22nd Annual

State of the Shore

Media Event

Asbury Park

May 23, 2024

SAMANTHA KREISLER
NJSGC
Communications Specialist

Get your beach towels and flip flops ready because summer is almost here! After this winter of rain and snow, New Jersey's residents and visitors are ready for the summer weather and sunshine. The locals and tourists aren't the only ones ready; most of our sandy shores are too!

Coastal flooding, erosion, and wave activity varied from location to location. The northern part of the state experienced higher peak water levels, while the southern part of the state experienced more flooding events. During a January storm, water levels at Sandy Hook measured some of the highest water levels since Superstorm Sandy. However, the storm this past April that dumped several inches of rain and downed trees throughout the state was the most intense storm that impacted Sandy Hook. While some beaches remained largely intact during this winter, others had erosion that may require some sort of remediation. These small or moderate storms that cause this are expected to become more and more common.

While many beaches suffered little to no erosion, some beaches in the south need replenishment to repair some of the berm erosion suffered by the mild-moderate storms this winter. Beachgoers should be aware of large sand bars this winter produced along the shore that can lead to dangerous rip currents. As the memories of Sandy begin to fade, this winter should serve as a reminder of the damage that can be caused by more common storms and the need to continue to maintain our beaches through programs such as the Shore Protection Fund.

The forecast for this summer is predicted to be very eventful. This summer's La Niña conditions are expected to result in more extreme weather. The four independent institutions have reached very similar models of above average number of storms. Despite relatively low probabilities of hurricanes making landfall in general, it's important to remember that it only takes a single storm to create catastrophic impacts.

As always, New Jersey Sea Grant Consortium is excited to provide year's State of the Shore Report to give the public insight of the condition of New Jersey's beaches. Just remember to be safe: wear your sunscreen, remain cognizant of your surroundings, check conditions, be aware of rip currents, and guard your fries from hungry seagulls. Have a great summer!

Sea Grant
NEW JERSEY
SEA GRANT CONSORTIUM

NOAA

STEVENS
INSTITUTE OF TECHNOLOGY
1870

State of the Shore Report

Dr. Jon K. Miller
Coastal Processes Specialist
New Jersey
Sea Grant Consortium
Research Associate Professor
Stevens Institute of Technology

and

Emma McCann
Stevens Institute of Technology

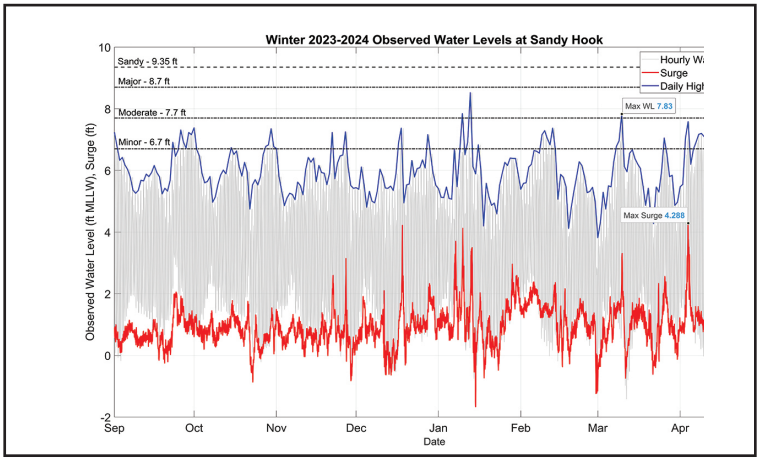
The state of New Jersey's beaches heading into the Memorial Day weekend varies from location to location. While there are very few communities where the beaches are in poor condition, a series of storms this past winter caused widespread erosion. Fortunately, most beaches were in fairly good condition heading into the winter and damage to communities and inland infrastructure was limited. In many locations the sand removed from the berm/dune over the winter remains in the system and will likely work its way back onshore over the summer. As the memories of Sandy begin to fade, this past winter served as a reminder of the damage that can be caused by more common storms and the need to continue to maintain our beaches through programs such as the Shore Protection Fund.

DR. JON K. MILLER

Coastal Flooding

In terms of coastal flooding, the northern part of the state experienced higher peak water levels this past winter; however, the southern part of the state experienced more flooding events overall and spent more total hours above the "minor" flood stage defined by the National Weather Service. The NOAA tide gauge at Sandy Hook measured water levels above the "moderate" flood threshold three times this past winter (Figure 1). The highest water level was recorded on January 13th and came on the heels of a storm from just a few days earlier that had already pushed water levels above the moderate flood threshold. Both storms brought significant rain and strong winds to the New Jersey coast. The combination of a nearly 4 ft storm surge occurring on top of a spring tide on the 13th resulted in a total measured water level of 8.55 ft above Mean Lower Low Water (MLLW). This was one of the highest water levels measured at Sandy Hook since Superstorm Sandy. Neither storm was the most intense of the winter, however. The highest storm surge which is a more true measure of storm intensity was recorded at Sandy Hook on April 4th. The storm surge was one of the byproducts of an intense storm system that dumped several inches of rain and downed trees throughout New Jersey. Fortunately, the peak surge during that event occurred coinciding with both a low tide and a neap tide when the water levels are normally suppressed. Had the peak surge occurred instead, during a high tide and a spring tide, the total water level would have easily surpassed the major flood threshold. In addition to these events, there were 14 other instances where the measured water level exceeded the minor flood threshold at Sandy Hook for an overall total of 98 hours.

The NOAA tide gauge at Atlantic City only measured water levels slightly above the moderate flood threshold twice this past winter (Figure 2). A maximum water level of 7.14 ft MLLW was recorded early in the season on September 26th as the remnants of Tropical Storm Ophelia moved up the coast. In addition to the coastal flooding, the storm dumped 10 in of rain in some areas of New Jersey. The extreme water level was the byproduct of a 2 ft storm surge coinciding with the evening high tide on the 26th. Just three days earlier an above average storm surge was recorded; however, that surge occurred during low tide, diminishing its impact. The largest storm surge of the season

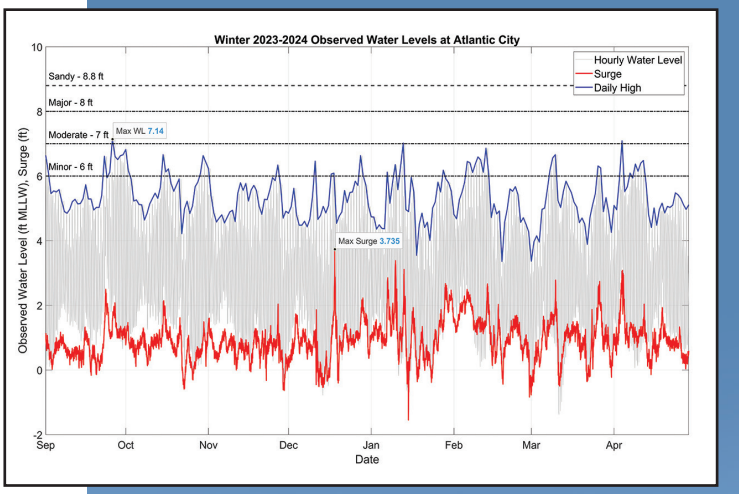


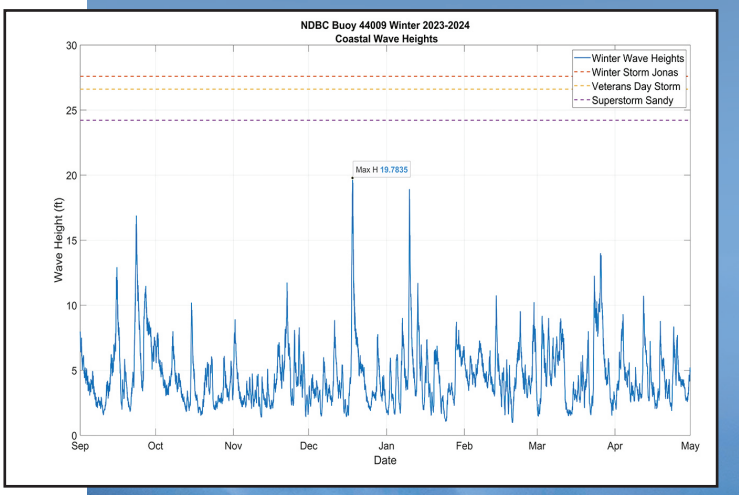
(3.7 ft) measured at Atlantic City occurred on December 18th. The large storm surge was just one of the impacts of what the state climatologist referred to as the strongest and most impactful storm of 2023. Strong pressure gradients associated with the storm generated winds of over 40 mph along the coast and several locations reported breaking waves in excess of 10 ft. Fortunately, the surge again coincided with a lower phase of the tide, reducing the potential flooding impacts. In addition to these events, there were 16 other instances totaling 115 hours where the measured water levels exceeded the minor flood threshold at Atlantic City.

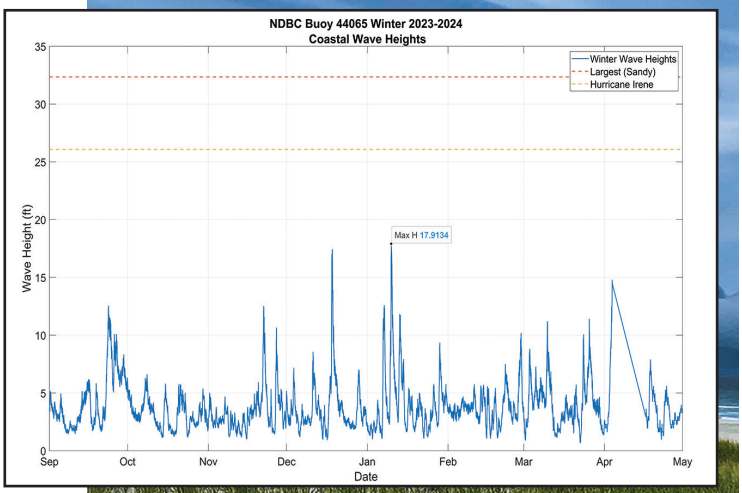
It is interesting to note that the maximum water level and maximum storm surge measured by the two tide gauges were associated with four different storms. While each storm did impact both locations, local factors contributed to the overall intensity and impact of the storms. Most notably, during fast moving storms, coastal flooding is extremely sensitive to the timing of the storm with respect to the local tides. The majority of both the minor and moderate flooding events are associated with storms that occur during spring tides when coastal water levels are elevated and when the peak surge coincides with high tide.

Coastal Erosion

While coastal erosion is more common during periods of coastal flooding, there are additional factors that determine the amount of erosion that occurs during a storm. The three factors that are typically associated with erosion are elevated water levels (flooding), elevated wave heights, and storm duration. Elevated water levels provide the platform on which waves capable of chewing up the beach ride, while the storm duration regulates how much time the waves spend attacking the beach. The impacts of coastal erosion can range from small and temporary to dramatic and long lasting. This past winter was more active than those of the recent past. Waves measured at NOAA buoy 44009 off the coast of Cape May are shown in Figure 3. Three storms generated waves in excess of 15 ft with the largest generating a 19.8 ft wave on December 18th. This occurred during the same storm that generated the largest storm surge of the season at Atlantic City. In many locations, the large waves resulted in significant erosion; however, in most cases the erosion was limited to the berm (flat portion of the beach) due to the lower overall water levels. Berm erosion is generally considered temporary, while dune erosion has longer lasting effects. In January a second storm event occurred during which the waves peaked at 18.9 ft. This time the event coincided with higher water levels. As a result of the higher water levels and previously compromised beach, more widespread berm and dune erosion was reported. In addition to these two storms, eleven other storms generated waves in excess of 10 ft off the coast of Cape May. For comparison, last year only eight storms surpassed the 10 ft threshold.







Waves measured at NOAA buoy 44065 off the coast of Long Branch are shown in Figure 4. Oftentimes the wave climate along the northern New Jersey coast differs from that off the southern coast due to the sheltering effect of Long Island. The presence of Long Island often reduces some of the largest waves associated with Nor'easters. Over the past winter, two storms generated waves over 15 ft along the northern New Jersey coast. The largest was measured at 17.9 ft on January 13th and was associated with the storm that also generated the highest measured water level at Sandy Hook. The combination of the elevated water level and the fact that many beaches had been weakened by the second largest storm of the winter in mid-December, contributed to widespread reports of berm and dune erosion. Unfortunately, these were not the only two impactful events as an additional nine storms generated waves in excess of 10 ft

While this past winter saw several storms capable of generating beach/dune erosion, it's important to keep in mind that these types types of storms can generally be classified as small-moderate, with estimated return periods of 2 to 5 years. In other words, these types of nuisance erosion events are fairly common and should be expected more frequently in the future.

Tropical Outlook

This summer is projected to be an extremely active hurricane season, with leading models from Colorado State University, the University of Arizona, Accuweather, and The Weather Company all predicting an above average number of storms. Accuweather has even referred to the season as "explosive". The two primary factors influencing this forecast are developing La Nina conditions in the Pacific and record warm sea surface temperatures in the eastern and central Atlantic. Both are conducive to the formation and intensification of hurricanes. The Colorado State University forecast is currently calling for 23 named storms, 11 hurricanes, and 5 major hurricanes, far exceeding the historical averages of 14.4 named storms, 7.2 hurricanes, and 3.2 major hurricanes. Closer to home, Colorado State University estimates the probability of a hurricane making impact (defined as one or more storms passing within 50 miles of a location) in New Jersey at 11%, and the probability of a major hurricane making impact at 1%. In spite of these relatively low probabilities, New Jersey residents are urged to remember that it only takes a single storm to create catastrophic impacts. Hurricane Ida is the most recent example. Although originally a major hurricane, Ida weakened to a tropical depression by the time it reached New Jersey, yet the storm still caused tens of billions of dollars of damage and tragically several deaths. New Jersey residents are urged 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.ready.nj.gov/plan-prepare/hurricanes.shtml.

	Named Storms	Hurricanes	Major Hurricanes
Colorado State University	23	11	5
University of Arizona	21	11	5
The Weather Company	24	11	6
Accuweather	20-25	8-12	4-7
Historical Average	14.4	7.2	3.2

Comparison of early season hurricane forecasts.

Current Conditions

The current condition of New Jersey's beaches varies widely. While many beaches remain healthy and in great shape heading into the summer tourism season thanks in large part to the sustained commitment of local, state, and federal officials, some communities remain vulnerable. Just this past winter a series of moderate Nor'Easters resulted in significant damage to beaches in Atlantic City and North Wildwood. Both communities are currently waiting for federal beach replenishment projects. Unfortunately, "nuisance" erosion events like those experienced this past winter are likely to become more and more common as sea levels rises in the future. A recent study conducted by Stevens Coastal Engineering graduate student Audrey Fanning suggests that by 2050 the number of cumulative storm hours resulting in nuisance erosion will triple and that by 2100 the number of hours capable of producing minor dune erosion will increase by a factor of seven. These impacts suggest that maintaining funding and support for shore protection during the periods between large storm events will only become more critical in the future.

In the short term, many of New Jersey's beaches will be accessible and open for business beginning this weekend. Early season swimmers are urged to use caution as large sand bars generated over the winter are still present in many locations. These sand bars can lead to the formation of dangerous rip currents. Swimmers are urged to never swim alone and only swim when lifeguards are present.

New Jersey Sea Grant Consortium
22 Magruder Road Fort Hancock, NJ 07732
732-872-130 njseagrant.org

Sea Grant
NEW JERSEY
SEA GRANT CONSORTIUM

STEVENS
INSTITUTE OF TECHNOLOGY

NOAA

This publication is the result of work, research sponsored by the New Jersey Sea Grant Consortium (NJSGC) with funds from the National Oceanic and Atmospheric Administration (NOAA) Office of Sea Grant, U.S. Department of Commerce, under NOAA grant number NA18OAR4170087 and the NJSGC. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the NJSGC or the U.S. Department of Commerce. NJSG-24-1023

Cover Photo - Anthony Picone - Interrupted Beach Day