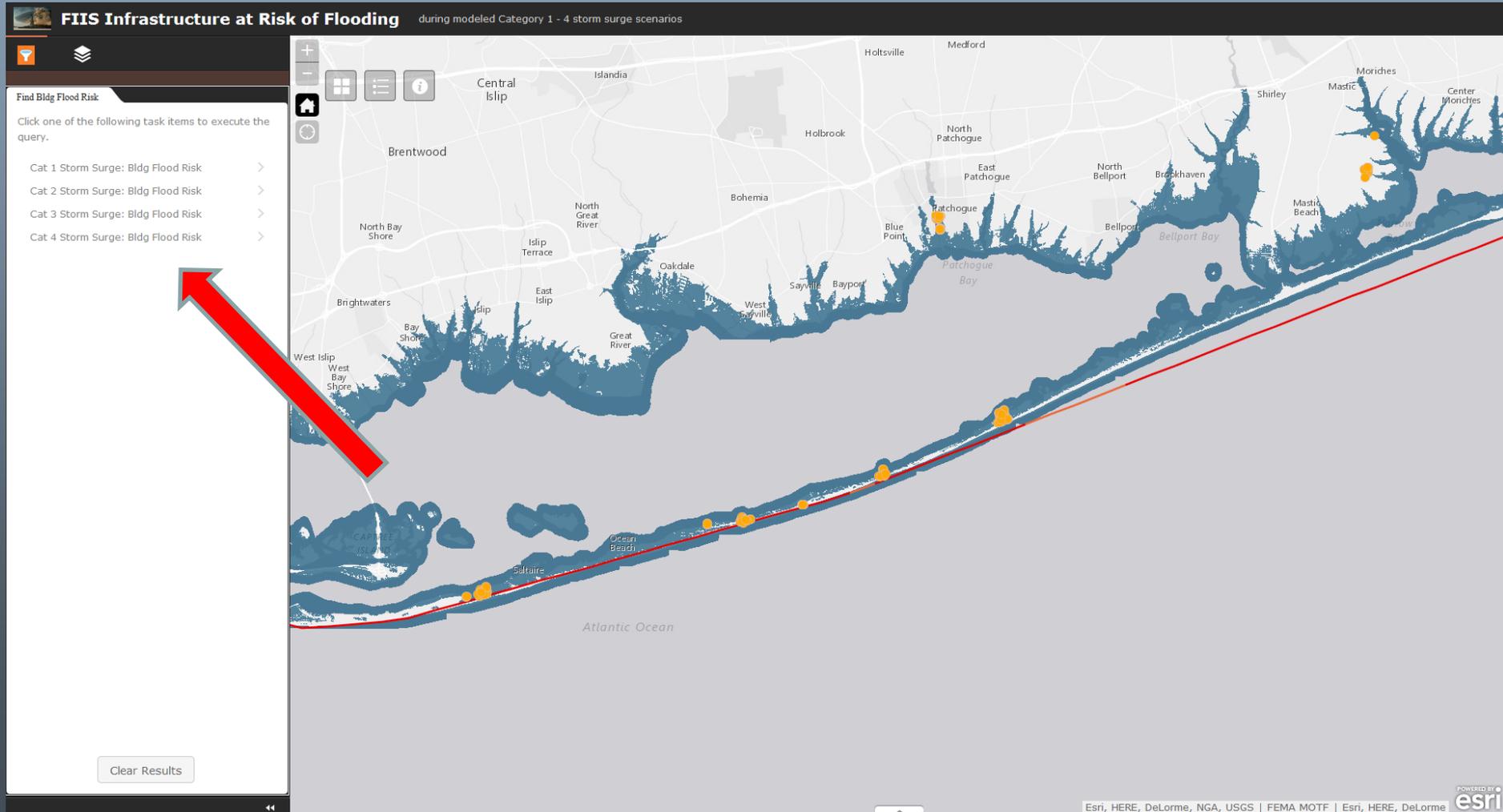




# Northeast Coastal and Barrier Network, I&M Program

## 1. Elevation Mapping of Critical Park Areas

<http://www.edc.uri.edu/initiatives/hurricane-sandy-nps-elevation-mapping-project>

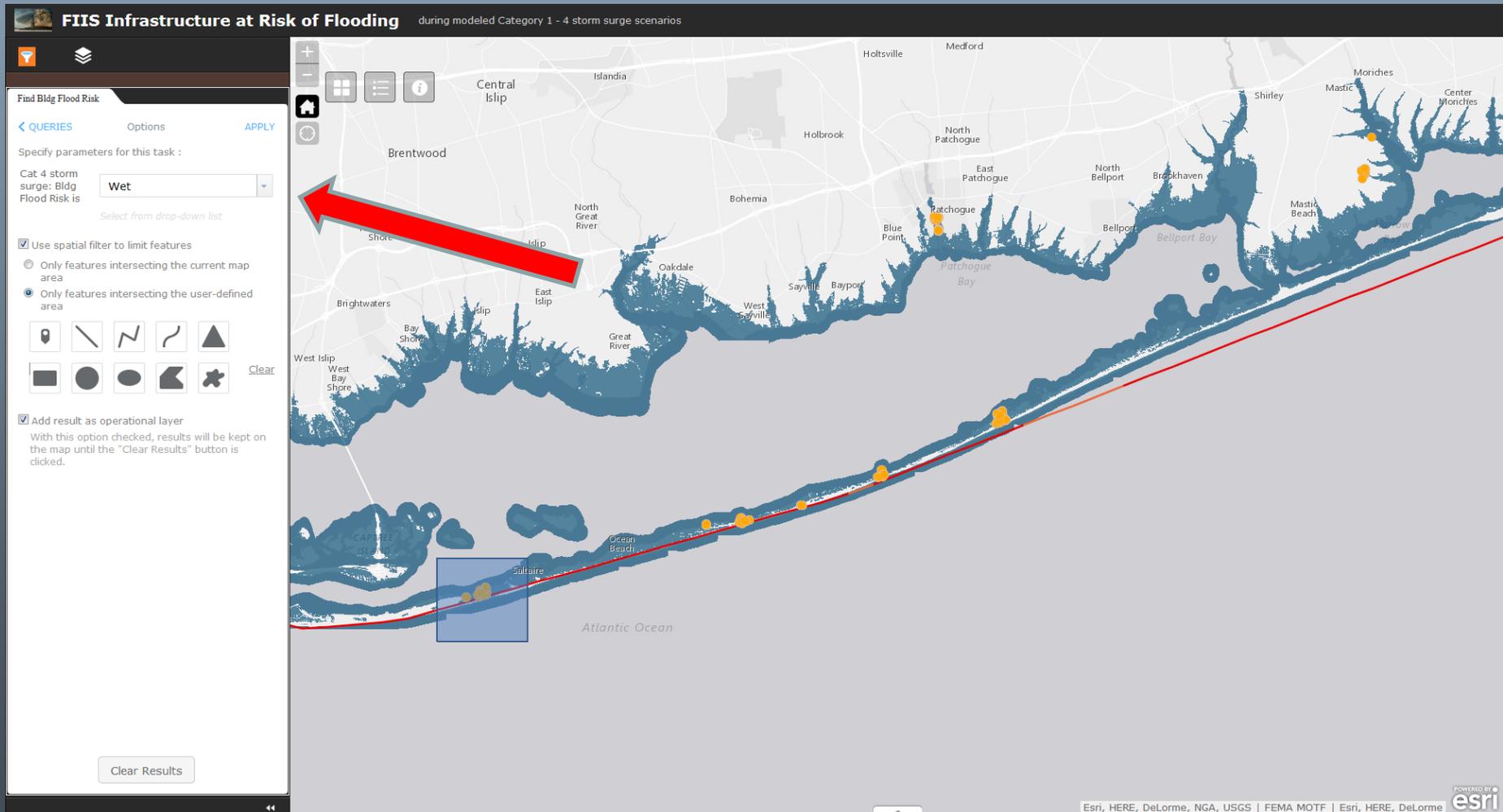




# Northeast Coastal and Barrier Network, I&M Program

## 1. Elevation Mapping of Critical Park Areas

<http://www.edc.uri.edu/initiatives/hurricane-sandy-nps-elevation-mapping-project>





# Northeast Coastal and Barrier Network, I&M Program

## 1. Elevation Mapping of Critical Park Areas

<http://www.edc.uri.edu/initiatives/hurricane-sandy-nps-elevation-mapping-project>

**FIIS Infrastructure at Risk of Flooding** during modeled Category 1 - 4 storm surge scenarios

Find Bldg Flood Risk

OPTIONS Results  
Number of features found: 41

FIIS-Light Station Visitor Use Area  
Lat: 40.63233072  
Lon: -73.21659052  
Descriptio: BW-LS Annex to Lighthouse 5  
FMSS\_ID: lhd13  
ele\_C4wtEI: -4.22  
Risk\_C4: Wet  
PICTURE: <http://focus.nps.gov/GetAsset/a815dca0-9c11-4054-8ba5-9f13176b3a47/proxy/hires>  
FIISAllElevations\_PICTURE: <http://focus.nps.gov/search/results/FMSSID/27075>

FIIS-Light Station Visitor Use Area  
Lat: 40.6323215  
Lon: -73.21636751  
Descriptio: BW-LS Annex to dock 5  
FMSS\_ID: lhd12  
ele\_C4wtEI: -4.06  
Risk\_C4: Wet  
PICTURE: <http://focus.nps.gov/GetAsset/7d94b977-33c7-4ed8-b07a-3dfa46f77afc/proxy/hires>  
FIISAllElevations\_PICTURE: <http://focus.nps.gov/search/results/FMSSID/27074>

FIIS-Light Station Visitor Use Area  
Lat: 40.63233926  
Lon: -73.21670525  
Descriptio: BW-LS Annex to Lighthouse 5  
FMSS\_ID: lhd14  
ele\_C4wtEI: -4.37

Clear Results

**Flood Risk calculation**  
(1st flr. elev - strm surge wtr elev) =  
**Wet:** values less than -0.2 m  
**Probably Wet:** values between -0.2 m and 0.2 m  
**Maybe Dry:** values more than 0.2 m

FMSS ID: 113611

Zoom to

Options Filter by Map Extent Zoom to Clear Selection Refresh

Flood Risk - FIIS Buildings (org)

OBJECTID_1	Lat	Lon	Elev	Title	Descriptio	Elevation	FMSS_ID	elev_wtEle	ele_C2_wtE	ele_C3wtEI	ele_C4wtEI	Risk_C1	Risk_C2	Risk_C3	Ri
81	40.63233072	-73.21659052	1.63	FIIS-Light Station Visitor Use Area	BW-LS Annex to Lighthouse 5	5.348 ft	lhd13	1.23	0.35	-2.36	-4.22	Maybe Dry	Maybe Dry	Wet	W
82	40.6323215	-73.21636751	1.79	FIIS-Light Station Visitor Use Area	BW-LS Annex to dock 5	5.873 ft	lhd12	1.39	0.51	-2.2	-4.06	Maybe Dry	Maybe Dry	Wet	W
83	40.63233926	-73.21670525	1.48	FIIS-Light Station Visitor Use Area	BW-LS Annex to Lighthouse 5	4.856 ft	lhd14	1.08	0.2	-2.51	-4.37	Maybe Dry	Maybe Dry	Wet	W
84	40.63201023	-73.2165475	2.38	FIIS-Light Station Visitor	Q-0000100D-401 S-03	7.808 ft	64886	1.98	1.1	-1.61	-3.47	Maybe Dry	Maybe Dry	Wet	W

41 features 0 selected



# Northeast Coastal and Barrier Network, I&M Program

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1. Elevation Mapping of Critical Park Areas for Planning and Post- and Future Storm Evaluation and Modeling
2. **Data Management and Change Analysis of LiDAR and Other Geospatial Data Collected Pre- and Post-Hurricane Sandy**





# Northeast Coastal and Barrier Network, I&M Program

## 2. Data Management and Change Analysis

<http://www.edc.uri.edu/Sandy/home>

- 3 Park Geodatabases
- Translated to Feature layers, Tile services, Web Maps, Web Apps
- 3 online-data listing apps
- 8 specialized web apps

The screenshot shows the website for the Environmental Data Center at the University of Rhode Island, specifically the Hurricane Sandy Data Management page. The page has a yellow navigation bar with links for 'About the EDC', 'Blog', 'Projects & Initiatives', 'Geospatial Extension', 'Learning Opportunities', and 'GIS @ URI'. Below the navigation bar is the university's logo and the text 'ENVIRONMENTAL DATA CENTER'. A search bar is located on the right side of the header.

### Hurricane Sandy: Data Management

Hurricane Sandy severely impacted many areas along the East Coast in October of 2012 including these three National Parks: **Assateague National Seashore (ASIS)**, **Fire Island National Seashore (FIIS)**, and **Gateway National Recreation Area (GATE)**. URI's Environmental Data Center is working with these parks to assist in their geospatial preparedness, response, and procedures in future storm events.

#### Assembled Data

- GATE:** Online Data Listing  
GATE: Geospatial Data Listing (A...)
- ASIS:** Online Data Listing  
ASIS: Geospatial Data Listing (A...)
- FIIS:** Online Data Listing  
FIIS: Geospatial Data Listing (App)

#### Applications

- FIIS:** Hurricane Data Products
- GATE:** Hurricane Data Products
- ASIS:** Hurricane Data Products

#### Workflows

- [Collarless Topo Maps from USDA | Geospatial Data Gateway](#)
- [Converting GeoPDFs with GDAL](#)
- [USGS Topographic Maps: Converting GeoPDF to JPEG2000](#)
- [USGS Topographic Maps: Converting GeoPDF to GeoTIFF](#)
- [Downloading USGS Topo Maps from the National Map Viewer](#)

[more](#)

#### GIS Blog

- [Developing a Topobathy Digital Elevation Model \(DEM\)](#)
- [Prepping and Adding Metadata to ArcGIS Online Items](#)
- [VDatum to Convert LAS Data into MHW Vertical Datum](#)
- [Tile Layers - keeping credits low](#)
- [Customizing US National Grid Maps for Post-Storm Recovery](#)

[more](#)



# Northeast Coastal and Barrier Network, I&M Program

## 2. Data Management and Change Analysis

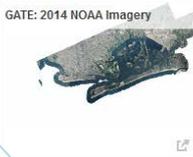
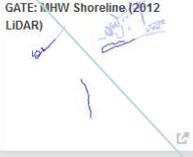
<http://www.edc.uri.edu/Sandy/home>

### GATE: Online Data Listing

Click on a thumbnail below to begin.

Search maps

Sort by Date Title Type Ratings Avg. Rating Comments Views

 <p>GATE: 2014 NOAA Imagery</p>	 <p>GATE: 2m Contours Smoothed (2012 LIDAR)</p>	 <p>GATE: 2m Smoothed Contours (2014 LIDAR)</p>
 <p>GATE: MHW Shoreline (2012 LIDAR)</p>	 <p>GATE: MHW Shoreline (2014 LIDAR)</p>	 <p>GATE: Park Boundary</p>
 <p>GATE: SLOSH (C1, C2, C3, C4)</p>	 <p>GATE: SLR (1m)</p>	 <p>GATE: SLR (2m)</p>
 <p>GATE: SLR (60cm)</p>	 <p>GATE: US National Grid Boundaries</p>	 <p>GATE_JBU: 2013 Quickbird Imagery</p>
 <p>GATE_JBU: 2013 Quickbird Imagery (BW)</p>	 <p>GATE_JBU: 2015 NOAA Orthoimagery</p>	 <p>GATE_JBU: Bare Earth DEM (2012 LIDAR)</p>

### Geospatial Data

Explore the geospatial data acquired for GATE as a result of the data needs identified after **Hurricane Sandy**.

A local copy of these data can also be found on the share drive at GATE.

Follow these directions to begin building your own map.

**Click on a thumbnail** of the data of interest to view the details: Description, Access and Use constraints and other pertinent information.

Click **Open** and choose to **Add layer to map**.

Follow **ESRI's** help for more details.

Home Gallery Map Scene Groups Sign In

## GATE: SLOSH (C1, C2, C3, C4)



SLOSH for Gateway National Recreation Area (SIU & JBU)  
Feature Layer by SandyStorm  
Source: Feature Service  
Last Modified: March 4, 2015  
★ ★ ★ ★ (1 rating, 2,432 views)  
Sign in to rate this item.  
[Facebook](#) [Twitter](#)

**OPEN**

### Description

This layer represents hurricane inundation polygons for category 1 through 4 hurricanes striking the East Coast. Hurricane surge values were developed by the National Hurricane Center using the SLOSH (Sea Lake and overland Surge from Hurricanes) Model data.

This layer was developed as part of the project "Assessing Inundation Risk from Sea Level Rise and Storm Surge for the Northeast Coastal National Parks" The Parks included in this study are Acadia NP, Assateague Island Nat. Seashore, Boston Harbor Island National Rec. Area, Cape Cod Nat. Seashore, Colonial Nat. Historical Park, Fire Island Nat. Seashore, Gateway National Rec. Area, and George Washington Birthplace Nat. Historical Park. This data only includes the results for the Staten Island Unit and the Jamaica Bay Unit

### Access and Use Constraints

The National Park Service shall not be held liable for improper or incorrect use of the data described and/or contained herein. These data and related graphics are not legal documents and are not intended to be used as such. The information contained in these data is dynamic and may change over time. The data are not better than the original sources from which they were derived. It is the responsibility of the data user to use the data appropriately and consistent within the limitations of geospatial data in general and these data in particular. The related graphics are intended to aid the data user in acquiring relevant data; it is not appropriate to use the related graphics as data. The National Park Service gives no warranty, expressed or implied, as to the accuracy, reliability, or completeness of these data. It is strongly recommended that these data are directly acquired from an NPS server and not indirectly through



# Northeast Coastal and Barrier Network, I&M Program

## 2. Data Management and Change Analysis

<http://www.edc.uri.edu/Sandy/home>

### Imagery Inventory: Post Hurricane Sandy

#### Explore Inventory

This inventory includes imagery collected soon **after Hurricane Sandy** made landfall in late October 2012, as well as imagery collected in the years following.

#### Get started:

- Simply click the **tabs below** to view the imagery by park, originator and year or
- **Use the map** at the right to explore the data by park. Use your mouse to click on a green boundary polygon.

*FIIS: Fire Island National Seashore*

*GATE: Gateway National Recreation Area*

*ASIS: Assateague Island National Seashore*

FIIS: NOAA (2012)

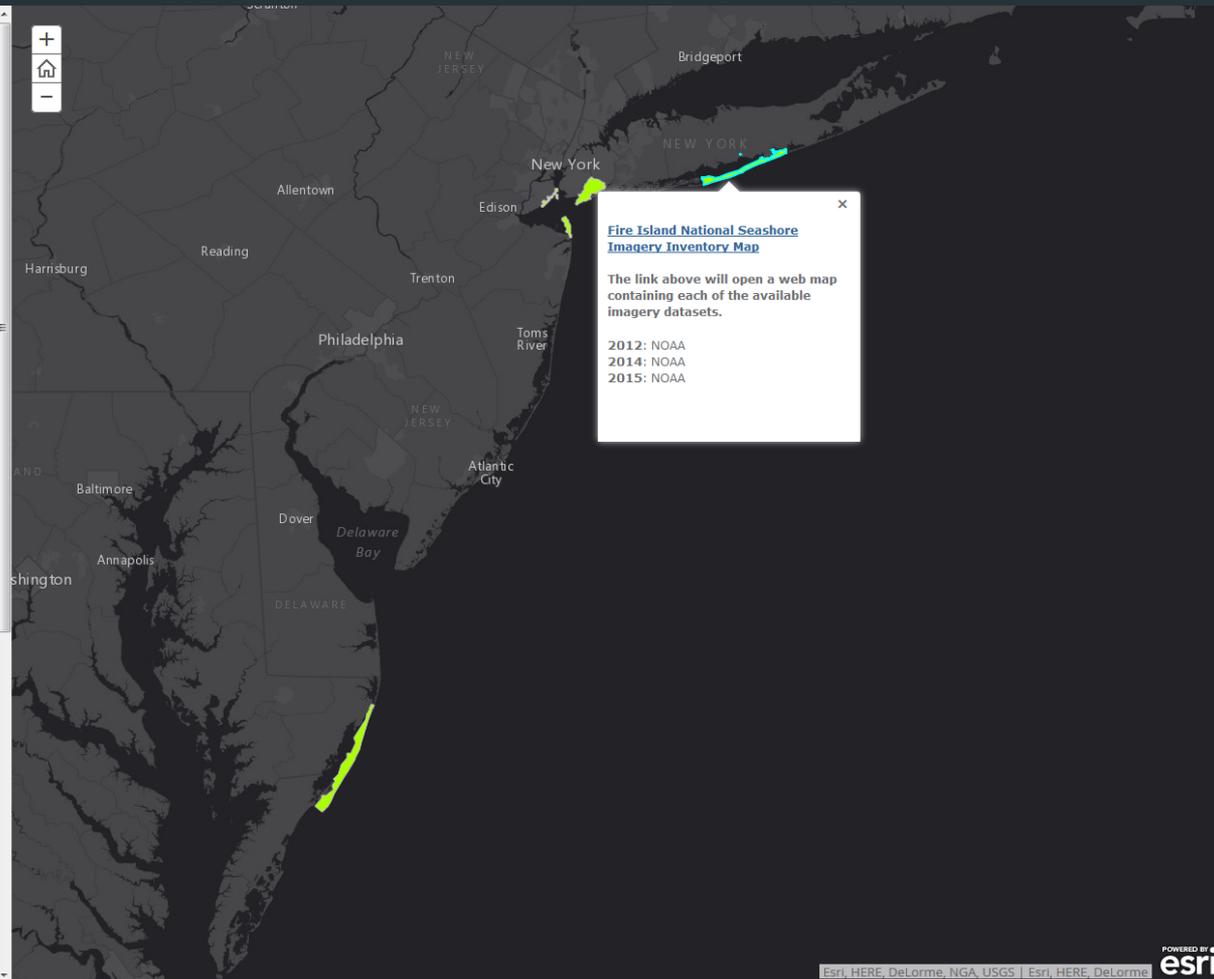
FIIS: NOAA (2014)

FIIS: NOAA (2015)

GATE: NOAA (2012)

GATE: Quickbird (2013)

GATE: NOAA (2014)





# Northeast Coastal and Barrier Network, I&M Program

## 2. Data Management and Change Analysis

<http://www.edc.uri.edu/Sandy/home>

### Imagery Inventory: Post Hurricane Sandy

Explore Inventory

FIIS: NOAA (2012)

FIIS: NOAA (2014)

Imagery collected by NOAA between January 1, 2014 and April 21, 2014

[Open FIIS Imagery Inventory Map](#)

FIIS: NOAA (2015)

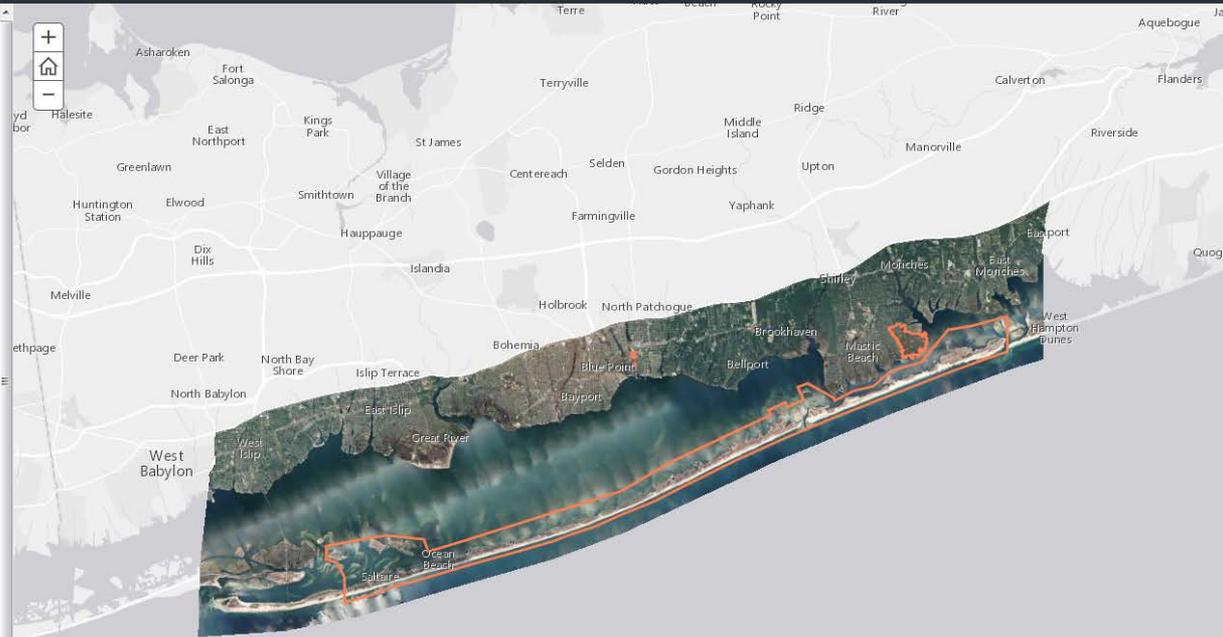
GATE: NOAA (2012)

GATE: Quickbird (2013)

GATE: NOAA (2014)

GATE: NOAA (2015)

ASIS: NOAA Imagery (2012)





# Northeast Coastal and Barrier Network, I&M Program

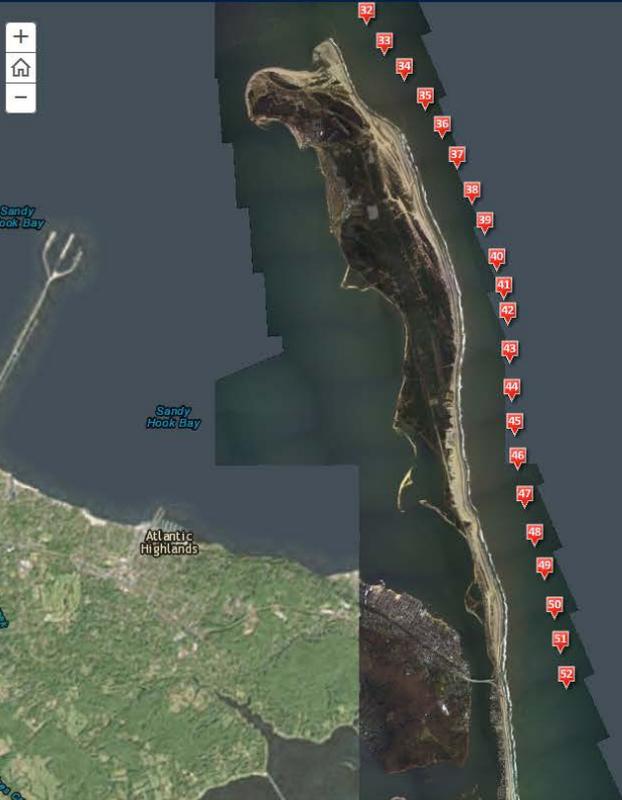
## 2. Data Management and Change Analysis

<http://www.edc.uri.edu/Sandy/home>

### GATE: Post-Sandy Oblique Aerial Photo Map Tour

Traditional aerial photos provide a view of an area directly beneath the airplane. These oblique photos show a view of the area as if looking out a plane's side window. These oblique photos were collected by the USGS between November 4-6, 2012. More information on these photos is available from: <http://pubs.usgs.gov/ds/0858/>.

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2012\_1105\_150456d.jpg

The photo's name to the left uses the following format:  
Year\_MonthDay\_HourMinuteSecond.jpg.



2012\_1105\_150456d.jpg



2012\_1105\_150503d.jpg



2012\_1105\_150510d.jpg



2012\_1105\_150518d.jpg



2012\_1105\_150526d.jpg



2012\_1105\_150532d.jpg



2012\_1105\_150532d.jpg



2012\_1105\_150548d.jpg



2012\_1105\_150554d.jpg



2012\_1105\_150600d.jpg



2012\_1105\_150606d.jpg



2012\_1105\_150614d.jpg



# Northeast Coastal and Barrier Network, I&M Program

## 2. Data Management and Change Analysis

<http://www.edc.uri.edu/Sandy/home>



### Fire Island National Seashore: Superstorm Sandy Incident Brief

#### Northeast Region (NER) Built Structure Reconstruction Areas

This shows both built structures damaged during the storm, as well as debris piles created during the storm. These damaged structures require either repair, reconstruction or removal.

*These data were developed in the following way:*

Staff with knowledge of post-storm ground conditions used pre-storm and post-storm orthoimagery to digitize the feature locations and approximate footprints. Although personnel completing this were familiar with ground conditions, many were not familiar with the geospatial technology used to do this.

**These data represent a portion of damaged built infrastructure, but does not represent a complete list of damaged infrastructure.**

#### USGS Oblique Aerial Post-Sandy Images

Shortly after Superstorm Sandy hit the northeast coastline on October 29, 2012, the USGS took to the skies to capture a different perspective of the damage caused by storm. Deviating from the typical vertical aerial imagery, the USGS used an aircraft to fly parallel to affected shorelines and capture oblique aerial images.

This [webmap](#) shows the oblique images for Fire Island that were collected by the USGS on November 5, 2012.

This [swipe mapping application](#) allows the user to view oblique photos in comparison with post-Sandy imagery and Esri World Imagery. [To view Fire Island click Tab 3.](#)

The point locations represent the location of the aircraft from which images were captured; they do NOT represent the location of the features within each image.

A pop-up associated with each point provides information on the date captured, as well as a thumbnail link to the full sized image.

#### For more information...

The page to the right provides more information on final products that have been produced by the Environmental Data Center at URI.

For more information on the Storm Data project at the University of Rhode Island, please visit this [link](#).

*This product was developed with the support of Hurricane Sandy supplemental funding competitively awarded by the National Park Service in partnership with the North Atlantic Coast Cooperative Ecosystems Studies Unit.*



LEGEND

**Reconstruction Lines**

Notes	Lighthouse Annex to Dock walk replacement
Editor's Name	
Edit Date (MM/DD/YY):	

OVERVIEW MAP





# Northeast Coastal and Barrier Network, I&M Program

## 2. Data Management and Change Analysis

<http://www.edc.uri.edu/Sandy/home>

### USGS Post-Sandy Oblique Aerial Imagery: Assateague Island, Fire Island and Gateway NRA

The oblique aerial imagery captured by USGS after Hurricane Sandy along with the ability to compare post-Sandy satellite and vertical aeriels, provides a unique view of the damage caused along the East Coast of the United States.

A story map   

THE UNIVERSITY OF RHODE ISLAND ENVIRONMENTAL DATA CENTER

1 2 3 4

#### Using this application

Use the tabs above to zoom into one of the three National Coastal Parks.

View the oblique imagery by clicking on a red point with your mouse.

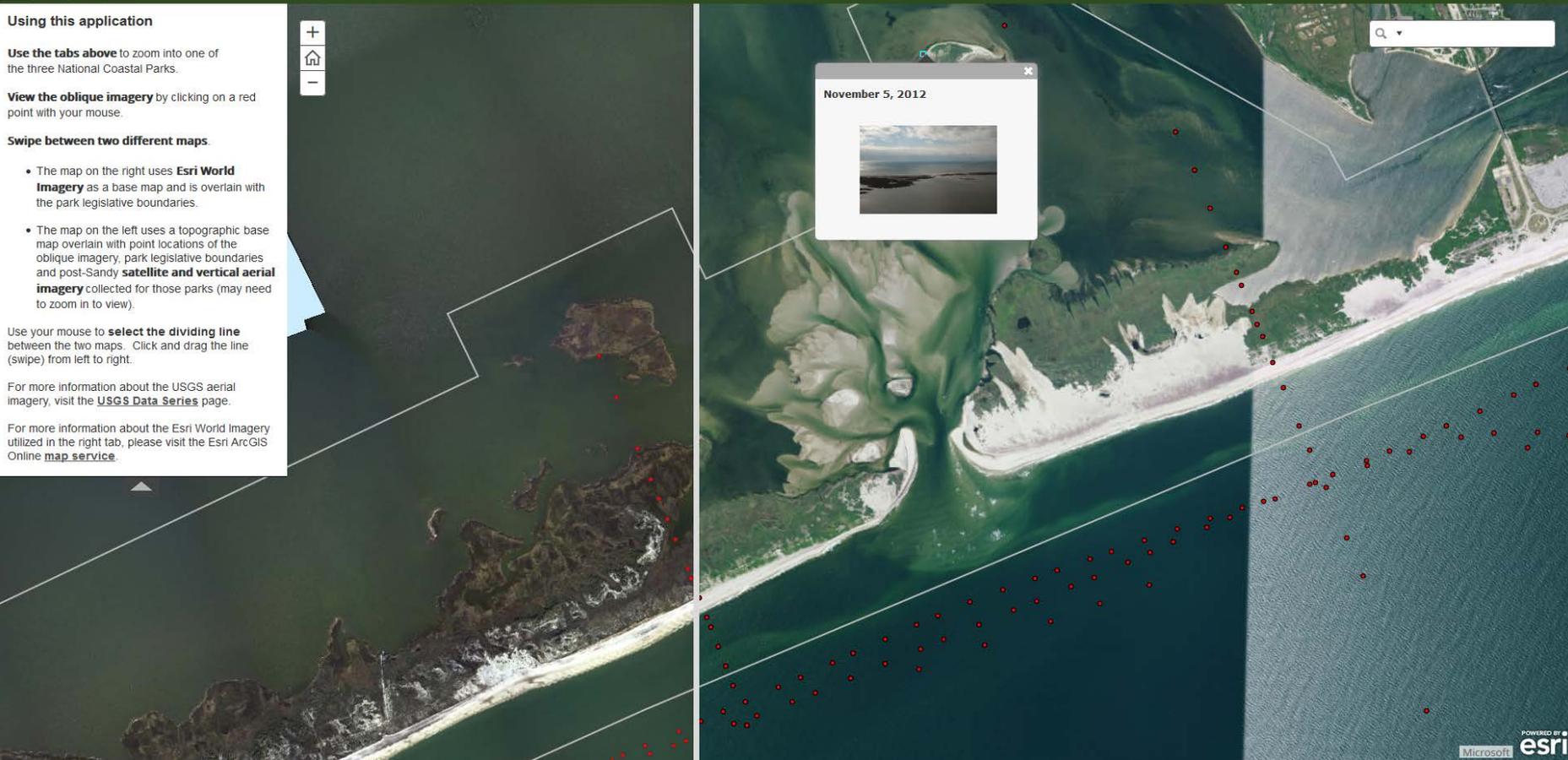
Swipe between two different maps.

- The map on the right uses **Esri World Imagery** as a base map and is overlain with the park legislative boundaries.
- The map on the left uses a topographic base map overlain with point locations of the oblique imagery, park legislative boundaries and post-Sandy **satellite and vertical aerial imagery** collected for those parks (may need to zoom in to view).

Use your mouse to **select the dividing line** between the two maps. Click and drag the line (swipe) from left to right.

For more information about the USGS aerial imagery, visit the [USGS Data Series](#) page.

For more information about the Esri World Imagery utilized in the right tab, please visit the Esri ArcGIS Online [map service](#).





## Next steps...

- Ongoing peer, park reviews
- Delivery of maps and apps to NPS AGOL account(s)
- Admin Tools for ArcGIS<sup>SM</sup> Online (Pro)





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**Hurricane Sandy: NPS Elevation Mapping Project:**

<http://www.edc.uri.edu/initiatives/hurricane-sandy-nps-elevation-mapping-project>

**Hurricane Sandy: NPS Storm Data Project:**

<http://www.edc.uri.edu/Sandy/home>

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