

# Hurricane Sandy Story Map

National Park Service  
U.S. Department of the Interior



Colorado State University



*Telling the story of NPS coastal resiliency  
research in NE coastal parks...*



# Hurricane Sandy Story Map



Hurricane Sandy made landfall in New Jersey on October 29, 2012, resulting in tens of billions of dollars damage and over 100 deaths in the US alone.



# Hurricane Sandy Story Map



In the wake of Hurricane Sandy,  
DOI funded research  
to study coastal resiliency.



The Northeast Coastal and Barrier Network (NCBN)  
created a story map to tell about  
the diverse research efforts underway in  
the four coastal parks most affected by Hurricane Sandy



Cape Cod Nat'l Seashore

Gateway Nat'l Recreation Area

Fire Island Nat'l Seashore

Assateague Island Nat'l Seashore

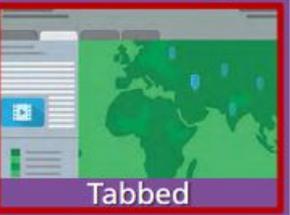
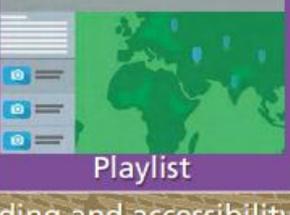
# Story Map

## Development Considerations

- Out of the box (existing template, little or no coding)
- Lots of content
- Non-linear design to allow users to explore options
- NPS branding/508 compliance (coming soon)

# Story Map Structure

- There are many existing SM templates to choose from...
- We considered several of these templates...

Sequential, Place-Based Narratives	A Curated List of Points of Interest	Presenting a Series of Maps	Comparing Two Maps	Presenting One Map
 Map Tour	 Shortlist	 Tabbed	 Swipe	 Basic
 Map Journal	 Countdown	 Side Accordion	 Spyglass	Custom Story Map Designs
 Playlist	 Bulleted	 Custom		

 Includes NPS branding and accessibility improvements – available now!

 Includes NPS branding and some accessibility improvements – coming soon!

July 22, 2015

Story Map Templates for NPS | 16

# Story Map Structure

- Considered Map Journal and Shortlist templates
  - Too limiting for our diverse and abundant content
- Decided to use **Tabbed Series** template
  - Embedded *Map Journal* template in tabs of main map
  - Legend issue required embedded *Side Accordion* on main tab
  - NCBN hosts documents
  - Flickr hosts photos (NCBN account)

# Story Map Tour – Main Page

## National Park Service Hurricane Sandy Coastal Resiliency Projects

No issues detected

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NE Coastal Parks & Hurricane Sandy

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High Resolution Elevation Data

Submerged Habitat Mapping

Jamaica Bay Science

Resource Briefs

Personnel Profiles

Photo Stories

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### Hurricane Sandy, October 2012

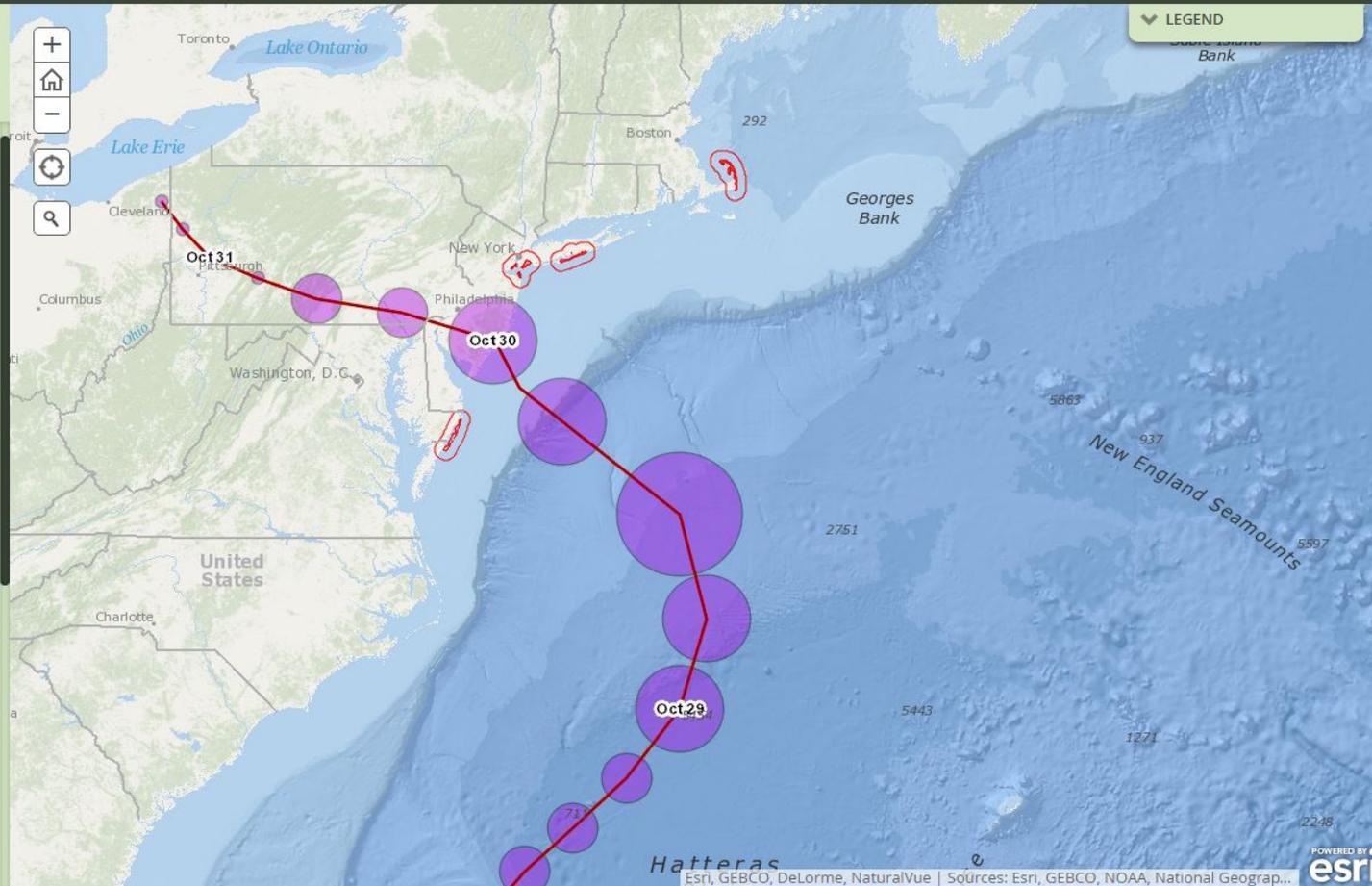


The following four National Parks along the northeastern U.S. coast were significantly affected by Hurricane Sandy, which made landfall in New Jersey on October 29, 2012:

- [Assateague Island National Seashore, VA & MD](#)
- [Cape Cod National Seashore, MA](#)
- [Fire Island National Seashore, NY](#)
- [Gateway National Recreation Area, NY & NJ](#)

These four parks (see red areas on map to right) received funding from the Department of the Interior and are conducting scientific research to better understand the effects of the hurricane, the resilience of natural systems, and how to better prepare for future storms.

The tabs at the top of the page allow you to explore different topics related to Hurricane Sandy science in these parks. After clicking on a tab, you can scroll



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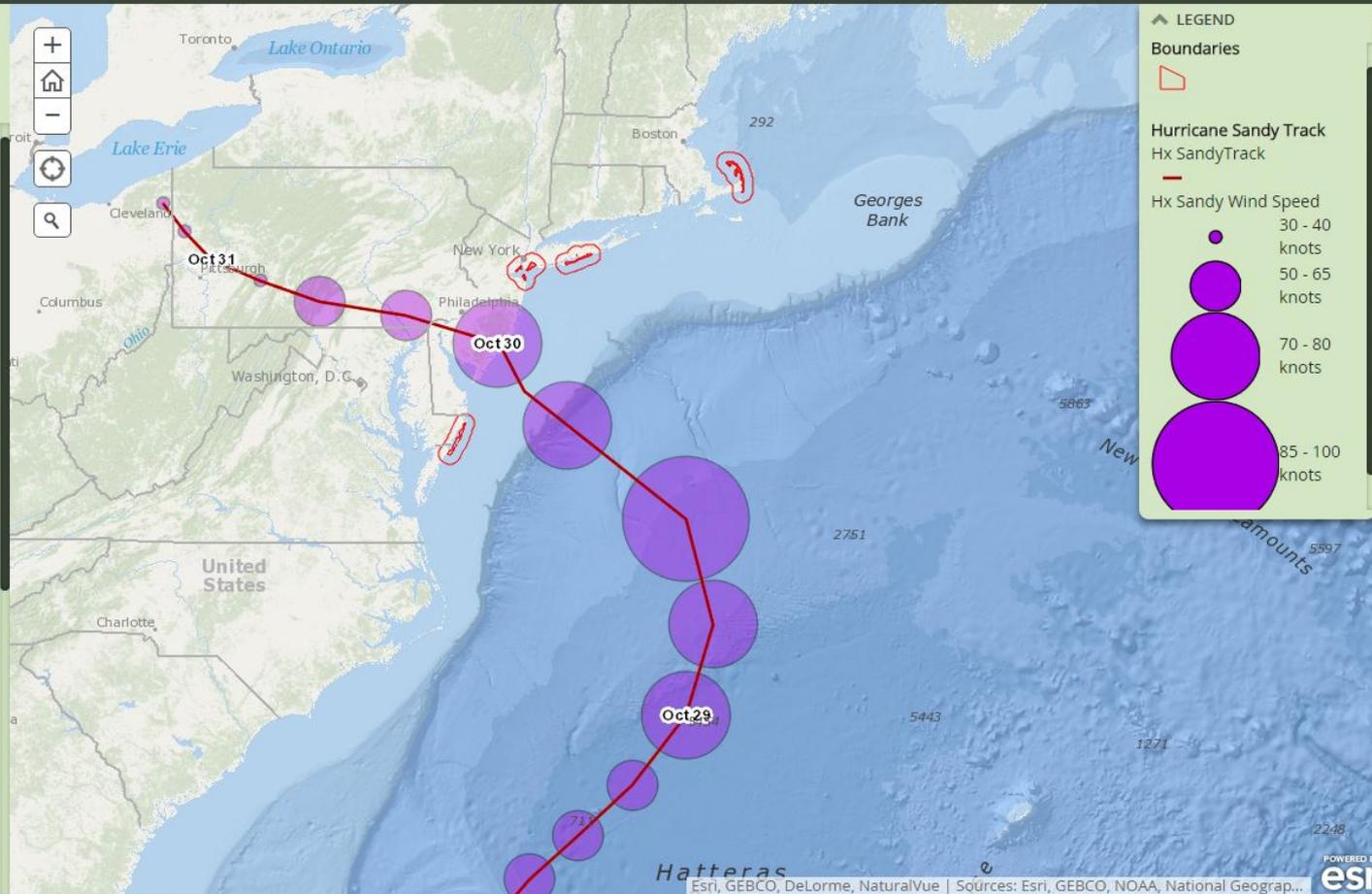


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#### Gateway National Recreation Area, NY & NJ

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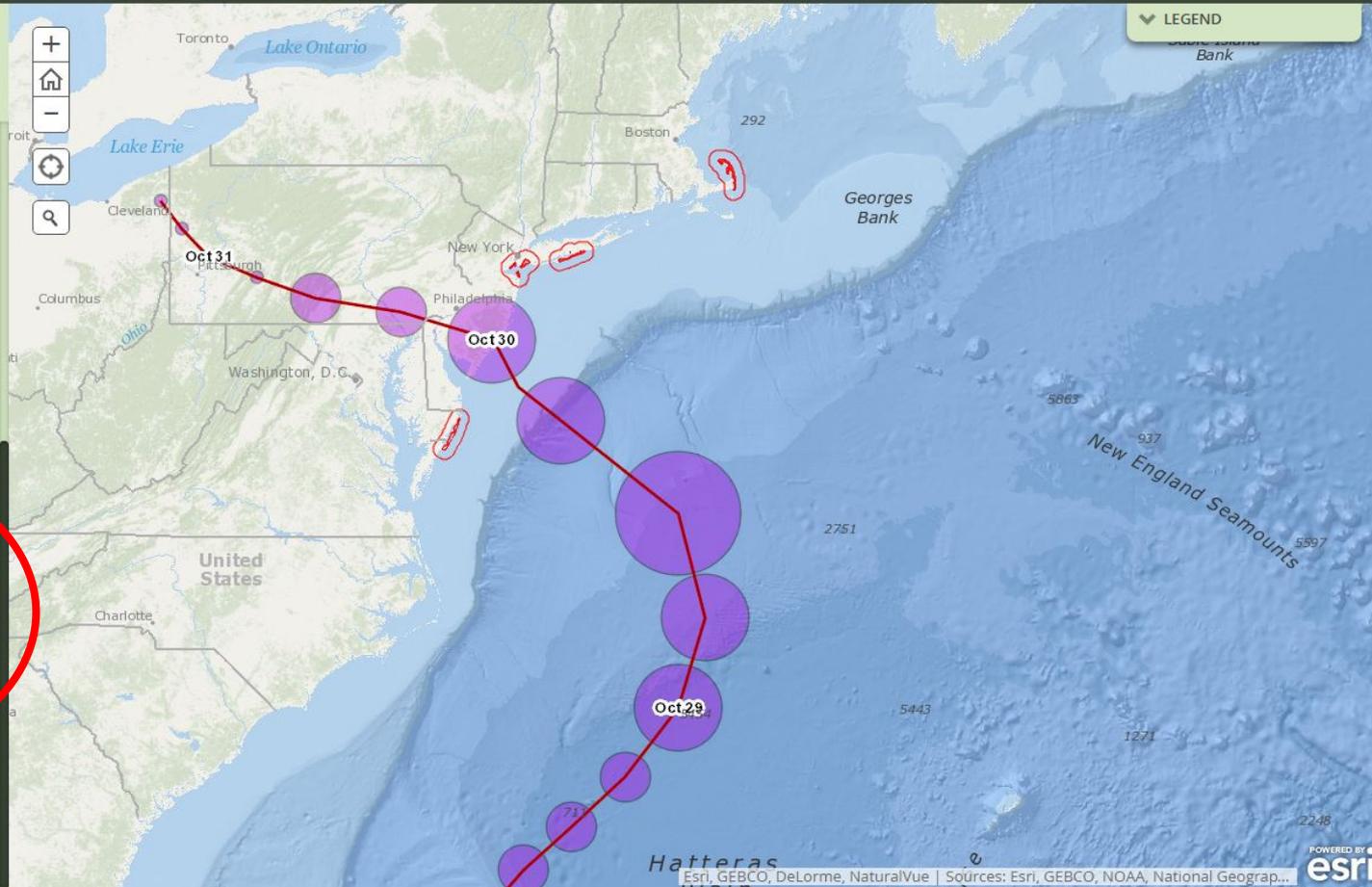
The tabs at the top of the page allow you to explore different topics related to Hurricane Sandy science in these parks. After clicking on a tab, you can scroll down to explore different sub-sections of that tab's theme, and click on text links to view related reports, web sites and photos.

Click below to watch a 7:27 minute ABC News video as Hurricane Sandy made landfall in New Jersey.



#### StoryMap Development Team:

- Thom Currits, Colorado State University Research Associate
- Sara Stevens, National Park Service NCBN Program Manager
- Kristen Hychka, University of Rhode Island Research Associate



# Main Page – Embedded Video

Hurricane Sandy: Super Storm Slams East Coast States



abc NEWS

The PERFECT STORM



abc NEWS

#ABCWorldNews



2:15 / 7:26



YouTube

# Ecological Impacts of Breaches

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Ecological Impacts of Breaches

No issues detected

## Physical Monitoring

In order to understand the physical changes that are occurring to the Fire Island Old Inlet Breach, created by Hurricane Sandy in 2012, the National Park Service (in collaboration with scientists from Stony Brook University) have been monitoring its physical characteristics. Some of the datasets being collected for this project include: bathymetry within the breach channel, shoreline change, water levels, and oblique aerial photography of the breach.

Bathymetry data are being used to understand changes to the depth of the channel, and are being analysed to help determine if the breach is moving towards natural closure. Survey-grade GPS units are also being used to monitor the edge of the shoreline adjacent to the breach.

For years, Dr. Charles Flagg and colleagues have been collecting aerial photography to document changes to Fire Island. Dr. Flagg is continuing this work by capturing images of the Old Inlet Breach. This documentation provides the NPS with a fascinating aerial photographic history of how the island is evolving. Visit [The Great South Bay Project](#) to access aerial photography, videos, and reports on the breach.

[Click here for more information on this project.](#)  
[More aerial photos of the breach](#)

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Plankton Community Assessment

# Ecological Impacts of Breaches

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## Ecological Impacts of Breaches

During Hurricane Sandy, three breaches occurred on Fire Island, two of which were filled and closed following the storm (one by natural processes and one with human intervention). The breach at what is called the Old Inlet within Fire Island National Seashore was left untouched. The breach provides an extraordinary opportunity to evaluate ecological responses to inform breach management decisions at Fire Island, and to inform future breach management decisions within the the mid-Atlantic region and elsewhere.

This project was developed to collect and synthesize information on the components of the Bay and estuary that rapidly respond to the new breach (water quality, plankton, seagrass) and those components, such as fish communities, that take longer to respond.

[Click here for more information about this project.](#)

Additional resources:

- [Compare pre- and post-breach aerial photography.](#)
- [More aerial photos](#) of the breach

Click the image to the right to play a video of an overflight

SoMAS Fire Island Sea Shore breach after Hurricane Sandy



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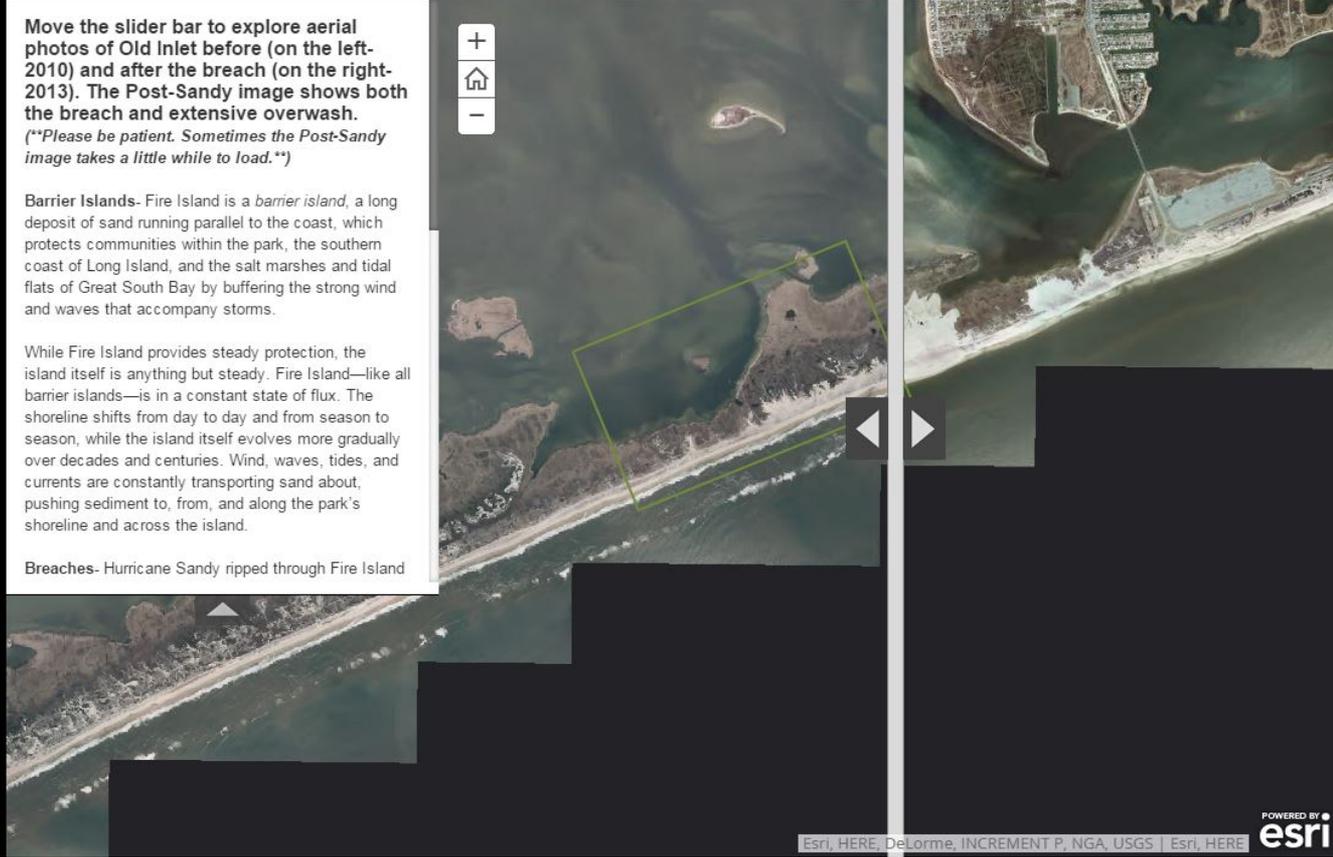
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Move the slider bar to explore aerial photos of Old Inlet before (on the left-2010) and after the breach (on the right-2013). The Post-Sandy image shows both the breach and extensive overwash. (\*\*Please be patient. Sometimes the Post-Sandy image takes a little while to load.\*\*)

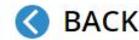
**Barrier Islands-** Fire Island is a *barrier island*, a long deposit of sand running parallel to the coast, which protects communities within the park, the southern coast of Long Island, and the salt marshes and tidal flats of Great South Bay by buffering the strong wind and waves that accompany storms.

While Fire Island provides steady protection, the island itself is anything but steady. Fire Island—like all barrier islands—is in a constant state of flux. The shoreline shifts from day to day and from season to season, while the island itself evolves more gradually over decades and centuries. Wind, waves, tides, and currents are constantly transporting sand about, pushing sediment to, from, and along the park's shoreline and across the island.

**Breaches-** Hurricane Sandy ripped through Fire Island



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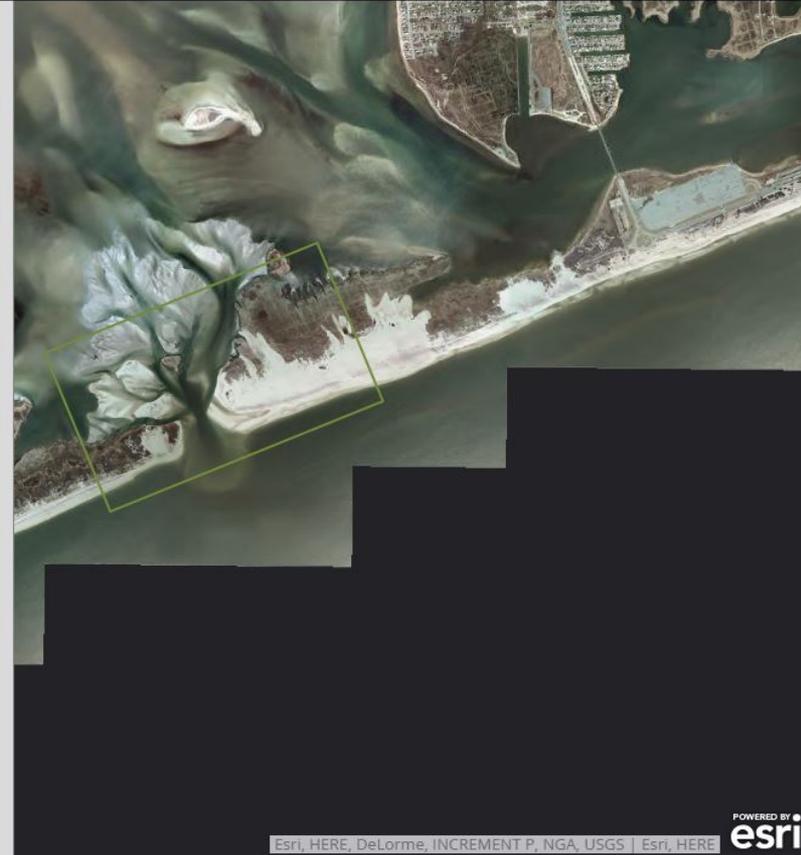
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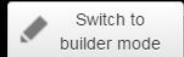
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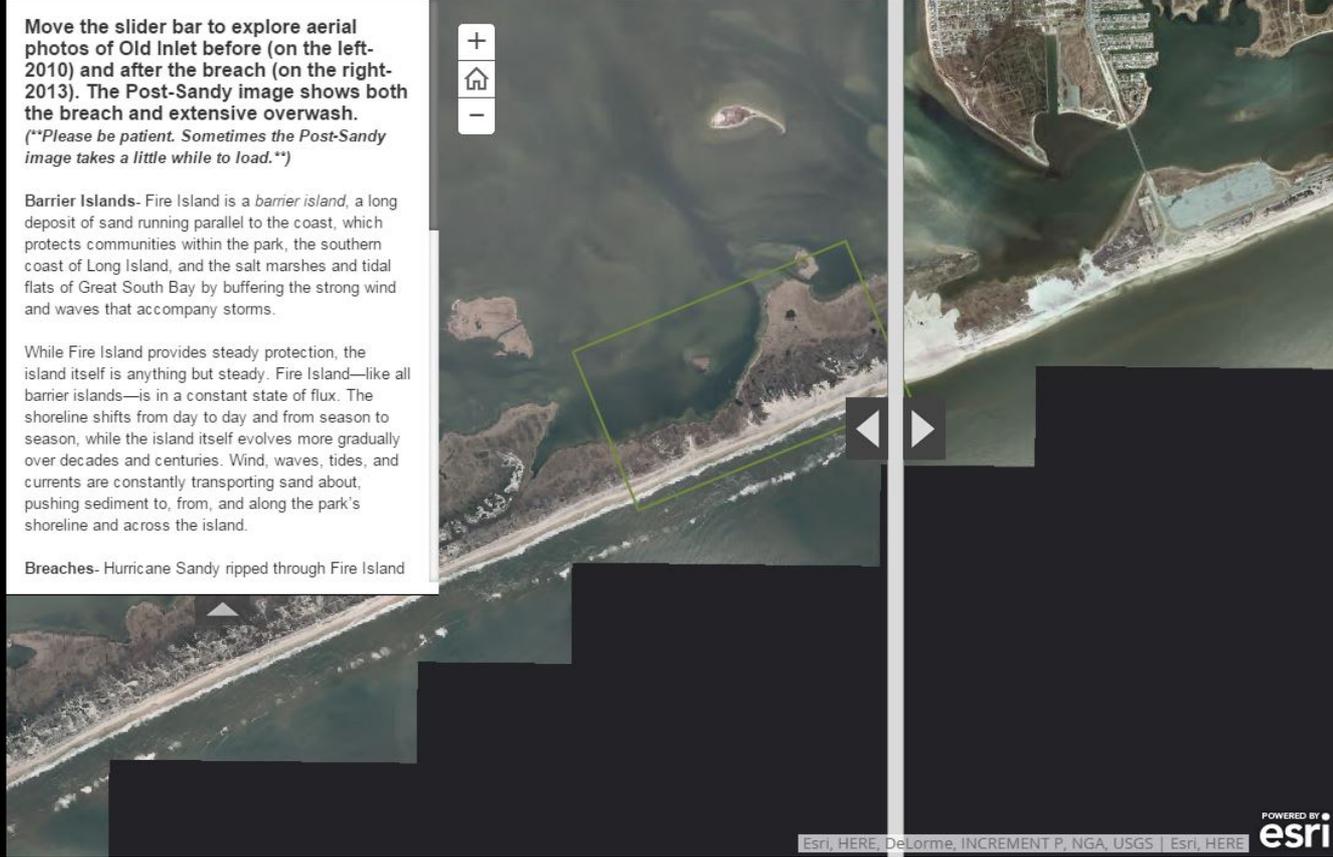
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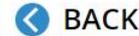
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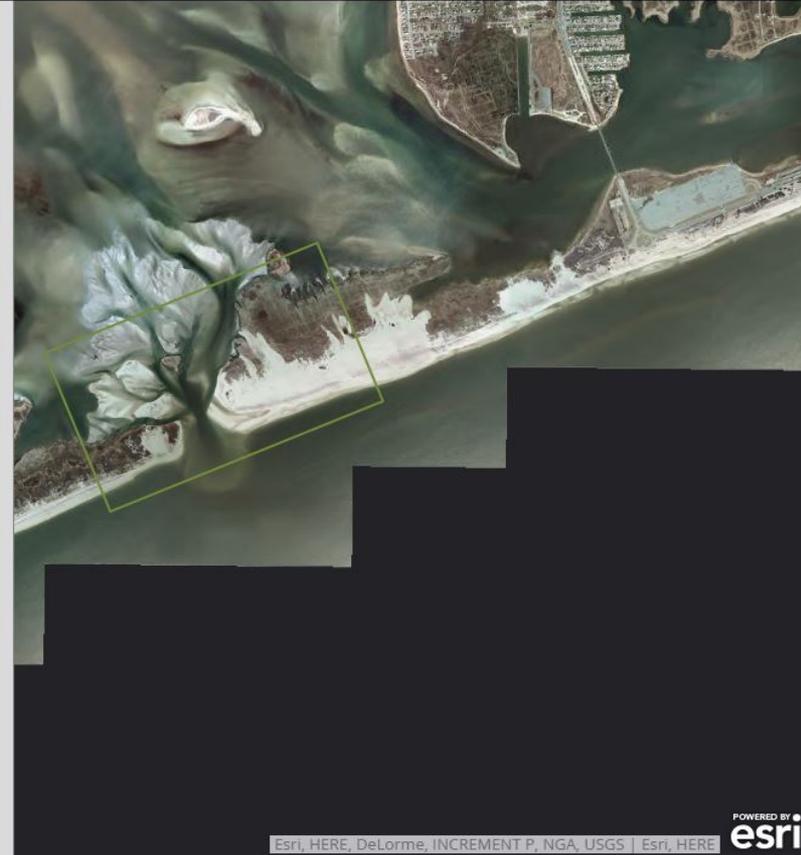
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# High Resolution Elevation Data

## National Park Service Hurricane Sandy Coastal Resiliency Projects

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### High Resolution Elevation Data

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#### Salt Marsh Resiliency Modeling

Salt marsh habitat is considered to be globally threatened, and the National Park Service manages some of the most pristine marsh left in the world. As part of this High Resolution Elevation project, detailed ground elevation, vegetation, accretion, and water level data are being collected on salt marshes within four National Parks (Assateague Island National Seashore, Cape Cod National Seashore, Gateway National Recreation Area and Fire Island National Seashore) as part of an effort to better understand salt marsh resiliency in light of sea level rise and climate change. Sea-level rise response modeling will then be conducted for these marshes in order for the NPS to better understand their resiliency over the course of the next 50-100 years.

[Click here for more information on this project.](#)

[Click here for a photo story of salt marsh resiliency research fieldwork.](#)

[Click here for a photo tour](#) of field work to collect high resolution elevation data in the salt marshes in Assateague Island National Seashore.

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#### Geomorphological Mapping

Prior to Hurricane Sandy, as part of the National Park Service (NPS) Inventory and Monitoring Program (NPS



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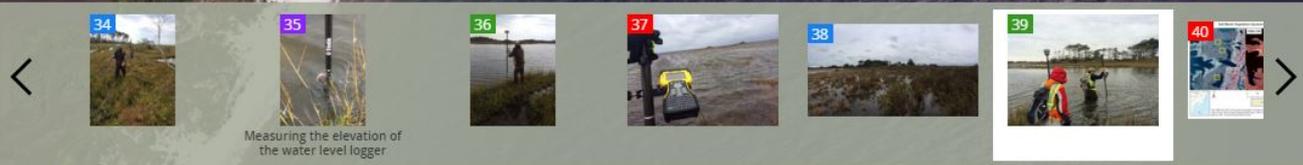
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BACK

### Assateague Island National Seashore (ASIS) post-Hurricane Sandy Data Surveys

ASIS Facebook Page

The NE Coastal and Barrier Network and the University of R.I. have teamed up to collect data that will help scientists and managers at ASIS better determine salt marsh resiliency in light of future storms and sea level rise. For a tour of our 2014 field work, click through our collection of geo-referenced photos. These photos are taken with a cell phone and the location services turned on so when a photo is clicked, the aerial photo on the



# Submerged Habitat Mapping

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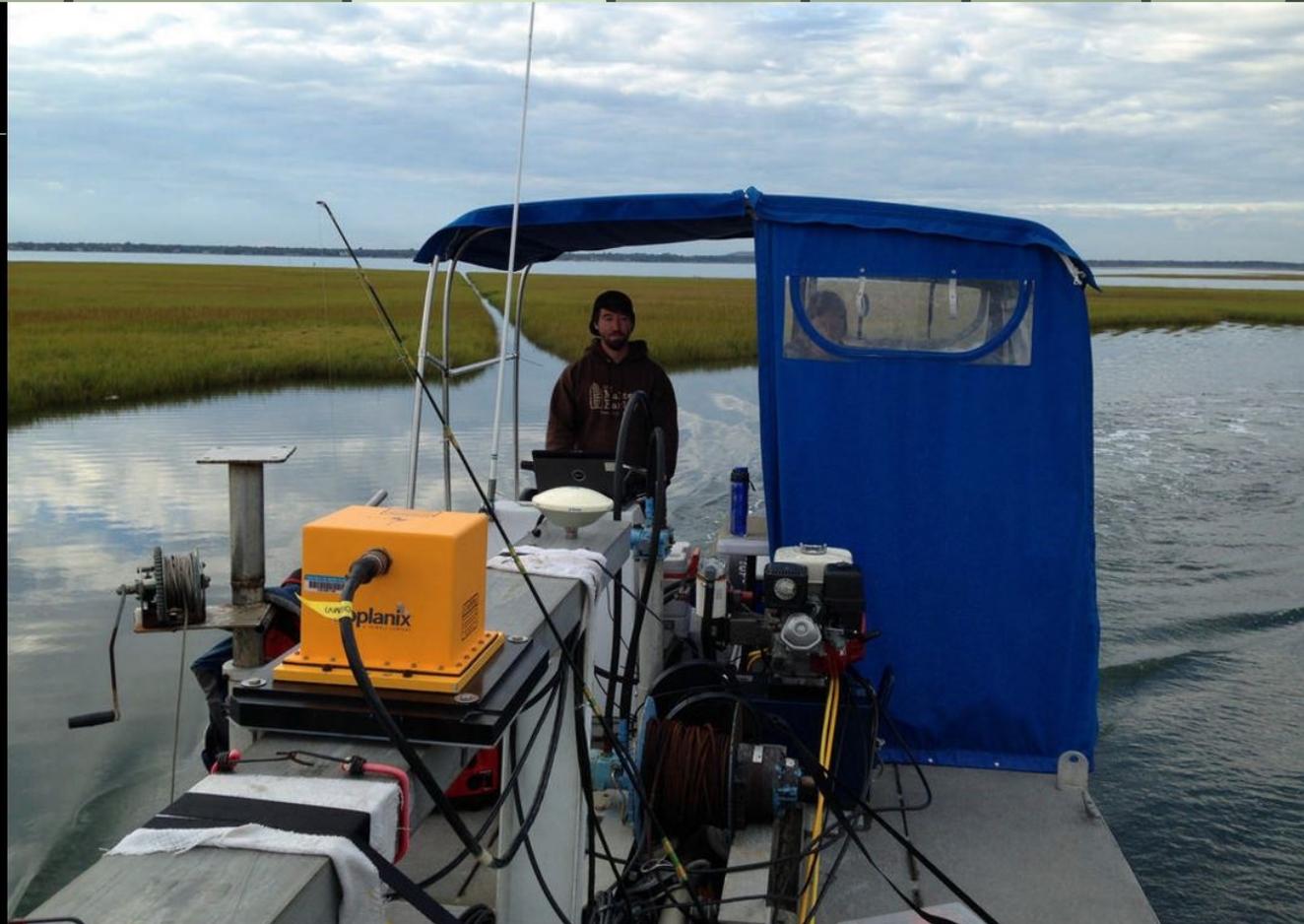
### Submerged Habitat Mapping

No issues detected

may include seagrass meadows, mud, sand, and cobble bottoms, natural and dredge channels, shellfish beds, and more. However, current information about these vast submerged park areas is limited.

Following Hurricane Sandy, the National Park Service embarked on a major collaborative effort with several universities to map and inventory these submerged marine areas in four coastal parks:

- At [Assateague Island National Seashore](#), researchers from the University of Delaware are mapping the entire 58km ocean shoreline, repeating an earlier mapping effort, providing a comparison of pre- and post-Sandy conditions.
- Researchers at Rutgers University are studying both the ocean and bay portions of [Gateway National Recreation Area's](#) Sandy Hook Unit, providing a complete assessment of this barrier spit that sustained significant flood inundation during Hurricane Sandy.
- At [Fire Island National Seashore](#), researchers from the University of Rhode Island are mapping the bayside of the Wilderness Area, a portion of the Seashore where a breach through the island was created by Hurricane Sandy.
- Scientists at [Cape Cod National Seashore](#) (Center for Coastal Studies) are mapping a diversity of submerged



# Submerged Habitat Mapping

https://sites.google.com/a/uri.edu/nps-hurrricanesandy-science/project-information/-submerged-habitat-mapping/assateague-island-ns-submerged-mapping

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## Hurricane Sandy Coastal Resiliency Projects

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Coastal Resiliency Projects > Submerged Habitat Mapping >

### NAVIGATION

#### BACKGROUND

#### ▼ COASTAL RESILIENCY PROJECTS

- ▶ ACQUIRE HIGH RESOLUTION ELEVATION DATA
- ASSESS GROUNDWATER RESOURCES
- BREACH MANAGEMENT PLANS FOR COASTAL PARKS
- ▶ EVALUATE ECOLOGICAL IMPACTS OF BREACHES
- ▶ JAMAICA BAY SCIENCE AND RESILIENCE INSTITUTE
- RESTORATION OF JACOB RIIS BEACH
- ▼ SUBMERGED HABITAT MAPPING

#### ASSATEAGUE ISLAND NS SUBMERGED MAPPING

#### CAPE COD NS SUBMERGED MAPPING

#### FIRE ISLAND NS SUBMERGED MAPPING

## Assateague Island NS Submerged Mapping



Dr. Arthur Trembanis (right) and graduate student Justin Walker launching an AUV mission.

The overall goal of this project is to resurvey the nearshore zone of Assateague Island National Seashore (ASIS) to determine what changes in bottom sediments, benthic fauna and fish habitat occurred and can be attributed to Superstorm Sandy. Specifically, the University of Delaware will (1) map the full survey area with surface towed side-scan sonar at a resolution comparable to that of the pre-storm survey, (2) resample a subset of the benthic stations that represent all sediment strata previously identified, (3) obtain novel data with our ROV and AUV assets, including bottom video and multibeam bathymetry, at specifically chosen locations on a much finer scale in order to enhance understanding of the benthic habitat and bottom type changes, and (4) compare newly obtained data to that from the pre-storm survey and determine changes that can be attributed to Superstorm Sandy. This survey design meets the aims of the National Park Service including documenting storm-related changes in sediments and marine habitats on multiple scales: from large scale, side-scan maps and interpretation of bottom types, to imagery (both video and photo) to characterize as fully as possible habitats from 1 to 10 m up to many kilometer scales, as well as from point benthic samples within each sediment stratum.

# Resource Briefs

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## Elevation Mapping - Extended

Using critical elevation data and maps to protect park resources

Photos:

- [Salt Marsh Elevation](#)
- [Salt Marsh Resiliency](#)
- [GPS Equipment and Training](#)

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## Geospatial Data Management

New mapping tools to empower NPS to protect coastal communities

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## Barrier Isand Breach Research

Hurricane Sandy provides a rare glimpse into barrier island processes.

Photos:

- [Aerial Photos of Fire Island Breach](#)
- [Ecology of Breaches](#)

## Resource Brief

National Park Service  
U.S. Department of the Interior

Natural Resource Stewardship and Science  
Northeast Region



## Hurricane Sandy Resilience and Recovery Efforts Using Critical Elevation Data to Protect Park Resources

On October 29, 2012, Hurricane Sandy hit the east coast of the United States, battering coastal towns with heavy winds and a storm surge of up to 14 feet in some areas. More than 23,000 people were displaced from their homes, and critical infrastructure, such as transportation and electricity, was permanently damaged. With over \$68 billion in damage, only Hurricane Katrina was more costly in U.S. history!

Three National Parks were particularly affected by Hurricane Sandy: Assateague Island National Seashore, Gateway National Recreation Area, and Fire Island National Seashore. These coastal parks are exceptionally vulnerable to the effects of storms and sea level rise because of their low elevation, the frequency of Atlantic hurricanes, the adjacent shallow continental shelf, and because they are located in an observed "hot spot" of sea level rise in the mid-Atlantic region.<sup>1,2</sup>

Given these vulnerabilities, scientists and managers from the National Park Service (NPS) and other government and academic organizations are working to integrate scientific data into planning for future effects of climate change, including

storms like Hurricane Sandy, and to develop comprehensive coastal storm response strategies that will help to protect public safety, property, and natural environments. To accomplish this, NPS staff must have a basic understanding of the techniques and uses for collecting and analyzing elevation data.

### Elevation Data and Maps

Elevation data and maps are critical research and management tools that illustrate and can help to predict changes to natural landscape features. Elevation data are three-dimensional points that scientists use to create digital elevation models (DEMs) or surfaces that can then be shown on maps as simple contour lines (three-dimensional renderings of a site) or be used to create thematic maps (Figure 1).

Elevation models can be used to track and predict areas most vulnerable to changes in sea level, identify potential areas of water inundation during storms, and inform land use modeling, landscape planning, and engineering. Inundation maps, which are created using elevation data, can help managers understand which park resources are lowest on the landscape and therefore most vulnerable to storm surge and the effects of climate change like rising sea levels.

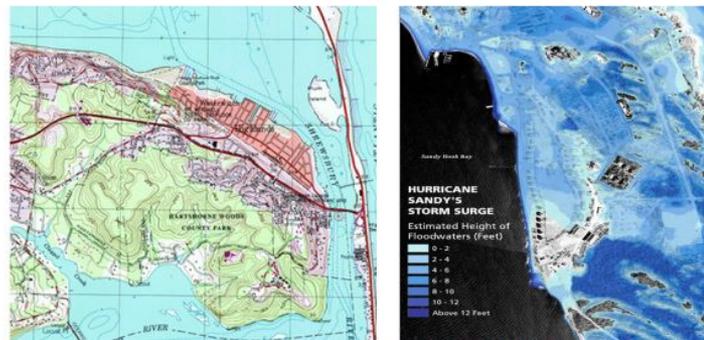


Figure 1. A. Contour map of southern Sandy Hook Bay. The curved lines indicate different elevations. Map courtesy of USGS. B. Inundation of the Fort Hancock area at Gateway National Recreation Area (GATE), NJ, as a result of Hurricane Sandy storm surge. The powerful storm resulted in several feet of flooding and damage across the Sandy Hook peninsula. Map courtesy of GATE GIS.

# Personnel Profiles

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Bringing shoreline dynamics and coastal resiliency research to life at Fire Island National Seashore

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Park scientists muster elevation data and enhance information systems to prepare for future storms

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## Hurricane Sandy Science

### This Park's Personality

#### *Interpretive Ranger Sonia Taiani Brings Shoreline Dynamics and Post-Sandy Resilience Research at Fire Island National Seashore to Life for Visitors*

It's a bright December day, but the wind sends a biting chill along the beach at Fire Island National Seashore, off the south shore of Long Island, New York. Visitors still come, few enough that passersby seem inclined to stop and say hello to one another. Only 60 miles from the center of Manhattan, the tone is different here.

Sonia Taiani, an interpretive ranger for the National Park Service (NPS), who has worked at Fire Island National Seashore (FIIS) for the last 22 years, recognizes some of these wintertime visitors as regulars. They come year-round and stop by the Wilderness Visitor Center just to chat with her before heading out to the beach. Without hesitation, Sonia says this is the most important part of her job: connecting with visitors. As a park ranger, "You kinda give a personality to the park," she says.

When Hurricane Sandy ripped across the U.S. East Coast in October 2012, it triggered a whirlwind of research projects in coastal parks. Knowing that coastal communities could anticipate an increase in sea level rise and damaging coastal storms like Hurricane Sandy, the federal government asked NPS scientists across the northeast coastal region to ramp up research on the resilience of coastal parks, including infrastructure, natural resources, and cultural resources.

At the center of this whirlwind are interpretive rangers like Sonia, who are helping to make sense of the research for park visitors and people who live in or near FIIS. FIIS is not a typical National Park. It has a distinctive sense of community. Within the park's boundaries, more than 4,000 people make their homes in 17 private communities. Park managers rely on the cooperation of private citizens to care for park resources through collaborative stewardship: an active relationship between the Park Service, the public, and shared natural resources.

To support strong collaboration, NPS relies on interpretive rangers, like Sonia, to share information about scientific research in National Parks and to clarify for the public what this research reveals about the health of the park's natural resources. "[I]t is the broader public that will decide the fate of these [natural] resources," as one report of the National Park Advisory Board puts it.



Sonia Taiani, an Interpretive Ranger at Fire Island National Seashore. Photo credit: NPS photo/L. Ries.

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### Northeast Coastal & Barrier Network

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- Discovering the Secrets of Resilience
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### Sounding Seafloor Habitats

Mapping submerged habitats at three parks affected by Hurricane Sandy.

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### Discovering the Secrets of Resilience

Monitoring sediment elevation changes occurring on the surface of salt marshes.

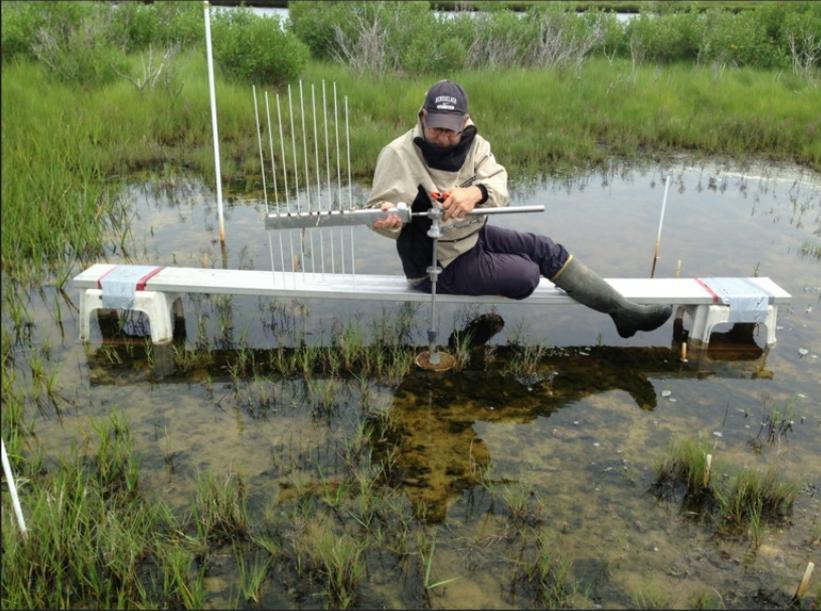
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### Enhancing NPS Elevation Mapping Capacity

Park Scientists Gear up to Gauge Coastal Parks' Resilience to Storms, Sea Level Rise, and Climate Change.

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### Discovering the Secrets of Resilience



The slightest shifts in the elevation of a salt marsh—millimeters per year—can indicate trouble. Salt marshes provide storm protection, promote good water quality, and provide habitat for invertebrates, fish, and birds. NPS photo.



**Featured Maps**

**National Park Service Hurricane Sandy Coastal**



**Lewis and Clark Trail National Register Sites**



**Volcanoes of Lewis and Clark Map Tour**



**Lewis and Clark's Scientific Discoveries: Animals**

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It is strongly advised that everyone take free online training (available [here](#)) before using ArcGIS Online.

<http://arcg.is/1KY1EpT>

An aerial photograph of a river with white-water rapids. The water is turbulent and white with foam. The banks are covered in lush green vegetation. The overall scene is dynamic and natural.

# Questions?

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