

STOCKTON UNIVERSITY COASTAL RESEARCH CENTER



Cape May City, NJ August 27, 2014 looking west toward Ocean Avenue at Baltimore Avenue where 25 years earlier this instrument location near the seaward toe of the dunes would have been over 150 feet out into the ocean in 1989. This illustrates the long term benefit realized with large-scale beach restoration.

New Jersey Beach Profile Network 2014 Annual Report on Shoreline Changes in New Jersey's Four Coastal Counties Raritan Bay to Delaware Bay Spring of 2013 Through Fall of 2014

Prepared for:

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EXECUTIVE SUMMARY

The New Jersey Department of Environmental Protection (NJDEP) authorized the New Jersey Beach Profile Network (NJBPN) project in 1986. The report is divided into four coastal county segments and provides a summary of beach changes for each county. Since it has been over two years since Hurricane Sandy, the objective is to report on exactly how each shoreline segment has responded to both extensive restoration efforts and situations where beach/dune recovery were more natural process driven.

The US Army Corps of Engineers (ACOE) undertook the restoration to design specifications all federally authorized, and constructed shore protection projects in the State. Funding under Public Law 113-2 allowed 100% federal payment to do restoration of existing projects in Monmouth, Ocean, Atlantic, Cape May Counties, and the tidal Delaware Bay/River shoreline. While the direct impact of Hurricane Sandy was published on the Coastal Research Center (CRC) website as soon as it was complete in December 2012, it has taken several years to follow both the direct sand placement as well as the slower rate of natural accretion. The report is also found on the website at www.stockton.edu/crc. Past reports are linked to the site so comparisons can be made to the 2012-2013 observations along the New Jersey coastline.

Key Data Summary Information Two Year Post-Sandy:

State-wide the average beach profile gained 23.01 yds³/ft. between the spring of 2013 and the fall of 2014, while the average shoreline position advanced 40.36 feet seaward. Clearly the magnitude was influenced by the massive federally funded effort along the NJ coast, but even the reaches where only natural changes occurred (northern Ocean County) the beach/dune system gained 7.96 yds³/ft. while the shoreline advanced 34.36 feet. On Long Beach Island where almost half the shoreline is under federal management the values were 20.99 yds³/ft. in sand volume gain with a 41.54-foot shoreline advance.

The data from the December 1992 NE storm also demonstrated that sand recovery on the beach happens rapidly up to 50%, then declines (in the absence of subsequent severe storms) over time so that 5 years later about 85% of the sand lost from the beach and dunes returns, but not always in the same configuration. Natural recovery in the dunes is slower, dependent on wind transport that adds less than 3 cu. yards/foot of dune frontage per year.

The survey data was analyzed to show changes in the four county shorelines and sand volume changes for the 18-month study interval. The three-month seasonal average sand volume changes for each county plus the 18-month summary are shown below. Beach nourishment projects in Monmouth, Long Beach Island (Ocean County), and Atlantic Counties produced the extensive sand volume increases over this study period. Since most work had already been completed in Cape May County by early 2013, these locations saw sand volume losses during 2013 that averaged considerably less by the summer of 2014.

The most dramatic change was seen in Monmouth County where the NY Corps District completed a near county-wide beach restoration with additional construction planned for 2015 to finish the work in Deal, Allenhurst and Elberon that were not done initially in 1995. The difference between northern Ocean County and Long Beach Island illustrate the impacts of these federally administered shore protection efforts where

extensive Sandy damage, breaching and overwash occurred where no federal work had occurred and next to no damage in areas of Long Beach Island where the federal project had been completed.

	S 13 – F 13 Cu. yds/ft.	F 13 – S 14 Cu. yds/ft.	S 14 – F 14 Cu. yds/ft.	S 13 – F 14 Cu. yds/ft.
Monmouth County	13.57	46.42	3.91	64.13
Ocean County	14.72	-1.66	0.74	14.25
Atlantic County	30.11	-19.34	12.56	24.44
Cape May County	-8.87	-6.00	-0.67	-15.54

The shoreline change values represent the derived difference in horizontal distance to the zero elevation position (NAVD88) from the reference monument on the two profiles being compared. Advances seaward are positive and retreats landward are negative. Each number shown below is the average change for all the sites in each county.

	S 13 – F 13 Feet	F 13 – S 14 Feet	S 14 – F 14 Feet	S 13 – F 14 Feet
Monmouth County	48.62	41.06	83.02	92.02
Ocean County	65.18	-33.88	7.88	39.18
Atlantic County	33.14	-10.00	-3.91	19.23
Cape May County	-14.10	-2.81	3.74	-13.18

Shoreline changes emphasize the beach restoration efforts in Monmouth County where the 18 month review between the Spring of 2013 and the Fall of 2014 surveys showed that nearly a 100-foot shoreline advance seaward occurred. The difference between northern Ocean County and Long Beach Island was a 7-foot difference in shoreline position with both the natural beach and the enhanced beaches showing decent shoreline shifts seaward by the fall 2014 survey.

Following the 1992 northeaster, the subsequent survey data supported a 4-year time span for the natural recovery process to restore the amount of sand returning via cross-shore transport by waves to complete the observed rebuilding of the beach berm. Dune damage was frequently restored by municipal efforts with either their front end loading or bulldozing capabilities. The post-storm wave transfer of the offshore storm deposit back toward the beach is far faster than wind transport of sand from the beach into the dunes to replace storm losses in the dunes. The former happens in 4-5 years while depending on the wind for the rebuilding of a dune system of size, uniformity with vegetation takes at least 20 years.

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INTRODUCTION:

The New Jersey Beach Profile Network (NJBPN) project provides local and regional information on coastal zone changes and is designed to document seasonal and storm-related damage assessments of the New Jersey shoreline. Each site has been visited annually in the fall since 1986. Semiannual visits, each spring and fall, began in 1994 following the passage of Public Law 93. The program was expanded to take surveys every spring following the winter northeasters and in the fall following summer beach accretion. In addition, new sites were established in the gaps of coverage and at all adjacent tidal inlet shorelines. The information collected consists of photographs of the beach/dune system at each site, a topographic profile of the dune, beach and seafloor to a minimum depth of 14-16 feet, and field notes on significant geologic changes. Also, construction activity is noted and necessary information regarding quantity and duration of such activity is gathered. The field data are used to generate graphical cross section plots, which can be used for comparison across the width of the active coastal zone. The cross section is also used to calculate sand volume and shoreline position changes. The 2014 report is focused on exactly how and where beach recovery has met expectations and what transpired to exceed expectations in terms of beach width and dune recovery. With hundreds of millions spent by the federal government, augmented by NJ shore protection money and some local enhancements, the evaluation of the post-Sandy beach condition is of utmost relevance. The information is arranged by county and sequential profile site location, and includes the survey cross sections, site photographs, and the description of significant changes. The tables of beach volume and shoreline change data are found after the county site descriptions for Cape May County in the appendix. A summary of each county's coastal zone activities follows the county profile site location diagram at the start of each county discussion.

THE NEW JERSEY COASTAL ZONE:

The northern coast in Monmouth County is considered a headland beach (carved into older geologic sedimentary units that created a sandy beach backed by a bluff of the older sediments) which erodes during serious storm events. Hurricane Sandy produced a marker among the centuries of this sort of erosion which has created two major sand spits, one to the north from Long Branch (Sandy Hook), and the other to the south from Bay Head (Mantoloking to Barnegat Inlet). To the south of Barnegat Inlet, barrier islands compose the remainder of the NJ coastline where individual islands are separated from the mainland by a series of bays and tidal lagoons. These islands are the local sand supply to the beach and as a result the shoreline moves landward with rising sea level.

STORM RECOVERY AND BEACH PROJECT EFFECTIVENESS:

The CRC crews working immediately following Hurricane Sandy found that by just two weeks following the storm, there were sizable offshore ridges of sand that ranged between 2 and 3 feet in height and over 100 feet in width at each profile site surveyed into the post-storm period. Immediately after the storm, the beach was concave upward from where the dune once stood, across the beach and into the ocean with few topographic features. The offshore bars began marching onto the wet intertidal beach by mid-November and continued to advance through the winter of 2012 – 2013. New offshore bars have continued to form and move landward.

While a sizable fraction of the sand eroded from the pre-Sandy shoreline was moved offshore into at least 10 feet of water, the rate of return was reassuring that similar results would come to pass similar to the post-1992 northeast storm recovery where 3-5 years after the event, much of the lost sand had returned. The combination of work completed by the US Army Corps and natural events has greatly enhanced the storm-damaged beaches.