

# State of the Shore

May 21, 2015

Asbury Park, NJ

## Welcome to the 13<sup>th</sup> Annual State of the Shore Media Event

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**MATTHEW  
McGRATH**

The State of the Shore report is one of the most vital tools we at New Jersey Sea Grant Consortium have.

The report is a collaboration of scientists and environmental managers. This pre-summer assessment is used by the media and tourism representatives throughout the state to show that

we have fantastic beaches.

Through this report, we have been able to chart our beach profiles over time. This 13-year undertaking was crucial in understanding how our shoreline changes especially in the wake of Superstorm Sandy. The research continues to be helpful in understanding how the Garden State shoreline is recovering from that storm, and the subsequently brutal winters.

The past two winters have been hard. The cold, the wind, and the snow pummelled the state, but as you will read, it did not beat on our beaches.

That's good news.

Our state's beaches are ready for day trippers, families on vacation, and tourists looking to explore our marine environment.

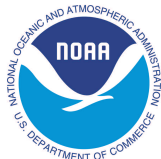
One change has been made to this report. The Consortium's Top 10 New Jersey Beaches contest winners will not be announced in conjunction with this report.

Voting for the survey historically occurred during the late winter when too few people could do more than fantasize about where they might be spending the summer. Voting has been moved to the late spring when it's warmer and when many people can sneak in a few early beach day respites before casting their ballots.

We'll be announcing the winners in early July, just before the Independence Day holiday. So far, the response to this change has been positive.

Voting for NJSGC's Top 10 Beaches continues through June 19 at 11:45 p.m. You can vote at [www.njseagrants.org/njsgc-toptenbeaches](http://www.njseagrants.org/njsgc-toptenbeaches).

Enjoy the summer.



**STEVENS**  
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Although New Jersey experienced yet another winter with record cold temperatures and significant snowfall accumulation, its beaches were once again spared. For the most part, the most intense winter storms followed landward tracks that kept the strongest winds over land, directed offshore or along the shore, where they were incapable of generating the extended periods of large waves and storm surge that result in beach erosion. Given the weakened condition of some of the state's beaches and dunes in places that are still recovering from Sandy, this lull in winter storm activity was a welcome respite.

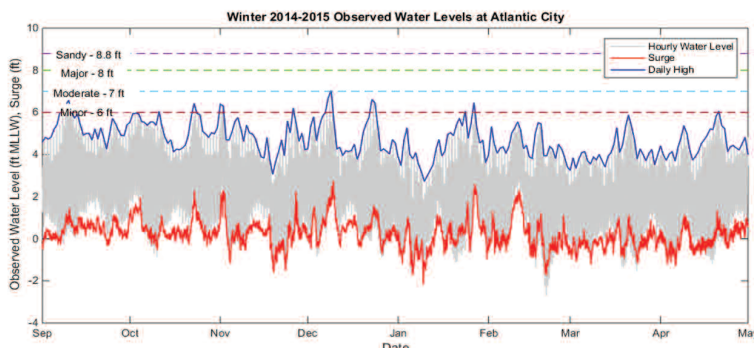
## Winter Storm Summary

Records from the NOAA tide gauge at Atlantic City, and the National Data Buoy Center (NDBC) wave buoy off the coast of Cape May were analyzed to provide further detail on some of the more significant storms of the season, and to help put the season as a whole in context. Water levels measured in feet above mean lower low water (MLLW) at the Atlantic City tide gauge are shown in Figure 1. Hourly observations are shown in gray, daily maxima in blue, and the storm surge (difference between the measured and predicted water levels) in red. Three

flood levels defined by the National Weather Service (NWS) are shown in addition to the water level recorded during Sandy to provide some context to the numbers. The wave heights measured off the shore of New Jersey during 2013-2014 are shown in Figures 2 and 3. In Figure 2, the average wave height, along with the wave heights exceeded on average only 5% (or roughly 438 hours per year) and 1% (or roughly 87 hours per year) of the time during a typical year are shown to provide context to these observations. Figure 3 provides a summary of the observations, where each bin represents the number of hours in which waves in a given range were measured.

Significant coastal flooding as reflected by the data in Figure 1 was relatively minimal this past winter. Although approximately 10 storms generated water levels in excess of the minor flood threshold established by the NWS, only one storm approached the moderate flood threshold of 7 ft above MLLW. Also worth noting is the fact that the duration of the high water events was relatively short, minimizing the potential for inland flooding issues and beach erosion. In terms of storm surge, several storms generated a surge in excess of 2 ft; however, with the exception of the storm in mid-December, the timing of these events was such that when combined with the astronomical tide, they only generated minimal flooding.

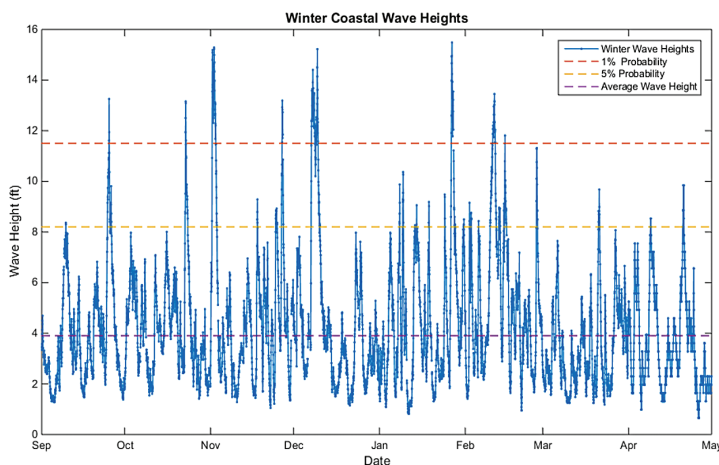
In terms of wave activity, there were 10 storms that generated waves in excess of 10 ft this past winter. While that number is about average, it is significant to note that there were very few periods of extended high wave activity, and only one storm in early December where the large waves were coincident with an extended period of high water. It is this condition of an extended period of elevated water levels and high wave activity that creates the most erosion potential.



**Figure 1: Water levels and storm surge measured at the Atlantic City tide gauge**



# Shore Report



**Figure 2: Wave heights measured offshore of Cape May at NOAA buoy 44009.**

One of the more interesting storms that didn't materialize was the winter storm in late January that resulted in the declaration of a state of emergency by Governor Christie. The forecast of a significant storm surge and developing offshore wave field threatened to cause major beach erosion. Fortunately, the storm tracked approximately 100 miles east of its forecast path, reducing the storm surge and waves associated with the storm, and sparing New Jersey's beaches.

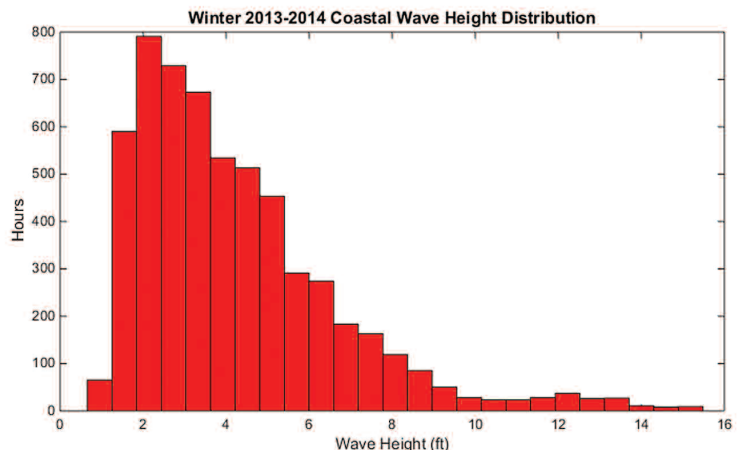
While the past two winters have been relatively quiet from a coastal storm standpoint, the prolonged periods of record low temperatures have highlighted an often overlooked coastal hazard – ice. Ice can negatively impact coastlines by freezing to structures, preventing drainage through ice locked storm water outlets, or riding up on shorelines scouring away vegetation and sediment in the process. While ice is generally considered during the design of coastal protection projects in colder climates, it has not routinely been considered in the design of New Jersey coastal protection projects. Recent work in New York and New Jersey has identified quantifying and accounting for ice impacts as one of the more important research questions for coastal green infrastructure projects in the region.

## Hurricane Outlook

On April 9th, 2015, the Tropical Meteorology Project at Colorado State University released its most recent

2015 tropical storm outlook for the Atlantic basin. The forecast is for an extremely inactive hurricane season, with only 7 named storms, 3 hurricanes, and only 1 major hurricane. Historically, the averages are 12.1 named storms, 6.4 hurricanes, and 2.7 major hurricanes. The likely development of a moderate to strong El Niño as well as an anomalous cooling of the tropical and subtropical Atlantic are cited as the two most important factors in suppressing the potential number of hurricanes. So far the conditions in 2015 are somewhat similar to those of last year which produced 8 named storms and 6 hurricanes, the strongest of which was Hurricane Gonzalo with winds of 145 mph. While the probability of a hurricane making landfall in New Jersey in 2015 remains low (0.6%), New Jersey residents need only think back a few short years to 2011 (Irene) and 2012 (Sandy) to be reminded of the potential consequences when those odds are overcome.

This year, the National Hurricane Center is offering an experimental graphic designed to highlight the areas most at risk of inundation due to the storm surge associated with a tropical cyclone. The storm surge frequently poses the greatest threat to life and property during a storm, and typically occurs at different times and different locations from a storm's winds. The storm surge warning system is expected to be fully operational by 2017. Also being offered again this year are the experimental Potential Storm Surge Flooding Maps that were rolled out in 2014. These



**Figure 3: Summary of hourly wave height observations at NOAA buoy 44009 (off Cape May).**

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maps identify the potential extent of inundation on a map and the flood depths (height above ground) that have a 10% chance of being reached. This product has the potential to significantly impact the way the public receives and responds to information about storms. When combined with experimental storm surge watches and warnings, the public will be better informed about where and when to expect water, and how much.

## Summer Outlook

The relatively quiet winter has left most New Jersey beaches in relatively good shape heading into the summer season. Any sand that was eroded during the winter likely remains just offshore in one or more bars. As the mild spring and summer conditions continue these bars will eventually get pushed up onto the beach, naturally restoring the beach to its pre-winter width. Moving into the summer season, some New Jersey residents will notice significant changes in their beaches. Large scale beach nourishment projects have been constructed or are under way along many areas of the coast. While these projects are invaluable in terms of preventing storm damage from ocean front waves and surge, communities need to be prepared for the next Sandy. Strong beaches and dunes are a great first step, but communities should continually be asking themselves, what else can we do? Some of the answers may involve things like creating or enhancing a dune, addressing bayshore erosion/flooding issues, restricting development in flood prone areas, and/or elevating vulnerable homes/infrastructure.

## By the Numbers

The chance of a hurricane making landfall in New Jersey this year is 0.6% according to the Colorado State University Tropical Prediction Center. That equates to a 6 in 1000 chance. How many of you would play the lottery with those odds? How many of you will take the time to prepare for a hurricane?

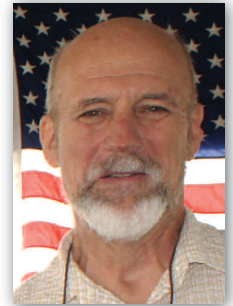
Nearly 100 people die in rip currents every year in the United States. In comparison, there are fewer than 60 documented shark attacks in the United States every year, and of those only a small number (12 since 2000) result in fatalities. Do you think about sharks before entering the water? Do you think about rip currents? Contact New Jersey Sea Grant Consortium for rip current safety information.

# New Jersey Beaches Two Years Since Hurricane Sandy

## Recovery & Army Corps Maintenance

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**DR. STEWART  
FARRELL**

## Introduction

In 1986 the New Jersey Department of Environmental Protection (NJDEP) initiated a statewide coastal monitoring program called the New Jersey Beach Profiles Network. The objective was to survey the dune, beach and shallow offshore to allow the determination of changes both positive or negative to the components of the state's coastline at a level that could define zones of either severe erosion or sand accumulation. This initiative followed a negative assessment of the state's ability to define beach storm damages from Hurricane Gloria in 1985. Then U.S. Senator William Bradley obtained a Congressional grant to the NJDEP that included the start-up funding to put the program together.

Work over the past 28 years has produced a series of individual site trends (105 locations) that when combined by island reach or shoreline community show just where and how sand moves along or across the New Jersey shoreline. The Coastal Research Center undertook an immediate post-Sandy review of all 105 sites using GPS surveying methodology and covered each site between October 31 and November 24, 2012.

Twice-annual surveys since have demonstrated the value and efficacy of the U.S. Army Corps of Engineers (ACOE) shore protection projects in providing a large measure of protection from Sandy wave damage and the application of Public Law 113-2 which authorized the ACOE to restore every authorized coastal project to the original design specifications at 100% federal cost.

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## Sandy Losses by County

Summary of each county shoreline response to Sandy showed that the sand volume loss amounted to over 3.3 million cubic yards in Monmouth County.

Ocean County Lost 5.0 million cubic yards of sand along the northern shoreline and 2.85 million cubic yards from Long Beach Island.

Atlantic County fared better, but has the shortest coastal section in the State. This county lost 0.85 million cubic yards of sand.

Cape May County lost 2.24 million cubic yards of sand, but four sites in Wildwood and Cape May City actually gained sand on their beaches as a result of the hurricane. A lower wind velocity and a north, northeast direction drove sand onto the beach from offshore. The sum of all ACOE projects in Cape May County added 3,743,227 cubic yards of new material to the county beaches.

Each cross section surveyed into 16 to 18 feet of water found that of the loss to the dune and beach, that sand was transported seaward and deposited starting in about 10 feet of water and extended seaward beyond the CRC survey distances by 200 to 500 feet into about 22- to 25-foot water depths. After two years about 80% of the deposit offshore has returned to the beach, but the dunes had to be rebuilt by man due to the long time interval to naturally re-build a destroyed dunefield. About half the remaining lost sand will return over the next three years if the comparison to the 1992 northeast storm recovery is a guide to the Sandy recovery process.

## Change Since Sandy, Two Years Later

The U.S. Army Corps of Engineer issued contracts to four dredging companies to proceed to restore their shore protection projects to design specifications of beach elevation and width during 2013. These sand placements came from sources offshore meaning that they were introducing a new sand supply to the New Jersey coastline never previously present. In addition, PL 113-2 allowed the ACOE to proceed to go to construction with 100% federal cost projects not yet built as of Sandy, but previously authorized. These included the reach between Long Branch and Loch Arbor in Monmouth County, several Raritan Bay projects, the remainder of Long Beach Island and the Ludlam Island project in Cape May County. These projects are either currently under construction or finished in 2014.

## Monmouth County

Monmouth County saw an average of 64.13 yds<sup>3</sup>/ft. in new sand added to the 36 cross sections producing a 92-foot average shoreline advance between April 2013 and December 2014. The 8 Sea Bright sites averaged a gain of 74.73 yds<sup>3</sup>/ft., the 6 Long Branch sites averaged a gain of 128.76 yds<sup>3</sup>/ft., and the 13 sites between Asbury Park and Manasquan averaged a gain of 46.20 yds<sup>3</sup>/ft.

## Ocean County

While northern Ocean County sustained some of the most egregious damages during Hurricane Sandy, this area had some of the least successful recovery rates in the two years since (average of 51.2%, ranging from a low of -2% to a high of 91% of the sand present on the beach and in the dunes prior to Sandy now over 2 years later). This in spite of the fact that real recovery in the form of the proposed federal shore protection project authorized and funded to go to construction is presently bogged down in the obtaining of easements to proceed on privately owned beach front parcels.

On the other hand, even with less than half the oceanfront on Long Beach Island under federal management, the southern segment of Ocean County has seen a 107% sand volume increase since Hurricane Sandy due to three segments of the shoreline restored to the federal project design specifications (Harvey Cedars, Brant Beach, and Surf City). The average county wide without the federal assistance was 69% across the entire county and 76.4% when the Army Corps work was counted. Over 3 million cubic yards of new sand was placed on LBI, with an additional 8 million more contemplated when the real estate issues are concluded.

## Atlantic County

Atlantic County received maintenance related to recovery from Hurricane Irene in August 2011 by early 2012. This effort paid dividends during Hurricane Sandy in preventing certain damage to the new Revel Entertainment project at the north end of Atlantic City and mitigating some overwash damage in Brigantine's north end hot spot. The damage done in Longport and Margate convinced Longport to seek inclusion in the ACOE project to continue the work south from Ventnor. The Margate City Council is equivocating because multiple oceanfront owners are strongly opposed to any dune as part of the project. They claim the timber



bulkhead is sufficient protection for the city. This in spite of the fact that waves during Sandy went over the bulkhead in sufficient force and water volume to move sand into homes, businesses and the general infrastructure all along Atlantic Avenue. It appears that the entire project will be completed relatively soon. The remaining issue is what to do in terms of dealing with the influx of beach fill sand into Great Egg Inlet around the 11th Avenue Longport jetty. Alternatives exist and have been discussed, however, the ACOE project extent ends at the 11th Avenue jetty in Longport with no plans to participate in any jetty changes or extension of the beach project.

## Cape May County

Sandy's sand redistribution at the southern Cape May County beach sites was redistributed largely as significant berm additions by the fall of 2014. The restoration of the ACOE constructed projects removed any significant storm losses and provided a source of sand to spread along the various shorelines.

Erosion continued to plague the northeast segment of Ocean City, Strathmere, Avalon and North Wildwood. Each site would be subject to additional maintenance in the future. Ocean City appears to be in satisfactory condition, with a major project set to begin extending from 34th Street in Ocean City across Corson's Inlet and south to Townsends Inlet.

Avalon continues to shed sand from the 10th to 21st Street segment and accumulate it between 35th and 70th Street beaches. The borough is planning a major restoration May 2015. In North Wildwood, back-passing is being used to provide minor sand volumes (50,000 cy) to enhance the northern five city oceanfront beach blocks. An additional 43,000 cy will be made available in the fall of 2015 from sand dredged from Beach Creek.

Since Sandy, work by the Philadelphia District ACOE has restored all authorized and constructed projects back to individual project design specifications.

Work continues on the final design for the project for North Wildwood to Wildwood Crest utilizing some form of sand harvesting from the excesses seen in Wildwood and Wildwood Crest beaches to produce a sand "recycling" program, termed "Back Passing".

The final element is the future revitalization of a one-time effort project to provide environmental enhancement to the Delaware Bay shoreline of western Cape May County. This project is not part of the Hurricane Sandy

PL 113-2 work, so must be funded separately. Back in the 1990s it was proposed as an environmental restoration for the western county coast, but never received congressional appropriations to proceed to construction. Recently the Philadelphia District is re-assessing this project.

A proposal currently submitted to the NJDEP for 6,000 feet of Delaware Bay shoreline in Middle Township (Reeds & Pierces Point beaches) is under review and if funded would dovetail with and complement the existing National Fish & Wildlife Service's Delaware Bay environmental habitat restoration program for benefit of horseshoe crabs and the red knots.

Even further up into Delaware Bay was an ACOE project completed in 2014 at Oakwood Beach in Salem County. Delaware River sand was transferred to a bulkhead shoreline to provide a new 50-foot berm totaling 350,000 cubic yards of material. This is representative of potential restoration projects in the future along the bay shoreline as a new venture in cooperative shoreline restoration.

The benefits to the State of New Jersey, its four coastal county municipalities and coastal citizens from the funding provided by Public Law 113-2 passed January 29, 2013 by Congress is extraordinary and should have greater appreciation in the media from State and local officials.

