

Showing new inlet formation  
caused by Hurricane Sandy  
using aerial photography and  
remote sensing programs

## Background on Project

- Used Aerial Photography from Google Maps and NOAA's Hurricane Sandy Response Imagery Viewer to compare pre- and post-Sandy landscapes.
- Focused on new inlets created by Hurricane Sandy's storm surge and wave action.
- Used ERDAS Imagine 9.3 to indicate inlet locations by combining pre- and post-Sandy imagery.
- 3 Sites

## Information on Sites: Cupsogue Beach County Park

- ◉ Located in the Village of Westhampton Beach, NY; Owned by Town of Brookhaven.
- ◉ 296 acre barrier beach (Suffolk County Government, 2012)
- ◉ On the western end of Dune Road; Groin located on the western most point of the Park and Island (West side of Moriches Inlet)



Source:  
[http://wpcontent.answcdn.com/wikipedia/commons/thumb/c/c0/Long\\_Island\\_Landsat\\_Mo](http://wpcontent.answcdn.com/wikipedia/commons/thumb/c/c0/Long_Island_Landsat_Mo)

## Info: Cupsogue Beach County Park

- ◉ Moriches Inlet – Created in 1931 by a Nor'easter. Split West Hampton from Fire Island (Mandia, 2012).
- ◉ Between 1933 and 1938 the Inlet widened and deepened, impacting littoral sand transportation.
- ◉ Widening stopped in 1938 when the Long Island Express created the Shinnecock Inlet on the eastern end of the island.
- ◉ Construction of the groins on the east and west side of Moriches Inlet started in 1952 by the US ACOE.



Source:  
[http://www.striperonline.com/pictures/smith\\_point/smith\\_point\\_4.j](http://www.striperonline.com/pictures/smith_point/smith_point_4.j)



## Information on Sites: Fire Island

- New inlet is located on Fire Island west of Smiths Point County Park
- Smiths Point County Park is located in Shirley, NY



Source: NPS ([http://www.nps.gov/fiis/playyourvisit/images/WVC-Aerial\\_285.jpg](http://www.nps.gov/fiis/playyourvisit/images/WVC-Aerial_285.jpg))

## Info: Fire Island

- Most of Fire Island is only accessible by boat and ferry. Only two points of access by car is Robert Moses State Park (eastern FI) and Smiths Point County Park (western FI).
- Fire Island is approximately 31 miles long. Permanent Population is 292 (US Census Bureau, 2010).



Source:  
[http://wpcontent.answcdn.com/wikipedia/commons/thumb/c/c0/Long\\_Island\\_Landsat\\_Mosaic.jpg/560px-Long\\_Island\\_Landsat\\_Mosaic.jpg](http://wpcontent.answcdn.com/wikipedia/commons/thumb/c/c0/Long_Island_Landsat_Mosaic.jpg/560px-Long_Island_Landsat_Mosaic.jpg)

## Information on Sites: Mantoloking, NJ

- Mantoloking, NJ is located on the same island as Point Pleasant and Seaside Heights (Ocean County, NJ).
- Total Area: 0.643 miles.
- Permanent Population: 296 people (US Census Bureau, 2010)



Source:  
<http://geology.com/satellite/new-jersey-satellite-image-m.jpg>

## Processes

- Natural processes that are impacted by the creation of new inlets:
  - Lateral and Near-shore sand transportation
  - Changes in beach size from dunes to wet-dry line
  - Sediment deposition on beaches, in back bays and in channels
  - Wetland elevation changes
  - Beach migration
  - Changes in vegetation

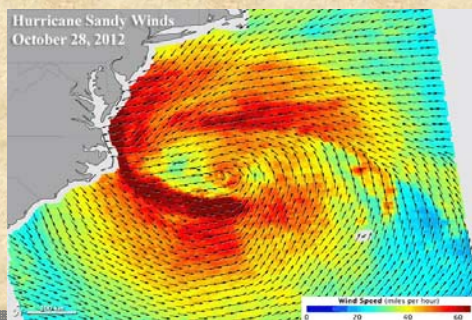


## Information on Hurricane Sandy

- Developed in the western Caribbean Sea on October 22<sup>nd</sup>.
- Reached Category 2 (Expect this to change to Category 3 in the post-season analysis by the NHC).
- Affected 24 states.
- Lowest pressure: 940 mbar
- Highest wind: 110 mph

## Info: Hurricane Sandy

- Storm surge reached upwards of 12-15 feet in Northern New Jersey, New York City Harbor and Western Long Island. Wave heights exceeded 30 feet for a 24 hour period. The area of ocean with twelve-foot seas peaked at 1.4 million square miles – nearly one-half the area of the continental US (Masters, 2012).
- Sandy's tropical storm force winds covered 560,000 miles (2<sup>nd</sup> in Atlantic history to Olga (2001)) (Masters, 2012).



Source: <http://www.wunderground.com/blog/jeffMasters/archive.html?year=2012&month=11>



Source: [http://www.nasa.gov/images/content/701091main\\_20121028-SANDY-GOES-FULL.jpg](http://www.nasa.gov/images/content/701091main_20121028-SANDY-GOES-FULL.jpg)

## What made Sandy so strong?

- Extremely large wind field created an immense storm surge that traveled for thousands of miles.
- Above average SST's along the East Coast and Caribbean Sea
- Injection of energy from the low pressure system ("Barclonic Energy")

## Methods

- Used Snipping Tool to create .PNG files for Pre- and Post-Sandy imagery. Resized images to 1000 x 400 pixels using Photoshop CS 5.
- Used ERDAS Imagine 9.3 to detect landscape change by creating multiple-date composite image data, using the layer stack function and changing raster attributes.
- ERDAS Imagine 9.3 automatically added Pyramid Layers to the imagery: Cupsogue (4); Fire Island: (3); Mantoloking (3)



CUPSOGUE BEACH COUNTY  
PARK  
WESTHAMPTON BEACH, NY

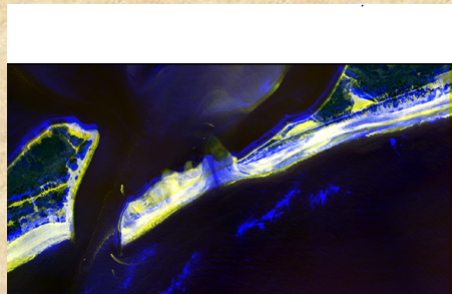
Pre-Sandy (Google Maps, 2012)



## Post-Sandy (November 6<sup>th</sup>, 2012)

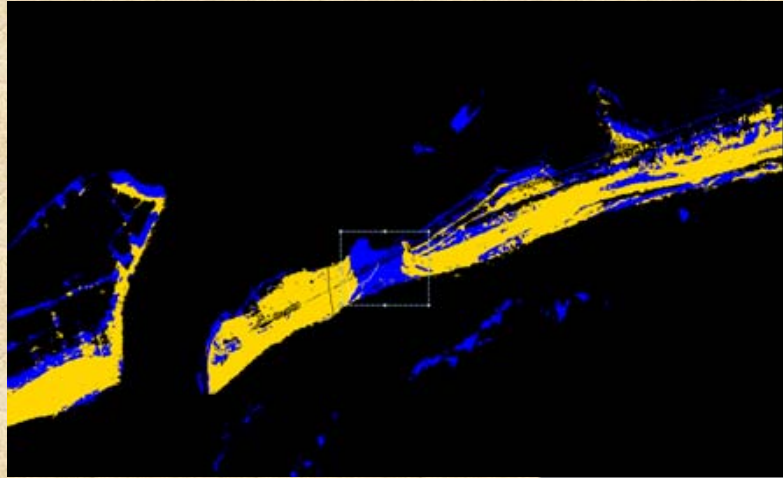


## Multi-Date Composite Image Data



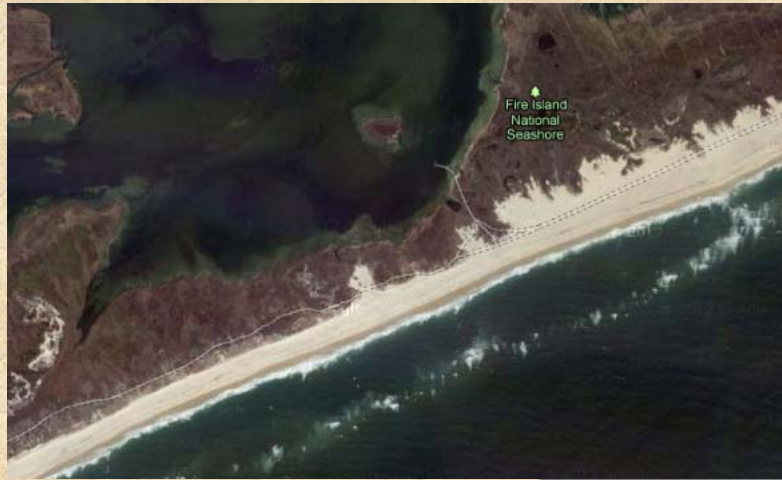


## Identification of new inlet

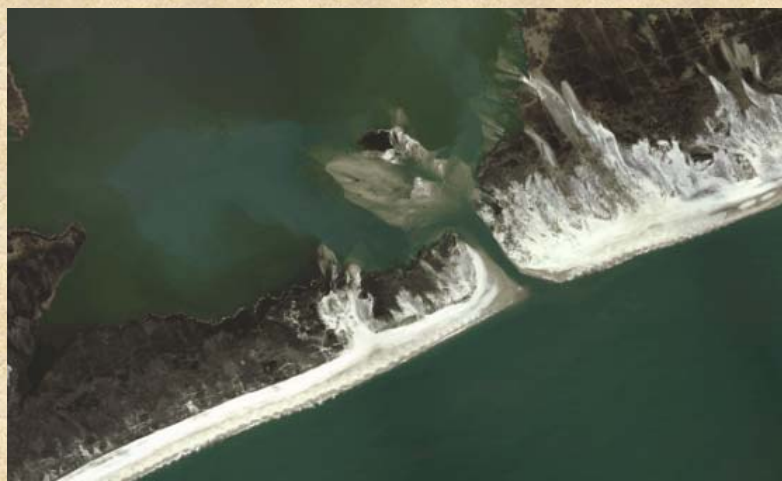


Fire Island National Seashore  
Smiths Point County Park,  
Mastic NY

Pre-Sandy (Google Maps, 2012)

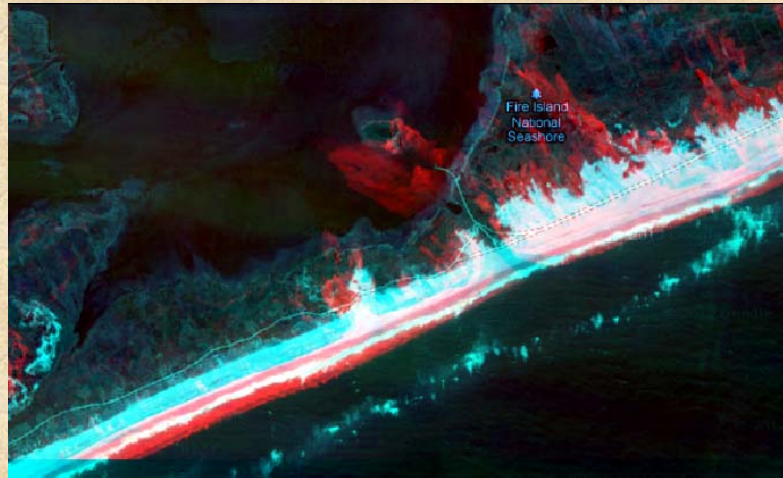


Post-Sandy (November 6<sup>th</sup>, 2012)

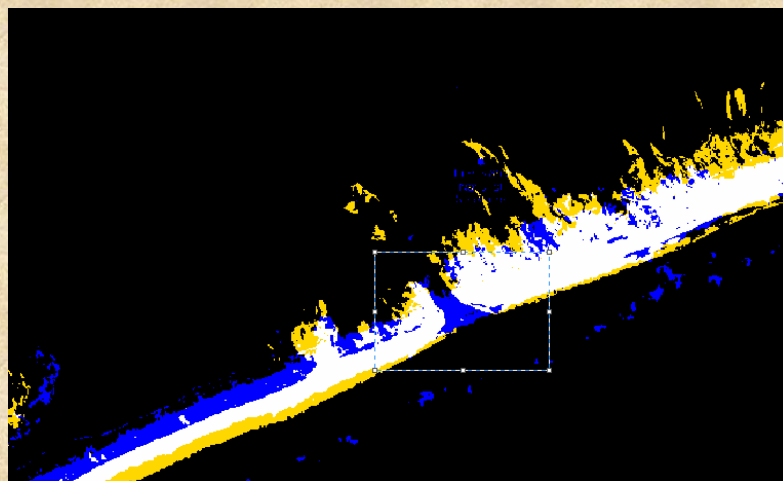




## Multi-Date Composite Image Data

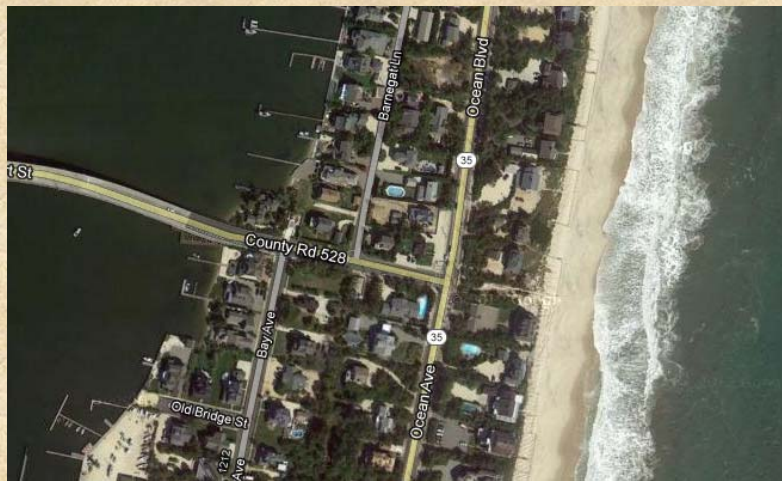


## Identification of Inlet



## Mantoloking, New Jersey

### Pre-Sandy (Google Maps, 2012)





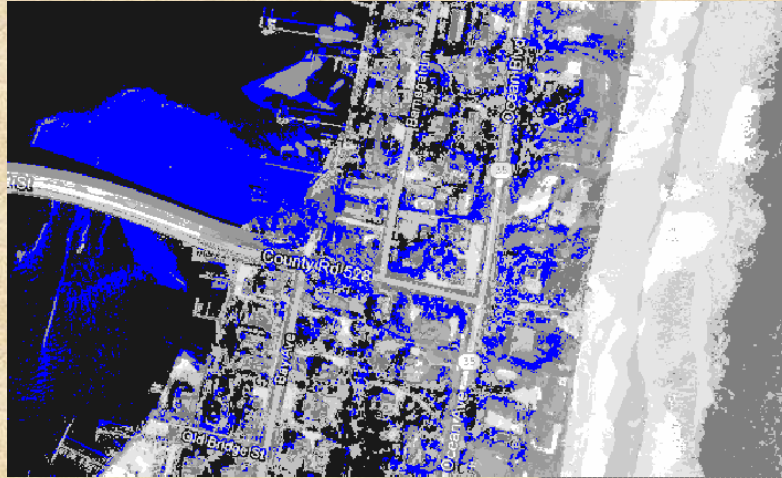
## Post-Sandy (November 6<sup>th</sup>, 2012)



## Multi-Date Composite Image Data



## Identification of Inlet



## Potential Errors

- Errors in data change and detection of landscape change in ERDAS Imagine 9.3
- Human Errors (Ex; Mental lapses)
- Snipping Tool errors.
  - Making sure each image (pre- and post-Sandy) covers the same exact area.



## Recommendation for Cupsogue Inlet

- Cupsogue Inlet
  - To US ACOE, NYS and Suffolk County Government
    - Leave inlet open. It will increase sand deposition on the west side of Moriches Inlet, as well as increase tidal flow through Moriches Inlet. This may help to establish sedimentation inside the Bay and increase wetland/eelgrass cover.
    - Help sediment and water flow through the Great South Bay (Ecological benefits).
    - Historically since the creation of Shinnecock Inlet, wetland and sand cover on the west side of the island has been decreasing. Leaving Cupsogue Inlet open would decrease erosion and increase sedimentation.
    - Economic and Ecological Challenges: Inlet filling may not take (would require taxpayer money) because of the complexity of sand and water flow through the Great South Bay.

## Recommendation for Fire Island Inlet

- Leave inlet as is. Monitor it on a weekly basis to determine whether the inlet is getting wider, deeper, or decreases in size.
- Historically, this spot on Fire Island was originally an inlet (called "Old Inlet") that closed on itself when Moriches Inlet was created to the east.
- Inlet closed because of the impact Moriches Inlet had on the transportation of sediment and water.
- Over time, if history repeats itself, the inlet should close on its own.

## Recommendation for Mantoloking Inlet

- Start to work on filling the new inlet in as soon as possible.
- Inlet is located next to the bridge, which could erode the infrastructure and cause the bridge to collapse, effectively impacting the recovery project.
- Highly residential area. Inlet will cause problems economically, environmentally and sociologically.

## References

- <http://www.suffolkcountynyny.gov/Departments/Parks/Parks/CupsogueBeachCountyPark.aspx>
- [http://www.27east.com/assets/news/Article/443804/IMG\\_7578.JPG](http://www.27east.com/assets/news/Article/443804/IMG_7578.JPG) (Cupsogue Inlet Pic)
- [http://www2.sunysuffolk.edu/mandias/38hurricane/geological\\_impact.html](http://www2.sunysuffolk.edu/mandias/38hurricane/geological_impact.html) (Mandias, 2012)
- <http://storms.ngs.noaa.gov/storms/sandy/>
- [https://maps.google.com/maps?hl=en&client=firefox-a&ie=UTF-8&q=cupsogue+beach&fb=1&gl=us&hq=cupsogue+beach&cid=0,0.9275551950770340935&ei=bcmUJTMlc\\_H0AHz4IHYAq&ved=0CKsBEPwSMAC](https://maps.google.com/maps?hl=en&client=firefox-a&ie=UTF-8&q=cupsogue+beach&fb=1&gl=us&hq=cupsogue+beach&cid=0,0.9275551950770340935&ei=bcmUJTMlc_H0AHz4IHYAq&ved=0CKsBEPwSMAC)
- [http://www.striperonline.com/pictures/smith\\_point/smith\\_point\\_4.jpg](http://www.striperonline.com/pictures/smith_point/smith_point_4.jpg) (Moriches Inlet Picture)
- [http://www.nps.gov/fiis/planyourvisit/images/WVC-Aerial\\_285.jpg](http://www.nps.gov/fiis/planyourvisit/images/WVC-Aerial_285.jpg)
- <http://2010.census.gov/2010census/> (US Census Bureau 2010 Information)
- <http://geology.com/satellite/new-jersey-satellite-image-m.jpg>
- <http://www.wunderground.com/blog/JeffMasters/archive.html?year=2012&month=11> (Masters, 2012)
- [http://www.nasa.gov/images/content/701091main\\_20121028-SANDY-GOES-FULL.jpg](http://www.nasa.gov/images/content/701091main_20121028-SANDY-GOES-FULL.jpg) (Sandy Satellite Image)