impact on New Jersey's beaches would have been minor; however, since the storms occurred in rapid succession, the beaches were unable to recover between storms, resulting in a cumulative impact that was much worse than might have been expected. Fortunately, most New Jersey beaches were in relatively good condition prior to the storms which mitigated most of the impacts on upland infrastructure.

Storm Erosion Index

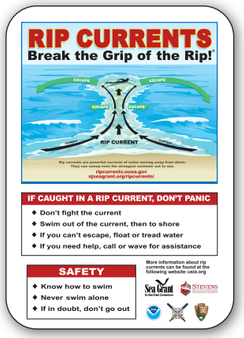
To assess the intensity of storms in terms of their potential to cause beach erosion, Stevens Institute of Technology has developed a Storm Erosion Index (SEI). The SEI combines wave height, water level, and storm duration in a physically meaningful way to estimate a storm's intensity and erosion potential. It is hoped that the SEI will become a valuable resource for the State and its coastal communities for raising awareness of coastal storms, particularly nor'easters, which often are overlooked. Based on SEI, the most intense storm of the 2017-2018 season was the March 21, 2018 Nor'easter. When compared to a 34-year New Jersey climatology (1980-2013) developed by Stevens Institute of Technology with funding from New Jersey Sea Grant, the storm ranks 27th in terms of erosion potential with a return period on the order of one year. This is consistent with observations provided above as to the severity of the individual storms that made up the March 2018 "Four'easter." However, if the SEIs for the four storms are combined, the March 2018 "Four'easter" rises to the 5th highest ranked storm in the record, with a return period of between 5 and 10 years. Although, this isn't a true representation of the combined effects as some recovery is expected between the storms, this provides a general impression of the series of storms, and is roughly consistent with the type of erosion that was observed.

Tropical Outlook

The latest forecast from Colorado State University's Tropical Meteorology Project calls for a slightly above-average Atlantic-basin hurricane season due to current weakening La Nina conditions in the Pacific, and anomalously warm sea-surface temperatures in the tropical western Atlantic, and anomalously cool sea-surface temperatures in the tropical eastern Atlantic. The result is a seasonal forecast which is up slightly from last year, and near the long-term average with a projected 14 named storms, 7 hurricanes, and 3 major hurricanes. The long-term averages are for 12 named storms, 6.5 hurricanes, and 2 major hurricanes. The probability of a major hurricane making landfall along the U.S. coastline is 63% which is slightly above the long-term average of 52%. Closer to home, the probability of a major hurricane making landfall in New Jersey remains low at less than 2%. There is, however, a 25% chance that a storm will bring tropical storm force wind gusts to the Jersey shore. In spite of the relatively low probabilities, one does not need to look back any further than last year with Hurricanes Harvey, Irma, and Maria, to be reminded of the potentially devastating impacts of relatively low probability, but high consequence events. The public is urged to keep those storms, as well as Superstorm Sandy, in mind, and to be prepared to 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, but then recover in the spring and summer as the bars migrate onshore. Based on the characteristics of the storms during the 2017-18 season, it is likely that most New Jersey beaches will recover the majority of their beach width by the middle of the summer. Beach goers are urged to use caution when entering the water early in the season as the presence of sand bars increases the likelihood of rip currents, and most lifeguard crews are not fully staffed until mid-to-late June. The rip current risk is especially high near any gaps in the sandbars and adjacent to any coastal structures. More information on rip currents and rip current safety is available at: http://njseagrant.org/extension/coastal-concerns/rip-current-awareness/.



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Cover photo - Larry Greenberg

Welcome to the New Jersey Sea Grant Consortium's

16th Annual

State of the Shore

Media Event

May 24, 2018 Asbury Park, NJ

Hello, sunshine! What a welcoming sight after a rather turbulent winter in New Jersey, marked by sub-zero wind chills and several fierce Nor'easters. Thankfully, most coastal communities were able to absorb any potentially severe impacts due to the Garden State's current efforts in proactive beach restoration and replenishment. The sandy shores and swelling surf are finally calling, so let's get ready for another bustling summer season in Jersey!

The infamously-dubbed "Four'easter" which occurred in March brought nonstop bouts of rain, snow, wind, flooding, and erosion to New Jersey's already hard-hit coastline. The beaches had little time to recover between such reoccurring storms, but since conditions were relatively good to begin with, infrastructure damages were limited. Combined, the "Four'easter" is considered the fifth highest-ranked storm in New Jersey's 34-year climatology record, based on Stevens Institute of Technology's newly-developed Storm Erosion Index (SEI).

The 16th annual State of the Shore report will help explain and analyze such ongoing issues. A collaboration of scientists and environmental managers, this report is used by media and tourism representatives throughout New Jersey to illustrate the ever-changing conditions of our shoreline.

This year's report focuses on coastal flooding and wave height activity, both which remained relatively mild throughout the blustering winter months. In preparation of the coming season, we'll also examine the tropical outlook for 2018.

Meanwhile, beachgoers are urged to use caution during the Jersey Shore's natural rebuilding period actively happening until late-summer. As the presence of sandbars increase, the potential for dangerous rip currents also rises. Eight rip current-related fatalities occurred in 2017, and it remains New Jersey Sea Grant's mission to raise awareness around such deadly ocean hazards. Included in this year's press kit, please find more information on ways we are working with coastal specialists and extension agents to encourage and promote beach safety. Always remember, "When in doubt, don't go out!"

Get ready for even more exciting things to come, and have a wonderful summer!

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State of the Shore Report

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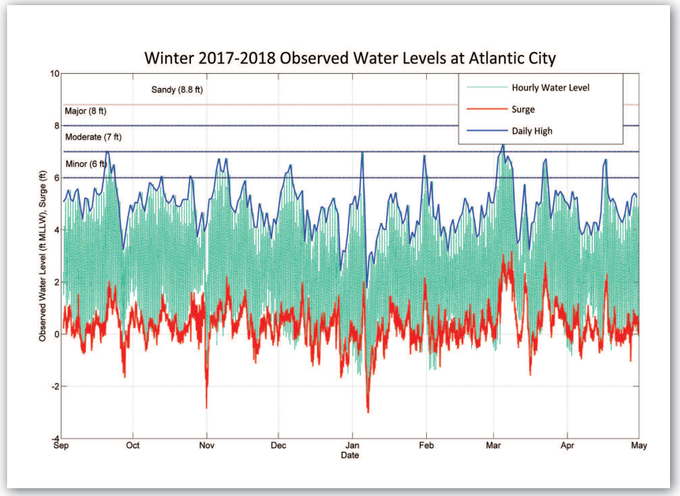
New Jersey's beaches have benefited from a relatively calm winter for a second straight year. After dodging early season threats from tropical cyclones Jose, Irma, and Maria, mild to moderate conditions persisted over the majority of the winter. Just six years removed from the devastation of Superstorm Sandy and two years after winter storm Jonas battered Cape May and Atlantic counties, New Jersey beaches benefited from the respite, and were in good shape throughout most of the winter. The most impactful storm of the season was actually a series of relatively small March Nor'easters that collectively have been referred to as the March 2018 "Four'easter." While each storm generated some localized coastal flooding and beach erosion, cumulatively, they had an impact on New Jersey's beaches similar to what would be expected during a much larger storm. Fortunately, the mild winter up until that point, combined with New Jersey's proactive beach restoration efforts, left most communities ready to absorb the impact. Currently, sand bars generated during the March coastal storms are in the process of working their way back on shore, which bodes well for the coming summer season.

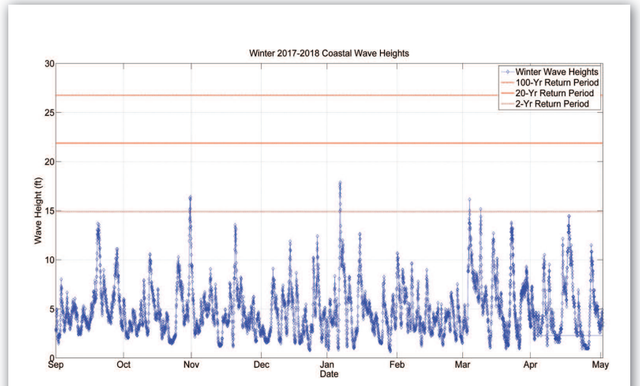
Coastal Flooding

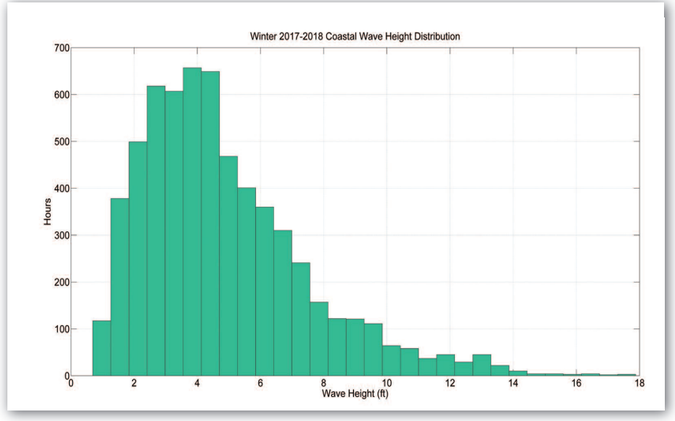
Generally speaking, most coastal areas only experienced minor coastal flooding this past winter both in terms of magnitude and frequency. Water levels at the Atlantic City tide gauge (shown at right) only exceeded the minor flood threshold (> 6 feet above mean lower low water - MLLW) a total of eight times all winter, with only one of those events exceeding the moderate flood threshold (>7 feet above MLLW). The first minor flood event of the season occurred in mid-September and was associated with the passage of Tropical Storm Jose offshore. The storm generated a storm surge in excess of 2 feet, and elevated water levels over a period of several days. October was relatively calm, but November and December both started off with minor flooding events. In both cases, the flooding was caused by smaller storms occurring coincident with spring tides when coastal water levels naturally reach their highest. The early December event was more problematic due to the fact that the elevated water levels persisted over several days. January began and ended in a similar fashion, with a series of small storms generating minor coastal flooding. The event at the beginning of the month was more significant in terms of peak water level, as it only fell 1/10th of an inch short of reaching the moderate flood threshold. The storm at the end of the month, on the other hand, persisted over multiple high tides, but the maximum water level was about 11 inches lower. In March, a series of storms impacted the coast (see the separate discussion below), the first of which generated the highest water level of the season, 7.21 feet above MLLW. This was the only storm of the season that generated water levels in excess of the moderate flood threshold. A series of smaller, but still impactful storms followed, causing the average water level during March to be nearly 1 foot higher than the previous month. After an extremely active March, things settled down in April, with only one additional storm exceeding the minor flood threshold.



Coastal Wave Heights

For the most part, New Jersey experienced a relatively mild winter in terms of wave activity. The National Oceanic and Atmospheric Administration buoy (44025) located 43 miles off the coast of Long Branch only recorded four wave events that exceeded the 2-year return period (i.e. an event having a 50% chance of occurring in any given year), and no events that even approached the 10-year threshold. The first significant wave event of the season occurred in late October, and was associated partially with the remnants of Tropical Storm Phillipe. Wave heights topped out at just over 16 feet as the storm skirted the New Jersey coast and pounded the northern New England coast. It wasn't until early January that waves once again exceeded the 15 foot threshold. During a "bomb cyclone" event in January that is more likely to be remembered for the foot of snow it dumped on many coastal communities, waves in excess of 17 feet were measured. This represents the largest wave of the season, but 17 feet is relatively modest compared to previous winters during which waves in excess of 20 feet have been relatively common. March and April were notable, not so much for the extreme waves that were recorded off the coast, but more for the persistence of larger than average waves. During that period the largest wave was measured in early March at just over 16 feet, but there were 7-10 storm events that resulted in waves in excess of 10 feet. For comparison, prior to March, only 11 storms generated waves in excess of 10 feet.





March 2018 "Four'easter"

The most significant coastal storm of the season was actually a series of winter storms which occurred in March, leading some to refer to the storms collectively as the March 2018 "Four'easter." Beginning on the weekend of March 3rd, a series of four Nor'easter's impacted the state, bringing rain, snow, wind, coastal flooding, and beach erosion. Fortunately, due to the path and speed of the storms, New Jersey's beaches were actually spared the worst of the storms' fury. New England, on the other hand, felt the brunt of the storms' force, as significant damage was reported due to flooding, wave overtopping, beach erosion, and direct wave impact. As discussed above, two of the four Nor'easters generated significant flooding along the New Jersey coast. The first storm in the sequence generated the highest water level of the season at Atlantic City, at 7.21 feet above MLLW. This was the only event of the season to exceed the moderate flood threshold. The first and second storms actually combined resulting in a storm surge (excess water due to the storm itself) that remained above 2 feet for the better part of 5 days. In some particularly low-lying coastal areas, this extended period of surge prevented water from draining back into the bay and ocean. In terms of wave impacts, each of the four storms generated waves in excess of 10 feet, resulting in localized coastal erosion. Had each of the storms occurred in isolation, the overall