

19th Annual State of the Shore Report

Thursday, May 27, 2021
McLoone's Supper Club
Asbury Park

New Jersey beachgoers always look forward to another summer of fun on our Jersey Shore. After a year of COVID-19 restrictions, they are more excited than ever. With beachgoers facing fewer requirements for mask wearing and social distancing, there is great anticipation for excellent conditions for sunbathing, surfing, sand castle building, relaxation and more.

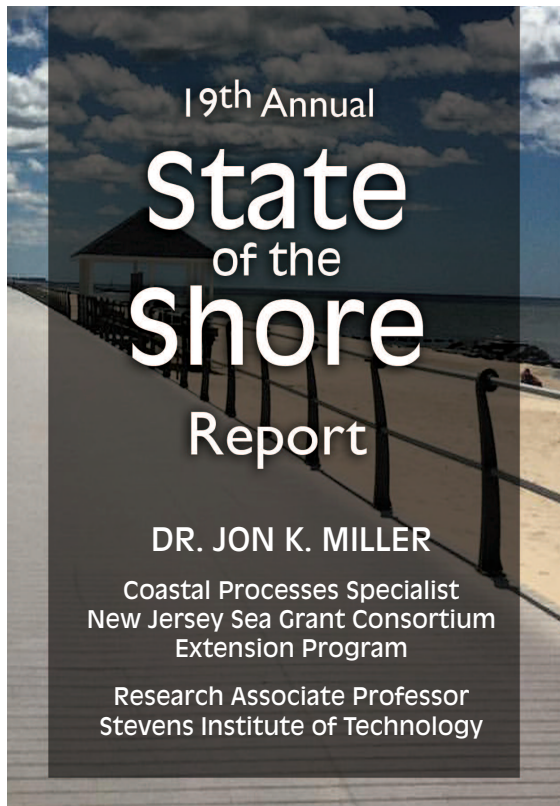
According to New Jersey Sea Grant Consortium (NJSGC) Coastal Processes Specialist Dr. Jon Miller of Stevens Institute of Technology, the Garden State's coastline is ready for just that. In his report, he gives up-to-date information on the events that affected the beaches during the year and what we can look forward to this summer.

For the last 18 years, except for 2020, we've conducted the State of the Shore Media Event at a coastal location. Over the past several years, media representatives throughout the region have gathered with local experts at Tim McLoone's Supper Club, located on the iconic Asbury Park boardwalk, to receive accurate, science-based information on current beach conditions and concerns, and outlooks for the Jersey Shore's upcoming summer tourism season.

NJSGC's mission will always be to promote the wise use of New Jersey's marine and coastal resources through research, education and extension. This year the Rip Current Awareness and the BEachSAFEly projects are of primary importance.

NJSGC proudly presents Dr. Miller's official "State of the Shore" Report.





If the Summer of 2020 proved anything, it was the value of New Jersey's beaches as a vital recreational resource for the state's residents. While the economic value of beaches has been quantified previously, the pandemic highlighted the importance of beaches to our social well-being. With so many activities prohibited due to social distancing requirements, spending time visiting New Jersey's beaches emerged as vital social outlet, which provided immeasurable emotional and psychological benefits. Although there are many hurdles that remain before life gets back to "normal," the outlook for Summer 2021 is decidedly more positive. Thanks in large part to a relatively mild winter, and proactive efforts by federal, state and local governments, New Jersey's beaches remain in good shape, and will be ready to welcome visitors for the unofficial start of summer at the Jersey Shore.

The State of the Shore Report provides a review of the winter storm season in terms of coastal flooding and erosion, and an update on the condition of New Jersey's beaches heading into Memorial Day Weekend. Tide gauge data collected in Atlantic City (<https://tidesand-currents.noaa.gov/>) and wave data collected at four locations off the New Jersey Coast (<https://www.ndbc.noaa.gov/>), confirm that the Winter of 2020-21 was one with only a few notable storms. With the exception of the February Nor'easter (dubbed Winter Storm Orlena by the Weather Channel) the majority of these storms had a relatively minor impact on New Jersey's beaches. Although Orlena caused several pockets of significant erosion, no significant structural damage was reported, and the majority of the eroded sand remains in the nearshore system. Although most of New Jersey's beaches remain in better condition today than they were prior to Superstorm Sandy, Orlena illustrated the importance of remaining committed to maintaining our beach and dune systems, as they provide both critical habitat and protection to the communities behind them.

Coastal Storms

Coastal storms can generate a variety of impacts with consequences ranging from severe (loss of structures during Sandy) to minor (nuisance flooding). Two of the more typical impacts commonly associated with coastal storms are flooding and beach erosion. Coastal flooding is caused by a combination of precipitation and storm surge. Storm surge is the extra water that piles up along the coast due to either local or distant storms. A key factor in determining the amount of flooding that occurs during a storm is its timing with respect to the tides. Small storms that occur during periods of higher tides can generate more flooding than larger storms that occur during periods of lower tides. While much of the focus is often placed on the elevation of floodwaters, impacts are often also strongly related to flood duration, which can prevent inland areas from draining. Sea level rise makes both problems worse, increasing the height of floodwaters and extending the duration of flood events.



DR. JON K. MILLER

In coastal communities, beach erosion is often also a major concern due to the protection the beach provides during the winter, and the revenue it generates through tourism in the summer. Beach erosion is related to the total water level along the coast (storm surge + tides) as well as the energy of the waves and the duration of the storm. The total water level influences what portion of the beach is impacted during a storm, while the size of waves determines the erosion potential. Although often overlooked, storm duration is important, because it determines how much of a storm's erosion potential is realized. According to a storm erosion index recently developed at Stevens, erosion potential in New Jersey peaks in October, with southern beaches being slightly more vulnerable than those in the northern part of the state.

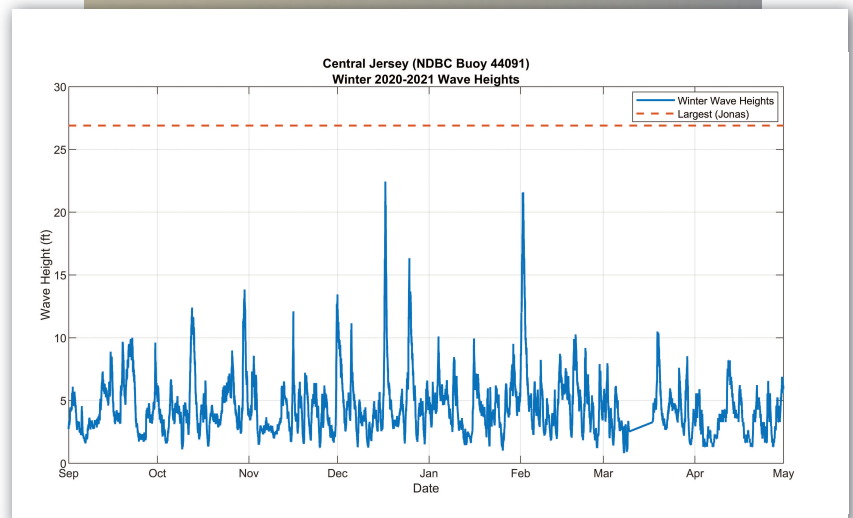
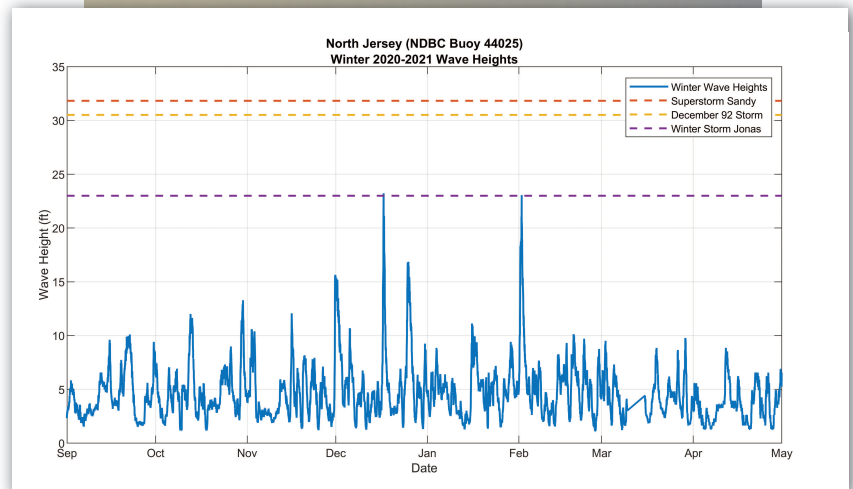
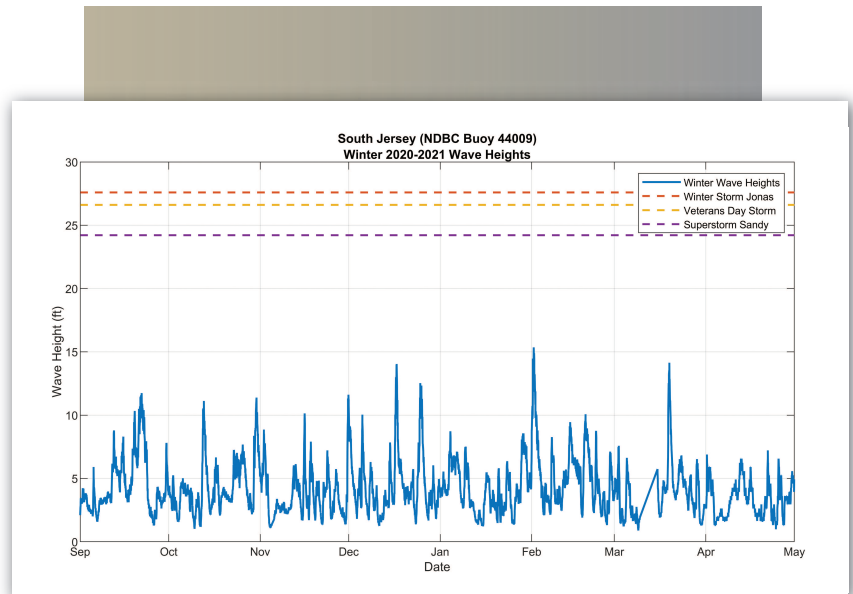
The majority of the coastal flood events this past winter failed to reach the moderate flood level (7 ft above Mean Lower Low Water) defined by the National Weather Service for Atlantic City. This is not to say the state escaped without any impacts, as eight separate events exceeded the minor flooding threshold (6 ft above Mean Lower Low Water). In total, water levels exceeded the minor flooding threshold for 62 hours this past winter and the moderate flooding threshold for five hours. Flooding events occurred regularly between September and early February, with at least one minor flood occurring each month. Since early February however, not a single event has reached the minor flood threshold. A somewhat concerning pattern is that many of the minor flood events occurred when the storm surge was less than two feet. This indicates that relatively minor storms are having a proportionally greater impact due to factors such as sea level rise.

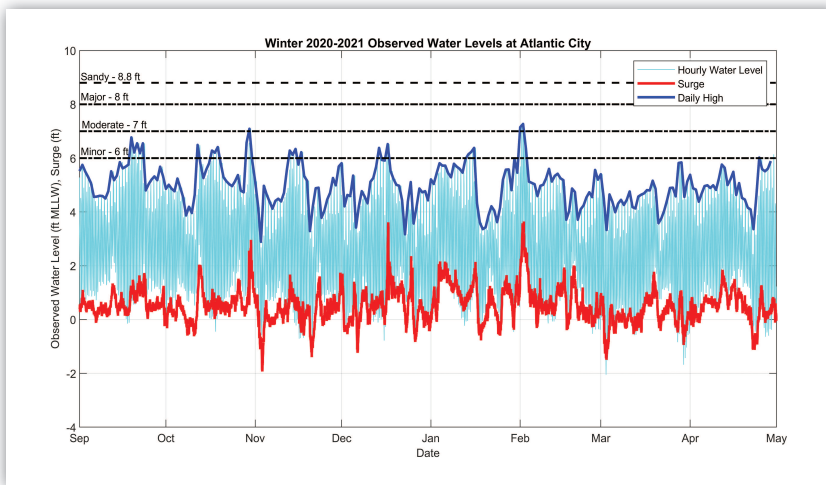
Although our analysis officially covers the period from September through April, a "pre-season" storm that deserves mention is Tropical Storm Isaias. Isaias formed off the coast of Africa in late July, became a hurricane in early August, and eventually made landfall along the Outer Banks on August 4th. Although New Jersey was affected by tropical storm force winds as Isaias moved up the coast, the storm's inland track limited the flooding and erosion associated with the storm. Had the storm tracked 100

miles to the east as suggested early on by several of the weather models, the impact along the coast could have been significantly greater.

After dodging the threat from Isaias in early August, the month of September was fairly quiet. The remnants of several tropical systems passing offshore generated some modest wave activity and pushed water levels past the minor flood threshold for several days during the mid-September spring tide. October saw two storms of note. A storm on the 12th associated with the remnants of Hurricane Delta generated a storm surge in excess of two feet. This storm was followed by a storm on the 29th associated with the remnants of Tropical Storm Zeta, which generated a nearly 3 ft surge. Wave heights were larger off the northern New Jersey coast during both events, maxing out at 13.8 ft off Barnegat Light (NDBC Buoy 44091) during the latter event. Both events were short-lived limiting the amount of beach erosion during the storms. November was extremely quiet, with only one notable flood event, associated with a relatively minor storm coinciding with spring tide. The relative calm was shattered by a major winter storm in mid-December. Winds in excess of 40 mph along the coast generated significant storm surge and large waves. At Atlantic City, the surge topped 3.6 ft. Fortunately, the surge peaked during the lower of the two daily high tides, when water levels were over foot lower than the preceding and subsequent highs. Wave heights in excess of 22 and 23 ft were measured off the coasts, of Barnegat Light (NDBC Buoy 4091) and Sandy Hook (NDBC Buoy 44025), respectively.

The start of the year provided a bit of a respite, with only minimal storm activity. Wave heights remained less than 10 feet through most of January, with only one brief period of minor coastal flooding during the mid-month spring tide. February started with a bang, and a Nor'easter that brought up to 30 in of snow to parts of the state. The storm, which became known as Winter Storm Orlena, began as an extratropical cyclone off the West Coast of the United States and brought heavy rains, strong winds and snowfall to a wide swath of the Midwest before impacting our region. On February 1st, the system developed into a Nor'easter off the Northeastern U.S., creating blizzard-like conditions and dumping up to 30 in of snow in areas of interior New Jersey. The strong winds associated with the storm generated a storm surge in excess of 3.5 ft at Atlantic City, which when combined with the astronomical tides, generated a water level of 7.27 ft above Mean lower Low Water. Fortunately, the storm moved away relatively quickly and the water levels receded as rapidly as they arrived. Wave heights during the storm ranged from a low of 15.3 ft off the southern NJ coast (NOAA buoy 44009) to a high of 23.1 ft off the northern NJ coast (NOAA buoy 44025). The combination of elevated water levels and large waves resulted in a significant amount of beach erosion throughout the state. Although less than a 10-yr storm by most metrics, the storm generated enough energy to move remarkable amounts of sand





More specific to New Jersey, the probability of one or more hurricanes affecting the state (defined as coming within 50 miles) is 11%, according to data compiled by Colorado State University. This is higher than the historical average of 7% due to the reasons described above. Due to its more northern location, Monmouth County has the lowest probability of being impacted at 6%, while the other coastal counties have a roughly 10% chance. Last year, Tropical Storm Isaias caused significant damage throughout the state, despite losing hurricane status prior to reaching New Jersey. These types of non-hurricane named storms are much more common, and unfortunately, the forecasted chance of New Jersey being affected by a storm of this type is 34%. When storms are approaching, residents are reminded to heed the warnings of state and local officials. Information on hurricane preparedness can be found on

the NJ Office of Emergency Management website at <http://www.ready.nj.gov/plan-prepare/hurricanes.shtml>.

Current Conditions

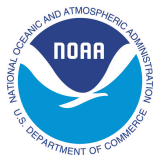
Overall, New Jersey's beaches are in good condition heading into the summer; however early in the season some beaches may appear narrow due to the prevalence of offshore sandbars generated during the February Nor'easter. Fortunately, the combination of several back-to-back, mild winters and New Jersey's robust beach nourishment program prepared the state's beaches to withstand such a glancing blow. As the beaches begin to build back through the spring and early summer, and the sandbars move around, beach goers are urged to use extra caution when swimming due to the potential presence of rip currents. A full listing of rip current safety tips can be found on the New Jersey Sea Grant website at <http://njseagrant.org/extension/coastal-concerns/ripcurrentawareness/>. Beach goers are also reminded that although we have turned a corner in our response to the pandemic, it is important to "BEACH SAFELY" and follow all state and local guidelines while enjoying the beach this summer. New Jersey Sea Grant will once again be collaborating with New York Sea Grant to distribute important safety tips via its website <http://njseagrant.org/beach-safely-campaign-njsgc-rapid-response-covid-19/> and social media feeds (Twitter - @NJSeaGrant; Instagram - @njseagrantconsortium).

from the dry beach to offshore portions of the beach profile. This erosion left many communities vulnerable; however, fortunately, the remainder of the spring was extraordinarily calm. Since the first week of February, the Atlantic City tide gauge has failed to record a single flood event, and only one of the offshore wave gauges recorded a storm with wave heights above 11 ft. As a result, only minimal erosion was reported after Orlena, and in many locations, sandbars began to move back on shore as early as mid-March.

Tropical Outlook

The most recent tropical forecasts from groups including NOAA, The Weather Channel, Colorado State University, the University of Arizona, and North Carolina State University are calling for an active 2021 hurricane season due to the unlikelihood of El Niño conditions developing in the Pacific and warmer than average sea surface temperatures in the subtropical Atlantic. Warmer sea surface temperatures provide the fuel for hurricanes, while the lack of El Niño conditions reduces the potential for vertical wind shear, which disrupts hurricane formation. Although details of the forecasts vary, most are calling for between 15 and 18 named tropical storms, with roughly half of those developing into hurricanes. The good news is that in spite of this increased storm activity, most of the forecasts are only calling for an average number (between 3 and 4) of major hurricanes (Category 3 or higher).

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Photo - Heather Edmonds - "Walking in the Clouds" Spring Lake