# Welcome to the New Jersey Sea Grant Consortium's 14th Annual State of the Shore Media Event


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As summer approaches, most of us in New Jersey have one thing on our minds: the beach. New Jerseyans are proud to have a state with miles and miles of spectacular coastline. Not only do we depend on the beach for our own recreation, many depend on the tourism industry that our beautiful beaches rightfully attract each year. Considering this, it is no surprise that many are interested in the conditions of our beaches and how they were affected by winter storms. We know Hurricane Joaquin and Winter Storm Jonas left their mark on New Jersey over the winter, but did these events leave an impact on our beaches? In the 14th Annual State of the Shore report, we are provided with answers. A collaboration of scientists and environmental managers, this report is used by media and tourism representatives throughout the state to illustrate the condition of our shoreline.

As you will read in the report, despite the fact that New Jersey was not hit directly by a tropical system like Sandy, the coastline was impacted. This is especially true of communities that are still recovering from Sandy. But there is good news. The beaches are now in a rebuilding mode that is part of a natural annual cycle and many beaches are expected to return to their original width by the end of the summer.

On one last note, you may remember that the results of New Jersey Sea Grant Consortium's Top Ten Beaches poll were previously announced at this event. Last year, the events were separated to give each its due attention. In the continued spirit of changes, the poll is now New Jersey's Favorite Beach and winners chosen for each coastal county in addition to an overall winner. So cast your vote at njseagrant.org/njfavoritebeach. Then relax and enjoy the summer!

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In spite of the fact that New Jersey was spared a direct hit from a tropical system like Sandy, New Jersey's coastline took a battering this past winter. This was particularly true in the communities that have yet to be restored after Sandy. A series of hybrid storms and traditional Nor'easters caused significant damage throughout the state. In some cases, the damages experienced during these storms were more severe than those that occurred during Sandy. A review of some of the data collected over the winter helps us understand just how severe the conditions were, and what to expect as we transition from spring into summer.

## Storm Summary

The water levels measured by the National Ocean Service tide gauge at Atlantic City are shown in Figure 1. Hourly observations are shown in gray, the daily high tide is shown in blue and the surge, or difference between the measured and predicted water levels, is shown in red. The data confirm that the moderate flood threshold was exceeded four times this past winter, while the minor flood threshold was exceeded nine times. The corresponding wave height data collected off the southern New Jersey coast by the National Oceanic and Atmospheric Administration's Delaware Bay buoy (#44009) is shown in Figure 2.

To help put the wave heights in context, design levels associated with the 2, 20, and 100-yr storms based on a U.S. Army Corps of Engineers wave hindcast are also shown. While the two-year storm wave height was only exceeded twice, the largest storm of the season (Jonas) exceeded the 100-yr level by a significant margin, and included some of the largest waves ever recorded at the buoy.

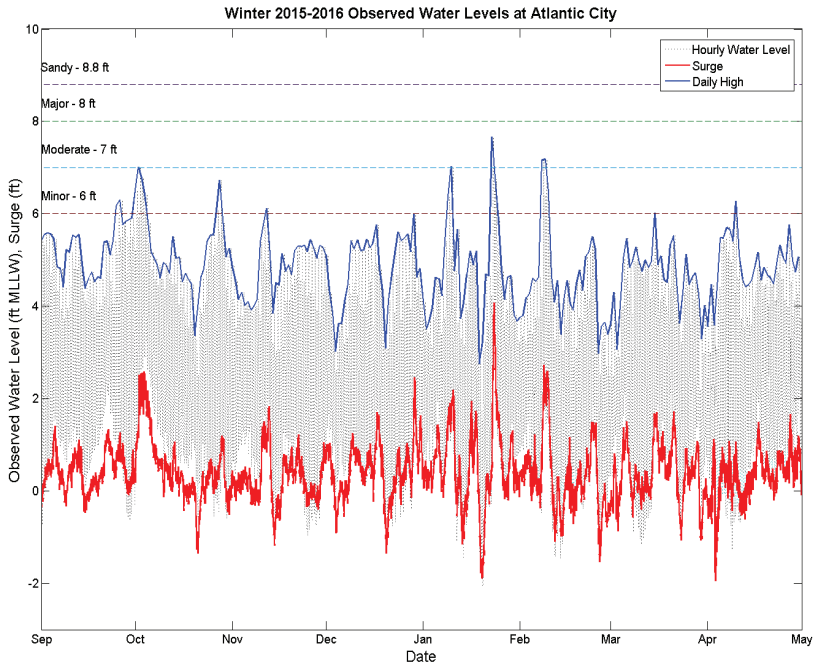



**Figure 1: Water levels and storm surge measured at the Atlantic City tide gauge**

## Joaquin

While there were several smaller storms during this past winter, two storms were especially noteworthy. The first occurred in late September/early October and is commonly associated with Hurricane Joaquin. Joaquin formed in the Caribbean, grew into a Category 4 storm, and threatened to take a path similar to Sandy before ultimately stalling out and moving offshore. In terms of coastal flooding, Joaquin failed to live up to the early expectations. Ultimately, the water level during the storm peaked at 7.02 ft above Mean Lower Low Water (MLLW) which barely exceeded the moderate flooding threshold. Despite the relatively modest flooding, Joaquin caused severe beach erosion, particularly in communities not protected by an adequate beach/dune system. The severity of the erosion was related to the critical combination of elevated water levels and wave heights acting over a significant period of time. As shown in Figure 2, the wave heights measured during Joaquin were large (20.01 ft); however the size of the waves and the elevation of the storm tide alone, cannot explain the severity of the observed erosion. The explanation for the storm erosion lies in the duration of the severe weather. Taking a closer look at Figure 2, it can be seen that there was a two week period surrounding Joaquin during which the wave heights rarely dropped below 5 ft. Waves occurring prior to Joaquin weakened the beach making it more susceptible to damage during the peak of the storm. When evaluated using the Storm Erosion Index (an index developed at Stevens Institute of Technology used to measure the beach erosion potential of coastal storms), Joaquin ranks as a top 3 storm, primarily due to its duration. Unfortunately for New Jersey's coastal communities, Joaquin significantly weakened many of the most vulnerable beaches, necessitating emergency beach fills in some areas.

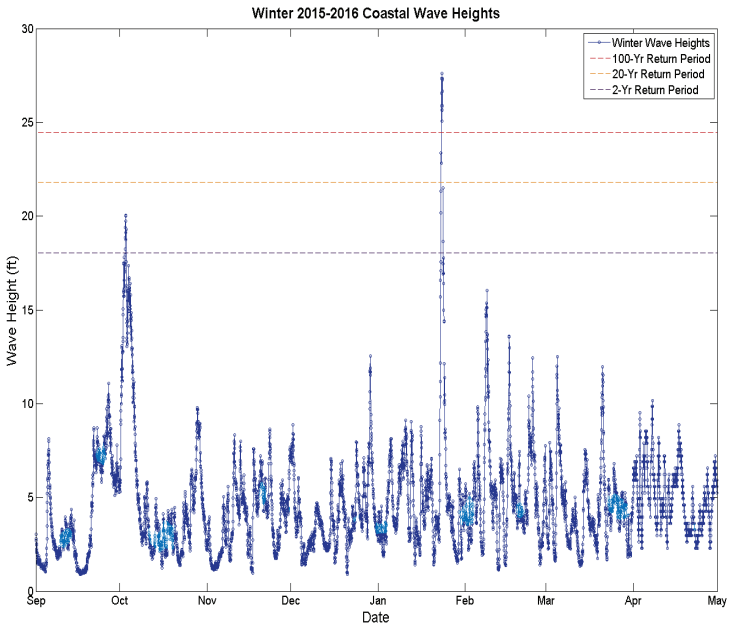



**Figure 2: Wave height data collected off the southern New Jersey coast by the National Oceanic and Atmospheric Administration's Delaware Bay buoy (#44009).**

## Jonas

The second major storm of the season was winter storm Jonas. Jonas originally formed over the Pacific and tracked across the southern United States before merging with a low pressure system off the Carolinas and rapidly intensifying. The storm resulted in significant snowfall accumulations throughout the Mid-Atlantic, but more importantly for coastal communities the immense energy associated with the storm generated extreme storm surges and waves. In many southern New Jersey communities, including Cape May and Stone Harbor, the water levels during Jonas exceeded those during Sandy as did the wave heights. The buoy off Delaware Bay recorded a wave of 27.59 ft during the storm which is more than 3 ft larger than what was recorded during Sandy, and which is on par with the largest ever measured at the location. As bad as Jonas was, New Jersey's coast was spared somewhat by the fact that the waves were predominantly directed to the southwest, resulting in a glancing blow, rather than a direct hit. Still, Jonas did significant damage in many locations further impacting beaches which were already in a vulnerable state after Joaquin. In some locations vertical scarps or cliffs of up to 15 ft were carved into the shoreline. Communities that were left staggering after Joaquin, were unfortunately faced with the extraordinary task of trying to repair their beaches to prepare for the potential of additional storms. Two months after the storm, Jonas was officially recognized as a major disaster through a presidential declaration. Preliminary FEMA estimates put the total cost of public assistance for Jonas at $82.6 million.

## Other Storms

Outside of Jonas and Joaquin, the winter storm season was fairly typical. In terms of the relative frequency of storms, this year was essentially identical to last year. Both years saw 10 storms exceed the minor flooding threshold and 10 storms generate wave heights in excess of 10 ft. The real outliers where the two major storms discussed above. Unfortunately, the erosion and flooding associated with those storms left some communities extremely vulnerable, necessitating storm preparations which wouldn't have been required under more typical circumstances. Of these other storms, the most significant in terms of flooding were a storm in early January during which water levels peaked at 0.02 ft above the moderate flooding threshold and another in early February which peaked at 0.18 ft above the same threshold. The second of the two storms caused more significant impacts as it came on the heels of Jonas, persisted over a period of several days,

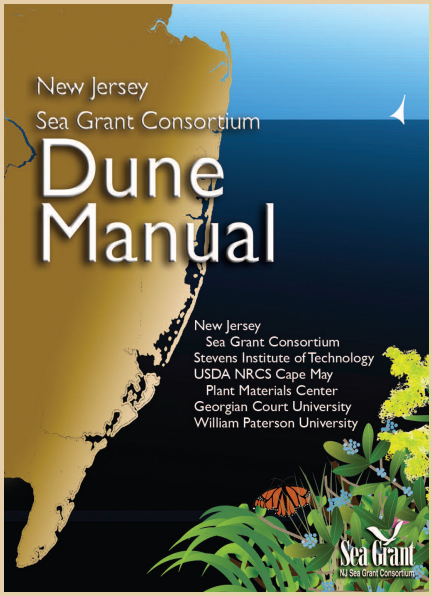
and was accompanied by waves in excess of 15 ft. Once again, the critical combination of elevated water levels, large waves, and an extended duration contributed to the ongoing erosion at many New Jersey beaches. Fortunately, the early February storm was the last major storm of the season and the remainder of the spring has been fairly typical with only two flooding events of note (one in mid-March and another in early April), and waves that alternate between mildly erosional, and beach building. As we transition into summer, the beach building waves are expected to become more and more prevalent.

## Tropical Outlook

The latest forecast from Colorado State University's Tropical Meteorology Project calls for an average Atlantic basin hurricane season with 12 named storms, 5 hurricanes, and 2 major hurricanes. This compares to long term averages of 12 named storms, 6.5 hurricanes, and 2 major hurricanes. As might be expected, the probability of a major hurricane making landfall along the U.S. coastline is also average at about 50%. Closer to home, the probability of a major hurricane making landfall in New Jersey remains relatively low; however as Irene and Sandy illustrated, major damage can occur in "smaller" storms and during storms that remain well offshore. The public is urged to be prepared and heed the advice of the National Weather Service and state and local officials when a storm is approaching. Information on hurricane preparedness can be found on the NJ Office of Emergency Management website at: http://www.state.nj.us/njoem/plan/hurricanes.html.

## Current Conditions

Currently many New Jersey beaches are in a rebuilding mode. This rebuilding is part of the natural annual cycle in which beaches erode and bars form during the winter, then recover in the spring/summer as the bars migrate onshore. The severity of the storms this past winter resulted in the generation of extremely narrow beaches and extensive sand bars in many communities. In the short term this created additional winter recreational opportunities in the form of enhanced surfing. Presently, New Jersey's beaches are beginning to recover as the storm bars are working their way back onshore. It is expected that most New Jersey beaches will recover the majority of their beach width by the end of the summer, however given the severity of this past winter's storms and the size and the position of the sandbars, full recovery may not be realized until mid-late summer. While the beaches are recovering, it is important that beachgoers be aware of the potential for dangerous rip currents. Rip currents generally form adjacent to jetties and groins or near gaps in sand bars. Given the prevalence and likely persistence of the sand bars this summer, extra caution is urged. More information on rip currents is available at: http://njseagrant.org/extension/coastal-concerns/rip-current-awareness/.




## Available Now: New Jersey Sea Grant Consortium's Dune Manual

*NJSGC's Dune Manual has been developed for government officials and others with the responsibility of building and maintaining dunes along New Jersey's ocean front and bay shores. Available on NJSGC's website, the guide addresses issues such as: permits and permissions, preparing a dune for planting, what to plant when, where and how; what not to plant, amendments to increase the success of plantings, and sources of native plants for restoration.*

*To access the guide go to njseagrant.org/dune manual. For questions concerning this project contact Dr. Peter Rowe at prowe@njseagrant.org.*

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