# 2011 New Jersey State of the Shore Report

# Welcome to the 9th Annual State of the Shore Media Event


**CLAIRE ANTONUCCI**

*Executive Director, Director of Education*

*New Jersey Sea Grant Consortium*


CLAIRE ANTONUCCI

Spring has arrived and with the record snowfall we had this past winter, it is most welcome. Residents and visitors alike will soon be flocking to New Jersey's beaches and shorelines to relax and renew. When they arrive they will find the beach in remarkably good condition according to this year's State of the Shore Report.

This is great news of course. New Jersey has wonderful beaches, each with its own attributes and attractions. We are blessed with 130 miles of them and each one comes in handy, especially when you consider nearly 9 million people live in New Jersey's coastal counties alone, a number that increases dramatically in summer. New Jersey's economy is highly dependent upon these beaches and the visitors who enjoy them. In addition to our ocean beaches, New Jersey has nearly 1,800 tidal shoreline miles that support marine recreation and tourism. This includes Barnegat Bay whose care has become a top priority of the Christie Administration. Together these environmental resources are the foundation of a coastal tourism industry that generates about 22 billion dollars each year.

The New Jersey Sea Grant Consortium has a long history of supporting New Jersey's coastal and estuarine economies. Our research program has made key contributions towards greater understanding and better management of New Jersey's beaches by advancing science-based practices including efficient and effective beach maintenance and replenishment methods. Our current research cycle supports the work of another participant in this year's State of the Shore report, Dr. Michael Peek of William Patterson University, who is comparing the tolerance of the widely used 'Cape' genotype of American Beachgrass in dune stabilization to five other American Beachgrass ecotypes. Our extension program includes among its many projects and programs that contribute towards the improvement of Barnegat Bay including the Clean Vessel Act and the Clean Marina and the Marina Industry Enhancement programs. We look forward to working alongside the Barnegat Bay Partnership and its director, Dr. Stanton Hales, to protect and restore the threatened ecology and economy of Barnegat Bay.

Products like this ninth annual State of the Shore Report are crucial to getting information about these projects out to those who need it the most—New Jersey's coastal planners, managers, policy makers, academics and the public. As a member of the staff of the New Jersey Sea Grant Consortium, I am proud to be a part of this report and, moreover, an organization that truly makes a difference.


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# 2011 New Jersey State of the Shore Report

DR. JON K. MILLER

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New Jersey residents may remember this past winter for the extraordinary amount of snow that was dumped throughout the state; however they will not remember it as a winter that battered the coast. Despite receiving over twice the average amount of snowfall, the beaches of New Jersey held strong. This reprieve was fortunate since it came on the heels of one of the most damaging winters in recent memory in 2009-2010.

## Coastal Storm Activity

Winter storm activity was analyzed using data collected from wave and water level gauges maintained by the National Oceanographic and Atmospheric Administration (NOAA). Two 3-m discus buoys located offshore of Cape May and Sandy Hook provide wave information, while a tide gauge located on the seaward end of the Steel Pier provides water level information. The water level data for September through April is shown in Figure 1, where the dashed line represents the water level with a two-year return period (water level that has a 50% chance of being exceeded in any given year). Figure 2 shows the same information for the wave heights measured at NDBC buoy 44025, while Figure 3 shows the surge, or difference between the astronomically predicted water levels and those recorded by the tide gauge.

Hurricane Earl threatened to get the winter storm season off to a rough start. Although the hurricane passed 100 miles off shore in September, it caused tropical force winds and high waves. These high waves combined with elevated water levels caused some beach erosion, especially in the Atlantic City region. The month of October got off to a stormy start when a low pressure system passed offshore close to the time of the new moon. Fortunately, the maximum surge associated with this storm which was nearly 2.5 feet occurred at low tide, reducing its impact. In spite of the fact that the storm peaked during low tide, the elevated water levels and high

**Figure 1**

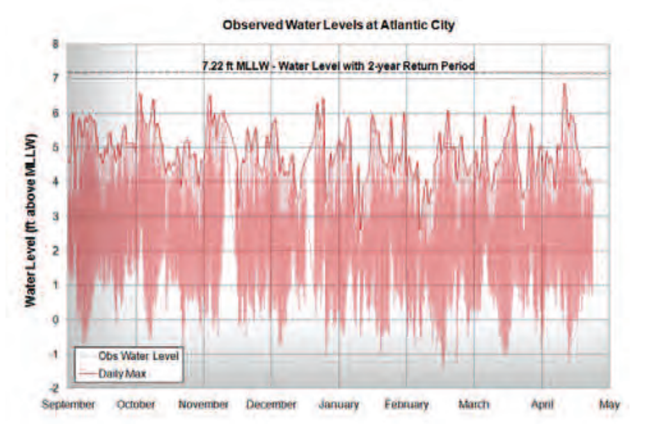
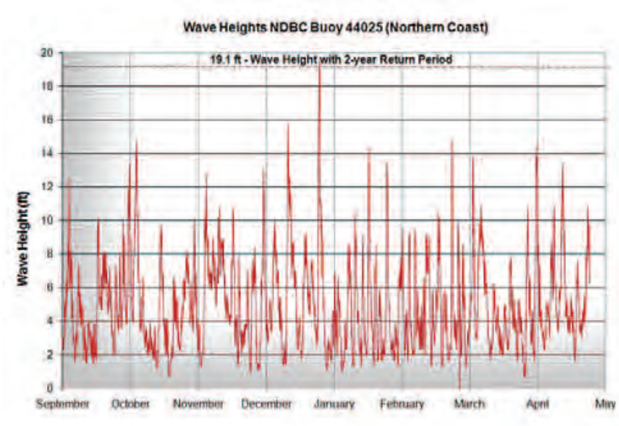



**Figure 2**

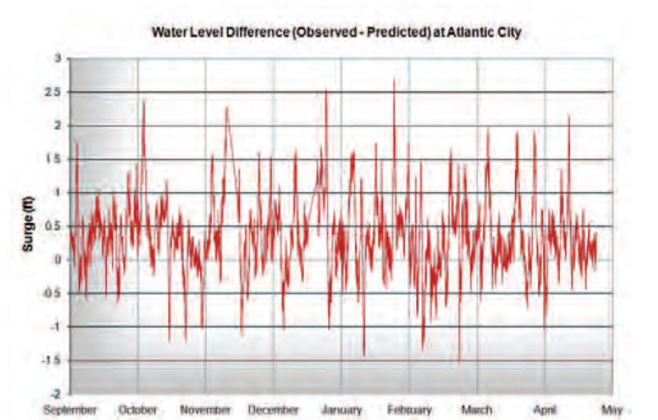


waves caused some coastal flooding in the southern part of the state. Throughout the remainder of October the weather remained fairly calm. Moving into November, a small low pressure system at the beginning of the month resulted in a moderate storm surge; however due to the timing of the event, coinciding with the new moon, water levels approached those seen during the October storm. The waves associated with this less intense storm were relatively small, and as a result only scattered reports of small amounts of beach damage were received.

After almost two months of calm weather, the Christmas Blizzard of 2010 swept through New England, dumping record amounts of snow on the 26th and 27th of December. In much of New Jersey, snow amounts equaled the average snow for an entire winter. The storm also brought high winds and higher than average water levels. The surge reached a maximum of 2.5 feet; however it peaked at low tide and during a period when water levels were lower due to the astronomical position of the moon, so the maximum observed water level during the storm was only 6.2 feet MLLW. Due to the large waves generated during the storm (which exceeded the two-year return period), the Christmas Blizzard still caused significant damage to the coast, in spite of the fortunate timing of the peak surge. Erosion and dune loss was reported in several communities in Atlantic and Cape May Counties.

January, February, and March saw several more significant snowfall events, eventually making this past winter one of the snowiest in the state's history. Fortunately, the tracks taken by these storms were such that they did not bring significant winds, waves or storm surges to the New Jersey coast and therefore coastal erosion was minimal. In mid-April, a storm system that brought heavy rain to the state, also generated the highest water levels of the year at Atlantic City. Similar to the early November storm, the high water levels had more to do with the timing of the storm than anything else. During the storm a moderate storm surge combined with higher than normal tides to elevate water levels along the coast; however the wave activity during the storm was relatively benign. As a result, beach erosion during the storm was minimal.

**Figure 3**

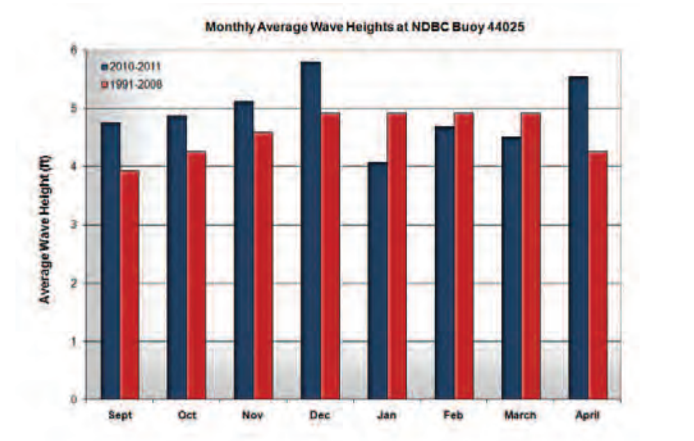



Overall, the winter season was relatively mild and a welcome respite after last year's damaging storms. With the exception of Hurricane Earl and the Christmas Blizzard, the winter storms of 2010 and 2011 inflicted minimal damage to the shore. Unfortunately, communities along the southern coast suffered disproportionately during these two events with the heaviest damage being reported in Atlantic and Cape May Counties.

## Historical Context

Last year, two storms produced water levels in excess of the two-year return period, and eight storms resulted in at least 2.5 feet of storm surge. This year, the highest water level achieved fell nearly half a foot below the two year level, and only 2 storms produced surges in excess of 2.5 feet. As far as wave heights go, Figure 4 shows a comparison of the monthly average wave heights reported at buoy 44025 this year with the long term averages. From

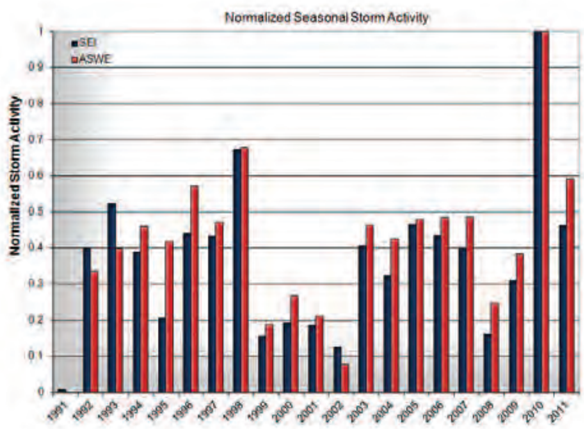
**Figure 4**




September through December, the wave heights this past year averaged 0.72 feet higher than the historical average; however in January through March they averaged 0.5 feet lower. The average for the entire winter at buoy 44025 was approximately 0.33 feet higher than the historical average.

While wave heights and water levels during a storm play a significant role in determining its impact, it is the combination of the two acting over the duration of the storm that ultimately determines its influence on the coast. For the past several winter Stevens has been using the newly developed Storm Erosion Index (SEI) to account for all of these factors and place storms and storm seasons in historical perspective. Cumulative totals

Figure 5




(July through the following June) of the SEI and a second parameter called the Accumulated Storm Wave Energy (ASWE) are plotted in Figure 5, where the values have been normalized (divided) by the total from 2010. Both parameters suggest this past winter was about half as stormy as last year, and on par with the relatively mild winters of the past decade. It should be noted, however, that the 2011 dataset is still incomplete, as all of the other totals run through June.

## Summer Storm Outlook

The Tropical Meteorology Project at Colorado State University released their most recent Extended Range Forecast of Atlantic Seasonal Hurricane Activity on April 6th. Their report predicts a very active hurricane season with a well above average number of storms expected. They call for 16 named storms, 9 hurricanes, and 5 major hurricanes (category 3, 4, or 5). This is compared to the average number of 9.6 named storms, 5.9 hurricanes, and 2.3 major hurricanes for the last fifty years. The Tropical Meteorology Project states that this significant rise in activity is due to a combination of factors which includes a strong thermohaline circulation (THC), weakening La Niña conditions in the Pacific, and above average sea surface temperatures in the tropical Atlantic. According to the forecast, the probability of a hurricane making landfall along the U.S. coast is 72%, which is considerably above the average of 52%. The probability of one of these hurricanes making landfall in New Jersey however, remains extremely low (about 2%). The likelihood that New Jersey experiences tropical storm force winds related to one of these storms however is much higher at approximately 7%.

## Conclusion

New Jersey was fortunate to escape this past winter without the occurrence of a major storm or series of storms. Twenty years ago, the "Perfect Storm" or "Halloween Storm" of 1991 ushered in a 15-month period of extraordinarily stormy weather that battered the New Jersey Coast. Several of the storms during this period are counted among the most significant of the past half century. Fortunately, the powerful storms of last winter were preceded by a decade of average or below average winter storm activity, making the beaches of New Jersey primed and ready to absorb such a significant blow. The mild conditions this past winter should allow New Jersey's beaches to continue to recover through both natural and anthropogenic processes. With the onset of the typical late spring and early summer conditions, New Jersey's beaches should continue to build reaching a maximum in mid- to late summer.

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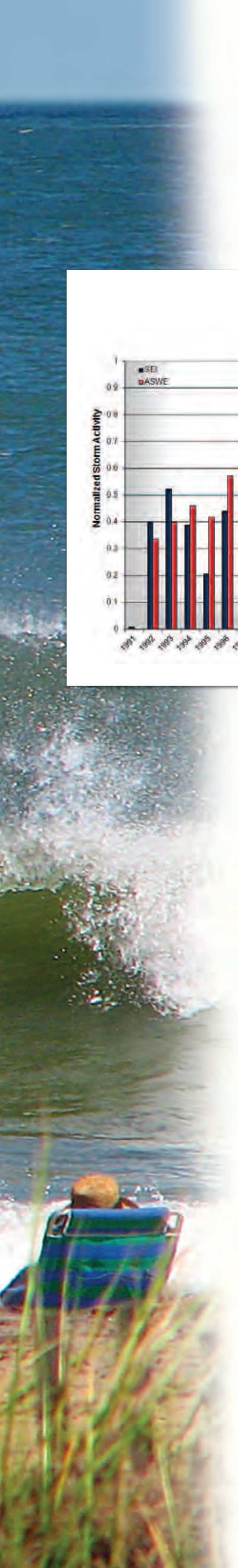

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2011 New Jersey State of the Shore Research Brief

**Dr. L. Stanton Hales, Jr.**
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# Watching Over New Jersey's Wetlands

Tidal marshes are hallmark features for the coastal plain region of New Jersey, including the Barnegat Bay and Delaware Bay estuaries, where they represent perhaps the most critically important habitat type for ecosystem functioning and human health. These wetlands provide critical services, including flood protection against rising seas, maintenance of water quality, carbon and nutrient sequestration, and fish and wildlife habitat for many recreationally and commercially important fishes and shellfishes. Though potentially imperiled by over-development and sea-level rise, marshes are among the most responsive habitat types to environmental change. However, coastal marshes throughout New Jersey remain poorly monitored and assessed with regard to sea-level rise or other potential threats. The lack of information about tidal wetlands hampers our collective abilities to provide watershed-scale guidance to managers about protecting and enhancing wetlands on a long-term basis.

This past summer, the Barnegat Bay Partnership (BBP) received more than $390,000 from the USEPA Region to support the establishment of an integrated wetlands monitoring and assessment network in New Jersey. The initiative is a cooperative effort with the Partnership for the Delaware Estuary (PDE), the New Jersey Department of Environmental Protection, the Academy of Natural Sciences In Philadelphia, and the U.S. Fish and Wildlife Service. This project is part of a larger initiative, the Mid-Atlantic Coastal Wetlands Assessment (MACWA), which spans the coastal area in New Jersey and Delaware. MACWA is envisioned as a part of the National Water Quality Monitoring Network.

The project employs USEPA's three-tier approach for monitoring and assessing wetlands. First, we have established a tidal wetland reference network in the Barnegat Bay and Delaware Estuary, which includes the placement of strategic permanent Sediment Elevation Tables to assess whether the wetlands are subsiding, accreting, or remaining static. Data collected at the reference sites will enable us to evaluate site-level changes in the wetlands. At all sites, we have initiated intensive monitoring of basic biological, water quality, and geomorphic parameters. In addition, we will soon begin a broad survey (up to 30 sample points, 15 per estuary) using USEPA's rapid assessment method for biota to ensure its suitability across the sub-regions of the mid-Atlantic states and marsh types. We will review and assess all of the collected information to identify and prioritize the key decision-making materials and tools to assist local and regional managers in integrating wetland protection and enhancement into watershed planning. Lastly, we will prepare information products that relate our findings to other studies and lay the basis for future expansion of tidal wetland programs and hold a mid-Atlantic sub-regional coastal wetland assessment workshop.

Fully functioning tidal marshes provide a critical line of defense for our coastal communities and sequester more carbon than any other habitat in our region. Loss of marshes will have a doubling effect on carbon in the atmosphere, because such losses lead to a decrease in future carbon sequestration plus an increase in the carbon dioxide produced as the decaying marsh is metabolized by bacteria. Tidal wetland assessment should help managers prioritize high functioning marshes for protection and restoration, especially if the motivation is for carbon sequestration (i.e., likely to be more beneficial to stem marsh losses than to plant trees.)

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***NJ MACWA Team: SET Installation in Reedy Creek Marsh, Barnegat Bay – 2010***

***Photo - M. Maxwell-Doyle***

2011 New Jersey State of the Shore Research Brief

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# Building a Better Beachgrass

American Beachgrass (*Ammophila breviligulata*) is a vital component of New Jersey's coastal environment. As the initial plant species to colonize the dune system, American Beachgrass initiates an important process of dune development and stabilization by intercepting wind-blown sand and stabilizing it with below-ground structures promoting the development of maritime forest. Despite the stabilization properties of dune grasses, coastal systems are highly dynamic and undergo alternating periods of accretion and depletion. Furthermore, humans are placing increasing demand on these systems for residential and recreational purposes. Consequently, society demands that these systems remain in place to protect the multibillion dollar infrastructure built on many barrier islands, and millions of dollars are spent on beach nourishment projects and dune restoration for this purpose.

In New Jersey, beach renourishment often occurs by pumping sand from offshore thereby creating an artificial fore-dune, then subsequent planting with American Beachgrass. Often these plantings are of a single species and in particular a single genotype, 'Cape' American Beachgrass. In 1970, the USDA Natural Resources Conservation Service released the 'Cape' variety of American Beachgrass specifically for these restoration projects. Since the 1970s, numerous restored dune systems were planted with this variety along the eastern United States and in New Jersey particularly, primarily in clonally propagated monoculture. In these restoration projects the single genotype planting of the 'Cape' variety assumes that this single genotype will perform better (e.g. ecosystem functioning; successional progression; resistance to disease, etc.) than a genetically diverse planting of Beachgrass and will result in the desired successional progression to healthy dune development. However, success has been mixed. For example, the town of Avalon, New Jersey conducted a beach renourishment project in the early 1990s and is now seeing a return of maritime forest, while a restoration effort in Atlantic City in 1997 has seen nearly 100% plant mortality in a 'Cape' variety planting.

The underlying principle we're addressing in this project is that a single genotype present in a population cannot function in wide range of microhabitats, and cannot adapt to changing climatic and other environmental pressures. Therefore genetic monocultures are less likely to persist through time than would a genetically diverse population. We will assess this by comparing the 'Cape' genotype to five New Jersey American Beachgrass ecotypes under commonly encountered abiotic stress conditions in a greenhouse setting. We hope to highlight the potential importance of genetic diversity in *A. breviligulata* populations since coastal dune systems are prone to disturbance and sensitive to climate change. Finally we will extend education and resource material to the community to allow for a more complete understanding and appreciation of coastal dune communities.

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