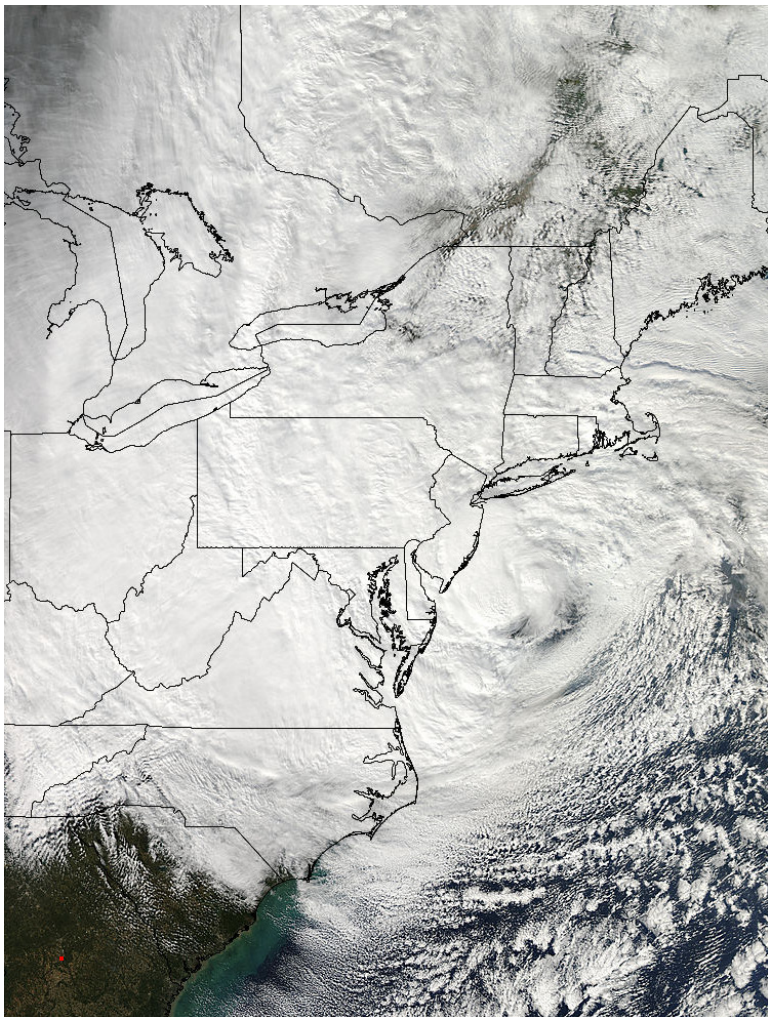
Sandy Provides a Rare Glimpse Into Barrier Island Processes

The response, resilience, and recovery of the Fire Island National Seashore wilderness area breach

Background

Fire Island National Seashore encompasses 26 miles of dynamic ocean and bay shoreline, lush dunes, maritime forests, and 17 residential communities. On October 29th of 2012, the largest storm on historical record in the Atlantic basin, Hurricane Sandy, made landfall near the park. The timing happened to coincide with an astronomically high tide as well, and as newscasts and photos that came out over the proceeding days would attest to, damage to property and shorelines was significant. Fire Island was fundamentally altered from Sandy, with waves and storm surge causing extensive beach and dune erosion and creating three breaches through the island. One was closed by natural processes shortly after the storm, another within the Smith Point County Park portion of Fire Island was closed by human intervention, while the third breach in the Otis Pike Wilderness Area of the Seashore remains open with tidal exchange between the Atlantic Ocean and Great South Bay.



On October 29th, 2012, the massive "superstorm" Hurricane Sandy battered the eastern searboards of NJ and NY. NASA image.

A Dynamic, Ever-Changing Landscape

Fire Island National Seashore is constantly being shaped and reshaped. 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. Wind and waves also transport sediment across the island, from a sand bar just offshore to the beach and dunes, and, during powerful storms, to the interior of the island, bay shoreline, and open bay.

Barrier islands, such as Fire Island, are by their nature very dynamic landforms, and breaching that occurs during major storms such as Sandy are part of the natural processes that help sustain the islands. There is historical confirmation of numerous breaches and establishment of inlets over the past several centuries at Fire Island, and the park offers a variety of interpretive programs that explore these processes and visits to the current breach.

The transfer of sediment across the barrier island from overwash and breaching events facilitates the necessary process of island migration in response to rising sea-level. Sediment transported to the bay can widen the barrier and provide new platforms for the establishment of salt marshes or intertidal sand flats that are habitat for shorebirds and other faunal communities.

A Unique Study Case

The Otis Pike Wilderness Area breach provides an extraordinary opportunity to document the physical and geological responses of the barrier island and bay, and to evaluate the largely unstudied ecological responses of back-barrier bays. Department of Interior (DOI) post-

Hurricane Sandy Mitigation funds have been instrumental in supporting numerous ongoing monitoring and research projects related to the Fire Island Wilderness Area breach. Understanding the responses of the coastal ecosystem to breaches will inform breach management decisions at Fire Island, within the mid-Atlantic region, and elsewhere.

Fire Island provides natural storm damage protection to the communities along the Long Island mainland shores of Great South Bay and breaching is a necessary process to maintain the natural barrier island system; however, breaks in the barrier may increase the risk of mainland storm damage (i.e., property flooding). Mainland communities had substantial flooding associated with Hurricane Sandy and have experienced flooding with storms following the breach, but it is important to note that analysis of water level data within the Bay and offshore by USGS and university scientists found that the new breach was not attributable to the high water levels in the Bay. Continued water level monitoring and documentation of ecological changes within the back-barrier bay will enable scientifically-supported breach management decisions for the Fire Island Wilderness Area breach that provide a balanced consideration of ecosystem services, habitat functions, resilience, and storm surge risk.

There are nine Great South Bay ecological studies being conducted with DOI post-Hurricane Sandy funds that will help provide a better understanding of fundamental Bay water column processes (water quality, plankton composition and distribution), fish, crab, and economically important hard clam populations, the occurrence of harmful algal blooms, and habitat changes with a focus on seagrass beds. Some of the studies have the benefit of comparing pre-storm to post-storm conditions, others are filling gaps in knowledge of Bay ecological processes and will enable a better assessment of future storm responses and documentation of system resilience, while still others are including an ecosystem-level modeling component to predict future responses of the Bay and resilience to climate change factors.

These studies are being led by investigators from Stony Brook University, a long-time Fire Island National Seashore cooperator. Students, both undergraduate and graduate, are fully engaged in these research efforts and gaining valuable exposure leading to careers in natural resource stewardship. The studies are planned for completion in November 2016.

Fire Island Wilderness Breach after Hurricane Sandy. NPS photo.

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