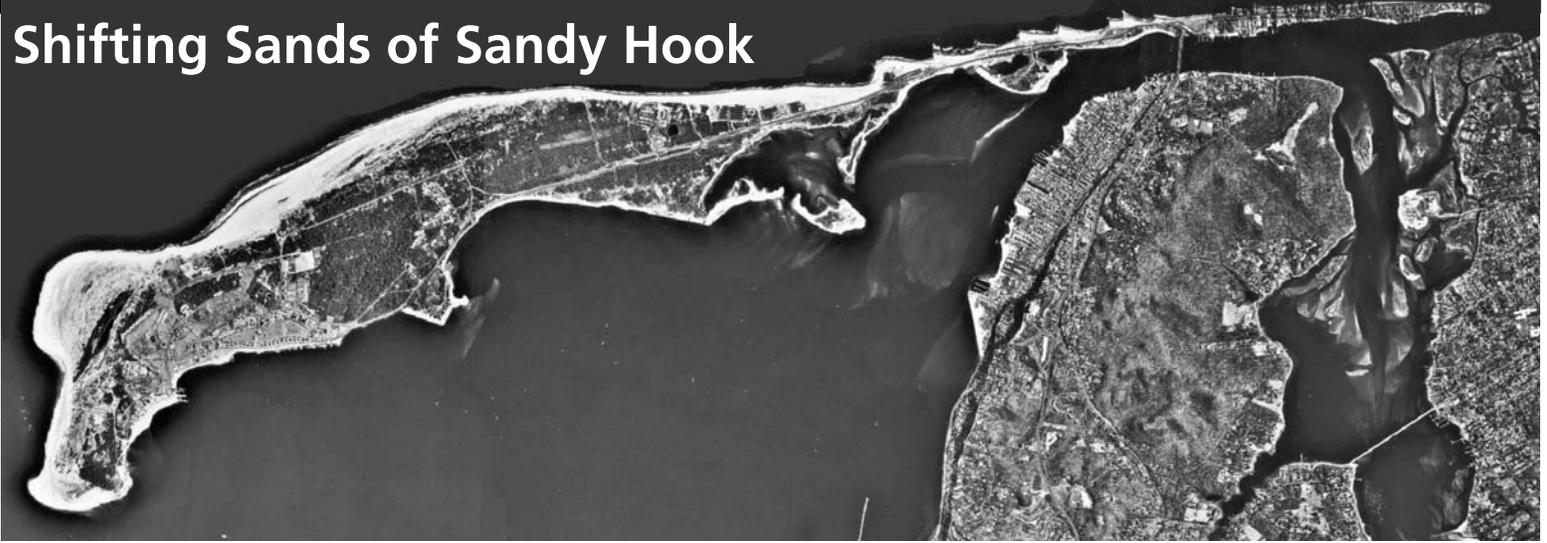




## Shifting Sands of Sandy Hook



### Land in Motion

Sandy Hook is at the north end of the 127 mile long New Jersey seashore. The Sandy Hook peninsula, like other barrier beaches, islands and sand spits along the New Jersey coastline, serves as a thin, fragile buffer between the mainland and the Atlantic Ocean. Wave action along the northern portion of the Jersey Shore moves ocean water in a northerly direction, creating what is called a longshore current. This current moves sandy sediments northward along the beach in a natural process called littoral drift.

### Shore Dynamics

Over several millennia the longshore current and littoral drift created Sandy Hook, which probably began as a small sand shoal extending from the Long Branch, New Jersey, area 6 miles to the south. The longshore current carried countless tons of sand and deposited it on the shoal until it became an elongated barrier beach peninsula that today are the towns of Monmouth Beach and Sea Bright. The peninsula terminates with the 6- 1/2 mile long barrier beach that is now the Sandy

Hook Unit of Gateway NRA. Long ago, as the SandyHook peninsula grew longer and wider, its southern end was occasionally broken by shallow water inlets, turning it into an island. Whenever longshore currents filled in and closed these inlets, Sandy Hook became a barrier beach peninsula again. This would last until the ocean flooded over the narrow beach neck, turning Sandy Hook back into an island. Today, Plum Island might possibly be a remnant of one of Sandy Hook's earlier barrier beach necks.

### Sandy Hook's North Tip

As the longshore current transported sand to the north end of Sandy Hook, it made the tip area curve or "hook" toward the northwest. An excellent way to measure the changes to the tip of Sandy Hook is to consider the Sandy Hook Lighthouse. When completed in 1764, the Sandy Hook lighthouse was 500 feet from the tip of the Hook. By 1864, the tip was over 3/4 of a mile from the lighthouse. Today, the lighthouse is about 1 1/2 miles from the tip. For many years, a natural, narrow, deep- water channel existed around the tip that sailing ships used to enter New York

Harbor. Channel dredging, which began in the 1880's and continues to this day, allowed larger ships to navigate the harbor. However, dredging altered the natural northwesterly growth of the Hook's tip farther out into the harbor. Also, periodic dredging probably affected the amount of sand flowing around Sandy Hook's tip that drifts along the Hook's bayside beaches. This situation, combined with natural wave action, tidal currents, and the construction of stone seawalls and wooden bulkheads on the bayside, has led to severe erosion problems by interrupting the flow of sand along the Hook's bayside beaches.

### Shoreline Management: Groins & Seawalls

Since the 19<sup>th</sup> Century, Sandy Hook's natural geological balance has been affected by human interference. The development of beaches south of Sandy Hook into popular resort towns had a direct impact on the Hook's shoreline. As early as the 1880s, people discovered that the ocean could wash away their beachfront property and the local, commercial railroad transportation line. In an effort to trap sand, build up their beaches, and protect their homes, shore towns built bulkheads, seawalls and groins.

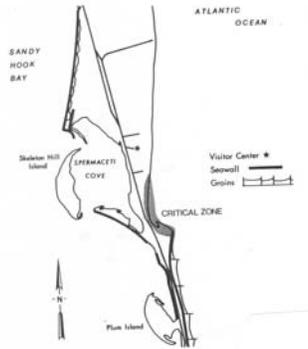
Groins (often called jetties) are relatively short walls built perpendicular to the beach that trap sand flowing north towards Sandy

Hook in the longshore drift current. Groins work well as long as there is a large supply of sand moving along the beach. The problem along the northern Jersey coast was an inadequate amount of sand compounded by the construction of the many bulkheads and seawalls built on beaches south of Sandy Hook. These artificial structures interrupt the natural flow of sand moving north and reflect wave energy so that sand is carried away from the shore. With less sand drifting along the seashore, groins build up and trap sand on their south sides, but their north sides experience accelerated erosion and are severely depleted of sand. With a reduced natural sand supply along the shore, a gradual beach erosion process

## Shoreline Management: Groins & Seawalls

began along Sandy Hook's south end that today is the southern portion of the park. Between 1863 and 1900 the U.S. Army constructed wooden and stone groins on the northern portion of Sandy Hook in an effort to build up sand at beach locations threatened with erosion. Granite "rip-rap" seawalls were also built around the Hook's tip in the 1890s to protect the army's new concrete harbor defense gun batteries. One of these seawalls can still be seen today lining the shoreline of North Pond, located on the ocean side of the old "Nine Gun Battery" at

North Beach. The focus of the army's fight against the sea shifted to the south end of Sandy Hook in the late 1890s. During the winter of 1896- 97 a violent Nor' easter broke through the beach neck that separated the Atlantic Ocean from the Shrewsbury River. The ocean destroyed a gravel road, threatened the army's long wooden elevated railroad trestle, and reopened a 2,700- foot wide shallow inlet. To close this breach, the army constructed a long massive rip rap seawall in 1898. The army later lengthened and reinforced this seawall to keep military operations functioning on Sandy Hook.



*The Critical Erosion Zone*



*Steel Wall at the Critical Zone*

## Shoreline Management and Sand Replenishment

The army's seawall prevented the ocean from making inlets, but the long stretch of ocean beach shoreline east and north of the 1898 rip-rap seawall gradually began to erode away. The erosion caused little concern being located on restricted army property. However, Sandy Hook evolved from military to public recreational use in the 1960s. Since that time, the accelerating beach erosion problem became a major natural resource issue because it severely affected public access and recreational opportunities.

In 1975, the National Park Service and Rutgers University initiated a research study of Sandy Hook's beach erosion problems. The worst area, from the north end of the seawall to Beach Area D was designated the *critical erosion zone*, where the beach and sand dunes were rapidly washing away. To replenish them, it was recommended that sand be pumped onto the critical erosion zone beach using a dredge pipeline. However, no action was taken, and ocean currents continued to erode this beach area. Two major storms in 1981 and 1982 finally undermined and destroyed a long stretch of the park's main road located in the erosion

zone. In 1983- 84, emergency funding provided for a sand replenishment project and the rebuilding of the park road, but by 1988 ocean currents had washed most of this sand away. During the fall of 1988, a steel bulkhead wall was pile- driven into the sand next to the main road to provide a buffer of protection until another sand replenishment project was conducted in 1989. After this project ended, the longshore currents continued to wash much of the sand north to the Gunnison Beach area of Sandy Hook. By 1996, the critical erosion zone had returned once again.

Beach erosion and sand replenishment projects are not confined to just Sandy Hook. In 1994 a long term sand replenishment project was begun to build up and maintain the eroded beaches south of Sandy Hook. A noticeable result of this project at Sandy Hook has been the build up and widening of the beaches at the Hook's south end along Beach Area B. Because the long term effect of these gains are uncertain and the critical erosion zone still loses more sand than it gains, the National Park Service is looking at alternatives to traditional, temporary replenishment projects.

## Alternatives

An alternative being considered by the park is the construction of a permanent slurry pipeline. This pipeline would take sand that has been transported by the natural force of the longshore current to the north end of Sandy Hook, and return, or recycle, it back to the Hook's eroding south end. In this way the critical erosion zone could be replenished with sand every few years to help maintain a wider beach area, and a more stable, constant shoreline. However, the effects of placing,

constructing, and maintaining such a pipeline might impact adjacent natural resources. The park has been working with other federal and state government agencies to study the effects a slurry pipeline would have on the Hook's marine and coastal ecology.

In the meantime, no matter which alternative is chosen to deal with beach erosion, one thing is certain; ocean currents continue to move the sands of Sandy Hook.

## For more information:

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**EXPERIENCE YOUR AMERICA**

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