

Coastal Topographical Change Analyses Associated With Superstorm Sandy at Miller Field, Staten Island, New York

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how much influence did Superstorm Sandy had on Miller Field's regular trend and how can this influence be quantified?

So, first we need to look at **data prior to Superstorm** Sandy to understand its regular trend.

We can then see how the effects of this meteorological event fits.

Northeast Coastal and Barrier Network (NCBN)

- Goals
 - Geomorphological Monitoring Protocol methodology
 - Comparable Regional Data
- National Database for National Park Services and Wild life refugees use
 - Available reports for general public use
- <http://science.nature.nps.gov/im/units/ncbn/>

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- As part of the monitoring projects of the NPS, the NCBN provides information to park managers and the public for a better understanding of the dynamics of coastlines. The better comprehension of these areas leads to an efficient and objective management of historical, natural, and recreational resources.
- Therefore, if we want to provide valuable and comparable data we need well established protocols and Standard Operating Procedures that answer to quality controls.

Protocols

Three programs to monitor geomorphological change primarily caused by sea level rise, storm events, and changes in sediment supply.

1D Shoreline Change

- Monitors the Spring and Fall high-tide, neap tide swash line.

2D Coastal Topography

- Datum based monitoring
- Monitors the elevation of the beach relative to a specific datum (NAVD88).

3D Volume - Areas of Special Interest

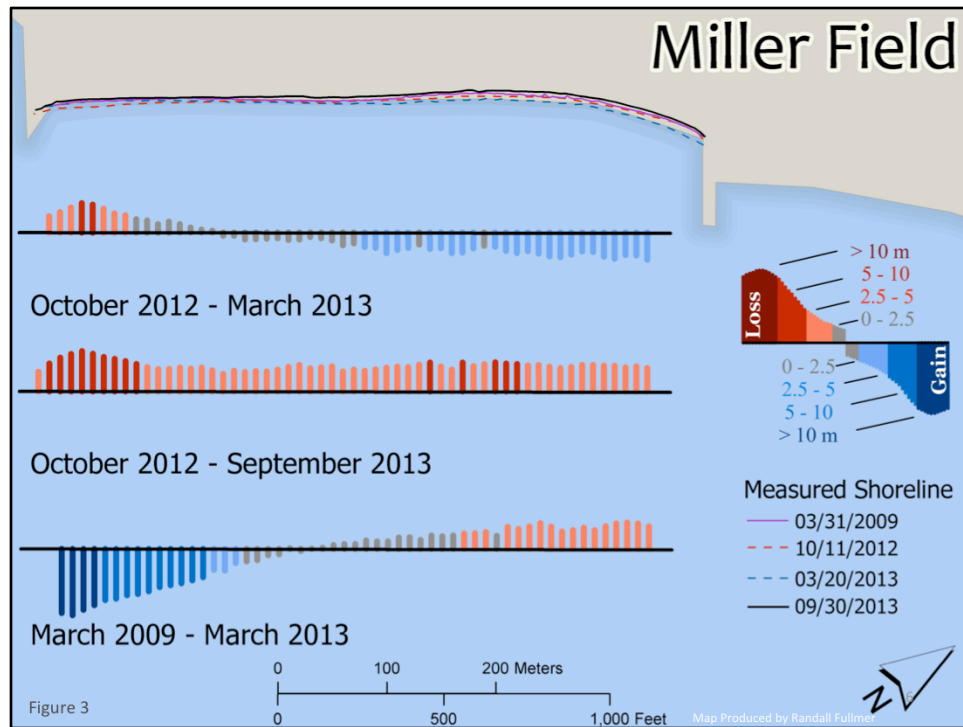
- Datum based monitoring
- Collect a high density points to produce a Digital Elevation model
- LIDAR – complementing tool

Edited from Spahn

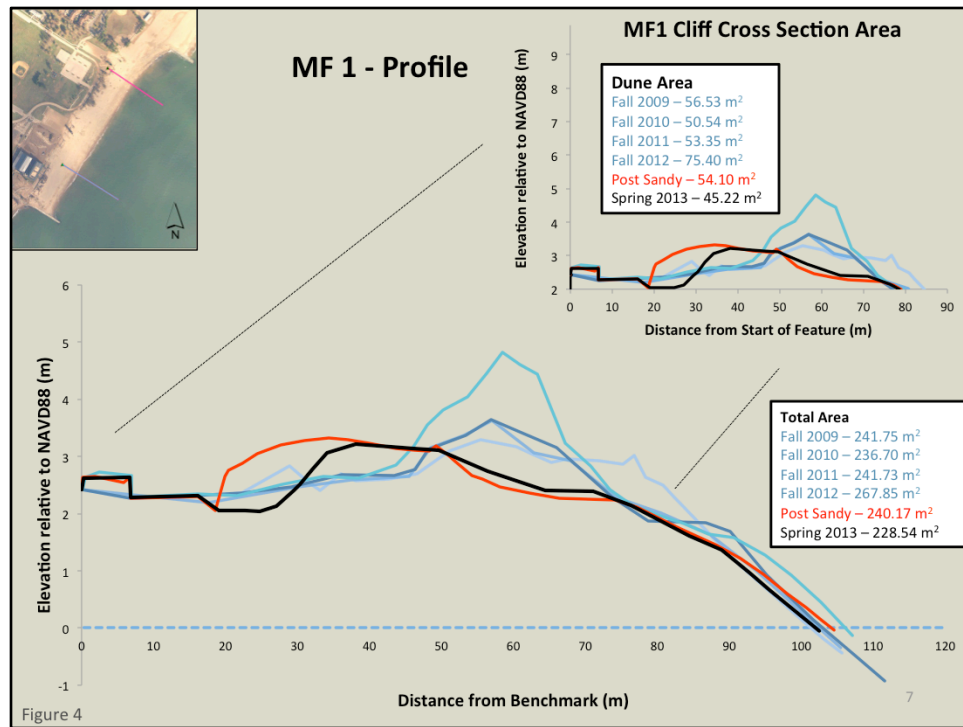
- Each protocol address its own objectives and has specific requirements, instruments, and software requirements. However, they cannot tell the whole picture by themselves because **not all changes happen in the same dimension**.
- Superstorm Sandy brought attention to the fact that we cannot underestimate the changes that a storm can bring to an area. For instance: NO 3D surveys for Miller field.



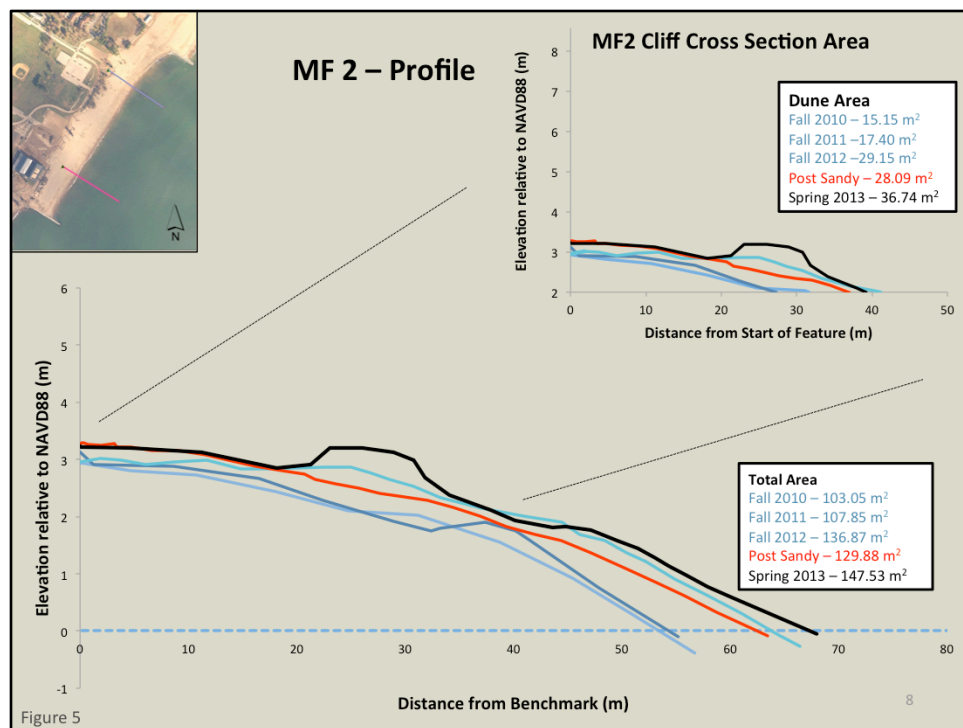
- Aerial picture showing the basic yet central characteristic of Miller field:
- Miller Field beach is enclosed by two groins making it an compartment of sand which has different responses to storms and seasonal variations.
- It is important to note the direction of longshore currents are from NW to SE
- **Also**, a City Beach which is constantly replenishing its beach with sand is located NW from MF. This is MF main source of Sand.



- Miller Field shows a interesting shifting mechanism in both end. That is, while in one year one end will lose (moving landwards) the other end will gain (moving seaward). The following year the mechanism will revert.
- This occurs because Miller field is a sand compartment enclosed between two compatments
- October (before Sandy) to March 2013 shows displacement landwards on the SE end.
- In the 5 year trend taking only Spring shorelines no evidence that Sandy actually influence the regular trend of MF



Major Dune Feature displaced and modified by Sandy



- Beach progressing seawards and showing a increase in Total area.

Geomorphological Changes

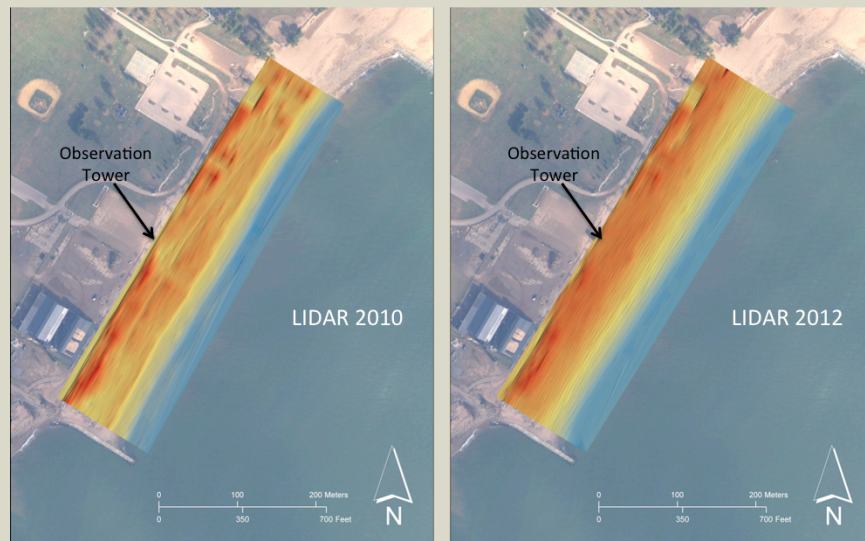


Figure 6

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- Superstorm Sandy made us reevaluate the constancy in our surveys. NO 3D data for MF.
- However, we can use Lidar to generate Digital Elevation Models to look at geomorphological features.
- Dune feature shows modification after sandy.





Net Volume Changes

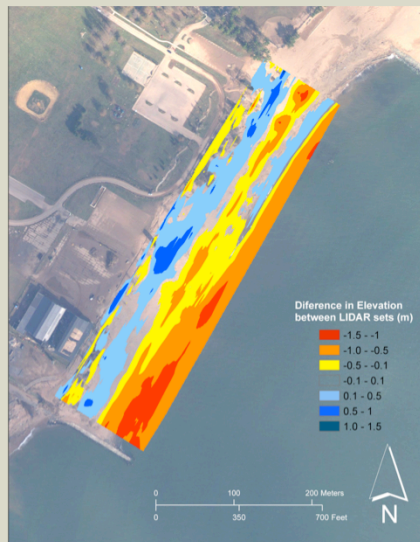


Figure 7

Accretion LIDAR 2010-2012 [m ³]	Erosion LIDAR 2010-2012 [m ³]	Net Volume Change [m ³]
3405.22	8110.18	-4704.95

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- Small accretion on the dunes.
- Also, intense erosion on the SW end which is explained by the especial nature of Miller Field.
 - The sand coming from the City Beach is captured in the SW growing of Miller field to a point of overflow in which erosion kicks in. Then, the process of erosion and accumulation cycles.

Summary

- So, how much of an impact did Superstorm Sandy have on Miller Field's regular trend?
 - Minimal shoreline displacement
 - Modification of major beach features

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