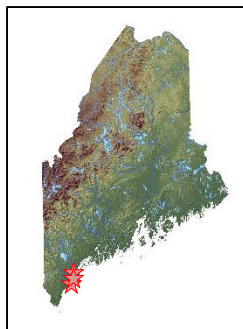


Maine Geologic Facts and Localities

May, 2018

Coastal Storm Impacts – Winter 2018 at Pine Point, Saco and Western Beaches in Southern Maine



43° 32' 28" N, 70° 20' 15" W

43° 29' 10" N, 70° 23' 8" W

43° 32' 24" N, 70° 19' 24" W

Text by

Peter A. Slovinsky

Introduction

During Winter 2018, the Maine Geological Survey was able to survey some of the shoreline erosion impacts of coastal storms from January through April at several select locations along Saco beaches, and Pine Point Beach and Western Beach in Scarborough. Due to limited resources, only certain beaches could be completed. All surveys were completed using a Leica network RTK-GPS, which is capable of horizontal and vertical accuracies of ± 2 cm. The edge of dominant dune vegetation, and as possible, the landward extent of overwash (flotsam, sand, and seaweed washed into the dunes) and the Mean High Water (approximately +1.4 m NAVD88) contour were surveyed. This data was then compared with similar shoreline data compiled from the summer of 2017 in order to analyze some of the dune and beach loss which occurred during the winter of 2018.



Photo by Peter A. Slovinsky

Maine Geological Survey

Winter 2018 Storm Conditions

The winter of 2018 featured numerous storms which resulted in inundation and erosion of the Maine coastline, especially along its sandy beaches. 2018 began with a very strong ocean storm, Winter Storm Grayson, which coincided with high tides on 1/4/2018. At the peak water level, predicted tides were 11.56 feet, with 2.12 feet of surge. Verified water levels from the Portland, ME tide gauge showed that this event resulted in the third highest water level (13.68 feet MLLW) recorded in Portland, Maine since 1912 (Figure 1).

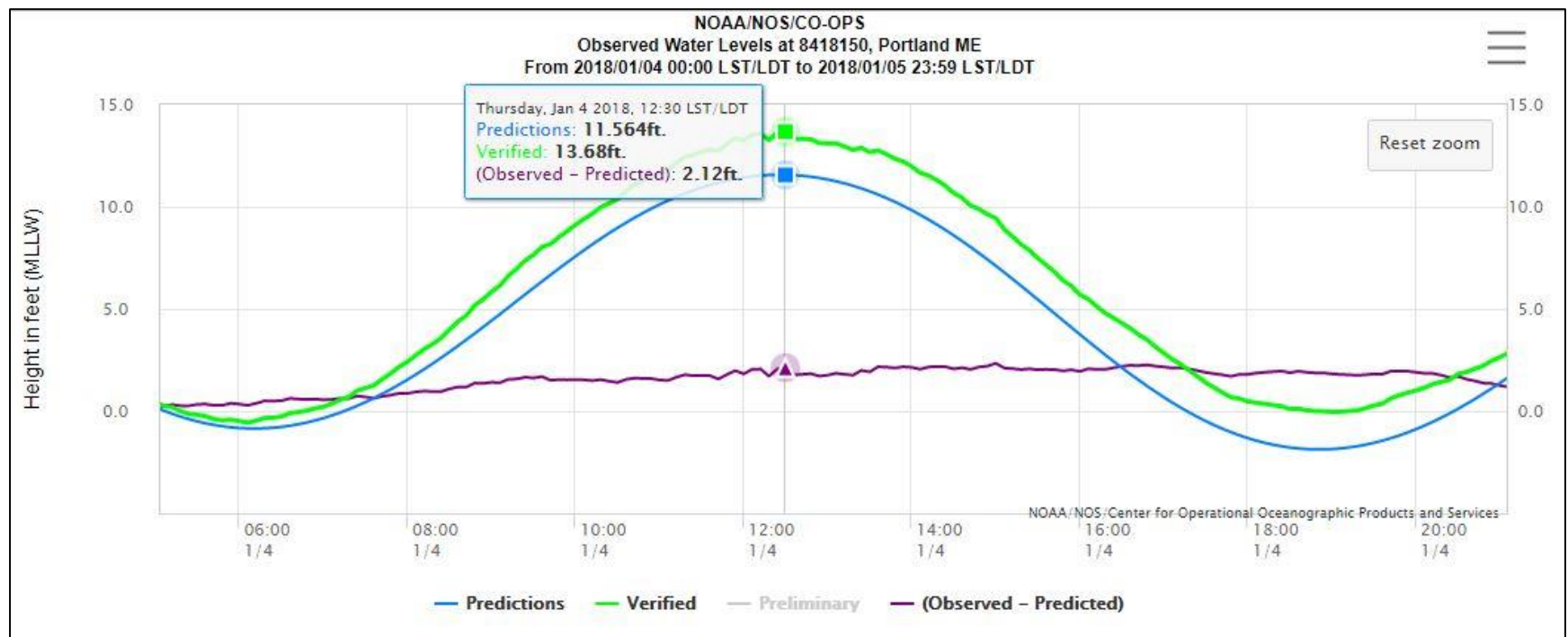


Figure 1. Verified water level at Portland, ME on 1/4/2018. Data courtesy of NOAA CO-OPs.

Winter 2018 Storm Conditions

This extremely high water, coupled with waves that exceeded 10 feet with periods of 14 seconds (Figure 2), resulted in **extensive coastal erosion and flooding along many coastal Maine communities.**

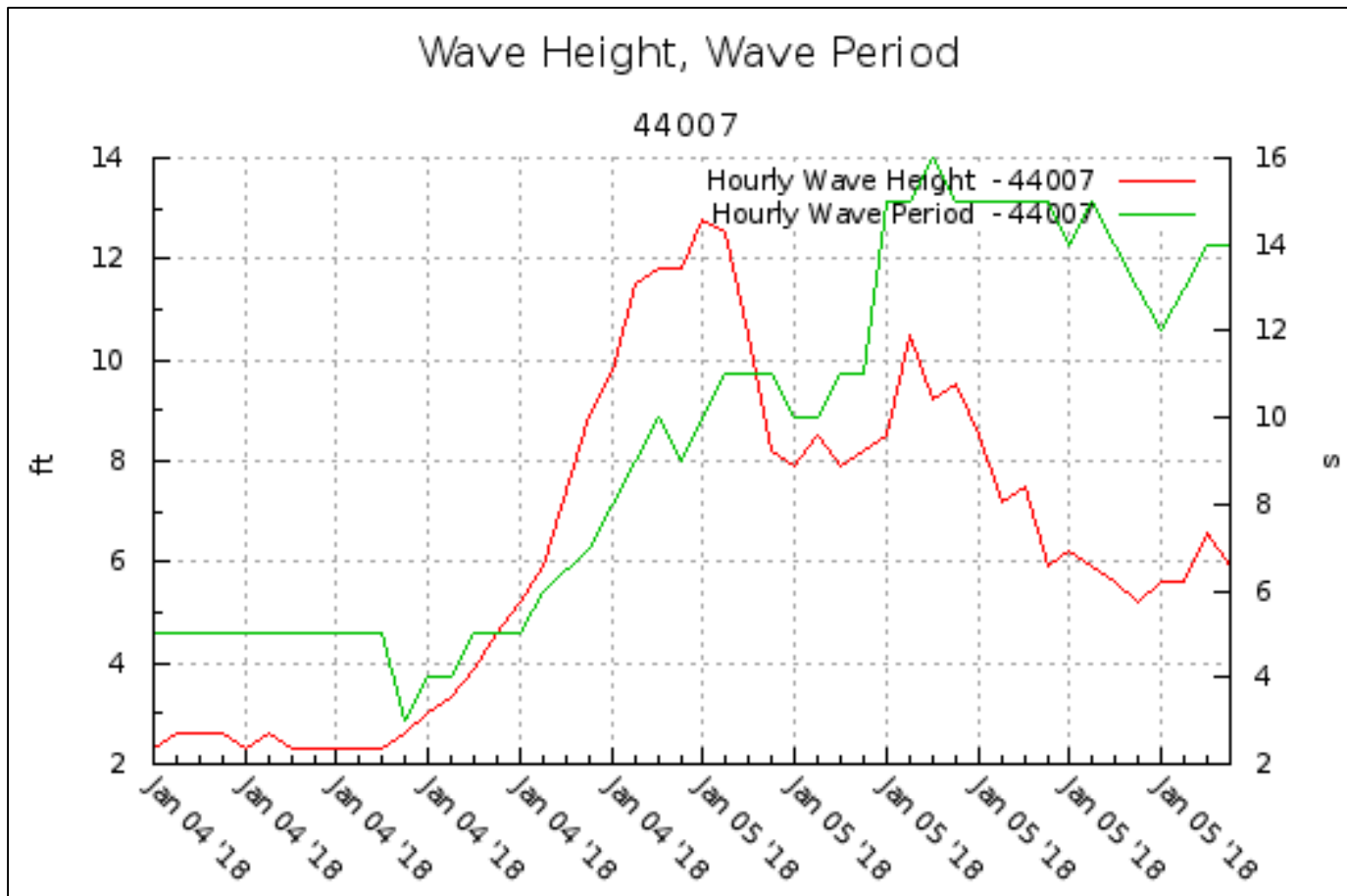


Figure 2. Significant wave height in feet (red line) and average hourly wave period in seconds (green line) at NOAA Buoy 44007 from January 4-5, 2018. Data courtesy of NERACOOS.

Winter 2018 Storm Conditions

Although a few additional storm events occurred in January and February, it was the “bomb” nor’easter of early March which resulted in significant coastal flooding and erosion, and made the beaches in Maine vulnerable to subsequent events. This long-duration storm event included strong, sustained northeast winds over 15 mph from 3/2/2018 to 3/10/2018, with sustained wind speeds reaching close to 40 mph (Figure 3).

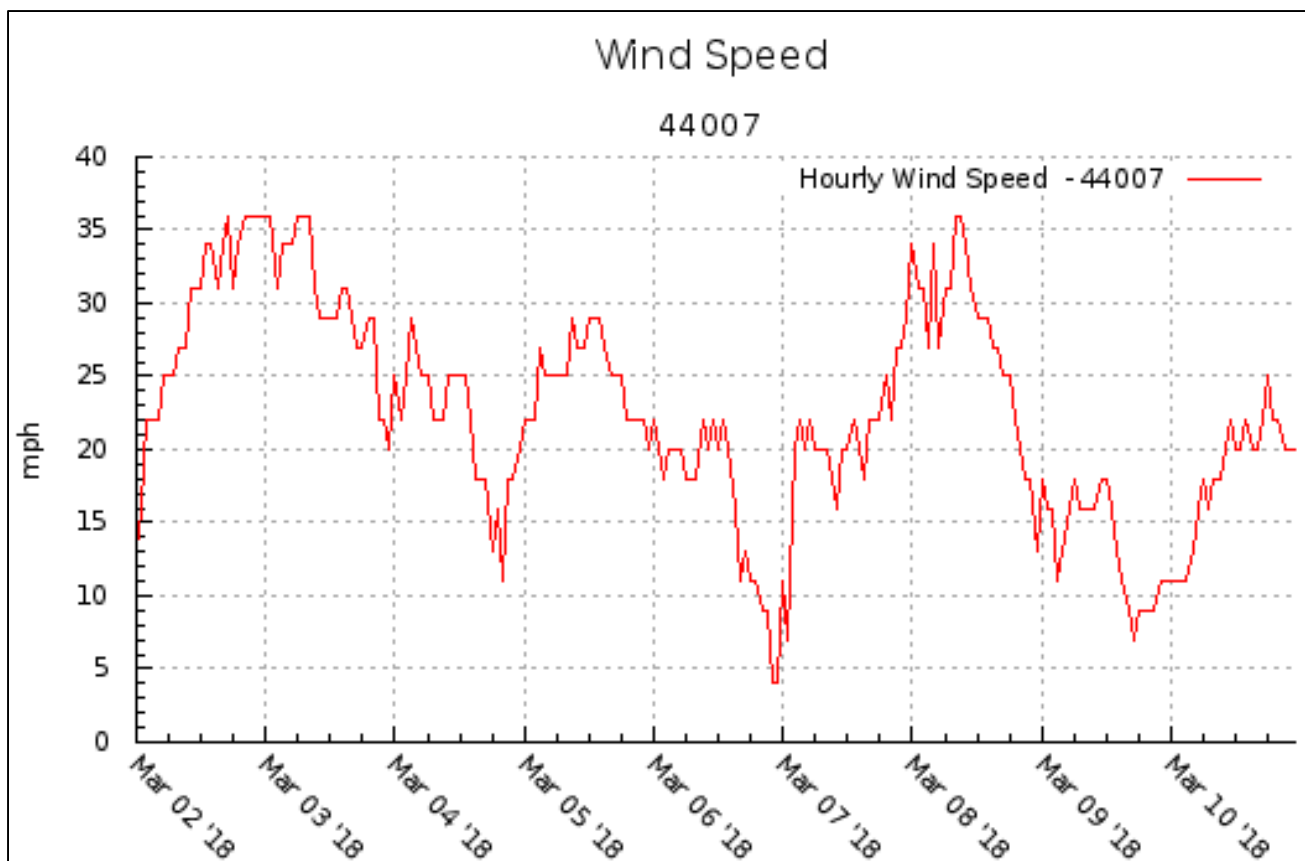


Figure 3. Hourly wind speeds at NOAA buoy 44007 from March 2-10, 2018. Data courtesy of NERACOOS.

Winter 2018 Storm Conditions

This period of sustained winds resulted in very large, battering waves which exceeded 10 feet with average periods between 14 to 16 seconds for a large portion of this time period (Figure 4).

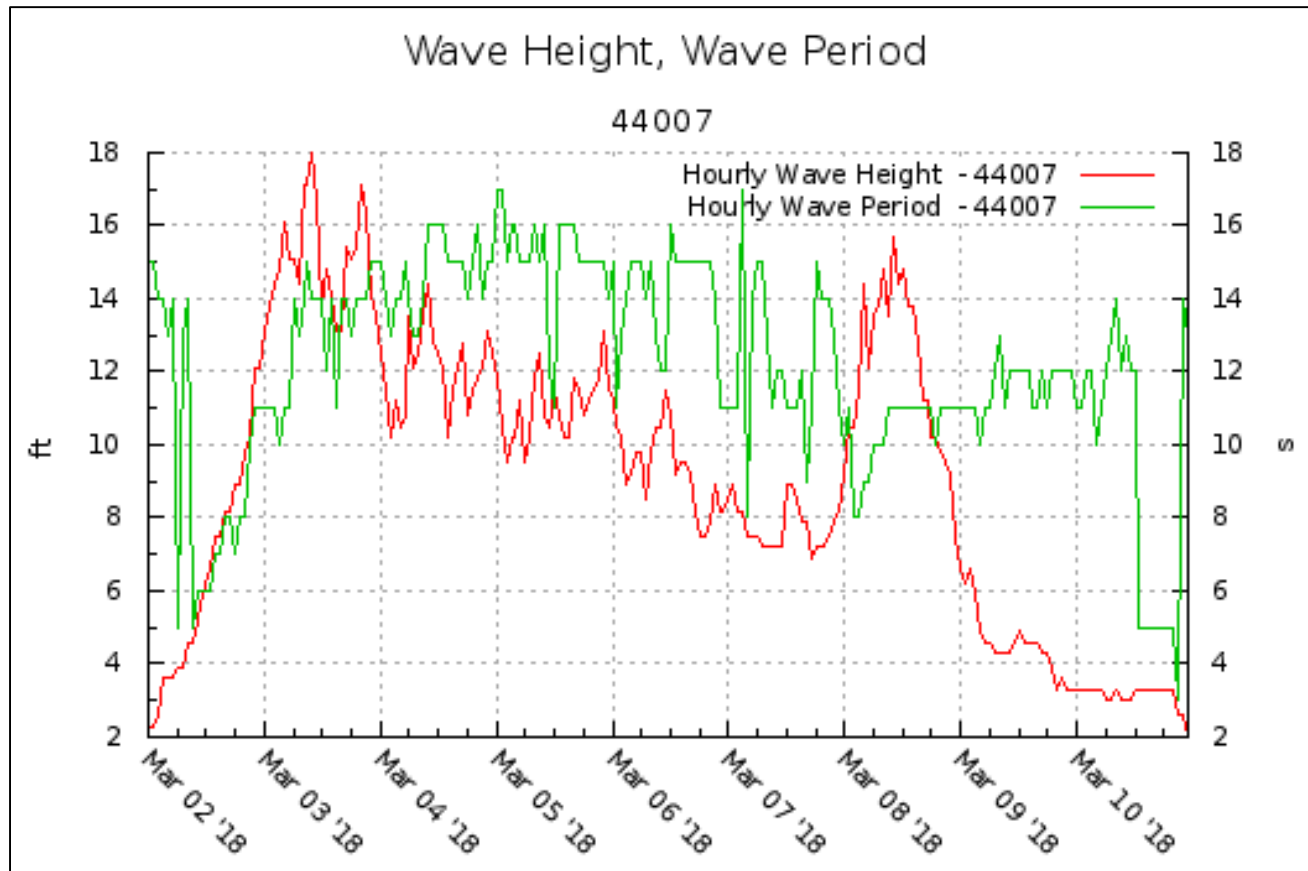


Figure 4. Significant wave height in feet (red line) and average hourly wave period in seconds (green line) at NOAA Buoy 44007 from March 2-10, 2018. Data courtesy of NERACOOS.

Winter 2018 Storm Conditions

The combination of sustained winds and large waves resulted in water levels at Portland, ME that exceeded flood stage (12 feet MLLW) for 9 high tides from March 2 through March 10 (Figure 5). These sustained high water levels and waves and winds led to dramatic coastal erosion of the sandy beaches and dunes along southern Maine, making them more vulnerable to subsequent events. This event was followed by more nor'easters on March 12-14, March 20-22, and March 27-29. These events were more short lived and more typical of the “normal” nor’easter, but they continued to erode southern Maine beaches.

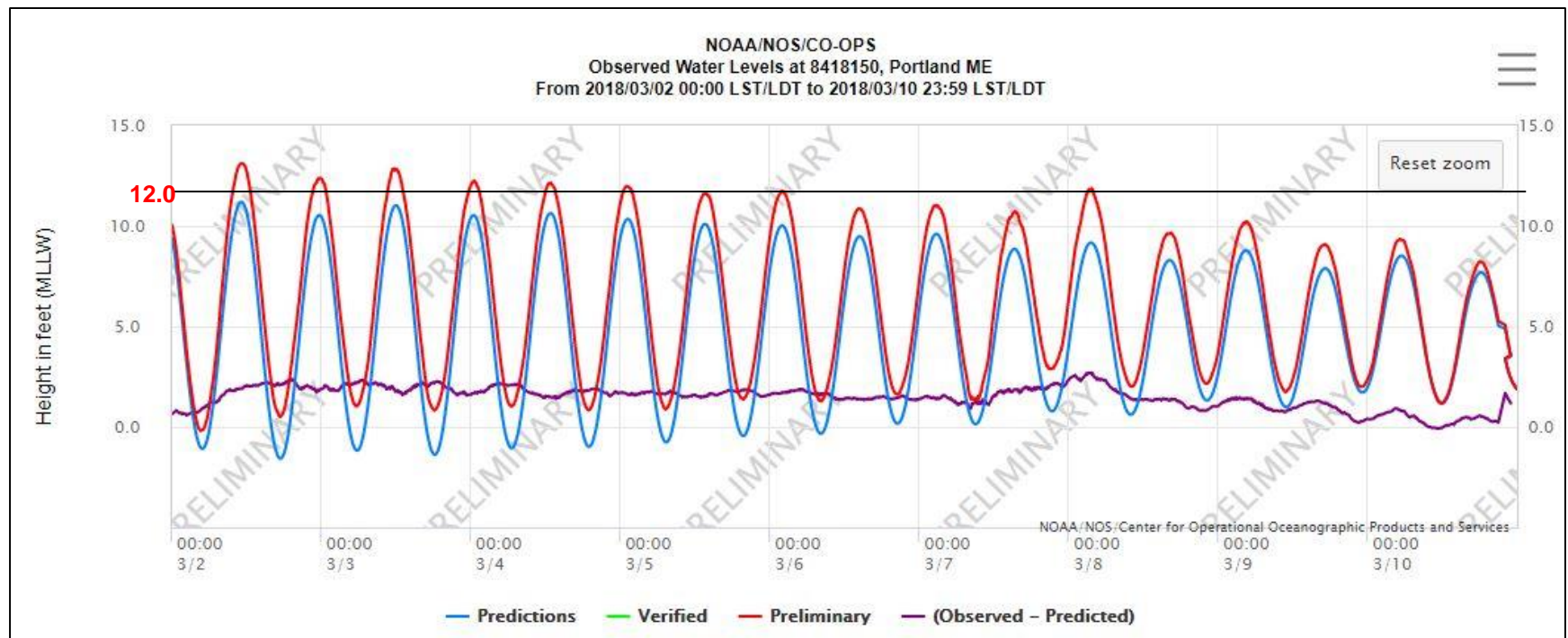


Figure 5. Preliminary water level at Portland, ME between March 2-10, 2018. Data courtesy of NOAA CO-OPs.


Winter 2018 Shoreline Changes at Pine Point Beach, Scarborough, Maine

On the next few pages, some shoreline changes along Pine Point Beach from the winter 2018 events are shown. Each summer, the Maine Geological Survey monitors the seaward extent of dominant dune vegetation using an extremely precise GPS as part of the [Maine Beach Mapping Program \(MBMAP\)](#). Along Pine Point Beach, the last survey was done on June 27, 2017 - this should be considered the “starting point” for comparison with post-winter storm features. On April 10, 2018, MGS surveyed the extent of dune erosion and the landward extent of “overwash” of the dunes from the jetty at the Scarborough River south to 9th Street. Overwash is a natural process of landward dune movement caused by storm waves overtopping dunes and transporting sand and flotsam into back portions of the dune.

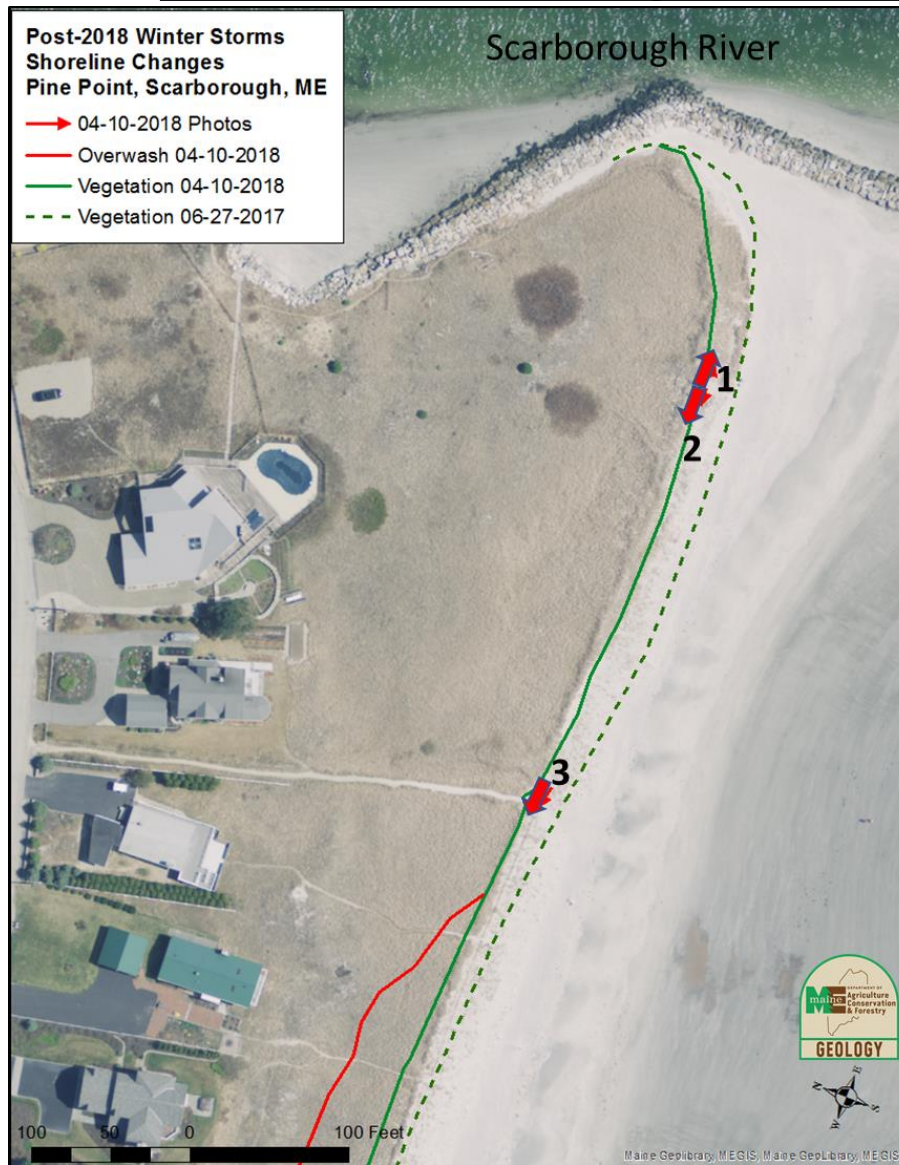
The **June 27, 2017 edge of dune** is shown as a **dashed (- - -) green** line.

The **April 10, 2018 edge of dune** is shown as a **solid (—) green** line.

The **April 10, 2018 extent of overwash** is shown as a **solid (—) red** line.

For each section of beach shown on the left side of the pages, red arrows () indicate the locations and directions of photographs taken of the different shoreline erosion features. These photographs are shown on the right side of the pages.

Winter 2018 Shoreline Changes at Pine Point Beach, Scarborough, Maine



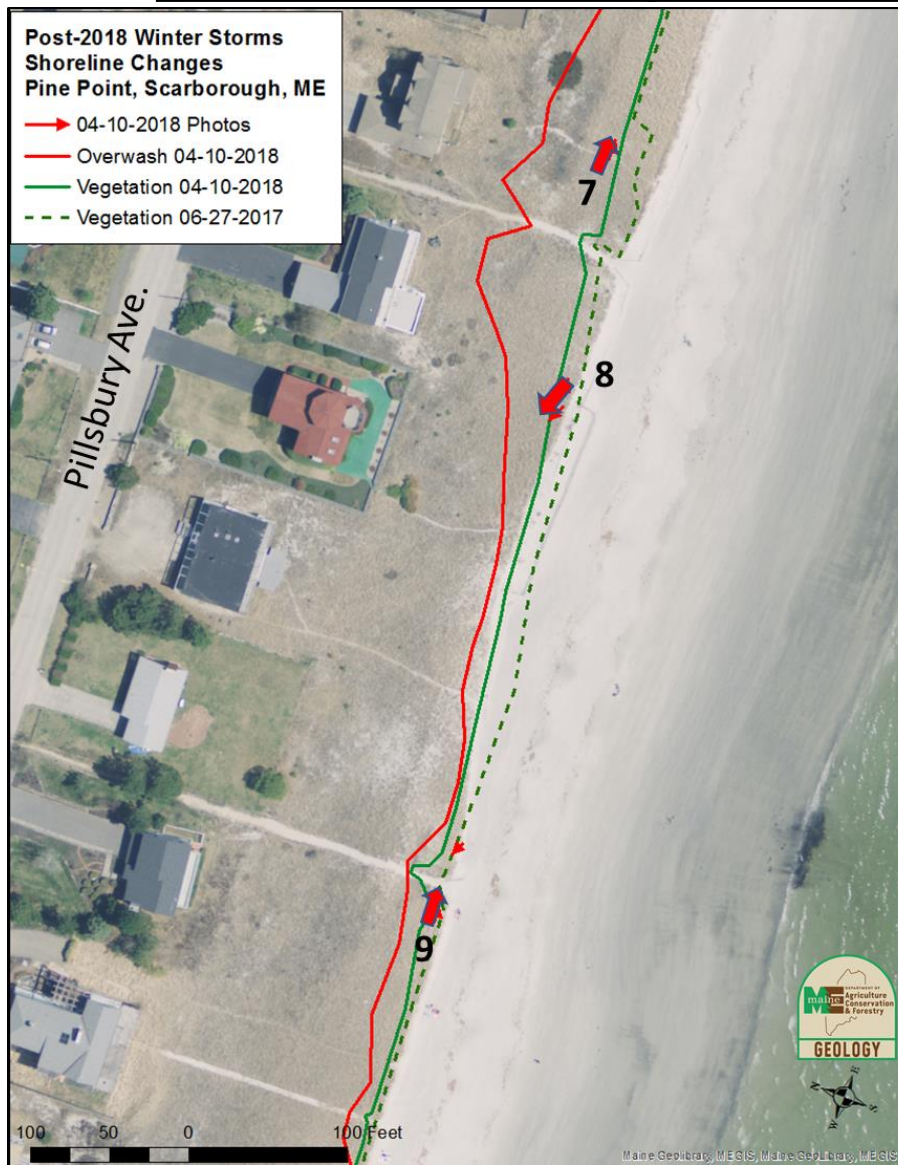
Images by Peter A. Slovinsky (4/10/2018)

Winter 2018 Shoreline Changes at Pine Point Beach, Scarborough, Maine



Images by Peter A. Slovinsky (4/10/2018)

Winter 2018 Shoreline Changes at Pine Point Beach, Scarborough, Maine



Images by Peter A. Slovinsky (4/10/2018)

Winter 2018 Shoreline Changes at Pine Point Beach, Scarborough, Maine



Images by Peter A. Slovinsky (4/10/2018)

Notes: Overwash and dune erosion just north of Hurd Park was minimal.

At Hurd Park, the dune paths allowed for overwash to penetrate up the paths and into the paved parking lot around 60-70 feet.

Just south of Hurd Park, overwash reached about 10-20 feet, and dune erosion was consistent at 5-10 feet.

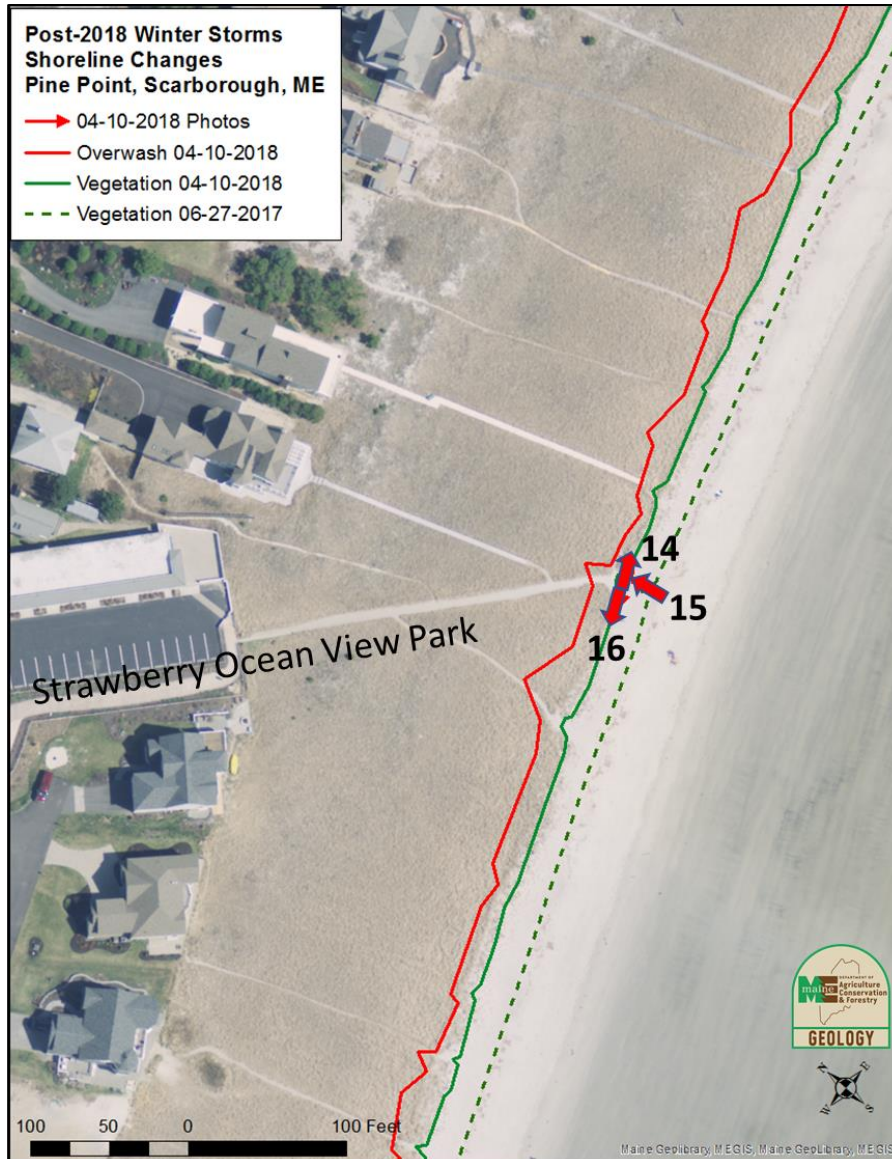
Note that dune erosion was consistently slightly higher at access paths.

Winter 2018 Shoreline Changes at Pine Point Beach, Scarborough, Maine



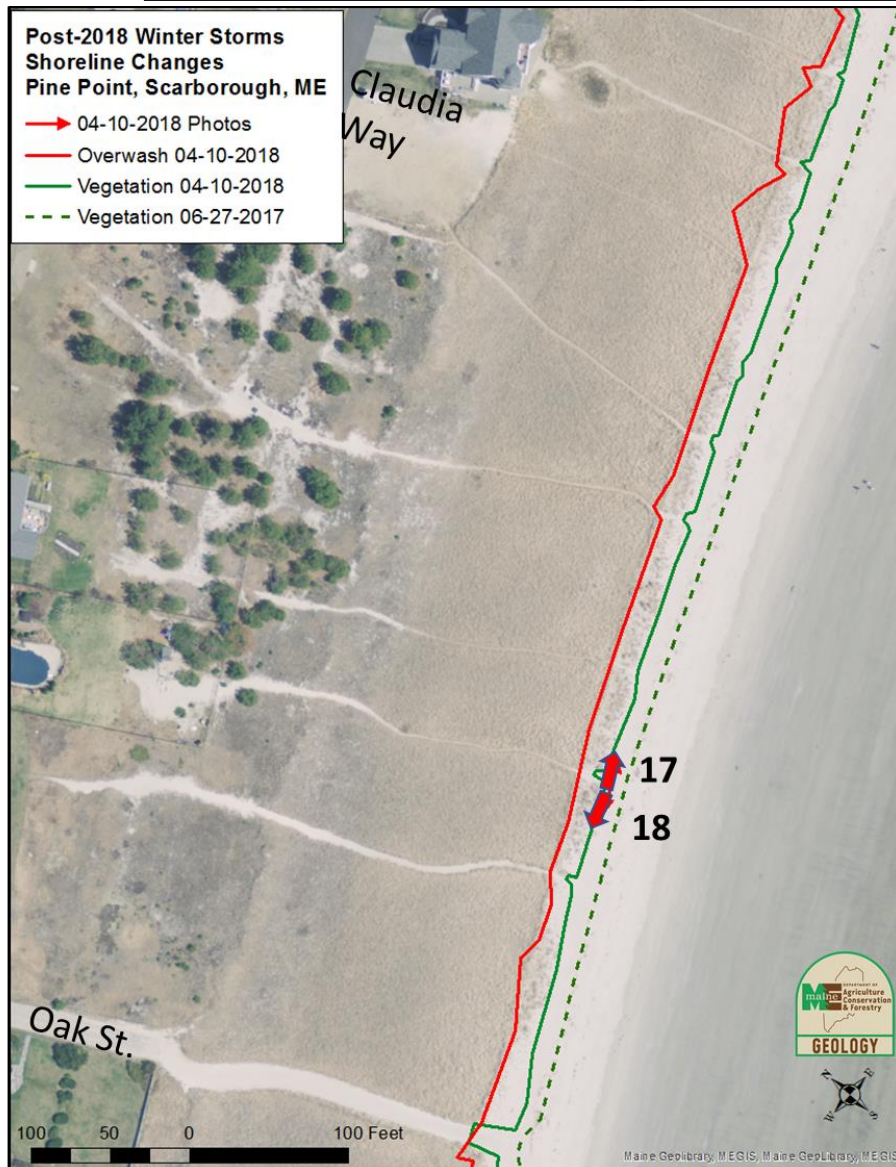
Images by Peter A. Slovinsky (4/10/2018)

Winter 2018 Shoreline Changes at Pine Point Beach, Scarborough, Maine



Images by Peter A. Slovinsky (4/10/2018)

Winter 2018 Shoreline Changes at Pine Point Beach, Scarborough, Maine



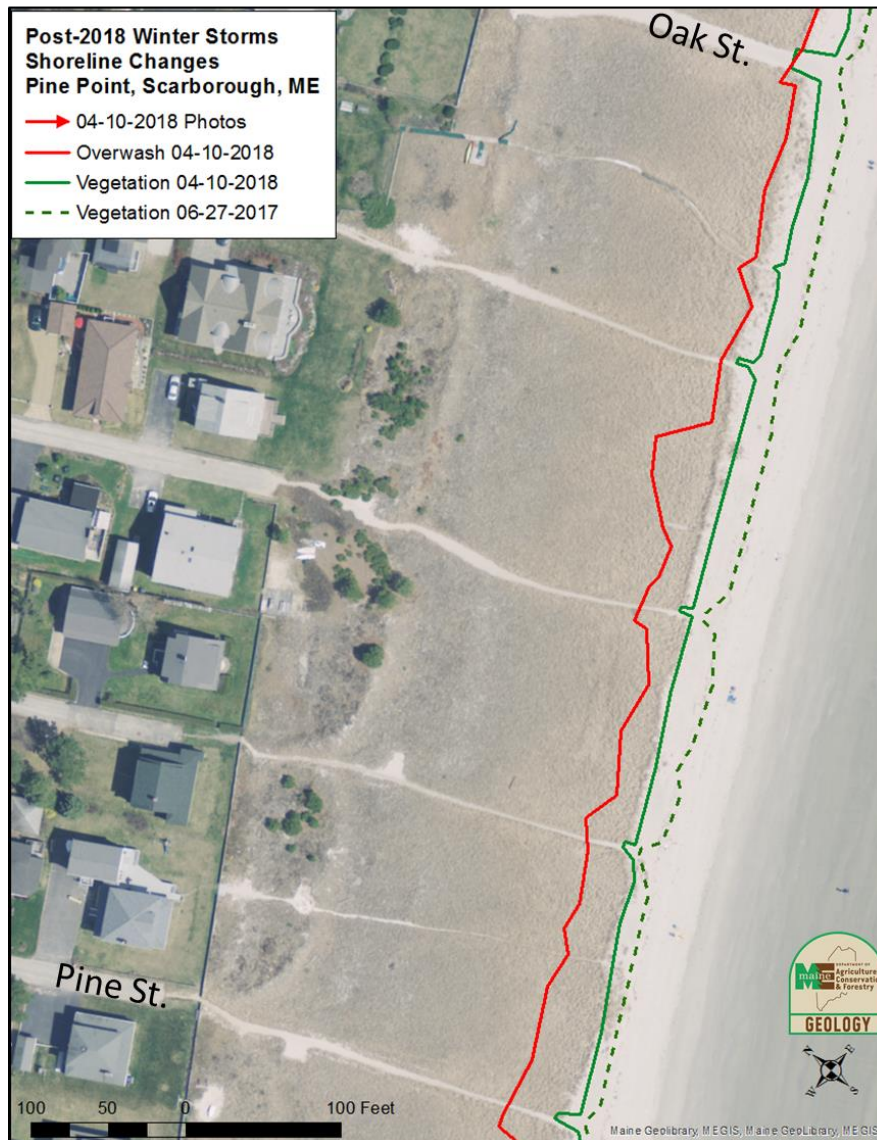
Images by Peter A. Slovinsky (4/10/2018)

Notes: From Oak Street to near Claudia Way, overwash averaged around 20 feet, with pockets up to 40 feet.

Dune erosion was relatively consistent around 15 feet.

Note that dune erosion was slightly higher at access paths.

Winter 2018 Shoreline Changes at Pine Point Beach, Scarborough, Maine



Notes: No photographs were taken along this stretch of the beach.

Between Pine St. and Oak St., overwash averaged about 15-20 feet, with pockets up to 50 feet.

Dune erosion was relatively consistent at around 10-15 feet.

Note that dune erosion was slightly higher at access paths.

Images by Peter A. Slovinsky (4/10/2018)

Winter 2018 Shoreline Changes at Pine Point Beach, Scarborough, Maine



Notes: Between 9th St. and Beach St., overwash was about 15-20 feet, with pockets up to 50 feet.

Dune erosion was relatively consistent at around 10-15 feet.

Note that dune erosion was slightly higher at access paths.

Winter 2018 Shoreline Changes along Saco beaches, Saco, Maine

On the next few pages, some shoreline changes along Saco beaches from the winter 2018 events are shown. Each summer, the Maine Geological Survey monitors the seaward extent of dominant dune vegetation and the Mean High Water Line (1.4 m NAVD88 contour) using an extremely precise GPS as part of the [Maine Beach Mapping Program \(MBMAP\)](#). Along Saco beaches, the last survey was done on August 4, 2017 - this should be considered the “starting point” for comparison with post-winter storm features. On March 7, 2018, MGS surveyed the extent of dune and beach erosion along these beaches, including the landward extent of “overwash” of the dunes from the State Park south to the seawall at Surf Street. Overwash is a natural process of landward dune movement caused by storm waves overtopping dunes and transporting sand and flotsam into back portions of the dune.

The **August 4, 2017 edge of dune** is shown as a **dashed (- - -) green** line.

The **August 4, 2017 Mean High Water** is shown as a **dashed (- - -) blue** line.

The **March 7, 2018 edge of dune** is shown as a **solid (—)green** line.

The **March 7, 2018 MHW** is shown as a **solid (—) blue** line.

The **March 7, 2018 extent of overwash** is shown as a **solid (—) red** line

For each section of beach shown, red arrows (➡) indicate the locations and directions of photographs taken of the different shoreline erosion features. These photographs are shown on the right side of the pages.

Winter 2018 Shoreline Changes along Saco beaches, Saco, Maine



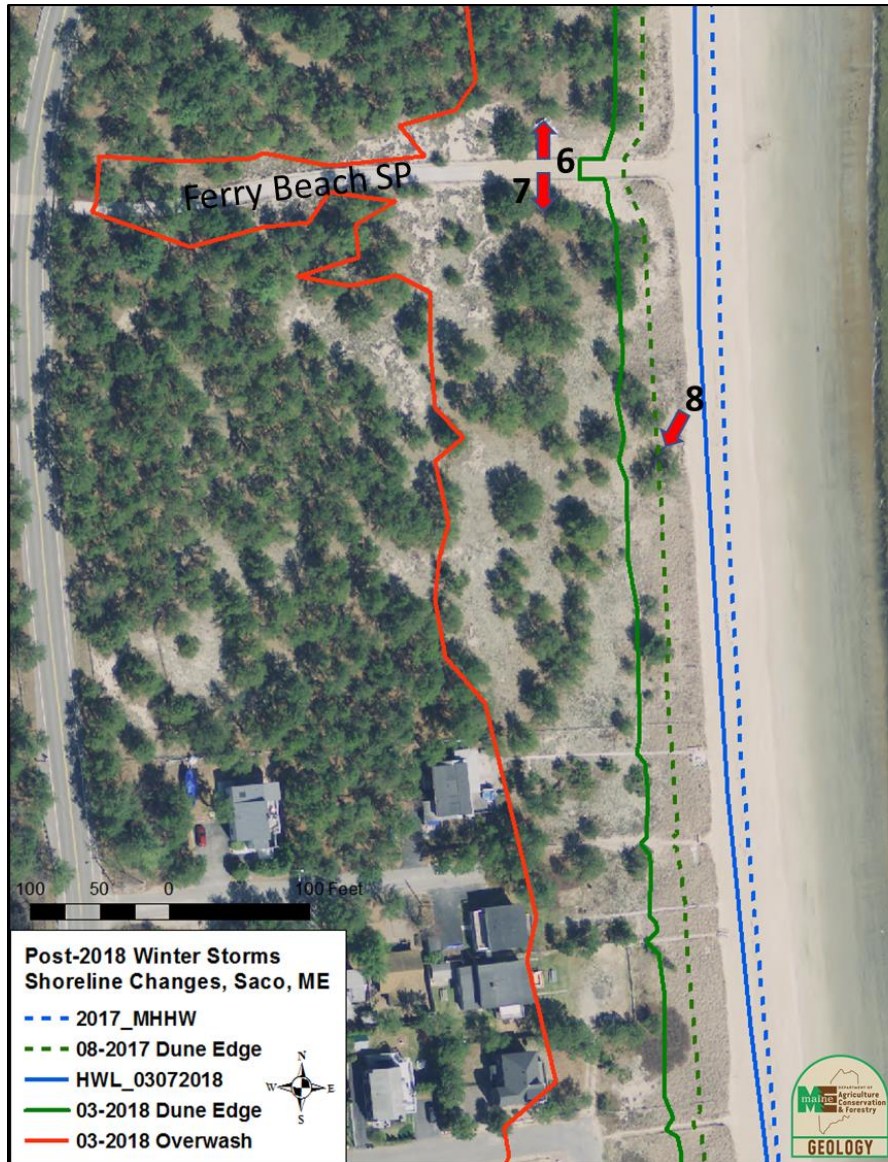
Images by Peter A. Slovinsky (3/7/2018)

Winter 2018 Shoreline Changes along Saco beaches, Saco, Maine



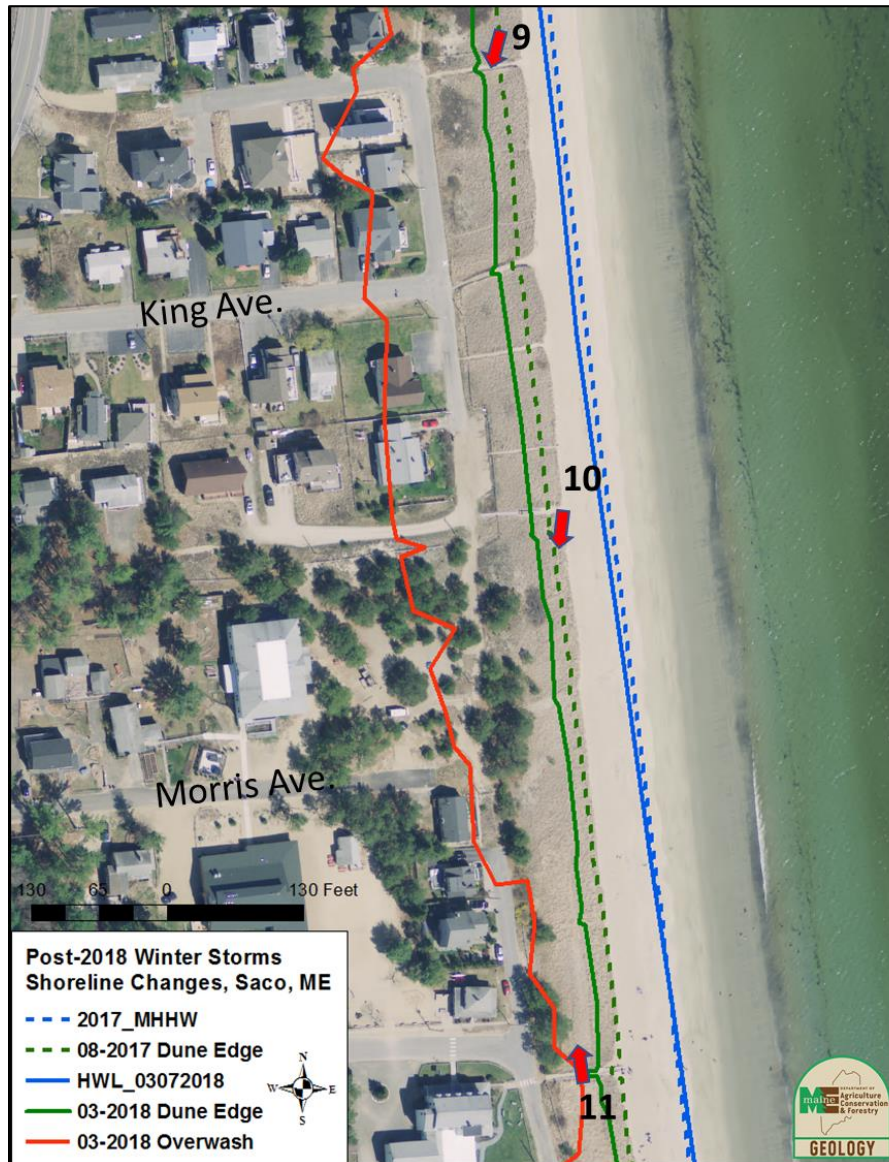
Images by Peter A. Slovinsky (3/7/2018)

Winter 2018 Shoreline Changes along Saco beaches, Saco, Maine



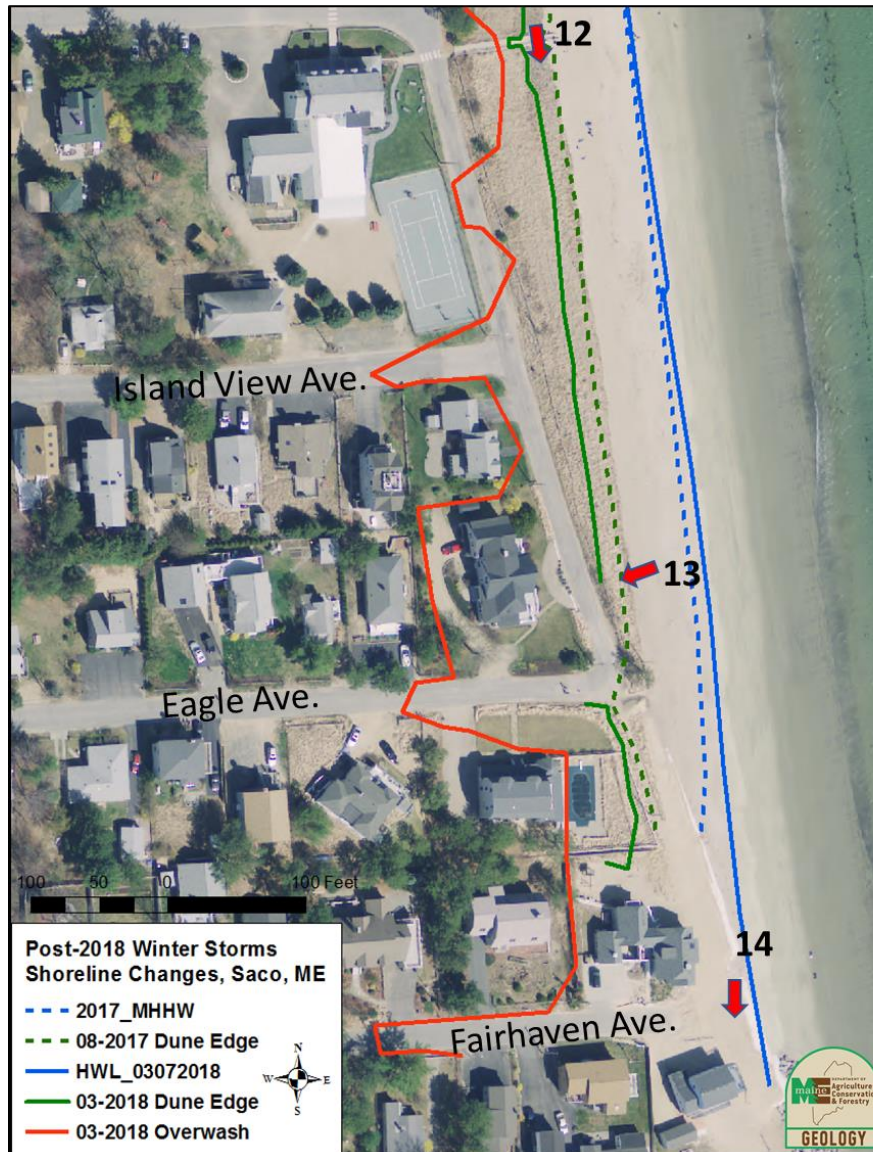
Images by Peter A. Slovinsky (3/7/2018)

Winter 2018 Shoreline Changes along Saco beaches, Saco, Maine



Images by Peter A. Slovinsky (3/7/2018)

Winter 2018 Shoreline Changes along Saco beaches, Saco, Maine



Images by Peter A. Slovinsky (3/7/2018)

Winter 2018 Shoreline Changes at Western Beach, Scarborough, Maine

On the next few pages, some shoreline changes along Western Beach from the winter 2018 events are shown. Each summer, the Maine Geological Survey monitors the seaward extent of dominant dune vegetation and the Mean High Water Line (1.4 m NAVD88 contour) using an extremely precise GPS as part of the [Maine Beach Mapping Program \(MBMAP\)](#). Along Western Beach, the last survey was done on June 14, 2017 - this should be considered the “starting point” for comparison with post-winter storm features. On March 5, 2018, MGS surveyed the extent of dune and beach erosion along Western Beach.

The **June 14, 2017 edge of dune** is shown as a **dashed (- - -) green** line.

The **June 14, 2017 Mean High Water** is shown as a **dashed (- - -) blue** line.

The **March 5, 2018 edge of dune** is shown as a **solid (—)green** line.

The **March 5, 2018 MHW** is shown as a **solid (—) blue** line.

For each section of beach shown, red arrows (➡) indicate the locations and directions of photographs taken of the different shoreline erosion features. These photographs are shown on the right side of the pages.

Winter 2018 Shoreline Changes at Western Beach, Scarborough, Maine



Winter 2018 Shoreline Changes at Western Beach, Scarborough, Maine



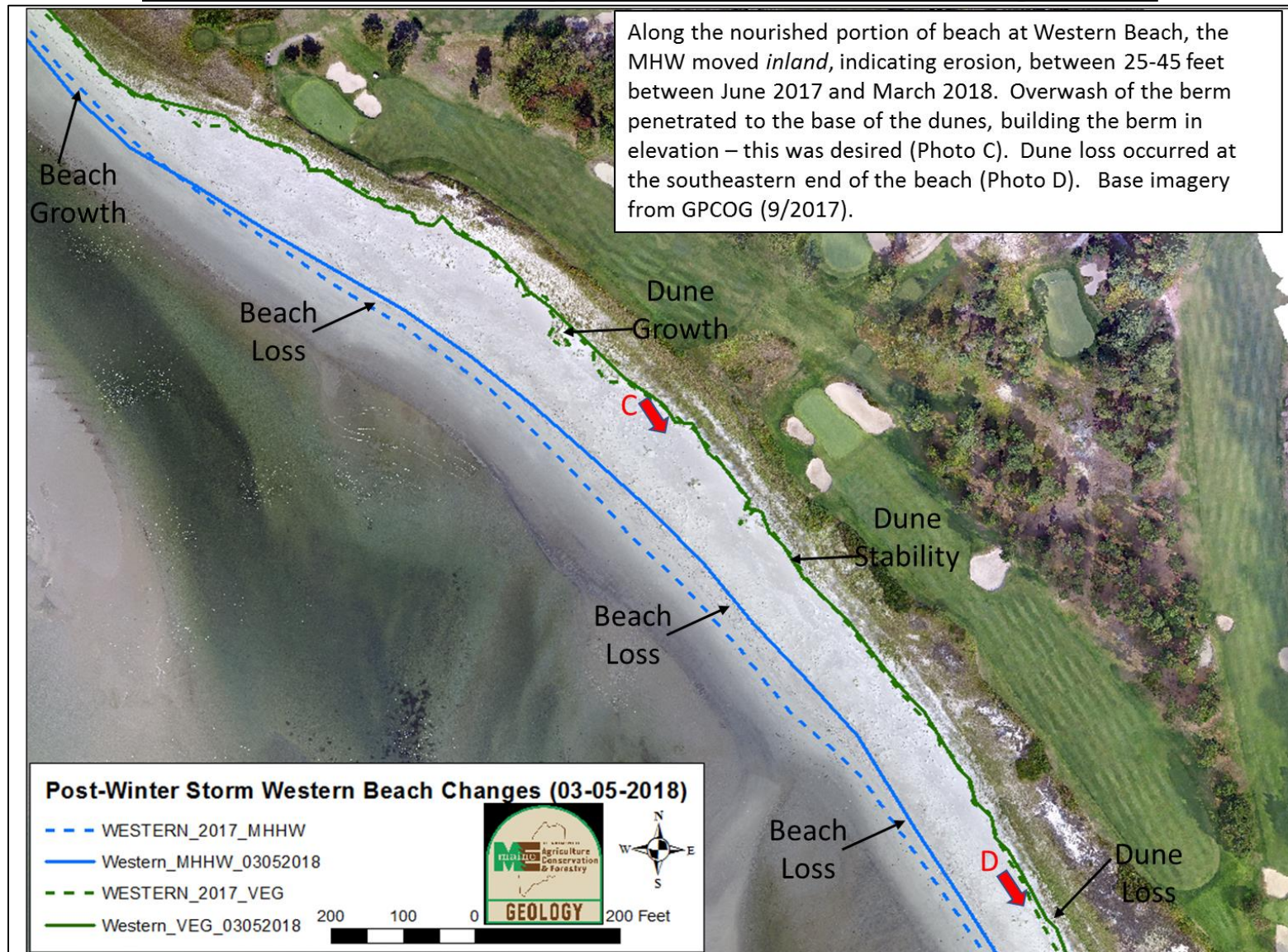
Photo A. Looking south at dune and beach erosion along Ferry Beach. The dune here eroded approximately 15 feet since summer 2017. Image by P.A. Slovinsky, MGS, 3/5/2018.

Winter 2018 Shoreline Changes at Western Beach, Scarborough, Maine



Photo B. Looking southeast at stable dune and berm growth along Western Beach. Along this stretch, the dune was stable and the berm grew seaward since summer 2017. Image by P.A. Slovinsky, MGS, 3/5/2018.

Winter 2018 Shoreline Changes at Western Beach, Scarborough, Maine



Winter 2018 Shoreline Changes at Western Beach, Scarborough, Maine



Photo C. Looking southeast at dune and overwashed berm along Western Beach. The dune along this stretch was stable. Although the MHW moved approximately 40 feet inland from summer of 2017, the berm clearly grew in elevation. Image by P.A. Slovinsky, MGS, 3/5/2018.

Winter 2018 Shoreline Changes at Western Beach, Scarborough, Maine



Photo D. Looking southeast at dune overtopping and beach erosion along Western Beach. The dune here was slightly eroded during the March 2018 events, but we expect this dune grass to re-establish this summer. Image by P.A. Slovinsky, MGS, 3/5/2018.

References and Additional Information

Contact [Peter Slovinsky](#), Marine Geologist, at the Maine Geological Survey for more information.

Maine Geological Survey runs the Maine Beach Monitoring Program, which collects annualized shoreline data and compares it with previous years. A [MBMAP online viewer](#) is available to inspect shoreline positions, shoreline change rates, mapped walls, and calculated dry beach widths along the larger beach systems in York, Cumberland, and Sagadahoc Counties.

The NOAA National Geodetic Survey flew [post-storm \(March 26, 2018\) oblique aerial imagery](#) along the coastline, from Cape Elizabeth south to Delaware.

Also, monthly volunteer beach profile data is collected at a variety of southern Maine beaches as part of the [Southern Maine Volunteer Beach Profile Monitoring Program](#). The program includes a [graphing page](#) which allows the public to query, graph, and view beach profiles collected from different time periods.

Currently active beaches (as of winter 2018) in the program and their acronym codes include, from north to south:

- Higgins Beach, Scarborough (HI);
- East Grand/Pine Point Beaches, Scarborough (EG);
- West Grand, Old Orchard Beach (WG);
- Goose Rocks Beach, Kennebunkport (GR);
- Goochs Beach, Kennebunk (GO);
- Laudholm Beach, Wells (LH);
- Wells Beach, Wells (WE);
- Ogunquit Beach, Ogunquit (OG); and
- Long Sands Beach, York (LS).