21st Annual

State of the Shore

Media Event

Asbury Park

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Spring is in the air and Summer is so close you can practically taste it. While It's obvious that the locals and tourists of New Jersey are ready for this summer, the question remains: Are our beaches? Well, according to our State of the Shore Report they most certainly are! Our beaches are in good condition after a few relatively mild winters in a row. Not to mention that New Jersey has taken steps to improve resilience, including developing a statewide coastal resilience strategy, creating buyout programs and elevation solutions, and embracing living shorelines and other natural infrastructure.

In terms of coastal flooding, erosion, and wave activity, this winter was relatively uneventful. However, two large storms made quite the splashes in our home state. Although no longer a Category 5 by the time it reached New Jersey, Hurricane Ian not only caused billions of dollars in damages, but also created some of the largest impacts of the season. During a Spring tide in December, water levels measured by the tide gauge at Sandy Hook reached their highest since Hurricane Sandy.

The summer forecast is a bit more complicated and comes with a high level of uncertainly based on developing El Niño conditions and unusually warm surface water in the Atlantic Basin, which can both increase the likelihood of formation and the intensity of hurricanes. We will have to wait and see how the Spring and Summer season progresses, so please remember to be safe and prepared when it comes to the coast.

From the top of Sandy Hook to the tip of Cape May Point, New Jersey's beaches are ready to welcome you to their shores. Have a great summer!

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State of the Shore Report

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Overall, most of New Jersey's beaches are in relatively good condition heading into the Summer 2023 season. A series of relatively mild winters in a row, in combination with efforts to protect New Jersey's beachfront communities after Superstorm Sandy, have contributed to these favorable conditions. In the decade since Sandy, New Jersey has taken several steps to improve the resilience of its coastal communities, including buying out damaged properties, elevating homes and businesses, embracing living shorelines and other natural infrastructure, and most importantly developing a statewide coastal resilience strategy. Beaches and dunes remain a critical element in that strategy, serving as the first line of defense against coastal storms. As the memories of Sandy begin to fade, it is important that the State continues to dedicate resources to programs like the Shore Protection Fund, which provides funding for these vital natural infrastructure projects.

Coastal Flooding

In terms of coastal flooding, this winter was relatively uneventful. As shown in Figure 1 on the opposite page, coastal water levels, as measured by the National Oceanic and Atmospheric Administration (NOAA), only reached the moderate flood threshold twice between September 1st and April 30th. The first instance was associated with the passage of the remnants of Hurricane Ian. Ian was a Category 5 hurricane that caused extensive damage in Florida as it passed over the Fort Meyers area. By the time the remnants of the storm reached the New Jersey coast, it had weakened substantially; however, it remained powerful enough to generate a storm surge in excess of 2.5 ft. Fortunately, the storm hit during a neap tide, when the natural tidal range is suppressed. This limited the total water level to 7.15 ft above the Mean Lower Low Water (MLLW). One of the more dramatic aspects of the storm was its duration. As the storm exited the area, it stalled over the Atlantic. The stalled storm kept the water levels above normal for several days and resulted in prolonged flooding and beach erosion (more below).

The most intense flooding of the winter occurred on December 23rd, as the measured water level topped out at 7.54 ft MLLW. This was associated with a pre-Christmas cold front that brought 60 mph winds, rain, thunder, and even hail to parts of the Garden State. Due to the storm's coincidence with a spring tide, the water levels measured by the tide gauge at Sandy Hook reached their highest levels since Superstorm Sandy (8.75 ft MLLW). Fortunately, the cold front pushed through quickly and water levels receded just as quickly as they rose.

In addition to these larger coastal flooding events, a series of smaller storms resulted in water levels that exceeded the NWS minor flood threshold. A total of nine storms generated minor flooding. Of these storms, nearly half were associated with storms with a surge of less than 2 ft. These are relatively small storms that happen to occur during periods of higher astronomical tides and are the type of events that are expected to become more common in the future as a consequence of sea level rise. The most notable of the remaining events was a mid-December storm which resulted in the largest observed storm surge of the season (3.5 ft). Fortunately, the event was short lived and occurred during a neap tide when water levels are naturally lower. For context, had the mid-December storm occurred later in December during the spring tide, the water level could have reached 8.7 ft which exceeds the major flood threshold and approaches the water levels observed during Superstorm Sandy.

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 the following: elevated water levels (flooding), elevated wave height, 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. Fortunately, this past winter was extremely mild in terms of offshore wave activity, limiting the amount of coastal erosion experienced by New Jersey's beaches. Wave heights measured off the southern and northern New Jersey coast by NOAA's National Data Buoy Center (NDBC) are shown in Figures 2 and 3, respectively. Although there is no specific wave height that defines a storm, 10 ft serves as a useful boundary between the more typical winter conditions and those associated with less frequent storm events. Buoy 44009 off the coast of Cape May recorded a total of 8 storms with maximum wave heights greater than 10 ft. At buoy 44025, located off the coast of Long Branch, 17 such storms were recorded.

At buoy 44009, the largest waves of the season were associated with the remnants of Hurricane Ian. Although the intensity of that storm was moderate at best, the duration of the storm exposed the southern New Jersey beaches to a prolonged period of erosion. For beaches that were in a weakened state prior to the storm, this prolonged period of moderate to low erosion still proved to be significant. This "death by a thousand cuts" for erosion was significant, although not unrecoverable for those locations. The second largest waves of the season (13.6 ft) at buoy 44009 were recorded during the pre-Christmas cold front that generated the highest water levels of the season. The coincidence of high-water levels and large waves was a recipe for disaster; however, the storm moved through so quickly that the erosional impacts were minimized.

Although Buoy 44025 had 17 incidents where the 10 ft wave height threshold was exceeded, 7 of these were associated with storms that either barely broke the threshold, or only remained above the threshold for a limited time (generally less than 5 hours). Along the north Jersey coast, the largest waves of the season were associated with the two December storms. The biggest waves (18.4 ft) were measured during the pre-Christmas cold front; however, the speed at which the cold front moved through limited the storm's erosional impact. The second largest waves measured off the north Jersey coast were associated with the mid-December storm that generated the largest storm surge of the season. The fact that the storm oc-

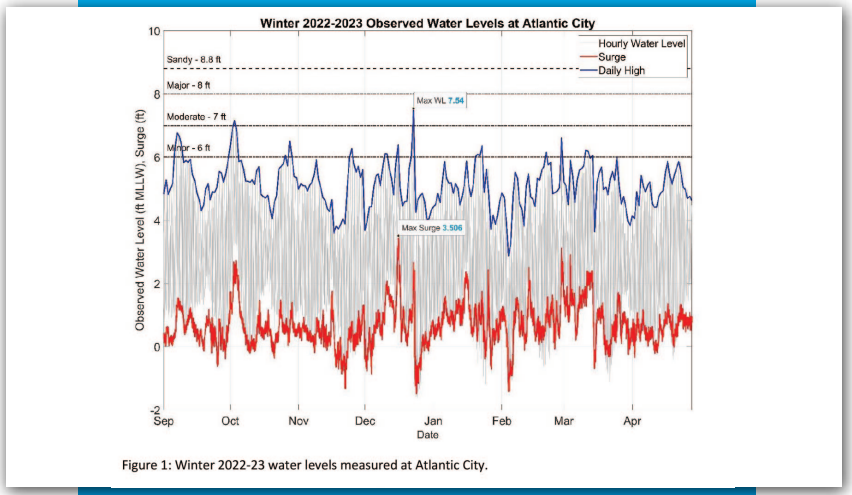

Figure 1: Winter 2022-23 water levels measured at Atlantic City.

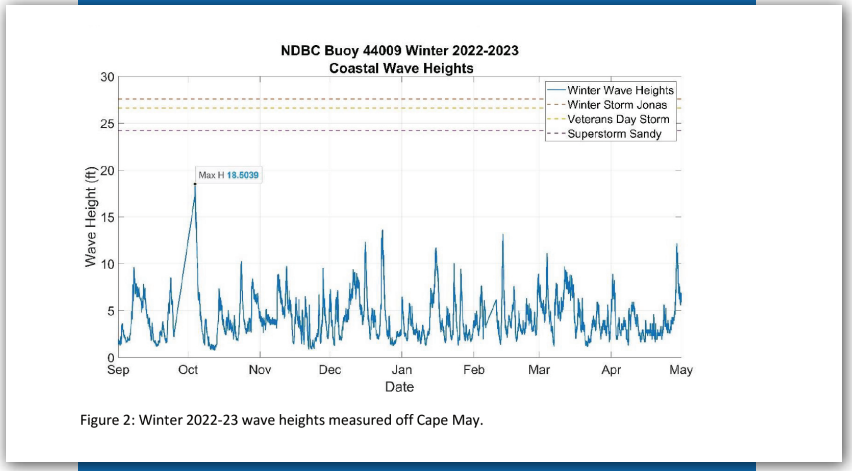

Figure 2: Winter 2022-23 wave heights measured off Cape May.

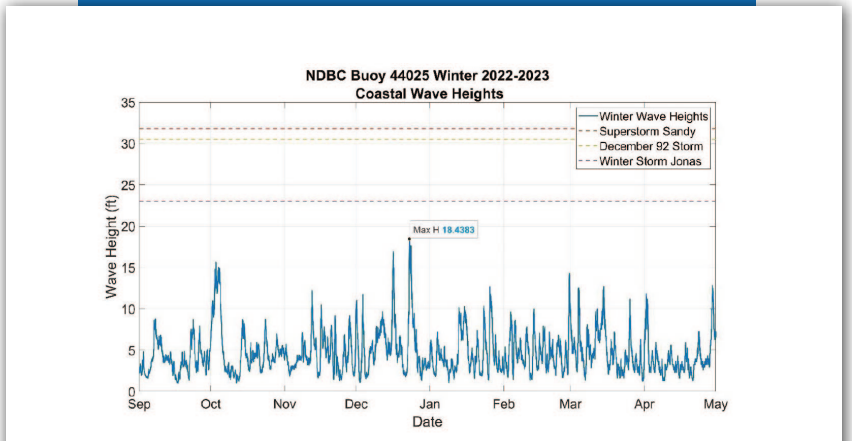

Figure 3: Winter 2022-23 wave heights measured off Long Branch.

surge of the season. The fact that the storm occurred during a period of extremely low astronomical tides limited the amount of dune erosion that occurred during the storm. Had the storm occurred during a period of higher tides, dunes up and down the New Jersey coast would have been directly impacted. The only other storm of note in north Jersey was the one associated with the remnants of Hurricane Ian. During that storm waves topped out at 15.6 ft and remained above the 10 ft threshold for several days. Although erosion in the northern part of the state was generally less dramatic than what was experienced in south Jersey, the remnants of Ian definitely left an imprint on many north Jersey beaches.

Tropical Outlook

This summer is projected to be a fairly typical hurricane season, as leading models from Colorado State University (slightly below), the University of Arizona (slightly above), Accuweather (slightly below), and The Weather Company (average) all predict a near average number of storms. This year the early season forecast is complicated by the fact that two of the primary factors affecting hurricane formation and intensification are producing conflicting information. In the Pacific basin, current forecasts are pointing towards the development of El Nino conditions, which reduces the likelihood of hurricane formation in the Atlantic.

In the Atlantic basin, however, the surface waters are currently warmer than normal which provides the energy to intensify storms. This increases both the likelihood of hurricane formation and the potential intensity of the storms. As we get deeper into the Spring/Summer season, if one of these factors becomes more pronounced, it could shift the forecast in one direction or the other. 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 7%, 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 10's 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.

Table 1: Comparison of early season hurricane forecasts

	NAMED STORMS	HURRICANES	MAJOR HURRICANES
Colorado State University	13	6	2
University of Arizona	N/A	9	5
The Weather Company	15	7	3
Accuweather	11-15	4-8	1
Historical Average	14	7	3

Current Conditions

Overall, New Jersey enters this summer season with many of its beaches in good shape. The past six winter storm seasons have been relatively mild. The combination of this beneficial weather pattern, along with federal, state, and local governments bolstering State beaches, have contributed to the good health of these beaches. Overall, the mild nature of these winter storms suggests that in many locations the erosion experienced over the winter is temporary. This erosion is part of a natural cycle whereby sand temporarily erodes from the beach and is stored offshore in sandbars that move back onshore over the Spring/Summer.

As the memories of Superstorm Sandy begin to fade, it is important that New Jersey continues to build on the progress made over the past decade in becoming more resilient. As we move towards an uncertain future impacted by climate change, it is certain that natural landscape features including beaches and dunes, maritime forests, and coastal wetlands will all continue to play a critical role in achieving balance and resilience within the natural/built system.

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Photo - The Sun Between the Dune Grass - Richard Pasquarella