# Fire Island National Seashore Change Analysis

**Evaluating Pre and Post Hurricane Sandy LiDAR data.**

**Fire Island National Seashore**

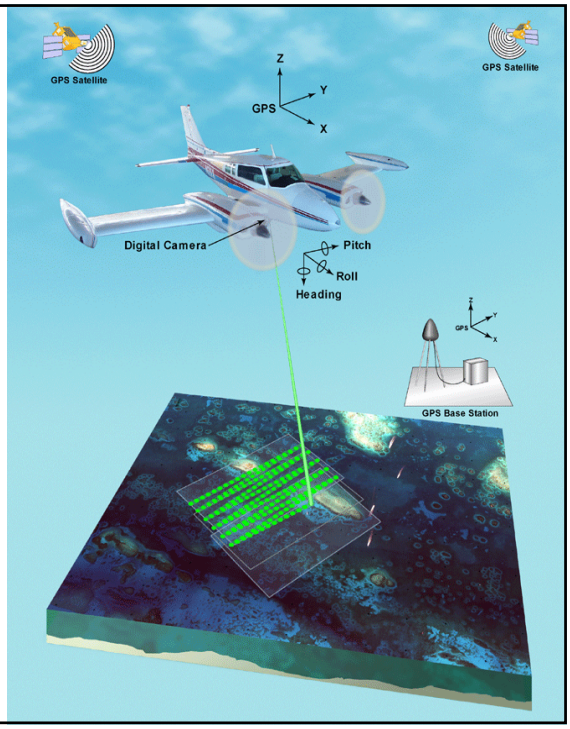
- Barrier Island that stretches east to west off the southern coast of Long Island NY.
- Approximately 32 miles long and averaging less than a mile in width.
- The landscape includes a primary dune system along the ocean side of the island with areas of salt marsh on the bay side.
- 10% forest, 40% wetlands, 25% open(beach, swale and fields), 25% developed (NPS and 17 local communities).
- Established as a National Seashore in 1964.
- Also includes the William Floyd Estate, the ancestral home of one of singers of the Declaration of Independence.

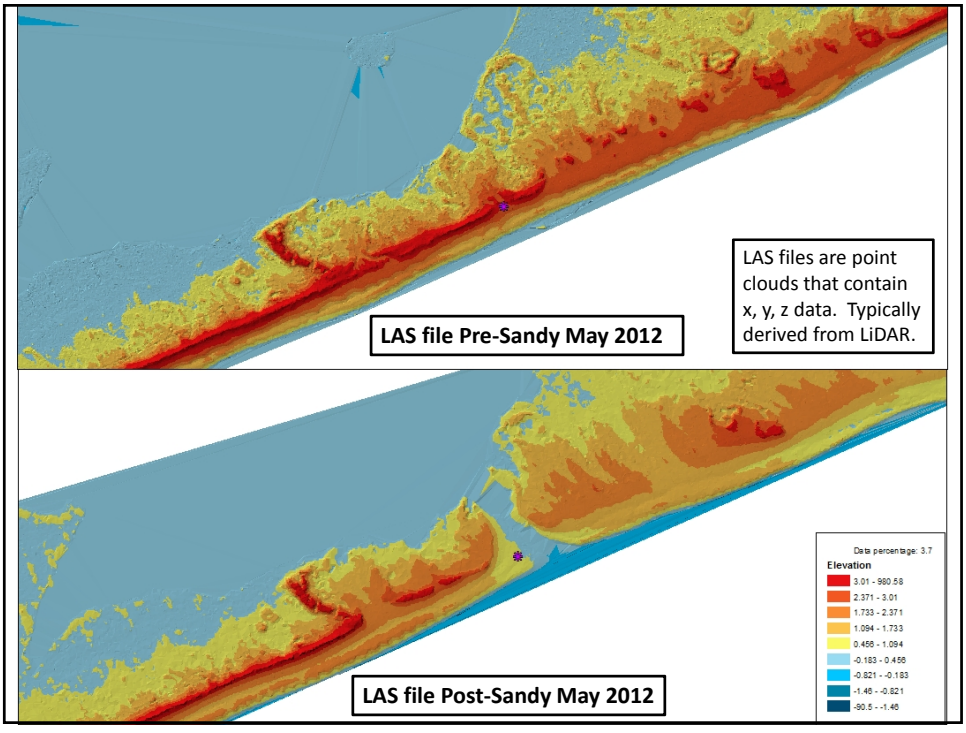

Photo Credits: The Great South Bay Project,
Stony Brook University, Charlie Flagg
November 2013


SoMAS
NY BROOK UNIVERSITY
Geo – Referenced photo mosaics as a KML file.
(The Great South Bay Project, Mark Lang)
© 2013 Google
Image © 2013 TerraMetrics
Google earth

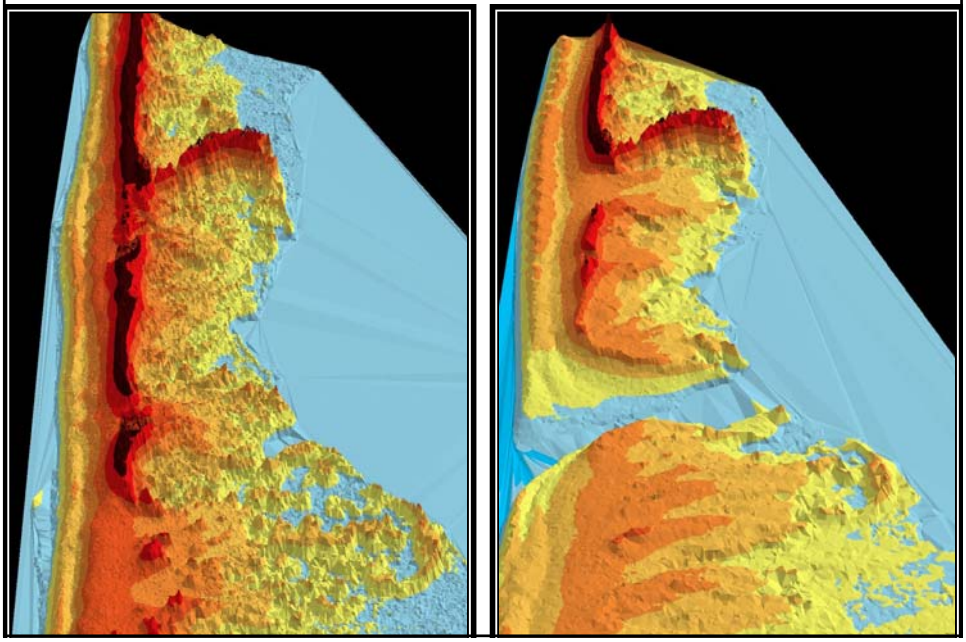
# LiDAR

- LIDAR (Light Detection and Ranging) is a remote sensing technology that collects 3-dimensional point clouds of the Earth's surface.
- Airborne LIDAR instrumentation uses a laser scanner with up to 400,00 pulses of light per second.
- The laser transmits pulses and records the time delay between a light pulse transmission and reception to calculate elevation values. These values are integrated with information from the aircraft's Global Positioning System (GPS) and orientation data from inertial measurement technology to produce point cloud data.
- Topographic LIDAR instruments use wavelengths in the near-infrared regions of the spectrum with a Nominal Pulse Spacing (NPS) of 3 meters or finer.
- Since LIDAR can be reflected from any object the laser pulse strikes, up to five returns are collected per pulse. These multiple returns are recorded and each point is assinged a classification to identify landscape features. Intensity of the reflected energy is also captured.



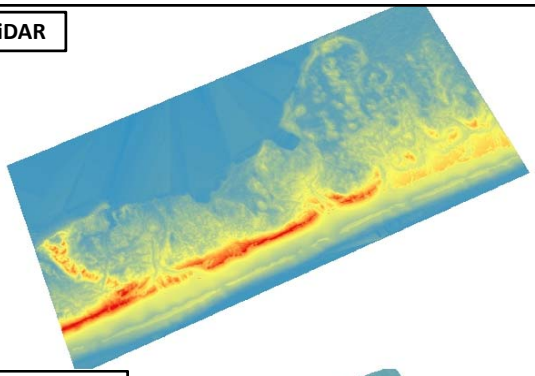



3-D view of LAS Files with a 20x extrusion of z values.



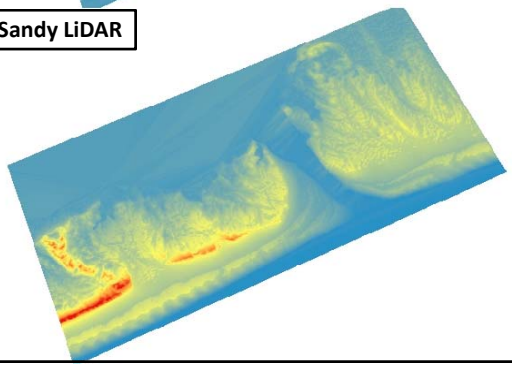
**May 2012 Pre Sandy LiDAR**

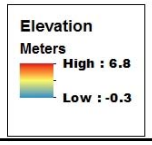
**Meters (NAVD88)**
Min: -0.29
Max: 6.74
Mean: 1.14
Std dev: 1.15

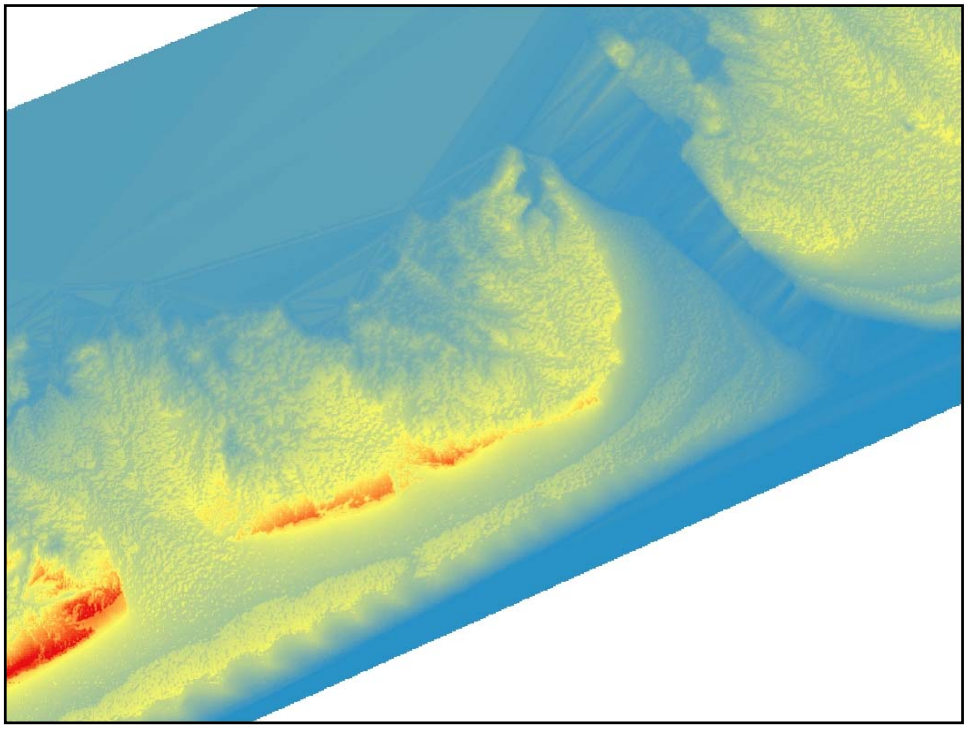


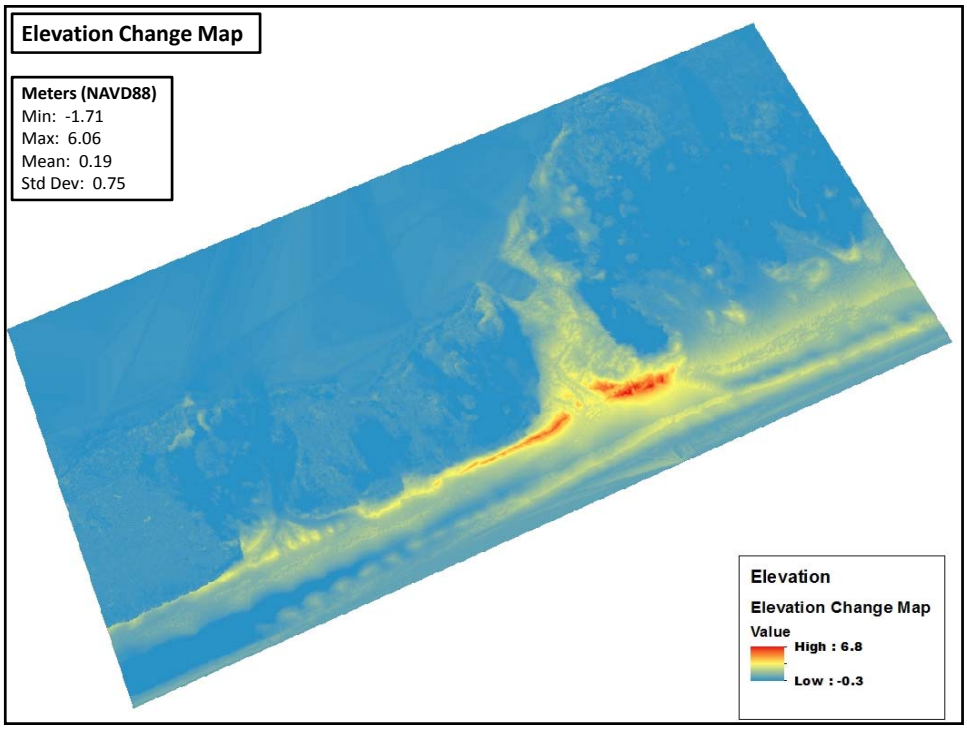
**November 2012 Post Sandy LiDAR**

**Meters (NAVD88)**
Min: -0.56
Max: 6.85
Mean: 0.95
Std Dev: 0.92

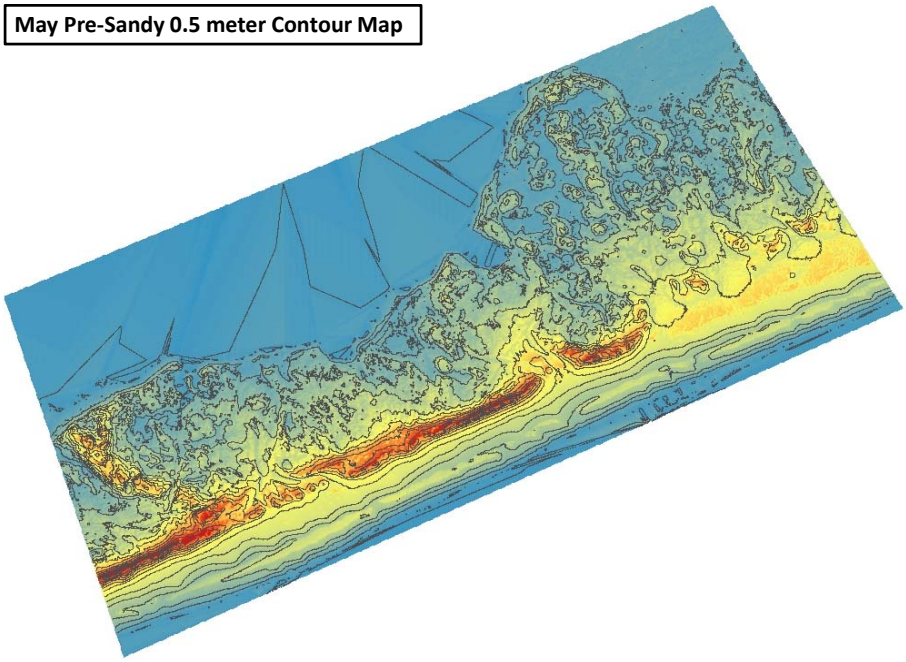




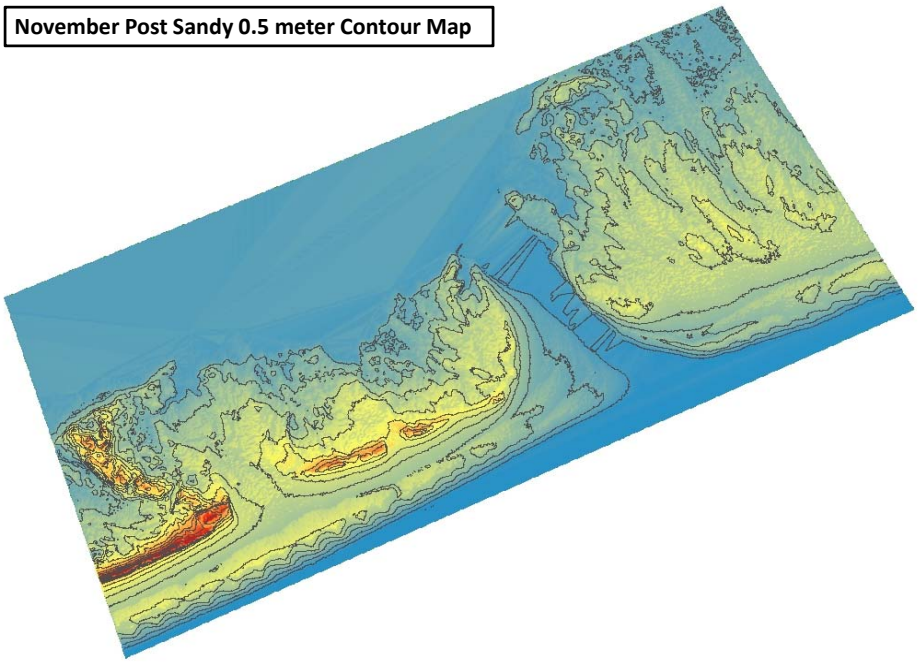



Elevation Change Map
Meters (NAVD88)
Min: -1.71
Max: 6.06
Mean: 0.19
Std Dev: 0.75
Elevation
Elevation Change Map
Value
High : 6.8
Low : -0.3

**May Pre-Sandy 0.5 meter Contour Map**

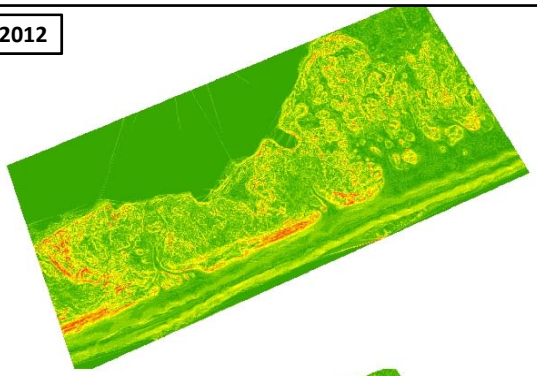


**November Post Sandy 0.5 meter Contour Map**



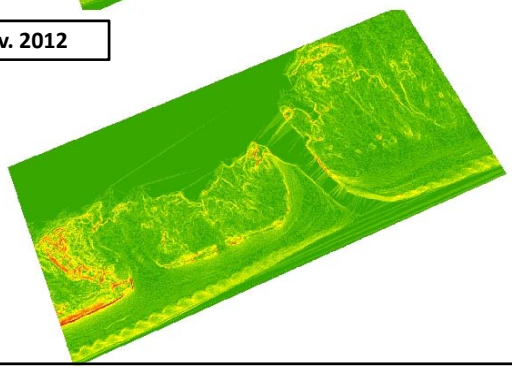
**Slope Pre-Sandy May 2012**

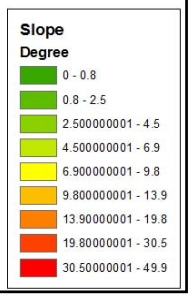
**Slope in Degrees**
Min: 3.02
Max: 34.94
Mean: 2.91
Std Dev: 3.31



**Slope Post-Sandy Nov. 2012**

**Slope in Degrees**
Min: 0
Max: 49.93
Mean: 1.89
Std Dev: 2.67

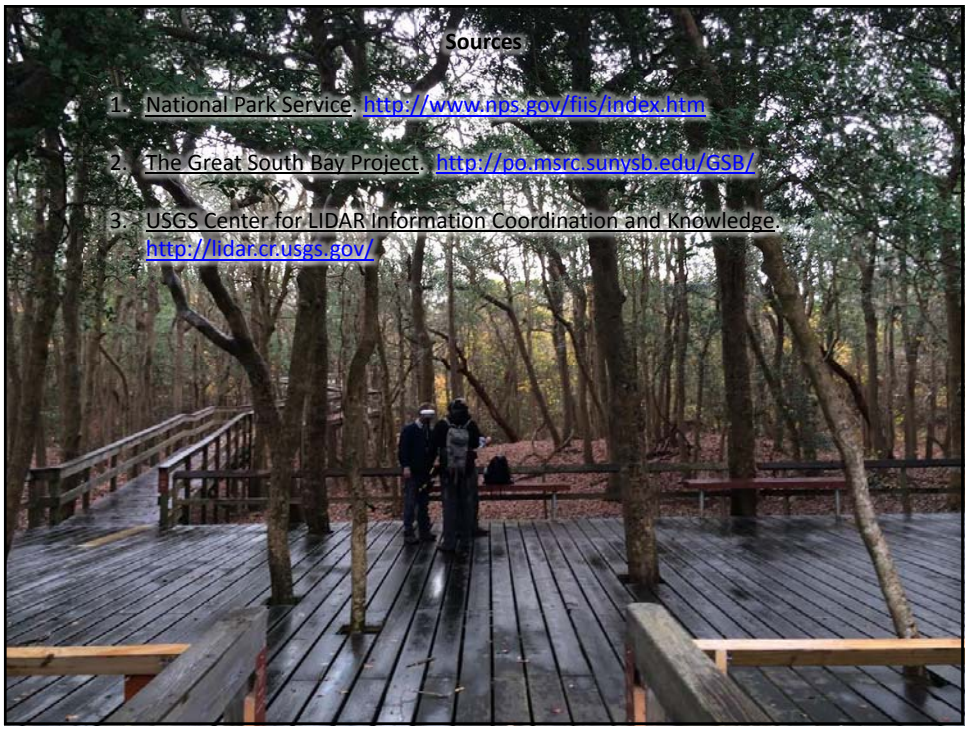





**Results**

| Field | Pre-Sandy Value | Post Sandy Value |
|---|---|---|
| Elevation Min (m) | -0.29 | -0.56 |
| Elevation Max (m) | 6.74 | 6.85 |
| Elevation Mean (m) | 1.14 | 0.95 |
| Slope Min (degrees) | 3.02 | 0 |
| Slope Max (degrees) | 34.94 | 49.93 |
| Slope Mean (degrees) | 2.91 | 1.89 |


Outcomes and further analysis
A breach formed in the barrier island, washing away sand and creating an inlet that lets water flow freely and separates the island.
A spike in elevation loss in the area of the breach. With moderate elevation loss across a section of the dunes as Hurricane Sandy over-washed the island.
A general loss in slope as the island was "flattened" do to over-wash of the dunes. Hot spots of Slope gain where high dunes were undercut and sediment loss created bluff like dunes.
A vegetation analysis as well as a habitat change analysis might be able to be done from LiDAR or other remotely sensed data such as imagery.
Management of this breach area has been and will continue to be an issue. Monitoring the changes will be an important step going forward.


Sources
1. National Park Service. http://www.nps.gov/fiis/index.htm
2. The Great South Bay Project. http://po.msrc.sunysb.edu/GSB/
3. USGS Center for LIDAR Information Coordination and Knowledge. http://lidar.cr.usgs.gov/