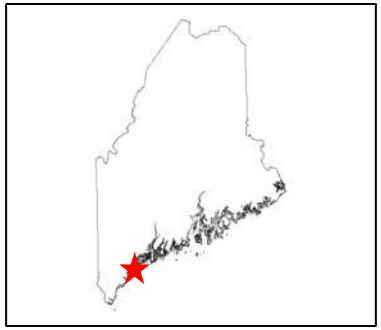
Geologic Site of the Month

June, 2014

Status of Beach and Dune Restoration at Western Beach, Scarborough



43°32‘15.98“ N, 70°19‘11.58“ W

Text by
Peter A. Slovinsky

Introduction

Western Beach is a small pocket beach between Ferry Rock to the northwest and the Prouts Neck headland to the southeast (Figure 1). It lies on the eastern side of the Scarborough River inlet, across the inlet from Pine Point, and is adjacent to the municipally owned Ferry Beach. Although Western Beach is privately owned by the Prouts Neck Country Club, it is open to the public and is a popular destination for sunbathers, fishermen and beach and dog walkers. In a larger context, the Scarborough River and Western Beach are located at the northern end of Saco Bay, Maine's largest expanse (approximately 7 miles) of contiguous beach and dunes in the State.

Figure 1. Western Beach in Scarborough, Maine.

History

The Maine Geological Survey published a Site of the Month in June 2006 on Western Beach that detailed much of the site's history including dominant inlet processes, shoreline change, and dredging. Western Beach was "nourished" with 90,000 cubic yards of sand dredged from the Scarborough River federal channel by the US Army Corps of Engineers in late 2004. The project resulted in a wide beach berm (also known as the "dry beach") but did not include the creation or restoration of sand dunes. Figure 2 shows views of the beach after nourishment was completed in December 2004.

Figure 2. Views looking northwest (left image) and southeast (right image) along Western Beach after the 2004 beach nourishment project was completed. Note the large, flat "dry beach" or berm that was created as a result of the project.

History

Since the beach nourishment of 2004, Western Beach has steadily eroded at a high rate, which is documented in the Maine Geological Survey August 2011 Site of the Month. Using Real Time Kinematic Global Positioning System (RTK-GPS), the MGS surveys the seaward edge of the vegetation line, in addition to the landward extent of the latest high tide line. Comparison of surveys from 2005 through 2012 (Figure 3) shows the beach eroded inland at a rate of up to 5 meters (over 16 feet) per year!

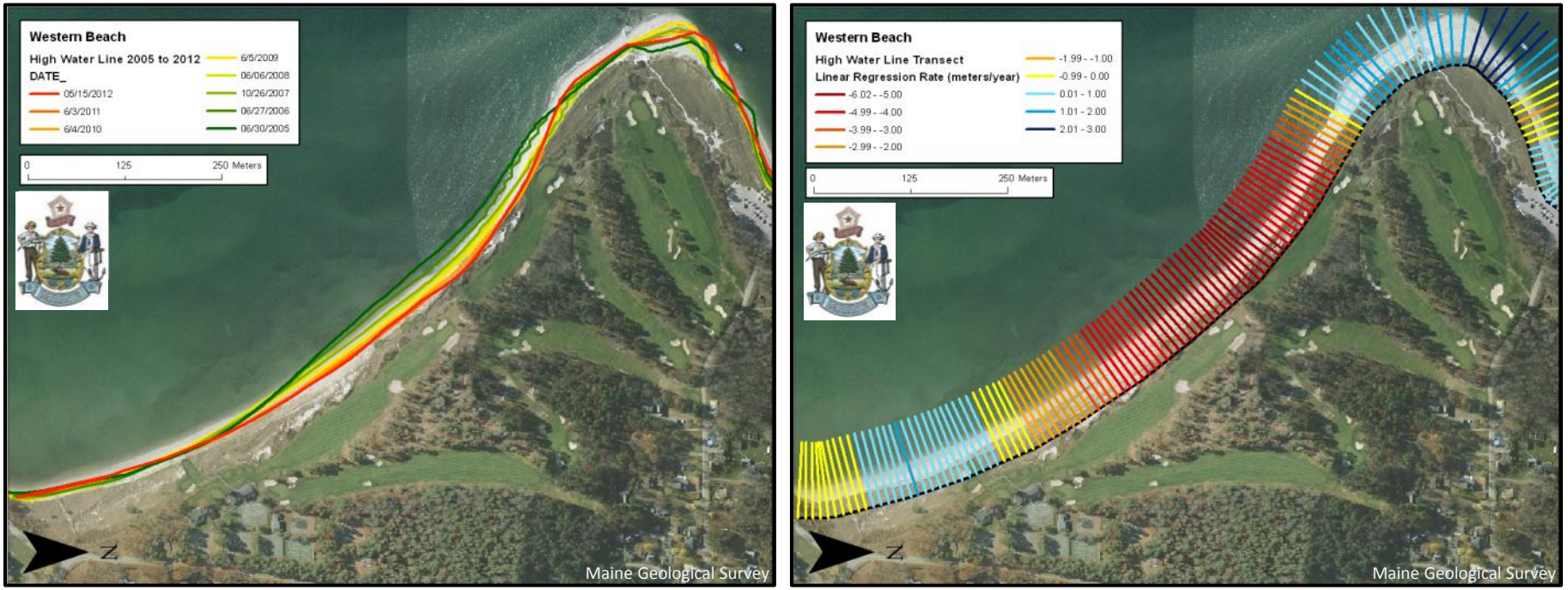


Figure 3. Comparison of high water line positions along Western Beach from 2005 through 2012 (left image). Calculated shoreline change rates (in meters per year) at transects along Western Beach (right image). The central portion of the beach eroded at up to 15 feet per year. Meanwhile, nearby beaches at Prouts Neck, Ferry Rock and Ferry Beach were either stable or grew.

History

By 2011, shoreline erosion along Western Beach had exposed a large section of an old rock seawall, which according to the Country Club, was built sometime in the 1930s (Figure 4). Erosion had also reached and was threatening to impact the 2nd hole tee box and a portion of a green. As a result, the Prouts Neck Country Club applied for and received permission from the Maine Department of Environmental Protection (DEP) to temporarily stabilize this stretch of shoreline, including the dune system to the southeast, with sand bags until seawall reconstruction could be permitted and reconstructed, in conjunction with an expected dredge of the federal harbor by the US Army Corps of Engineers in the winter of 2013/2014.

Figure 4. 1930's seawall exposed by erosion in 2011 along Western Beach. Left image: view to the northwest. Right image: view to the southeast.

Erosion Control Response – Prouts Neck Country Club

In 2013, the country club placed permitted temporary sandbags along the seaward side of the eroding dune at two separate locations; 1) where the dilapidated seawall was, and 2) where the sand dune had eroded to the southeast of the seawall (Figure 5). Beach-compatible sand from upland sources was trucked in and placed on the landward side of the sandbags. Figure 5 shows the temporary sandbags and sand trucked into the site. The sandbags remained in-place until the seawall was replaced and sand was available for dune reconstruction in conjunction with the federal dredging of the Scarborough River channel in the winter.

Figure 5. Temporary sandbags and placed sand along a section of rapidly eroding shoreline in 2013. Left image: view to the northwest. Right image: view to the southeast.

Erosion Control Response – Federal Channel Dredging

Dredging of the federal channel of the Scarborough River in the winter of 2013/2014 underwent significant delays due to contractor timing, weather, and other factors. The dredging used a platform dredge with suction (also known as a "cutterhead") which lifted water and sand from the channel, and pumped it onto the beach using a long pipeline. Once on the beach, the material was dewatered in a large mound, and then shaped with equipment.

Figure 6. View looking southeast of the dredging operation. The dredge platform is visible in the river channel and the pumping pipeline is in the foreground.

Erosion Control Response – Federal Channel Dredging

Additional images from the winter 2014 dredge operation.

Figure 7. Pumped material is mounded on the beach via the pipeline.

Erosion Control Response – Federal Channel Dredging

Additional images from the winter 2014 dredge operation.

Figure 8. Excavator digging pits for the material dewatering.

Erosion Control Response – Federal Channel Dredging

Additional images from the winter 2014 dredge operation.

Figure 9. Pipe end where sand is pumped onto the beach for dewatering.

Erosion Control Response – Federal Channel Dredging

Additional images from the winter 2014 dredge operation.

Figure 10. Dewatered sand on the beach before shaping.

Erosion Control Response – Federal Channel Dredging

Additional images from the winter 2014 dredge operation.

Figure 11. Water draining from dewatering sand on the beach.

Erosion Control Response – Federal Channel Dredging

Channel dredging called for the removal of about 116,000 cubic yards (yds^3) of material. According to the US Army Corps of Engineers, about 24,000 yds^3 of material was dredged during the winter of 2013/2014. About 8,000 yds^3 of it was from outside of the federal channel. This means that around 100,000 yds^3 remains to be dredged. The dredging and subsequent beach nourishment and dune restoration project will have to be completed in the fall/winter of 2014 due to seasonal restrictions that protect threatened and endangered species.

Figure 12a. View northwest of mounded dredged sand, waiting to be shaped.

Photos by P.A. Slovinsky, 04/07/2014

Figure 12b. View of the dune ridge that was created with dredged and trucked in material along the edge of the golf course. It has yet to be planted with beach grass. Same area shown in Figure 5.

Erosion Control Response – Prouts Neck Country Club

The country club completed its seawall reconstruction at the same time as the federal dredge was occurring. As a condition of the permit, the wall had to be covered with trucked-in, beach-compatible sand and planted with beach grass. The completed project as of June 2014 is shown below in Figure 13 (left image). The country club also completed a dune restoration project along a significant stretch of the beach that included creation of a frontal dune, and planting with American beach grass. This is shown in the right image, below.

Figure 13. View southeast (left image) of artificial dune built on the reconstructed seawall. The stretch of reconstructed dune in the right image is in the background. View northwest (right image) of reconstructed dune ridge.

2014 Beach Nourishment Results

As of June 2014, the beach had been graded and the dune construction completed. The wall is covered with sand dune that now protects an area of the Prouts Neck Country Club golf course. Sand fencing protects the new vegetation from foot traffic and also traps wind-blown sand at the toe of the new dune. Seaward of the dune is an area of nourished beach with a wide berm. The berm helps protect the dune from wave action while the American beach grass gets established.

Figure 14. Panoramic view looking southeast towards Prouts Neck. The artificial dune is built on the reconstructed seawall as well as on an area of nourished beach to the right.

2014 Beach Nourishment Results

The photograph below shows the nourished dry beach (berm) and reconstructed and planted sand dune along the Prouts Neck Country Club golf course.

Figure 15. Panoramic view looking southeast, of a section of the nourished dry beach. The reconstructed and planted sand dune is visible in the middle of the image. The Prouts Neck Country Club golf course is behind the dune, to the left.

2014 Beach Nourishment Results

The photograph below shows the nourished dry beach (berm) and reconstructed and planted sand dune along the Prouts Neck Country Club golf course.

Figure 16. Panoramic view looking northwest, of a section of the nourished dry beach (berm). The reconstructed and planted sand dune that is covering the seawall is to the right in the image. Pine Point is in the distance.

Comparison of 2005 and 2014 Beach Nourishment Results

The next few pages compare images along certain sections of Western Beach from directly after the beach nourishment project in January 2005, with images from June 2014. Note that the images may not be taken from the exact same location, but are close enough for qualitative difference assessment between the results of the two projects. Figure 17 compares views looking northwest along Western Beach towards Pine Point.

Figure 17. The left image shows the northwest view of the completed beach nourishment in January 2005. Note the wide, flat, dry beach or "berm". In the right image, from June 2014, note the lack of a beach berm, signified by the wrack line near the dunes , but a clear increase in the frontal dune crest elevation as a result of dune restoration efforts.

Comparison of 2005 and 2014 Beach Nourishment Results

The photos below compare the 2005 and 2014 views looking southeast along Western Beach towards Prouts Neck. Note the differences in the dry beach width. Also, note that the 2005 project did not include any dune restoration efforts – just the construction of a berm to the base of the existing dunes. The 2014 project integrates restoration of the dunes with beach nourishment.

Figure 18. The left image shows the southeast view of the completed beach nourishment in January 2005. Again, note the flat, wide dry beach or "berm". In the right image, from June 2014, note that the beach berm created from the dredged material is much smaller, and stops in the foreground of the image since the project was not completed.

Comparison of 2005 and 2014 Beach Nourishment Results

The photos below compare the 2005 and 2014 views looking southeast along Western Beach towards Prouts Neck. Note the differences in the dry beach width. The entire berm and dunes that existed in 2005 post-nourishment had been eroded. The new dunes are visible in the image on the right.

Figure 19. The left image shows the view southeast, of the completed beach nourishment in January 2005. The right image shows approximately the same view in 2014. This shows the extent of the dune restoration project along a portion of the beach. Note the lack of dry beach in the 2014 image.

Comparison of 2005 and 2014 Beach Nourishment Results

As documented in our previous 2006 Site of the Month, the 2004 dredging of the federal channel of the Scarborough River and consequent beach nourishment at Western Beach created significant habitat for threatened and endangered species including least terns and piping plovers. The following spring and summer saw numerous nesting sites for both species.

Although the 2013/2014 dredge and nourishment project was not fully completed, the small amount of nourished beach which was created will likely attract nesting bird species through the summer months of 2014.

Additionally, the dune restoration which was completed along Western Beach will most assuredly help protect the golf course at the Prouts Neck Country Club from erosion.

If the entire beach nourishment project is completed – hopefully in the winter of 2014/2015 – there should again be a significant benefit for shorebird nesting habitat, storm protection for the golf course, and recreational space for beach users.

Photo by P.A. Slovinsky

References and Additional Information

Slovinsky, Peter A., 2006, Beach Nourishment at Western Beach, Scarborough, Maine: Benefits for the Beaches and the Birds, Maine Geological Survey Site of the Month, June 2006.

Slovinsky, Peter A. and Dickson, Stephen M., 2009, State of Maine's Beaches in 2009, Maine Geological Survey Open-File Report 09-57, 68 p.

Slovinsky, Peter A., 2011, Shoreline Erosion at Western and Ferry Beaches, Scarborough, Maine, Maine Geological Survey Site of the Month, August 2011.

U.S. Army Corps of Engineers, 2013, Scarborough River Maintenance Dredge Press Release No 2013-121, New England District, December 13, 2013.