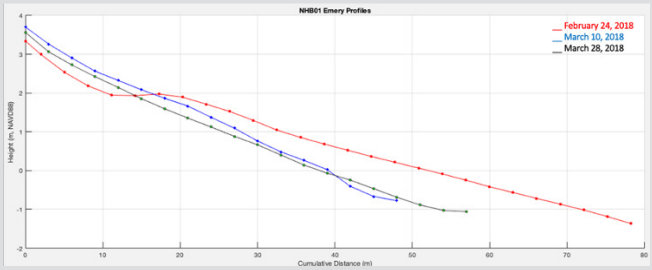
NH Volunteer Beach Profiling Report 2020

North Hampton State Beach, NH

NHB01

North Hampton State Beach is strongly affected by two landmasses, Little Boar's Head to the north and Godfreys Ledge to the south (see map). Overall, the beach at profiling station NHB01 is narrow, steep, and can change very quickly. The beach is often covered with a thin layer of sand during accretional conditions, but during erosional periods the sand veneer is easily eroded, revealing cobbles and boulders. During major storms, these cobbles and boulders are pushed up forming a ramp against the concrete seawall.

Max and min average elevation



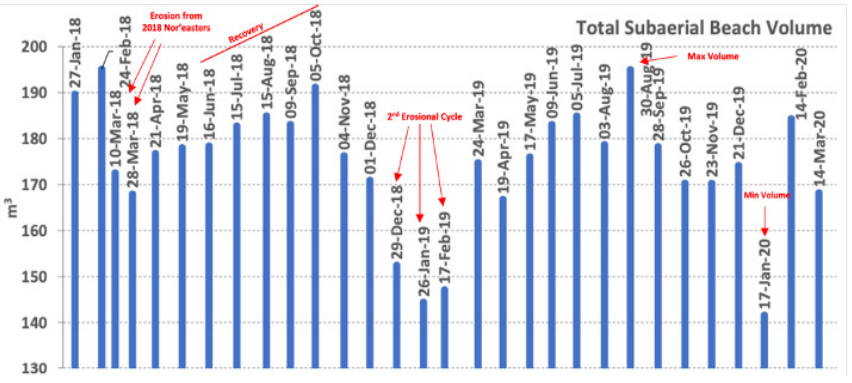
The figure above shows beach elevation profiles that extend from the seawall to the low tide line at profiling station NHB01. The February 2018 (red) profile depicts pre-storm beach conditions. The March 2018 profiles (black and blue) show the impact of the 2018 nor'easters. Note the erosion of the lower beach contrasted by the increase in elevation at the seawall in the post-storm profiles. This increase in elevation at the seawall in March is due to the formation of the gravel ramp mentioned above from sediment being pushed landward by the waves. Once formed, the ramp allows pebbles and cobbles to overtop the seawall causing additional damage to the infrastructure.

Changes in sand volume at NB01

Each blue line represents the estimated volume of sediment measured along a 1-meter- wide swath of the beach for each given date at NHB01. A series of storms in Mar 2018 caused major erosion. The beach recovered for a period of ~7 months but a second cycle of erosion occurred in Dec 2018 and Jan 2019 due to winter storms. This erosional cycle left the beach at some of the lowest volumes recorded during the study period at NHB01. The beach regained volume quickly following these storms and reached its maximum volume in Aug 2019. The beach reached its minimum volume in Jan 2020 (likely due to two strong storms in Dec 2019), but again recovered quickly. When sediment volume is lower, the coast is more vulnerable to storm impacts such as flooding and overwash. High volumes of sediment on the beach can help combat storm damages, but in Mar 2018 high volumes of sediment were pushed against the base of the seawall resulting in overwash and damage to infrastructure.

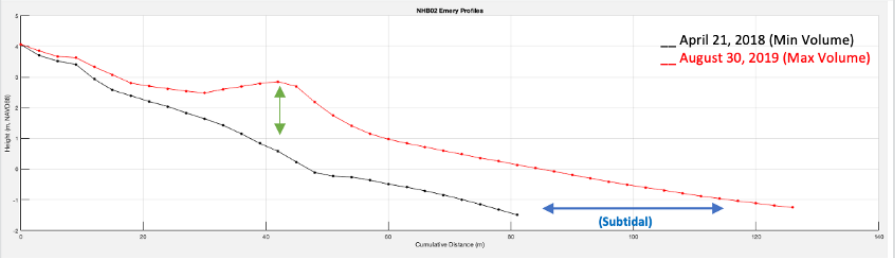
NHB01 Storm effects and recovery

Photos A and B were taken on Mar 3, 2018 after nor'easter Riley. Photo A shows a sediment ramp that formed which ultimately allowed wave energy to push larger sand and gravel over the seawall which is shown in photo B. Major damage occurred to the seawall, bathhouse, parking lot, roadway, and nearby private property as a result of Riley. Photo C was taken on Oct 5, 2018 when the beach had recovered.



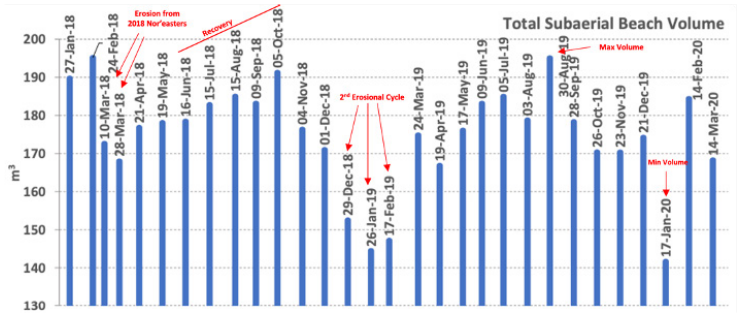
NHB02

NHB02 is located south of Godfreys Ledge. Unlike NHB01, this site has a small sand dune system at the upland border instead of seawall or riprap. NHB02 had some of the largest changes in elevation along the NH coast during the study period. Even though NHB02 underwent major changes in length, elevation, and sediment volume due to storms, it experienced longer periods of accretion afterward (unlike many other NH profiling stations). This is most likely caused by the influence of Godfreys Ledge which alters wave approach and provides protection from northeast storms promoting sediment deposition.



Max and min average elevation

The figure at left shows beach elevation profiles that extend from the seaward edge of the sand dunes to the low tide line at profiling station NHB02. The two profiles represent the maximum and minimum beach profiles over the study period. The minimum was recorded in Apr 2018 (black) and the maximum was recorded a year and half later in Aug 2019 (red). The elevation difference at the berm was ~2.3 m (green arrow). The elevation difference at the lower beach was not measurable because the profile in April 2018 was under water (subtidal) revealing the impact of the late winter 2018 nor'easters. These were some of the largest changes in elevation measured during this study along the NH coast.



Changes in sand volume

Each blue line on the figure to the left represents the estimated volume of sand and gravel at station NHB02 along a 1-meter- wide swath of the beach for each given date. NHB02 was extensively eroded during the March 2018 nor'easters. However, the beach recovered with minimal periods of erosion from fall 2018 through fall 2019. In fact, the fall 2019 profiles have the longest lengths, highest mean elevations, and largest volumes measured during the study period at this site. However, it is important to note that the location of NHB02 downdrift of Godfreys Ledge affords protection that other areas of North Hampton Beach and Plaice Cove do not have. Thus, the beach to the south likely has different trends.

The white dashed line in this photograph shows the NHB02 transect, which extends from narrow dunes across the beach to the waters edge at low tide. The upper beach is a mixture of sand, pebbles, and cobbles.

WHAT'S NEXT?

North Hampton Beach management options

- Restore historic sand dunes for sand storage and storm protection
- Construct raised walkways through the dune at NHB02 to allow sand movement and accretion
- Construct living shorelines, or nature-based approaches to shoreline stabilization
- Nourish the beach south of Godfreys Ledge with sand, potentially sourced from dredging projects
- Continue monitoring the State Beach to assess suitability for beach nourishment
- Allow seaweed deposited by tides to remain to aid in building sand on the beach
- Conduct outreach on the importance of beaches and dunes in protecting the coast
- Explore the ecological history of the area to understand what landforms previously existed

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