



Photo: Town of Scituate

SPRING 2024 NORTH SCITUATE BEACH NOURISHMENT

Why are Beaches Important?

The natural function of a sandy beach is to provide a buffer between land and sea that acts as a damping mechanism to dissipate wave energy and protect coastal upland areas. Naturally, beaches are dynamic systems that shift and adjust to changing ocean conditions. These adjustments occur over timescales that typically range from daily response to local storm events, to seasonal changes due to more energetic winter conditions (Figure 1). Many year-round beachgoers will notice a much lower and rockier beach during the winter months due to the sand migrating offshore and creating bars that dissipate wave energy farther from the shoreline. With sufficient sediment supply, the beach is generally able to rebuild itself during the spring and summer. However, many beaches along developed coastlines lack enough sandy material to maintain this cyclical process, resulting in less and less beach over time.

Project Details:

**Construction: March
1st – April 30th, 2024**

**Engineered for Storm
Protection**

**Native Beach
Compatible Material**

**CZM Grant Funded
Support**



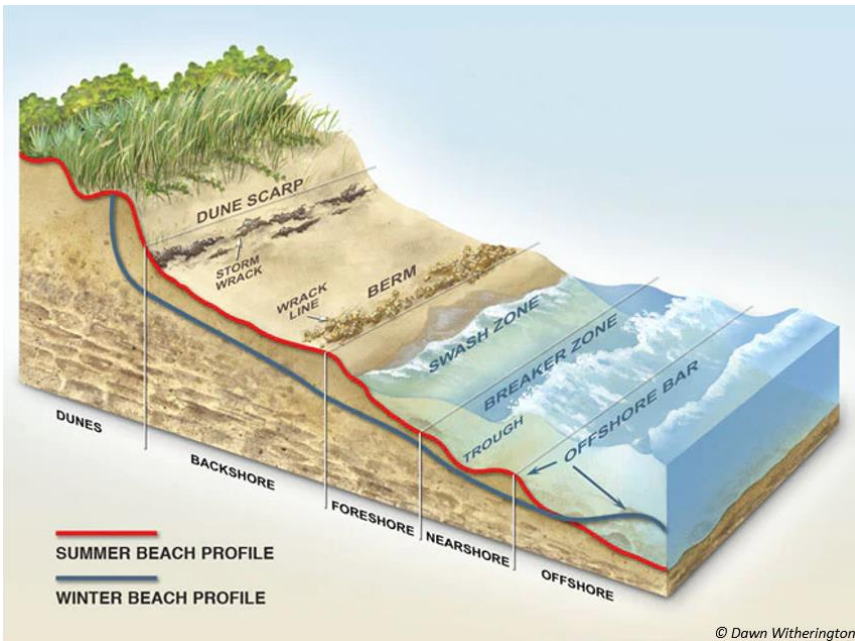


Figure 1: Cross-section of a typical sandy beach showing the summer (red line) and winter (blue line) profiles.

How Can Beach Nourishment Help?

Placing additional sediment on the beach (beach nourishment) is an essential step to compensate for the reduction in sediment supply caused by coastal structures, such as revetments and sea walls, while also restoring the beach as a functioning coastal protection mechanism. A common misconception often associated with beach nourishment is that the sand is merely dumped in the ocean and rapidly disappears. Although beach nourishment is not a permanent remediation, a properly engineered

beach nourishment design can provide storm damage protection and reduce coastal flooding in low-lying areas of the community (Figure 2).

The Process

The early stages of nourishment may often look like a losing battle against the ocean. However, during construction, sand is placed so that natural coastal processes can reshape the nourished beach into the desired beach profile form. During the first week of construction, the North Scituate Beach Project was impacted by two easterly storms coinciding with a spring tide cycle causing a rapid reshaping of the nourishment. Figure 3 shows

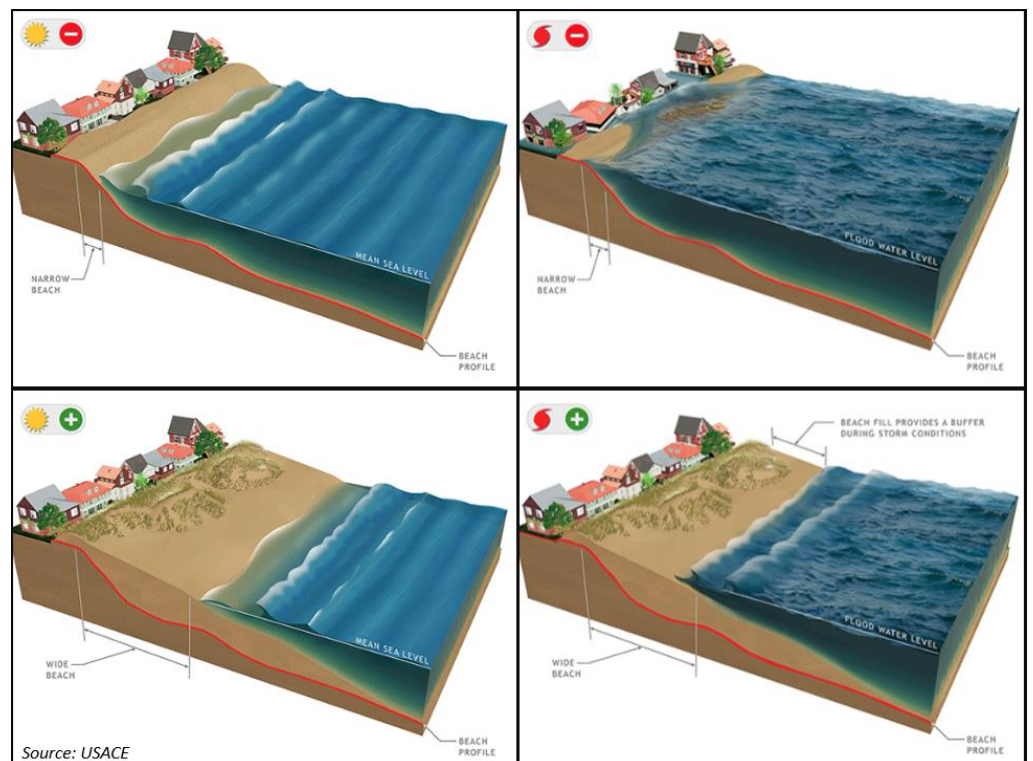


Figure 2: Cross-section representation of the protection provided by an engineered beach nourishment during a coastal storm.

how the nourishment was reshaped in response to the storm events. During storms, the sloped seaward face of the nourishment will appear to erode quickly as sediment moves offshore to prevent larger waves from breaking close to the beach. While this may appear to be erosion or lost material, it

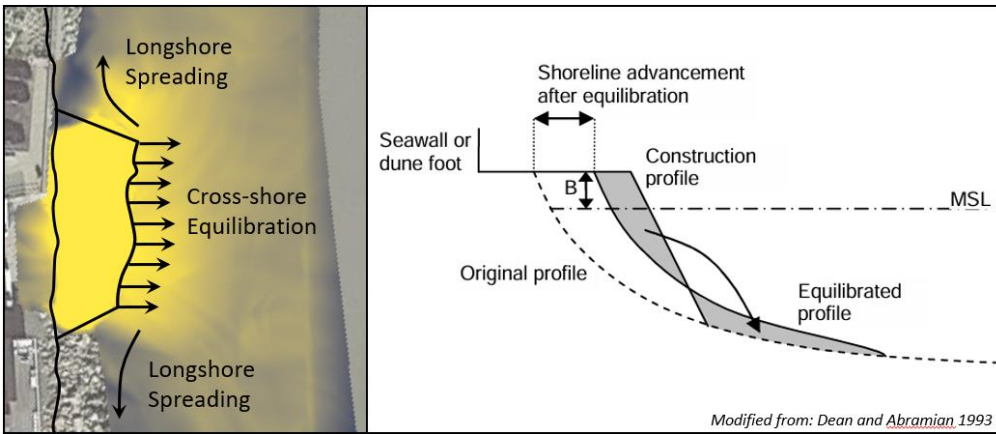


Figure 3: Plan view of material spreading from nourished area after the first week of construction (left), and a profile view of the typical equilibrating process of a beach nourishment (right).

It is important to note that this reshaping of nourishment material is an important natural process and indicates that the project is performing as designed. The sediment will also spread laterally to create a gradual and more natural transition to the existing beaches to the north and south. Although the appearance of the

nourishment will change dramatically, the majority of the material remains within the template of the nourishment area during short storm events. As an anticipated response, this reduces the amount of material that is needed in these areas of the nourishment template. Figure 4 shows how the spreading and redistribution of nourishment material elevated the surrounding beach during the first week of construction, contributing to the accelerated rate of placement during the next following week.



Figure 4: Beach elevation change from before nourishment (left), during the first week of construction (middle), and second week of construction (right). The red circle shows the partial burial of a specific rock in the revetment through natural spreading of the material and the complete burial due to placed nourishment material (source: SCS).

What to Expect

After construction is completed, it is normal for the newly nourished beach to readjust and change substantially within the first few months as the beach transitions to a more natural form. The slope of the beach is expected to change or 'equilibrate' to local coastal processes and seasonal conditions. In this context, the formation of a scarp or beach step along the berm is common as the slope adjusts. Additionally, the lateral spreading of material will continue, as beaches tend to favor smooth transitions and gradual changes rather than abrupt features and discontinuities along the coast.

Due to the dominant southerly direction of sediment transport along this section of the Scituate coast, it is anticipated that the beach south of the nourishment area will benefit and widen from material moving and being deposited in that direction. Elevation surveys taken after the first week of construction represent this general trend of placed material spreading to the south (Figure 5). The surveys show an increase in beach elevation along the profiles between the two placement areas and to the south of the nourishment. The amount of elevation increase begins to taper off towards the southern extent of the nourishment template. This increase in beach elevation is responsible for reducing storm wave impacts along this stretch of shoreline.

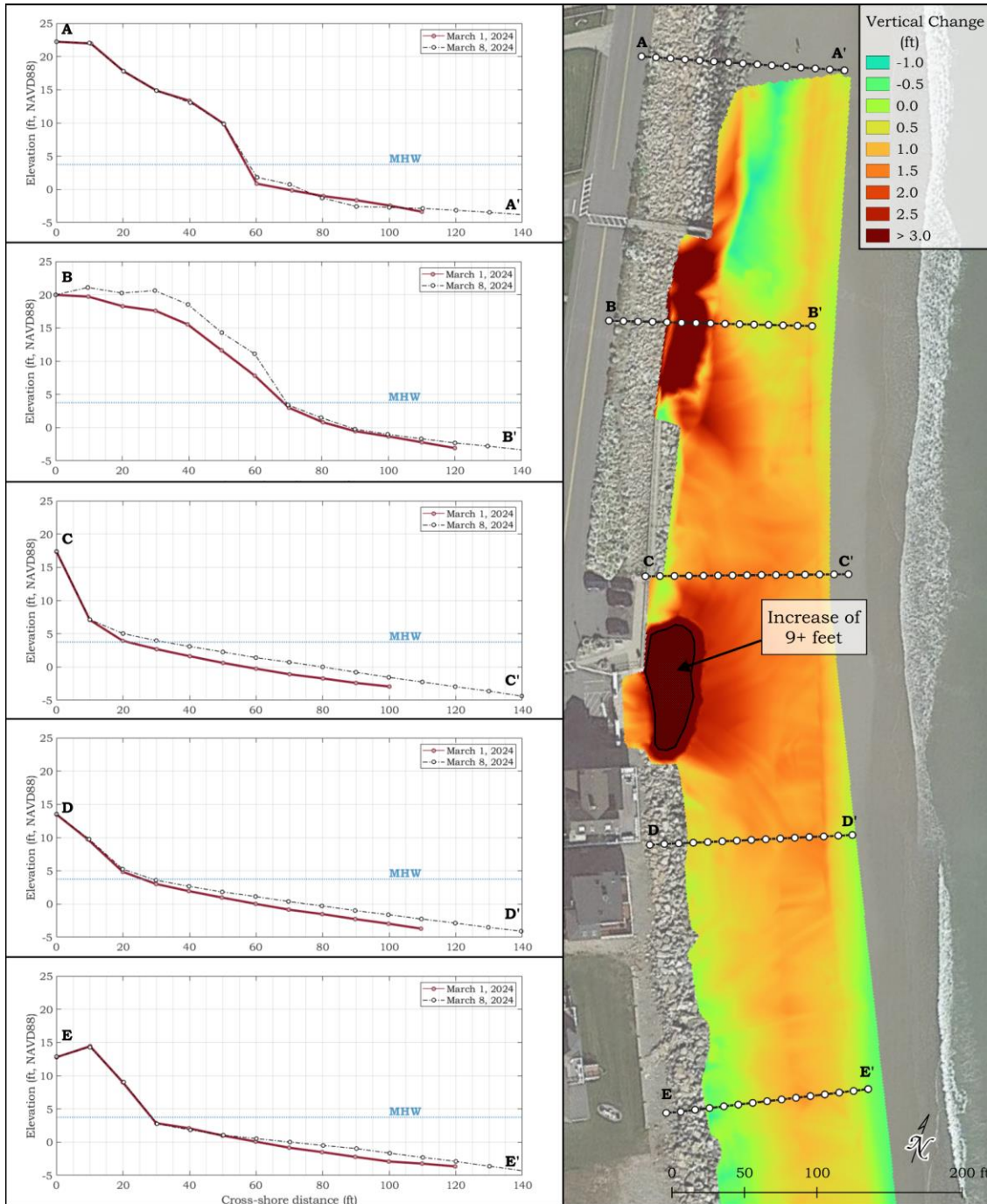


Figure 5: Colored heat map showing the change in beach elevation between surveys taken prior to nourishment and following the first week of construction (right), as well as profiles along the nourishment template showing the specific vertical change (left; source: SCS).